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Drake R8: Type B Spurs Elimination

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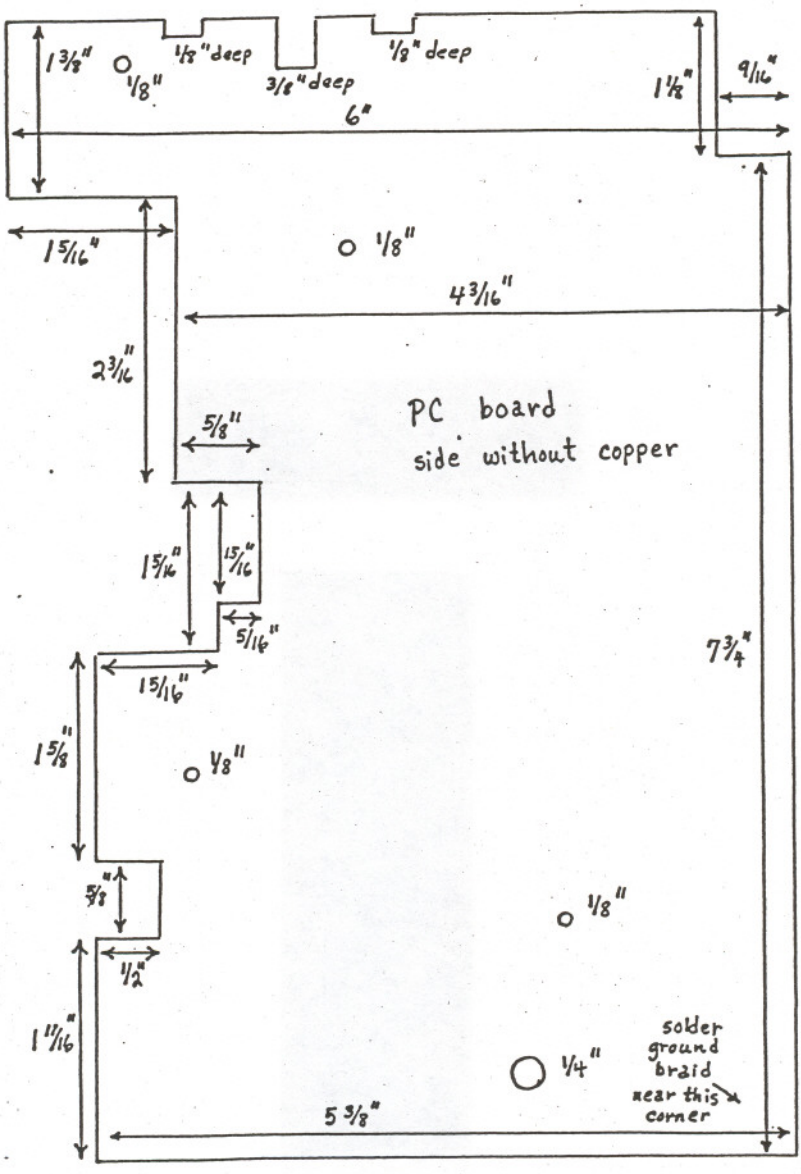
In my review, "Drake R8: A Second Look," I discussed several types of spurs which aflict the R8. One kind, which I called type B, are found on virtually all weak signals below 10.5 MHz at certain tuning settings, and sound like hets, warbling hets, or noise. The type B hets change frequency much more quickly than ordinary hets as you tune across them, so you can often tune away from them. However, weak signals are difficult enough to hear anyway without additional noise and hets provided by type B spurs, and it is sometimes not obvious that a type B het is present so that you can take evasive action. Moreover, the AM synchronous detector can sometimes lock onto type B hets.

The type B spurs (hets and noise) seem to be caused by some kind of RFI radiated from parts of the AM synchronous detector and picked up by the PC board leads of the front end filters. To find the source of the type B spurs I used a 3 turn 2 inch diameter loop made from insulated wire and connected the small loop in series with my usual antenna. A type B spur was tuned, and the small loop was used to probe various locations on the R8 IF/audio PC board until an increase in the intensity of the type B spur was observed. Type B spurs intensities increased only when the small loop was in the vicinity of U112, which is one of the integrated circuits for the AM synchronous detector.

The front end bandpass filters have an unusual aspect which is apparently related to the type B spurs, namely diode switches CR112 and CR117 which isolate the input and output leads (PC board traces) for bands 1 - 7 filters (below 10.5 MHz) from the input and output leads for bands 7 - 9 (above 10.5 MHz). No type B spurs are observed for bands 7 - 9 (above 10.5 MHz), while type B spurs are observed on virtually all weak signals at certain tuning positions for bands 1 - 6 (below 10.5 MHz). Moreover, if CR112 and CR117 are jumped, and all input and output diodes for bands 1 - 6 are doubled (to maintain original filter isolation), then type B spurs are also observed for bands 7 - 9.

Although interesting, the CR112/CR117 kludge obviously does not solve the type B spur problem below 10.5 MHz. The correct solution, which eliminates all type B spurs completely, and which seems to reduce the intensities of some of the other spurs, is to place a grounded shield between the RF and IF/audio PC boards as close as possible to the bottom side of the RF PC board.

I started with a 6 by 9 inch single sided fiberglass PC board and nibbled away on it until it could be mounted with fiberglass side flush against the bottom side of the R8 RF PC board (or rather flush againse the ends of component leads). The exact dimensions of my final shield are shown below. If there was more space between the RF and IF/audio PC boards, then all that nibbling might have been unnecessary (if the type B spurs were still eliminated with a wider spaced shield). Since the copper side of the PC board shield faced down and rested against many of the plugs on the IF/audio PC board, and since the copper side of the PC board shield is grounded, the back sides of all plugs and tall electrolytics were taped over with Scotch 27 Glass Cloth Electrical Tape (available from Amidon). The PC board shield was attached to the R8 RF PC board with four 1/2 inch long 4-40 stainless steel screws and nuts with flat nylon washers used for insulating spacers. Depending on the size of the flat nylon washers, you may have to cut off parts of the edges of the



flat washers with diagonal cutters so that the flat washers will clear nearby components. The four mounting holes I used are shown on the shield diagram as 1/8 inch diameter holes. Note that a 1/4 inch hole through the shield is needed so that the RF PC board can be reinstalled with the shield attached. Note also that the four mounting holes I used to mount the shield to the RF PC board mate with four of the alignment access holes on the RF PC board. This means that to align the R8, the shield must be removed.

The PC board shield extends about 9/16 inch beyond the right side and about 1/4 inch beyond the front of the R8 RF PC board. A 9/16 by 1 1/8 inch notch at the righ rear corner of the shield allows P107 cable to clear the shield. There was enough slack in my P107 cable to wind 2 1/2 turns of the cable around an Amidon FT-114-75 ferrite toroid core, which seems to reduce the intensity of some of the other spurs. The dimensions of the PC board shield may be unnecessarily large. I was not inclined to nibble away on the PC board to determine the minimum size necessary to eliminate type B spurs.

To ground the shield, a short length of miniature coax braid was soldered to the indicated corner of the PC board shield, the other end of the braid was soldered to a #4 ground lug, and the ground lug was attached to a pressed-in 4-40 nut near the front of the R8 chassis with a 1/4 inch 4-40 screw and lock washer. The convenient pressed-in nut near the front of the chassis is probably for installing the optional VHF converter. You may need to cut a small notch in the right-front corner of the PC board shield so that a screwdriver blade can access the ground lug nounting screw.