

# SoundWaves

VRPS Summer 2013

## *From the President*



Well, I surely cannot complain about the heat here in Texas. It has been absolutely a beautiful start to summer. But, like all good things, I know this cannot and will not last. So I am settling in with plans to do a number of indoor projects I typically save for when it is either too hot or too cold to work outside. I have lots of those projects! I always use this issue of the *SoundWaves* to remind folks of the numerous radio meets throughout the country, and what a great opportunity it will be to get to one or more of them. Personally, Beverly and I will be headed to Willowbrook, Illinois, at the end of July. The ARCI Radiofest is a real favorite of mine. The folks that head that organization do a really fine job of entertaining and educating a couple of hundred radio collectors.

After three days in the Chicago area, Beverly and I will be headed north and east looking for cooler weather. Really do not expect to find any...but, might as well hit a few antique shops, flea markets, museums, and, since we are gonna be in the area, why not make the annual AWA convention in Rochester, New York? It has been 12 or 15 years since I was last at an AWA convention. I wanted to go this year because of the grand opening of their new radio museum. So, if our luck holds, we will miss most, if not all, of the hot August temperatures in Texas. Of course, this would mean I will likely miss the August meeting, but I assure you I am leaving this meeting in extremely capable hands with Mike Grimes and Randy James at the helm.

As soon as I get back, I will begin planning and putting into place an auction in Fort Smith, Arkansas, slated for September 27th and 28th. This will be a two day event, something for every one. Consoles, table sets, thousands and thousands of tubes, parts, literature...a large building full of radio stuff. Watch for further information. I will follow up that auction with another at the end of October. This will be a really great auction with a variety of super radio collectibles. You will want to mark your calendar for October 26th. This sale will be held in Garland. Watch for more info and pictures for both of these sales as they get posted on my website.

Seems the year is screaming by... but doesn't it always? Until next time, good hunting.

## Notes from the April 20, 2013 Meeting

V.P. Randy James conducted our meeting of about 30 attendees. He had word from Jim Sargent that he would be having three auctions during the June to September period. (Jim's auctions present many opportunities for additions to our collections – or to disperse them for those wanting to sell collections.) Program Director Mike Grimes announced the topic for the upcoming June meeting – “Speakers and output transformers”. He also told us that a member had positively identified some mystery objects presented earlier – consisting of objects containing arrays of 7 and 9 pins. They were used to hold the tube socket pins steady while chassis were being wired at the Raytheon factories. Mike then passed a new “mystery item” around for the members to study and try to guess the purpose. He then introduced our program presenter, John Kusching.



John's presentation featured the website Radiomuseum.org - that provides a vast radio museum database for antique radio collectors around the globe. Accompanying John was the creator of this virtual museum, Ernst Erb, visiting from Switzerland. John's presentation was designed to familiarize us with the website's many useful features and its methods for growing the museum database more and more as time passes. He first described the museum organization and method of operating and later went into details about features of the museum. It operates like a club with registered memberships - with requirements for maintaining membership that are an incentive for each member to help build the museum database by contributing (uploading) data, photos, schematics etc through uploads. A point system is used to gain privileges to download data from the museum. Accumulated points can be used to obtain free membership at the onset, or to maintain a level of access commensurate with the degree of uploaded support for the database. Alternately, a cash amount of \$25 can be used to purchase downloading accessibility to 66 schematic diagrams. This same privilege can be had by the submission of only 4 schematics to the database (subject to a screening process).

Points can be refreshed by additional cash contributions, but the incentive system is designed to continuously build up a wealth of information. The data that you upload can consist of schematics, photos, corrections or additions to existing data, new models not yet in the database, catalogs, manuals, etc. The searchable information contains categories such as catalogs, tube data, search-by-tube-lineup. Each radio or test equipment model is assigned a page according to manufacturer and model number. The page contains photos (if available), schematic diagrams, tube lineup, power supply information, frequency ranges of bands, etc. As an example of the search capabilities and cross-referenced data, the tube types listed in the lineup are highlighted in blue, and a click will bring up the tube datasheet. The quality of the data is maintained by a number of administrators (John is one of them) who screen all of the uploads for suitability and formatting needs, before adding them to the database.

Following is a list of searchable features offered by the museum:

- Supplier lists; manufacturers; all models made by a particular mfr.
- Tubes used in models; all models that use a tube type or a particular tube lineup.
- Personal collections pages, including photos of collection (can be private or public).
- Museum finder – names and locations of museums having antique radios and related.

The website can be searched by anyone to see if there is information available on a given model. The model page will appear with a portion of the schematic that is not useful for download. Other functions listed are grayed out if you are not a member, but you can see the type of info that is available. Guest Ernst Erb supported John in answering the many questions from the group. There are about 16 VRPS members who are active on the website. If you wish to become a member of the museum, you may e-mail one of the administrators here in the USA, either John Kushing himself – [Kushing@verizon.net](mailto:Kushing@verizon.net) or [ctalbrech@yahoo.com](mailto:ctalbrech@yahoo.com).

### April Mystery Item

$$C = \frac{1000 \times I_{(f)}}{0.377 \times \sqrt{14400 - E_{(f)}^2}}$$

C = capacitance in microfarads  
I = current in amperes  
E = voltage in volts  
f = filament

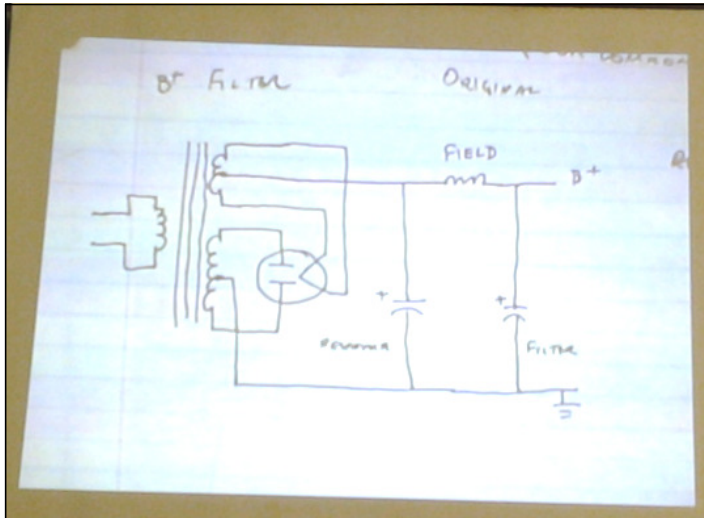
Author's Note: The "mystery item" turned out to be a simplified formula for calculating the needed capacitance for a ballast to replace a line-cord resistor. I recognized it because I have plodded through the process the hard way, and this formula nicely boils it all down to a single operation.

Bill McKeown

### Notes from the June 15, 2013 Meeting

Jim Sargent conducted the meeting, starting with reminders of upcoming events, including the upcoming July Repair Session. Then he called for us to go around the room announcing our names and cities. Program Director Mike Grimes announced the topic for the August meeting – a show-and-tell for "Shelf Queens". We can bring any item that has been sitting around un-restored for awhile, but we haven't done anything with it for one reason or another. We will share the reason(s) with the group and maybe gain some inspiration or help to tackle it. Mike passed around the new "mystery item", consisting of two Bakelite blocks having several tube sockets on the top of each one and a single array of tube pins coming out of the bottom. He then introduced our program presenter, Mike McCarty.

The topic of Mike's program was Speakers, and how to deal with them in radio restoration. He first addressed the issue of bad sounding speakers – weak, distorted or with scraping and rattling sounds. He gave a description of the theory of operation of a dynamic (voice coil type) speaker to help understand what problems are to be found. A very common problem is mechanical contact between the voice coil and the magnetic pole elements of the speaker. Because the coil must move freely in the magnetic field and the gap between the pole pieces is fairly small, centering of the coil in this gap is essential. Otherwise, we get the scraping, rubbing and rattling sounds from mechanical contact. Mike showed physical examples of the several ways used to maintain centering of the coil in the gap. "Spider" is the general term for whatever is used to keep it centered. In some speaker designs there is a fabric/Bakelite piece (e.g. linen-phenolic) with spiral arms that flex when the speaker operates. There is a screw in the center of the piece that holds it at center once adjusted. (Sometimes the screw can be loosened and the adjustment corrected.) Many speakers use a stiff cloth mesh spider that is formed with convolutions to allow for motion of the coil in and out of the magnet assembly. Often the glue that holds the cloth to the steel frame has deteriorated and left the spider loose. This, in itself, can cause a noise during operation. Fresh glue can be worked under it and allowed to dry while the coil is held at center somehow. Thin plastic strips, e.g. from shrink-wrap packages, can be put in the gap to center the coil. A paper speaker cone can function well in spite of having small holes and short



tears in the paper. Larger holes can be patched with coffee-maker filter paper or tea bag paper. Paper tears can be bridged with clothes drier anti-static drier papers.

Voice coils are sometimes open. They can be checked by touching wires from a 1-1/2 volt battery to the voice coil terminals. A noise will be heard if the coil is OK, even if the field-coil is not powered (there is always a little residual magnetism in the assembly). This test will work even if the output transformer is still connected. Another method is to touch power from a 9 volt battery to the primary winding of the output transformer, which checks the transformer at the same time.

Most early dynamic speakers had field coils, and they can be difficult to repair. Fairly often, however, the coil is open near the outside end of the winding. By carefully removing the outer paper layers, the soldered termination of the fine magnet wire and the external lead can be uncovered. Usually corrosion at or near the joint will have caused the open circuit. Of course the coil can be rewound, but there are literally thousands of turns of wire on it and a large spool of wire will be needed if new wire is to be used. Another issue with field-coil speakers is short circuits to the speaker frame. If such a frame is mounted to the chassis it can short out the power supply of the radio. If not mounted to the chassis, it can be a shock hazard while working on the radio.

If a field-coil type speaker cannot be saved, then either another one of its type or a permanent magnet (PM) speaker will take its place. In either case, extra steps may be needed to account for the different coil or absence of any field coil. In some radios the field coil is connected

directly across the rectifier output. For these cases, a PM speaker can be substituted while the original field coil is simply disconnected. The power supply circuitry in the radio most often incorporates the field coil for its resistance and/or inductive properties. In some radios the field coil is connected directly across the rectifier output. Its resistance is relatively high. If used to repair another radio, a speaker of this type may need a resistor connected across it to duplicate the resistance of the original coil. Otherwise a series resistor can be added to make up for the new speaker having a lower resistance. If a permanent magnet speaker is used, a resistor will need to be used in place of the speaker field coil. In either case, to make up for the lack of an inductive element, the filter capacitor that connects to the end of the resistor opposite the one that connects to the rectifier tube will need to have its value increased by about 5 times (e.g. 40 instead of 8 mfd.). The capacitor at the rectifier should be about the same value as the original (more is not always better) so that, when the radio is turned off the filament-type rectifier tube will not get "flashed" by the reverse voltage sustained by the capacitor. In some older radio circuit designs the speaker field is connected in the return side of the





power supply, and the voltage developed across the coil is used as a negative bias source for the audio output tube. For these circuits, especially, the resistance of the field coil needs to be replicated using resistors, series or parallel, as needed, to get the same resistance as the original speaker. If no data is available as to the resistance, tube-manual operating data on the output tube can be used to calculate a useable value. Otherwise an experimental test value (e.g. 1000 ohms, 5 watts) can be tried and modified to make measurements of the bias voltage agree with the tube "operating conditions". For self-bias designs, the output tube bias voltage can be measured across the cathode resistor. Mike wrapped up his discussion with a review of measures needed to replace output transformers, including calculation of impedance matching values and transformer selection considerations.

At the end of our program member Dale Allen treated the group to a showing and discussion of his rare globe radio. It is a spherical chrome plated radio with floor stand, circa 1946, made in the UK by EMOR Radio. The sphere is 11-1/2 inches in diameter, with dials wrapped around the equator. Googling on "EMOR radio globe" provides links to photos and videos related to this radio – worth seeing.

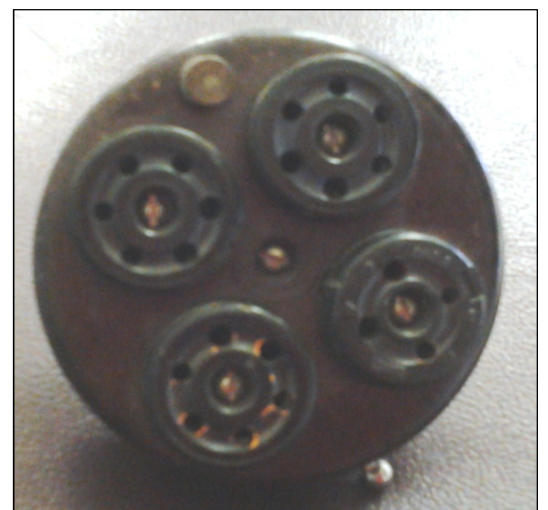
The mystery items were determined to be adapters for testing tubes in a very early tube tester.

## **Program "Mystery item" identification prize winners:**

1. Formula for capacitor to replace resistor power cord: Bill McKeown
2. 7/9 Tube pin holder for production soldering: Dale Allen
3. Tube tester adaptor from 5 pin to 6 pin updated advanced tubes and type 29 tube, Wunderlich: Bret Frohwein
4. Coil in an octal tube (yet to have a winner)

Mike Grimes

## **June Mystery Item**





**Radio Detective Mysteries:  
*The Case of the Confusing Console*  
By Mike McCarty**

I was repairing a Telefunken console recently, and came across mysterious symptoms. When the volume control was turned down very low, the radio functioned normally, but when the volume was turned up high, it oscillated very loudly, that is, it screamed. I replaced the speaker with a high wattage resistor so I wouldn't be deafened, and began to seek the cause of the problem. The first step was to remove all the RF tubes. I removed the RF amp, the FM converter, the first FM IF amp, the second FM IF (and AM IF) amp, and the AM converter. The radio still exhibited the symptoms, so I figured this was an "AF only" problem, and replaced all the RF tubes.

I then removed the AM/FM detector/AVC/first audio tube, and the symptoms went away. I replaced this tube, and removed the 12AX7 which functioned as a second AF amp, and a "concertina" phase splitter. There were still no symptoms. I replaced this tube, and removed the push-pull audio power amplifier tubes, and the symptoms came back. I figured the cause had to be in the circuitry associated with the first AF amp, second AF amp, and/or phase splitter.

There is a maxim among electronics engineers that amplifiers oscillate, and oscillators don't. When an amplifier oscillates, it is because there is positive (in phase) feedback from an output back to an input somewhere. Normally, with newly constructed devices, one would look for a "layout problem", that is, wires or

components carrying signals in the output circuitry which are positioned physically near wires or components in the input circuitry. The presumption is that this is not the case here, because at one time the radio was performing properly.

So, I needed to ascertain which components were part of the feedback path. My next step was to gather more information about the exact symptoms. A quick check with an oscilloscope probe on the power supply B+ (a prime suspect in unintended coupling between stages of an amplifier) showed that there was negligible signal on the B+. This ruled out feedback through the power supply.

I put the probe on the "hot" end of the volume control, and saw that, when the volume control was advanced more than about 1/3 of its travel, a strong nearly square wave was present, and that by turning the volume control down, I could reduce it in amplitude, then it became a nearly sine wave, then died out. So, the volume control is definitely part of the feedback path. That is, there is a signal in the output circuitry getting back into the volume control circuitry somehow. I needed to find the source of the signal being fed back.

Since the signal on the plate (output) of a triode, as is used for each of the tubes I had ascertained were part of the problem circuitry, is out of phase with that on the input (grid), I knew that the signal was not coming back from the plate of the first AF tube. The next tube in line (12AX7) is another (twin) triode, and so the signal on the plate of the first section of that tube is suspect. I removed the coupling capacitor from the plate of the second AF amp, and the symptoms indeed went away. I was making progress!

The next stage was another triode with outputs from both the plate and the cathode, a so-called "concertina phase inverter". The signal on the plate is out of phase with that on the grid, and that on the cathode is in phase. The plate signal was "wrong phase", but that on the cathode was a suspect. I reconnected the coupling capacitor, then unsoldered the resistors from the cathode, and replaced them with a suitable replacement so the tube would continue to function, but the output from the cathode was removed from the rest of the circuitry. Still no symptoms. I reconnected the original resistors, and decided to think.

What was going on? The volume control was perhaps ten inches away from the circuitry I was looking at, and there was no obvious path in the schematic by means of which the signal could get from there back to the volume control. I decided to perform a quick check on the volume control influence. I de-soldered the audio coupling capacitor from the middle "slider" terminal on the volume control. Still no oscillation. So, the signal was not getting into the circuitry connected to the volume control slider, and then getting to the volume control that way. If that were true the volume control could "kill" the oscillation by shorting out the signal which was getting in otherwise. However, this proves that the signal on the slider was coming from the volume control, not going toward it.

Since the "cold" (no signal) end of the volume control was directly connected to ground, I jumpered the "hot" or signal end of the volume control directly to the "cold" grounded end, and re attached the audio coupling capacitor. The symptoms came back! Now I was really puzzled. Possibly the jumper had an internal break? A quick check with the oscilloscope showed no signal on the "hot" terminal of the volume control, and no signal on the "cold" terminal of the volume control, but a definite signal on the "slider" terminal. This made no sense!

How could a signal on the cathode of an output tube across the chassis from the volume control be coming out of the slider on the volume control when both the other terminals on the volume control were verified shorted to ground, and had no signal on them?

Nee-nee-nee-nee, we're in ....



Tune into the next issue of the Sound Waves for the solution of this seemingly impossible situation, or solve the mystery yourself!

Go to : <http://www.vrps.org/Repair.html> to see the partial schematics to aid you on your quest.

Note from the editor: You are welcome to send in your own baffling problems..hopefully with a solution. Please send your stories to [mcaruth@att.net](mailto:mcaruth@att.net).

## MONTHLY MEETING PROGRAMS 2013

NOTE: Programs will be held at various locations in Irving, Texas. Make note of the location as they may change from time to time. Senter East, 228 Chamberlain St.; or Garden and Arts, 906 S Senter Rd. Maps are located on the WEB site, <<http://www.VRPS.org>>, EVENTS page. Programs start at 2pm. unless otherwise noted. Call us on the cell *tellie* if you get lost: 972-898-7251 or 972-742-8085.

### AUGUST 17, Garden and Arts Building

Shelf Queens—Bring a radio or other item that you have been meaning to restore but just have not gotten it done. What is your excuse? Good one? And/or an item that you have completed will be welcome, if you would like to show it off. Also, bring a refreshment or snack that you can share. This will be our summer social meeting.

### SEPTEMBER 21, Garden and Arts Building Parking Lot

Tail Gate Swap Meet. 8am to Noon. Come early and bring your surplus to sell or trade.

### OCTOBER 19, Senter East Building

World wide Broadcast Station QSLs, EKKO stamps, or other verification of radio reception has long been a hobby in itself. Bring your collection or items to share and discuss.

### NOVEMBER 15-17, Mesquite Convention: Hampton Inn

Annual Convention. Come join us for our 40<sup>th</sup> Anniversary. Auctions, flea market, and banquet. See detail of Convention coming soon.

### DECEMBER 7, Garden and Arts Building

Annual Christmas Party. Bring a covered dish and something to "Show and Tell." Meat and beverages will be provided. Silent Auction items will be welcome. Starts 6pm.



*A Frequent Visitor to VRPS—Bill's Car Turns 50.*

I bought it new 50 years ago, in April 1963, and until mid 2012 it was a daily driver - my "work car". It has actual miles of 184,000 and has been restored to look like new inside and out. As most people know, the VW factory did not install radios, but provided a mounting and grill for a 4 inch speaker and a removable panel in which to install a radio. Several radio manufacturers made radios that exactly fit the opening, with names such as Sapphire and Blaupunkt. A little known fact is that Motorola also made both a manually-tuned and a pushbutton model, with matching VW

trim. In 1964 I bought the manually-tuned model, which cost around \$64.00 - a lot of money in those days. It says "ALL TRANSISTOR" on the dial. I have kept this 6 volt radio working. It has 3 germanium transistors in the front end, two silicon transistors in the audio and a TO-3 germanium power output device- the ubiquitous 2N174. I had to repair the I.F. transformers by opening them up and removing the silvered mica caps and using 120pf NPo ceramics in their place.

Bill McKeown



## Photos from the May Swap Meet



# SoundWaves

(continued from page 8)

**Programs are subject to change, contingent on scheduling conflicts. As always, your suggestions for programs/content are welcome. If the programs do not fit your needs and you want something different, let me know. I need volunteers to organize other programs, so consider presenting a program yourself.**

**Call me anytime or send me an email. Mike Grimes 972-898-7251 (cell), or K5MLG@verizon.net.**

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