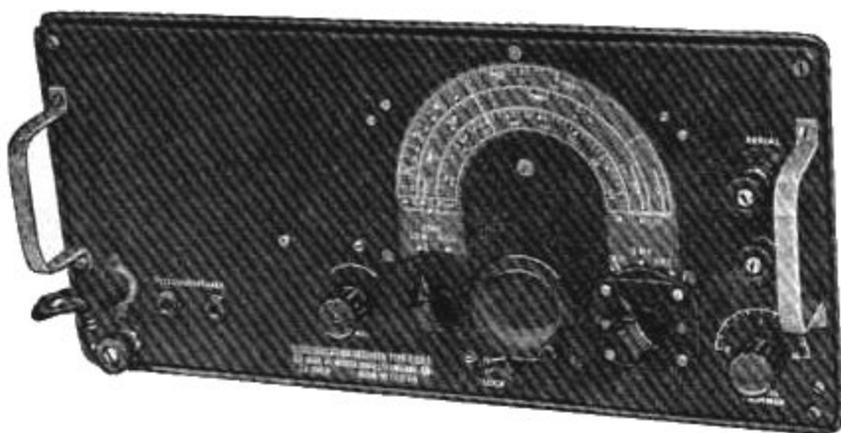


Mods to the PCR

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THE well-known surplus receivers, types PCR, PCR2 and PCR3, are very good value for money but fall short of being true communication receivers in three respects; selectivity, band-spread and lack of a b.f.o. However, their solid, stable and spacious design is capable of worth-while development. This article describes some simple inexpensive modifications which provide a b.f.o. and greatly improved selectivity, bringing the PCR more than half-way to being an acceptable communications set. The further addition of a crystal controlled front end converter, such as those described in the ARRL handbook and others, would bring the PCR nearly all the way and at a total cost still below that of a "real" surplus communications receiver.

FIRST STEPS

The first necessity, if the set is a PCR or PCR2, is to substitute a band covering from 50 to 200 metres for the existing long-wave band. Sets of "trawler-band" coils for this purpose are available commercially.* The PCR3 already covers the necessary range.

The next step is improvement of selectivity. This is simply done by increasing the "Q" of the i.f. stages by regenerative feedback, achieved by bringing the i.f. amplifiers near to, but just short of self-oscillation by introducing capacity between the anode and grid of each i.f. valve.

SIMPLE MOD

Figure 1 shows two simple modifications. The anode of each i.f. valve is connected to a four or five inch length of screened cable with the screen earthed. The other end of the cable has the screen removed for about an inch, leaving the insulated inner conductor protruding. This protrusion is led to a point about a quarter of an inch from the grid cap of the same valve. When close enough, the valve will oscillate. In the case of the first i.f. the point chosen is a little short of producing oscillation, and is anchored with tape or other means. In the case of the second i.f. the inner is anchored near enough to make the valve oscillate. The point of oscillation is then controlled by a 5k Ω variable resistor in the cathode line to earth. This gives variable selectivity. It behaves similarly to the reaction control in a

straight set, but is much more stable and controllable.

The 5k Ω control can be mounted on the panel. A convenient place is vertically above the a.f. gain control. The original bias resistor stays in the cathode circuit as does the by-pass capacitor. The moderately improved selectivity in the first i.f. stage combined with judicious use of the oscillation control of the second stage gives a remarkable improvement.

This arrangement can also provide a somewhat vigorous b.f.o. action by turning up the oscillation control and short-circuiting the a.v.c. line to earth. A 50pF variable capacitor can be connected across the last i.f.t. primary, preferably through a capacitor in series, to block off the h.t., the i.f.t. dust core being detuned to compensate. S.S.B. signals can be received quite well, but the arrangement compromises both gain and selectivity.

The full capability can be realised with a simple transistor b.f.o. built in a tobacco tin and mounted horizontally under the chassis, bolted to the mixer stage coil box. The circuit is shown in Fig. 2. At this frequency almost any arrangement of the components inside the tin is acceptable, provided the coil is made accessible for tuning its dust core. The 9 volt supply is provided by a potential divider from the 200 volt h.t. and decoupled with a 50 μ F electrolytic. A double pole on-off switch is mounted on the panel of the PCR. One pole switches the b.f.o. on by connecting the h.t., and the other shorts the a.v.c. line to earth simultaneously.

The coil is made from a spare 465kc/s dust core

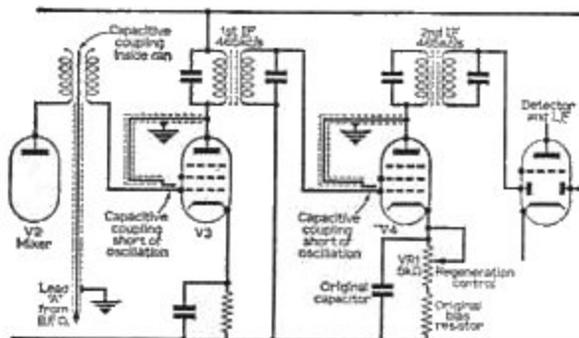


Fig. 1: Simple method for increasing the selectivity of the i.f. stages.

* Repanco

★ **former.** Remove the secondary entirely and the coil former close to the primary. Wind one-third of the turns from the discarded secondary on top of the primary to make a tightly coupled transformer. If there is a fixed capacitor across the primary leave it alone. The coil should be firmly fixed in the tin with a hole for mounting the slug. The writer pushed the coil former into a hole punched in the base of the tin and secured it with epoxy resin not forgetting to remove the wax. A half-cylindrical depression can be made at the base of the tin and the OC45 transistor laid in it. Over it, is placed a short strip of aluminium foil and this is held down with sticky tape. This heat sink contributes to the stability of the oscillator, which, in practice is surprisingly good. Note that the tin is earthed and forms the negative connection for the 9 volt line. This allows the b.f.o. tuning capacitor to have one side earthed. This capacitor should be of 50pF maximum to swing the b.f.o. frequency sufficiently up or down from the 465kc/s central frequency. It is mounted on the front panel where convenient. The high-low tone control switch on the PCR might be discarded to make room. Simply cutting the wires results in the "top cut" condition. This is the opposite of what might be expected because the tone control is in the negative feedback line. Capacitor C2 is the padding capacitor in the b.f.o. tuned circuit. It may exist already in the converted i.f. transformer, but if not, it may be necessary to experiment during lining-up to find the right value to restore the resonant frequency of 465kc/s.

COUPLING

The b.f.o. output is taken from the collector of the OC45 by a screened cable about nine inches long. The last four inches have the screen removed and the insulated inner wire is pushed up through a hole in the bottom of the first i.f. transformer. This gives sufficient capacitive pick-up. The output of the b.f.o. is low to achieve stability and is not sufficient to be fed to the detector stage.

LINING-UP

Check the voltages on the transistor. The total should be 9 volts with about 1 volt between transistor base and the positive line. Remove the mixer valve in order to stop the local oscillator. Switch on the PCR and close the double pole b.f.o. switch. Tuning the dust core slug should produce carrier wave noise in the loudspeaker. The i.f. regeneration control previously described may be advanced to make the second i.f. valve oscillate. A strong beat note will be heard and can be varied in pitch by means of the b.f.o. tuning capacitor. Failure to hear the b.f.o. oscillate, provided the circuit is correct, will be due to either the leads on the coil secondary winding being the wrong way round, or insufficient or too much capacitance across the tuned coil. To check, remove the fixed capacitor C2 and substitute a 250pF variable. When the right value is found re-substitute with an equivalent value capacitor and adjust the slug with the lid of the tin closed.

Set the main b.f.o. tuning capacitor to exactly half-way and tune the slug to obtain zero beat. The b.f.o. is now oscillating at 465kc/s. Tuning the b.f.o.

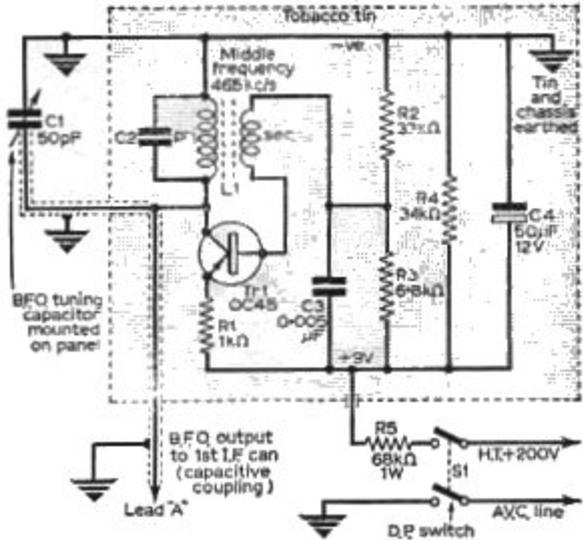


Fig. 2: Simple transistor b.f.o. suitable for use with the PCR. Note: there is no battery, the unit drawing power from the h.t. line and R4 should be 3kΩ.

capacitor clockwise to increase capacity lowers the beat frequency for receiving upper sideband and vice versa.

Turn back the i.f. regeneration control and replace the mixer. This b.f.o. does not, in practice, swamp the a.v.c. as the i.f. regeneration oscillator undoubtedly does, but it is preferable to short out the a.v.c. simultaneously with b.f.o. operation to obtain greater sensitivity. If very strong s.s.b. signals overload the receiver, the main tuning trimmer at the bottom right corner of the panel can be used effectively as an r.f. gain control. It would now be prudent to re-align the i.f.t.'s.

★ components list

Resistors:	Capacitors:
R1 1kΩ	C1 50pF variable.
R2 33kΩ	C2 see text.
R3 6.8kΩ	C3 0.005μF
R4 3kΩ	C4 50μF 12V electrolytic
R5 68kΩ 1 watt.	
VR1 5kΩ pot.	

Miscellaneous:
465kc/s i.f.t. (L1), d.p.d.t. switch (S1), chassis and case, OC45 transistor, wire, solder etc.

Once lining-up has been completed there is no further call for the ability of the second i.f. stage to oscillate. To prevent perplexity should the regeneration control be accidentally advanced it is worth while screwing a stop into the panel at the point of maximum Q short of oscillation. One b.f.o. at a time is quite enough! ■

Readers might be interested to know that the last article on the PCR appearing in PRACTICAL WIRELESS was PCR Mods by W V Woods, June 1965 issue. Unfortunately this issue is now long out of print, but readers might try their local libraries since some of the larger ones do keep bound volumes of our magazine. We cannot supply any copies of this issue and mention this for reference purposes.