

SOUND WAVES

VRPS JULY 2010

FROM THE PRESIDENT

By Jim Sargent

Well as I type this column, it is the first day of summer. If today is any indication, it will be a hot one for sure. Guess I do not mind as long as I have a working A/C unit and can afford the electricity to run it. But, it also begins the season of many of our favorite radio swap meets, both locally and across the nation. If you get a chance (while the gas prices are ...should I say "low", then please do yourself a favor as a member of the antique radio and phonograph community and visit one or more of these large meets. You will often see more regional items but you will also meet collectors you might only know by their eBay name or via a reference in Antique Radio Classified. Either way, hopefully the experience will enrich not only your own collection, but will open you to suggestions for ways to enhance or improve some of the things we do here at the VRPS. Okay, on another subject. Our June meeting was a real treat. I mean that in every way. Frankly, most of you know I am not much of a foo foo guy. I was actually kind of leery of the suggestion that we have "desserts" at the meeting as we show and discuss photos of our collections, work bench arrangements, etc. Well, now I am a believer. The crowd was down a wee bit from normal, but frankly those not there are the ones who missed out. There is a write up of the meeting elsewhere so I will not go into detail. However, I marveled at some

to the photos showing how folks display their collections. Pat Jankowiak had a lengthy photo display via computer of his collection. No, they were not things that you would find in most of our collections, but Pat has the room and expertise to collect and understand some very fine test instruments and early computers. My guess is he is on the cutting



edge of what will be viewed in museums in the future (maybe some are today). Others had similarly impressive displays via pictures. But the desserts, yep, I am a believer!! We were told to bring our favorite dessert, so I brought Blue Bell ice cream, but frankly I fell in love with the cherry cobbler with pecans that Wanda Cherryholmes allowed Cleo to bring. As I close for this issue I want to selfishly remind you of an auction I will be conducting in July. This sale will include 4 estates, from Louisiana, Oklahoma and Texas. About 300 items, some unique and rare, will be available. Most will be sold without reserve. Check the ad elsewhere in this issue for more details. Finally, I continue to try to send out an email reminder to the membership prior to any club event. Hopefully you get these. If you do not and you want to, just send me you email address and I will add you to my extensive list. Until next time, good hunting and see you at the auction.

2010 MONTHLY MEETING PROGRAMS

NOTE: Programs will be held at various locations in Irving, Texas. Make note of the location as they will change from time to time. Senter East, 228 Chamberlain St.; Garden and Arts, 906 S Senter Rd; and Heritage Park, 217 S. Main St.; will be the locations.. Refer to the WEB site. 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 21, 2010 (Senter East Bldg Parking Lot)

Summer Swap Meet 8am (be there earlier for the good stuff!) to Noon.

SEPTEMBER 18, 2010 (Heritage Park Bldg)

The Vacuum tube revisited, again? No one subject is more important to vintage radio collectors than the vacuum tube. This month, Mike McCarty will explain mu, Gm, Rp and such tube characteristics with actual demonstrations of their measurement.

OCTOBER 16, 2010 (Senter East Bldg)

"On the Air" will be the subject of the program. We will view classic radio videos illustrating how radio shows were put together and brought to the listener. Please bring items which you may wish to share having to do with getting a vintage radio show "on the air." This would include such items as mics, tubes, sound effects, transcriptions, etc.

NOVEMBER 19-21, 2010 (Hampton Inn, Mesquite, TX)

Annual VRPS Convention: Auctions, Contest, Flea Market, Banquet.

DECEMBER 4, 2010 (Senter East Bldg)

Annual Christmas Party. 5pm to 11pm.

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.

RADIO REPAIR SESSION

Don't forget the annual Radio Repair Session on July 17 at the Garden and Arts Building at 906 S. Senter Rd. in Irving. Bring those radios that you just can't get to work and Bill McKeown and his band of merry men will help you make those old sets sing again! The session will start at 8:00 AM and should end around 2:00 PM. Bring your testers and tools and learn how to use them. There will not be a regular meeting this month.

NOTES FROM THE APRIL 17, 2010 MEETING

The April meeting was well-attended once everyone found the location of our meeting place – the Heritage Park Building on Main St. in Irving, TX. We have used it in the past, but rarely. The meeting date coincided with major radio-related events, so some of our club officers were among the missing at this meeting.

The meeting topic was “The Vacuum Tube Revisited”, perhaps a reference to a fairly recent presentation by Mike McCarty. Kurt Ehrlich gave us a talk geared more to the history of their development, application and manufacture, whereas Mike had discussed more of the theory of operation and application of vacuum tubes. Kurt showed a DVD video titled “Electronics at Work” put out by Westinghouse in 1943. This interesting video appears to be a PR presentation for Westinghouse tailored to students and possibly recruits for the industry. Of course it had a war-time “flavor”, showing applications of Westinghouse electronic devices to the war effort. After the video, Kurt reviewed the early history of the vacuum tube and the big names associated with vacuum tube inventions, such as DeForest, Fleming, Langmuir, Miller, Tellegen, Hazeltine and others, all of whom made their contribution to the success of radio. As is usually the case, many of them used the earlier inventions of others as stepping stones. A good example was Fleming’s “valve” that made use of Edison’s observation that an electric current could pass only one way between a light bulb filament and a relatively cold electrode inside the bulb. (It seems ironic that Edison did not think it was a useful, patentable, property).

Kurt discussed the various tube functional types, their application and how each basic type (diode, triode, pentode, heptode, pentagrid, etc) was an improvement over earlier ones. The remote-cutoff pentode was an important invention that made automatic volume control easy to incorporate at very little cost. Of course none of the new types totally replaced the earlier ones, there always being certain applications where they fit best. For example, triodes and tetrodes are still useful for some applications even today. He discussed the history of adopted conventions for numbering tubes leading up to the widely-used convention of using the filament voltage as the first numerical values appearing in the tube identification, e.g.

the 6L6 and 117Z3 have 6 volt and 117 volt filaments, respectively. Some numbering systems were more arbitrary, such as many ruggedized versions having simply 4-digit numbers. Kurt discussed tubes specially designed to deliver more output power, especially the beam power tube which provided a way around the Philips pentode patent.

Kurt offered copies of a very detailed discussion related to his talk. It talks about the technical data pertinent to the functioning of different tube types and includes an example of the manufacturer’s technical data – the 6CG7. It is interesting that this tube is designed to have a controlled heater-warm-up time for use as a horizontal oscillator. This assures that, in series-string TV sets, it will be warmed up and oscillating before the horizontal output tube warms up – an important feature to save the latter from damaging plate currents. This tube is electrically identical to the octal-based 6SN7, also used as a horizontal oscillator in earlier TV sets. The document also provides schematics of typical circuits that provide the functions of rectifying, r.f. and i.f. and audio amplification and detection.

Many of us were looking forward to our traditional May swap meet, the June “show us your collection” and eventually to the July Repair Workshop. (Now is the time to decide what you might bring to the latter).

Notes from the author – As a young engineer I remember there was a shelf full of RCA vacuum tube data books in my department. These contained very detailed information needed for the designer of circuits that used vacuum tubes. They covered all of the consumer and industrial tubes, including many transmitting types. This was a few years prior to the development of the transistor. The data was in about 20 volumes 2½ inches thick.

Once again - there is a very good discussion in the front section of some RCA tube manuals illustrating and explaining the clever way the remote-cutoff feature is incorporated into the tube design.

Bill McKeown

FROM THE BENCH

Heptode Converters, or Why on Earth does Anyone Need Another Article about Five Grids? (A continuation from Sound Waves Oct 2009)

In an earlier article, we investigated basic operation of the Heptode Frequency Converter, a.k.a. Pentagrid Converter, paying some attention to basic principles of operation. This marvelous tube combines the functions of electron coupled oscillator, mixer, amplifier, and gain control. It's an amazing device! In this article, we'll look into differences between the various devices called Heptode Frequency Converters. As we'll see, they are not all the same.

Briefly to recap the previous article, the active tube elements are the cathode, five grids, and the plate. The grids are simply named G1 through G5, numbering them from the cathode (correction of a mistake in the previous article) to the plate. Usually, the cathode, G1, and G2 are used, with external circuitry, to form a triode oscillator. This generates the local oscillator signal for heterodyning or mixing for a difference signal at the intermediate frequency of a superheterodyne receiver. G2 playing the role of the plate of the oscillator. Either G3 is used as the signal input, with G5 acting as an ordinary suppressor, or G4 is used as the signal input, with G3 and G5 acting as electron beam accelerators (somewhat like the screen in an ordinary tetrode).

If one carefully studies the tube manuals, three different types of converters/mixers can be found: Heptode Frequency Converters, Pentagrid Frequency Converters, or more briefly, Converter Tubes. In the previous article, the differences between two of them was mentioned briefly, and the third type was completely ignored. In this article, we'll explore the differences in behavior between these tube types, and why a circuit designer would prefer one over the other.

In one type of tube, exemplified by the 6A7, we find G3 and G5 are internally connected within the tube, and G4 is used for the radio frequency signal input



to the tube. In this tube G1 is wound with even spacing between the turns, whereas G4 is wound more tightly at the ends than in the middle. This results in G4 having what is called a "remote cutoff" characteristic, in which the gain of the tube progressively decreases as the bias on the grid is made more negative. This characteristic is used for the automatic volume control (AVC) function,

which allows the receiver automatically to adjust its gain to compensate for signal fade, and prevent "blasting" the listener as he tunes across a strong station. This type of tube gives very adequate performance at medium frequencies, up to about two megahertz, after which its conversion gain, that is the ratio of intermediate frequency signal power output to radio frequency signal power input, begins to fall. This is due to reduced efficiency of the local oscillator portion of the tube. So, this type of tube has limited application at short wave frequencies, and is practically useless at FM radio frequencies used today.

In another type of tube, exemplified by the 6BE6, we find that G2 and G4 are connected together, and no one electrode within the tube functions as the sole plate connection for the oscillator. These two grids also shield the radio frequency signal input grid, G3, from the plate, and act as electron beam accelerators. The radio frequency signal grid G3 is wound with variable pitch, as mentioned above, for AVC function, whereas G1 is wound with fixed pitch for a sharp cutoff characteristic. The final grid G5 acts as a conventional suppressor, as in a normal pentode RF amplifier tube. In these tubes, the signal grid G3 has very little effect on the space charge surrounding the cathode, and so there are also reduced "pulling" effects, in which the tuned circuit attached to the signal grid affects the tuning of the local oscillator. These effects may be noticed at the high frequency end of the reception band, where the difference, in relative terms, between the tuning in the antenna circuit is not much different from that in the local oscillator circuit. Consider the ratio between 1700 KHz and 2145 KHz, as when a 455 KHz intermediate frequency is used.

In the third type of tube, more properly called the Pentagrid Mixer, and exemplified by the 6L7, the connections are as given for the 6BE6, but G1 is the RF signal grid, and is wound for a remote cutoff characteristic, and AVC bias voltage input. G3, sometimes called the modulator grid, is a separate control grid, wound for sharp cutoff, and is used to accept the local oscillator signal, which must be provided by a separate tube,

usually a triode due to the lower noise present in triodes. G3 exerts a strong control over the current flowing to the plate. G2 and G4 are internally connected, and act to accelerate the electron stream toward the plate. G5 is used as a suppressor, similarly to that in a normal pentode tube. In this form, the tube provides extreme isolation between the oscillator and antenna circuits, and may be used at frequencies in the hundreds or thousands of megahertz. The Pentagrid Converters like the 6BE6 may also be used with separate local oscillator injection (into G1, however), with improved high frequency performance, though not as effectively as the Pentagrid Mixer.

Note that, while the second form of Pentagrid Converter (e.g. 6BE6) and the Pentagrid Mixer (e.g. 6L7) have the grids internally connected in the same manner, they are functionally rather different, as the grids are reversed as to which has the remote cutoff characteristic.

In summary:

There are pentagrid converters with G3 and G5 internally connected

- G1 oscillator (sharp cutoff) grid
- G2 oscillator plate
- G3+5 accelerator and screen (resp)
- G4 signal (remote cutoff) grid

there are pentagrid converters with G2 and G4 internally connected

- G1 oscillator (sharp cutoff) grid
- G2+4 accelerator and shield (resp) [shield, not screen]
- G3 signal (remote cutoff) grid
- G5 suppressor

and there are pentagrid mixers with a similar connection but with an external oscillator (usually a triode) and different grid characteristics

- G1 RF signal (remote cutoff) input grid
- G2+4 accelerator and shield (resp)
- G3 local oscillator (sharp cutoff) input grid
- G5 suppressor

The pentagrid converters with G2 and G4 connected together, better isolation is achieved between the oscillator and mixer parts, and also have better high frequency behavior.

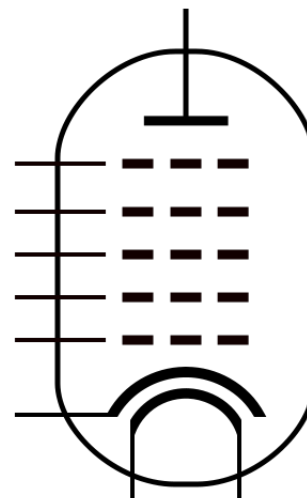
The ones with G3 and G5 connected tend to lose LO output as frequency goes up, and are more susceptible to "pulling" of the oscillator. G4 acts as a shield between

the oscillator and mixer portions of the tube. This is not a screen grid in the classic sense: screening a single control grid from the capacitance of the plate. G4 helps isolate the oscillator from the influence of the mixer portion, especially pulling, and also from bias changes due to effective plate/grid voltages. Because no single element acts as the oscillator plate, they work together as a composite plate for the oscillator, and as a shield between G3 and the other elements, especially G1. G5 is a classic suppressor.

When G3 and G5 are connected, G5 acts more as a classic screen for G4, though it helps somewhat to shield G4 from the other electrodes to a lesser degree, and hence reduces somewhat the influence of the signal grid on the oscillator.

The pentagrid mixer gives significantly more isolation and better high frequency performance than does either style of pentagrid converter.

by Mike McCarty



<http://en.wikipedia.org/wiki/File:Heptode>.



6L7 RCA VACUUM TUBE



6BE6 RCA VACUUM TUBE

NOTES FROM THE JUNE 2010 MEETING

The June meeting was held at the Garden and Arts Building. We had a decent turnout for a June meeting- about 20 people. President Jim Sargent opened the meeting with an announcement about his auction on July 24 (see notice in this issue). He then reminded everyone about the repair session on July 17 at the Garden and Arts Building in Irving. After answering any questions from the membership he turned the meeting over to Program Director Mike Grimes.

Mike explained the intent of the meeting- an event where members could show photos, etc. about their collections, workbenches, or anything else related to the hobby that they wanted to share with the others. We were also asked to bring a dessert, beverage (non-alcoholic) or snacks for everyone to enjoy.

Pat Jankowiak started off with a presentation of photos of his massive collection of industrial, military, commercial, and vintage amateur equipment. We were able to project the pictures on a screen enabling everyone to see them as he explained what they were. Pat has a very extensive collection of early computers, including a 1980 Osborne, Digital Equipment Company, National Semiconductor with a paper tape reader, and others. He has a lot of industrial test equipment, power supplies, and various testers from the 1940's. There were numerous rack mounts of equipment, such as uhf transceivers and military and industrial communications gear. Pat showed photos and explained about a set of Air Force chapel chimes he has that were built by Stromberg-Carlson and use all relay logic. He showed his collection of early electronic calculators and said he has a large stock of CRT's for sale. He has spent many years amassing this equipment (and probably a sore back)and it generated a lot of interest and questions from the members.

Mike McCarty showed photos of his workbench- a folding card table. Mike is an example of the adage that you can't judge the quality of a person's work by their working conditions. Anyone who knows Mike knows that he has a tremendous amount of knowledge about electronics. But just to be on the safe side, he has a bust of Thomas Edison (wearing a VRPS hat) watching over him.

Jim Sargent displayed a photo of himself in 1966 with a DX-120 Hallicrafters receiver. He still has that radio- not to mention the original box it came in! Jim showed pictures of his radio collection in 1976- 5 radios and 1 horn – my, how it has grown!

Mike Grimes showed pictures of his workbench- or should I say workshop! Mike has a work area (in the house, even!) that makes most of us green with envy. It is huge and is outfitted with everything a person might need to fix any radio. He also showed pictures of some of his collection- many Atwater-Kent radios and an Atwater-Kent lamp, a David Grimes radio, and numerous Zenith radios, including a Walton 12 tuber.

Shirley Denney brought an album with pictures of many of the radios that her late husband, Walton, had in his collection. Walton passed away recently and we really miss him. He had fought diabetes since he was a child and was part of the pioneer program to develop the use of insulin for diabetics.

Cleo Cherryholmes has one of those workbenches that most of us can only dream about and can best be described by one word- WOW! Like Mike Grimes' it is very extensive and has every type of test instrument known to man. He showed pictures of it along with some of the items being repaired- several early 7 inch televisions. Cleo has a fabulous collection! Everything works and is arranged so you can actually see every item. While he was a freshman in high school in Iowa he built his first radio (a one- tuber) from parts he scrounged from junkyard radios. One of the more unusual items is a lamp he built in an 833 tube. He has an extensive collection of 1939 Arvin and Airline 2 and 3 tube radios (which originally sold for under \$5.00 each), 1940's radios, subminiature tube radios (1953-1954), hybrid radios (tubes and transistors in the same radio- 1955), and all of the 1980's Sony Watchmen televisions. Antique dolls from Wanda's (Cleo's wife) collection have a way of popping up among the radios from time to time.

Walt Zalesky brought a couple of nice radios from his collection to show everyone. He demonstrated a nearly mint condition Westinghouse refrigerator radio and a Continental 4-tuber. Anyone who has seen Walt's work knows how meticulous he is with his restorations.

Kurt Ehrlich brought some pictures of his collection- many vacuum tubes and radios-Borg-Warner, Hallicrafters, RCA, a 1929 Philco, a 1939 Canadian Marconi console, a Browning Laboratories FM tuner, and Atwater-Kent models 337 and 20.

We were a little leery about scheduling the theme of this meeting. It was very different from anything we had ever done before and we were not sure how it would go- if at all. Whew- if member interest and participation is any indication of the success of a meeting, this is a keeper! Everybody had a great time and we all got to enjoy an evening, not only of seeing lots of old radios and equipment, but also enjoying the delicious snacks and desserts brought by the members.

By Randy James

VRPS CONVENTION 2010 CONTEST CATEGORIES

It's that time again! Time to start getting those entries ready for the 2010 Convention Old Equipment Contest! Please note the new categories for this year.

- 1. Crystal Radios**
- 2. Battery Receivers - Pre 1928**
- 3. AC Table Radios - Pre WW II**
- 4. Console Radios**
- 5. AC/DC Tube Radios**
- 6. Transistor Radios - Pre 1965**
- 7. Phonographs and related accessories - Pre 1928**
- 8. Loudspeakers (Horn or Cone) - Pre 1930**
- 9. Military and Amateur Radio Equipment**
- 10. Novelty Radios - Tube or Transistor**
- 11. Open Category - Radio or Phonograph Related Items not fitting in other categories**
- 12. Art Deco Radios**
- 13. Vacuum Tubes**
- 14. Foreign Radios**
- 15. Restoration Category - NEW CATEGORY! Entry must include documentation (pictures, etc.)!**
- 16. Manufacturers Category - WESTINGHOUSE**

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internet items begins at 9 am followed by the live and internet auction beginning at 10 am. A shipper will be on site for your
open for previewing on Friday, July 23 from 4 pm to 8 pm. Day of auction preview begins at 8 am. First auction of non-in-
Check the photo line up at www.sargentauction.com Bid in person or live via the internet at www.collector.com Doors
Don't miss this sale!
tion for another book concentrating on the post-War years. There is a wide variety of items to be offered in this sale.
as the co-author of the classic series of books on Zenith radios. Many of these sale items had been gathered in prepara-
consoles, table models. Special to this sale are items from the late John Bryant collection. Collectors will recognize John
Sale includes items from at least 3 estates plus additional consignments. Radios, phonographs, (platter and cylinder),

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