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New Life for a Pierson KE-93

Part 2 of 3.

Part one of "New Life for a Pierson KE-93" discussed the power supplies that were sold as companions with the receiver during the 1957 era. All of the identified problems that I had discovered were also listed, and each will be discussed in the appropriate section as we proceed.

The objective of my involvement with this receiver project stemmed from an early fascination with Pierson receivers, even though I'd never used one. Perhaps the compact design captured my attention, since this receiver was physically different from competing receivers of the period.

Again, let me emphasize that the Pierson KE-93 ham band communication receiver was ahead of its time in design technology and performance (see **Photos A** and **B**). During the early 1950s era, Standard Coil developed a turret tuner for the front end of TV sets that revolutionized the industry. Until the advent of the turret tuner, channel frequency stability and poor RF sensitivity were very common problems. Service technicians had a real battle on their hands attempting to fix TV problems — then along came the Standard Coil turret tuner and we all sighed with relief at last.

Pierson took advantage of the Standard Coil–style TV tuner design and placed one in the front end of the KE-93 (see **Photo C**). As a result, the RF lead lengths were shortened considerably and the coil Q factor was increased, improving both RF sensitivity and input selectivity (see **Photo D**). Of course, the mechanical stability

***Photo A.** Front panel view of the Pierson KE-93 communications receiver.*

***Photo B.** Rear cabinet view of the receiver showing the connectors.*

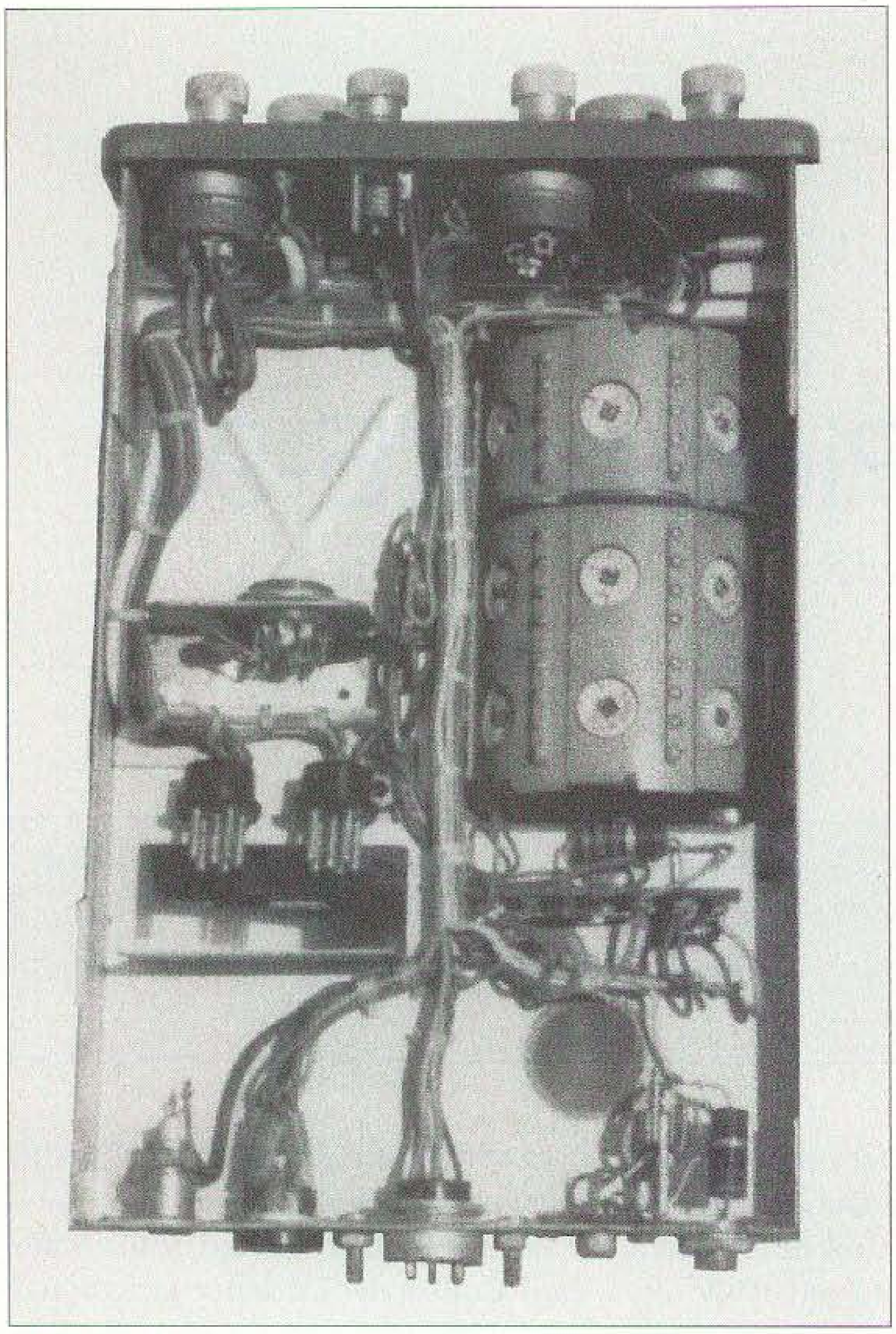

Photo C. Inside bottom view of the receiver showing the wiring harness and the coil turret.

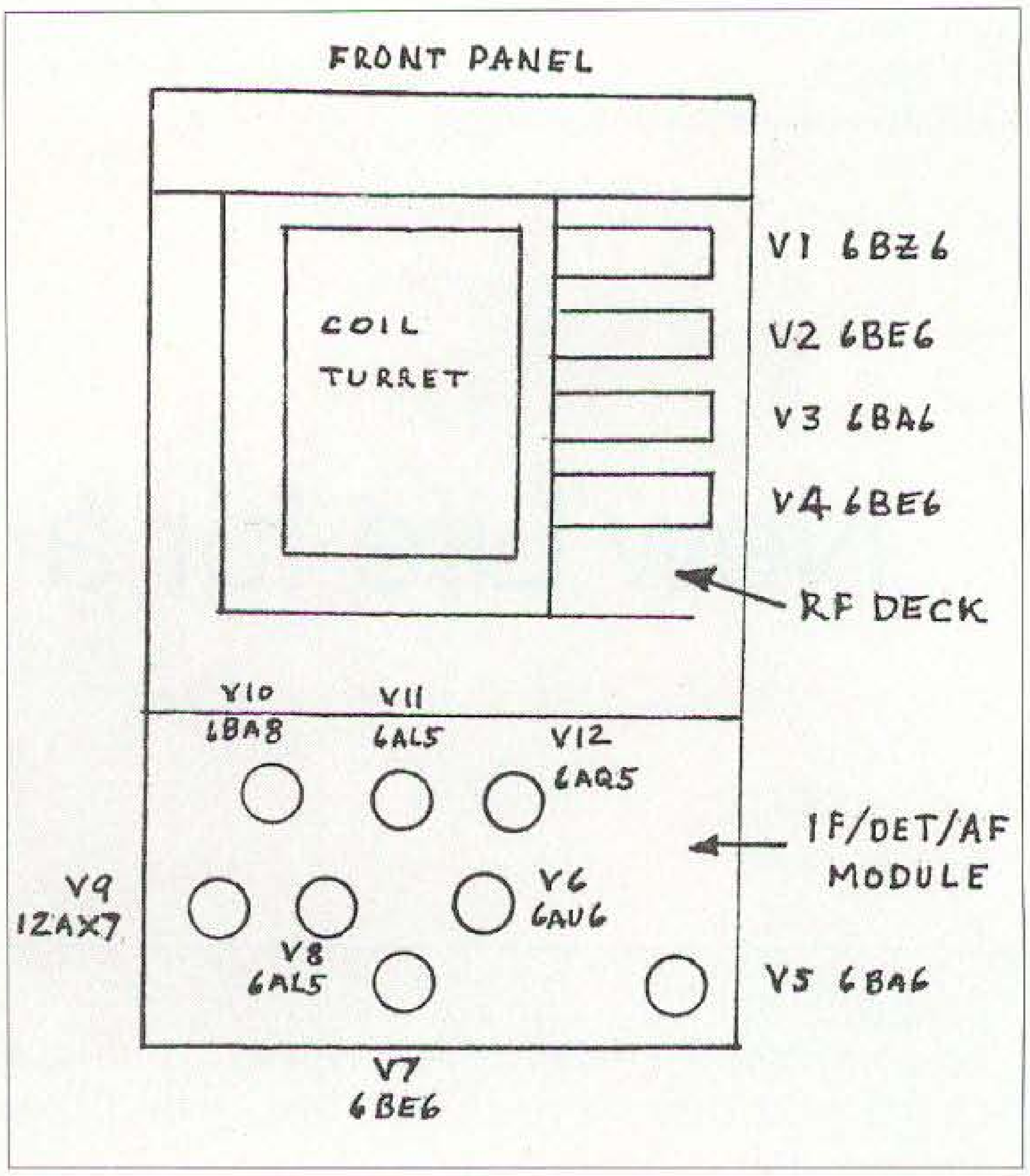

Fig. 1. General layout of the Pierson KE-93 receiver.

of the front end was vastly superior to competitive receivers.

Another mechanical advantage engineered into the KE-93 was a partial modular design. **Fig. 1** shows the general layout of the receiver. The entire IF detector, noise limiter, squelch, and audio were packaged into one small module and placed on the back porch of the receiver. When mounted, the IF system was fully RF shielded, protecting it from stray RF noises and signals.

One disadvantage of the compact design was aftermarket troubleshooting. Because of the modular design and the way things were mounted, a technician could not easily measure voltages at the socket of the IF tubes. Only the front-end tube sockets pins were readily accessible for voltage measurements.

As noted in **Photo E**, all of the resistors used in the IF module are mounted on a terminal strip running the length of the chassis. Therefore, checking resistor values in the IF module is reasonably easy. Nearly all of the disc ceramic capacitors are accessible for changing should that be necessary. But to measure voltages at the tube socket pins, an independent test station with a power supply would be preferred. **Table 1** shows the resistance values that I measured at the socket pins of each tube within the receiver. Tube basing diagrams shown in **Fig. 2** provide a function reference as an aid during troubleshooting.

Photo D. Inside top view of the receiver showing the dial drum, coil turret connections, and compact design. Note the short lead lengths used in the front end.

Receiver

Having not previously looked inside a Pierson receiver I felt it was necessary to work up a signal path diagram, as shown in **Fig. 3**, so that I'd be able to examine and troubleshoot the receiver should repairs be required. During this part of the analysis, I discovered that the KE-93 is a double conversion receiver for the 80–10 meter bands and single conversion for broadcast and 160 meters. Conversion switching takes place by activating two microswitches with a lobe on the coil turret. Two switches are required, with one of them switching the signal from the first mixer into the second mixer or bypassing the second mixer and going straight into the IF. The second switch selects output from either the second mixer or from the first mixer.

Once I got the receiver operating, I measured the conversion frequencies and found the IF centered at 265 kHz. The crystal used in the oscillator of the second mixer operates at 2.465 MHz, causing the output from the first conversion to be 2.200 MHz. At 2.200 MHz, the image is pushed out to 4.4 MHz away from the desired input signal, reducing the amplitude of any image signal to something negligible. With the image on the high side of the input signal, it is further reduced in amplitude.

A further analysis of the IF module revealed that the noise blanker circuit is very similar to the Lamb design. During the 1950s era, noise limiters used in most ham receivers were of the series and/or shunt pulse noise gate types. Although quite effective, there was always a noise "stump" remaining after being clipped, and this residual noise stump was audible. In addition, when listening to an AM signal, some peak audio clipping took place and the user could actually hear distortion on the resulting audio signal.

Using the Lamb design, there was an increase in noise rejection as well as the elimination of all audible distortion as a function of noise blanking. Audible noise stumps were eliminated because no noise stumps are produced by the system. **Fig. 3** shows the design features of the noise blanking system used in the Pierson KE-93. A tuned circuit operating at 265 kHz feeds a noise amplifier whose output is rectified to a DC voltage value. The amplitude of the DC voltage is a direct function of the noise level within the IF signal path. Once developed, the noise-generated voltage is fed into the last IF amplifier, causing an instantaneous reduction in stage gain during the noise duration period. A damper diode was added to the KE-93 circuit to prevent an overcompensation as a result of noise pulses.

Squelch was another feature designed into the KE-93. I'm not aware of any other 1950s AM ham band receiver that had squelch. Of course, it was easy to implement in the KE-93 once noise rectification was performed as it is typically done in the modern ham and commercial FM radios. White noise within the IF path decreases as a function of the received signal strength. Utilizing that feature, the derived DC noise voltage is used to control an audio gate. A pot on the front panel of the KE-93 allows the

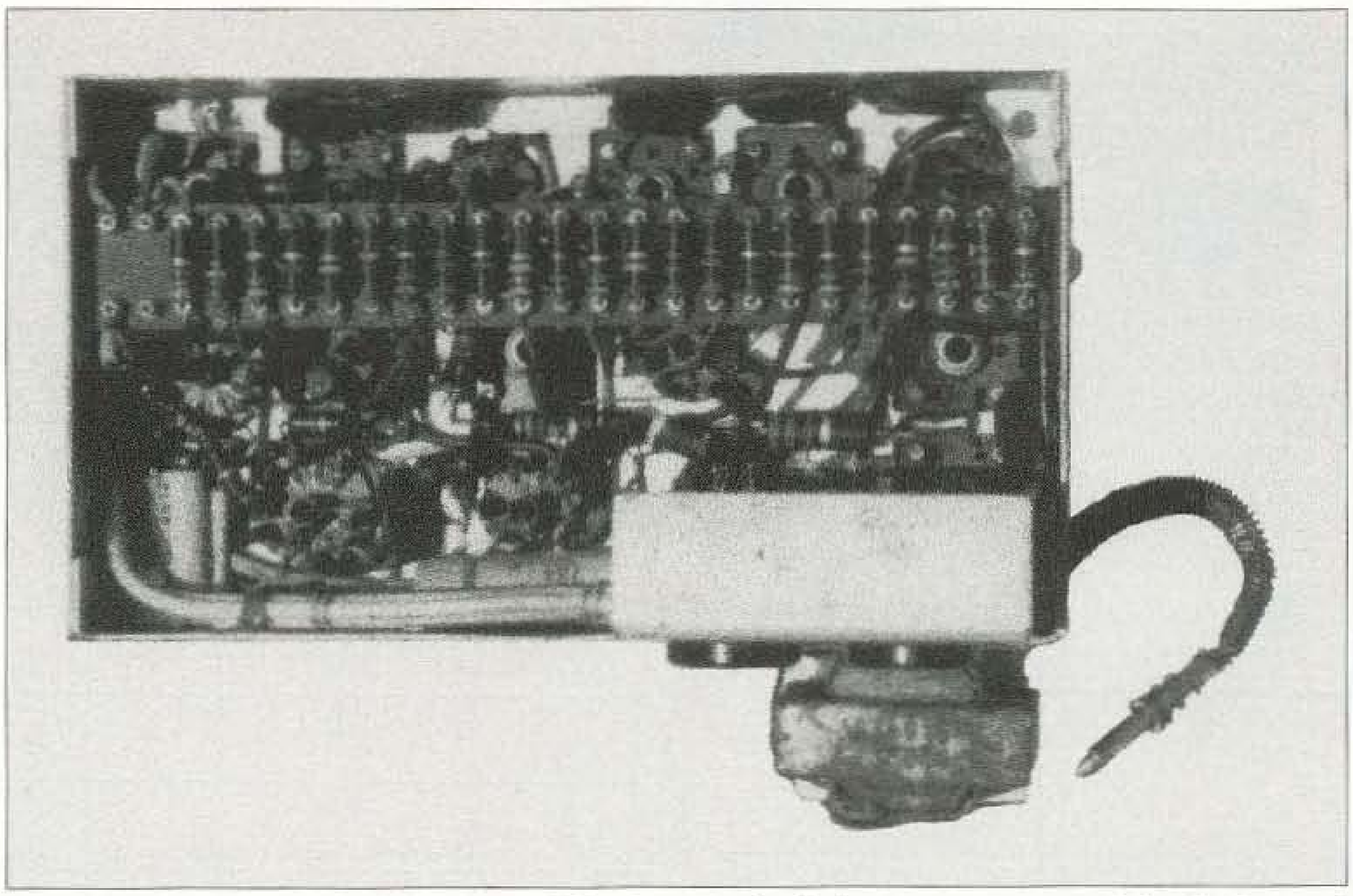

Photo E. *Bottom view of the IF module showing both the compactness of the design and the availability of the resistors for troubleshooting purposes.*

	Tube Pins								
Tube	1	2	3	4	5	6	7	8	9
V1 6BZ6	180	0	—	—	15k	95k	0		
V2 6BE6	55k	500	—	—	8k	51k	0		
V3 6BA6	17k	0	—	—	9k	32k	0		
V4 6BE6	49k	600	—	—	14k	110k	∞		
V5 6BA6	∞	0	—	—	65k	38k	∞		
V6 6AU6	0	0	—	—	65k	120k	300		
V7 6BE6	∞	1.7k	—	—	65k	120k	470k		
V8 6AL5	0	1M	—	—	1.6k	0	270k		
V9 12AX7	173k	∞	∞	—	—	∞	48k	0	—
V10 6BA8	∞	∞	1M	—	—	∞	5M	60k	60k
V11 6AL5	1M	470,	—	—	0	0	470k		
V12 6AQ5	470k	330	—	—	60k	60k	470k		

Table 1. This chart shows the resistance measurements that I obtained from one receiver. Resistance values for the IF module were taken with the module removed from the receiver.

user to select the signal threshold for squelch operation.

Dial cord

After getting power applied to the receiver, I had started to perform some tests, when the dial cord jumped out of one of the pulley grooves. So what happens now! Upon examination of the situation I found the compact design was actually a hindrance to working with the dial cord. I hesitate to think of having to replace the dial cord, but decided it would be proper to prepare for the event should it occur. **Fig. 4** shows the dial cord stringing pattern that can be used as a guide should replacement become necessary.

Here is what happened: As I rotated the tuning knob from the low frequency position toward the high frequency end of the dial, the cord jumped off of one of the idler pulleys. Getting the cord back over the edge of the pulley without nicking the cord was a real challenge requiring an abundance of patience. I ended up using a pair of thin, long-nosed pliers to stretch the cord's tension spring end toward the opening on the tuning

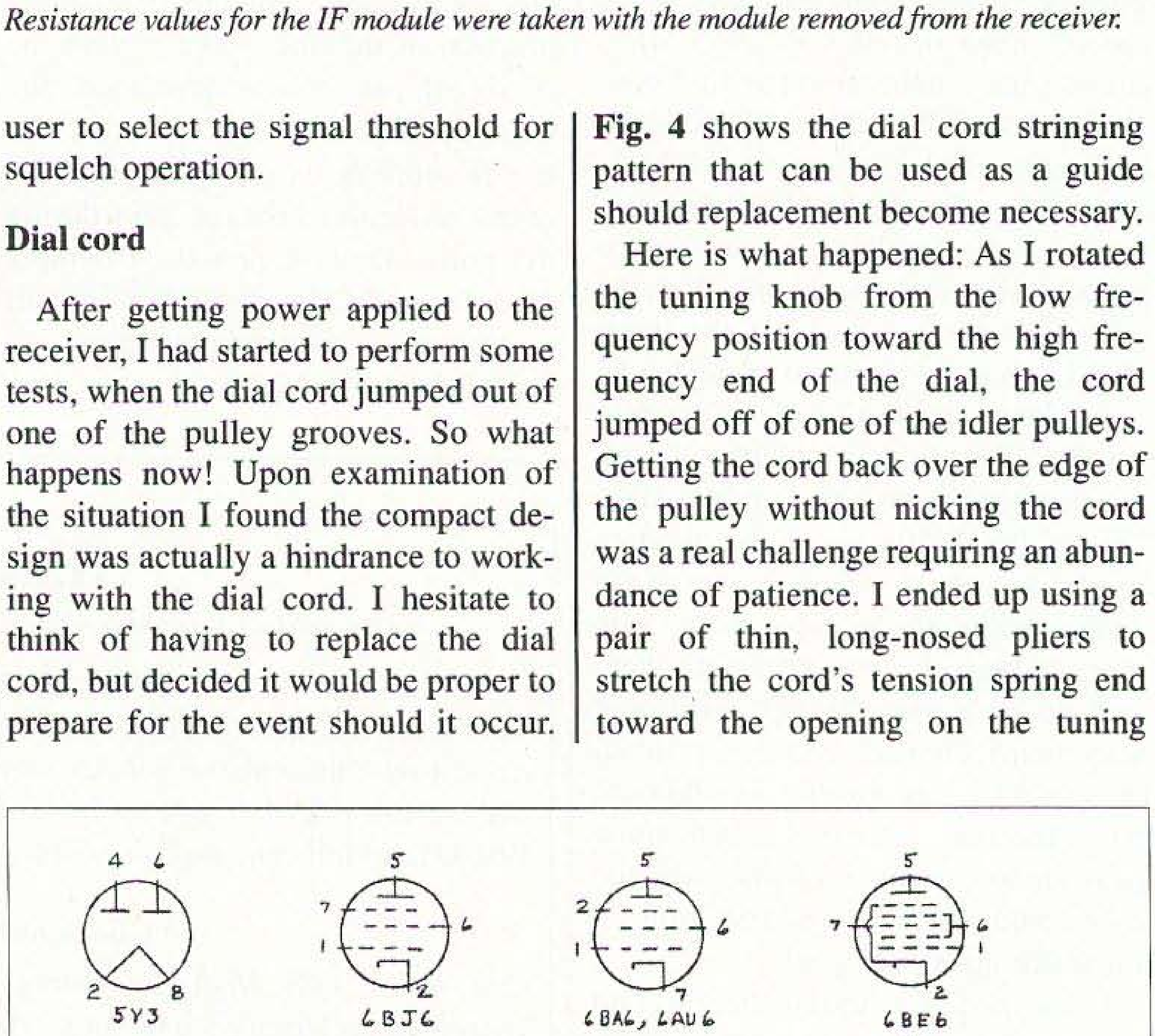

Fig. 2. Basing diagrams for all of the tubes used in the KE-93 and base power supply.

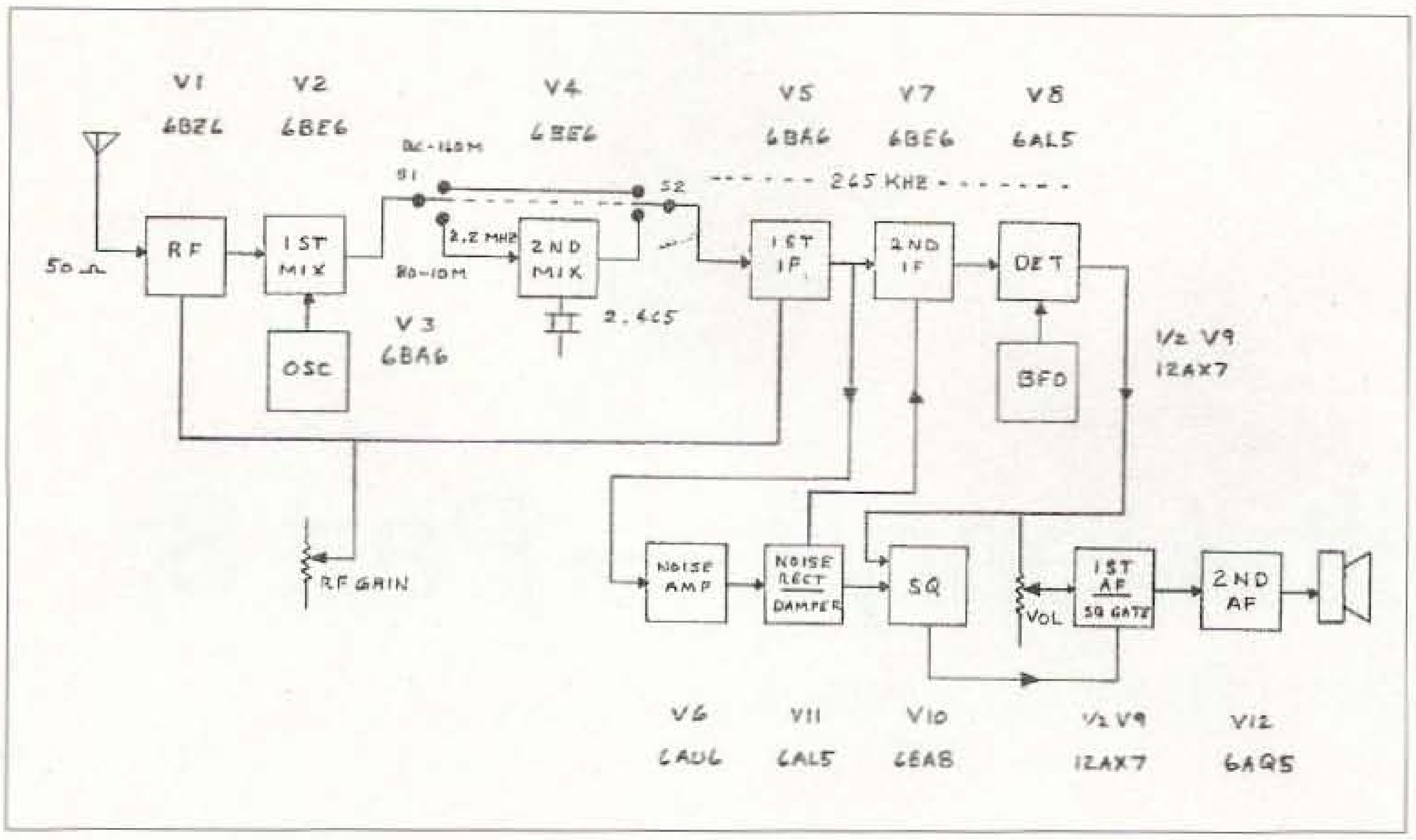

Fig. 3. Block diagram showing tube functions and the signal path for the Pierson KE-93 receiver.

drum. This action provided sufficient slack in the cord such that I eventually managed to place the cord where it belonged.

Of concern during this operation was that the spring, pulley, or dial cord should incur no damage. Holding and pulling on the cord to slide it over the edge of the pulley was pretty tricky since I had only a smooth, thin-shafted screwdriver and a round toothpick as working tools. Later, I realized that I could probably have used a paper clip stretched out with a small hook formed on one end. Hopefully I'll never have to find out if that would work.

The biggest problem was the lack of working space for the pliers, my hands, and the toothpick. It was at this point that an abundance of patience was required. There was a loud sigh of relief when the cord dropped over the edge of the pulley. But now I thought

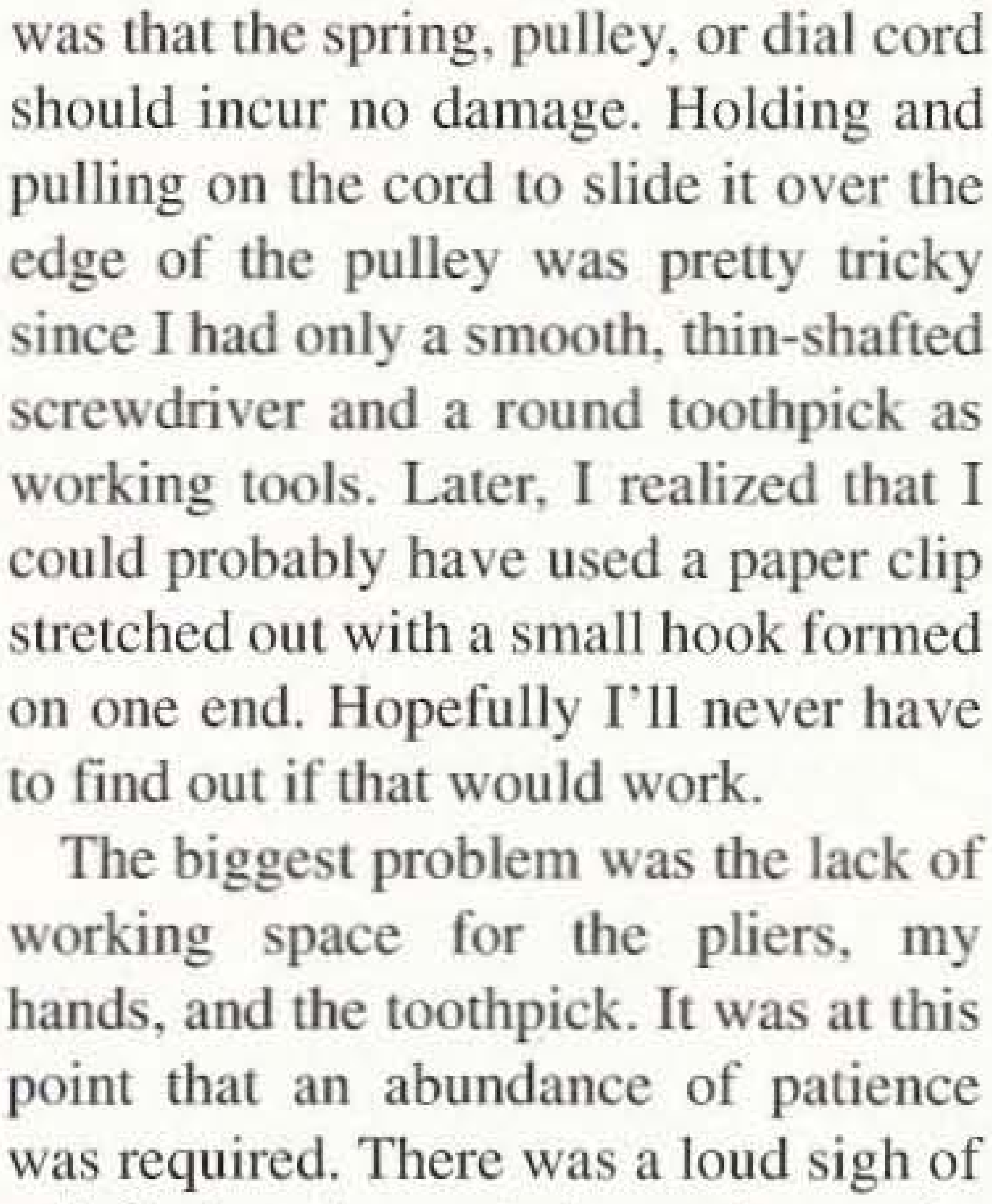

Fig. 4. Dial cord stringing diagram for the KE-93 receiver. The arrow points to the pulley most likely to cause the cord to jump.

about having to repeat the process, unless I took the necessary action to prevent it from happening again.

With the cord in place, I carefully rotated the tuning knob while watching the pulley shown with an arrow in **Fig. 4**. As the knob was rotated, the dial cord walked along the knob shaft away from the pulley, causing the cord to ride up and over the edge of the pulley. Of course, I stopped rotating the knob once I detected the problem situation. How to "fix" the problem was the real question. Through observation I noted that the knob shaft was badly corroded, causing the cord to stick to the shaft when some slippage would be normal. I also noted that the edge of the pulley was corroded and that the corrosion was grabbing the cord and lifting it up to the pulley's edge, allowing the cord to jump over.

The following indicates the steps that I took to alleviate the cord-jumping situation:

(1) The accumulated rust and corrosion on the knob shaft had to be removed, but the dial cord was in the way. Yet, the shaft needed to be polished without damaging the cord. To gain access to the majority of the shaft, I rotated the dial to one end of the band, allowing the dial cord to walk toward one end of the shaft and exposing nearly half of the shaft. Using a pencil eraser, I worked on the exposed corrosion until the majority was either removed or polished. Rotating the knob shaft in the other direction walked the dial cord to the other end of the shaft, providing access to the corrosion on the other half. While rotating the knob shaft, I made sure the cord stayed within the pulley groove because I didn't care to repeat the cord stringing operation.

(2) While working on the knob shaft, I noted that the edge of the pulley was corroded and needed to be cleaned. The pencil eraser didn't seem like an appropriate tool, so I used my fingernail as a file. Rotating the knob shaft caused the pulley to rotate, allowing the edge of my fingernail to scrape along the inside edge of the pulley. Nearly all of the roughness was removed after a few minutes of that action.

(3) To reduce the tendency for rusting and to lubricate the dial cord's path, I used a small amount of beeswax. The wax was rubbed onto the knob shaft, into the pulley grooves of all pulleys, and along the dial cord where it rode in the pulleys.

The "fix" appeared to stop the tendency for the cord to ride up and over the edge of the pulley, and I've had no further trouble with the cord.

Next steps

Part one of this series examined the Pierson KE-93's companion power supplies and began the preparation for power application to the receiver. Part two continued the preparation and began addressing some of the identified problems, including the jumping dial cord. At this point in the process, the receiver was not yet operational.

Part three will continue my experience with the Pierson KE-93 receiver and the steps that were taken to make it operational. Included will be discussion on how it was tested and how well it performed. 73