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QST Issue: Nov 1962
Title: Simple Three-Band Preselector for 20, 15 and 10, A
Author: Lew McCoy, W1ICP

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• Beginner and Novice

A Simple Three-Band Preselector for 20, 15 and 10

How To Improve the Performance of Your Receiver

BY LEWIS G. McCOY,* W1ICP

A look through the Ham-Ads in *QST* or through your local radio store will show that there are quite a few used receivers available, many at quite reasonable prices considering what they cost new. A Novice or beginner would be wise to consider such receivers for his first one. Many of these older receivers have excellent tuning mechanisms and provide good bandspread, and some even have crystal filters to improve selectivity. However, there is one disadvantage in that while these older receivers do a good job on 80 and 40 meters, their performance sometimes suffers on the higher bands, 20 through 10. Usually the sensitivity and image rejection are poor. The lack of sensitivity is due to the poorer performance of older tubes and circuit components as compared with their modern counterparts. The poor image rejection was an inherent trouble with many of these receivers because they used a low intermediate frequency (465 kc.) for a conversion frequency without having enough selectivity in the front end to overcome the image problem.

This article describes the construction of a simple regenerative preamplifier for the 14–30-Mc. range. When the preamplifier is added to one of these older receivers, the receiver performance is improved considerably on the higher bands. The additional gain will enable you to boost up the weaker signals and at the same time will provide a great deal more image rejection.

A preamplifier like the one described here is merely an additional radio-frequency amplification stage which is built on its own chassis. The receiving antenna is connected to the preamplifier and the output of the unit is fed into the antenna-ground terminals on the receiver. Any signals coming in on the antenna are first amplified in the preamplifier before reaching the receiver. The fact that the preamplifier uses a tuned circuit in its input also helps the over-all selectivity, thereby reducing image response.

Preamplifier Circuit Details

The circuit for the preamplifier is shown in Fig. 1. In order to keep the cost down, there is no power supply built into the unit, as it is easy to take the power from the receiver; more about that later. However, some amateurs are reluctant

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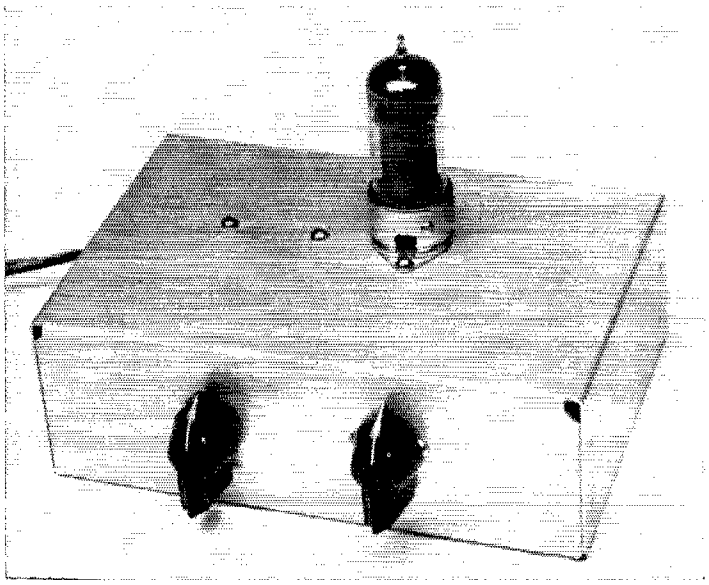


This is a view of the completed preselector. The knob at the left is for C_1 and the one at the right is for C_2.

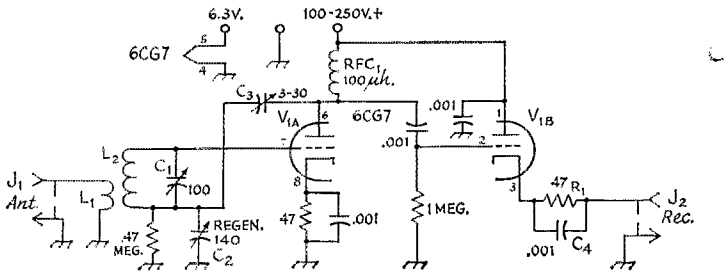


Fig. 1—Circuit diagram of the preamplifier. Resistances are in ohms; resistors are ½ watt. Fixed capacitors are 0.001-μf. disk ceramic.

C_1—100-μμf. variable (Hammarlund APC-100-B).
C_2—140-μμf. variable (Hammarlund APC-140-B).
C_3—C-30-μμf. mica compression trimmer
C_4—0.001-μf. disk ceramic.
J_1, J_2—Phono jacks.
L_1, L_2—See Fig. 4.
R_1—47 ohms, ½ watt.
RFC_1—100 μh. (National R33, Millen 34300-100).

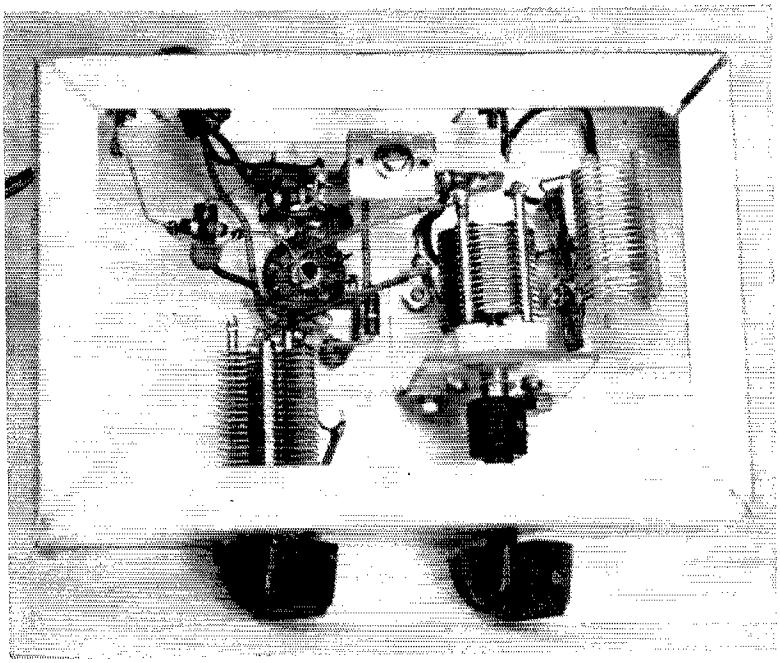
to make any soldered connection to a receiver, so for those of faint heart we have provided the circuit of a simple power supply that will run the unit.

The r.f. stage of the preamplifier is one half of a dual triode, a 6CG7. L_1, the input link, is coupled to L_2, which is tuned by C_1. The range of the L_2C_1 combination is from a frequency slightly below the 14-Mc. band to a little higher than 30 Mc.

The most gain and selectivity can be achieved when the r.f. stage is operated just below the point of self-oscillation. In this circuit, C_2C_3 provide the feedback to make the stage regenerative. C_3 is set so that regeneration and oscillation can be controlled by C_2.

Output from the r.f. amplifier is fed to the second section of the triode, which is operated as a cathode follower. The cathode follower isolates the preamplifier from the receiver. Without it, any adjustment of the front end of the receiver, such as the antenna trimmer, might cause the preamplifier to break into oscillation. Output from the cathode follower is coupled to the receiver via C_4.

The power supply (if needed) is a half-wave type. (Fig. 2) The filter consists of $C_1R_1C_2$. D.c. voltage out of the filter is approximately 130 volts. If you take the voltages from your receiver, the preamplifier can be run on any voltage between 100 and 250 volts d.c. Current requirements are only a few milliamperes. The heater requirements are 6.3 volts at 0.6 ampere. This can easily be taken from any receiver having a power transformer. The reason we say power transformer is that some of the cheaper receivers connected the heaters of five or six tubes in series across the a.c. line. In such a setup it would be impractical to try and get the power from the receiver. Getting the d.c. voltages from such a receiver is also not recommended because it could be dangerous; the power supply of a transformerless receiver is not isolated from the a.c. line.



The coil assembly is mounted alongside C_1, in the upper right corner in this view. C_1 is mounted on the polystyrene plate and an insulated shaft extender is used to bring the shaft out to the chassis front.

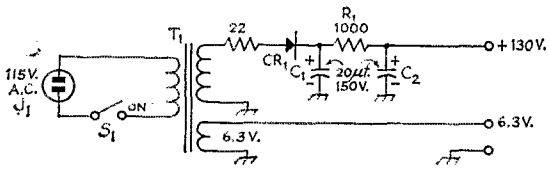


Fig. 2—Diagram of a power supply for the preamplifier. Resistances are in ohms, resistors are 1 watt.

C_1, C_2—20-μf., 150-volt electrolytic.
CR_1—Silicon rectifier, 400 volts p.i.v., 200 ma. (International Rectifier 2E4).
J_1—A.c. line plug.
S_1—S.p.s.t. toggle switch.
T_1—Power transformer, 125 volts, 15 ma., 6.3 volts, 0.6 amp. (Stancor PS-8415).

Also, if the unit is used with such a receiver, it is necessary to have a d.c. ground return for the cathode of V_{1B}. This can be accomplished by installing an r.f. choke, the same type as RFC_1, between the output side of C_1R_1 and chassis ground.

Construction Details

The preamplifier is built on a 2 × 4 × 6-inch aluminum chassis. All the components are mounted below deck except the tube. The shafts of C_1 and C_2 are brought out to the front of the chassis. The tube socket is mounted 2½ inches in from the front of the chassis and 2½ inches in from the side as viewed from the front. C_2 is mounted on the chassis front with its shaft 2 inches in from the chassis side.

C_1 must be insulated from the chassis, so it should be mounted on a piece of polystyrene or bakelite sheet. A full-sized template for this sheet is shown in Fig. 3. The sheet is supported by a metal bracket which is mounted to the chassis. The bracket is one inch long with a ⅜-inch lip and is the same width as the sheet (see bottom view).

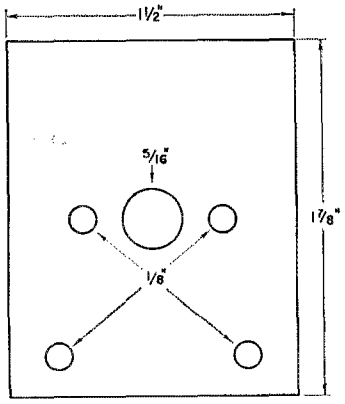


Fig. 3—Template of insulated plate for C_1 mounting.

The neutralizing capacitor, a 3–30-μμf. trimmer, is mounted on a terminal strip. The coils L_1 and L_2 are made from a single length of Miniductor coil stock, and the assembly is mounted on a terminal strip. Details for making the assembly are given in Fig. 4. This assembly is mounted alongside C_1 near the rear of the chassis. The two phono jacks used for the input and output connections are mounted on the rear of the chassis.

The power-supply leads — three are required — are brought out the rear of the chassis through a rubber grommet. One lead is for the plus B, another is the 6.3-volt heater lead, and the third is a ground lead.

Some receivers have an auxiliary power output and if so, the preamplifier power leads can be connected to it. The voltages available can be determined from the receiver instruction manual. If there is no such outlet, the leads must be connected to points that will provide the necessary voltages. Usually the easiest place to find the plus B line is at the output side of the power-supply filter. You can also check the circuit diagram in the receiver manual for additional help in locating a power take-off point. The 6.3-volt line can easily be identified by checking the pin connections on one of the receiver tubes against the circuit diagram. If you don't have a diagram, you can look up the base connections for any of the receiver tubes in the tube charts in the *ARRL Handbook*.

The ground lead from the preamplifier should be connected to the receiver chassis ground. Be sure the receiver power is off before making any of these connections.

Adjustment Procedure

Connect an antenna to J_1, and also connect J_2 to the antenna terminal on the receiver through a length of either RG-58/U or RG-59/U. Don't make the coax line any longer than necessary. Tune your receiver to the 14-Mc. band and turn on the receiver (and converter, if it has its own supply). Next, turn on the b.f.o., and then tune C_1 through its range. Listen for a loud rough signal which indicates the preamplifier is oscillating. If the preamplifier stage doesn't oscillate, slowly decrease the capacitance of C_2 and re-

(Continued on page 154)

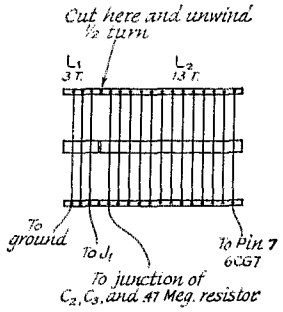


Fig. 4—Drawing of the L_1L_2 coil assembly. The assembly is made from a single length of B & W Miniductor coil stock type 3007, ⅝-inch diameter, 16 turns per inch, No. 20.

Hmmmmmm . . . sloppy fist might of sent a NN for a C. Small matter. Concentrate on the big picture. Make it WIAW. Guy never gave me his handle . . . some of them ops . . . oh well, every little point counts . . ."

"Now, where's that Explanation 'cut out'? Keep the rules handy. 'High man in each section gets a certificate' . . . wonder what color? . . . And so it's back to the fray . . . and . . . 'Once again dear friends into the breach . . . God for Harry, Englaaaannnnnnd and Saint Georrrrrrrge' . . . eqsscqss" QST

Simple Three-Band Preselector

(*Continued from page 44*)

check with C_1. If you cannot find a setting that causes the unit to oscillate, you'll have to change the setting of C_3 by loosening the screw. Be sure to use an insulated screwdriver or else turn off the power before making this adjustment. Find a setting of C_3 that causes the unit to oscillate with C_2 set at minimum capacitance, plates fully open. Once you have this setting, slowly increase the capacitance of C_2 until you reach the point where the unit stops oscillating. Now slowly tune C_1 until the background noise peaks up. Tune in a signal with the receiver and then repeak C_1 and C_2. Once you find the correct setting that gives the most gain you probably won't have to change the setting of C_2 across the band. However, it will prove necessary to repeak C_1 as you go across the band.

Switch your receiver to tune the 15-meter band and follow the same procedure in tuning up with the exception of the adjustment of C_3, which doesn't need to be changed once set properly on 14 Mc. The same procedure also holds for 10 meters.

You'll probably (and we hope) be pleasantly surprised how this little unit will put some snap into your receiver. QST

November, 1937

. . . This issue carried results of the 5th annual ARRL Field Day. It was a big success, as some 642 individuals had participated. The Egyptian (Illinois) Radio Club established a new Field Day record by making 204 QSOs.

. . . Technical articles included the description of a 10-watt speech amplifier by Grammer, a new i.f. amplifier system of high selectivity by Miles and McLaughlin, dope on rewinding an auto generator to make a 110-volt emergency generator, by W6JTV, a complete 100-watt deluxe phone-c.w. transmitter by W6DUW, and miscellaneous hints and kinks for the experimenter.

. . . Antennas were big in this issue. W6AM (hmmmmm, that call sounds familiar) told how to make the most of directive antennas (ah, yes, he still is). W6AAR (J. N. A. Hawkins) discussed the problem of figuring how long is a quarter wavelength, taking into account the velocity of propagation on antennas and transmission lines. W2JOA covered that perennial problem, match and mismatch of antennas and transmission lines. And there were a couple of pages of notes on steatite insulation and its properties.

(*Continued on page 156*)