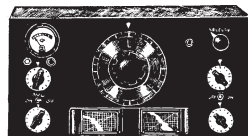


THE COMMUNICATIONS RECEIVER



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The 1927 Pilot Wasp Receiver

By Barry Williams, KD5VC, email: barrywilliams@nov.com

In this third article in the "Wasp" series, author and historian Barry Williams discusses the first of the sets, the original Wasp. Readers who are tempted by this little receiver, can find additional background information in the Paul Bohlander (W3VVS, SK) article in the January 2006 issue.

Barry also places this set in the context of the 1920s, the engineering standards and practices of the time, and the components available. (W2DGB)

Amateur and Communications Receivers in the 1920s

In the March, 1926 issue of *QST* there is an article about the "Old Reliable" receiver, and being curious about what an "old" receiver design would be in 1926, I went to the article. To my surprise the receiver included a regenerative detector followed by two stages of transformer-coupled audio. If this is the "Old Reliable," what later developments were made that did not survive into the 1930s?

Starting at the time of the First World War, amateur operators were given the 600-meter spot frequency, while special stations were allowed to work above, and sometimes below, this frequency. By the mid-1920s the amateur service had been given the harmonically related bands of 1.75 to 2.0 MHz, 3.5 to 4.0 MHz, 7.0 to 8.0 MHz, etc.

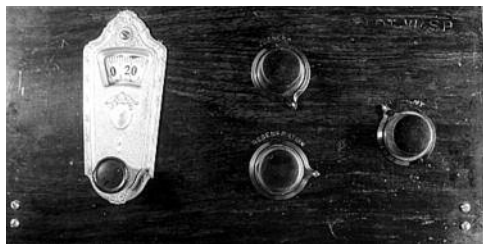
Looking back to this era, we see TRF receivers, a few superhets, and the popular Brown-ing-Drake with its advanced coils that surpassed the popular coil designs of the period. In addition to the "low-loss" coil designs, we see super-re-

generative receivers, and also reflex circuits, which used a single tube to amplify both the RF and audio frequencies.

So-called "low-loss" coils were often wound on basket weave forms and tied with string. The diameters were fairly large, and anything touching such a coil could distort it. If you had one of these coils, and built a frequency chart to show frequency vs capacitor setting, then removed the coil, when you plugged it back in you needed to start over.

A few coil designs used very small strips of collodion or a similar material to hold the turns in place in an attempt to stabilize these frequency shifts. (Collodion is made by dissolving nitrocellulose [guncotton] in ether and alcohol; when dry it makes a tough clear plastic sheet.) In 1927 the "low-loss design" period was ending, and the poor mechanical designs for coils were being replaced by coils wound on forms.

Many of the forms were made of a phenolic resin filled with wood dust (also termed wood flour) and cured by steam drying. The water content of the wood dust was highly variable,



The Pilot Wasp.



Wasp interior with coilset. One coil is installed in radio.

and led to equivocal results; the forms in some cases would expand considerably with increases in ambient humidity. Eventually other materials were used as fillers, such as the ground mica used in National's "R-39" molded parts. The Hammarlund Comet Pro actually used ceramic coil forms.

It should be noted that frequency standards were not easily available, and receiver frequencies were calibrated from a few BC stations or harmonics of BC transmitters.

We should also take a look at the receiving tubes available in the mid-1920s through to the end of 1927. These were triodes, primarily the 199, 200, '01A and '00.

The '00 was a soft tube used only as a detector, while the '01A had a hard vacuum, a relatively large grid-to-plate capacitance, and the ability to withstand the higher plate voltages needed for amplifying signals. These tubes also had directly heated cathodes, requiring battery power.

For broadcast use the capacitance had to be "balanced" out, something that was later called neutralizing. In the BC band, one example would be the Browning-Drake style coil with the UV-199 tube. The '01A could be used, but "balancing" was more difficult. The neutralization of the existing triodes over the short-wave bands was basically not possible.

The tuning systems of this era were varied widely. Some used three separate coils: one for the primary, one for the tuned secondary, and a third, the feedback coil. Some systems used a small variable capacitor in series with the antenna lead to the primary, which was fixed in relation to the secondary. The feedback (regeneration) coil was also fixed in position, with feedback controlled by a "throttling" condenser.

The Twin-Coupler Co. of Poughkeepsie, NY, produced a series of coils that covered the short-wave range. These were wound on a ribbed cylindrical coil form, with one end of the form closed by a flat plate carrying five pins in the standard layout for five-pin vacuum tubes.

This firm also made the Wasp coils, covering five frequency ranges, each with a different colored pull ring. Each had three windings on the ribbed form. Ranges were 17 to 30 meters (red), 30 to 52 meters (orange), 48 to 105 meters (yellow), 93 to 203 meters (green), and 200 to 500 meters (blue).

The coils that the writer has have darkened a great deal over the last 83 years. One set has apparently spent most of its life in the original box. The yellow ring is now brown. The green and blue rings have a tint of the original color, but are

almost black. There is no mention of the Pilot Co. on the coil box. However, the coils do appear in a Pilot catalog, and we think that Pilot purchased the Twin Coupler Co. in the late 1920s.

Introducing the Pilot "Wasp"

Pilot advertised itself as "the world's largest manufacturer of radio parts." In 1927 they introduced the Pilot Wasp as a new receiver kit. Pilot supplied a pre-drilled front panel, chassis and chassis supports made of phenolic board. The front panel markings—including the Pilot name and identification of the regeneration controls and filament rheostat—were stamped in gold. Unfortunately, the stamping appears to have been done by hand, with varying pressure, as some parts of the lettering stand out, and some letters only have parts of the original decals.

The circuit of the Wasp is very straightforward for a regenerative set. It uses three type '01A tubes, including a regenerative detector with a pass capacitor and a grid leak. The antenna is brought in through a 15 pF variable capacitor to the top of the secondary for short antennas, or to the primary for long antennas. The secondary is tuned by a 140 pF variable capacitor controlled by a fixed-ratio drive.

The signal at the plate of the detector tube is fed through a pair of 100 pF variable capacitors in parallel. One of these is set to either full capacitance for the BC band or to minimum for the other bands. The other is used to throttle the signal to bring the detector into oscillation for CW signals, and to just below oscillation for voice signals.

The output of the detector is fed through an RF choke to the first audio transformer, from this transformer to the first audio tube, and from there to the second transformer and the final audio tube. In order to stop "fringe howl" a high value resistor is added from the grid of the first audio tube to the negative filament line.

The radio uses a six-volt battery for the filaments, controlled at 5.0 volts by the filament rheostat. The plate voltage is taken from a pair of 22.5-volt batteries and a 45-volt battery.

The plate of the detector can be set at 22.5 or 45 volts, depending on the way it goes into oscillation. It appears that the various '01A tubes had widely varying performance. If all else failed, Pilot recommended changing out the detector tube until one was found that went into oscillation smoothly. The full 90 volts are used on the two audio amplifiers, with the second audio tube getting its plate voltage directly through the headphones.

The 1927 Wasp has been described as a toy. For one thing it lacked a tuned RF stage. However, even the most advanced receivers of that time had only an untuned RF amplifier to reduce the radiation from the detector and to match impedance. Almost any amateur, up to the end of the decade, would have felt quite at home with this little set.

Once the Wasp was on the market and selling well, Pilot decided to manufacture a short-wave converter for broadcast-band receivers. The Wasp Converter was simply a Wasp without the audio stages. The owner would remove the detector tube from his broadcast set and plug the cable from the converter into the detector socket. This provided the voltages for the converter, and the signal for the audio stages in the BC set. The operation was the same as for the Wasp, and same coils were used.

The Wasp Coils

The coils for the various Pilot models are very similar in appearance. The forms are virtually identical and all are wound with green DSC wire. When "orphan" coils are found, the question of identification arises. If the coil has three windings it is for the Wasp or the converter. A coil with a single winding is the RF amplifier coil for the Super Wasp, and a coil with two windings is for the detector of the same set.

There is one exception. The BC band coil for the RF amplifier has two windings. If the small winding is on the top, it's the RF amplifier coil. If the small winding is on the bottom, it's the detector coil.

The ribbed forms are approximately 1½" across the ribs. The overall height is about 3⅞", and pins are about ⅝" long, the coil body is 2½", and the ring extends ⅜" above the coil form.

Receiver Copies

You may find a home-made receiver using the distinctive Twin Coupler black coils with green wire, and sometimes these sets have almost all Pilot parts with the exception of the dial, the



The Wasp Short-Wave Converter.

front panel, and the chassis. About a year ago I found one of these copies. The dial mechanism was by National. The tuning capacitor, not a Pilot SLF type, had been shortened to get the correct capacitance. The sockets and transformers were mounted on a piece of unfinished pine, and the front panel had been used at least once before.

On the other hand, included were the antenna coupling variable capacitor, the regeneration capacitors, the grid leak clips and the grid leak, and the coupling capacitor sockets for the tubes and coil. Three good globe-type '01As were in the sockets. The two audio transformers were by General Radio.

There were four original Wasp coils, including the BC coil, and the price was quite low. It appears that not as many of the Wasps survived as did the Super Wasps, and a complete original unit with all Pilot parts is difficult to find. A couple of the home-brew sets using some Pilot parts may provide enough to duplicate the original. (Refer to the 2006 article mentioned in the Introduction.)

The Pilot company continued in operation into the era of television. Receivers produced after the Super Wasp featured band-switching superheterodyne circuits, but there does not appear to be a lot of interest in the later Pilot products, with the possible exception of the early television sets.