

Hickok Model 556 Traceometer Restoration

By David Boyle, Club Member

Background

Several years ago I purchased and took on the task to repair, refurbish and calibrate an *RCA Chanalyst*. This wonderful 1940 instrument is a product of its time. Several radio test equipment companies were offering the radio service industry an instrument that was somewhat all inclusive by including "under one roof" so to speak; most required test functions. The Rider Company, known by us for publishing the *Riders Radio Service Manuals*, manufactured and sold an all-inclusive circuit analyzer around 1938. RCA quickly bought the patent rights and then sold their version as the *RCA Chanalyst* starting in 1939. They sold it for \$107.50. Obviously, only a "well heeled" radio repair shop could afford one in the era of the Great Depression.

Other companies soon followed suit with their own similar versions. Several of those other companies were *Meissner* and *Hickok*. In 1940, the first *Meissner*, Model 10-1154, sold as a kit for about \$60 and the wired version for \$85.50. The more expensive *Hickok* Model 155 sold for \$120. *Meissner's* last version, Model 9-1040, sold for \$114 in 1948. The last model *Hickok* was the 156A. Many (but not all!) brands of analysts ceased production by the advent of WW-2.

Not long after the completion of my *RCA Chanalyst* project I began looking to acquire a version of this type and style instrument manufactured both by *Hickok* and *Meissner*. I was able to purchase a restored *Meissner*, Model 10-1154, from a fellow club member, that left me looking for a *Hickok*. The only significant difference between the *RCA* and the *Meissner* series analysts is that both those instruments utilized electron ray or "eye" tubes as the function output indicator. My now sought after *Hickok* model series uses meters in the analogous output functions. I believe meters would be more quantitatively accurate and add more "WOW" factor to the already impressive front panel. After several years of casual searching I found a seller that had finally concluded that he would never get around to restoring it and sold it to me for an attractive price. That was last winter (2013). This winter of 2014-15 was when I took on and completed this subject project.

Purpose and Functions

Note: The following section has been somewhat excerpted from the *Hickok* manual for accuracy, clarity, and because I'm a lazy writer! The *Hickok Traceometer* was designed to provide a means of not only rapidly locating troubles in radio receivers but also to facilitate the alignment and checking of each stage or overall performance of the receiver. Five meters make possible seven simultaneous measurements without affecting the normal operation of the receiver

under test: two frequency measurements, four voltage measurements, and one wattmeter measurement. With this instrument many possible troubles in radio receivers could readily be located and isolated.

The Traceometer consists of the aforementioned five independent indicating meters. The use or function of the instrument will depend on the meter or meters used. Each test lead is specially constructed to permit measurements without affecting the actual circuit under measurement or test.

DC Vacuum Tube Voltmeter--- zero center scale with ranges of 2.5 to 500 volts, positive or negative with respect to ground. It may be conveniently used for measuring avc, discriminator, grid, plate, and other DC voltages. *AF Vacuum Tube Voltages*---with ranges of 0.1 to 500 volts, may be used to measure ac or audio frequency (AF) voltage within 40-20,000 cycles.

RF-IF Low Frequency---with ranges from 5,000 micro-volts to 25 volts with the frequency range of 95-1600 kc.

The Rf-IF low freq. may be used to determine the frequency of the signal under test within the ranges already specified.

Osc-High Frequency---with ranges from 0.3 to 150 volts for the 0.6 to 1.5 Mc frequency range and 1.5 to 750 volts for the 1.5 to 14 Mc frequency range.

The Osc-High frequency meter may also be used to determine frequency of the signal under test if it is in the range already specified.

Watts---will measure the wattage, up to 150 watts (unity power factor), of any electrical device plugged into the provided panel socket.



COLORADO RADIO COLLECTORS ANTIQUE RADIO CLUB

Founded October 1988

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Message from the President

Thanks for all your support for my first meeting as the president. I am certainly not as good at this president stuff as Dave was. Dave Boyle is just a natural leader type.

We had a lot of good show-and-tell, so thanks to all that presented. I still have to try that duct tape tip that Tom provided us on the dustless removal of an old finish.

We have our show to look forward to, and Dana Cain will attend our March meeting to provide us information on the Vintage Voltage Expo that hosts our show.

Thanks to Dave Boyle for getting in touch with Dana and getting the ball rolling on the show.

Also thanks go out to Robert Baumann for taking

care of ordering the awards for the show. And just as a reminder, or maybe just a reminder to me, our theme this year is Tubes and tube type displays.



We still need someone to step up and take over for Larry Weide and his auction work. The auctions are critical for the financial health of our club, so please think about volunteering for this important work. Who ever volunteers will not be alone, for I am sure we all will help to make the auction a success.

Thanks to Steve Touzanlin, Rich Kuberski, and Richard Beckman for your work in getting the Flash out. The Flash provides the glue to this club.

Scott Thomas

CRC CONTACTS

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NOTE: at = @ in email addresses

Upcoming Events

3/1/1932	Lindbergh baby kidnapped
3/6/1836	Battle of the Alamo
3/7/1876	Bell patents telephone
3/29/1973	US withdraws from Vietnam
4/12/1861	Civil War begins
4/14/1865	Lincoln is shot
4/13/1970	Apollo 13 returns to earth
4/23/753BC	Rome founded
4/30/1945	Hitler commits suicide
5/5/1961	First American in Space
5/8/1945	V-E Day
5/14/1804	Lewis & Clarke depart

Meeting Locations

(Unless noted otherwise)

Littleton	Castle Rock	Colo. Spgs
	January	
March	July	May
September		November

CRC MEETINGS

Meetings are held on the 2nd Sunday of every other month starting in January (except May is 3rd Sunday) 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 \$20. New memberships will be prorated to the following June.

(Continued from page 1)

Monitor --- a built-in 4" speaker that can be plugged into the AF monitor jack or connected to the receiver under test for verification of audio performance.

Several notes before proceeding with the Traceometer repair and restoration narrative:

If you hook up a short antenna to the input of the RF-IF Low Freq. then configure the various function rotary switches to the "monitor" position, plug in the built-in monitor speaker the Traceometer becomes a TRF radio. Tuning is achieved on the RF-IF dial. This can be used as a validation that those functions are working properly and the dial settings match the received station frequency.

The manual furnished with the Traceometer is quite comprehensive on the theory and operational instructions but is entirely devoid of any repair or calibration information. There are not even any in-circuit schematic voltage references. The only exception is the DC VTVM voltage and balance. Thank you very much, *Hickok!*

Initial Repair Steps

As purchased, the overall visual and cosmetic condition was as expected for an old instrument born in the same year as I! Nothing appeared to be missing internally or externally (**Photo 2 & 3**). The only obvious and somewhat troubling visual issue was corrosion...several types and places. The all important front panel showed lots of grime and scattered rust spots in many areas. **Refer to Photo 2.** There was a severe case of rust and gross corrosion on the bottom of the cabinet interior. This had spread to the inside lower portion of the front panel where all the input jacks are located along with 3 rotary selector switches and attached components (**Photo 4**).resistors and capacitors that all were part of the input impedance and attenuation/voltage dividing circuits. Several other areas on the chassis too.

Some of this severe corrosion originated from the decomposition of three old "D" cell batteries left for many years in a, now destroyed, battery holder/tube. There was no indication of any misuse, overheating, or broken components. In short, this old Traceometer was a *perfect candidate for repair and a partial cosmetic restoration* (considering the rust and corrosion).

Some initial repair steps pertinent to both instruments and old radios:

The general rule of replacing all the electrolytic and original paper style capacitors applies. But, first check for major "show stoppers".

Remove and test all the tubes, replace any questionable ones, but do not toss any of those marginal tubes yet. Try them again after the instrument/radio is working OK. Then see if they might work in the circuit as intended, weak or not! Go ahead and place the good tubes back in their locations, but not the rectifier tube.

With the rectifier tube absent, using a Powerstat or equivalent variable ac line source, slowly add ac power while monitoring the ac voltage on the plate/s of the rectifier tube socket contacts where the power transformer high voltage lead connect. Increase input ac voltage to no more than about 30% (40 volts) on the input. The HV should be about 30% of the expected "unloaded" value, let's say about

100-150 vac. Go ahead and measure the various filament winding(s) voltages. Here again, look for about 30 % of expected value.

This test will generally exonerate or point to possible power transformer problems.

Other possible "show stoppers" are all the other transformers and inductors such as coils and IF transformers. You may/may not want to conduct some "power-off" resistance checks.

Then proceed to "rebuild" the power supply circuit using all new electrolytic and other types of capacitors, if called for. Also check and replace out of tolerance or suspicious looking power resistors in the power supply circuits. That done, go ahead and replace any obviously over-heated components, electrolytic, and nasty appearing paper "caps." throughout the entire chassis area. After that you may want to go ahead and slowly power up with all tubes installed while monitoring B+ voltage in various branch circuits. Remembering that there may be some bad capacitors or other problems yet to be discovered. Now, if no smoke appears go ahead and replace all the remaining original capacitors. Leave the mica caps alone unless later troubleshooting indicates otherwise.

The earlier Traceometer models 155 and my model 156 used a extremely complex RF-IF shielded sub-chassis. **Refer to Photo 5, shown with shield removed.** You may be able to discern where several paper capacitor (caps) were impossible to replace without removing the entire sub-assembly. Forget that! I went ahead and replaced all the remaining Traceometer capacitors, including any resistors significantly out of tolerance.

Finally ready for a full power test of all circuit voltages, again looking for any abnormal condition (low voltage, absent voltage, overheating of resistors, smoke!) . *All circuit voltages appeared as expected.*

At this time, carefully using long insulated meter probes, I measured the voltages directly across those few remaining paper caps buried under the other components and band switch wafers and mechanism on the RF-IF sub-chassis. The dc voltages across them was less than several volts, not to worry provided the eventual calibrated performance was in-spec. One can also look at the schematic and locate these remaining caps and somewhat analytically determine voltage stress and capacitor in-circuit function and decide how important capacitor change-out is to you and the circuit itself.

General Note: It is not the intention of this article to provide explicit radio or test instrument tutorials on repair practices and methodologies. I just wanted to describe sufficient introductory information that would enable one to start "getting into" the first basic steps of old radio and / or test instrument repair.

Significant Issues With This Traceometer

Corrosion and rust, as previously mentioned.

All rotary selector switch contacts were dark with years of oxidation.

The 4.5 volt battery supply would need to be entirely re-

placed.
Without calibration information I would have to carefully scrutinize the schematic to understand which of eight padder/trimmer capacitors in the RF-IF sub-chassis affected the preciseness of the frequency in relation to the dial...and the over range linearity on each band setting.

Final Repairs - All Good News!

General note: As explained earlier, typical of these all-in-one analysts, each major function is a mostly isolated “stand alone” circuit. Because of essentially no interaction of functions one can start verifying and, as appropriate, calibrate before going on to the next of the five major Traceometer analyzing functions. The following repair and refurbishment steps are not necessarily in order:

Replaced one rotary selector switch that was corroded beyond repair. Also all the various caps that were attached to this switch. I found a NOS exact duplicate in my parts supply. **Refer to Photo 6**

All remaining selector switch contacts were carefully cleaned with De-ox-id brand contact cleaner and lubricant using a commercial wooden stick, long reach, cotton tip with additional cleaner applied. You never want any kind of solvent to get onto/ into padder/trimmer caps or coils.

I use my own brand of combination electronic control lubricant and penetrating solvent and apply this to each control shaft as it enters the rotary switch or potentiometer (pot.). Good for another 70 years! Also *judiciously* sprayed De-ox-id cleaner into the various control pots, and the toggle power switch. Oiled the bearings in the two topside variable condensers.

Removed all the input jacks and other components from the bottom of the panel. Had to replace 3 jacks and refurbish the other components due to extreme corrosion.

Completed the clean up and “beautification” of the front panel using a combination of general purpose spray cleaners, automotive paint rubbing and polishing compounds, Scotchbrite pads (careful here!), clean bath towel rags, and lots of “elbow grease”. Even buffed/polished all the meter faces and knobs. Looks Great, given the starting point. Also cleaned the top of the chassis, of course.

Decided to replace the, now missing, under chassis D cell battery holder by installing commercial clip style holders on top of the chassis (**Photo 7**)...call it “restorer's liberty.” Placed three Duracell batteries with an expiration date of 2023 in them and wired them into the proper circuit. I'll change them out when I reach 83 years old! Remind me, please.

I had to fabricate six special test leads. Each test lead is unique and specific to each test function. Here again “restorer's liberty” was imposed in the color choices for each lead (**Photo 8**). I used the Traceometer schematic and text description as a guide:

*DC Volts; Maroon probe, orange test lead wire, phono plug.

*RF-IF Low Freq; Black probe, black shielded test lead wire, 0.85pF coupling, phono Plug.

*Osc. Hi Freq; Red probe, green test lead wire, 0.12pF coupling to a phono plug.

*AF/AC Volts; Red probe, red wire, phono plug.

*Ground lead; Black test lead wire, bifurcated terminal for screw type ground terminal.

*Speaker (monitor); Yellow test lead wire from speaker to a phono plug.

Finally, the cabinet handles were removed and the cabinet was sanded, cleaned, and repainted. Blue paint on the interior and silver hammer-tone on the outside. Handles were polished and re-installed.

I did a lot more than mentioned here, as we all do; but now time to power up the Traceometer again and complete the final checkout, operational performance, and calibration, as required.

Functional Testing, Adjustments, and Calibration

Several quick voltage checks indicated all was still well with the Traceometer.

Each function indicating meter came into balance adjustment per manual.

DC Volt Meter performed admirably accurate with the new 4.5 DC volt source.

The Wattmeter was checked using a 100 watt incandescent bulb.

Injection of various calibrated frequency signals were used to adjust both the RF-IF Low Freq. and the Osc. Hi Freq functions. After figuring out which of 8 padder capacitors affected each band dial readings and range linearity (**Photo 9**). In the aforementioned Photo 9 you will notice the 8 holes in the shield to access the padders and appropriately adjust with an alignment tool. If still interested, the reader can look back at Photo 5 to get a better view of the padder capacitors. That done; calibration was considered completed.

The AF circuit was connected to the Monitor speaker, all front panel dials and switches were properly configured, then my “bench” antenna was connected to the input of the RF-IF Low Freq Function. Amazingly - instant am radio across the dial was heard. A few more tweaks on the calibration “padders” resulted in even more dial accuracy.

Summary

I'll now place this fine appearing and impressive instrument next to the *RCA Chanalyst* and the *Meissner Analyst* in my old radio display room. It may never get turned on again. For your author, “it's all about the journey, not the destination.”

David Boyle Sr., January, 2015



Photo #2



Photo #3

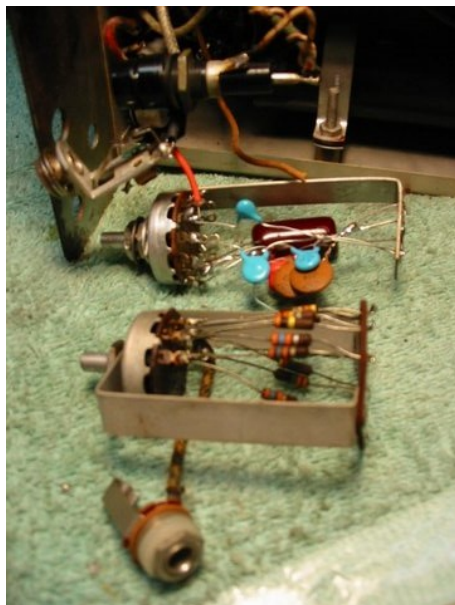


Photo #6



Photo #4

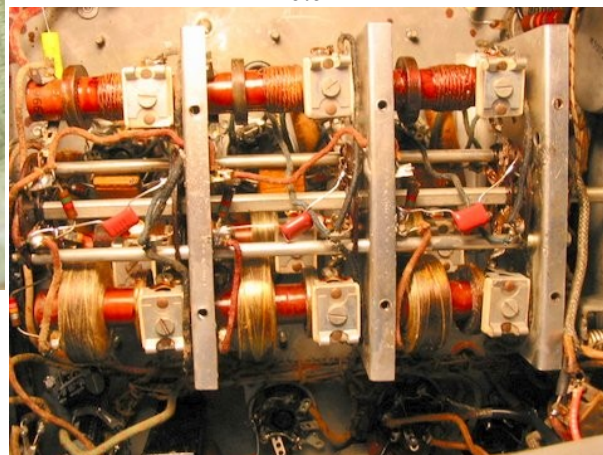


Photo #5



Photo #8



Photo #7

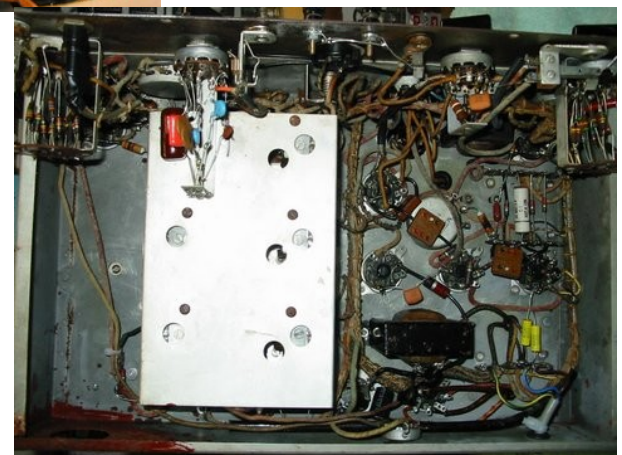


Photo #9

Classic Gear for Audio, Radio, TV & Music

Vintage Voltage expo

If it has
TUBES
it's here

band gear
synthesizers
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AUDIO

2015 Colorado Radio Collectors Annual Show and Competition

WHAT? It's that time again?

Yes friends and neighbors, it IS that time again. The **2015 CRC Annual Show** in conjunction with **Vintage Voltage** is upon us. By the time you receive this issue you will only have two weeks to complete the work on your entries.

This year, the Special Category is

Tube Display

This is the 8th year that we will be joining with the Vintage Voltage Show at the Ramada Plaza Inn at I-25 and 120th Avenue in Northglenn. Last year the turnout was tremendous with thousands of people going through the facility.

This is your chance to strut your stuff. Bring your cherished radios to show everyone and see what others have brought. Although there will be a featured category, don't forget that all of the standard categories will still be available. We have yet to run out of space for the display of radios, so dig deep and bring a bunch of them along.

These are the judging categories:

Accessories
Bakelite
Battery - 1926-1929
Catalin
Cathedral
Classic Audio
Communication Gear
Console - Full Length
Console - High/Low Boy
Crystal Set
Homebrew
Kit

Metal Box - 1920's
Metal Case
Military
Novelty - Transistor
Novelty - Tube
Plastic - Tube
Portable - Pre 1939
Portable - Post 1938
Pre 1926
Speakers

Specialty—Tube Display

Television
Test Equipment
Tombstone
Transistor
Tube/Parts Display
Wooden - Line Powered
No Judging - Display Only
Best of Show
Best Restoration
Best Educational Display
Peoples Choice

2015 Colorado Radio Collectors Annual Show and Competition

March 29, 2015 Ramada Plaza Convention Center I-25 at 120th Avenue in Northglenn.

The Special Category this year is:

Tube Display

Record the information about your show entries on this form and give it to Larry when you register. *Registration deadline 9:30.*

Name _____ Phone # _____

Brand _____ Model _____ Year _____ Category (listed above) _____

1			
2			
3			
4			
5			
6			
7			

Photos from the last meeting.



New Member Harold Deist



Bill Busch to be show coordinator for 2015



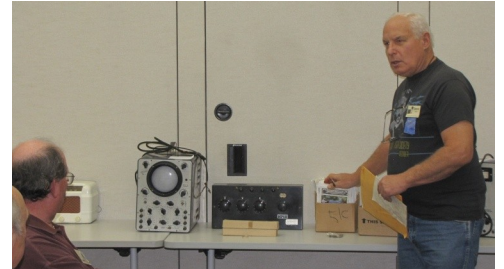
Dave asks for volunteer to take on Larry-Weide's auction job —No takers YET



Steve Touzalin talks about new DVD of all of the past club Newsletters



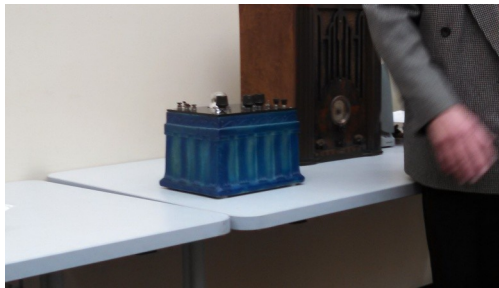
Steve gives a demo of how to access the news letters on the DVD



Lots of stuff for raffle table



Yuriy Yedidovich shows off his Ingram clock & Radio



Bill Harris's Van Briggie Radio



Steve Touzalin whit thi restored 1936 Coronado 693



Wayne Russert discusses amp for Tiny Town Project



Tom Zaczek with his rebuilt Coronado 648



Good turnout for this month's meeting

Hey guys, some of you have web sites with very cool stuff. Send Rich Kuberski the link to your site with a brief description and he will publish the information in the newsletter so club members can admire your hard work.

His email address is listed on page 2



The Open Trunk

Member submitted advertisements



REPAIR SERVICE:

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

Call David Boyle
303-681-3258

11/09

For Sale: by Dave Boyle

Most of the following instruments have been completely refurbished, repaired as needed, and calibrated
Most have manuals and test leads.
Prices are negotiable so please make an offer.

1) Philco Grandfather Clock Radio ..chassis and clock only.. Completely repaired/refurbished chassis with VG .original speaker. Works great, Clock has a new motor. Ready for installation. At give away price since customer did not ever pay for the repairs. **Make offer (cheap!)**.

2) HP 608 F VHF Signal Generator, with scope cart, also spare special tubes, and manual. **Free to a good home!**

3) Eico 5inch oscilloscope, Model 425 Completely gone-thru, new hi-voltage caps, all out of spec parts replaced, **NEW CRT!**, etc. \$68.00

4) Eico "Professional" VTVM.6 inch wide meter. \$45.00

5) RCA Institute RF Signal Generator All standard frequency ranges and 400 Hz audio frequency too. \$30.00

6) Heathkit TV Alignment Generator, Model IG-52. \$25.00

7) Lamda regulated power supply. 0-14Volts. Solis state, 5 VDC @ 2 amp, as an example. 2 available. \$7.00 ea.

8) Ballantine Labs. Model 321 VTVM.true RMS and p-p measurements. Rack mounting with manual. **Make offer!**

9) Philco Model 91 *complete working* radio chassis with two good speakers and a working tuning shadow meter! Original VG 12 inch speaker. **(cheap!) Call with offer.**

Call David Boyle,
303-681-3258

01/15

Wanted: 1920's Wooden Horn Speakers and a Crosley Musicone Speaker.

Also 1920's battery sets, especially Neutrodyne sets, Pre 1930 AC Radios and a Crosley Widget Console Radio

Michael O'Leary 602-354-7011
moleary9@cox.net.

WANTED: To buy: 1948 Motorola 5A9B portable radio, Maroon color. Good condition only.

Dewey Reinhard 719-596-5516
deweyfly30@gmail.com

WANTED: Broadcast or recording mics, especially from 20's to 1950's.

Crosley Pup Info

NBC chimes, all eras.

Tom Keeton 303-797-8073

Wanted: Two tuning condenser knobs for a Crosley model-X, will buy or trade for them. Charles Combs, 508 E. Daniel St., Albany, MO 64402.

charley@albanymo.net

I have collected radios of all types for 30 years and now it is time to let them go to new homes.

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I have tube radios including Tombstone, Cathedral, and Novelty etc.

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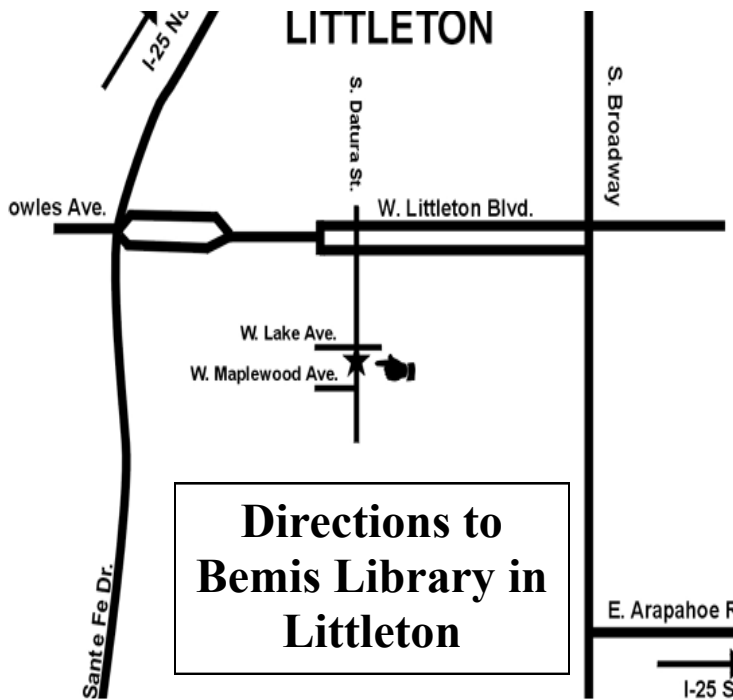
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SUBMISSION OF ARTICLES & ADVERTISEMENTS

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. Submit to Steve Touzalin 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 March 8th 1:00 meeting will be at the Bemis Library in Littleton



Directions to Miller Library in Castle Rock

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.

Are you ready for the 2015 CRC Show?
Not much time left—March 29th
See inside for more details



**Colorado Radio Collectors
Antique Radio Club
417 S. Queen Cir.
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FIRST CLASS MAIL