

## MOTORBOATING

(Not the kind you may think!)

By David Boyle

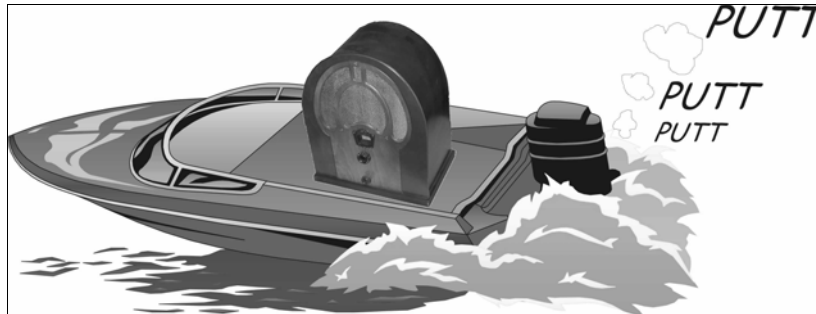
This is, once again, another article in my continuing technical series on old radio circuits, theory, and repair.

### Back Ground

I recently had the opportunity to repair a fellow club member's Zenith chassis. The audio output at the speaker sounded like a very low frequency pulse which resembled the exhaust of a outboard motor. This is an infrequent but maddening condition called "motorboating". A number of causes can be attributed to this unacceptable condition and they are always ( 95% ) localized to the audio stages past the 2<sup>nd</sup> detector and are generally manifested in multistage amplifier circuits of a AC line powered radio.

### Condition and Causes, Case # 1

If the regulation of the power supply B+ is poor, a large current drawn by the audio output tube will drop the voltage



windings; replace the transformer.  
-Rectifier tube below spec. Replace or substitute with a higher power capacity.

If a choke and/or a speaker field coil is in the B+ power supply circuit, be sure they are still up to spec. and that the voltage drop across them do not reduce audio circuit plate voltage below schematic listed values.

output of the supply. This voltage drop will cause the voltage to also drop on the other plates in the audio amplifier circuits which, in turn, will reduce their plate currents. The change in plate current will have a pulsing effect on the audio signal that is sent to the final audio output tube. The frequency at which those signal pulses are repeated depends upon the values of the components in the circuits involved. A vicious cycle is thus established when the characteristic "putt, putt, putt" of a outboard motor is heard in the speaker.

-Replace the choke with another one that has lower reactance values.

- 2) If the power supply filter circuit has a resistor in the filter network instead of a choke - be sure this power resistor has the proper value. A slightly lower value may help increase B+ regulation.
- 3) Be sure all power supply voltage dividing resistors have the correct value.
- 4) Now that the B+ is exonerated the focus is now on the entire string of audio stages. Try tube substitution of all audio tubes.
- 5) If it is a transformer coupled audio stage as shown below in Figure 1, you must ensure that all audio transformer cases and/or frames are well grounded. This will reduce inductive coupling between audio stages. Thankfully, transformer cou-

### Causes and Remedies, Case #1

1) B+ Power Supply, inadequate or poor regulation:

-Replace all electrolytic capacitors in the B+ supply with new caps of the proper capacitance and operating voltage.

-Power transformer HV winding has insufficient power output or shorted

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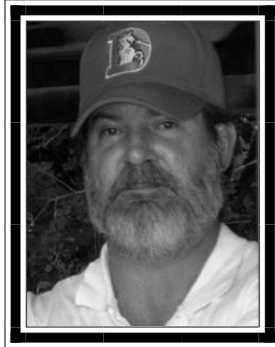
# COLORADO RADIO COLLECTORS ANTIQUE RADIO CLUB

Founded October 1988  
The Flash! © 2009, all rights reserved

## Message from the President

Ah, springtime.... longer days, warmer weather, and the Spring Radio Show.

Time to start dusting and polishing those treasures you want to share with friends and the unsuspecting public.



square feet of exhibits. This will attract hundreds of people, all with similar interests.

Your CRC name badge allows for free admission to the Expo.

This year's show, again in conjunction with The Vintage Voltage Expo, should be as great as in past years.

More info will be discussed at the March 8<sup>th</sup> meeting in Castle Rock Hope to see you all there.

There will be thousands of

Brian Hagrman

## CRC CONTACTS

<b>President</b>	Brian Hagrman (303)794-6674
<b>Vice President</b>	<b>OPEN</b>
<b>Treasurer</b>	Mike Cook (303) 471-9596 mldcook@hotmail.com
<b>Archive and Books</b>	Charles Brett (719) 495-8660 brett3729@aol.com
<b>Egroup Manager</b>	Mark Dittmar (303) 403-0669 mbdittmar@comcast.net
<b>Flash! Publisher</b>	Steve Touzalin (303) 988-5394 stevetou@comcast.net
<b>Flash Editor</b>	Rich Kuberski ROKuberski@msn.com
<b>Flash! Distribution</b>	Richard Beckman (303) 344-8565 rebdalbeck@msn.com
<b>Webmaster Website</b>	Bill Grimm www.radioace.com

## Upcoming Events

3/8/09—CRC meeting in Castlerock  
3/29 Vintage Voltage/Annual CRC Show - Northglen  
4/4 LarcFest, Boulder County Fairgrounds  
5/17 – CRC meeting in Littleton

## CRC MEMBERSHIP

Annual membership in the CRC runs from July to June. Dues entitle members to attend meetings, "The Flash!" our newsletter, discount book prices, participation in our spring show and Fall auction. Current annual dues are \$12. New memberships will be prorated to the following June.

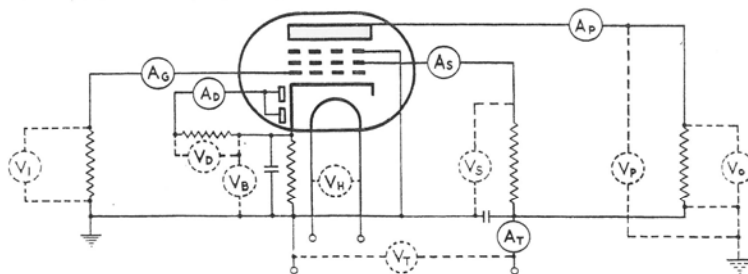
## CRC MEETINGS

Meetings are held on the 2nd Sunday of every other month starting in January (except 3rd Sunday of May) at 1:00pm. The meetings consist of business, "show & tell", raffles, auctions, swap meets, technical discussions and other subjects of interest

## METERS: WHERE TO PUT THEM

This diagram is intended to refresh the memory of users with regards to fundamental practice. A diode-pentode was chosen for illustration since its elements permit broad analysis of meter placement in virtually all tube circuits

Because modern testing equipment is designed to conserve the harrassed serviceman's thinking-time there is always danger that the individual meters comprising such instruments may not be used to best advantage.....



### VOLTAGE MEASUREMENTS

- V<sub>B</sub> (Grid Bias) High resistance voltmeter (0-10-50)
- V<sub>D</sub> (Diode Voltage) High resistance voltmeter or vtvm (0-1-5)
- V<sub>H</sub> (Heater Voltage) Low scale of a.c. voltmeter (0-10-25)
- V<sub>I</sub> (Signal Voltage) Output meter or v.t.v.m.
- V<sub>O</sub> (Output Voltage) Output meter or v.t.v.m.
- V<sub>P</sub> (Plate Voltage) High resistance voltmeter (0-250-500)
- V<sub>S</sub> (Screen Voltage) High resistance voltmeter (0-100-500)

### CURRENT MEASUREMENTS

- A<sub>D</sub> (Rectified Current) Microammeter or low-range ma. (0-0.05-1.0)
- A<sub>G</sub> (Grid Current) Microammeter or low-range ma. (0-0.05-1.0)
- A<sub>P</sub> (Plate Current) Milliammeter (0-5-100)
- A<sub>S</sub> (Screen Current) Low-range d.c. milliammeter (0-1-10)
- A<sub>T</sub> (Total Current) Low-range d.c. milliammeter (0-1-10)

Actual voltages slightly higher than meter reading, accuracy dependent upon resistance of instrument

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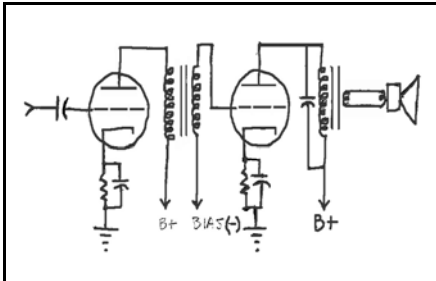


Figure 1: Typical Transformer Coupled Amplifier

pled audio stages are not prone to motorboating!

Condition & Cause, Case #2

Figure #2, describes a typical resistance coupled audio amplifier circuit. The causes and remedies of motorboating are a little more complex.

Each tube stage of a cascading audio amp. is 180 degrees out of phase of the preceding tube stage. That is to say that as the plate current increases in the first stage, it decreases in the second stage. Every coupling, either inductive or capacitive, between grids or plates of two adjacent stages will tend to cancel each other. This decreases overall amplification but also decreases any tendency to oscillate which could be manifested as motorboating. On the other hand, any feedback caused by adverse coupling between the first and third stage is twice 180 or 360 degrees and is in phase or regenerative ( viz-a-viz: 1920's regenerative detector circuits using a feedback loop via the "tickler coil" ). This makes the stages form an oscillating circuit. In some cases, oscillation will be at audio frequencies, sometimes at a few cycles per second, which again, is called motorboating. Degenerative or out-of-phase ( inverse ) type of feedback is usually not bothersome. In fact, many hi-fi amps. incorporate circuits using inverse feedback to stabilize and decrease some types of distortion. In summation; regenerative feedback is not desired in our old radios for it results in noise, distortion, and possibly motorboating.

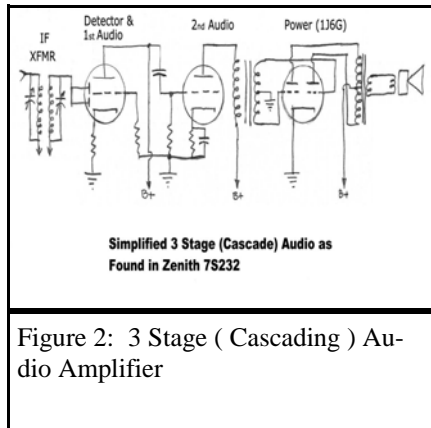


Figure 2: 3 Stage ( Cascading ) Audio Amplifier

Causes & Remedies, Case #2

- 1) To decrease the effect of regenerative motorboat oscillation; first try substituting all the audio tubes regardless of what the tube tester indicates!! I believe in this practice for all radio circuits since tested "good" tubes will not always work the same under various conditions and circuits.
- 2) Pull out the 1<sup>st</sup> audio tube, if motorboating stops there will be a good chance that the problem is in this stage. Similarity, pull tubes from the 2<sup>nd</sup> audio stage. This may help localize the offending stage.
- 3) Verify that all resistors are in tolerance in the offending audio stage. Go ahead and simply replace all the audio capacitors including any electrolytic types as B+ filters and cathode bypass caps.
- 4) Another, albeit, more complex method is to break the motorboat oscillation by the installing a simple decoupling filter network. Please refer to Figure 3, below. It is usually sufficient to place the filter in the first offending tube circuit as ascertained in step 2), above. Also refer to Figure 2), to re-familiarize yourself with a cascade audio circuit.

The filter consists of resistor 'R' of about 10,000 ohms to 100,000 ohms and a capacitor 'C' of 2-4 mfd. If the trouble persists similar filters can be placed in the other audio tube stages.

Summary

Motorboating is a defect generally localized in the audio frequency circuits

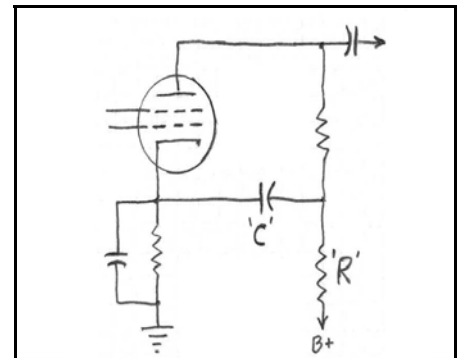
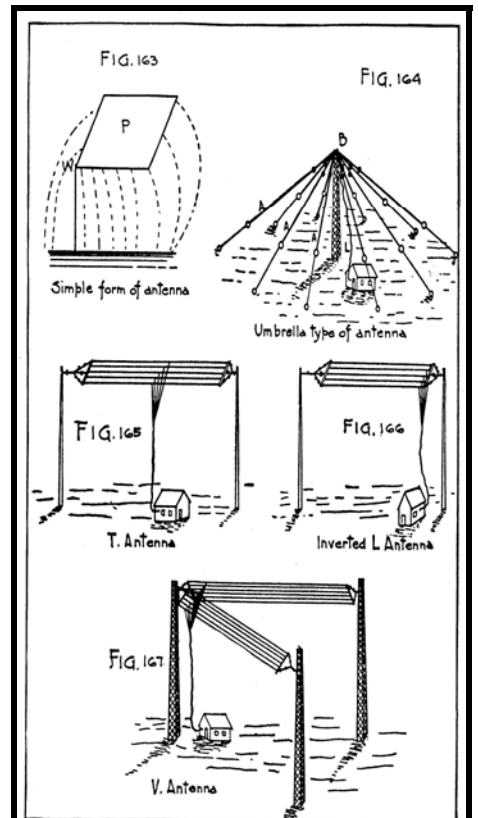


Figure 3: Simplified Schematic Showing Decoupling Filter

of the radio. It is usually associated with poor B+ regulation of the radio's power supply. This was described in Conditions and Causes Case #1. There can be other causes not addressed in this article but are infrequently encountered and could be attributed to RF and/or IF circuit faults.



Antenna Designs  
From: *The Principles Underlying Radio communication*  
U. S. Army Signal Corps—1921

## Photos from the January 11th CRC Meeting in Littleton



Dave Boyle conducting an Auction of tubes and parts donated



David Soliday and his Silver-tone radio



Bill Harris showing his Philadelphia Storage Battery (Philco) battery eliminator



Dennis Laurence and his Silver-tone radio



One of the four chemical rectifiers from the Philco battery eliminator



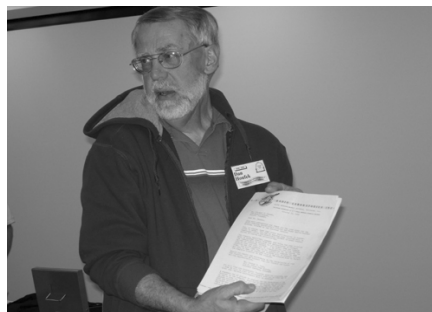
Two intercoms cabinets and one catlin air cleaner cabinet modified into radios



Barney showing Dan Houfok and Don Wick his HP cathode tube.



Dave Gonshor and his "intercom" radio



Dan Houfok with literature and letters on a E.H. Scott Phantom console



Larry Snyder grabbing a box won during the raffle

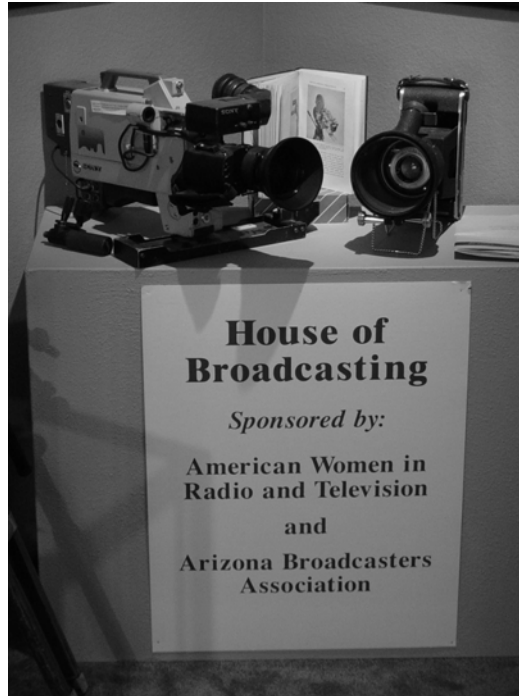
# A Visit to the House of Broadcasting

By CRC member Robert Baumann

I have family in the Phoenix area and one afternoon while I was visiting, we found ourselves window shopping in upscale Scottsdale. Perhaps you can imagine how I felt a little out of place amongst their “prestigious 5<sup>th</sup> Avenue shops”. I consider myself to be very frugal, indeed a bargain hunter. But to most who know me, I’m simply cheap. I’m certainly no slave to fashion or one who seeks out overpriced, designer name brands. But there I was, across the street from what’s known as The Galleria in front of the Santa Fe West Building by a shop called Anthony’s Gifts when a sign in their window inviting the public to view a broadcast museum on the second floor caught my attention. You should understand my relief and anticipation as I climbed the stairs: a welcome diversion from an afternoon of *shopping* during which I had my MasterCard safely tucked away.

I had quite by chance discovered the House of Broadcasting, Inc. (HOB) “Arizona’s premiere radio and television home” who’s mission is “educating the public and preserving and celebrating the history, personalities and paraphernalia of radio and television in Arizona”. The entrance was unattended, there was no required admission and on that afternoon, I was the only one in the place. I found 2000 square feet of “multiple gallery rooms displaying unique books, photos, broadcasting awards, cameras, editing and lighting equipment, costumes, memorabilia from Buck Owens, correspondence, early Arizona news anchor attire, novelty items from Arizona radio stations, video tapes, sound bites, classic music memorabilia and other paraphernalia of the electronic media”.

Clearly those from the area might identify more closely with these stations and personalities but as a vintage radio



enthusiast, it was the next best thing to stumbling onto a museum dedicated to radio itself. It was, after all, the forethought of David Sarnoff (and others) who realized broadcasting was where money could be made, catapulting first radio and then television into almost every home and securing an important



place for these forms of communications in our history forever.

I happened to have my camera so I

took the representative photos that appear here. But as I left that afternoon, a couple of questions lingered in my mind. How did this wonderful display come to be? How is it funded, especially considering the public was welcome with no required admission? I took a business card with contact information which I proceeded to misplace. But when I returned to the area last November, finding out the answers to these questions had become an objective.

I had the pleasure of interviewing the President of the HOB board of directors which consists of 23 local industry leaders. I learned how the Phoenix Chapter of American Women in Radio and Television and the Arizona Broadcasters Association had founded HOB in 1997, and that it was initially limited to donated storefront space for a display in an area mall. The museum has been at its current location (formerly occupied by country singer Tanya Tucker) since 2003. Fund raising is ongoing in an effort to eventually purchase a permanent home planned to be more than twice the current size. Financial support comes from the Arizona Broadcasters Association; area radio and television stations; industry and personal contributions and special events such as celebrity book signings by veteran broadcast authors like Hugh Downs; broadcaster tributes and live radio broadcasts of “Those Were the Days” by Chicago host Chuck Schaden. Two main annual fundraising events include a Celebrity Roast and Salute in the spring and a Celebrity Golf Tournament each fall. I was given a program of the most recent Celebrity Salute celebrating HOB’s 12<sup>th</sup> anniversary on May 17, 2008.

HOB has currently loaned several artifacts to the ASU Walter Cronkite

*(Continued on page 6)*



at



(Continued from page 5)

School of Journalism in downtown Phoenix. It was suggested that I would enjoy spending at least a couple of hours visiting this display and I look forward to doing so next time I'm in the area.

The House of Broadcasting is located

7150 E. 5<sup>th</sup> Avenue in Scottsdale. It is open daily from 10 AM to 6 PM. I encourage any CRC member or vintage radio enthusiast who might find them self in the Phoenix area to set aside a couple of hours to visit the

HOBİ. For those who don't plan to visit the area in the foreseeable future, the HOBİ website is: [www.houseofbroadcasting.com](http://www.houseofbroadcasting.com).

Much of the same information I was provided

and have shared here appears in HOBİ brochures and on this website. There are some additional photos of the displays but much of the website is understandably dedicated to photos of past fundraising events. I look forward to visiting the recommended Cronkite display myself next time I'm in the Phoenix area.



JOHN F. RIDER'S

## Perpetual Trouble Shooter's Manual



is recognized as the standard in the radio industry. Every service man who has need for wiring diagrams of commercial receivers should consider well when buying a manual which is supposed to give him all of the required service data.

The first Trouble Shooter's Manual by Rider was published in 1929. It received very excellent response from the service industry. The Perpetual Trouble Shooter's Manual was received with even greater approval.

There are many reasons why this loose leaf manual of more than 1000 pages has been accepted by the radio service industry—why it has been found to be the greatest aid to the practicing service man.

Having been prepared with the co-operation of the radio receiver manufacturers, the material presented is accurate in every detail.

Recognition in and the co-operation of the radio manufacturing industry has made possible the presentation of electrical values—color coding—chassis layouts—transformer color coding—voltage data—socket layouts—pictorial views of the chassis—changes made in receivers—etc. **EVERYTHING** the service man requires so that he can service rapidly and accurately.

### A Supplementary Service to Rider's Perpetual Trouble Shooter's Manual

**Guaranteed minimum of 96 pages per month - 288 pages per quarter - 1152 pages per year of up-to-the-minute Radio Service Data available in "Monthly" or "Quarterly" mailings.**

**2300 PAGES BY SEPTEMBER**

Every owner of Rider's Perpetual Trouble Shooter's Manual and subscriber to Rider's Supplementary Service will by September, 1932, have a two volume manual of at least 2300 pages of the most accurate, valuable and time-saving service data available in the radio industry.

In days gone by, radio receivers were simple circuits. Today they are complex. Radio receivers are continually changing. . . . A few years ago the average service man could get along. . . . Today you must be better than average to get by. . . . Modern service must be rapid and accurate. . . . Nothing but the proper amount of service data will enable you to work accurately and rapidly—to meet competition and make more money.

### MONEY BACK GUARANTEE

You risk nothing in subscribing to this service. At any time if you are not satisfied that you are receiving more than full value, merely return the supplements and any premiums and we shall willingly and promptly return your money. . . . No questions. . . . No reservations. . . . You can't lose.

Price for the Manual only \$5.00 postpaid.

Price for the "Quarterly" Service \$.50 per month.

Price for the "Monthly" Service \$.75 per month.

The Manual and Supplementary Service are available upon the Easy Payment Plan. Send for descriptive literature.

## RADIO TREATISE CO., INC.

1440 BROADWAY

"Service" Magazine - Feb. 1932

NEW YORK CITY

The Rider's Manuals can be downloaded at: <http://hertzmail.com/riders-vols/>

# Time to get ready for the 2009 Annual CRC Show!

This year, on Sunday March 29<sup>th</sup>, the Colorado Radio Collectors Antique Radio Club will be holding it's annual show at the Ramada Inn, in conjunction with the 3rd annual "Vintage Voltage Expo" show. As many of you know, this is by far our best opportunity to not only show the community what antique radio collecting and the CRC is all about, but it also allows those CRC members with radio and associated gear for sale to put their goods before a crowd of hundreds of people who will be there specifically to look AND to purchase.

So, get those treasures down off the shelf and win a prize and/or make a buck. For further information, contact Dave Boyle at (303) 681-3258

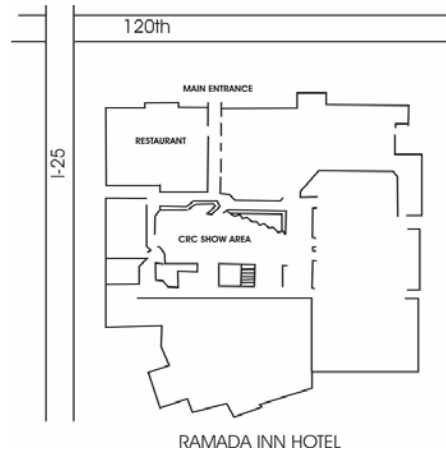
- Our contest and show space is in the hotel's main entrance atrium, through which all show visitors and participants must pass.
- Unloading and access will be through the North entrance.
- Tables will be available, but final layout and arrangement will be when full setup is done Sunday morning.

## CRC Timetable

- 7:00 am - Unloading, begin setup and registering
- **9:30 am - CRC Contest Registration Cutoff**
- 10:00 am - Complex opens to public, begin selling
- 10:15 am - Judges briefing
- 10:30 am - Judging commences
- 1:00 pm - Awards posted
- 3:00 pm - Show closes, begin breakdown

### Costs for Space and Table Rental:

The "Vintage Voltage Expo" show promoter will provide the CRC complimentary show space and tables. CRC members will pay for tables that are used for selling. **The cost this year is \$40 for each table or three tables for \$100.** Sellers may share this cost with



each other in any combination they choose.

### Contest Judging Categories:

- Accessories
- Bakelite
- Battery - 1926-1929
- Catalin
- Cathedral
- Classic Audio
- Communication Gear
- Console - Full Length
- Console - High/Low Boy
- Crystal Set
- Kits/Homebrew
- Metal Box - 1920's
- Metal Case
- Novelty - Transistor
- Novelty - Tube
- Plastic - Tube
- Portable - Pre 1939
- Portable - Post 1938
- Pre 1925
- Speakers
- Specialty - "Homebrew/Kits"
- Television
- Tombstone
- Transistor
- Tube/Parts Display
- Wooden A/C
- People's Choice \*
- Best Restoration \*\*
- Best of Show \*\*
- \*=Popular vote by public
- \*\*=Popular vote by CRC members

### Judging Criteria:

- ⇒ Exterior condition

- ⇒ Internal condition – judged if visible from the outside
- ⇒ Presentation - how well displayed, documented, etc
- ⇒ Rareness - few are in existence
- ⇒ Uniqueness - novel, not many like it

Note that these criteria are weighted, with an emphasis on condition and presentation - **Preparation counts! Every radio counts!**

Ribbons for top entries in each category as well as a Best of Show plaque will be awarded as a result of paired member judging.

### Additional Items of Interest:

- o Power will be available, but consider bringing an extension cord and/or outlet strip.
- o As in the past shows, sellers may include any items that fall into the category of "collectable" - they need not be strictly radio related. Any electronics related item may be displayed!
- o Volunteers are needed to watch over displays. Please consider coming and staying for at least a while even if you're not entered in the contest or selling.
- o You are highly encouraged to wear your CRC membership badge. You will need your badge for free entry into the building for you and your family.

**Please have your Brand, Model, Age & Category info ready when registering!**  
**BE PREPARED**

### NOTICE

*Neither the CRC nor the "Vintage Voltage Expo" promoters assume any liability for lost, stolen or damaged articles, brought to this event by anyone, for show or for sale.*





# The Open Trunk

Member submitted advertisements



**WANTED:** Buy/Sell/Trade: "Heavy Metal" communications gear, telegraph related items, vintage calculators & microphones. HQ180A@aol.com. Robert Baumann, (303) 988-2089

**FOR SALE:**Note...All of the instruments listed below are refurbished, repaired and VG.

**Heathkit 5" oscilloscope, #0-12**, built by myself, perfect for radio repairing..

**\$30.00 OBO**

**RCA # W-44** audio generator, sine and square wave. Like new **\$.30.00 Firm Superior # TV-50**, Radio and TV signal generator. VG, calibrated,

**\$50.00 OBO**

**BK model # 606**, tube tester, also calibrated per manual, VG,.....**\$40.00 OBO**

**VOM** looks like a typical Triplett or Simpson from the 1950's. Much newer of Japanese Mfg. VG with leads, and great black handled case..**\$28.00 OBO**

**Accurate Instrument Company;**

Utility Tester for radios, home appliances, etc. Can test 1950's era tube filaments ( 4 different sockets plus a B/W TV CRT socket on long leads )..

Has ability to test ac and dc volts, resistance, amperage----everything for the home appliance. Quite a post war collectable that has the test leads, manual, all in a nice case! Great for the garage work bench---teach your wife to use it!.....only **\$11.00 OBO**

**David Boyle 303-681-3258**

03/09

## **REPAIR SERVICE:**

Radio repairs for club members.

Reasonable rates. Good references.

**Call David Boyle**

**303-681-3258**

12/08

**FOR SALE: DeForest F-5** radio. This radio has been restored/repared to play well. It will be sold w/o tubes, but will include an untested DeForest DV-5 (short pin,ceramic based, tipped) tube that came with the radio, and an original Deforest Radio Company stock certificate.

I wrote an article about the history and manufacture of this radio in Nov 2002. This article and pictures of the radio and the stock certificate can be seen at the following address.

<http://www.nazcaresources.com/waynewrites/F5%20from%20front.jpg>

<http://www.nazcaresources.com/waynewrites/stock%20certificate2.jpg>

<http://www.nazcaresources.com/waynewrites/nov%202002%20article.jpg>

Please call or email me for further info, including price, delivery, etc. The sale of this radio will be to the first person who responds with payment.

**Wayne Gilbert, 303-431-6774**  
**wagil@aol.com 12/08**

**WANTED:** I need a couple of station selection push buttons for a Zenith '41 console.



**Larry Weide (303) 758-8382**  
**lweide@msn.com 12/09**

## PLAN TO ATTEND:

A radio workshop is planned right after the March CRC meeting in Castle Rock. It will provide hands-on instruction of basic radio troubleshooting steps using a volt/ammeter (VOM).

Anyone interested is encouraged to bring a meter, with test leads, to use or for others to use. Either digital or analog is ok, whatever you have. Also feel free to bring a complete radio chassis (with speaker) that is working or maybe requires some sort of repair. To keep the instruction at the " basic " level for all attendees

please bring only a low tube count radio such as an All American Five from the early 1950's. If you do bring a radio chassis please bring along a schematic for the subject radio. Most schematics can be found at <http://www.nostalgiaair.org/> if you don't have one. If there is enough interest, this could be one of many such workshops in the future. This will be a perfect chance to participate, have fun, and learn!!!

**The March 8th, 1:00 pm meeting will be at the Philip S. Miller Library in Castle Rock**

## Directions

From I-25: Take the Plum Creek Parkway, exit #181  
Turn East onto Plum Creek Parkway.  
Turn Left (North) onto S. Wilcox Street and continue north 2 tenths of a mile.  
The Philip S. Miller Library is on the east side of the street at 100 S. Wilcox St.  
The building is towards the back of the parking lot, past the Dairy Queen.



**Colorado Radio Collectors  
Antique Radio Club  
417 S. Queen Cir.  
Lakewood CO 80226**

**FIRST CLASS MAIL**