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MMI 465

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This summer I had an internship at Telefunken Elektroakustik in South Windsor, Connecticut. They are known for hand built high quality vintage microphones for use in both the studio and on stage. I had a variety of tasks that covered pretty much the entire microphone production process. While working at Telefunken, I learned a great deal about how microphones work and all of the different steps that go into microphone production.

Telefunken was founded in Berlin, Germany in 1903. Their products ranged from power tools to radios. From 1947 to 1958, they distributed the U47 microphone. They also produced the ELA M 251 from 1960 to 1963. In 2000, owner Toni Fishman decided to start building Telefunken microphones again. Initially called Telefunken USA, it was renamed Telefunken Elektroakustik in 2009. The microphones in production today are the Diamond series, the RFT series, and the Dynamic series, as well as the ELA M 260 tube series, and Stereo microphone sets.

The Diamond series of microphones includes the U47/U48, C12, and four versions of the ELA M 25x series. Each microphone has been historically recreated according to original specifications. These microphones are assembled in one of two lab spaces in the building. The two microphones I worked on in this series were the U47 and the ELA M 250. For the U47, my task was to assemble the base of the microphone. Parts included in this task are a metal-machined piece and a plastic connector with seven pins in it. I made a batch of 30 bases to be assembled with the rest of the components at a later time. For the ELA M 250, I took 30 of those

bases and had to polish the six connector pins with metal polish and isopropyl solution. Since all of the Diamond series microphones are built to such a high standard, this is pretty much the limit of what I did with these microphones.

The other lab space is where the RFT series microphones and Dynamic series microphones are assembled. I spent the majority of my time working on the RFT microphones in this lab. The RFT microphones differ from the Diamond series in that they are more affordably priced, combining high quality parts with more cheaply manufactured parts from over-seas. The RFT name is taken from a rival German company from the 50's and 60's that produced knock-off versions of Telefunken microphones. The current RFT microphones are the AR-51, the AK-47 mk II, and the CU-29 "Copperhead." With the AR-51, I have been a part of several stages of production of this microphone.

The AR-51 shares the same amplifier elements (transformer and ECC81 vacuum tube) as the C12 Diamond series microphone, but uses an overseas capsule and power supply. On my very first day, I assembled all the major components of the AR-51 microphone together- the base, the tube socket, the circuit board, and the capsule all get screwed into a metal chassis that makes up the body of the microphone. On another day, one of my tasks was to cut all of the wires for this microphone from spools of 28-gauge wire. I also have sanded body tubes on the top and bottom so that it touches the microphone metal frame to complete the grounding. I have also spent time with the power supply for this microphone. The power supply also is a remote polar pattern selector; it has nine different polar patterns. I tested the female seven-pin socket on the power supply with a voltmeter to make sure the right pins were seeing the right voltage amount.

One interesting thing I worked on for this microphone was actually building the circuit board that I had seen earlier in the production process. I started with a printed circuit board and had to insert three capacitors and several resistors. Prior to this, I had not taken the time to learn resistor color codes. One of the lab technicians helped me to learn the codes easily for future reference. After soldering all the connections and traces, I had to clip the leads to make the board look nice and neat. I only had to do a batch of six boards, but it was a good introduction to printed circuit board assembly.

A task that they gave me that they do not usually give to interns was attaching the capsule to the rest of the microphone. The capsule has three wires coming from it; the polarizing voltage, the front membrane voltage, and the rear membrane voltage. They are soldered to the top of the circuit board. The different voltages sent to the capsule is what makes the capsule have different polar patterns. This is somewhat involving because you have to be careful about pulling on the wires from the membrane and having them come off. I can see why this task is usually reserved for the lab technicians only.

Since the AR-51 is a tube microphone, it has a special seven-pin cable that gets sold with it. Telefunken has to make sure that these cables are held to just as high of a standard as the microphones themselves. One of my tasks was to re-wrap cables for this microphone. Their cable supplier ships the wrapped cables too big to fit in the Telefunken packaging, so it was my job to re-wrap them to a smaller diameter. After I did a batch of around thirty, I also had to test them to make sure they passed signal. I used a control power supply and an AR-51 microphone to check this. The main thing to look for was that the supplier sometimes puts too much solder in the female end and it can get stuck in the microphone base. Such cables would not be shipped out with a microphone kit.

Similar to the AR-51, I have been a part of many stages of the CU-29 “Copperhead.” This microphone is a cardioid only tube condenser microphone. I have assembled in a similar fashion to the AR-51 all of the essential parts to the microphone. The base, circuit board, and capsule all get screwed onto a metal chassis. This part is always really cool because it is at this point all of the separate microphone components begin to look like an actual microphone. I have also cut all the wires for this microphone. After, I soldered the wires to the base of the microphone, as well as soldering them to the circuit board and soldering the appropriate traces. I also polished the pins on the vacuum tube of this microphone with metal polish, isopropyl solution, and a Dremel felt tip tool.

Another interesting part of this microphone’s production I was a part of was the testing of the capsule. Each capsule is tested in an anechoic chamber to ensure that it has the right frequency response. Inside of the soundproof chamber is a stock body of this microphone that has been rigged in such a way that the capsules can easily be swapped for quick and efficient testing. The speaker is hooked up to a computer program that sweeps the frequency range with an impulse and displays the response on-screen. The graphs can be places on top of one another to see if there are any outliers in the batch.

One last part of the CU-29 Copperhead production that I helped with was the final shipping stage. There was an order of 12 microphones that were being shipped to England that needed to have their power supplies switched from 115 to 230 volts. I had to take each supply out of its packing box and flip the switch from 115 to 230 volts before putting them back in the box to be sent to England.

The last microphone I worked on in the RTF series was the AK-47 mk II. The way it is made is very similar to the way the Copperhead and AR-51 in that all the parts are made in

batches to be assembled together later. I built several parts for this microphone. I plugged the circuit board, assembled bases, wired the microphone, and re-wrapped cables for the final packaging.

Another microphone series I worked on was the ELA M 260. The only thing I really did with this microphone was making up a batch of thirty connector pins. I had to suck the Chinese solder off of the pins first so that it wouldn't create a cold solder connection when I added American solder. Then I soldered each of the pins so that when the wires were soldered onto the base later, it would make that part easier. Lastly, I had to solder a jumper from pin four to the ground tab at the top of the base.

The M80 is another microphone that I worked with, though very briefly. One of the parts of the production was to check the quality of the rubber microphone clips that are shipped out in the M80 boxes. I had to clean a box of roughly one hundred clips with a generic cleaning solution and peel off any excess pieces of rubber from the molding process. Though not very technical, this is still an essential part of the process to ensure that the customer receives the highest quality microphone.

Another part of my internship that I thought was very important was the relationships I built with everyone working there. Having just technical skills is only a part of any job. The people that work at Telefunken were not only very smart, but were nice people work with and be around as well. They made passing the time while doing repetitive tasks, like wrapping cables, a lot easier. I have learned so much about microphones this summer at Telefunken Elektroakustik. This was a great first internship, and I have learned that I would really like to work at a small, technical company like Telefunken.