

## ARC-5/BC-455 Modification Notes Phil Salas – AD5X

Back in the 60's, I had an ARC-5/BC-455 receiver that I used for monitoring the 40 meter ham band. I don't know what ever happened to that receiver, but recently I had the opportunity to pick up one of these radios again. The modification/updating of this receiver turned into a fun project.

The old military ARC-5 series of receivers were used with a matching transmitter in bombers (typically 3-pairs) and fighters (one pair) during WWII. Today the most popular receivers are the ARC-5/BC-453 (190-550KHz, the old Q5er), the ARC-5/BC-454 (3-6 MHz), and the ARC-5/BC-455 (6-9.1 MHz). These receivers use 6-tubes with 12-volt filaments, with the tubes paired up and each pair's filaments wired in series so as to operate from 26VDC. You also need a 125-250VDC high voltage power supply for the tube plates. Refer to the "Plate Voltage Power Supply" article elsewhere on this website.

The first thing to do is rewire all the tube filaments in parallel so they can be operated from a 13.8V power supply. I used a Powerpole connector for the 13.7VDC filament input, and a 2-pin male Molex connector for the plate voltage input. The high voltage requirement is less than 100ma, and the filament requirement is 1.5-amp. I removed the rear multi-pin ARC-5 connector and replaced it with my own connector mounting bracket assembly that I built using a small piece of 0.032" aluminum sheet and a nibbling tool as can be seen in Photo A. I painted the bracket black to match the ARC-5 receiver chassis.

After adding the DC connector assembly, I wired a 1-ohm 3-watt resistor in series with the 13.8VDC input to drop the filament voltage to 12.3VDC. I next replaced the three 0.22uf, the twelve 0.05uf, and the three electrolytic capacitors (5uf, 8uf and 15uf) with modern capacitors. After 50+ years, these capacitors are almost certainly leaky, shorted or open. Except for the 15uf capacitor, all capacitors should be rated at 250VDC or higher. The 15uf capacitor can be rated at 100VDC. I used 10uf electrolytics for both the 5- and 8uf capacitors, and a 22uf electrolytic for the 15uf capacitor. I mounted the replacement capacitors on the terminal strips called out in the parts list. Photo B shows the main bottom of the receiver with all capacitors replaced, and Photo C shows the new front panel mounted 10uf capacitor.

Refer to Figures 1 & 2 for the front panel connector and component wiring diagrams. I found that a 50K linear potentiometer works best for the audio gain control. Some folks use a 25K pot, but this leaves too much audio at the minimum volume setting. And an audio taper pot doesn't work well at all. I bought the 50K pot with an integral SPST switch, and I used this switch to key a small DPDT relay to turn on the voltages to the receiver by running a new wire from front panel pin 7 to the relay. The relay is plugged into a 16-pin IC socket and is then mounted upside down on the chassis with double-sided tape as can be seen in the upper left corner of Photo B. I also added a small 8-to-1000 ohm audio transformer with the headphone jack so that the ARC-5 audio output more closely matches modern headphones. You can see how I mounted the switch,

transformer, and pot on the front panel mounting plate in Photo D. Photo E shows the front assembly mounted in place.

**Tuning Shaft** One problem with these receivers is the recessed 1/4" -splined shaft which requires a special knob for receiver tuning. These knobs are hard to find, and can be expensive if you do find one. I built a very effective shaft adapter/extension that is easy to reproduce. You will need to purchase a short piece of 3/16" ID plastic tubing and a 1/4" OD aluminum rod from your local ACE Hardware Store.

Mix up a small dab of 2-part epoxy and lightly coat the first 0.2" of one end of the 1/4" rod. Now, force the 3/16" ID plastic tubing over this end of the 1/4" rod so that it overlaps 0.2" of the 1/4" aluminum rod. Let the epoxy cure for 24 hours, and then cut the tubing and aluminum rod as shown in Figure 3. To help support the shaft in place, I used a 3/8NPT brass plumbing cap with a 1/4" shaft clearance hole drilled in the center. You may wish to paint this 3/8NPT brass cap flat black or silver to match your radio. Photo F shows the individual shaft parts before assembly (top), the final shaft adapter/extension and drilled 3/8NPT cap (bottom), and the hard-to-find ARC-5 tuning knob (left).

Now, align the open end of the plastic tube with the splined shaft and push the new shaft adapter/extension into place. This will take a little effort at first, and then it will almost snap in place. Put a knob on the shaft and verify that tuning works well. Next, pull the shaft adapter/extension off the radio and put just a *small* amount of epoxy into the open end of the plastic tubing with a toothpick. Then push the shaft adapter/extension over the splined end of the tuning shaft. As the 3/8NPT brass cap is slightly larger than the radio shaft collar, wrap a few turns of black electrical tape over the shaft collar so you can screw the brass cap over the shaft adapter/extension and the radio shaft collar. Photo G shows the new shaft adapter/extension in place. The knob I used is an Eagle 1.75" diameter "spinner" tuning knob available from Mouser Electronics for \$8.55, part number 450-1755.

Table 1 – ARC-5 components needed for conversion

<u>QTY</u>	<u>Description</u>	<u>Source/Part Number</u>	<u>Price ea.</u>
1	Molex 2-pin plug	Mouser 538-03-06-2024	\$0.20
2	Molex 0.062 pins	Mouser 538-02-06-2103	\$0.18
12	0.056uf 250V caps	Mouser 5989-250V.056-F	\$0.23
1	22uf 100V cap.	Mouser 647-UVR2A220MED	\$0.30
2	10uf 250V caps.	Mouser 647-UVR2E100MPD	\$0.39
1	DPDT relay	Mouser 655-RTE24012F	\$2.40
1	50K pot/ switch	Mouser 31VM405-F	\$1.99
1	1 ohm 3-watt resistor	Mouser 594-5093NW-1R000J	\$0.54
1	8/1000 ohm xfmr	Mouser 42TL013-RC	\$1.56
6	Terminal Strip	Mouser 158-1005	\$0.55
3	0.22uf 250	All Electronics RMF-224	5/\$1.00
1	1/8" stereo jack	All Electronics MJW-20	\$0.50
1	SPDT switch	All Electronics MTS-4	\$1.00
1	1N4007 Diode	All Electronics 1N4007	6/\$1.00

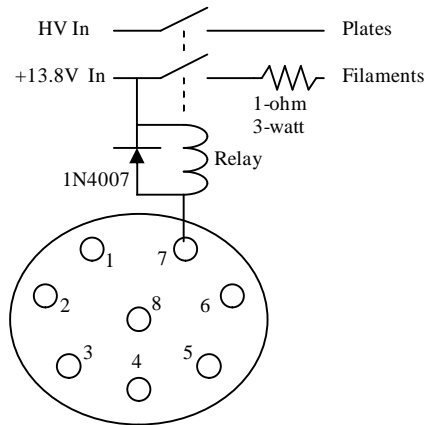


Figure 1: Front Panel Connector (Viewed from front)

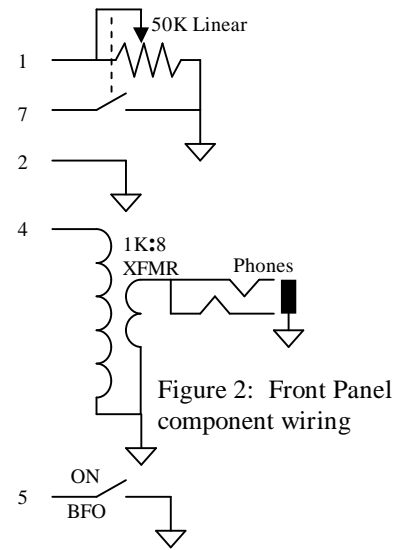


Figure 2: Front Panel component wiring

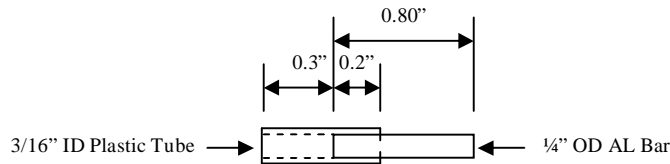


Figure 3: Shaft Adapter/Extension



Photo A: LV and HV connectors



Photo B: Bottom view (relay in upper left)

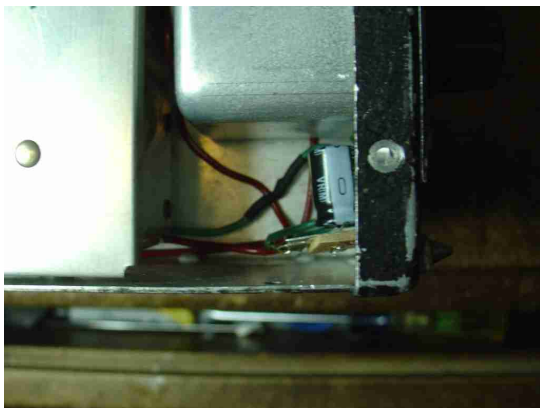


Photo C: New front panel capacitor

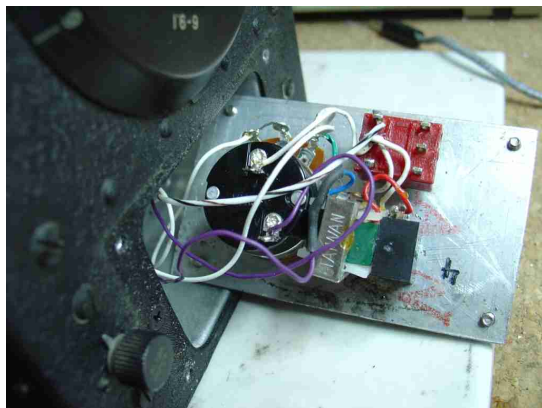


Photo D: Front Panel components



Photo E: Control panel mounted in place



Photo F: Plastic tube, 1/4" rod, 3/8NPT cap, and final shaft adapter/extension (lower left)



Photo G: Shaft adapter/extension in place