The author's ART-13

George W. Kindt, W3VYY
133 Marlyn Ave.
Bryn Mawr, Pa.

Converting the ART-13 to SSB

The Collins Auto-tune aircraft transmitter, known more generally as the ART-13, has proven to be one of the better pieces of surplus radio gear. Like hundreds of hams, I was fortunate enough to lay my hands on one of these beauties and for the past several years I have thoroughly enjoyed using it on 80, 40, and 20 meters. As most all owners of the ART-13 already know, they pack a respectable wallop on both AM and CW and with a slight modification of the speech amplifier to permit the use of a crystal mike, the quality and punch is second to none.

Despite the fact that I had been enjoying all the contacts I could handle on both AM and CW, I nevertheless began listening to the guys on the high end of 80 with their "Duck Quacking" and was envious of the fact that they seemed to be having a regular ball for themselves. At first I was "agin" it, since I did not have the equipment and it looked like an expensive proposition. About that time a few of my friends began to give me the needle with such quips as, "You're behind the times," "It's the coming thing," etc., etc. It worked; I knew I had to get on SSB and now I had to figure *how*. I read all the ads and looked over all the available equipment on the market. An ad by *Barker & Williamson* describing their new *51SB Single Side Band Generator* struck a happy note since it appeared it could be used successfully with the good old ART-13. A short talk with the *B&W* engineers developed that the *51SB* was a natural for use with the ART-13. Here we already had a good stable VFO, frequency multipliers, and an ideal final tube. The job of converting appeared to be relatively simple.

After ten minutes of studying the circuit diagram of the ART-13 and taking a quick look at the actual location of the parts and space involved, it was clear that the conversion was going to be easy. Actually, the entire conversion required slightly less than three hours, not counting the time spent dressing up the works with a few decals. As a matter of fact, I was truthfully surprised at the ease with which this conversion was made and even more surprised with the marvelous reports and unexpected increase in power. The pictures of both front and rear of the ART-13 are pretty much self-explanatory, but for the hundreds of owners of ART-13's who might want to get on SSB the easy way here is how it's done.

The 51SB plus eight small parts did the entire job. Required are: two *Amphenol* #83-1R fittings, two *Amphenol* #83-1SP fittings, one small 15 $\mu\mu$fd. 600 volt ceramic condenser, one 8-50 ceramic trimmer condenser, one *Jones* plug and thirty six inches of RG-65U. Since you will want to retain the AM-CW properties of the transmitter you will also need one DPDT toggle switch. This toggle switch is installed in the center of the blank panel which is used to replace the low frequency oscillator. The result is that with one switch on the 51SB and the newly installed AM-SSB switch on the transmitter we accomplish the change-over from SSB to AM or vice versa.

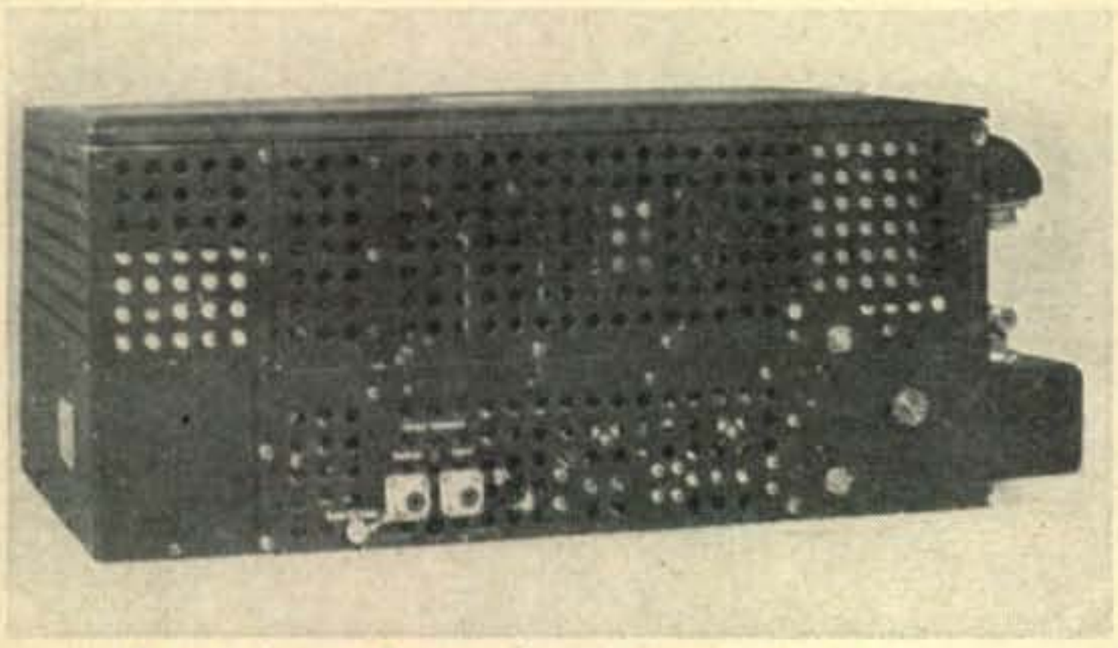
Figure 1 is the original circuit diagram of the grid and grid metering system. The resistor shown in dotted lines will be found in some models of the ART-13, while in others the circuit will be exactly as shown in hard lines. This is one of the few differences in the several models of the ART-13 which were pro-

duced for the Armed Services, but it has nothing whatever to do with our conversion. It has been shown merely to eliminate possible questions later on. Should your transmitter have such a resistor leave it alone. If it doesn't, just forget we even mentioned it.

Do It Yourself

Figure 2 is the circuit diagram of the entire modification. That is all there is to it. The toggle switch shown in this diagram is the one which we installed on the front panel as mentioned above. This could just as well be located on the rear apron if you are reluctant to alter the appearance of the front panel. A few decals will make the switch look very much a part of the panel layout.

Now, with the transmitter upside down on the bench and with the bottom cover removed, you will find the grid choke *L107* staring you in the face. It is mounted on a small terminal



Rear view of complete conversion

board which is bolted to the 813 socket. Don't remove any parts, merely snip the short piece of wire that runs from the grid choke to the coupling condenser *C116* in the multiplier stage. The next move is to mount the two *Amphenol* 83-1R fittings on the rear apron immediately adjacent to the 813 socket. The vent holes in the rear apron are just the right size for the screw in a *Greenlee* punch, so drilling is confined to the four small holes for the mounting screws in each fitting. We used the second row of holes up from the bottom since this placed the fittings in a position which gave us the very shortest possible leads.

Next, install the 8-50 trimmer in another of the vent holes right next to the appropriate coax fitting. Here again no drilling was necessary since the hole was just the right size for the twenty five cent variety trimmer which we used. Connecting the two coax fittings and the two small condensers as shown in *Fig. 2* is now a simple procedure.

Decisions, Decisions!

At this point you have to decide where the toggle switch will be mounted. Whether it is placed on the front panel or on the rear apron makes little difference since very low voltages

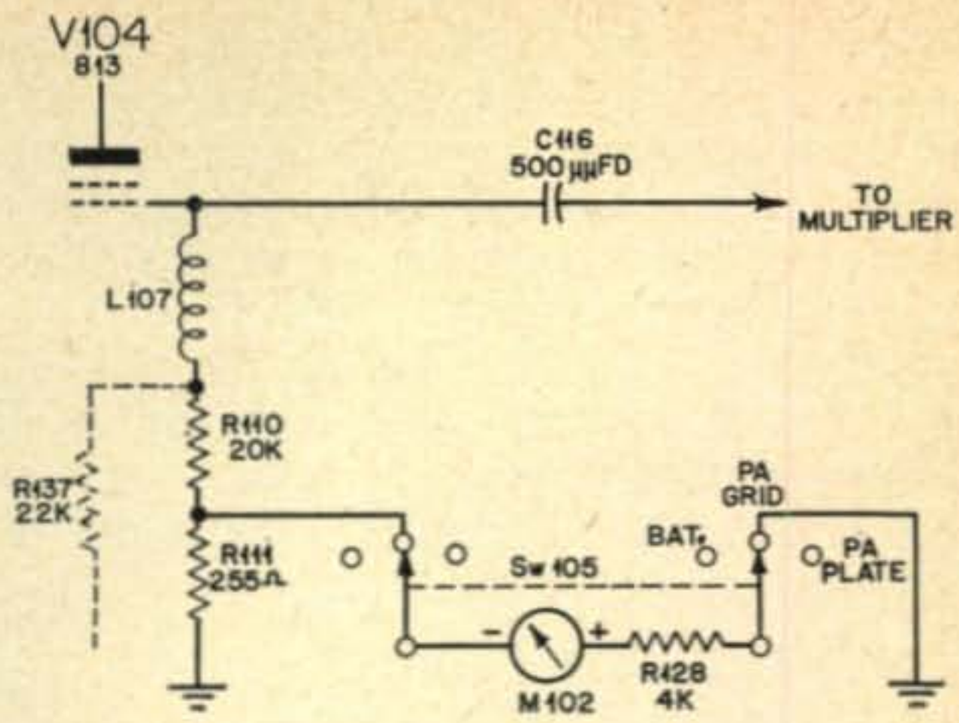
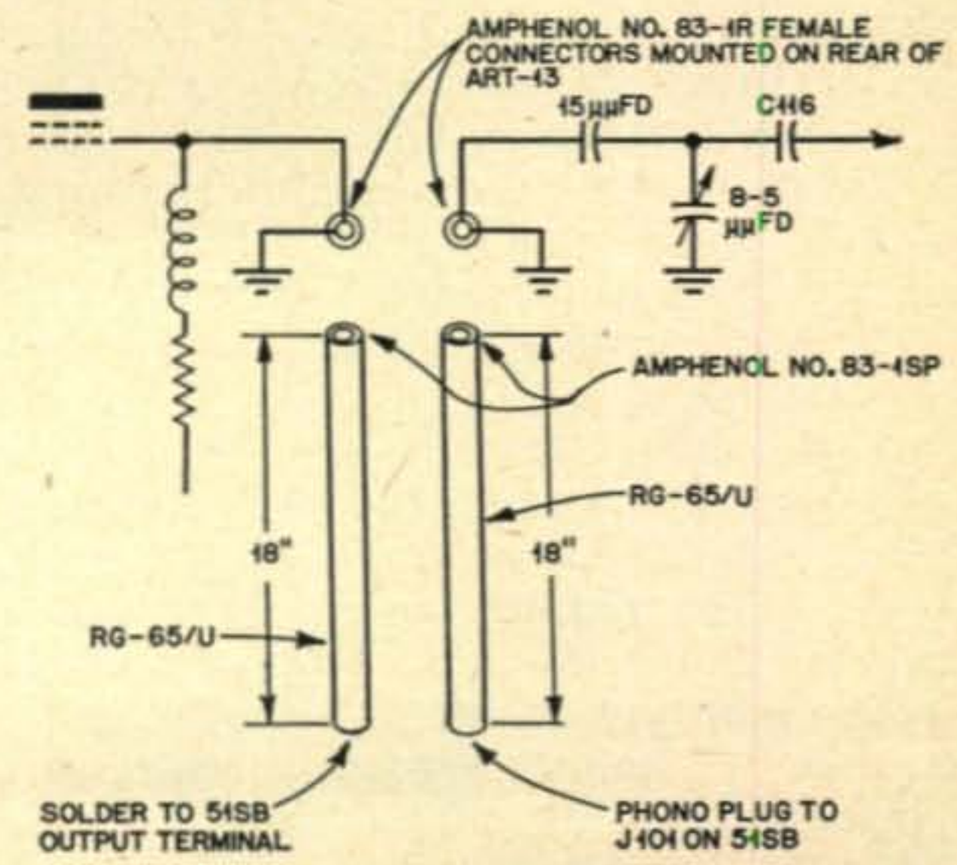


Fig. 1. Original grid diagram

are involved. Turn the transmitter right side up and alter the metering circuit as shown in *Figure 2*. This involves lifting the end of the grid metering resistor *R111* which is now grounded and also lifting from ground the corresponding terminal on the meter switch in the ART-13. Connect the newly installed AM-SSB toggle switch as shown. Note that it performs three functions: In the SSB position it applies the external bias to the grid of the 813 and at the same time shorts out the original bias resistor *R110*. In the AM position it returns the grid circuit to its original condition. Incidentally, it is necessary to short the original grid bias resistor for SSB operation in order to prevent the grid varying should you drive into the grid region under modulation peaks. The last step in converting our ART-13 is the installation of the *Jones* plug through which the bias voltage will be carried. Here again the job of drilling is at a minimum since the vent holes fit the two terminal *Jones* plugs very nicely.

In order to permit side by side installation of the 51SB and our ART-13 it was necessary to lengthen the RG-65U leads. Those which came with the 51SB were too short so we made up two new pieces each 18 inches long. We were concerned about this at first but found that adjustment of the 8-50 trimmer



Make up of new RF connector leads

installed on the rear apron made up very nicely for any difference that may have existed between our new longer leads and those supplied by *B&W*. It was also necessary to lengthen the control lead which comes from the front of the 51SB. Their original shielded lead would not quite reach the key jack on the transmitter so we merely replaced this lead with a piece of lamp cord and it worked just fine. Of course, shielded wire would be more proper, but none was handy.

Tune It

Tune up procedure is a very easy matter once the conversion and installation is completed. The instruction manual supplied with the 51SB is very explicit and should be studied carefully before any voltage is applied to either it or the transmitter. Most owners of ART-13s

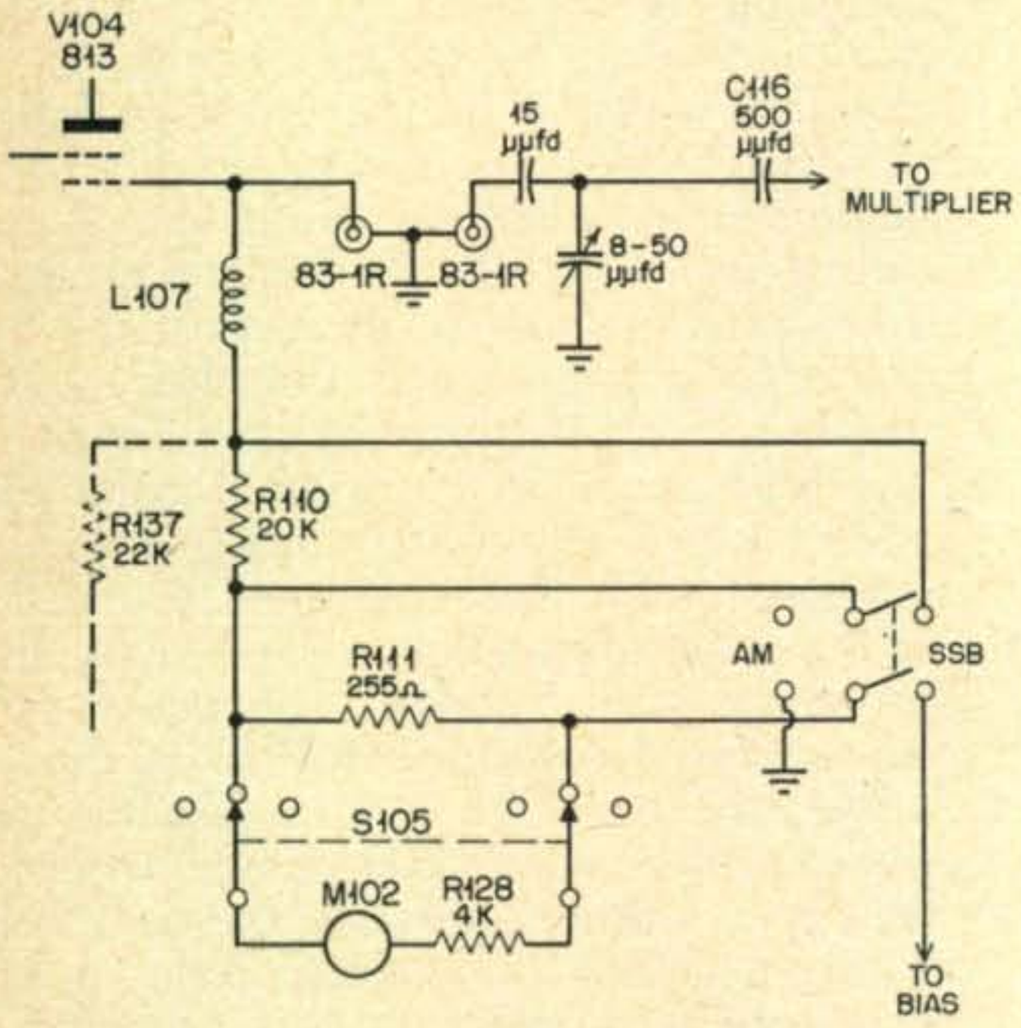


Fig. 2. Entire conversion for SSB

already know the tuning procedure for the transmitter, but for the record here's how we did it. The emission switch on the ART-13 was set on *CW*, the Tune-Operate switch set on *Tune* and our newly installed SSB-AM switch set on *AM*. The Balance-Unbalance switch on the 51-SB was set on *Unbalance*, the meter function switch was set on *Output* and the Band Selector of course set to the band on which we were tuning up. By the way, let me urge you to start out on 20 meters since it was my experience that once the trimming etc., was done on this band no further adjustments were necessary.

With all controls set in this manner and the filaments properly heated throw the high voltage on and dip the final amplifier. Then check the grid drive, making sure it is peaked by tuning both the *Driver* and *Balanced Modulator* tuning controls on the 51SB. At this point things will be running smoothly and you can now repeak the 8-50 trimmer installed on the rear of the transmitter for maximum grid drive. Also, it is now a good idea to repeak the output trimmer in the 51SB. This is identified by *B&W* as *C122* and is located on the r-f chassis near *V103*. When adjusting this trimmer for maximum grid drive be sure to rock the *Driver Tuning* control so that you will be sure of getting maximum output from your 51SB. You can always reduce the grid drive later on by backing off slightly on the *Driver Tuning* control. As a matter of fact, this will more than likely be necessary when operating on 80 meters and is a very nice feature not available with the ART-13 in its original state.

Assuming the transmitter is now tuned up and working nicely in the *AM* position, it is now time to adjust it for SSB operation. After turning off the high voltage, set the newly installed switch on the ART-13 to *SSB*. Push the Balance-Unbalance switch on the 51-SB to *Balance* and turn on the high voltage. It is assumed you will have connected bias voltage to the new Jones plug and it is suggested that you start with about 90 volts. Note the idling current on the plate meter of the transmitter and adjust the bias voltage to provide a resting plate current of between 35 to 40 ma. In my case, I run 1600 volts to the final tube and the bias is set to provide a resting current of exactly 40 ma. which seems to be just about optimum. Once this bias adjustment has been accomplished it is time to balance out the carrier in accordance with instructions given in the 51SB manual.

Up to this point you have adjusted your ART-13 in the usual fashion in the *CW* position, loaded to approximately 100 to 120 ma. Now comes the nice part, you can now throw your two switches back to the "carrier" or *AM* position and, leaving the Emission switch in the *CW* position, load on up to at least 190 or 200 ma. Don't for heavens' sake, leave it in that position too long with carrier, but once it is tuned to that amount of current you are all set to "knock em dead" with SSB. The 813 easily handles this kind of current on SSB and the quality of the signal will bring very flattering reports. You will find that under normal SSB operation the plate meter will appear to kick up to only about 150 ma. but this is only because the meter is damped and does not actually record the instantaneously reached peaks.

When returning to AM or CW operation it is obviously necessary that you either retune because of the excessive plate current or use another channel. The nice part of the ART-13 is having those other channels to use as well as the fact that we now can go from SSB to AM by merely flicking two toggle switches. Incidentally, it is neither necessary nor desirable to disconnect the 51SB when going back to either AM or CW. It gives you a perfect control of your grid drive and improves the entire operation. Personally, I am delighted with the performance of my newly improved ART-13. ■