

January 2014



***NOTE FROM PRESIDENT TOM***

Hello, All!!!

It's a new year and there is a lot going on at the Society Shop. Work continues on customer radios and some of these have proven to be quite difficult to repair. One I am working on works fine for several hours and then loses the station and becomes noisy. The usual capacitors have been replaced, and three tubes have been replaced and circuit disc with five-part internal parts has been replaced with a circuit board with five discrete parts mounted on it. Not much else to replace. I have enlisted Marvin Shepherd's and Dave Cisco's help on this repair. I had the radio out of the case playing, and Marvin said it would never quit like that. I put it back in the case and covered it with a towel and sure enough, it started acting up. Obviously, a heat problem.

Pulling it back out of the case, I started checking voltages. All looked within range of the schematic specifications. By now, Marvin had left, so Dave helped. He asked if I had put a scope on the grids, and I didn't even have a scope on the bench (we do now). Checking the radio with a scope is not done much by our members, but based on Dave's instructions and seeing the scope readouts, I will use this method more often. The radio worked fine, again out of the case, so we shut it down for another day. I said all of this to show you the help that is available when working at the Shop. You are not alone!



Above, two of our most knowledgeable members, Marvin Shepherd (left) and Tom Hayes, confer on a radio matter. When they are talking about a radio issue, you can bet it is a doozy!

Dee has had his share of tough radios to repair, but he took time out last Saturday, to help a fellow who had driven from Atlanta to our Shop to get his old radio fixed. Dee worked his magic, and the fellow was off, back to Atlanta, but not before he received a full tour of our Shop, radio displays, library, radio station, ham radio station and parts inventory. I have an idea he will be back!



There are several events coming up in which we will be participating, including the Radio Play at the Virginia Samford Theatre in Birmingham on Saturday, February 22, at 7:30 p.m. We have a block of 30 tickets, purchased by the Society. Some of you requested tickets, but have not paid for them, so these tickets may be available to other members who may want to attend. Johnny Outland and Dave Cisco are working to finalize our attendees and have the list of attendees who have paid. This group outing is part of our twenty-fifth-year anniversary celebration. Speaking of twenty-fifth-year anniversary, we still need material for our book. Right now it appears that the book will be a mystery.

The Atlanta Antique Radio Swap Meet and Auction will be held on February 15, from 7 a.m. until 2 p.m. at the Jim Miller Park, 2245 Callaway Road, Marietta, GA 30006. This Show is conducted by the Southeastern Antique Radio Society and is free to the public. The Jim Miller Park indoor facility has ample parking, easy loading and unloading access, PA system and restrooms. I hope we have some members attending and possibly, a car pool or two going the Show. For more information, go to <http://sarasradio.com/nextswapmeet.htm>.

The Birmingham Ham Fest will be on March 1 and 2 at the Zamora Temple in Irondale. We will have 11 tables, five for historical displays and six to sell Society radios and equipment, parts, magazines, and there will be room for members to sell some items, also. We are working to get a large military radio display, including an actual World War II Military Communications Vehicle (displayed outside), set up with our historical displays.

We have an opportunity to sell some of our surplus equipment at this event. We need help on Tuesdays and Saturdays to check out this equipment and get it organized and ready for sale, if you have the time to help. The money from these sales will help pay our recurring bills like the internet service.

The California Historical Radio Society has decided to purchase another property for their permanent home since the KRE Building was no longer available for purchase. They have called for their pledges to be honored, and we have sent a \$1,000 check to CHRS to honor our pledge made to them in 2012. CHRS new building will house the Bay Area Hall of Fame, the Maxwell Communications Library, the Society of Wireless Pioneers Archives, the CHRS Vintage Radio Museum and more. For more information, go to [www.californiahistoricalradio.com](http://www.californiahistoricalradio.com).

We held our Society Christmas Party on December 30, 2013, and had great participation and fellowship! Thank you all for coming! And the food was great! For some reason, more people ate less food this year, allowing the Society to give the Jimmy Hale Mission a 10 lb. ham, a smoked turkey breast, rolls and pecan pies. My brother and I delivered the food, and I can tell you, they appreciated it! We should be very thankful!

Here's some pictures of our Party--



M. H. Smith, Charlie's wife, put on the board, the words to a song called Radio Men. It is sung to the tune of the Notre Dame Fight Song. We all sang this catchy song at the Party:

### **Radio Men**

Cheer for antique radio men  
They know the good old days of back when  
Radios were large and grand  
Radio waves filled all the land

Rheostats, bakelite, dials that spin  
Antennas, warm-up, time to tune in  
Nipper was just a pup back then  
Hoorah for the radio men

Don't miss the article on Determining Output Transformer Impedance by Bill Harris. It covers some of the things Robert covered in this month's radio class. His next class will be on February 1 at 9 a.m. at the Shop. We have been having signal problems on SKYPE with Robert's transmission from Loxley, so we hardwired the internet, forgoing WiFi, and we had no problems for the two-plus-hour lesson.

On Friday, January 17, a group of residents from Galleria Woods toured the Shop and Museum. They asked questions and showed great interest in the work we do in saving old radios and repairing them and displaying them. It brought back fond memories about radios and the old shows on them. They also asked that we bring the radio show that Dave Cisco and Dee Haynes put on to their place. We will schedule that soon. Here are some pictures of their visit:





We lost one of our radio parts resources at the end of the year when Ack Radio closed its Birmingham store. Dee and I visited with Mike at the store last week and picked up some donated reference books for our Library. Dee and Steve Westbrook made an additional trip to pick up about 5,000 new resistors and some new radio books we can sell at the Ham Fest. Dee will have an article about Ack Radio in a future Newsletter. This leaves one less radio parts house in town, so our radio parts stockpile becomes more important for our continued radio repair efforts. It's good to be a member, so you can have access to these parts.

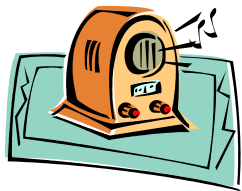
Membership dues for 2014 are due now. While the membership fee is small (\$25 Regular and \$10 Student), it shows your support for the Society and makes you officially a part of something great, helping to sustain the Society, now twenty-five years old. We send this Newsletter to more than 180 individuals around the country and abroad by e-mail, but we only have about 90 paid members. **You do not have to join (Pay Dues) to receive the Newsletter.** Please consider renewing your membership with a \$25 check to AHRS, PO Box 131418, Birmingham, AL 35213. Thanks!

The next Monday night Membership meeting will be on January 27 at 7 p.m. with a Board meeting at 6 p.m. We are planning to show the 80<sup>th</sup> WSY celebration panel discussion held at Alabama Power Company in 2002. We will also discuss plans for the Birmingham Ham Fest. Please come and be an active part of your Society. See you there!

So long until next time!

*President Tom*

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### **OLD TIME RADIO BITS**

Most of us do not seem to like commercials, and I am no exception. Except for the Super Bowl, I do my best not to watch them. Most shows I watch on TV are not live; they are recorded on my DVR, which the satellite company furnishes me (for a fee, of course). Then, as a commercial comes up, I just press the magic button that lets me skip ahead by 30 seconds. Press it enough times and the show I was watching is back.

However I must admit that I do have an interest in commercials of days gone by. When radio was in its heyday, a single advertiser would sponsor a complete episode of a show. The Shadow was sponsored at one time by Blue Coal. Jack Benny had many sponsors during his run-- one which was Jell-O. Superman was sponsored by Kellogg. Frequently the commercials were consolidated into the show, so that the listener could not miss them. If you were to tune away from a commercial, you were missing part of the show.

Very interesting are those commercials that we do not see on television today, for example, cigarettes. There are also commercials for companies that are no longer in business or at least are not in the business for which they were known--Admiral Radio (today it's appliances), Beech Nut Chewing Gum (today it's baby food), Bromo Quinine Cold Tablets, Campana Beauty Products, Signal Gasoline (today it's Honeywell), Studebaker, Top Value Stamps, and on and on.

There are many commercials in my collection of OTR shows. Here are a few of the ones that were mentioned already:

- [Blue Coal](#)
- [Jell-O](#)
- [Kellogg](#)
- [Admiral Radio](#)

- [Beech Nut Chewing Gum](#)
- [Bromo Quinine](#)
- [Campana](#)
- [Signal Gasoline](#)
- [Studebaker](#)
- [Top Value Stamps](#)
- [Camel Cigarettes \(The most preferred brand by thousands of doctors\)](#)
- [Chesterfield Cigarettes](#)
- [Fatima Cigarettes](#)
- [Winston Cigarettes](#)

All together, there are 125 commercials available for your listening pleasure. You can find them [here](#). If you want to listen to all of them, [here](#) is a playlist (tested on Windows Media Player and VLC) which will play all 125. If I have missed any of your favorites, just let me know, and I will see if I have it available offline.

I even have a few black and white television commercials in the collection. Maybe one day someone will be watching the commercials that we try so hard to avoid today.

Have a great 2014!

*Larry Lokey*

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[Website - otronmp3.com](http://Website - otronmp3.com)

## Determining Output Transformer Impedance



Many thanks to Bill Harris at [radioremembered.org](http://radioremembered.org) and Bill's Antique Radio Emporium for allowing the use of this article in our newsletter. Bill has an interesting site and some instructive radio information.

\*When replacing the audio output transformer on a radio, the replacement should match the impedance of the original as closely as possible. Universal output transformers are available which have multi-tapped primary and secondary windings to match a wide impedance range.

It is not uncommon for the vintage radio collector to have various output transformers laying around that have been removed from old radios that are only good for parts. Often times, the primary and secondary impedance information is not available for these units, and it would be nice to have that information to be able to use these in a set that needs a new output transformer.



The average beam power output tube, such as the 6V6 requires a load of around 5,000 ohms, and the average speaker voice coil can vary from as low as 1 ohm to 8 ohms or more. So, how do we determine which of our output transformers will match that impedance range? With some simple test equipment and ohms law, we can calculate the impedance of an output transformer, but first let's look at the function of an output transformer and how it works.

### Function and How It Works

A tube is a high-voltage/low-current (high-impedance) device, while a speaker is a low-voltage/high-current (low-impedance) device. The function of the audio output transformer is to transform the high impedance of the output tube to match the much lower impedance of the speaker. This is necessary to get an efficient transfer of the audio signal to the speaker. The output transformer as an impedance matching device works on the principal of reflected load. To keep the math simple, let's assume an output tube is supplying a 100 volt ac signal to the primary of an output transformer with a 10:1 winding ratio, and the secondary is feeding a 10 ohm voice coil. With 100 volts across the primary, there will be 10 volts across the voice coil connected to the secondary. Using ohms law, there will be 1 amp of current flowing in the voice coil.

$$I = E/R$$

$$I = 10/10 = 1 \text{ ampere}$$

For further simplification, we will assume 100% efficiency in the transformer. Since we have a 10:1 ratio, the current flowing in the primary will be .1 ampere (1 amp in secondary divided by 10). With 100 volts across the primary, ohms law tells us that the primary looks like a 1,000 ohms impedance load to the tube.

$$Z = E/I$$

$$Z = 100/.1 = 1,000 \text{ ohms}$$

Now if we decrease the impedance of the load, what happens to the impedance in the primary? If we place another 10 ohm voice coil in parallel with the original one, we now have a 5 ohm load. Using ohms law again, we see that the current in the secondary is now 2 amperes.

$$I = E/R$$

$$I = 10/5 = 2 \text{ amperes}$$

This means that the current in the primary also doubles to .2 amperes. Again using ohms law, the impedance of the primary is now 500 ohms.

$$Z = E/I$$

$$Z = 100/.2 = 500 \text{ ohms}$$

This is called the reflected load. A 10 ohm load reflects back a 1000 ohm impedance, while a 5 ohm load reflects back a 500 ohm impedance. The reflected impedance is a function of the turns ratio of the transformer. Notice that the ratio of the primary impedance to the secondary impedance is the square of the turns ratio, or 100:1. In other words, a 10:1 turns ratio will give an impedance ratio of 100:1.

### Checking an Unknown Output Transformer

We can now use this knowledge to determine the impedance of any unknown output transformer. All we need to do is determine the turns ratio of the transformer, and with that information, we can calculate what impedance will be reflected back to the primary with a given load on the secondary. The test equipment to do this is quite simple; an ac voltmeter and a variable source of 60 Hz ac is all we need.

To determine the turns ratio, we apply an ac voltage to the primary and measure the voltage in the secondary. The voltage on the secondary will be stepped down by a proportional amount determined by the turns ratio of the transformer. A variable auto-transformer (sometimes referred to by the brand name Variac) is used to apply the variable ac to the primary (see note below). An ac voltmeter is connected to the secondary to measure the output voltage. To make the calculation of the turns ratio easy, the input voltage is increased until the voltage on the secondary reads 1 volt. With the secondary reading 1 volt, measure the input voltage to the primary. Since the voltage on the secondary is set to 1 volt, the voltage measured on the primary will be the turns ratio. For example, if the voltage on the primary measures 25 volts, the turns ratio is 25:1.



An auto-transformer does not provide isolation from the ac line. For safety reasons, the auto-transformer should be used in conjunction with a 1:1 isolation transformer.

Now, armed with the turns ratio, we can calculate the impedance ratio and the impedance that will be reflected to the primary with a given load in the secondary. Remember we said earlier that the impedance ratio is the square of the turns ratio. With our 25:1 turns ratio transformer, the impedance ratio is the turns ratio squared or,  $25 \times 25 = 625:1$ . So if the transformer is working into an 8 ohm load, the impedance that will be reflected to the primary will be the impedance ratio (625) multiplied by the load impedance (8 ohms), equal 5,000 ohms. If the load in the secondary is changed to a 4 ohm load, the reflected impedance in the primary would be  $625 \times 4 = 2,500$  ohms.

So it can be seen that the turns ratio of the transformer determines what impedance will be reflected to the primary by the load impedance of the secondary, and that an improper load on the secondary can have several effects:

If the load impedance is too low, this will increase the current in the transformer windings. This also reduces the primary impedance that the output tube sees which increases tube current flow.

If the load impedance is too high, this reflects a higher than normal impedance in the primary for the output tube. This will result in poor sound quality and lack of volume.

The impedance load seen by the tube and output transformer is not constant. The frequency of the audio signal will vary over a wide range. The inductance in the windings will have a different impedance at different frequencies. At a certain frequency an 8 ohm voice coil may have an impedance of 10 ohms or at low frequencies; it may have an impedance of 4 ohms. This varying load impedance is reflected back to the primary, so the tube and output transformer must work into a varying impedance range.

### **Choosing a Replacement Output Transformer**

Now let's assume we have a set that has an output transformer with an open winding that must be replaced, and the output tube is a single 6F6. The schematic will sometimes give the dc resistance of the windings, but that doesn't help us know what impedance the transformer should be. First we look at the chart in the Tube Handbook and see that a 6F6 should work into a load resistance of approximately 7,000 ohms. What about the speaker voice coil impedance? If we do not know the voice coil impedance, we can get a fairly good estimate by measuring the dc resistance of the coil and multiplying by 1.25. Let's say this one measures 6.5 ohms, multiplied by 1.25 = 8.125 so we could call this an 8 ohm voice coil.

With this information we can determine what the turns ratio should be. By dividing the secondary load of 8 ohms into the 7,000 ohms required by the 6F6, we get an impedance ratio of 875:1. If the impedance ratio is the square of the turns ratio, then the turns ratio is the square root of the impedance ratio. Taking the square root of 875 gives us a 29.6:1 ratio, so an output transformer with a turns ratio in this range should work.

By using the test procedure outlined above, we can test our spare output transformers to see if we have one that will meet our approximate 30:1 turns ratio requirement.

### **Wattage Rating**

Output transformers are rated in wattage. A good rule of thumb is that the replacement transformer should be about the same size as the original. If the replacement has the same size core or larger it should handle the wattage OK.

## **MEETING TIMES**

We meet every Saturday (unless a Holiday weekend) at 09:00 AM, at the one-story AHRS Shop at the corner of 8th Avenue North and 18<sup>th</sup> Street (1801 8th Avenue North, Birmingham, AL 35203). Use the rear (Southeast) entrance.

Also, we have opened the Shop on Tuesdays at 09:00 AM until around 11:30 AM when we go to Marilyn's Deli and Dog for lunch next door. Note that parking can be a problem on Tuesdays because it is a business day and the lot is usually filled, so you may have to find street parking occasionally.

**We meet on the fourth Monday night of each month, too, at 7:00 PM. Please come join us!**

## **FREE ELECTRONICS CLASSES**

One more great benefit from becoming a member of AHRS--free Electronic classes!

Classes are taught the first Saturday of each month (except when something special is taking place, then we agree on what Saturday).

We start from the beginning Ohms Law, inductors, resistor and Capacitors color codes, as well as what each component does within the radio circuits. We also teach how to use test equipment used in the repairing of radio. We teach troubleshooting radio troubles, as well as how to read a radio diagram. There are coil winding classes, and one-on-one repair help.

Come join these classes.



**DUES! DUES! DUES!**

Membership dues are \$25 a year, payable beginning in January. If you have questions about your dues, you can contact John Outland at 205-354-5258. **Dues can be mailed to AHRS @ P.O. Box 131418, Birmingham AL 35213.**

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