HLARA RADIOGRAM

The Quarterly Publication of the Heartland Antique Radio Association, Inc.

October 2007 Edition

Greetings From the President

Welcome to another issue of the Heartland Antique Radio Association's Radiogram. Many thanks go to Radiogram Editor and Vice president Dan Weilacher for his efforts. Also, thanks to the members who contributed content for this issue.

The last few months have been great for the club. Meeting turnout has been pretty good as well as attendance at the special events. We conducted another Radio Tune Up and despite some rainy weather, had a good showing. We also held our Second Annual Fall Picnic and Swap Meet. The weather was beautiful and 19 members and spouses turned out for some good food, radio bargains and fellowship.

We've been talking about conducting a Radio Electronics Class for the members that would be interested in attending. I think this would be very beneficial to interested members. If enough people are willing to attend, we'll start getting it together and begin the classes sometime after the first of the year. Let one of the club officers know if you're interested. The club did this several years ago and it was very successful.

As always, your club leaders have their eye on the ball and will continue to keep things interesting and offer activities other than the monthly meetings. Remember, this is your club and your input and participation is vital in its continuing success. Until we talk again, enjoy this issue of the Radiogram.

Chris Cunningham
HLARA President

RESISTIVE LINE CORDS IN AC/DC RECEIVERS

By Curt Lutz

Back in the mid 1930s, radio manufacturers introduced the AC/DC receivers (employing series-string filaments and no power transformers). These radios could be built for about half the parts cost, due to the elimination of the power transformer -- the most expensive component.

The AC/DC radios provided another advantage, since they could operate from 110 Volt DC power, which was the only power source in some towns at the time this concept was introduced. Thomas Edison pushed for 110 DC power back in the 1920s and 1930s, while Westinghouse promoted 110 Volt AC for house power. Believe it or not, the last (Edison) 110 Volt-powered section of New York City was only recently converted to AC operation a couple years ago. As we all know now, the Westinghouse concept was the way to go, and most of the 110 Volt DC-powered communities changed over to AC power within a few years. Note that, when operated on DC power, the plug needed to be inserted so that the positive side of the line connected to the plate of the rectifier tube; if reversed, the rectifier would not conduct, although the filaments would still light up. The following suggestions assume that you will be operating the AC/DC receiver strictly on AC power.

Now, in order to operate the vacuum tube filaments in this series-string configuration, there are some simple rules:

1. Since the filaments of the tubes are wired in series, the total added filament voltage of the filament string must be equal to the AC line voltage. If the voltage drop across the series filaments is less than line voltage, a resistance was added to provide the additional voltage drop -- so the tubes would have the correct voltage and current.

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For more info see HLARA.org

A Simpler Time

By Chris Cunningham

Anyone who knows me knows about my passion for antique radios and old time radio programs. Even though I stay very busy with work and family, I still find time to be the President of the Heartland Antique Radio Association. www.hlara.org I bill my time (photographic and legal) out at $100.00 an hour. Why would I spend the equivalent of $2000.00 in labor to restore a radio that may be worth only $300.00 when finished? The answer is it's a labor of love. A question I have asked myself is what is the root of this fascination? The answer, at least in my case, is a bit more complex than one might think.

The golden age of radio began in the late 1920s and lasted into the late 1950s. I am a bit of an enigma. My very way of life is dependent on cutting edge technology. Without the internet, cell phones, laptop computers, and the omnipotent Microsoft Outlook to keep everything on schedule and running smoothly, I would be truly lost. Even with all this technology at my beck and call, I have always felt I was born in the wrong era.

The Golden Age was a time when life moved a bit slower. Everything was a bit less complicated. Even during WWII, things were simpler. While it was a troubled time for the world, there was a simple and absolute clarity about what needed to be done. The country came together and sacrificed and did the job

2. The VOLTAGE ratings of the tubes may be different, with various voltages, such as 6, 12, 25, 35, 45 or 50 Volt ratings,

3. The CURRENT rating of all the tubes must be equal; all tubes need to have the same current rating,

In most early AC/DC sets, the tubes would have all had a 0.3 Amp filament current rating. Most of these early sets used two or three tubes that had 6.3 Volt filaments, plus a couple tubes with 25 Volt filaments. Again, all the tubes would have had a 300 mA current rating. OK, so when you series the three 6.3 Volt filaments and the two 25 Volt filaments, the filament string needs 68.9 Volts -- but we have a nominal line voltage of 110 Volts (Nominal AC line potential is now close to 120 Volts. In order to make this work, we need to drop about 50 Volts across a resistance of some type, so that the voltage across this filament load is right around 69 Volts. In some early sets there were two 6.3 Volt filaments, plus two 25 Volt filaments, so the series filament string needed 63 Volts, so we needed to drop about 57 Volts through a resistance.

There were three methods used to drop the excess line voltage for the filament string;

1. Install an additional tube socket and plug in a BALLAST TUBE (basically this is nothing but a wire wound power resistor, assembled into a plug-in device).

2. Install a wire wound dropping resistor on top or under the chassis.

3. Utilize a three-conductor line cord, having two non-resistive conductors, plus one resistive conductor. These resistive line cords worked OK, but they were truly dangerous. The cords would run pretty warm, and, if a short ever happened in the filament string circuit, it was not unusual for the house to burn down. Frankly, these radios with resistive line cords would have been fairly safe, had they simply used a fusible plug at the input of the line cord. In fact, if you have one of these old radios with the resistive line cord, and it still functions as it was designed, I suggest that you replace the old plug with a fusible plug, plus fuse it very close to the actual current. Most of these old radios only consumed between 20 and 40 Watts, so I suggest you employ a ½ Amp fast-blow fuse.

that needed to be done. Before and after the war, men worked hard and supported their families and wives stayed home to run the household and raise the children. If you couldn't afford something, you saved up your money or did without. No one expected or felt they deserved a handout from the government. If someone had more than you, they didn't owe you something because you had less. The welfare mentality had not been born. Such thoughts were un-thinkable.

This was the old American way of life. A way of life that is forever lost. It is that time and that way of life my old radios represent. When I bring an old radio back to life, I've restored a device that brought news of Lindbergh's flight into the home. A device that carried news of the war, a device that stirred the imagination of countless children with The Adventures of the Lone Ranger, Jack Armstrong The All American Boy, and Tales of the Texas Rangers. In the evening, the glow of the vacuum tubes brought the family together for entertainment and for news about that simpler world.

Every radio is a time machine that can keep alive the memories of a simpler and better time. I do not feel that I own the radios I restore. I am only the caretaker for a brief time, keeping something magical safe until it is time to pass them on to the next caretaker. By keeping these old radios alive, perhaps the memory of a simpler time will also be kept alive. The country will never return to that time but the soft glow of the radio tubes allow us to visit that simpler time and perhaps the memories will prevent that simpler time from being completely lost.

November 15th Membership Meeting, Nathan-Hale Library
December 1st HLARA Christmas Party at the Anderson's Home
January 17th HLARA Membership Meeting, Nathan-Hale Library

Nov. 16th-18th VPRS Convention, Mesquite Texas

If you have an AC/DC set with a plug-in ballast tube, check out the filament string to see that all tube filaments are OK (tube tester can be useful with this), then check to make sure that ballast tube is OK. Many of the early AC/DC sets had a dual section ballast resistor, with a lower resistance to drop about 5 to 6 Volts (for a panel lamp), plus a larger resistance for dropping the rest of the 63 or so Volts.

If you find yourself with one of these AC/DC radios with a resistive line cord, I definitely recommend that you eliminate that dangerous device. There are several ways to defeat the resistive line cord.

1. Consider some tube substitutions. As mentioned above, most of the early AC/DC sets used those 300 mA tubes., such as 6K7, 6A7 or 6A8, 6Q7, 25L6 or 43 (25-Volt), and 25Z5 rectifier. You could replace each of these tubes with the 150 mA equivalent tube, like 12K7, 12A7 or 12A8, 12Q7, 35L6 and 35Z5 tubes. A few years later, the 6-S and equivalent 12S Series tubes appeared, such as 6SK7, 6SA7, and 6SQ7appeared; these 6.3 Volt filament tubes can be replaced with the 12S Series tubes, such as 12SK7, 12SA7, 12SQ7, along with the 35, 45 & 50 Volt rectifier and audio output types, etc. If you plan this carefully, you just might eliminate the need for any series resistance in the filament string -- 12.6 X 3, plus 35 plus 50 adds up to 122.8 Volts -- this will work great and eliminates any need for a wire wound power resistor. My preference is to revise the tube complement to utilize all 150 mA filament tube types, which can eliminate more, if not all dropping resistors. When changing from a 25Z5 to the 35Z5, you also can eliminate any resistor that may have been there to provide the nominal 5-6 Volts for a panel lamp; this now is available at two filament pins of the 35Z5 rectifier tube.

2. Replace the line cord with a standard two-conductor line cord, plus install a suitable power resistor inside the radio. In many of these radios, this can be very difficult, as they often left little or no space to locate a big wire-wound resistor, either above or under the chassis. Many of these sets were miniaturized, with tubes, IF cans, tuning capacitors and other top-of-chassis components crowded together, leaving no place for mounting a big power resistor above the chassis. No matter where you put such a resistor inside the cabinet, it will add

RADIO ART

By Dan Weilacher

This Beautiful 1940 Zenith 12-S-471
done in color “sketch” effect. If you have a radio you would like to have done in PC sketch in color or black and white email it to
mailto:dan.weilacher@hlara.org

substantial heat in the cabinet. When I make this conversion (from a resistive line cord), I usually use a Dale 50 Watt Power resistor; these Dale-type resistors are about 2.5 inches in length, housed in a finned aluminum case about ½ inch in diameter, and have two lugs that can be used to bolt the resistor to the rear flange under the chassis. This type resistor will provide maximum heat dissipation through direct surface bonded to the chassis, preferably to the rear, but in some cases space may only be available on the front or one side of the chassis.

Keep in mind that such a power resistor must be rated at no less than twice the actual dissipation; in other words, if you put in a resistor that drops 60 Volts at 0.3 Ampere, that amounts to 18 Watts, therefore, the power resistor must have a rating of at least 36 Watts. Using a 50 Watt rated resistor, attached to a chassis flange, will provide much better heat dissipation than a resistor hanging in free space (especially if located under the chassis). These 50 Watt power resistors are available from most electronics suppliers, such as Mouser, MCM, All Electronics and others; brands are: Arcol, Dale, Vishay, etc.

My preference is to revise the radio to utilize all 150 mA filament tubes, which cuts the filament string heat in half, and eliminates most, if not all the dropping resistor heat waste; the radio runs much cooler, there is significantly-reduced damage to plastic or composition cabinets and everything is much more efficient.

One more method exists to get reduced filament current/average voltages, using a silicon diode; this option is discussed in an article written by Bob Shindhelm and included in this HLARA Newsletter.

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Replace Resistor Line Cord with a Diode???
That is the Question!

By Robert Shindhelm

Many of us have some old AC/DC sets that were built back in the '30's that had resistors built into the line cords. . Since no manufacturer at that time made tubes with heater voltages so that the voltage drop of 5 or so appropriate tubes added up to 110/115 V, these radios typically were built with 2 - 25V tubes and 3 – 6V tubes which adds up to about 70V. This required a line cord dropping resistors in the order of 105 to 120 ohms with some additional internal resistance built in to the heater string to which the dial light was hooked across. The resistor line cord would deliver about 70 to 80 V to the heater string leaving a few volts for dial lights, internal resistors, etc. This worked pretty well since it put the 10 Watts or so of heat outside the cabinet although the cord ran noticeably warm. So far as I know there weren't too many houses burned down but I'm sure a few cats and dogs fried when they chewed on the nice warm wire.

I'm sure you all have read a recommendation somewhere that the easy replacement for a line cord resistor is to simply do away with it and install a one amp, 600V diode in series with the heater string. And those of you who have done this little trick can testify that in general, it works and it is easy. If you hook the diode in series with a 100 W bulb and apply 120 V AC you get a dim bulb and you can measure about 54 V with a DC voltmeter across the line on the load side of the diode. Put the diode in the heater string of a radio and the radio will probably work fine. Voila! Eureka! Wonderful! No heat! Easy repair! Cheap! Is this great or what? Well I donno'.

Lets take a look though at what comes out of a "110 V" AC wall receptacle.

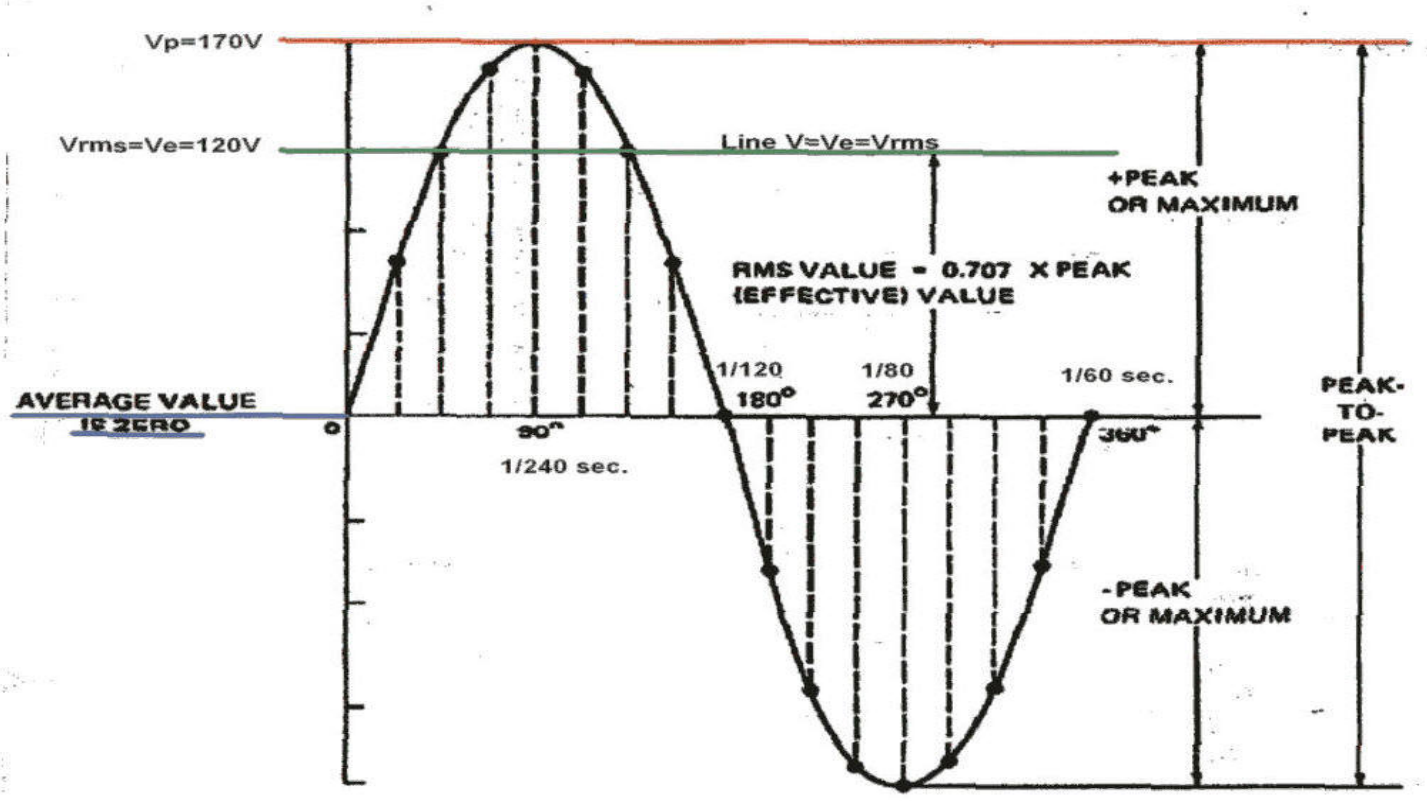

Figure 1. AC Waveform

Figure 1 is a graph of the voltage present in a 120V AC 60 hz circuit. In normal 60 hz household current the direction of electron flow reverses every $1/120^{th}$ of a second. The electrons flow in one direction with the voltage rising from zero to a positive peak of 170V in $1/240^{th}$ sec then declines back to zero in the next $1/240^{th}$ sec, reverses direction and increases to a negative peak of 170V in another $1/240^{th}$ sec, and finally goes back to zero in a total of $1/60^{th}$ sec to complete the cycle. Now wait a minute! What do I mean 170Volt? We're talking about regular "110 V" household electricity here! That's right. In the first place, there isn't any "110 V" AC anymore. Voltages have risen and in most places the RMS or effective voltage is 120 to 125 volts. AC Voltmeters are generally calibrated to read RMS voltage, which is the AC voltage that has been mathematically calculated and experimentally verified to provide the same amount of power as a DC voltage of the same magnitude. In an AC sine wave the RMS voltage is .707 times the peak voltage. It is interesting to note that the average value of an AC sine wave is zero!

Now lets look at an AC current after it goes through a diode.

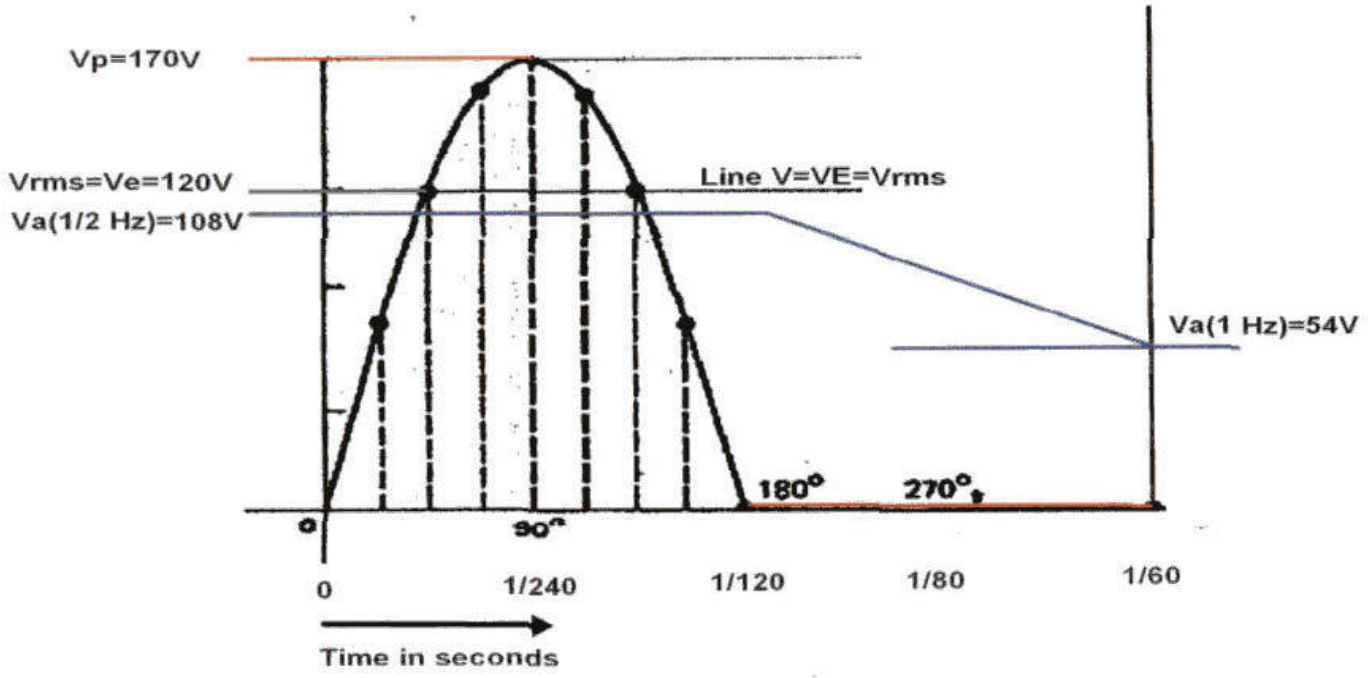

Figure 2. AC Waveform After Half Wave Rectification

Figure 2 is a graph of the voltage present across the line after being rectified by a diode. You will notice that the first half of the cycle is exactly the same as Figure 1. The electrons start flowing in one direction and the voltage increases from zero to 170 V peak in $1/240^{th}$ sec then decreases to zero after a total of $1/120^{th}$ sec. However, when the electrons attempt to reverse flow the diode stops them and there is no current flow, no voltage, no nothin', for the remainder of the cycle. When you put a DC voltmeter across the line you will measure about 54 volts as we said before. But when you look at the first half of the cycle the peak voltage is the same as before at 170 V and the RMS voltage is the same at 120 Volts. Another thing is different too. We now show an average voltage over the first half cycle of 108 V and an average voltage of 54 V over the entire cycle. DC voltmeters read average voltages and this is what we read. Unfortunately, averaging is a mathematical or conceptual procedure and in reality the voltages present in your radio will be the instantaneous values shown, i.e. 170 V(instantaneous peak).

The diode does not reduce the voltage. The only easy way that I know of, to reduce the peak voltage is with resistance. What the diode does do is reduce the time that the current flows by a factor of ½. There is however, I'm sure, some thermal averaging going on in the heater circuit so you are probably not in danger of burning out tubes. The 'Bug-a-Boo' in this little scenario lies in the fact that there are certain limitations put on the allowable voltages applied between the heaters and the cathodes of indirectly heated tubes.

Many of these old radios used a 25Z5 as a half wave rectifier and a 43 or a 25L6 (electronically the same tube) as an audio output and as you know the cathode of the audio output is usually at essentially ground potential. If you will examine the heater wiring diagrams of these old radios you will notice that the line cord resistor dropped voltage is always connected directly to the heater of the 25Z5. The second tube in line is the audio output. The H-K voltage limitation on the 25Z5 is 350V which presents no problem. The H-K limitation on the output tube is 90 V which potentially is a problem. These limitations are in the tube manuals but you have to look for them.

If you consider that you have a voltage drop of 50 volts in the line cord resistor plus 25 volts drop for the rectifier tube drop, that gives you a total voltage drop of 75 volts to the output tube. The old radios were designed around a 115 V line voltage, which would calculate to be a peak voltage of 163 V. That would put 88 V between the H – K of the output tube. The new 120 V design standard with a peak of 170V increases the H – K voltage to 95 V. If you put a diode in as a replacement for a line cord resistor, that will put the H – K instantaneous voltage up to 145 V! H'mmmmmmmmmm. I donno'. Sure looks cheap and easy. There's no heat. I don't know anyone that says they're having a problem. Should I do it? I donno'. H'mmmmmmmm. Actually, I never have. I've never been able to make up my mind.

Robert B.Shindhelm

EXTRA **EXTRA**

HLARA OFFICIALS ATTEND GALA

On Sunday October 28th, President Chris Cunningham and VP Dan Weilacher took part in a celebrated event at the Green Onion. Joe Riddle of radio station KRVT 1270 summoned "Noon Time Swing Time" listeners to a good fellowship and camaraderie luncheon at the south Tulsa establishment. Many new friendships and fun was had by all that attended. A display of antique radios wowed the crowd, estimated at over 60 and packing the private party room. Many "Swing Timers" commented that they had not seen tube radios in many years and thanked Chris and Dan for bringing them out. Stan Tacker, the owner of KRVT, and DJ Ross Atkins attended as well. Master of ceremonies, Joe Riddle gave away many great prizes as well two vintage bakelite radios raffled to two lucky attendees.

Radios on display at the Green Onion

Joe Riddle’s Noon Time bunch
enjoying great fun and food

Proud new owner of a 1947 Silvertone,
Mick McConnell poses with Chris and Dan