

## Repairing a Yamaha CR-620 Amplifier

**Product:** Yamaha CR-620, Natural Sound Stereo Receiver

### **Background:**

Recently I've been trying to set-up a High-Fidelity audio system at my house to play some records that I have. I purchased an Insignia NS-BTST21 turntable, grabbed two JBL L19 speakers that were sitting in my parent's garage, and was given a faulty Yamaha CR-620 amplifier, which my uncle had found at a thrift shop.

Setting up the system, I noticed that one of the two speakers sounded very muted and crackly. To test if the speaker was blown, I swapped the speaker inputs from the amplifier, and I found that both of the speakers working fine individually. Next, I decided to test the amplifier outputs, as there is an independent output for each speaker. I found that one of the amplifier outputs was the problem and most likely that there was an issue with one of the speaker channels.

The Yamaha CR-620 was one of Yamaha's mid-range units in production from 1977-1979. Looking at a piece of equipment from this time was super interesting because most of the electronics were still analog instead of digital. Additionally, the equipment had a lot of interesting mechanical mechanisms to make things work, such as the radio tuner and some of the dials.

I took apart the amplifier to check the internals and found it really interesting. I ended up digging up the wiring schematic for the machine and tried replacing couple of components that looked damage: PCB discoloration due to overheating and some corrosion on some SMD. At this time, the unit is still experiencing the issues after replacing some parts, but I plan to dig into it some more when I have some free time. In this report, I will be documenting some of the interesting finds.

### **Photo Sequence:**



*Figure 1. Front View of the Yamaha CR-620 powered on.*



*Figure 2. Turntable, Amplifier, & Speaker Set-up*



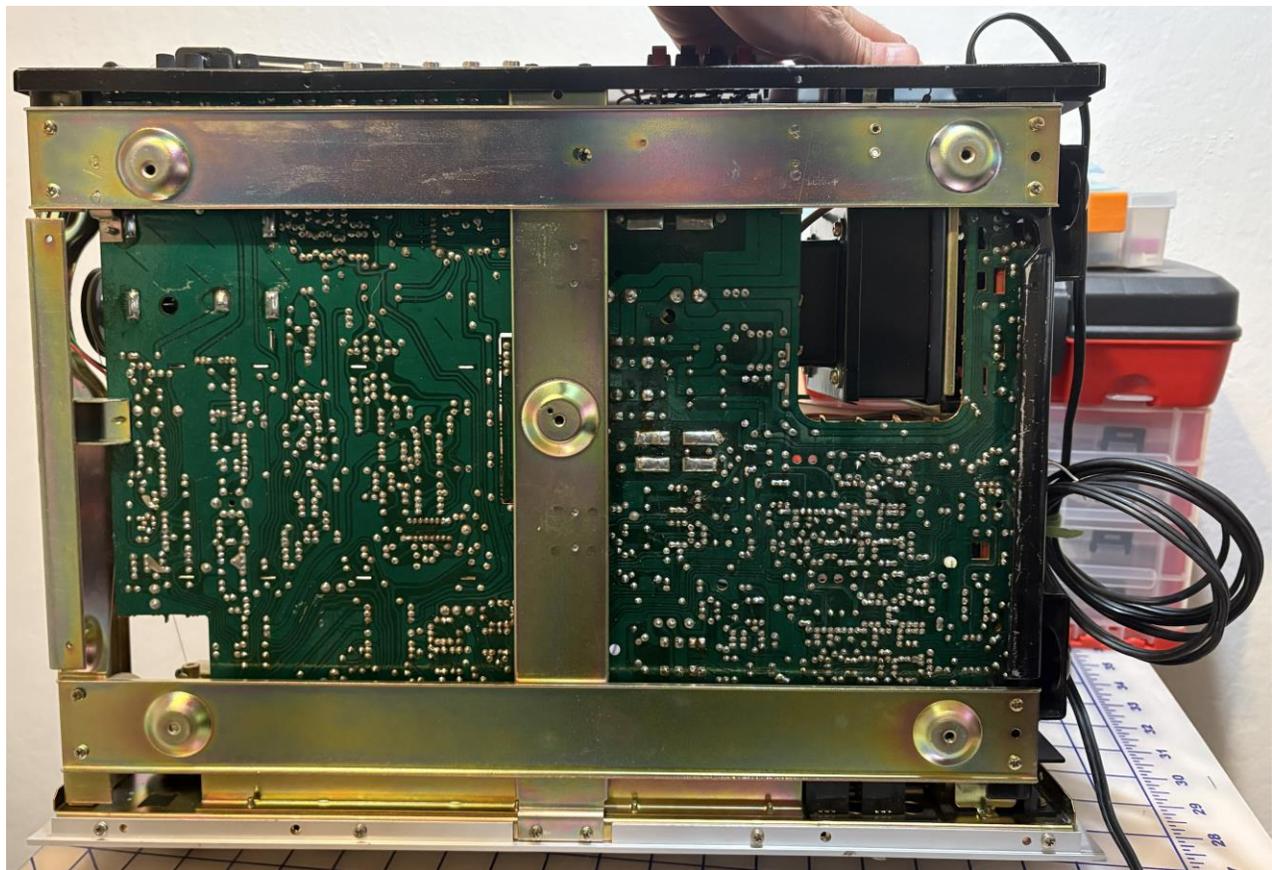
*Figure 3. Front View of the of the Amplifier turned pm*



*Figure 4. Front View Close up on the left side*



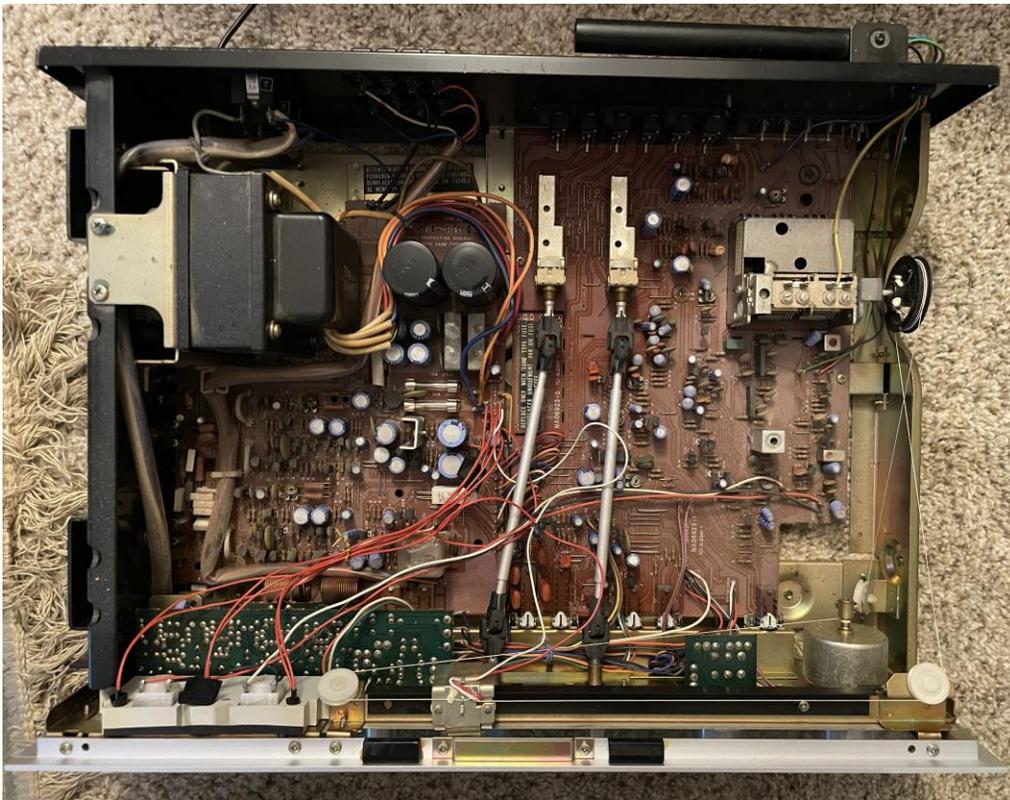
**Figure 5.** (Left) Bottom View. Silver Fasteners are what holds the electronics panel to the wood housing.  
(Right) Silver Fasteners with screws removed



**Figure 6.** Bottom View of the Amplifier removed from the wood housing. Electrical housing shown will expose bottom of PCB. SMD soldered connections can be seen and accessed from the bottom.



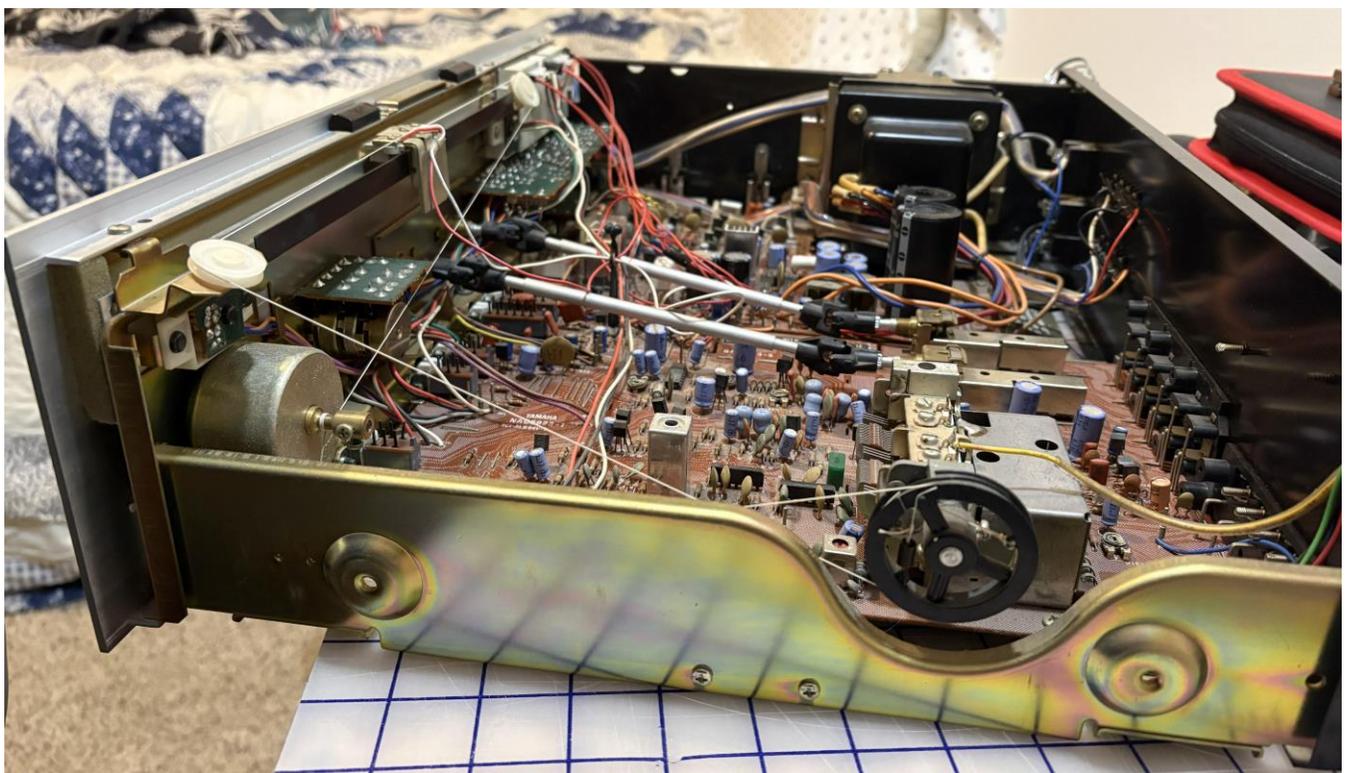
*Figure 7. Empty Wood Housing.*



*Figure 8. Top View of the exposed Electrical Panel*



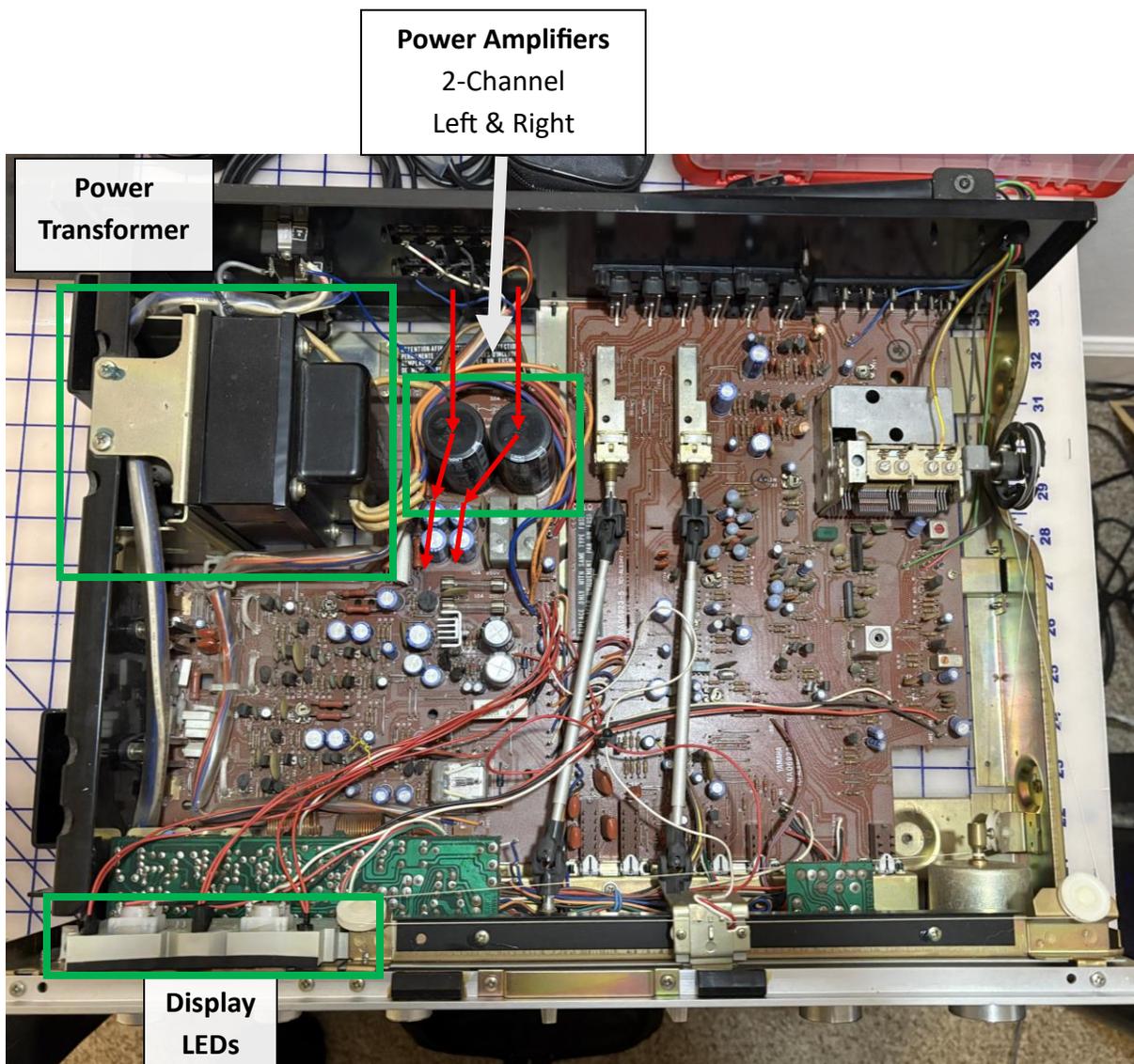
*Figure 9. Back View of the Amplifier w/o wood case.*



*Figure 10. Side view of the Amplifier w/o wood case.*

### Product Design Analysis:

What impressed me so much about this product's design is that there are absolutely no digital components. Taking apart any electronics from the 2000's onwards, you will find programmable circuit boards (PCBs). In modern amplifiers, most of the sound amplification and tuning is done by digitizing the data (discretizing) and then by amplifying the digitized data. In this amplifier, the sound waves, converted to electrical current, are amplified by a complex series of capacitors, resistors, and transistors.



*Figure 11. Amplifier electrical board shown from Top View. Major components are labeled.*

Additionally, the mechanical components in the amplifier, such as the Radio Tuner and the Input Selectors, are purely mechanical systems, with no electrical motors. The Radio Tuner is literally concocted by running a piece of string/wire around the amplifier in a loop leading to the radio frequency tuner. The Input Selectors utilize 8" rods, with couplings on each side to connect the knobs to the electrical input selector.

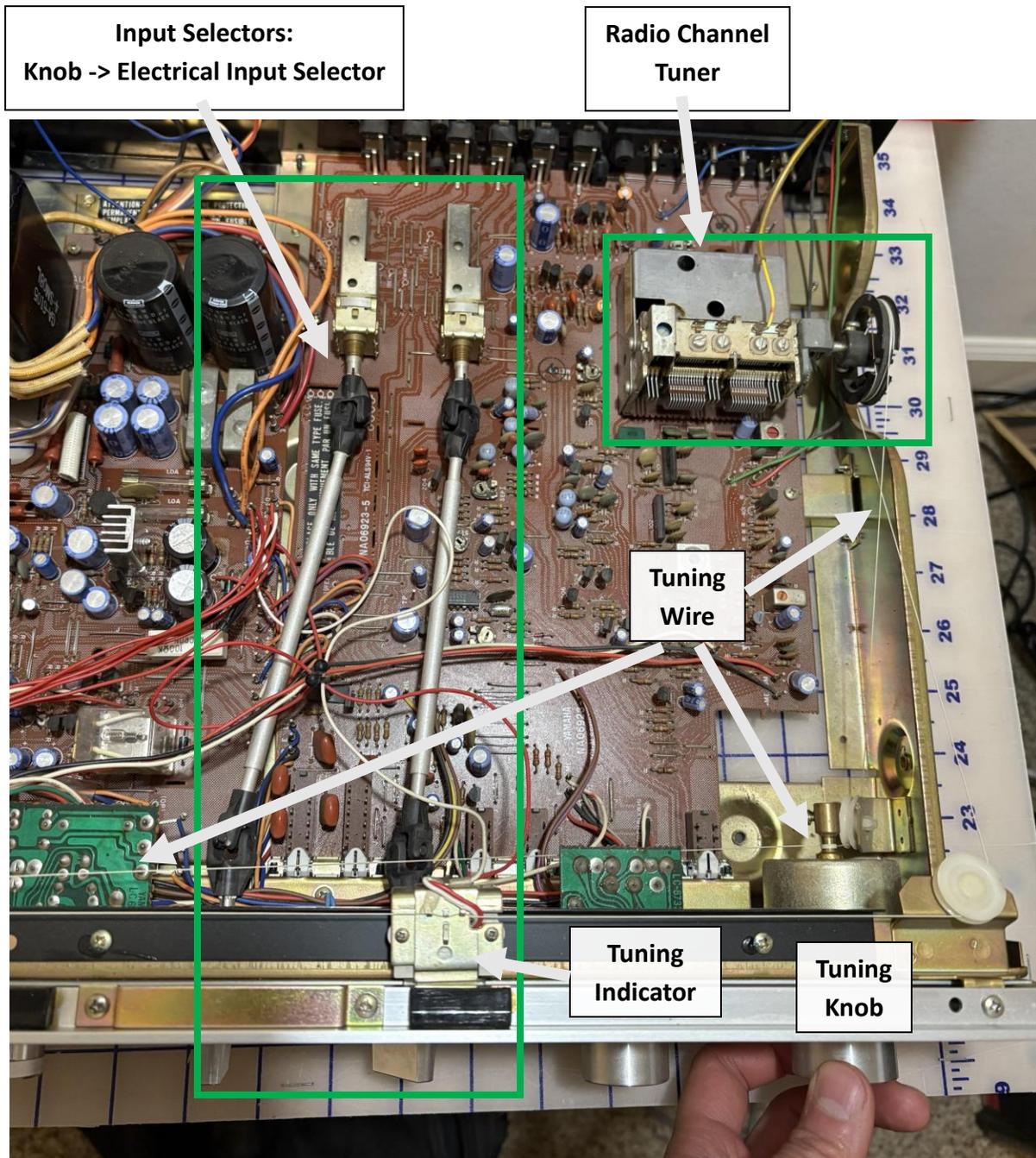
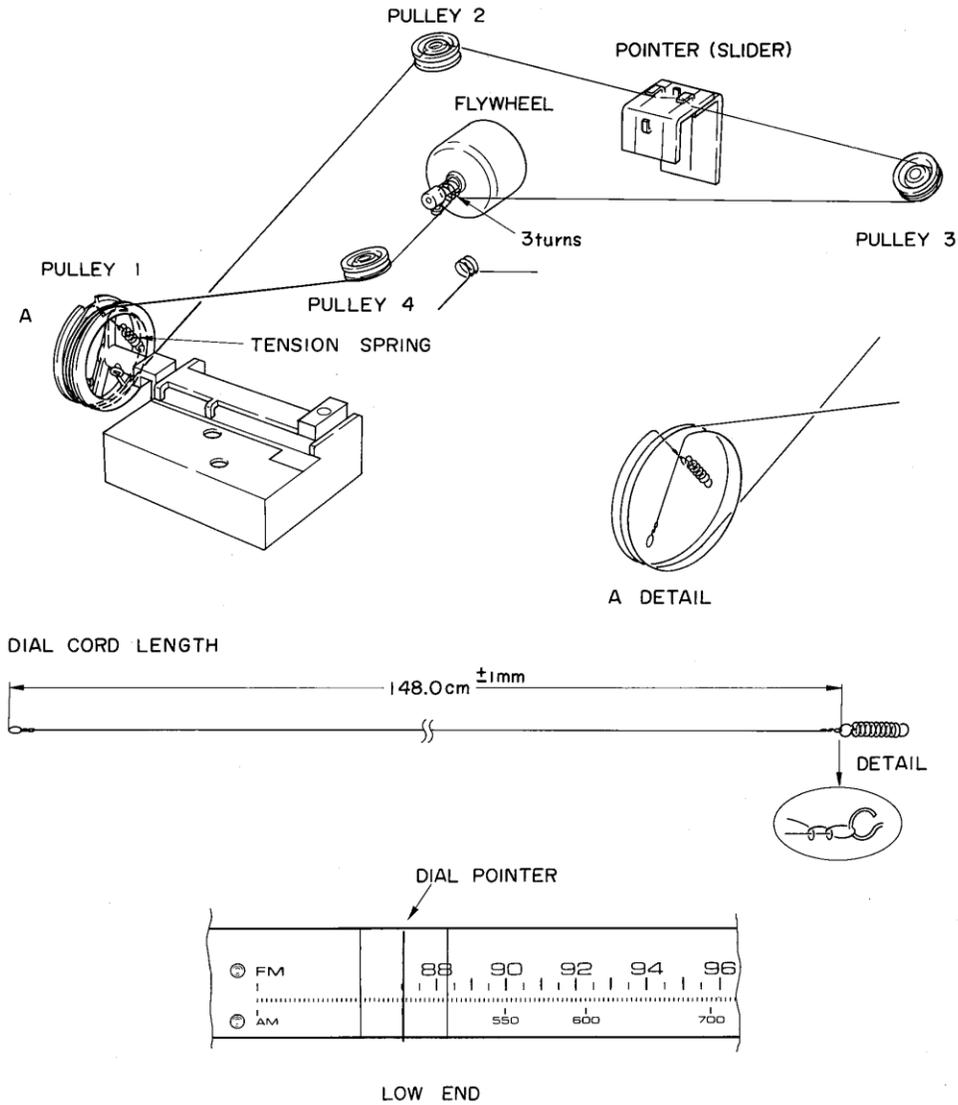


Figure 12. Amplifier electrical board shown from Top View. Mechanical Components Identified.

## DIAL CORD STRINGING

### DIAL CORD STRINGING

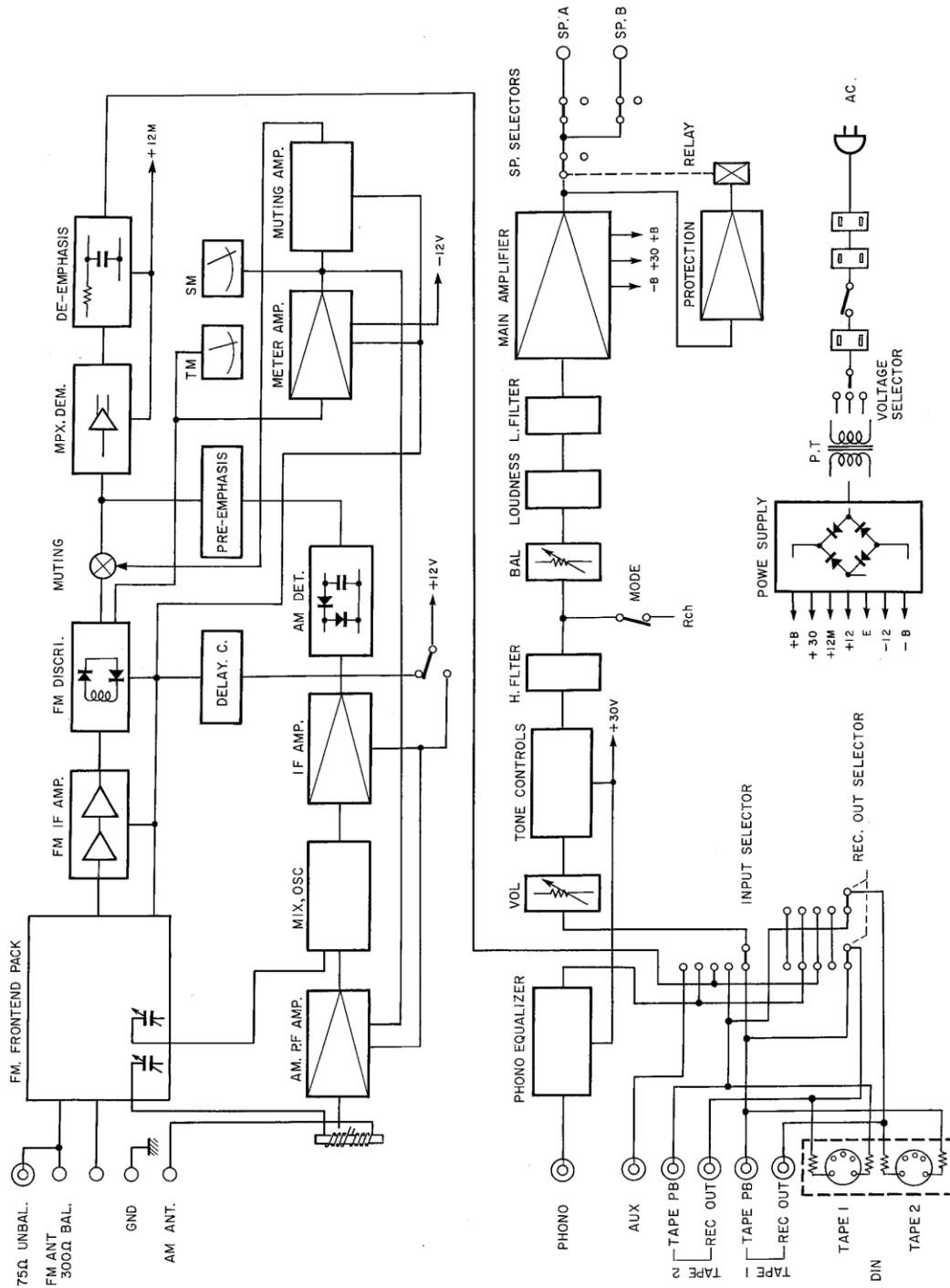


After dial cord stringing, turn the tuning knob fully counterclockwise and set the pointer to lower end indication of the scale as illustrated above. Then hook the string to the pointer assembly and lock by painting.

Figure 13. Diagram showing how the mechanical Radio Tuner Dial works.

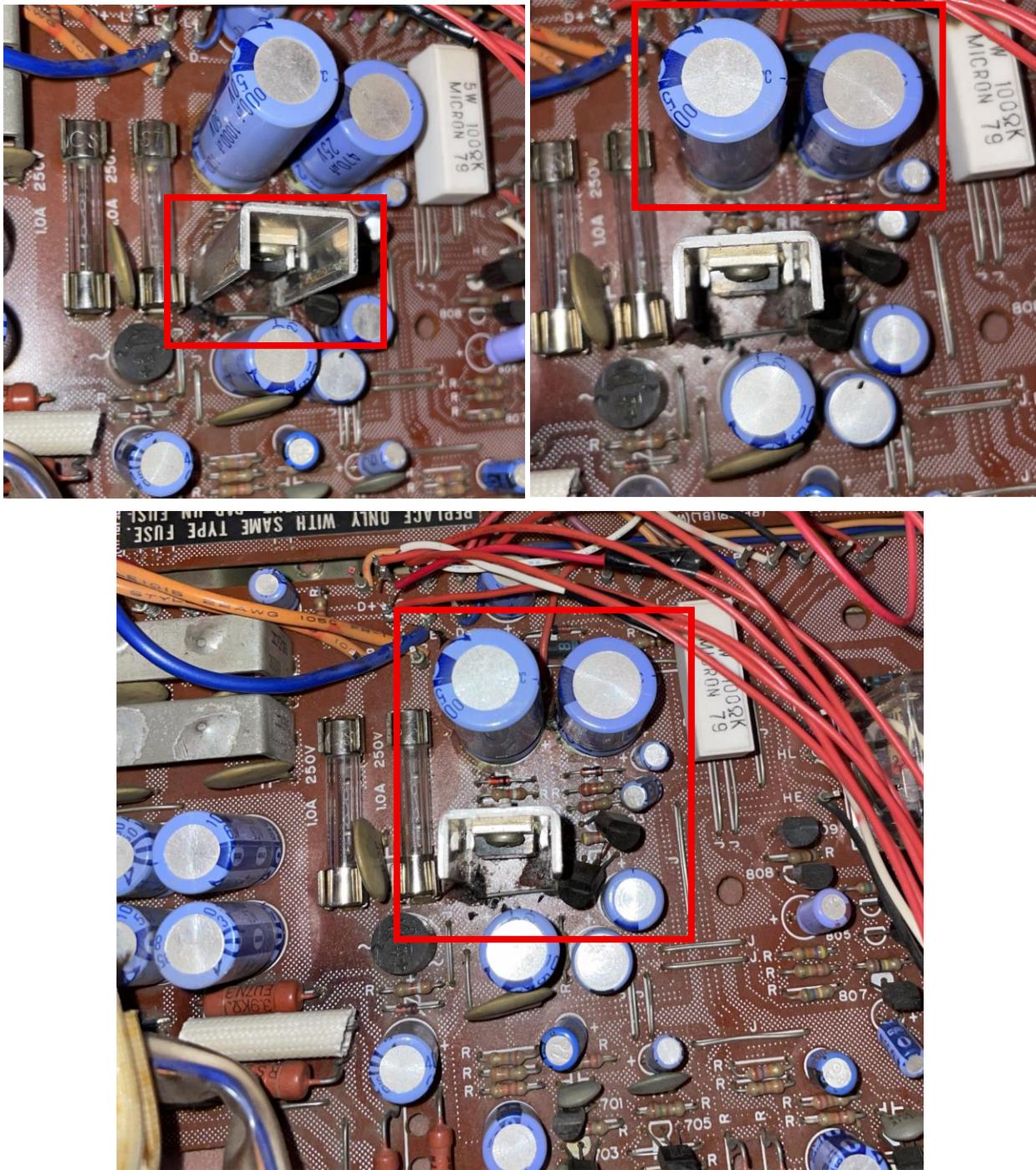
Amplifier Block Diagram:

**BLOCK DIAGRAM**



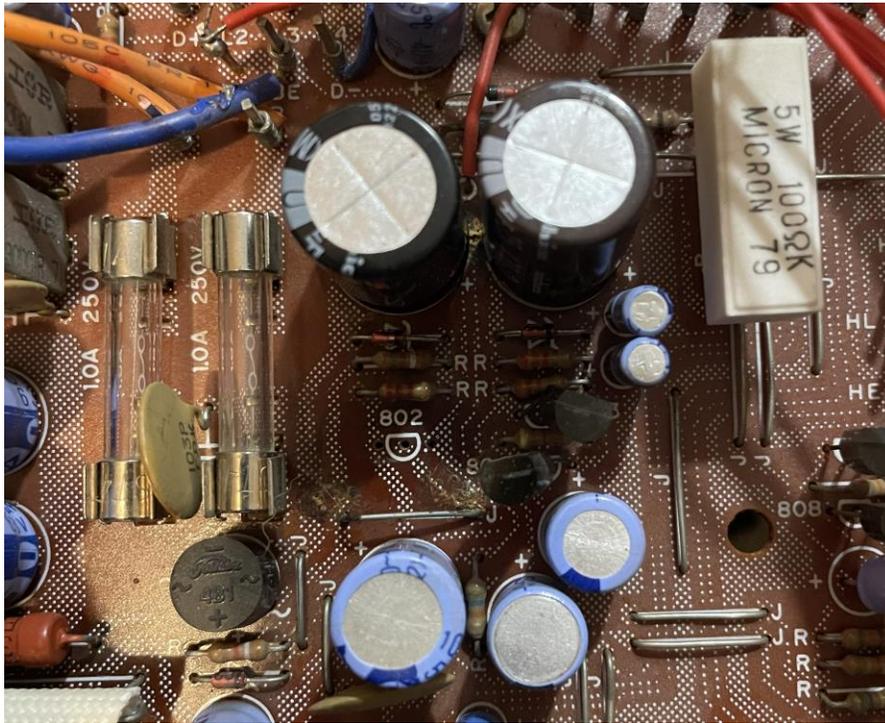


**Suspected Damaged Parts:**

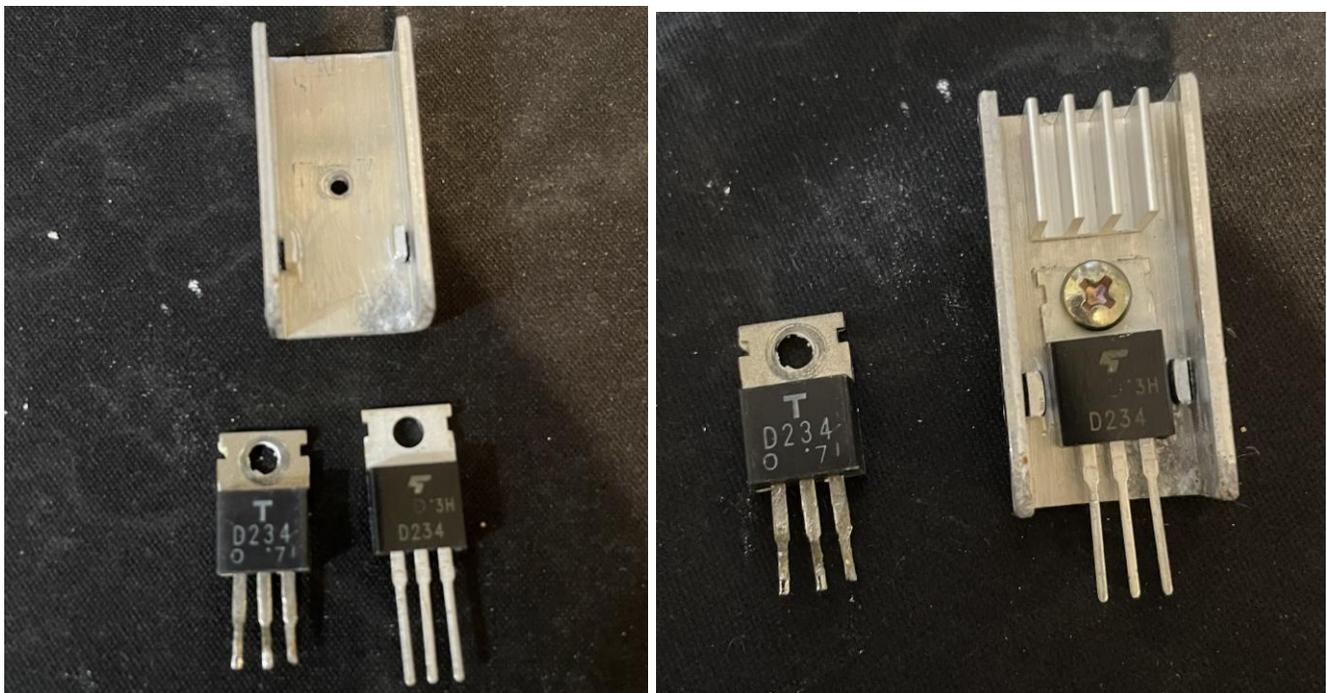


*Figure 14. Some Electrolyte leak seen around the two blue electrolytic capacitors. Burnt substrate seen around the transistor mount.*

## Replaced Parts



*Figure 15. Board with the Blue Electrolytic Capacitors replaced with new Black colored Electrolytic Capacitors. Location 802 showing the Removed Transistor. Can see that the board has been cleaned.*



*Figure 16. Suspected blown transistor from the sound amplification channel. (Left) Unmounted transistors. (Right) Replacement transistor mounted with heat sink added.*