

The

# FLASH!

The "Colorado Radio Collectors Antique Radio Club" Newsletter

*Dedicated to the preservation and education of wireless, radio, television and associated equipment.*

Volume 31, Issue 2

**CRC Meeting March 8th, Littleton**

March/April 2020

## Meter Conversion

by Larry Snyder, CRC member

### Converting an ammeter to a voltmeter

#### Ohm's Law

The rate of the flow of the current is equal to the electromotive force divided by the resistance. It can be written as  $I = V/R$ , or  $R = V/I$ , or  $V = I \times R$  where:

**I is the current flow in Amperes**

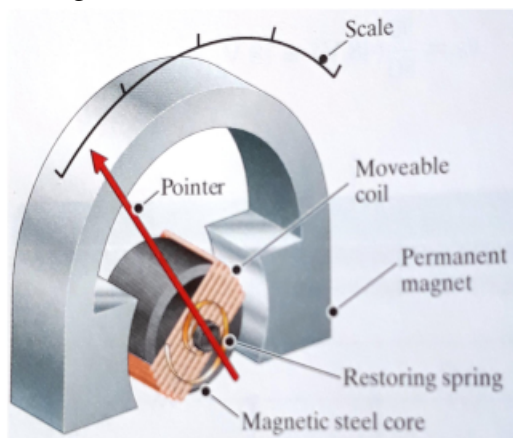
**V is the electromotive force in Volts**

**R is the resistance in Ohms =  $\Omega$**

Using an analogy of water passing through a hose spray nozzle; the pressure inside the hose is the voltage V, the flow of the water is the current I, and the nozzle is the resistance R to the flow.

#### Moving-Coil Meters<sup>1</sup>

This paper discusses meters we may find and use while working on our radios. A moving-coil arrangement, often called a D'Arsonval movement after its inventor, is commonly found in these meters.



The construction consists of a coil of fine wire wound on a drum mounted between the poles of a permanent magnet. When direct current flows in the coil, the magnetic field of the current reacts with the magnetic field of the permanent magnet. The resultant force turns the drum with its pointer, winding up the restoring spring. When the current is removed, the pointer returns to zero. The amount of deflection indicates the amount of current in the coil.

When the polarity is connected correctly, the pointer will read up-scale, to the right; the incorrect polarity forces the pointer off-scale, to the left.

The pointer deflection is directly proportional to the amount of current in the coil. If 100-uA is the current needed for full-scale deflection, 50-uA in the coil will produce half-scale deflection.

*continued on page 3*

# Club Announcements

## MESSAGE FROM THE PRESIDENT

As I write this message, our next CRC meeting is just around the corner on March 8th at the Littleton Bemis library. I promise to be at this one... Terrible for the new president to miss his first meeting however I had a chance to go see my KC Chiefs win a key play-off game at Arrowhead Stadium - Kansas City. Thanks again to Dave for chairing the January meeting.

Our March meeting will have a full agenda, which I'll save for the meeting, however there are a few key topics to note here. First and foremost is the 2020 Vintage Voltage Expo & Annual CRC Show on April 19th!

Once again held at the Denver Merchandise Mart; 451 East 58th Ave. Please note that the show entry form is contained in this Flash and has all the show details. **Also note that pre-registration is required.**

You can bring your completed entry form to the March meeting or email to Alexis at "[alekosalexand@gmail.com](mailto:alekosalexand@gmail.com)". A note of thanks to Paul Thompson who volunteered to be back up computer guru with Alexis for show and auction duties. By way of recognition, many thanks to Alexis and Larry for all the excellent computer work on past Auctions and Shows - Great Job! And a special thanks to Rich Kuberski for being this year's show coordinator.

If you have questions about the show, Rich is the guy with the answers. In addition, Dana Cain will be at this meeting too to talk about the Vintage Voltage Expo and other items such as table costs and our assigned radio set up area. Bring your questions to the March meeting.

This year's show theme is a great one since we all have one in our collections: My Favorite Radio. If you recall at last year's show we had several display tables that went unused, so for this year I would like to encourage more of you to bring out those beautiful "Favorite" radios to display at the show. No excuses, everyone should have a radio at the show. As you know, this event is well attended by the public, so come on out and bring something to show off. Your current CRC badge is your admission ticket.

As for new roles in the club, Paul Heller volunteered to be this year's VP and is also lead coordinator for the Horizon High School old radio exhibit on March 12th at Horizon HS in Thornton, CO. More on this at our March meeting. This event will be in the school's auditorium entrance lobby and is in conjunction with a student program. If you'd like to participate contact Paul or Larry Snyder who will also represent the CRC as co-host.

As always we are looking for new volunteers to take on club duties. We are still looking for a new volunteer to be the Grill Master for the fall auction. In this role you will coordinate purchasing the ingredients (hamburgers, hotdogs, buns, etc. - of course reimbursed by the CRC). Dave Boyle held this position for as long as I can remember and is a surpurbe grill master and Im sure will help transition his apron to the new volunteer.

In closing - be careful shoveling all the snow and I look forward to seeing you at the March 8th meeting in Littleton!

**Mike Cook**

### Meeting Locations (Unless noted otherwise)

Littleton	Castle Rock
January	March
March	May
May	July
September	November

### CRC MEETINGS

Meetings are held on the 2nd Sunday of every other month starting in January (except May is the 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, participation in our spring show and Fall auction. Current annual dues are \$20. New memberships will be prorated to the following June.

### Upcoming Events

Mar. 8th	CRC meeting
April 19th	V.V. Show
May 17th	CRC meeting

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### CRC Contacts

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#### Website

#### address:

<http://coloradoradiocollectors.com/CRC/>

These meters respond only to the current in the coil which rotates the pointer. That current may be all, or just a portion, of the total current flowing through the meter's terminals depending on if it is an ammeter or voltmeter or an ohmmeter. What makes these meters different is how the values associated with the pointer position are labeled on the meter scale!

### **$I_m$ is the full-scale deflection current**

This is the current in the moving coil needed to deflect the pointer all the way to the right to the last mark on the printed scale. Typical values of  $I_m$  are from about 10  $\mu\text{A}$  to 30 mA.

### **$R_m$ is the resistance of the moving coil**

This is the internal resistance of the wire in the moving coil. Typical values range from 1.2 ohms for a 30-mA movement to 2000 ohms for a 50- $\mu\text{A}$  movement. A movement with a smaller  $I_m$  has a higher  $R_m$  because many more turns of fine wire are needed.

### **Meter Shunts**

A meter shunt is a precision resistor connected across the meter movement for the purpose of bypassing a specific fraction of the circuit's current around the meter movement. The combination then provides a current meter with an extended range. The shunts are usually inside the meter case, but not always. Typically, the schematic symbol for the current meter does not show the shunt at all. The scale of a meter with the shunt resistor is calibrated to take into account the current through both the shunt and the meter movement. Therefore, the scale indicates the total circuit current in the circuit.

$I_{sh}$  is the current flowing through the shunt resistor in the ammeter

$R_{sh}$  is the resistance of the shunt resistor in the ammeter

$R_{sr}$  is the resistance of the series resistor in the voltmeter

$I_{Total}$  is the total current flowing through the terminals of the ammeter

So much for the definitions and the terminology used.

### **Let's convert an ammeter into a voltmeter.**

To do this we must 1) remove the shunt from the ammeter, and 2) add a series resistor  $R_{sr}$ , into the voltmeter circuit.

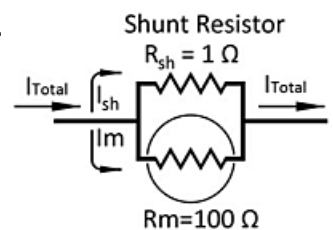
I had a 0-100 mA ammeter that I wanted to change into a 0-7.5V voltmeter to observe the A+ voltage on my Antique Electric Supply K101A battery eliminator. There was a 1-ohm  $R_{sh}$  shunt across the terminals, external to the ammeter casing. I removed the shunt resistor and measured the coil resistance  $R_m$ , finding it to be 100 ohms. The following methods describe how I found the value of the series resistor  $R_{sr}$ .

### **Method #1 Using mathematics and Ohm's law**

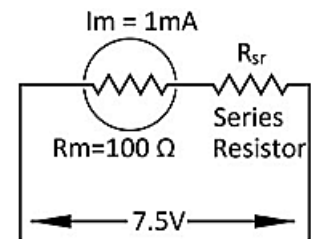
In the ammeter the two resistors  $R_m$  and  $R_{sh}$  are in parallel and together act as a current divider in which the individual currents are inversely proportional to the resistance values. This means the current  $I_m$  is 1/100 of the current through the shunt resistor  $R_{sh}$ .

But, full scale on the dial reads 100 mA which is a value 100 times larger than the actual current  $I_m$  through the coil.

Therefore, the actual current  $I_m$  through the coil must be =  $100 \text{ mA}/100$  or  $0.001\text{A} = 1\text{mA}$ .



The voltmeter schematic is shown here with the ammeter's shunt resistor removed and the series resistor added. For the voltmeter to go to full scale,  $I_m$  must be 1mA when  $R_{total} = R_m + R_{sr}$ . For this conversion, I want the voltmeter to go to full scale when 7.5 volts is applied. Using Ohm's law, the total resistance  $R_{total} = V/I_m = 7.5\text{Volts}/.001 \text{ amp} = 7500 \text{ ohms}$ . Therefore, series resistor  $R_{sr}$  must be  $(7500 \text{ ohms} - 100 \text{ ohms}) = 7400 \text{ ohms}$ .



## Method #2 Using a variable resistor

This method does not use formulas or require calculations. A voltage source that is the full-scale voltage is required. This could be any 7.5-volt DC source, or even five dry cell batteries in series. A variable series resistor  $R_{sr}$ , aka potentiometer, is also required.

I used a 10k, 0.1-watt variable resistor available from [mpja.com](http://mpja.com), item 32359 vr, which came in an assorted pack of 65 variable resistors ranging from 100 ohm to 1 mega-ohm for \$4.95.

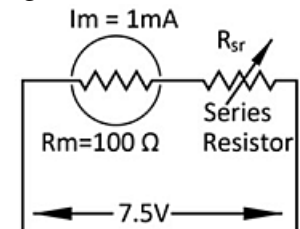


**Step 1.** Connect the meter & variable resistor  $R_{sr}$  with the 7.5-volt supply as shown.

**Step 2.** Start 'testing' with higher value resistors working your way lower to prevent "pegging" the meter. Adjust the resistors from high to low, until the pointer is at full scale.

**Step 3.** When the meter reads full scale the resistor is the correct value. It measured 7380 ohms on my DMM.

**Step 4. Done!**



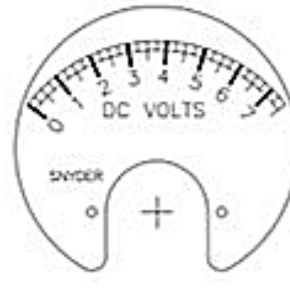
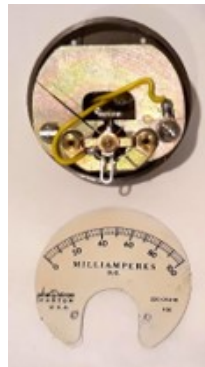
Voltmeter schematic

## Making the meter scale for the voltmeter

I opened the meter and very carefully removed the meter's scale plate being careful not to damage the delicate pointer.



Original scale



New scale



Finished meter

On the left the ammeter has been removed from the case and the D'Arsonval movement can be seen. Removing the 2 screws near the bottom allowed removal of the scale plate. Once the scale plate was off, and free of the pointer, I traced the outline of both the scale and the scale plate, marking and measuring key features such as the angle between the 0 and 100 mA lines, the radius to the tip of the pointer, the location of the center of the movement, the screw hole locations, the entire outside shape, etc. I then drew this shape, with the new 0-7.5v markings, using a Cad program on my computer. The meter face could also be scanned and edited using Photoshop or a similar program.

After I printed and cut the shape out, I attached it to the unused backside of the scale plate with rubber cement. This left both front and back, undamaged in case a future hobbyist would want to change the meter back or into something else.

Sources and References:

1. Grob's Basic Electronics, Mitchel E. Schultz, 11th edition, Chapter 8, McGraw-Hill

**The MAY CRC meeting is tentatively scheduled at the Highlands Ranch Library! more details later....**



# 2020 Colorado Radio Collectors Annual Show

The **2020 CRC Annual Show** in conjunction with Vintage Voltage is on April 19th this year. This is the thirteenth year that we will be joining the Vintage Voltage Show. The show this year is again at the The Denver Mart Expo Hall.

Every year the turnout is tremendous with thousands of people going through the facility. This is your chance to show off your stuff. Bring your treasured radios and equipment 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.

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. Take advantage of this opportunity to show off your stuff! We have yet to run out of space for the display of radios, so dig deep and bring a bunch with you!

## CRC Show Schedule

Doors open/setup	8:00 AM
Registration	8:30 - 9:30
Judging Begins	10:00 (sharp!)

## Judging Criteria

- **Exterior condition**
- **Interior condition (if visible)**
- **Presentation: display, 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, so everyone has a chance!*

Be sure to place your display(s) in the correct areas designated by the display category signs. Also be sure to go to the computer desk to register and get entry tags.

Also, we depend on members to do the judging - **please be available.**

This years "Specialty" category:

**'My Favorite Radio'**

Please use the enclosed form to enter your items for the show.

For registration, email your information to:

Alexis Alexandridis [alekosalexand@gmail.com](mailto:alekosalexand@gmail.com) - **Required !!!**



Classic Gear for Audio, Radio, TV and Music

**Sunday, April 19th, 2020**

**\*Denver Mart\***

**Open to the public: 11:00am - 4:00 pm**

**I-25 at 58th Ave - Exit East**

# 2020 Colorado Radio Collectors Annual Show Entry Form

## Contest Judging Categories:

Accessories	Kit	Pre 1926
Bakelite	Metal Box (1920's)	Speakers
Battery (1926-1929)	Metal Case	Telephony & Telegraph
Battery nonportable (1930+)	Military	Television
Catalin	Most Educational Display	Test Equipment
Cathedral	No Judging (Display only)	Tombstone
Classic Audio	Novelty (Transistor)	Transistor
Communications Gear	Novelty (Tube)	Tubes/Parts Display
Console (Fulllength)	Phonograph	Wooden (linepowered)
Console (High/Low Boy)	Plastic (Tube)	Best of Show
Crystal Set	Portable (Post 1938)	Best Restoration
Homebrew	Portable (Pre 1939)	People's Choice
	"Specialty Category"	

## 2020 Colorado Radio Collectors and Annual Show Competition

April 19, 2020 Denver Mart Expo I-25 at 58th Avenue

**The Specialty Category this year is: "My Favorite Radio"**

Record your entries information on this form and email your info to

[alekosalexand@gmail.com](mailto:alekosalexand@gmail.com)

NAME

PHONE#

BRAND

MODEL/YEAR

CATEGORY

RESTORE

PROJECT? Y/N

1

2

3

4

5

6

7

8

PUT ANY ADDITIONAL ITEMS ON A SEPERATE SHEET



# January Club Meeting Photos

submitted by Bill Grimm



David Boyle receives a Superior Service Award from the club



Paul Heller - our new VP



Another good turnout



Rich Kuberski's Silver-Marshall, Inc. Model 739, 3 Tube Converter



Wayne Russert's 1919 Streetcar, Motor Resistor Plate



Larry Snyder's "AES" Battery Eliminator Kit with Enhancements



Merril Campbell's Delco Bakelite Radio



Front view of Rich's Silver Marshall



A view of Larry's custom meters - see his article in this issue!



Closeup of Merrill's Delco



Raffle items....

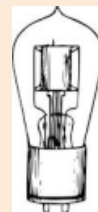


....more Raffle items.



## Announcement for March Meeting

As some of you already know; Rich, Paul, and myself will be bringing approx. 600 +/- tubes to the March CRC meeting. Tubes were given to the club by a former member now residing in Greeley. Disposition to those members desirous of acquiring a variety and significant quantity of tubes from this large "batch" will be by a set fee of \$5.00 payable to the club. Members that want to participate are asked to bring several small boxes or plastic shopping bags, etc. to the March meeting, and hence, carry the tubes home. Participating members will have an opportunity to somewhat select which tubes they want...but also: "no tube to be left behind"...will rule this fantastic event!



See you there, David Boyle

## 'Open Trunk'



### Classified Ads

**REPAIR SERVICE:** Radio repairs for club members. Reasonable rates. Good references.

**Call David Boyle 303-681-3258**

#### FOR SALE:

1) Knight (Allied Radio) Model KG-680 In-Circuit Capacitor Tester

Note: This is a unique in-circuit capacitor tester for opens and short indications. Not the usual test bench capacitor tester for capacity and other electrical characteristics. Eye tube is very bright. Completely electronically refurbished with required new parts and one new tube, other tubes good. Tested and ready to use with instructions. New test leads. Complete manual available "free" on the Internet. \$60.00

2) EMCO Model 20DT Dual Trace Oscilloscope.

Works fine, just retired from my own radio/TV repair and test bench! With both probes. Ready to use. \$80.00

**Call David Boyle, 303-681-3258**

[djboylesr@msn.com](mailto:djboylesr@msn.com)

**FOR SALE:** Radio Tubes. Tested as "Very good" to "good." Tested on some of the top

end and calibrated Hickok testers. Have around 3000 plus tubes tested and boxed ready to go. Inventory includes many new tubes. Prices on used tubes typically would be 50% or less of AES posted prices. Cost of all new or used tubes can be negotiated.

**ALSO FOR SALE:** Large selection of NOS Dial Belts from recent sources. GC and JFD Brands. All I need is brand and model number...I have catalog data to look up the correct belt. If I have it...\$4.00 each.

**David Boyle 303-681-3258** or better yet: [djboylesr@msn.com](mailto:djboylesr@msn.com)

**FOR SALE:** Radiola 1925 Super-heterodyne Second Harmonic "Semi Portable (AR-812). Cabinet has some scratches on original varnish. Contains 6 RCA 199 triodes that test good. Sub chassis components are encased in wax and are difficult to access. The receiver does not play. Battery power. \$250

**Jerry Knievel 303-766-0845**

[jerryknievel@gmail.com](mailto:jerryknievel@gmail.com)

**FOR SALE:** Full size/console TV 1950's B&W RCA 6-T-65 "Eye Witness" Farnsworth small console radio/record

player k-262 - please contact **Larry Steele (719) 596-8883** [larrysteel@comcast.net](mailto:larrysteel@comcast.net) in Colorado Springs

#### FOR SALE:

Tube Radios - Tombstone, Cathedral and Novelty Transistor Radios.

I have collected radios of all types for 35 plus years and now it is time to let them go to new home/s. I have over 250 tube type and over 5,000 transistor (both novelty and shirt pocket type)

Please call **303-2381384**

[radios4us@aol.com](mailto:radios4us@aol.com)

Thank You,  
**Ron Smith**

**WANTED:** I am searching for a vintage Sony PS-F9 Vertical Record Player sometimes referred to as a Sony Flamingo Record Player. Please contact **Jonathan Brown** at [jbrown220@aol.com](mailto:jbrown220@aol.com) or call **303-514-9900** Thank you.



## 'Open Trunk' Ads - continued

### FOR SALE:

1) 1942 Philco A-801 chairside. Fair condition, needs restoration. Unique factory radio using spare car radio-interesting history behind it. \$60

2) 1933 Philco 19LZ chairside. Rare, only 2500 made. Good condition, chassis rebuilt, plays well. Cabinet good. \$150.

**Dan Buseti, 720-318-6199, Aurora, CO**  
[menwagoh@q.com](mailto:menwagoh@q.com)

### WANTED: Pla Pal Poker Radio. Call

**Gary Stone 720-771-2080,**  
[redson68@hotmail.com](mailto:redson68@hotmail.com)

Thanks!

**WANTED** – Austrian Minerva receiver model 388 made in 1937-1938. The model number should be on the center column on the front bakelite housing below the magic eye but if missing will be stamped on the back. Please contact Bob Krassa

[bob@krassa.com](mailto:bob@krassa.com) or call 303-475-2824  
Thanks!

**FOR SALE:** HD video Projector avail for sale . ( Just got a new 3D unit)

An Optoma H79 w 1.35x pwr zoom glass lens works great! Great color & contrast using DLP dark chip 3. Vertical lens shift /keystone adjust. Was Run in lamp economy mode most of the time. Low hours - only on its 2nd lamp. Was used only for "movie nights". Multiple gold plated inputs. Pro type for home theater. Double case for real quiet fan, set for high altitude. Just got a new Optoma w/3D. Call for a demo. \$450.

Rob Beyer 719-229-6247  
Monument. [robmooda@gmail.com](mailto:robmooda@gmail.com)

Photos shown to the right:

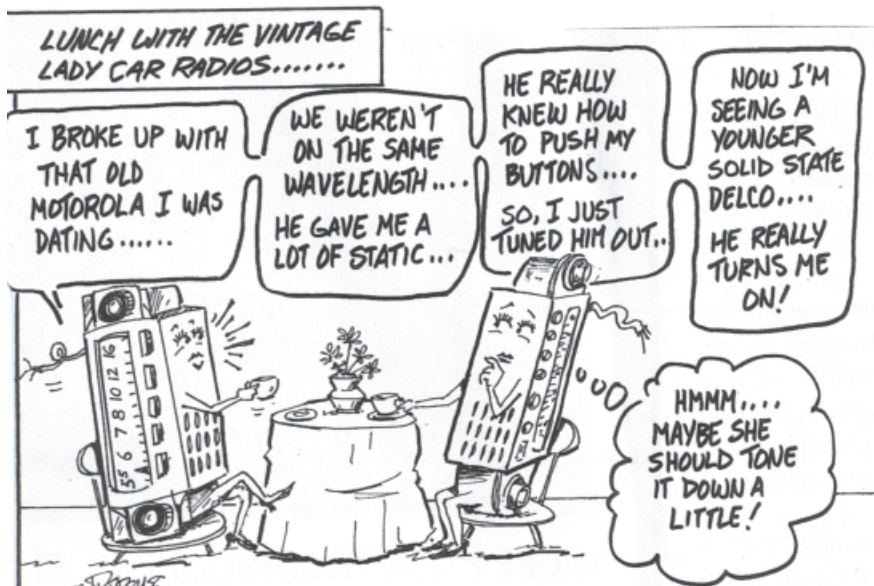
Here's a review:

[https://www.projectorcentral.com/optoma\\_h79.htm](https://www.projectorcentral.com/optoma_h79.htm)

Was a very high end pricy unit new . No longer produced, but still looks great !!



**NEEDED: One to two line 'Tips' for the FLASH! Send us your tip or secret method today!**



## WANTED: Articles for the FLASH!

It is your club, your newsletter. Send in your repair or restoration details, or your latest find. Share your latest project. We need half to full page articles as well as multiple page articles. See below on how to submit an article. (We will even accept hand-written or typed articles)

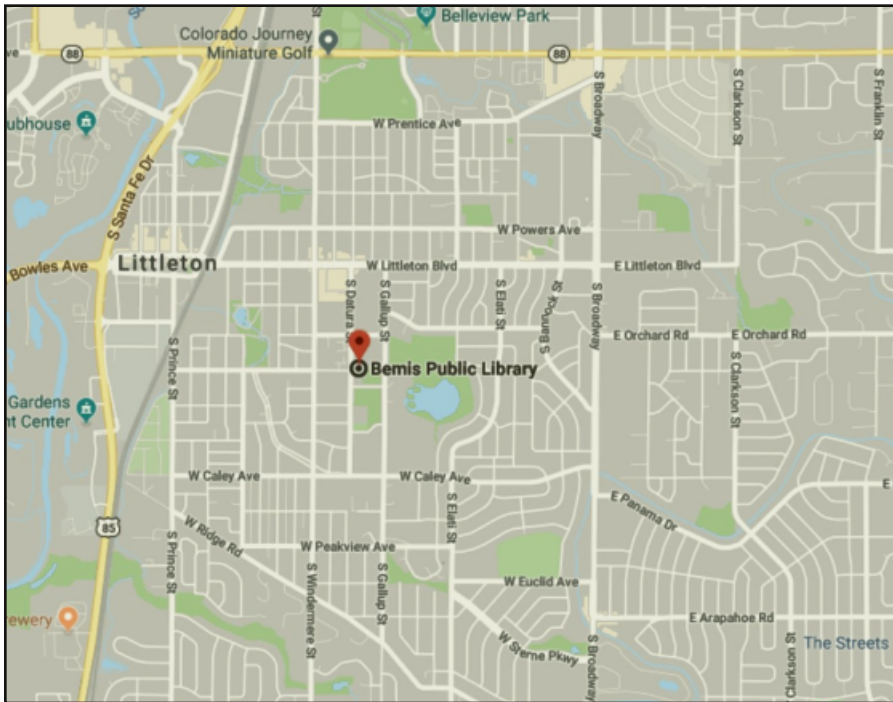
### SUBMISSION OF ARTICLES & AND ADVERTISEMENTS

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, OpenOffice, RTF, or as plain text**. Submit to Steve Touzalin by email at: [stvetou@comcast.net](mailto:stvetou@comcast.net) or Larry Snyder at [lsnyder200@cs.com](mailto:lsnyder200@cs.com) 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.



# CRC Meeting March 8th at 1:00 PM



## Directions to Bemis Library in Littleton

From Santa Fe and Bowles:  
Head east through  
downtown Littleton,  
continue to Littleton Blvd.  
Go south (right turn if  
coming from downtown  
Littleton) on Datura St,  
almost 1/2 mile from  
Littleton Blvd

The Bemis Public Library is  
on the east side of the street  
at 6014 S. Datura St.



**Colorado Radio Collectors**

**Antique Radio Club**

417 So. Queen Circle

Lakewood, CO 80226

**1st Class Mail**