

Dedicated to the Preservation and Education of Wireless, Radio, Television and Associated Equipment

* NEWS FLASH *

The November CRC meeting will be held at the Wings over the Rockies Air & Space Museum. You MUST bring your badge for free entry. Let the person at the gate know you are meeting in the Lowery conference room. See pages 9 & 10 for more details.

The Scrounge Box

By Larry Weide (reprinted from April 1993)

Hi...all you CRCers! This month I'd like to write about a subject that will likely be of interest to collectors who restore low end 1930 radios - the substitution for defective resistance line cords. To begin with, I want to thank Dick Hagrman and his brother Ray for much of the information in this article. In particular, I want to thank them for all the empirical work they did to distill their substitution technique down to a simple procedure and a few component values.

During the 2nd decade of commercially available radios the cost of owning a receiver began to drop dramatically. One reason of course was that by the beginning of the "Thirties" mass production and volume selling was in full swing. At the same time however, cheaper methods of construction were also being implemented.

One of these cost reduction methods was the elimination of the AC power transformer - the most expensive, largest and heaviest component on a radio chassis. Most of us are familiar with the common method of transformer-less operation. The high, or "plate" voltage is derived directly from the rectified and filtered AC line voltage. At the same time, the filaments of the tubes are supplied with the proper voltage by placing them in series with the input AC line voltage. It turns out however that, during the early years of this filament supply technique, the available tubes, setup in typical arrangements, could not by themselves handle the entire AC input line voltage. Examine Fig. 1 to see how the tube filaments were arranged with a resistor to properly distribute the voltage among the tubes.

Until newer tube types became available, and eliminated the need for the series resistor, this system worked pretty well except for one thing - the resistance component dissipated a lot of heat. There were two common solutions to this problem. The more expensive method was to place the resistor in an electron tube style plugable container known as a ballast tube. This "tube", though it got quite hot, was mounted above the chassis and away from most of the other components. The cheaper method was to use a resistance line cord. This cord looked like any other cloth covered AC line cord of it's time, but it also contained a third conductor that was actually a resistive wire (like nichrome) that acted as the required resistor for this type of radio.

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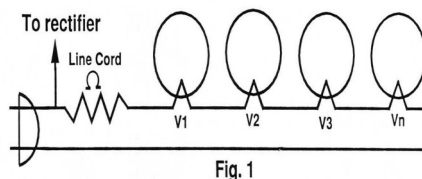


Fig. 1

The resistance value of each tube filament, and of the resistor, are designed such that each tube gets it's proper voltage and the resistor gets what is left. The total voltage IS the value of the input AC line voltage. Of course, all of this is under the control of good 'ole Ohms Law.

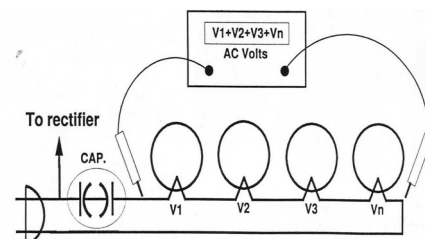


Fig. 2

The advantage of the voltage dropping line cord was that it would dissipate the generated heat outside of the radio cabinet and eliminated one more component to mount inside the radio. Alas, it had a major dis-

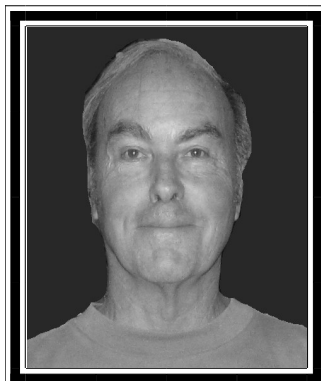
COLORADO RADIO COLLECTORS ANTIQUE RADIO CLUB

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Message from the President

Presidents Message

Greetings fellow club members. We are going to have a crystal forum at this upcoming meeting. Bring a crystal radio to the meeting for show and tell and be prepared to talk about your experiences with crystal radios.



Our auction & picnic were FANTASTIC, details are in this issue.

Please note that the upcoming meeting is at the Wings over the Rockies Air & Space Museum on the old Lowery AFB.

Tom.

CRC CONTACTS

President	Tom Kelly (303)504-0550
Vice President	Marty Phillips 719-495-4229
Treasurer	Mike Cook (303) 471-9596 mldcook@hotmail.com 2383 Indian Paintbrush Circle Highlands Ranch, CO 80129
Archive and Books	Charles Brett (719) 495-8660 brett3729@aol.com
Egroup Manager	Mark Dittmar (303) 403-0669 mbdittmar@comcast.net
Flash! Publisher	Steve Touzalin (303) 988-5394 stevetou@comcast.net
Flash Graphic Editor	Rich Kuberski ROKuberski@msn.com
Flash! Distribution	Richard Beckman (303) 344-8565 rebdalbeck@msn.com
Webmaster	Bill Grimm
Website	www.radioace.com

Upcoming Events

10/31—Halloween
11/11—Veterans Day
11/24—Thanksgiving
3/25—CRC Show

Meeting Locations (Unless noted otherwise)

Littleton	Castle Rock
January	March
May	July
September	November

CRC MEETINGS

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

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.



(Continued from page 1)

advantage. These line cords didn't last long due to the effects of heat on the rubber insulation. In fact, it is rare to find any of these cords in good shape today - even unused ones. Since frayed and defective cords of this type are very dangerous you will not find them being newly manufactured.

The usual method of repair is to replace the old resistance line cord with a conventional two conductor one and a suitably sized resistor. This method certainly works but it puts us back to square one in terms of the troublesome heat dissipation. Then there's also the problem of where to safely mount a power resistor inside a cabinet not designed for such things.

There is another way! Simply put, we can substitute the voltage dropping resistor directly with a capacitor. Using Fig 2 let's take a look at how this technique works.

As the input AC current passes through the tube filaments it charges the capacitor, first in one direction then the other. The rate of this charging, and the average value of the resulting current flow, is in direct relationship to the filament resistances and the capacitor value. As mentioned above, the voltage across each tube would be calculated with Ohm's Law as: tube VOLTAGE = capacitor CURRENT times filament RESISTANCE. Since the trick is to calculate the size of the capacitor for a particular tube lineup (not hard but tedious), we tip our hat to the Hagrman brothers for providing us both specific part values and testing information.

The capacitor must be a special type. It's a non-polarized electrolytic. It's non-polarized to handle the AC current, and electrolytic because of the relatively high capacitance value required. Although it's technically possible to use back to back electrolytics in this service, Dick says that experience shows the readymade non-polarized capacitor is the most reliable type.

In the case where your radio has a tube

lineup whose total filament voltage doesn't match one in Fig. 3, we suggest you use the following testing and capacitor value locating procedure;

A. Install what you believe to be a suitable size trial capacitor. Remember, this capacitor directly replaces the line cord resistor.

In many cases the line cord resistor had a low resistance tap that was used as a shunt for a pilot lamp. If your set had such a cord, you will need to replace this shunt resistance with a 5 watt resistor whose value can be found in your radio's documentation, or you can select a cord resistance from Fig. 4, then go to Fig. 5 to find the closest tap value.

B. Attach an AC voltmeter to span the entire filament string as shown in Fig 2. **YOU MUST NEVER LET THIS VOLTAGE RISE ABOVE THE SUM OF THE CORRECT VOLTAGE FOR ALL THE TUBE FILAMENTS OR TUBE DAMAGE MAY RESULT!**

C. Using the proper SAFETY precautions, plug your radio into power through a Variac or similar voltage adjusting device.

D. Carefully monitor the voltage in step B as you SLOWLY bring the Variac output voltage up towards the AC input line voltage.

D1. If the voltage in step B reaches the total filament voltage BEFORE the Variac output voltage reaches the line voltage, then the capacitor is too big - too much current.

D2. If the voltage in step B is low when the Variac voltage has reached the input line voltage, then the capacitor is too small - too little current.

E. Repeat the above procedure, using different capacitor combinations, until your results (the total filament voltage being measured in step B) is within +/- 10% of the desired value.

Naturally, you're going to have to find a place to install the capacitor. However, since it runs quite cool, you can mount it

anywhere where there's room AND safe access to the AC line. Below you will find a source that Dick has used for his capacitors. The ones that Dick found have the advantage of being fairly small, have axial leads and are shrouded in insulating plastic. The alternative to this capacitor is the AC motor start capacitor. This type is much easier to find, but they're likely to be larger.

By-the-way, this technique works equally as well for defective ballast tubes that can't be replaced (I have however found exact replacements at Antique Supply in Tempe). Once again, you may have to deal with a pilot light shunt in this device as well.

Fig. 3: Hagrman Derived Capacitor Values for Common Tube Filament Voltage combinations.

TOTAL FILAMENT VOLTAGE	CALCULATED CAPACITOR VALUE
24 volts	7.2 μ Fd
68 volts	10.0 μ Fd

Fig. 3: Hagrman-Derived capacitor Values for Common Tube Filament Voltage Combinations

RESISTANCE	TUBE LINEUP
135 Ohms	25Z5, 43, 4 (6.3 V.)
160 Ohms	25Z5, 43, 3 (6.3 V.)
180 Ohms	12Z3, 43, 4 (6.3 V.)
200 Ohms	25Z5, 43, 2 (6.3 V.)
220 Ohms	12Z3, 43, 3 (6.3 V.)
250 Ohms	12Z3, 43, 2 (6.3 V.) 25Z5, 3 (6.3 V.)
290 Ohms	12Z3, 3 (6.3 V.)
300 Ohms	12Z3, 3 (6.3 V.)
330 Ohms	12Z3, 2 (6.3 V.) 4 (6.3 V.)
350 Ohms	12Z3, 1 (6.3 V.) 3 (6.3 V.)
390 Ohms	2 (6.3 V.)

Fig. 4: Line Cord Resistance Values for Specific Tube Lineups. Note: n (6.3 v.) = quantity of 6.3 volt tubes in radio

TOTAL RESISTANCE	TAPPED RESISTANCE
160 Ohms	24 Ohms
165 Ohms	30 Ohms
180 Ohms	25 Ohms
200 Ohms	25 Ohms
200 Ohms	40 Ohms
280 Ohms	40 Ohms
360 Ohms	80 Ohms
430 Ohms	80 Ohms
510 Ohms	80 Ohms
560 Ohms	80 Ohms
960 Ohms	80 Ohms
1950 Ohms	360 Ohms

Fig. 5: Common Values for Tapped Resistance Line Cord

Good luck on your next cord replacement.

Are you paying attention? The November meeting place has been changed. It's at the Wings over the Rockies Air & Space Museum on the old Lowery Air Force Base. See pages 9 & 10 for details.

CRC Annual Auction - Sales Summary Report

CON(DITION): E=Excellent, G=Good, F=Fair, P=Poor

COM(MENT): WT=with tubes, NT=no tubes, NWK=not working, REF=refinished, UNK=working unknown

PC=parts chassis, NIB=new in box, NOS=new old stock

Lot Description	Minimum Bid	Hammer Price	Exception	Con	Com	Ham'r Time
Air King 257 1938	\$20.00	\$25.00				17:02
Airline - table TRF		\$35.00				16:52
Airline 14WG-757A 1941		\$2.00				17:00
Airline 62-197 1935 - console no spkrs/knob		\$2.00				17:14
Airline 62-49 1932 - no knobs		\$25.00				17:11
Airline 94-BR1535A 1951		\$15.00				17:06
Airline Bakelite 1949	\$10.00	\$10.00				17:03
Airline GRX-1089A		\$20.00	Buy-Back			16:49
Arvin 444 1946 - table		\$40.00				16:59
Atwater Kent - console cabinet only		\$1.00				16:54
Atwater Kent 20 battery set		\$20.00				16:47
Atwater Kent 376 1934 - console		\$5.00				16:54
Atwater Kent 40 1928		\$25.00				17:03
Atwater Kent 40 no tubes		\$35.00				16:59
Atwater Kent 820 1933 - cathedral		\$45.00				16:50
Atwater Kent E3 Speaker		\$30.00				16:47
Atwater Kent Speaker		\$35.00				16:47
Bin of Tubes		\$130.00				17:10
Bird 4110 Watt Meter	\$20.00	\$30.00				16:59
Bird 4304 Watt Meter	\$40.00	\$60.00				16:52
Box 2 radios	\$2.00	\$2.00				16:47
Box 3 Portable Radios	\$10.00	\$10.00				16:46
Box 3 Transistor Radios	\$5.00	\$5.00				16:51
Box Mags and Catalogs		\$70.00				17:01
Box Misc. Tubes		\$70.00				17:06
Box of 624 Tubes	\$20.00	\$20.00				16:47
Box of Chassis		\$2.00				17:08
Box Tubes		\$160.00				17:10
Centinnal Table		\$5.00				17:02
Channel Master transistor qty 2		\$7.50				17:11
Clarion Table		\$20.00				17:02
Columbia Coin Op Radio		\$15.00				16:58
Crosley 1-120U		\$55.00				16:58
Crosley 48 Widget 1931	\$325.00	\$575.00				16:48
Crosley 716 1936	\$125.00	\$150.00				16:48
Crosley Reproduction	\$20.00	\$30.00				17:01
Crystal Set qty 2		\$35.00				16:58
Cummings 304 Drill Set	\$8.00	\$0.00	No Sale			0:00
Detrola Console Cir. 1938		\$5.00				17:00
Eico CRT Tester/Rejuv. 663 70's		\$2.00				16:50
Eico Tube Tester 667 70's		\$40.00				16:47
FADA 192-A 1938		\$40.00				17:03
Firestone 4-C-3		\$15.00				17:01
Firestone S-7399-1 1942 - cabinet only		\$5.00				17:11
Freed NR-55/56 1929 - console		\$5.00				17:04
Freshman - grandfather clock/radio		\$10.00				17:00
GE 414 1950 - table		\$5.00				16:58
GE 86 - console no knobs		\$0.00	No Sale			0:00
GE Chrome Grill AM Portable		\$25.00				16:59

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Lot Description	Minimum Bid	Hammer Price	Exception	Con	Com	Ham'r Time
GE H-51 - hi-boy no knobs		\$10.00				16:52
GE Isolation Transformer		\$15.00				16:48
GE L-630 1941	\$25.00	\$25.00				17:01
GE L641 40's	\$5.00	\$5.00				17:02
GE Multiband Transistor		\$2.00				17:11
GE Radio/Phono	\$2.00	\$5.00				17:00
GE T265A 1964		\$1.00				16:47
GE Table Cir. 1938		\$15.00				16:47
GE Transistor qty 2		\$10.00				16:47
General Scientific - resistance decade box		\$10.00				17:08
Gilfillan Neutrodyne GN-1 - table		\$5.00				16:47
Grunow 1171 1935 - console		\$10.00				17:11
Grunow 1191 1936 - 1 knob missing		\$20.00				17:04
Grunow Console Cir. 1938		\$45.00				17:02
Guild Country Belle 1956	\$25.00	\$25.00				16:49
Hallicrafters S-38B 1950's		\$20.00				16:47
Hallicrafters S-72		\$55.00				16:54
Hallicrafters S-94 - VHF 30-50Mhz		\$5.00				16:54
Hammerlind HQ140X w/Spkr 1955	\$95.00	\$130.00				16:48
Heath HM-102 RF SWR Meter	\$20.00	\$30.00				17:11
Heath HM-2101 RF Watt Meter	\$20.00	\$20.00				17:11
Heathkit SG-7 - RF sig gen		\$20.00				16:54
Hitachi V212 Scope	\$20.00	\$50.00				17:08
Horse Radio		\$120.00				17:05
HP 403 B Volt Meter	\$10.00	\$30.00				16:52
Jackson 636 Tube Tester		\$25.00				16:47
Kadette - console no knobs		\$5.00				16:47
Kemper K-67 - no tubes 1928	\$5.00	\$7.50				16:47
Knight kit sig. tracer		\$15.00				17:01
Kolster Speaker		\$25.00				17:03
Lafayette Cathedral		\$85.00				16:52
Lafayette Table		\$20.00				17:01
Learadio 40's	\$40.00	\$60.00				17:01
Learadio 6611PC 1946	\$1.00	\$1.00				16:50
LearJet - portable AM/FM/8-track		\$5.00				17:01
Magnavox 1-45-4 1945	\$2.00	\$2.00				17:06
Majestic 71 1929		\$0.00	Donation			0:00
Majestic 90 Chassis and PS 1932	\$10.00	\$10.00				16:52
Majestic Grandmother Clock 1931	\$250.00	\$0.00	No Sale			0:00
McJones 7124 Watt Meter	\$20.00	\$25.00				16:51
Meck AC/DC portable		\$10.00				17:01
Metrodyne Super 5 1926 - console no tubes		\$10.00				16:47
Midland 10-542 - table AM/FM/SW/VHF		\$2.00				16:54
Military Headset/Mic	\$10.00	\$10.00				16:58
Mitchell Lullaby 1261 1949		\$20.00				17:01
Montola 1938		\$25.00				17:00
Motorola 60XA2 1940		\$15.00				17:14
Motorola TV 9TV5 9" 1949		\$15.00				17:05
Pacific 6322 1937	\$85.00	\$160.00				17:11

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Parmak Table		\$5.00				16:52
Philco 112X 1932 - console no knobs		\$20.00				17:05
Philco 16B 1933	\$200.00	\$0.00	No Sale			0:00
Philco 1931 70 - chassis only		\$10.00				17:07
Philco 1937 37-16X - cabinet only w/speaker		\$120.00				17:00
Philco 20 1931		\$85.00				17:04
Philco 32 1934 - console		\$5.00				16:50
Philco 37-650 1937	\$90.00	\$0.00	No Sale			0:00
Philco 38-7 1938 - console		\$20.00				17:02
Philco 40-122 1940	\$10.00	\$20.00				16:47
Philco 40-145 1940		\$35.00				16:48
Philco 40-150 Slant 1940	\$20.00	\$20.00				17:02
Philco 40-185 1940 - console		\$2.00				16:47
Philco 49-101 1949		\$15.00				16:46
Philco 53-702 1953	\$10.00	\$25.00				16:48
Philco 665 1936 - console		\$7.50				16:50
Philco Cathedrals qty 2		\$20.00				16:50
Porto Bar Radio PA510 1949	\$45.00	\$70.00				17:14
Primeir table		\$1.00				16:47
Radiola 33 w/Spkr		\$40.00				16:55
RCA 25BT-2 1942 - table		\$2.00				17:02
RCA 2661 - two radios	\$5.00	\$0.00	No Sale			0:00
RCA 28X 40's	\$5.00	\$15.00				17:11
RCA 2-US-7 Radio/Phono 50's	\$5.00	\$5.00				16:48
RCA 350A 1935 - console		\$1.00				17:06
RCA 66X-13		\$15.00				17:02
RCA 7K 1936 - console 2 knobs missing		\$0.00	No Sale			0:00
RCA 98C VTVM	\$40.00	\$0.00	No Sale			0:00
RCA C13-2 1935		\$50.00				17:14
RCA Stratoworld		\$40.00				16:46
RCA T10-1 1938		\$40.00				17:11
RCA T8-14 1935	\$90.00	\$0.00	No Sale			0:00
RCA truetone ELD-699- console 2 knobs mi		\$15.00				17:11
RCA Tube Caddy w/tubes		\$30.00				17:04
Realistic12-712 - portable AM/FM		\$7.50				16:51
Rocker Crystal Set Replica		\$10.00				16:51
Sears 90 1924		\$40.00				16:52
Shop Craft Drill Set	\$10.00	\$10.00				16:54
Silvertone 833		\$20.00				17:02
Simpson 213 VTVM	\$40.00	\$0.00	No Sale			0:00
Simpson 467 DMM		\$35.00				17:11
Simpson RF Amp Meter	\$5.00	\$10.00				17:11
Sony 5-307UW TV		\$2.00				16:47
Sony S-303W TV & case		\$15.00				17:05
Spartan - table AM/SW		\$30.00				17:01
Spartan - table AM TRF w/ xtra chass., AC s		\$35.00				16:47
Sparton 589 highboy		\$10.00				16:52
Sparton table radio		\$45.00				16:52
Standard Electric Adjust-O-Volt Power		\$7.50				16:48

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Stewart Warner 12-4D - table		\$7.50				17:06
Stewart Warner R-180 1939	\$20.00	\$40.00				16:55
Stromberg Carlson 410 table		\$25.00				17:02
Superior Instr.TV-50 Sig. Gen.		\$15.00				16:46
Telechron 8H59 1950		\$20.00				17:01
Tropiana Orange Novelty Transistor		\$20.00				17:01
Variac Voltac		\$30.00				16:48
Watterson 526 1947	\$10.00	\$15.00				17:11
Westinghouse H-389-T7 - table AM/FM		\$1.00				17:06
Wire Recorder		\$20.00				17:06
Zenith - table AM battery		\$15.00				17:02
Zenith 5B540T 1941		\$15.00				17:06
Zenith 5D312 1938		\$90.00				16:50
Zenith 5S237Y 1938		\$75.00				16:48
Zenith 5S327 1939 - chassis only		\$2.00				16:52
Zenith 6G001YZ1 1948	\$35.00	\$55.00				17:05
Zenith 6S128 1936	\$175.00	\$220.00				17:04
Zenith 705 1933 - table		\$0.00	No Sale			0:00
Zenith 7S232 1938 w/ chassis 8S262		\$1,050.00				16:50
Zenith 7S633R 1941 - table AM/SW buttons		\$25.00				16:48
Zenith AM/FM -1		\$25.00				16:46
Zenith AM/FM -2		\$20.00				17:14
Zenith Chairside 1937	\$60.00	\$0.00	No Sale			0:00
Zenith Freq Meter BC221-T		\$45.00				16:55
Zenith G500 Trans. 1949	\$50.00	\$50.00				17:14
Zenith G510Y	\$20.00	\$45.00				16:51
Zenith Royal 3000-1		\$80.00				17:06
Zenith S17366 1955		\$10.00				16:47
Zenith T-723 1955 - table - #1		\$1.00				16:47
Zenith T-723 1955 - table - #2		\$30.00				16:58
Zenith Tombstone 1937	\$40.00	\$0.00	No Sale			0:00
Zenith Trans. A600L 1957	\$175.00	\$175.00				16:46
Zenith Y600 Trans. Oc. 1946	\$55.00	\$85.00				16:58

Total Sales (buy-backs not included) = \$6,506.00

CRC Commission = \$678.00

Donations = \$0.00

Auction/Picnic

By Rich Kuberski

Once again, we had another very fine day for our auction and picnic. Perfect weather, good friends, fine cuisine and an abundant supply of tempting radios to examine and bid on. There was such a good selection of stuff that everyone could find something that they could love. I know that I did. In spite of the fact that I admonished myself before the auction about bringing home anymore consoles. I bought a Philco 112X. The price was just too good to leave it there. (And, I have the radio repaired and refinished and it is on display in my home. It may be at the March show—look for it.) Many items were selling at bargain basement prices, but quality items brought premium prices. I am convinced that the day will come in the not too distant future when we will all be regretting not stocking up on the bargains that we have seen.



As always, we can thank Larry Weide and Barney Wooters for computer services, our magnificent auctioneer Tom Pouliot and Dave Boyles & crew for a fine meal. Certainly, others participated and we thank them too. While the rest of us are goofing off, these guys are hard at work making sure that everything goes off smoothly. If you missed this fine event, stay tuned for the CRC Show, it's coming soon.

Photos from September 11th Meeting at the Philip Miller Library in Castle Rock



New Member
Jim Tobin



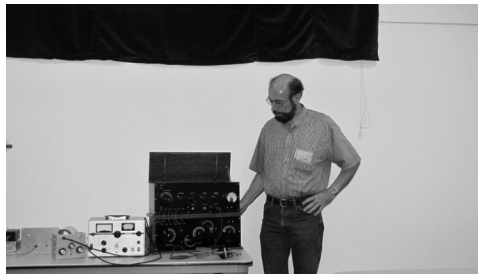
Larry Weide talks about the 2011 CRC
Show videos



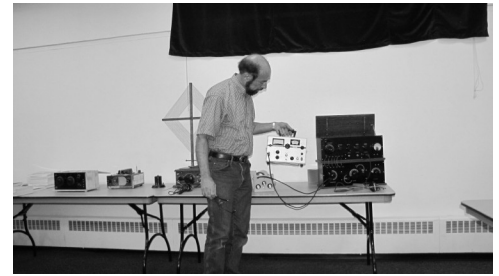
Dave Boyle talks about the Picnic/Auction



Tom Kelly talks describes the raffle items



Tom Pouliot describes his early 20's
homebuilt radio he found on eBay



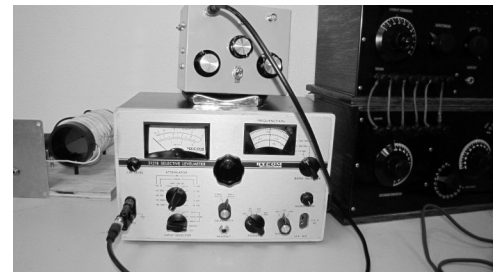
Tom Pouliot describes his selective input
meter



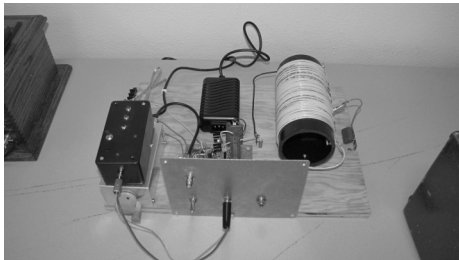
Mark Dittmar with his home built
transmitter



Tom's homebuilt radio



Tom's selective input meter



Mark's homebuilt transmitter



Don Andrus shows off his crystal set with
directional antenna



Barney Wooters with a very fine DeForest
Spherical Audion tube



Neil Gallensky with his crystal set find



Gerald Knievel with his direction finder



Dave Boyle describes Howard Radio Tuner



The Open Trunk

Member submitted advertisements



WANTED: Buy/Sell/Trade: "Heavy Metal" communications gear, telegraph related items, vintage calculators & micro-phones.

Robert Baumann, 303-988-2089
HQ180A@aol.com. (07/09)

REPAIR SERVICE:

Radio repairs for club members. Reasonable rates. Good references.

Call David Boyle
303-681-3258

11/09

For Sale: by Dave Boyle

All of the following older but "classic" radio and TV repair instruments have been expertly refurbished, repaired, and calibrated as appropriate.

All Instruments come with test leads, as required and most have manuals. Prices might be negotiable.

- 1) Heathkit TV Alignment Generator; IG-52. \$65.00
- 2) Heathkit's best "Laboratory" Signal Generator, IG-42 (I use one myself). \$105.00
- 3) Heathkit Capacitor Tester, C-3. Also checks leakage, power factor, and resistance. \$65.00
- 4) Heathkit Tube Tester, IT-21. Tests older types too! \$50.00
- 5) Eico Model 324 Signal Generator. \$60.00
- 6) Precision Apparatus Company (PACO) Model E-400 Sweep Signal Generator. \$55.00
- 7) Eico Model 425: 5" oscilloscope. Two to choose from, both rebuilt, one with new CRT. Perfect for old radio and audio repair work. \$45 and \$65 respectively. With manual.

Call
David Boyle, 303-681-3258 5/11

Wanted

Knight KG-2000 Manual (copy okay)
Robert Schineller 303-682-1949
Schineller@comcast.net

Many old Tubes for Sale

Try me before you order over the internet and save shipping.

01A, 24A, 27, 35/5, 47, 71A, 80 and many others. All tested on my Hickok TV-7/DU tester.

Mike Cook 303-471-9596

Additional information for November meeting at the Wings over the Rockies Air & Space Museum.

Museum is located at 7711 E. Academy Blvd., Denver, Co. Doors open at noon on Sunday.

Club members **MUST** wear your identification badge and check in with the Admissions person at the desk on the left as you enter. This identifies you as a Club member so you won't have to pay the \$9.00 admission fee. We will be using the Lowry Room in the northwest most corner of the building.

The Avionics/Wireless radio exhibit room is directly behind the large white NASA/ Martin Space Module at the flashing strobe beacon on section of radio tower on the west wall. The Space Station module will be open for your visit and inspection; come up the blue stairs under the rotating beacon. You can actually experience "zero gravity" while in the Space Module.

Radio station **K0WAR** may be operating that day also.

C. Bart Whitehouse.

Custom Embroidered CRC LOGO on Shirts and Hats Only \$5.00 + Tax per Garment

- Choose the LOGO size - up to 3" high
- Choose the colors, up to four
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- Provide your own garment, or...
- Choose from a wide selection in a catalog; www.imprintswholesale.com

For orders, catalog prices and further info contact the seamstress directly.

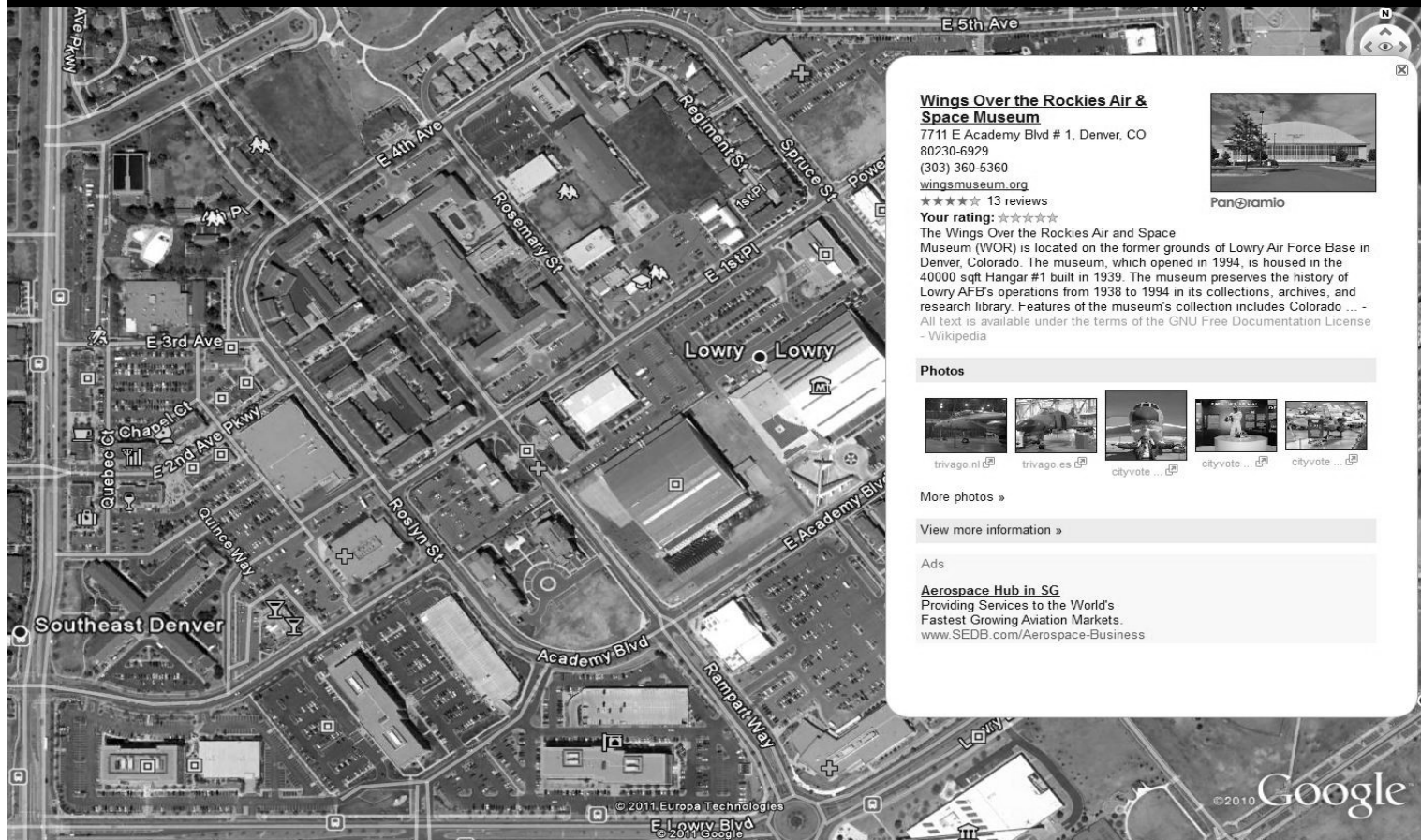
Judy Houser
(303) 771-3577
Highlands Ranch, Colorado

SUBMISSION OF ARTICLES AND ADVERTISEMENTS

Classified Ads for The Open Trunk and articles of any radio/electronic or historical related subject to be published in the Flash are encouraged and welcomed. The article(s) should be submitted in Microsoft Word, RTF, or as text cut/paste into your email to Steve Touzalin, either by email at stevetou@comcast.net , or by postal mail to 417 So. Queen Circle, Lakewood CO 80226 .

Formatting isn't necessary, but if you do, set the font to Times New Roman, size 10, left justified. If you have graphics (.jpg files) to be inserted, please name them and be specific about how you would like them placed. We will do our best based on space limitations.

The November 13th, 1:00 meeting will be at the Wings over the Rockies Air & Space Museum in Denver



See previous page for additional details on meeting.



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

FIRST CLASS MAIL