Making A Good Transceiver Even Better

A few simple mods make the Atlas 180/210/215 series transceivers more flexible and convenient for both s.s.b. and c.w. work.

BY JOHN SCHULTZ, K3EZ

THE Atlas series of transceivers has certainly opened up many new operating possibilities for both mobile and portable operation. The transceivers have all the basic features one could need, especially for s.s.b. operation, but like any good thing, further improvement is still possible. This article summarizes first of all, the factory service bulletins which have come out on the 180 family. These are not described in any detail since they are available from Atlas, but many Amateurs might not be aware of their availability. Then, various ideas and modifications are described in detail which can improve the versatility of the transceivers. Some are no-hole modifications while others require the mounting of new controls or switches on the front panel.

One shouldn't be afraid of "operating" on the front panel if it is done with care. Fortunately, all the front panel controls and switches are screw-fastened or shaft-nut-fastened so one can remove the whole front panel rather easily. A new front panel can be purchased and installed later whenever one might want to remove some modification and restore the unit to its original condition. All of the modifications described are applicable to the entire 180/210/215 series unless otherwise mentioned.

Service Bulletins

Bulletin 1: Discusses power output variations between units and reasons why they exist. Procedure to adjust power output level if below specs in c.w. mode.

Bulletin 2: Self oscillation in transmit mode, especially when working into reactive loads. Describes re-routing of coax to PA enclosure. Applicable to units below serial 2300.

Bulletin 3: Reduced sensitivity on 10 and possibly 15 meters. Describes changing of v.f.o. transistors and retuning of 10/15 input circuits. 210 units only.

Bulletin 4: Describes installation of i.f. and image suppression traps. Not usually needed but if one is going into an unusually strong signal density area, such as portable in Europe, the traps might be worthwhile.

Bulletin 5: Various small modifications to improve a.g.c. action and c.w. keying waveshape.

None of the above Service Bulletins presents any major modifications to the 180 family. Unless one has experienced difficulty with a 180/210/215 series transceiver in any of the specific areas mentioned, it generally is not necessary to pursue the matter further. The Atlas Co. seems, however, most willing and cooperative to be of help when needed. Requests for Service Bulletins should be addressed to: Atlas Radio, Mr. Clint Call, W6OFT, Customer Service Manager, 417 Via del Monte, Oceanside, Calif. 92054.

Parts for the modifications involved are available on a very nominal or no-cost basis. The best thing to do when contacting Atlas is to mention which Service Bulletins seem to be applicable and to give the *model* and *serial* number of the transceiver involved.

Portable Power

Any source of 12 volts that can supply about 8 amps. continuous and 16-18 amps. peak can be used as a portable power source. Obviously many different sorts of batteries can be used and one can sometimes find good buys in nic-cad batteries from surplus houses. The use of nic-cad's with a 7.5 amp./hr. rating will allow full power operation. An available battery pack which has been tested with

many 180 family units is the Globe-Union GC-1200 rechargeable power pack. It is not a nic-cad unit but a completely sealed gelled electrolyte type of battery supplying 12 volts at 7.5 amp./hr. It comes complete with a case (6½" × 6½" × 4") and a.c. charger and makes for a really compact power source. It is available for about $60 from many supply houses (Burstein-Applebee, for instance) and will work for several hundred charge/discharge cycles. Its one big disadvantage is that the charger will burn up on 50 Hz so don't take it overseas! The author learned this the hard way and inquired of the company if a few more cents couldn't be spent on transformer iron in the charger to make it truly portable for 50/60 Hz operation. No reply.

How long you can operate with the pack depends on the transmit/receive time ratio. Under normal s.s.b. usage it will last about 2 hours per charge at full power. This time can be considerably extended by turning down the mic. gain in s.s.b. or in c.w. (for latter mode mic. gain becomes carrier insertion control) once initial contact has been established.

Whatever portable power source is used, note that the 180 family power output varies quite a bit with the supply voltage. At 13.6 volts (the spec. voltage) output is 80-100 watts. At 11.5 volts it drops to 55-70 watts. At exactly 12 volts it is 62-77 watts.

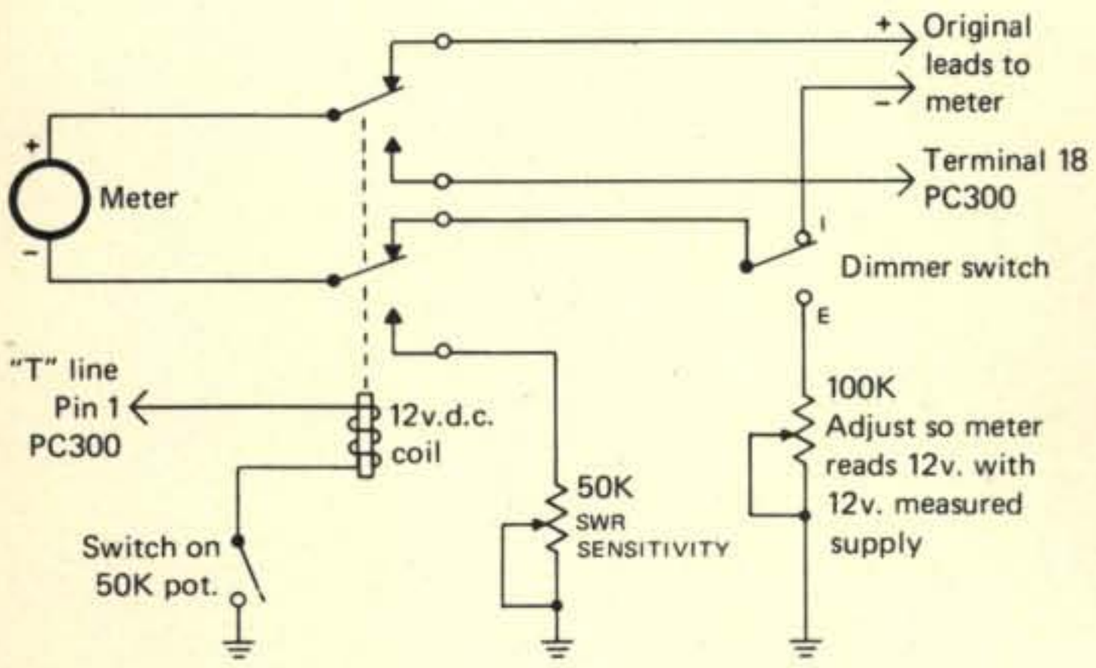

Fig. 1—Circuit to allow front panel meter to function additionally as a voltmeter to read supply voltage and as a meter to read the reflected power output indication of the built-in s.w.r. bridge.

Dimmer Switch Modification

One of the simplest but very useful modifications is to get a little more use out of the dimmer switch. In most installations, it isn't necessary to have two levels of dial illumination available. So wire in the desired level and this will free the dimmer switch. Figure 1 shows an arrangement where the panel meter is used in a switching arrangement so it functions, as normal, as an S meter in receive but in transmit can be used to measure supply current, voltage or reflected power from the built-in s.w.r. bridge. This supplies a lot of useful information since the output power is very dependent on the supply voltage and s.w.r. It also eliminates the need for an external s.w.r. bridge if a matching network is used since one can tune it simply for minimum reflected power. The scale on the panel meter is perfect for voltage measurement since it is already calibrated for a 0-16 range.

A relay is used to switch the meter for the s.w.r. function. A surplus crystal-can relay is ideal for this purpose and draws very little current (10-30 ma). The relay can be mounted in any location, one convenient spot being on the bracket behind the meter. A switch on the sensitivity pot for the s.w.r. function is used to activate the relay. The former dimmer switch is used to switch between voltage or current measurement. The 100 K series multiplier pot can be a PC type mounted by the switch. The sensitivity pot (a miniature ⅝" dia. transistor radio replacement type available in most radio supply houses) is mounted in a hole drilled between the a.f. and r.f. gain controls. Used with a small knob, it will not interfere with use of the controls. One can, of course, wire the dimmer switch alone for voltage/current measurement and forget the s.w.r. function if desired.

The s.w.r. Sensitivity control knob is located between the a.f. and r.f. gain controls at the lower left side of the Atlas front panel. The panel light dimmer switch is used for meter switching, while the panel lights are permanently wired for the desired brilliance.

CW Monitor

Figure 2 shows a simple but effective c.w. sidetone oscillator. It can be mounted on a small PC board behind the a.f. output jack on the rear panel of the transceiver. Because it takes its power from the +c.w. line, it is only activated in the c.w. mode. The output level is sufficient for loudspeaker or headphone operation. An adjustable output level is often convenient to have and a 1K miniature pot for

this purpose can be mounted on the rear panel just above the "neg.gnd" socket.

Receiver Incremental Tuning

This is probably the single most desirable feature that the 180 family lacks. Many schemes were tried to install RIT that would be effective and yet not upset the good frequency stability of the v.f.o. One problem is that different oscillator ranges are used on different bands and so it is almost impossible to derive a simple RIT scheme that would have exactly the same frequency range on all bands. A compromise arrangement was finally made which is relatively simple and which provides a tuning range of about ± 1.5 kHz on 80 meters to ± 5 kHz on 10 meters. This range is still more than enough to prevent leap-frogging.

Figure 3(A) shows the RIT circuit. A relay was used, although a more complicated electronic switching scheme is possible, because small crystal-can relays are very compact, reliable and inexpensive through surplus outlets. A Varactor diode and series fixed 24 pf capacitor are connected from the collector to ground of Q_{401}, the v.f.o. oscillator stage. The fixed capacitor must be either a silver mica or NPO type. If one carefully examines the v.f.o. PC board in the area of Q_{401} there will be found some unused connection points. These can be utilized to mount the added components on the PC board. The manner of mounting is not critical except that all components should be rigidly soldered in place and the 1 meg resistor should be as close as possible to the junction of the Varactor and the 24 pf capacitor.

Tuning is accomplished by a miniature 100 K pot (with switch) mounted on the front panel to the right of and below the mic. gain control. It is the only room left on the right side of the panel to mount a pot but the location is a convenient one for operating purposes. A small lamp can be mounted above the tuning pot to indicate when the RIT function is active. The connection points for the coil of the relay were chosen so that during transmit the relay will always de-energize even if the RIT switch is on to ensure the transmitted frequency remains constant.

The Varactor does not have a linear voltage/capacitance characteristic. The 50 K pot going from the slider arm of the 100 K "tuning" pot is adjusted so that 2.5 volts is present on the slider arm with the 100 K tuning pot set in its center position. The slider arm on the 100 K "set" pot is set also to 2.5

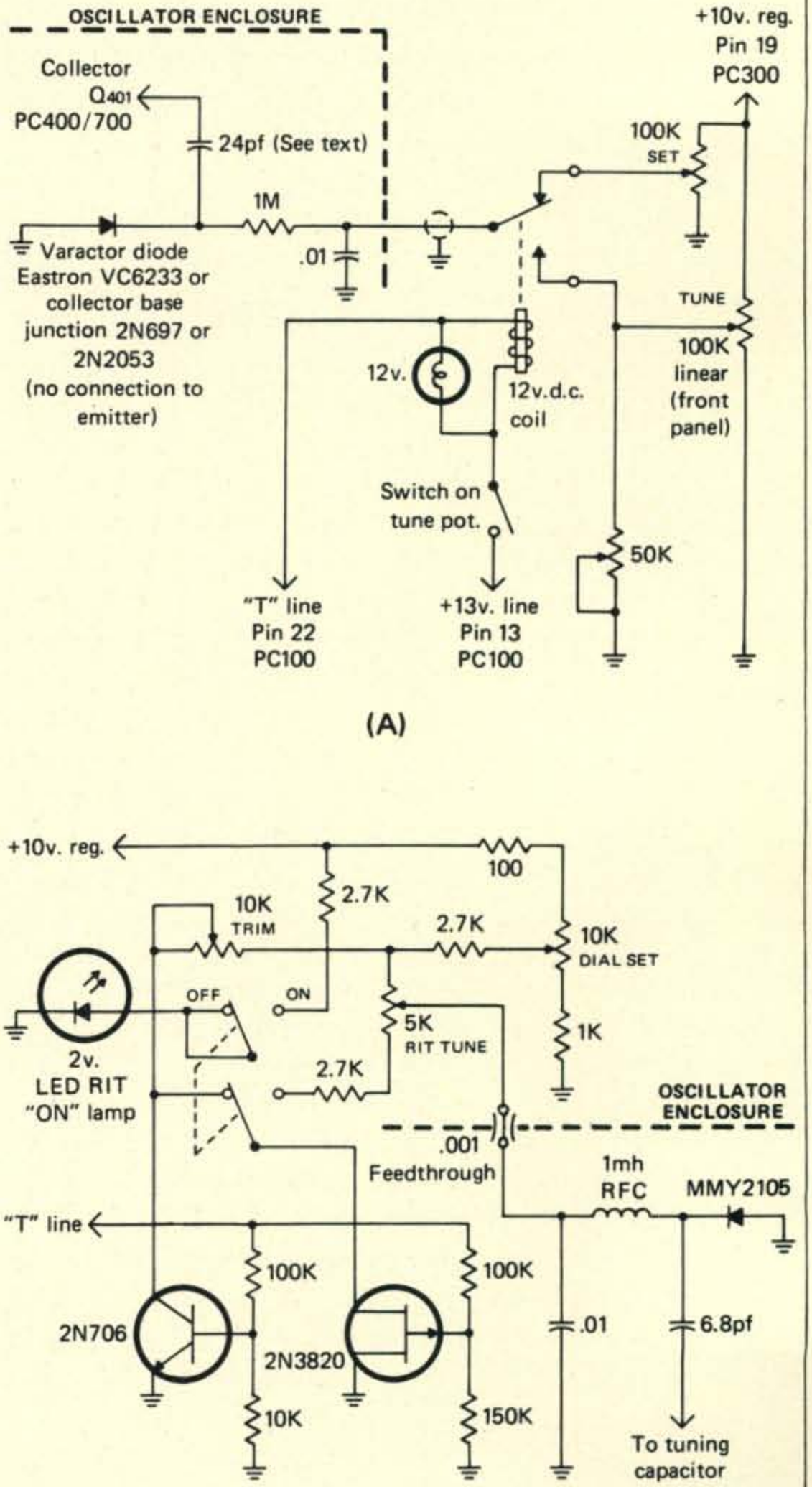

Fig. 3—(A) RIT (receiver incremental tuning) circuit. This is one of the most useful circuits that can be added to the 180/210 family transceivers. (B) This more elaborate all-electronic RIT circuit was developed for Atlas. Notice that the Dial Set capacitor is replaced by a pot. The Trim pot is adjusted so no frequency shift occurs when going from RIT "on" to "off" with the RIT tune pot centered.

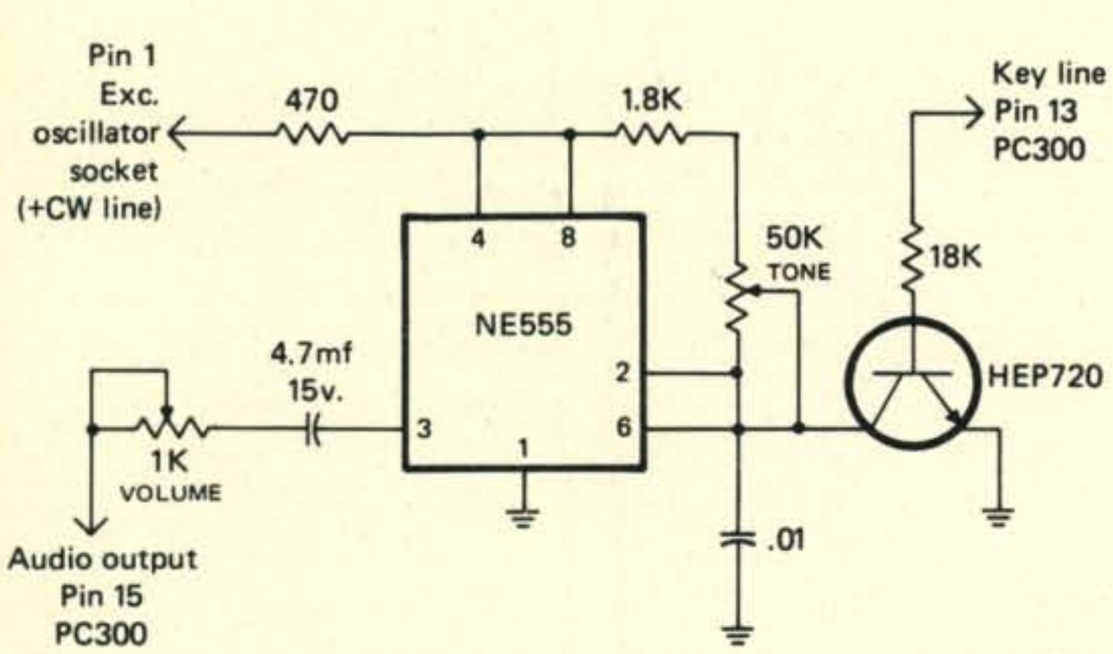

Fig. 2—C.w. sidetone oscillator. Circuit is active only in the c.w. mode and output is sufficient for both headphone and loudspeaker use.

Receiver Incremental Tuning control knob fits nicely into the front panel layout of this Atlas 210, just above the Mode switch.

volts. Measure both voltages with a high input resistance v.t.v.m. The adjustment centers the frequency control range of the RIT tuning pot fairly well although one can do it much more exactly with a counter on the v.f.o. The 50 K pot and the 100 K "set" pot can both be PC types and mounted directly on the terminals of the tuning pot. The relay can be mounted anywhere on the chassis next to the PC 100 module. "Mounting" of the relay need not be with screws. Epoxy or other cement will keep the light-weight crystal can relays in place under the roughest mobile use.

Figure 3(B) shows a completely all-electronic RIT circuit although it is a bit more complicated. As shown, it would require a front panel mounted d.p.d.t. switch plus the RIT tuning pot. The LED "on" lamp for the RIT function could be eliminated. But a s.p.d.t. switch on the RIT tuning pot would still be required to implement the circuit with only one front panel hole.

25 kHz Calibration Markers

The 100 kHz crystal calibrator of the 180 family does not allow easy determination of sub-band edges. Atlas probably did not install a 25 kHz calibrator because of the nature of the v.f.o. design they choose. The dial set capacitor covers such a wide range on some bands (well over 25 kHz) that confusion would result with 25 kHz markers. A 25 kHz marker can still be installed, however, but it would either have to be switchable in and out or the dial calibration tightened up so the dial set capacitor need hardly be changed from its 12 o'clock position. The latter can be done with a counter and patience, working with the v.f.o. notes

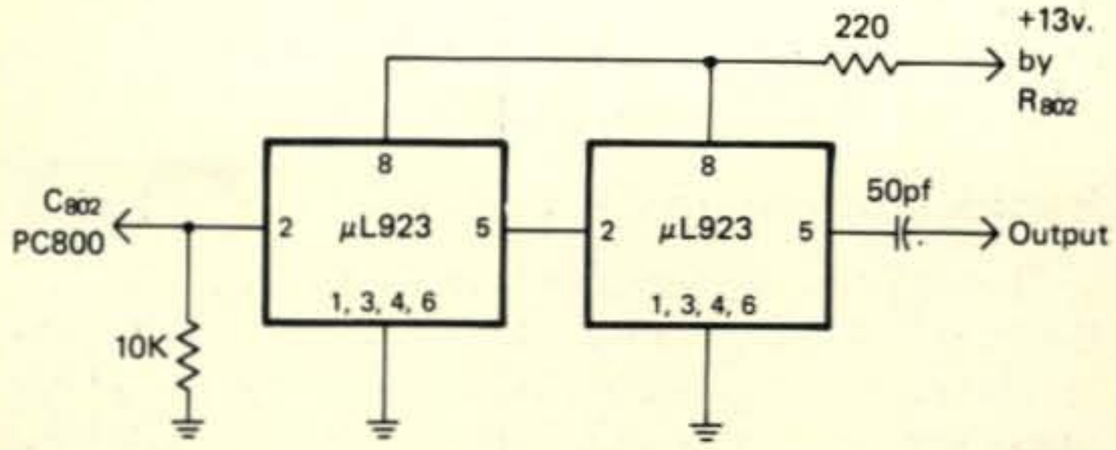

Fig. 4—This circuit will provide 25 kHz markers from the 100 kHz calibrator. Lift the shielded wire going to C_{802} and insert in series. Note precautions in text on use of such a circuit.

found in the Atlas manual. The circuit of a simple divider circuit that will produce 25 kHz markers from the 100 kHz internal calibrator is shown in fig. A.

Simplified CW Switching

Usage of the 180 family on c.w. is awkward because to go from receive to c.w. send one has to rotate the function switch from "rec." through "trans" to "CW". There are several ways to improve this situation. One can mount a miniature toggle switch directly below the r.f. gain on the front panel, wired as shown in fig. 5. This serves as the c.w. send/receive switch and the function switch is left in the "rec" position. Another approach is electronic switching, activated each time the key is depressed. A good circuit for this purpose developed by some German amateurs is shown in fig. 6. The d.p.d.t. relay is wired the same as the d.p.d.t. switch of fig. 5. The pull-in time of the relay will not be noticed at normal keying speeds and the fall-out time after keying stops is adjustable by the 5 K pot. If a crystal-can relay is used, there is enough room along the outside side of the PC 100 board to install the circuit internally.

CW Selectivity

Although the 180 family has an excellent s.s.b. filter, more selectivity will be quickly desired by

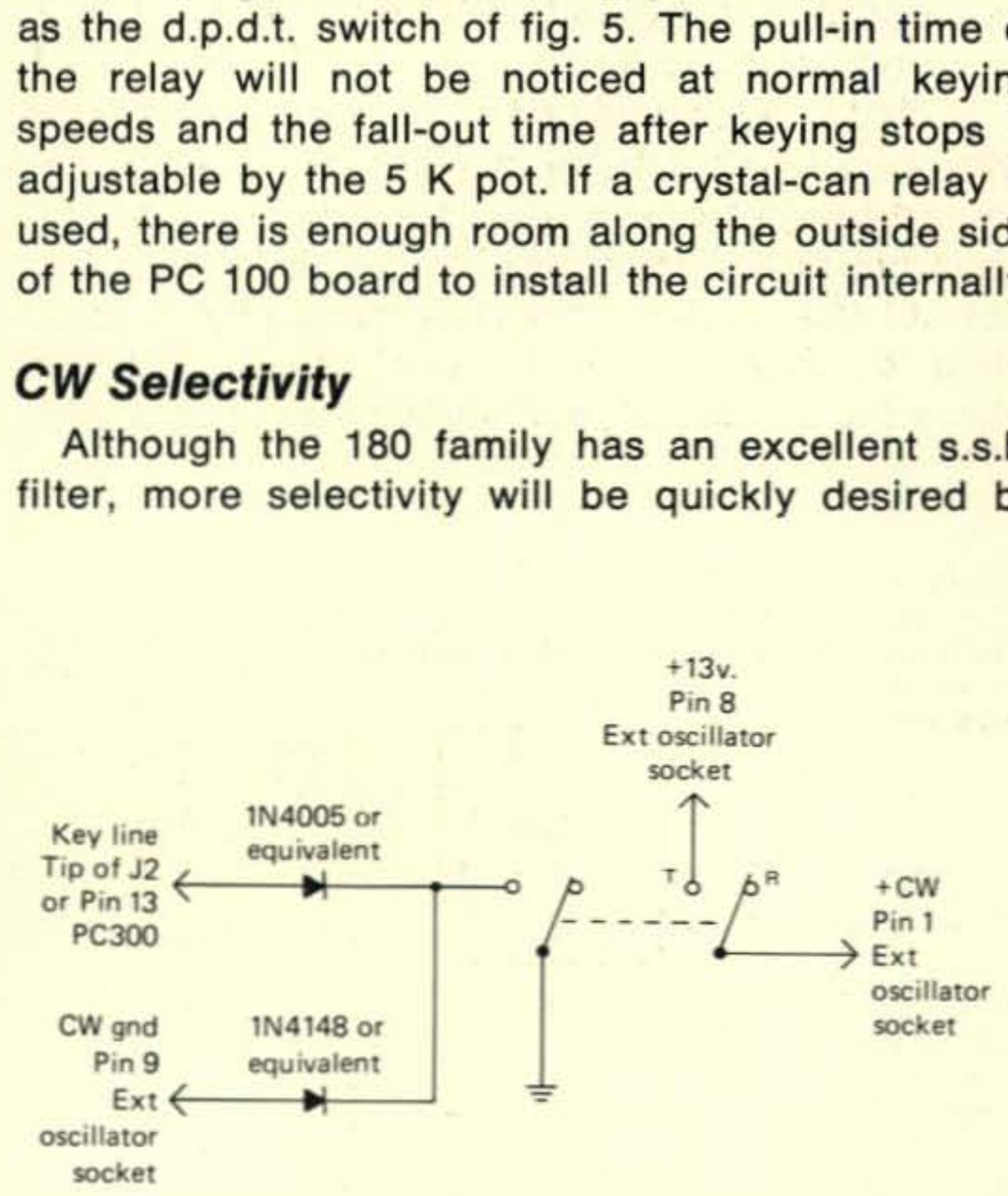

Fig. 5—Simplified send/receive switch for c.w. It may be installed either internally or externally.

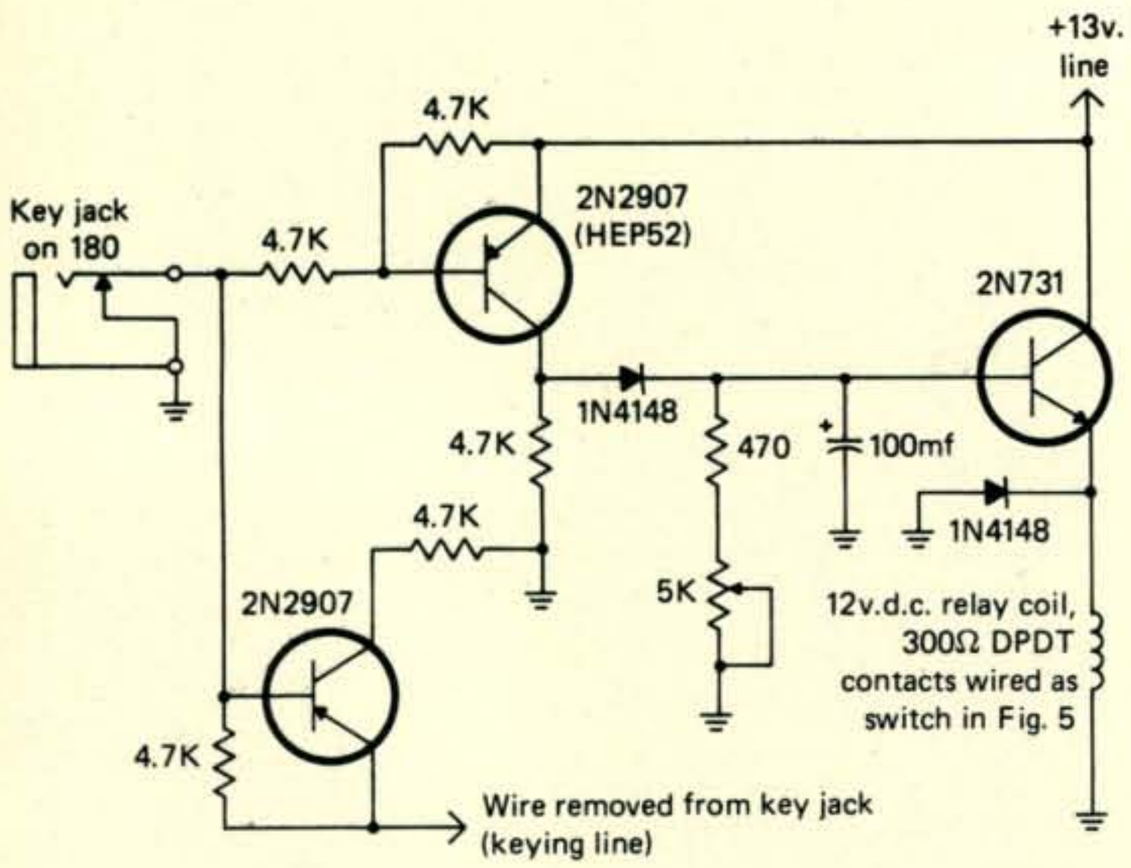

Fig. 6—Neat little semi-break-in keying circuit. 5 K pot regulates hold-in time of relay.

anyone working much c.w. As usual, the a.f. filter approach or the i.f. filter approach is possible. It is probably possible to somehow add still more controls and switches to the front panel of the transceiver but it was decided to use an external enclosure for the c.w. filters tried. There are many designs available for active a.f. filters which can be made to work with the 180. One good peaking filter is shown in fig. 7 which is intended for headphone operation only. It can be mounted in a separate enclosure and the power and audio output lines to it taken over the "ext spkr" and "ext osc" plugs on the 180. An alternative is to mount it internally near the loudspeaker where there is sufficient space.

Fortunately, Atlas did bring the line to the 5520 kHz i.f. filter to the "aux" socket on the rear panel. One has to remove the internal short between pins 6 and 9 on this socket but then one has available a circuit in series with the s.s.b. filter and also a +12 volt line.

A simple external two pole crystal filter used in series with the s.s.b. filter will provide very good c.w. selectivity at low cost. A suitable circuit is shown in fig. 8. The crystals themselves can be ordered from a source such as JAN crystals. The trimmers are used to make the response symmetrical about the center frequency. The best way to adjust them is with a scope but fair/good results can be achieved even without test instruments by using the 100 kHz calibration oscillator as a test signal and watching the S meter as the signal is tuned through. Since the filter will be in the i.f. chain in the transmit mode also it must pass the carrier frequency. First be sure the filter works fine in the receive mode. If then a power output drop occurs on transmit as compared to without the filter, the carrier frequency offset trimmer C_{608} on PC600 needs to be readjusted. Put the sideband selector switch in "norm" position and adjust C_{608} so the former power level is restored.

For those who really insist on keeping all modifications within the transceiver, the c.w. i.f. filter could be placed inside the transceiver and switched

(continued on page 70)

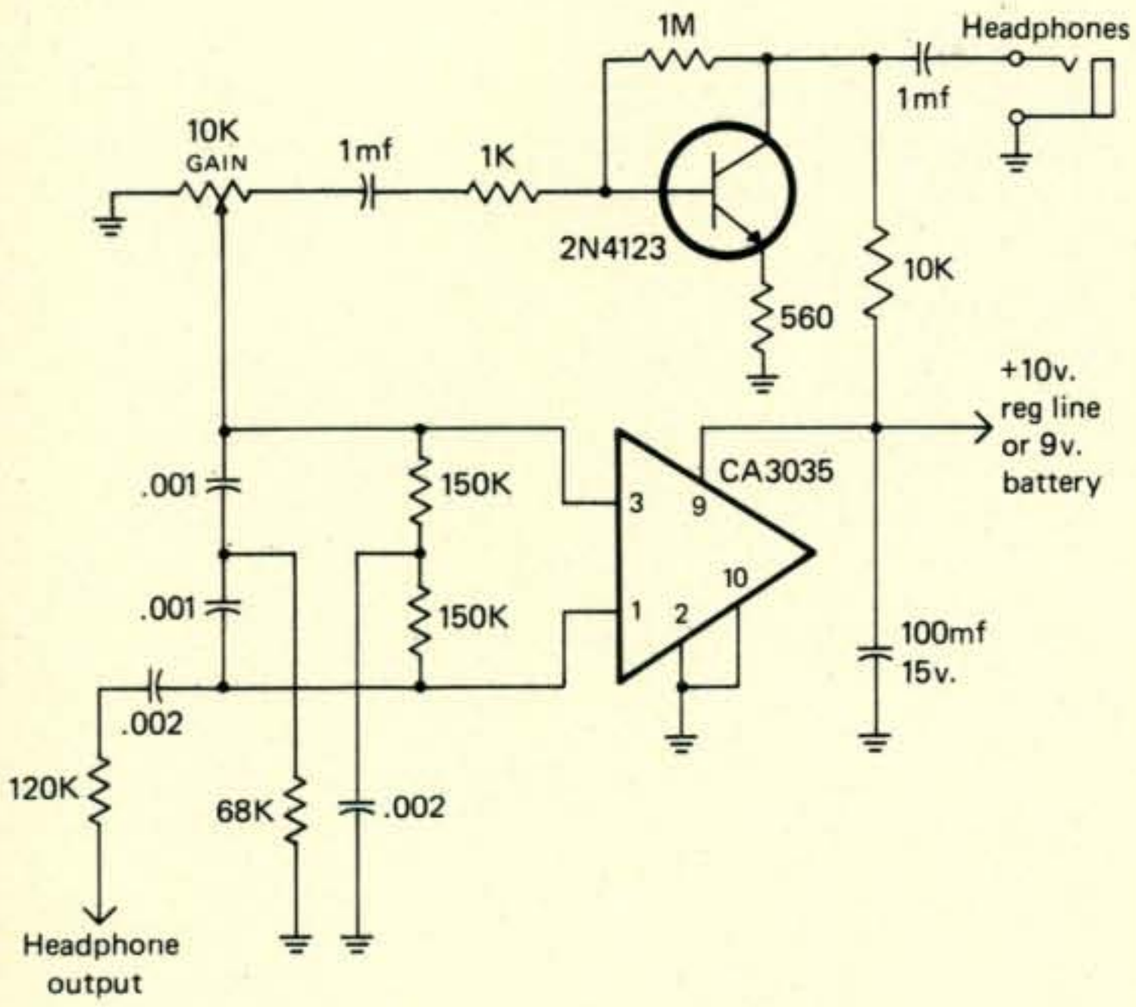

Fig. 7—Active a.f. c.w. filter peaking at 1000 Hz. It can be mounted in an external enclosure or internally. Note that the "Ext Spkr" jack on the 180/210/215 is a two-circuit type. Regular audio can be fed out on one circuit and peaked audio fed out on the other with a selector switch at the headphones.

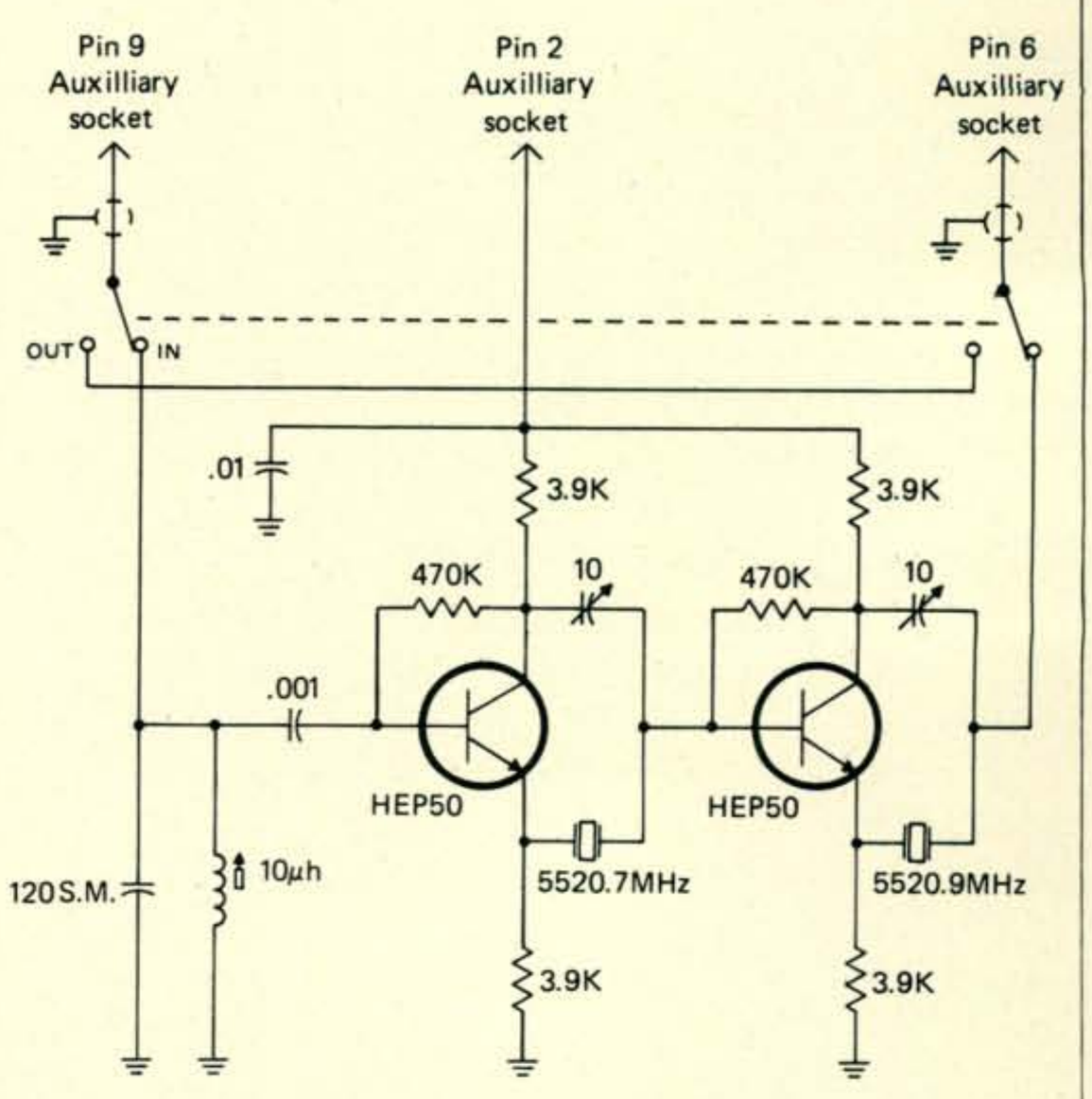

Fig. 8—200 Hz c.w. i.f. filter. The slug tuned coil is peaked to equalize gain with c.w. filter switched into i.f. signal path.

lofty position as overviewer of technological action and philosophical thought, the *psychological* approach claims that your reason for any decision is only a facade for the true impulses at work. This can be most disconcerting for the Ham who supposed that his hobby was presentable in anyone's parlor. It is illustrated only too well by the classic encounter between the two "shrinks" approaching one another on an otherwise-deserted sidewalk.

"Good morning," exclaimed the more extroverted of the two.

"Hmm," mused the other to himself, "Now, what could be the *meaning* behind such a remark?"

Of a certainty, no dismay will be felt by the author upon learning that the *philosophic* value of this article surpasses that of its humor! ■

Adding 20 meters to HW-16 *(from page 42)*

dicating that the oscillator is working. The r.f. coil is then adjusted for peak signal strength. The oscillator coil is then readjusted for peak signal strength and the adjustment is backed off a turn or two in the direction which produces the most reliable operation of the oscillator. The only additional adjustment necessary is to peak the padder in the driver plate circuit. With either a v.f.o. or crystal connected and the meter switched to "Rel Pwr," the "Tune" control is adjusted for maximum output without keeping the key down too long at any one time. Then the padder is adjusted for maximum output, completing the alignment.

The modified rig has been in use at WA6LSL for several months and has given a good account of itself. Power output on 20 meters is not quite as great as on 15 meters, probably because of the constants of the π-network, but it's ample to hold a good QSO. Those contemplating adding 10 meter coverage should include an extra switch section since the plate load of V_7, the oscillator, will have to be switched. On 10 meters, V_7 would double to 14 MHz and V_8 would double on to 28 MHz. ■

Calibration Control for HW-16 *(from page 43)*

signal, and adjust the receiver v.f.o. coil and tuning knob until the zero-beat of the calibrator signal coincides with the zero setting on the dial. The other two bands may now be zeroed by slight adjustments of the new calibrator capacitor. Dial accuracy may also be checked and corrected at any 100 kHz point on the dial using this new control. ■

CQ Reviews Tempo VHF/ONE *(from page 40)*

Conclusions

The Tempo VHF/ONE is a good performer on f.m. While I suspect it will also perform well on s.s.b., I must withhold judgement until tests have been run on the transceiver with the s.s.b. adaptor. The transceiver sells for $495.00. The s.s.b. adaptor is $225.00. Add to this an a.c. supply and you are in the neighborhood of $750.00. This makes the complete package with LED digital frequency display competitive in price with other units offering f.m., s.s.b. and a.c. supply in a single package, without LED digital display. It will be interesting to see which design approach proves the more popular. ■

Improving Atlas 180/210 *(from page 24)*

in and out of the i.f. chain with a d.p.d.t. relay. If the c.w. send/receive toggle switch previously described is installed, sufficient contacts would be made free on the function switch to control the relay. Thus with the function switch in "rec" one could work c.w. without the filter and in "CW" the c.w. filter would be switched in. The author has not tried internal mounting but it would appear that if the 1000 mf capacitor going to pin 2 of PC100 were moved to a vertical position, where it can be accommodated, sufficient space would be freed in that area for the circuit.

RF Filter in Keying Circuit

Several instances were noted in a portable situation where r.f. was coming back into the transceiver over the leads to a key and causing unstable keying. A .01 mf bypass and two ferrite beads mounted immediately on the key jack inside the transceiver took care of the problem.

Dial Cord Tension

After a period of some use it was noted that the tuning was developing some mild backlash. The simple cure for this problem was to carefully make one more turn of the dial string around the shaft of the gear reduction drive. This can be easily accessed by removing the bottom v.f.o. cover plate. Those who prefer a bit firmer feel to the tuning might want to do this.

External Antenna Switching

It might be useful to note that the bandswitch has one completely unused section in the v.f.o. enclosure. It could be used to switch different antennas, loading coils, etc. via relays on the different bands. Leads from the switch section could be brought out to unused pins on the "ext osc" or "aux" sockets.

The photos show a 210 unit with the front panel modified to include the s.w.r. sensitivity control on the left (between a.f. and r.f. gain) and the RIT tuning on the right (below mic. gain). The large size tuning knob (an old SP-600 knob) is just the author's preference for a knob with a heavier feel than the original Atlas knob. ■