

The Antelope Valley Picture Tube Rebuilding Company

By Joe Ullo (Owner/Operator 1975-76). Photos by Dad (Joe Sr.)

Here is one answer to the question: Why would anyone buy a one-man CRT rebuilding setup?!!! It happened in the desert area 60 miles north of Los Angeles, CA in a valley that included Lancaster, Palmdale, and several other communities all collectively referred to as the Antelope Valley.

As a kid in the 60's I used to see ads in the back of the electronics magazines for one man picture tube rebuilding equipment from Lakeside and other companies. I didn't give too much thought to them until I started working after school at Lancaster Radio between 1970 and 1972. At that time the local shops were charging about \$250 to \$350 for a color tube replacement. The grade B rebuilt tube was responsible for about \$100 wholesale of that cost. The cost of replacing a tube was causing a lot of old sets to be stored away in garages. I thought if I got one of those one man rebuilding setups I could put a lot of those old sets back into operation for a reasonable price. I had heard stories that there were 2 somewhat successful local attempts at one man rebuilding businesses during the 60's but they ended because one owner passed away and the other owner shut down due to a divorce. Before I could do anything about it I got a job at one of the local aircraft plants and had no time for the CRT rebuilding idea.

Then came the great aircraft layoff of 1974. Like many others I was out of a job and the CRT rebuilding idea returned. Since there was no internet and I wasn't currently working for a TV repair shop I wasn't aware that the 21" round and 23" rectangular rebuilt color tubes had dropped in price and could be purchased wholesale at \$35 each or 3 for \$100 from Dunbar CRT rebuilders in Culver City. The local shops were still charging \$250 to \$350 for tube replacement. As a green 22 year old I didn't realize it then but it was considered good business practice to keep repair prices high when you are also selling new sets as many repair shops in this area did in those days. I inquired at several shops if they would be interested in locally rebuilt tubes for \$50. All but 2 said yes if the tubes had at least a 1 year guarantee but no one mentioned they were already getting 3 for \$100.

One of the shops I talked to told me that Loewen's TV used to rebuild their own tubes but had recently stopped because they no longer did repair work and they might want to sell their rebuilding equipment. The only one man CRT rebuilding equipment company still in business in 1975 was Lakeside and they wanted \$5500 for a single oven setup. So when the Loewen's TV owner offered to sell me their CRT Color Champion equipment and some supplies for \$1500 still set up in a small shop that I could rent for \$75 a month and the tech that used to operate it would teach me, I couldn't resist buying it! That was September 1975.

Over the next couple of months I learned about setting up a business while I practiced the delicate art of glass welding. The tech that previously operated the rebuilding equipment had been sent to a training session at the CRT Color Champion factory a few years earlier when Loewen's TV had originally purchased the new rebuilding equipment. Since Loewen's TV used the equipment only for the tubes they needed for their own repair department the equipment didn't get used every day but the tech said "dozens" of color tubes were rebuilt on the equipment over the years they owned the equipment. There was very little demand for B&W tubes so only the rebuilding of color tubes was worthwhile.

The training I got from the previous tech gave me a good start and the manuals that came with the equipment were pretty accurate. Most of the parts and supplies I needed were purchased from Southwest Vacuum in Arizona. I had to make some equipment modifications and come up with ways of doing and organizing processes to allow daily operation of the equipment for a full time rebuilding business. The usual rebuilding process went something like this:

1. Wash the "always dirty" incoming dud tube and inspect it for deep scratches that could cause an implosion during the heating and pumping process.
2. Measure and record neck length and inner neck Aquadag coating length.
3. Cover the tube with the canvas safety bag and put on safety goggles!
4. Score the neck glass with a file and use the hot wire cutter to crack the glass all the way around. I found that putting a metal sleeve over the neck and using a half round file with the flat side against sleeve as a guide would

allow scoring evenly all the way around the neck. This helped to get a perpendicular cut. Scoring only part way and using the hot wire cutter would occasionally not cut straight possibly due to imperfections in the neck glass.

5. Gently tap the end of the neck until you can just hear air start leaking back into the tube. Let this proceed slowly. Air rushing in too fast can damage the screen phosphor. When the air leak sound stops gently tap the neck again. The air leak sound might start again. If the air has equalized the neck glass will separate and the old gun can be removed.
6. If the tube has a laminated safety faceplate it needs to be removed because the laminate glue can't withstand the high heating temperatures during the vacuum pumping process. The faceplate is removed by heating the tube in the oven until the laminate glue comes loose.
7. Clamp the tube in the lathe. Wash the inside of the neck with the solvent to remove the old Aquadag coating and getter flash residue. Rinse and thoroughly dry. Repaint with new Aquadag coating to the measurements previously recorded leaving a small window in the painted area to see the getter flash later. Shine a flashlight inside the neck to check for a thin even coating of the Aquadag.
8. Adjust the tube in the clamp holder so it will spin true to the vertical axis. The tube can be turned by hand and the flame nozzles can be used as a run out gauge for minimum wobble at the end of the neck. Install a piece of new neck glass on the rubber holder and adjust the gap spacing between the new and old neck glass. It helps to use a straight edge to align the tube neck to the new neck glass. Again check for wobble. Start the lathe spinning slowly. Light the flame nozzles with gas only to start warming both pieces of neck glass. Since heat rises set the flames a little below the gap. After warming for a while raise the nozzles up to the gap and add oxygen to cause both edges to start melting. Here's where the real "fun" begins. There is an air tube attached to the rubber holder end of the new neck glass. The other end of the air tube has a tobacco pipe style mouthpiece. You hold the mouthpiece in your mouth and the flat carbon paddle in your left hand. With your right hand you raise the lower neck glass holder until

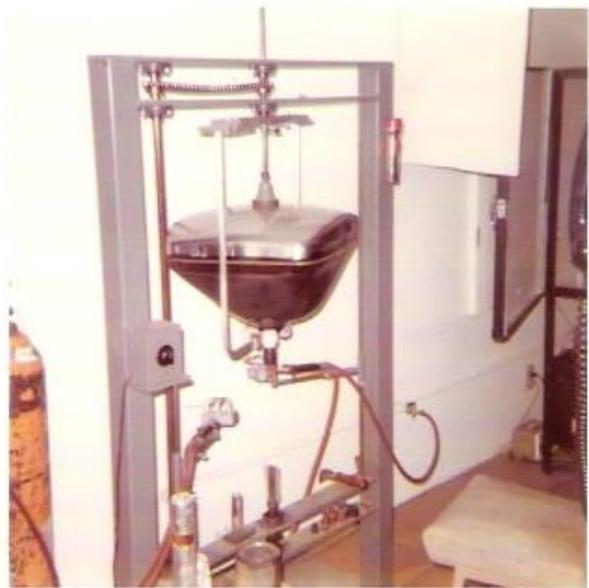
the molten edges touch and join together. Then you let the holder return to the lower position. The glass will start to sag inward. You blow just enough air pressure to counteract the inward sag while using the flat carbon paddle in your left hand to correct outward sag and use your right hand to slowly back away the flame nozzles allowing the glass joint to harden. The oxygen can be turned off and gas only flames used for a while for gradual cooling. It is definitely an art. It took a lot of practice to judge the right spacing between the new and old neck glass, the right amount of edge melt before joining the 2 pieces, and the right amount of air pressure. The slower the cool-down process the better to produce a stress free weld with minimum distortion that wouldn't crack later. Remove the tube from the lathe and quickly cover the neck with the annealing tube. I let it sit overnight and checked for cracks the next day before installing the gun.

9. Note: Keeping the lathe chains reasonably tight and lubed keeps small instantaneous speed variations between the tube and the new neck glass or gun base from causing stress zones in the cooling weld.
10. Realign the tube in the lathe. Using the appropriate gun stem adapter on the lower lathe spindle raise the gun into the neck until it is at the same spot as the original gun. Adjust the rotation of the delta gun so the blue gun will be as close as possible to top center of the tube. This will make the tube easier to converge. Start the lathe turning slowly and make readjustments to the tube to minimize the wobble distances between the gun base and the neck glass. Start the gas only flames against the neck glass a little below the gun base. After a while raise the nozzles nearer the base and add oxygen. When the neck glass sags in and touches the gun base bring the oxygen flames in close below the base and the weight of the excess neck glass should cause it to tear and drop away and let the upper neck glass seal with the gun base. If the excess neck glass doesn't tear away a carpet knife or a pair of long nose pliers can sometimes be a help to start the excess glass tear-off. Slowly back off the flames to let the seal harden and then reduce to gas only flames for awhile. After turning the flames off quickly remove the tube from the lathe and cover the neck with the annealing tube to retain the heat for as long as possible. I let it sit overnight

and checked it the next day for cracks. The tube was now ready for the oven.

11. NOTE: It is not a good idea to weld glass on the lathe when the nearby oven is cooking and drawing vacuum on a tube because of the possibility of an implosion. The resulting thunder clap sound once caused me to create a really unusual looking piece of warped neck glass "art".

The photos show how close the lathe and oven were. The lathe used natural gas and oxygen to produce a flame hot enough to melt glass. The oven used natural gas only. The lathe has 2 sets of tri-tip flame nozzles. The one on the right was used for melting the glass. The one on the left was used just to keep the glass warm when the right side nozzles were moved away. Near the bottom of the picture you can see an annealing neck cover, a can of Aquadag coating used to coat the inside of the neck, the carpet knife, and various adapters for neck glass and gun base-stems. The flashlight hanging on the upper right of the lathe was used to shine inside the neck to show any bad spots in the new Aquadag coating.



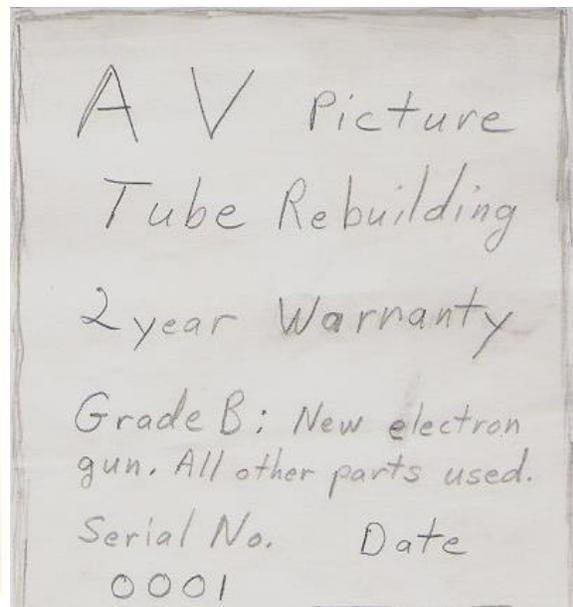
12. Mount the tube in the oven being careful when aligning the neck stem through the bombardier coil and the tipoff coil into the diffusion pump opening. The CRT Color Champion oven tube support was probably

designed originally with B&W tubes in mind. The heavy color tubes caused a slight tilt. Also, maneuvering heavy and/or hot tubes with delicate vacuum stems in and out of the diffusion pump inlet without breaking the stem was not easy. I built a power lift device using threaded rods, a wood block, a car power window motor, and a battery charger. It gave support to both sides of the CRT support and actually worked pretty smoothly for raising and lowering the tube. A photo and a very poorly drawn diagram of the lift are shown further on in this article.

13. After tightening the diffusion pump connection and connecting the gun base wires, turn on the gas, light the flame, and close the door. There is a small viewing hole in the door for adjusting flame height and for watching the tipoff coil “sunrise” that indicated a complete seal. There is also a small hole in the top side of the oven for inserting the high temp thermometer.
14. At this point it is time to follow the manual for pump startup and shutdown timing and procedures. The manual also gives the times to apply voltages to “age” the gun elements and when to run the neck bombarder coil and tipoff coil. I found that 1 hour building up to temperature, 4 hours pumping, and at least a 1 hour cool down produced a nice crisp picture on the 21” round and 23” rectangular color tubes that most people needed. Of course that meant that the 2 tubes per day that the sales brochure claimed would be hard to do.
15. After turning off the flames I usually tried to leave the tube set in the oven until the next morning.
16. Put on safety goggles and gloves. Open the door and quickly cover the tube with the canvas bag. Disconnect the gun base wires and loosen the diffusion pump connection. Here is where the power lift made it easy to lift the tube straight up out of the diffusion pump connector. Remove the tube from the oven.
17. The tipoff coil melted the glass vacuum stem near the gun base to seal the tube. Use a file to score across this melted area leaving enough length to maintain the seal and carefully snap off the excess vacuum tube.
18. Flashing the getter was a bit awkward. With the tube in the canvas bag stick the neck into the appropriate size bombarder coil on the outside of

the oven and use the foot pedal to turn the bombarder on and off multiple times to keep the getter glowing orange for about 30 seconds to 1 minute before it flashes and leaves a silver deposit on the inside of the neck. Now the tube is ready for testing and burn in.

19. I used an Amphenol CRT tester to check for shorts, gas, and good emission from all 3 guns. For the burn in test I made a test jig from a Setchell Carlson modular chassis in a box made from 1x12 pine mounted on a plywood base with supports to let the tube neck reach the chassis yoke, base, and high voltage connections for easy installation and removal. I used a Heathkit dot generator for a purity check and quick alignment and then let the tube show an over the air television channel for about an hour.
20. If everything checked out (fortunately, it almost always did) I replaced the safety faceplate if the tube had one, masked and repainted the outer Aquadag coating, and finally attached the A. V. Picture Tube warranty label and serial number. The first 5 labels were handmade. Then I got a local print shop to professionally make 100 labels. I actually used them all.



The photos show the Setchell Carlson test/burn-in jig and a prototype warranty sticker. The labels actually used had the industry standard 1yr. warranty.

The oven was also used to heat the tubes to remove bonded safety glass faceplates. On some the bonding glue came off easy like the one in the photo. Other tubes like the 23EGP22 had the stickiest hard to clean off gooey mess I had ever encountered. It required alcohol, Windex, and lots of elbow grease. The holding fixture table really helped when cleaning the screen and when reattaching the faceplate. There was no re-gluing process available so the faceplates were reattached using double sided sticking rubber foam weather stripping around the edges to space the faceplate off the tube face. Then heavy duty duct tape was used to completely seal and hold the faceplate and tube securely together.

The right side of the safety glass removal photo also shows the washing pan for the “always dirty” incoming tubes. Sitting in the pan is the heavy canvas safety bag used to cover hot tubes when removing them from the oven and when flashing the getter. The heat resistant gloves were definitely needed but they probably had asbestos in them in those days.

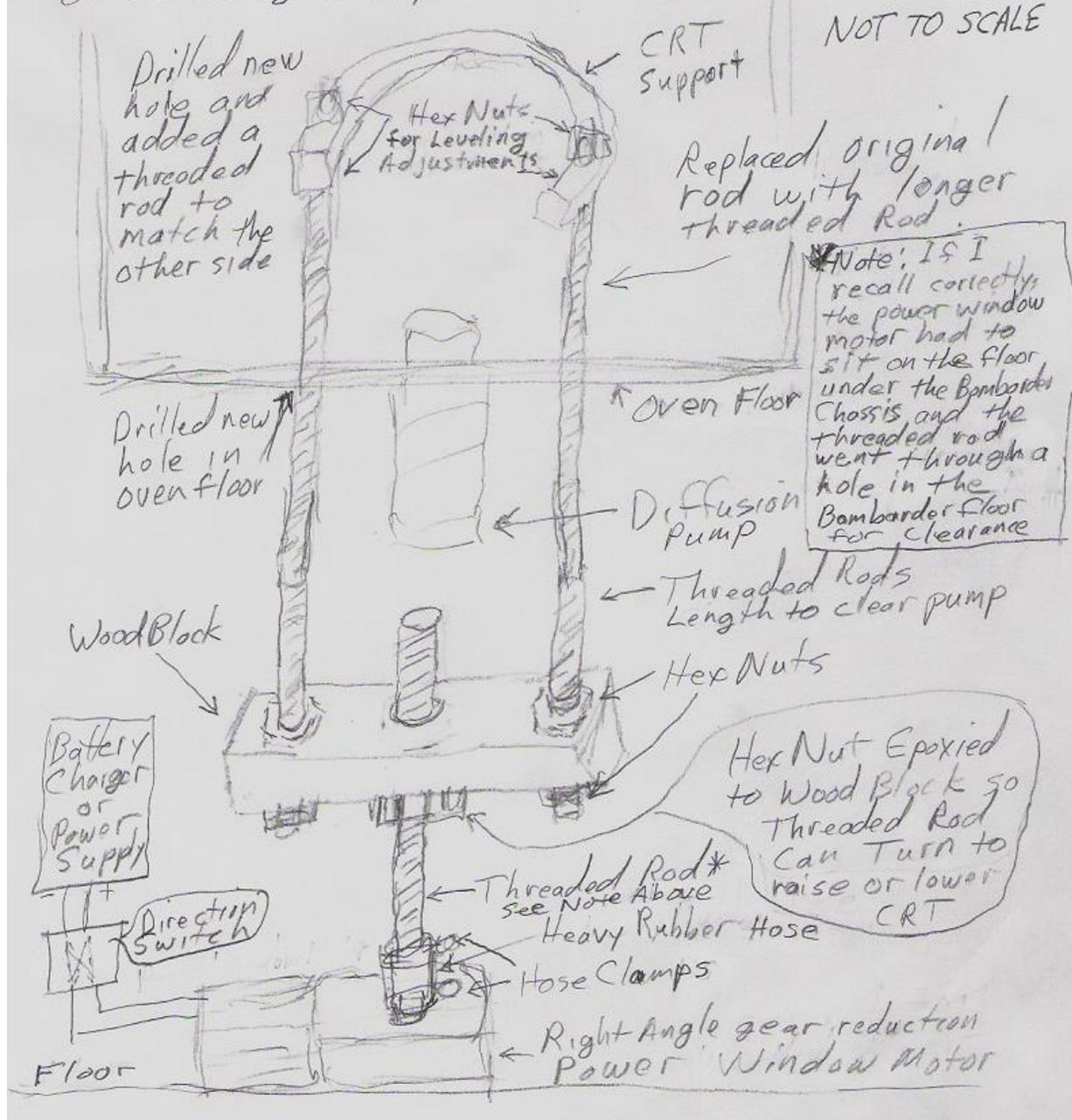


The oven photo shows the power lift. The added second support rod is just to the left of the tube neck. The 12v battery charger is on the floor to the left of the bombardier. The direction switch and car power window motor can be seen on a pad under the bombardier. A diagram of the power lift setup:

POWER CRT LIFT

Used by Antelope Valley Picture Tube Rebuilding 1975-1976

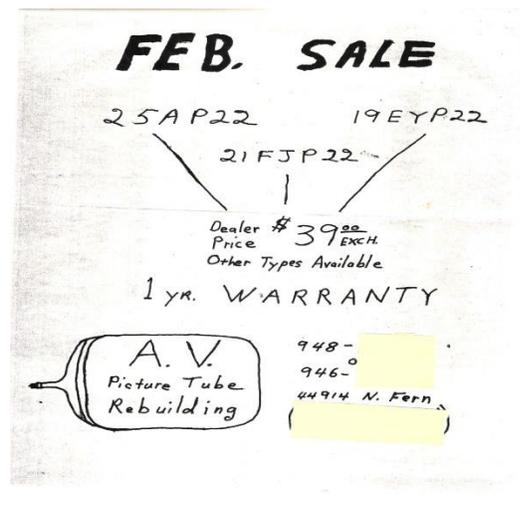
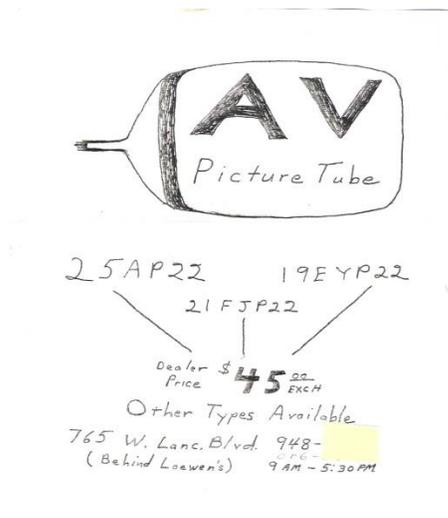
A really poor quality drawing of the power CRT lift I built and used on my CRT Color Champion oven to prevent stem breakage when installing or removing heavy and hot CRTs from the Oven.



Beside the need for the power lift the oven had another problem:

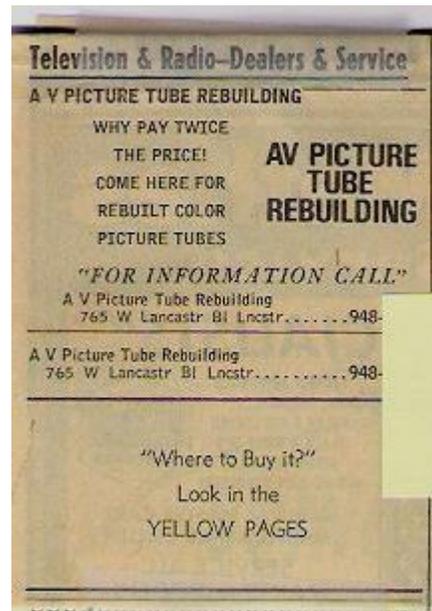
There was heat, heat and more heat! To reach the temperatures required to drive the gas out of the glass the oven originally raised the surrounding room temperature to almost 90 degrees even with the window air conditioner running on high. I thought about trying to seal the oven better or put more insulation on it but that would have caused the cool down to take a lot longer. I built a shroud from aluminum backed plywood that covered the top half of the oven and directed most of the heat out through a ceiling fan to the outside. The shroud had doors that opened for access. It is hard to see in the photos because the camera seems to have caught the doors edge on. The room temperature became more reasonable.

I had originally planned to sell only wholesale to repair shops so I sent advertising flyers to as many of the local shops as I could offering the 3 most needed tube types (21",23",19") with a 1year warranty for \$45 each delivered to their door usually within an hour. That was when a couple of shops informed me of Dunbar Rebuilding's 3 for \$100 deal. I dropped the price as low as I could go and still make minimum wage, \$39 each. A couple of shops said that would be worth it because Dunbar was a 120 mile round trip but they would have to wait a while to see if I was going to be around long enough to honor the warranties. The 2 flyer prototypes are shown below:



So I had to start selling retail to the do-it –yourselfers and the “working from their garage” repair guys. It seems there were a lot of them. The Antelope Valley was a high tech aircraft building area and a lot of those techs were out of work at that time so repairing televisions in their garages seemed like a natural thing for them to do. However, it did irritate a lot of the regular shops.

I put ads in the local papers and the phonebook Yellow Pages. I settled on a higher price of \$59.43 exchange to cover the advertising and other costs of selling retail. I was often asked why I picked the unusual number .43. The answer was that when the sales tax was added the total price came to \$63.00 even so I didn’t have to deal with making coin change.



The business really began to pick up. Some customers didn’t have a rebuildable exchange so I had to charge a \$20 dud fee. Unfortunately, I started running low on rebuildable dud tubes. To make sure I always had the most common tubes on hand I actually had to take advantage of the Dunbar Rebuilding 3 for \$100 deal myself!

Dunbar Rebuilding in Culver City, CA. 60 miles south of the Antelope Valley was a large tube rebuilder capable of 50 + tubes per day. The friendly people working there were very nice. When I introduced myself they had already heard about A. V. Picture Tube from one of the A.V. TV repair shops who bought tubes from them. The boss at Dunbar gave me a tour of their facility and let me watch and ask questions about their methods of doing things. He said anytime I had any other questions just give them a call. I mentioned there were some unusual tube types that I couldn't rebuild or some that I couldn't find duds for. He said to let them know and they would ship by UPS what I needed at wholesale prices. That's what I call great service! I bought 9 tubes on the 3 for \$100 deal and several times I ordered uncommon tubes from them.

To deal with the "diminishing duds" problem I put ads in the local papers offering to buy those non-working color televisions that had been stored away in garages. Since I was only buying them for the tubes I could only offer \$5 to \$25 depending on the tube type. Most of the people who called would have given them away just to get back the space in their garage but I paid for them anyway. Some of these televisions still had good picture tubes. It seemed like a waste to rebuild a good tube. So, after testing them on the Amphenol tester and on the test jig I sold used tubes with a 90 day warranty for \$10 for round and \$20 exch. for rectangular. This turned out to be popular with the "do-it-yourselfers". Most of the televisions I picked up had cabinets damaged from the storage conditions. If the television still had a nice cabinet I fixed it and sold it for \$75 to \$150. The \$75 to \$100 sets had used tubes with 90 day warranties. The \$150 sets had 1yr warranty rebuilt tubes and 90 days on the rest of the set. The only one I got a warranty call on was a \$75 "roundie" that needed degaussing after having been moved a couple of times.

I started getting calls from people who wanted to buy the rebuilt tubes but also needed someone to install them. I didn't have the time to do that since many sets have more wrong with them than the tube. I found 2 licensed repair shops that would install and converge the tubes for \$25 to \$35 (assuming

nothing else was wrong). Antelope Valley residents could now get those bad tube color television sets repaired with a rebuilt tube for less than \$100.



This early photo shows part of the storage room. Too many used "roundies" on the shelf and not enough rectangulars for rebuilding! This was when I had to buy some extra tubes from Dunbar Rebuilding. Rebuilt tubes in boxes on the left and a repaired television for sale on the right.

By the summer of '76 the business had grown enough to support itself but it was only making minimum wage for me. I ran A.V. Picture Tube from Monday through Saturday but, fortunately, on Friday and Saturday nights I had a second source of income that I had relied on since I was 13. I filled in playing drums in local bands. It had always provided that little extra needed for car insurance, books for junior college, etc. It had become an important enough part of my life that if I wasn't playing in a band I was at least listening to one on the weekends. However, that second profession would cause a major change in A.V. Picture Tube's future.

One Saturday evening in July '76, after a hard day of rebuilding picture tubes, I went to watch a band playing in the lounge of a local hotel. They did a ShaNaNa style oldies show as well as playing the current "top 40" of 1976. Their drummer was leaving the band at the end of the A.V. gig. I tried out for the position and since I knew how to play the oldies as well as the new stuff I got the job. The job paid the same per week as I had been making at the aircraft factory, they already had bookings for the next 6 months, and I would

be playing music 6 nights a week instead of working in a factory listening to rivet guns. For a single 23 year old it seemed like a dream come true. The only problem was we would be leaving for the next gig in Arizona at the end of October. A.V. Picture Tube would have to be sold.

I listed A.V. Picture Tube with a local real estate agency for just a little over what I had in equipment, inventory, and the sales commission. It sold in a couple of weeks to a nice couple who were engineers in the aircraft industry. They were looking for something different to do since their jobs were a little slow at this time also. Since the business part was already established they could spend their time on learning the art of tube rebuilding. I showed them what I had learned. They caught on quickly and were up and running faster than I did. Although they didn't have to, they said they would still honor the warranties from the tubes I sold since not even one tube had come back yet. That would be good business public relations since some customers were repeat customers.

I spent the next couple of months after the sale dividing my time between training the new owners and band rehearsals. By the time I left with the band in October A.V. Picture Tube was running pretty good. After about three mos. the band had a 1 week break. When I came home one of the things I did was check in on A.V. Picture Tube. Business was OK but slowing a little because the aircraft factories were starting to pick up again and some of the garage repair shops were closing as the electronics techs went back to work. The next time I returned home was about 5 months later. Internal friction had caused the band to break up. Unfortunately, that is a common story and I was definitely disappointed. I decided to check in on A.V. Picture Tube and it was GONE!

I wasn't able to contact the new owners but one of the neighboring businesses said that they had been recalled to their engineering jobs and had moved the equipment into their garage intending to run A.V. Picture from there only on the weekends. Unfortunately, it didn't happen. Business had been slowing down even more because so many techs and "do-it -yourselfers" were being recalled to the aircraft plants. Also, some of the larger repair shops

were starting to do tube replacements for under \$200 and the price of new color sets was getting lower. The economic feasibility of a one man tube rebuilding business in the Antelope Valley had reached its end.

What happened to the equipment? Several months after the end of A.V. Picture Tube I was walking through a place called Shorty's Swap Meet on my quest for unusual electronics. Shorty's was basically a 2 acre outdoor thrift shop that was the Antelope Valley's place to go for used electronics or auto parts. There in a pile of other electronic stuff I spotted my Setchell Carlson test jig still in its home made pine box! There were some other small items that I remembered having at A. V. Picture Tube. I asked Shorty what happened to the lathe and the oven. He said they had been sold to a man who wanted to salvage them for the motors and pumps. Arrgh! What a sad end for such unique equipment.

With the "dozens" of tubes that Loewen's built, the 100+ tubes I built, and the few months' worth of tubes the last owners built I would estimate this CRT Color Champion built about 200 tubes. The reliability and quality of the tubes was pretty good considering only one tube was returned under warranty that I know of. It had a "broken neck". The tubes that I built that didn't make it through my final testing procedure included 2 implosions in the oven, 1 bad blue gun, and 1 that wouldn't converge for some unknown reason. The rebuilt tube I installed in my parent's RCA set was still working 10 years later when the set was stolen and the tube I installed in my Admiral/Cartrivision combo was still working 6 years later when I sold it (sure wish I hadn't sold that!).

I was recalled to my aircraft tech job for the next 35 years (still played weekends in case there was another big lay-off!) but I'll always remember A.V. Picture Tube as an unusual and interesting experience.