Southeastern Antique Radio Society

Newsletter
www.sarsradio.com

Winter 2019


Year In Review 2018

PRESIDENTS CORNER – REED FISHER

SARS members were once again treated to a holiday year end party at Jim and Mary DelPrincipe's home near Dahlonega. It was a wonderful time, great food, great conversation. It's always fun getting to see Jim's collection of radios, his awesome work area and his supercool shortwave control room - just amazing.

Remembering back to the beginning of the year, we held our annual winter swap meet at a great new venue and we look forward to 2019's upcoming swap meet on February 16th, once again at the American Legion Post 201 in Alpharetta.

We have many interesting knowledge shares at our monthly meetings, from oscilloscopes, foreign radio, transistor radios, vacuum tube history and ongoing discussions for what turned out to be our theme of the year – radio safety.

In closing, helpful, friendly, kind are what we remember as we send our final signoffs to our dear friends Roddy Pearce and Johnny Hubbard who sadly passed-on during the final months of 2018, we'll miss you both. Please see more about Roddy and Johnny below in this newsletter and also visit our website for memories of these wonderful men through stories and pictures.

As 2019 enters, we look forward to gathering together at swap meets, monthly club visits, and sharing new radio restoration challenges.

In two years it will be the 100th anniversary of the first commercial radio broadcast. It's not coincidental that it's near an election day, as the first broadcast was intentionally set to be on an election day to demonstrate the ability to get news fast. Stay tuned for exciting SARs activities to celebrate this historical event.

Join SARS Now:

Go to our Website at www.sarsradio.com for complete information on how to:

- Become a member
- Have fun at monthly dinner meeting
- Attend triannual swap meets for great deals – buy, sell, trade

In This Newsletter

- Hot Chassis and Safety Decision making

Next Time

- History of a Wattmeter

SARS Officers:

- President: Reed Fisher
- Vice Pres: Aries Kosmetatos
- Treasurer: Jim Millholland
- Membership: Mark Palmquist
- Webmaster: Jim DelPrincipe
- Secretary: Mark Edwards

Part 1 - Safety Issues Attendant to Restoration and Use of Radios Using Series String Filaments (Hot Chassis)

Paul Hart

This document does not provide any troubleshooting advice; it is limited to issues of safety.

Brief History

In the early days of radio, most vacuum tubes were intended to be operated using battery power. By the 1920s, many radios were AC operated using transformers and tubes that had 1.5, 2.5 or 5V filaments. In 1933, many new tubes with 6.3V 0.3A filaments were released as well as the types 25Z5 and 43. Each of these tubes had 25V filaments and required 0.3A of current. In 1931, Cornell-Dubilier began the first large scale production of electrolytic capacitors. The availability of those tubes and electrolytic capacitors made possible the first small inexpensive radios without power transformers; the tube filaments could be connected in series. Many such radios were manufactured during the depression and survive today.

Typically, in the early hot chassis days, the full complement of tube filament voltages required did not add up to the line voltage; this required a series dropping resistor. Many radios used ballast tubes to dissipate the necessary energy, but they were bulky and were a major heat source. It was also common practice to include the necessary series resistance distributed in the line cord to dissipate the heat over its length. With age and mishandling, these cords could become a fire and shock hazard.

Many of these radios had one side of the line connected to the chassis, creating a serious shock hazard depending on which way the power cord plug was inserted in the receptacle since polarized plugs and receptacles were not in use. "This changed with RCA's introduction in 1939 of a 150 mA complement, familiar today as the 'All American Five'; 12SA7 converter, 12SK7 IF, 12SQ7 detector-audio, 50L6GT output and 35Z5GT rectifier. Sylvania's 1940 loktal answer was the 14Q7-14A7-14B6-50A5-35Y4. Development of RCA's miniature AC-DC lineup was delayed by war, but was complete in 1945: 12BE6-12BA6-12AT6-35W4-50B5."(1). Series string connection of the filaments of these tubes did not require a dropping resistor. The 35/50B5 was supplanted by the 35/50C5 to satisfy UL listing requirements.

During the long time of manufacture of series string filament radios, many of them continued to use the chassis as a ground return, connected to one side of the power line. Such a radio is commonly termed a "hot chassis". Radios were not generally equipped with polarized plugs and receptacles were not polarized; depending on the orientation of the plug, the chassis could be connected to the "hot" side of the AC line. Many of these radios were well insulated to avoid user contact, however, any contact with the chassis, control shafts, unprotected screw heads, etc., could expose a person to serious shock hazard. In many later radios, an often-used improvement was to employ an insulated negative bus, connected to the chassis through a capacitor, often in parallel with a high value resistor.

Underwriters Laboratories (now UL LLC) was created in 1894 to study and certify many types of equipment for safety from shock and fire hazard. UL's scope of evaluation has expanded dramatically since its formation. Detailed evaluation of shock hazards for radios began in 1945. "In 1945, all radios were two-wire products as grounding had not yet been implemented in the National Electrical Code" (2). It is extremely important that in servicing radios, original manufacturer design elements that enhance safety not be compromised. If possible, more recent practices in the pursuit of greater safety should be implemented.

Since these radios were produced, consumer electronics and the requirements for items connected to AC power have evolved dramatically. We now live in an environment of low voltage consumer electronics using solid state devices, often with "wall warts" to power them, double insulated appliances, Ground Fault Interrupters with three wire and polarized AC plugs. By comparison, series filament string AC/DC radios manufactured and widely sold since the implementation of transformerless design continue to pose shock and fire hazards, especially when reawakened after being dormant for many years. These radios were widely produced and are currently collected, restored and utilized. Appropriate caution should be exercised in repairing and using these radios.

Servicing and Restoring Radios

Presumably, persons who are restoring old radios will be knowledgeable of the hazards and issues associated with working on them. Many of us who work on these radios are of advanced years; the effects of shock may be more life threatening than they would have been at an earlier age. In the case of transformer operated radios, a good power transformer should serve to isolate the AC mains from everything in the radio, with the exception of the switching and wiring associated with connecting and interrupting power application to the transformer primary. Even with transformer operated radios, a new line cord should be installed, preferably a three-wire type with the ground lead properly connected to the chassis. If that is not possible, a cord with a polarized plug should be installed and correctly connected in the radio.

After extended times of unpowered storage, power should not be applied to any series string radio without use of an isolation transformer and a Variac. This is even more important if test equipment is to be connected to the radio which is likely to have its own grounding connection.

Before conducting any work functions on a radio, you should familiarize yourself with the circuitry. You should determine whether it has a "hot chassis" or insulated chassis and review the circuit to determine which side of the line is interrupted by the on-off switch. Some radios have the on-off switch wired in the cold side of the line. If this is not changed, when the radio is turned off, most of the internal circuitry will rise to the level of the "hot" side of the line. If a dropping resistor is required for the filaments, you should know where it is and determine its condition. If a filament string resistor is contained in the line cord, make sure the cord and resistance element are new; better yet, substitute a power diode for the series resistor. Always install a modern polarized line cord or if possible, a three wire cord with the ground lead properly connected to the chassis.

In working on these radios, you should be familiar with the risks associated with conducting repairs and restoration and utilize the most effective means at your disposal to render the process as safe as possible. An important component of these practices is to be mindful of the way the radio may be used in the future.

Routine Operation of a Restored Radio

Once a radio has been restored to normal operation, presumably it may be used or demonstrated from time to time. For the collector who understands the characteristics of these radios, their idiosyncrasies will be understood and appropriate cautions observed. However, some of these radios may be taken into possession and operated by others who do not have a full appreciation of the possible hazards involved. These radios should not be operated in kitchens or bathrooms or in any location where contact paths are available between the radio and appliances (which are almost certain to be securely grounded) or metallic plumbing. They should not be operated in areas that might be subject to moisture. These radios commonly radiate considerable heat; if one is accidentally left on for extended periods, it could become very hot. Long term heat exposure could melt a plastic cabinet or otherwise constitute a fire hazard.

Conclusion

Collection and restoration of old radios can be an interesting, instructive and rewarding activity. Your practices and procedures should be carefully considered to ensure your safety while doing service work and result in a radio that will be safe to operate into the future.

Underwriters Laboratories was created to certify many types of equipment for safety; the requirements for such listing have evolved. Detailed evaluation of shock hazards for radios began in 1945 and has evolved over the years. It is extremely important that in servicing radios, original manufacturer design elements that influence safety not be compromised. If possible, some restorers will implement more recent practices and UL recommendations in the pursuit of greater safety. This is not a recommendation for either, but rather an illustration of decisions people are faced with. See the following link for information on shock hazards https://incompliancemag.com/article/electric-shock-from-radios-a-review/ **.**

1. Tube Lore, Ludwell Sibley 1996, pg 4.
2. **In Compliance Magazine, Electric Shock from Radios, Jan. 29, 2016**

Part 2 - Members Decision Process for Tube Radio Power Restoration

Lloyd Tate in collaboration with other SARs Members

Business dictionary.com defines the word "decision" as "A choice made between alternative courses of action in a situation of uncertainty". When it comes to deciding how to restore the power supply aspects of an antique radio, uncertainty abounds. Many sources available provide their opinions on various courses of action, but where is the source of truth. UL is recognized as a

credible 120 year old organization for reference of safety standards, however, it may not be easy for amateur restorers to effectively interpret the meaning, or even find the correct material.

This article is not a how-to, nor is it an instructional guide on safety, grounding, or other electrical considerations for repairing or restoring antique and vintage tube radios. It is however a discussion of the decision-making process that our members face when conducting a restoration. The following is for those who already have the proper respect for high electrical currents and voltages and have been effectively trained and are well practiced in the art of servicing old tube radios (see our disclaimer at top of newsletter). To summarize from above:

1. The first AC radios used power transformers with two prong non-polarized plugs. The benefit of a power transformer is that it isolates the radio circuitry and metal chassis and case from the mains power by virtue of electro-magnetic separations – but of course you already know that.

2. A few years later, for cost effectiveness, some smart gal or guy decided radios did not need a power transformer to operate, they could simply use the mains power directly by using new vacuum tubes in a series string design, clever power supply design – a few electrolytics and done. However, that brought with it some risks because it gives up the isolation that a power transformer inherently offers. Essentially AC/DC power supplies do not prevent the possibility of mains power ,120 VAC, connecting all parts of the radio directly. Even when properly designed there are still risks. The risk entails reversing two wires – the Hot Mains Power and Mains Neutral power. As a result the Hot Mains power can be directed to the chassis. That leaves 120 volts sitting there waiting for a good conductor to channel its current through to the ground. That conductor is the person touching the radio, perhaps via a screw on the side of the unit, the shaft where a missing knob used to be, or the lonely radio technician forgetfully touching the actual chassis, thus conducting all those electrons right from their hand to their feet into the ground.

3. One more design for your awareness is the infamous "curtain burner". This is an AC/DC hot chassis early application. This design engages the power cord as a resistor to essentially use up a small amount of power not used by the tube filaments. In other designs, ballast tubes were used and eventually only normal tubes were used by proper design combination to dissipate the entire 120 volts among themselves. This article will not discuss curtain burner radios as it warrants an article unto itself and there are many sources available across the wonderful world wide web for that info.

The radio repair or restoration technician must decide on the following menu of options when dealing with a radio that requires repair or restoration:

1. Radios with Power Transformers:
    1. Replace plug with period correct same blade configuration OR
    2. Replace plug with polarized blades OR
    3. Convert to three prong power plug with third prong safety ground to chassis

2. Hot Chassis:
    1. Replace plug with period correct same blade configuration OR
    2. Replace plug with polarized blades OR
    3. Convert to three prong power plug with third prong safety ground to chassis
    4. AND Re-configure wiring so that hot mains wire routes through power switch

The decision-making process to select an option from above is driven by the individual goals of the technician/restorer for the particular project underway. Goals can include:

- Repair to working state only, fixing only what's broken
- Concours (public competition) restoration
- Maintain in collection with infrequent use
- Daily use restoration by technician
- Daily use restoration for third party

For whatever the goal is, the ultimate user/owner of the radio must be considered when making the decision of whether to modify the radio for risk reduction of electrical shock - are they aware of the risks and proper procedures associated with operating old radios and do they know what precautions to take and what ongoing care will be needed. The technician must take that into consideration.

The following is not a recommendation or intended to provide any direction. It is strictly observational and intended to demonstrate that all radio restorers are faced with this challenge of safety revisions –the UL does not provide prescriptive guidance regarding how to update old radios to be in compliance with current UL standards. This results in a great deal of variation and potential defects as to how radios are repaired or restored in regards to safety, and highlights the inherent potential danger of owning and operating old radios repaired or restored by various technicians who follow their own methods and interpretations/opinions for safety revisions.

To highlight this inconsistent application of safety practices, following are some findings just within our own club, from some informal conversations. First, most members take into consideration who the ultimate owner will be, are they keeping it for their own collection, or passing it on to a customer or friend. You can see that at this point, compromise in safety is already a factor because if a member intends to keep the radio, they may choose to forgo some safety revisions because they believe they understand the risk and are prepared to handle the radio with knowledgeable care. Be that as it may, this lack of consistency in safety is risky. Risk comes from lack of documentation to what upgrades were made and to what extent, plus what upgrades were <u>not</u> made and what does that mean to the operator.

Most members that the author has talked with, at the very least, add polarized plugs to all radio restorations – note the term "most", not "all", so variation (lack of consistency) is introduced again. Some members, for hot chassis radios, sometimes swap the hot mains wire with the ground (not the third prong neutral safety) at the on-off switch. Depending on the radio, this can be fairly easy

or very entailed due to space limitations and other factors. For those reasons, members may not always choose this approach – again variation is introduced, and safety is again compromised.

In conclusion, there are other safety considerations as well, but the point should be clear. Without a common professional standard that we can all adhere to or at least be consistent with, antique/vintage radios should always be treated with the proper respect for high voltage and operated with knowledgeable precautions that they deserve. Now get back to that restoration and have fun!

Friends Missed

Recently, the SARs community has been saddened with the loss of two long-time friends and members, Roddy Pearce and Johnny Hubbard.

Roddy was a long-time member of SARS, a past vice president and friend to all who knew him. He worked closely with Rich Rogers during his tenure as president and others as well, and has always been helpful to all of us. Roddy took great pride in running our radio contests at the annual winter swap meets and enjoyed building and maintaining his own wonderful collection of antique radios and associated equipment.

Johnny was a longtime friend to many in the antique radio community. He was a gentleman's gentleman, very kind, gentile and a pleasure to know. Johnny was known for his generosity, kindness and his compassion for others. He has always had a fascination with anything shiny, detailed, handcrafted, which lead him to buy his first antique radio, a 1931 Philco 70. That's where it all began. Refurbishing that one Cathedral radio, lead to buying, selling and trading other wood, Catalin and Bakelite radios. Johnny's passion for the beauty and craftsmanship in the radios spread into all kinds of other simple machines made during the early 1900's. Soon, his collections included clocks, lamps, toys, just about anything produced during that eclectic, modern age of luxury, known as the Deco period.

May their new journeys be absent of static and filled with heavenly transmissions of joyfulness, our prayers go with you both.