At the Repair Bench – Alinco DX-70T – April 2026

Figure 1 - Alnico DX-70T transceiver

A short while ago, one of my fellow GCARC members came to me with an Alinco DX-70T HF mobile radio (Figure 1) that had lost the majority of its output power. We quickly determined that he had had some antenna and feedline issues that likely caused the failure, so this one was basically just an evaluate and repair proposition.

The Alinco DX-70T is a multi-band HF plus 6-meters mobile-designed transceiver that has a nominal 100-watt maximum RF output power. This unit has only two output power levels, a low-power setting at a nominal 10 watts, and a high-power setting at the full maximum output. When tested, the maximum output from this unit was just about seven watts, and then even that fell off to a zero output during testing.

The transceiver is basically of a three-board design, with a *MAIN* or processor board, a *PA* or power amplifier board, and a *FILTER* or output board. The RF signal is initially generated on the *MAIN* board, and it is then passed via a coaxial cable to the *PA* board where it is amplified to the output level, and then is finally passed on also via coaxial cable to the *FILTER* board where the signal is cleaned up and dressed for transmission to the world at large. The *FILTER* board also serves to pre-process the received signal before passing it on to the remainder of the RX circuitry and finally to the audio circuits.

The *PA* board uses a rather strange arrangement of multiple transistors to do its work (Figure 2). A 2SC3419Y transistor is used as a bias-level controller. A 2SC1971 transistor is used as a pre-driver, a pair of 2SC1972 transistors as drivers, and finally a pair of 2SC2904 transistors are used as the power amplifier devices. All of these transistors are of the NPN type and are of silicon construction. All of them except the 2SC2904 types are in the ubiquitous TO-220 package with a single mounting tab. With the exception of the 2SC3419Y, all of these transistors are designed for use as RF devices. The 2SC1972 driver transistors also serve as the power amplifier transistors for the 6-meter band, which is limited to approximately ten watts. One of the two driver transistors is bridged by an

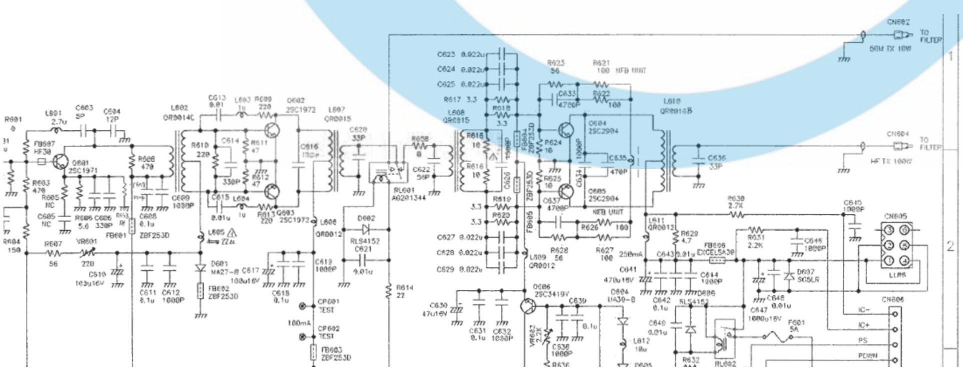

Figure 2 - PA board schematic excerpt

MA-27B varistor diode which serves to control power roll-back based on transistor temperature.

In-circuit testing and voltage measurement revealed that with the exception of one of the driver transistors, all of the transistors on the *PA* board had failed. I decided to replace the driver transistors as a matched pair, and obviously, the remainder of the transistors on that board required replacement as well. I set out to do so.

Access to the *PA* board requires removal of the *FILTER* board from the chassis, as well as disconnection of numerous interconnecting wire harnesses and coaxial cables. Mounted to the *PA* board is a small daughterboard, which sits above the power amplifier transistors. All of the transistors are secured to the chassis via machine screws through their mounting tabs, or through their flanges in the case of the 2SC2904 devices. One of the two driver transistors is installed vertically to the side wall of the chassis; the rest are all installed horizontally through the *PA* board (Figure 3).

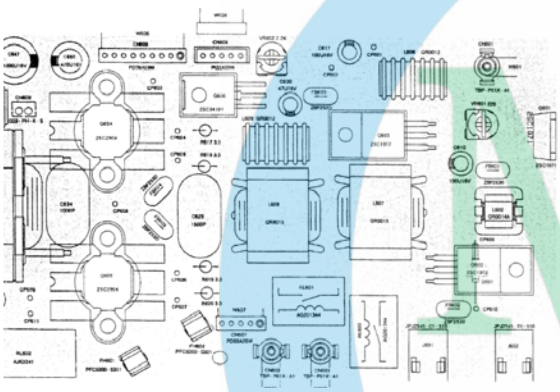

Figure 3 - PA *board transistor layout arrangement*

Access to the 2SC2904 power amplifier transistors is best obtained by removal of the daughterboard mentioned previously, though removal of it is not absolutely necessary. However, in examining this radio, it was discovered that the daughterboard was cracked and bent. This made it apparent that this radio had been worked on in the past, and that a poor job was done at that time. This necessitated removal of the daughterboard so as to make a repair to that board. As it turned out, although the ground plane on the board's lower surface was broken, the ground plane on the upper surface was flexed but not broken, providing the necessary ground path for the components mounted to the daughterboard. We will discuss the daughterboard repair later.

Replacement of the transistors was a straightforward removal and installation process… almost. In removing the bias and driver transistors, it was discovered that the *PA* board had also been damaged by a prior repair activity. Several of the printed circuit board (PCB) traces had lifted from the board, and were held in place only by the solder on the transistor leads and the leads themselves. This was extremely difficult to work with as far as re-installing the new transistors was concerned. I decided to make more permanent and effective repairs to the PCB. In the case of most of the damaged PCB traces, they were damaged easily because they were very small, effectively being islands of copper trace material connected to traces on the lower side of the *PA* board by *vias.*

A *via* is a hole that extends through the PCB substrate from a trace on the upper surface to a trace on the lower surface, usually plated or lined with conductive material, effectively connecting the upper-surface pad or trace to the lower-surface pad or trace. This is a common methodology used in passing current from one surface of the PCB to the other. It also provides a ready path for some skilled board repair.

I made most of the individual repairs by scraping some solder mask from the appropriate trace on the lower surface in the location of a usable via, preparing an area to which I could solder a repair conductor. I then used a short length of solid 22AWG wire that I passed through the via and bent over against the board's lower surface. I soldered the bent wire to the scraped trace area, making a through-board connection to that trace. Then, on the upper surface of the board, I cut the wire to the proper length to fit the location under repair, and then bent the wire down against the PCB top surface, aligning it with the transistor lead. Finally, I simply soldered the transistor lead to the wire segment, and the repair was complete. I made several pad repairs in this manner, coating each repair on the PCB underside with brush-on solder mask.

Additional repairs were needed that did not pass through the board. They were made by once again scraping some solder mask from the damaged trace and soldering in a short length of wire. The wire was formed along the path that the damaged trace had originally followed, and then the relevant transistor lead was soldered to the wire.

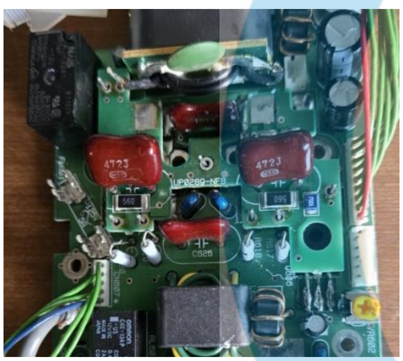
Figure 4 - Repaired daughterboard in place in radio – not yet soldered in

Once all of the transistors were replaced and the *PA* board had been re-installed into the chassis, it was time to repair the daughterboard. This was done by first heating the board with some hot air, and then flexing the heated board back into its proper flat form. Next, I scraped some solder mask from the bottom surface of the board on either side of the crack. I completed the repair by soldering a length of bare bus wire along the edge of the crack on either side, and then soldered the two wires to each other, effectively bridging the crack. I then coated the entire repair with brush-on solder mask. To finish the job, I re-installed the daughterboard to the *PA* board (Figure 4).

After installing the *FILTER* board and making all of the inter-board connections, I performed an alignment of the transmitter, setting the bias voltage as a part of that process. Finally, I tested the transmitter output, finding it to be slightly higher than anticipated at 107 watts on the high-power setting, and 12.6 watts on the low-power setting.

This repair was a straightforward replacement of failed components with the thrown-in chore of repairing somebody else's poor workmanship. A good technician will try as hard as possible not to leave such a mess behind for someone else to clean up. However, it is entirely possible that this unit had been repaired be a former owner or another hobbyist. I certainly hope that it was not done that way by a professional.

See you next month….