MEETING NOTICE

The next meeting of the NJARC will take place on Friday, March 9th, at 7:30 PM at the David Sarnoff Library in Princeton, NJ. Contact President Phil Vourtsis (732-446-2427) or visit us at http://www.njarc.org for directions. We’ll be awarding prizes to the winners of our 2007 BCB DX contest and judging our Homebrew Contest entries. We’ll also continue to collect 2007 dues, so please have cash or a check at the ready ($20 for single membership/$25 for joint).

MEETING/ACTIVITY NOTES

Reported by Marv Beeferman

THE ON-LINE BROADCASTER

The New Jersey Broadcaster is now online. To date, 78 of your fellow NJARC members have subscribed, saving the club some $1,400 per year. Interested? Send your e-mail address to: mbeeferman@cs.com

Be sure to include your full name!

The helm was in the able hands of Vice President Richard Lee at the February meeting. As a warm-up to the second phase of the Ed Lawlor auction, our resident video visionary, Dave Sica, offered a viewing of “On the Air” produced by the Chevrolet Motor Division of General Motors. An over-dramatized black-and-white documentary from the early 40s, the film traced the transmission of a program of musical numbers from a typical radio station to the listener’s living room.

Under the direction of Richard Lee, Al Klase and Sal Brisindi, the Ed Lawlor auction went very smoothly and some very nice pieces were hammered down at very reasonable prices. A few of the results are offered in this month’s Broadcaster.

Ray Chase reports that, in spite of the cold weather, quite a bit of progress is being made at InfoAge:

• The “hands-on” room is essentially completed and carpeted and is ready to give kids a real “feel” for science.
• A heated storage room has been set up for excess NBHF and museum artifacts. Electric heating elements are being considered for the museum’s HVAC unit; the 3 or 4 electric heaters presently in use are enough to protect our displays but were not enough to heat the museum for Sunday traffic. Hopefully, we’re done with the super cold temperatures of last month.
• A DVD player was installed in the utility room and several more blinds and their valances were repaired.
• The large RCA, air-cooled transmitting tube donated to the museum was set up for display.

What in the world! No, not a long lost experimental radio but some of the “apparatus” in the Mad Science Lab at the Infoage haunted hotel this Halloween. Included was a Jacobs ladder, Tesla coil and a bunch of stuff chosen to look weird and scary with lots of meters, tubes, dials, etc.

• The Jacobs Ladder display has been moved to the museum and Ray is taking steps to “turbo-charge” the Tesla coil.
• A plan is being developed to feature an InfoAge exhibit every week in an article mailed to all newspapers in New Jersey for their free “Local Events” sections. Ray has provided the first two write-ups: “See Your Sound” and “Remember Vacuum Tubes” which describe two current displays at the museum.
• We are reviewing three volumes of books published by the Exploratorium Science Museum in San Francisco. They provide the details for setting up science displays at a fraction of the cost of purchased displays. Ray will be providing a list of items to keep your eyes out for at flea markets, auctions and equipment sales that could be useful.

Ray also says that we have a large Dumont model RA-110 console TV at the museum that was donated by its original owners who gave it the smoke test about 10 years ago. It’s in very nice, original condition and would be great to view vintage TV shows on. Are there any volunteers to take on the task of making the set operational?

Steve Goulart reports that InfoAge was featured on the Weekends Perspectives show coming out of Philadelphia (channel 6). The initial segment was planned to focus on Dr Johnson’s film No
Upcoming InfoAge Events:

April 21: OMARC ham flea market at the Diana site
May 5: New Jersey Shipwreck Symposium
May (?): NJARC Crystal Set Symposium
June 2: “Wall of Honor” dinner and fundraiser
June 9/10: Northeast Vintage Computer Fest
June 16: Antique & Classic Car Show
July 28: NJARC Swapmeet
Sept. 15: WW II USO style dance and canteen
Oct. 11-27: Haunted Hotel and Hayride

Our gracious host at the David Sarnoff Library, Executive Director Alex Magoun, reports that on David Sarnoff’s 116th birthday (February 27th), he received a check for $5,000 from Vizma Sarnoff. This is the largest individual donation ever received by the Library. Alex says that this and additional gifts will allow him to begin hiring some part-time staff - an education coordinator to begin planning and scheduling field trips to the Library’s exhibits, and a marketing and development director to build on the various initiatives that he has started in promoting the Library’s activities.

Alex would also like to encourage us to support David Sarnoff’s charter induction into the New Jersey Hall of Fame by voting for him in the Enterprise category at www.njhalloffame.com/bestandbrightest.htm. Right now, Buzz Aldrin is leading in this category so please vote and encourage your friends and associates to join in.

In the “this isn’t your father’s radio” department, I recently came across a news release for Silicon Lab’s Si4730/31, the industry’s first fully integrated, 100% CMOS AM/FM radio receiver IC. Powered by 2.7 to 5.5 VDC, the chip only requires two external components and less than 15 square millimeters of board area excluding the antenna inputs. Among its features, the IC offers interference rejection in both AM and FM bands and optimum sound quality under varying reception conditions via digital signal processing. It also has advanced seek algorithms, soft mute, auto-calibrated digital tuning, FM stereo processing, analog or digital audio outputs and a programmable reference clock.

Finally, although not exactly radio-related (I get to do these things as editor), I noticed in NextTECHS that a company was searching for a funding and development partner for a product which will passively inhibit wireless signals within restaurants, theaters, libraries, places of worship, etc. Just the perfect cup of tea for someone whose annoyance factor has reached the boiling point as a result of wireless phone rings, inane, second-hand conversations and the disturbing light in a darkened theatre from a portable phone’s screen.

The proposed technology is interesting - it doesn’t use signal grounding. An incoming radio signal impinges on a coating of dielectric material which acts like a mirror. This “mirror” reflects a certain portion of the signal and decreases its strength. The remaining radio signal then impinges upon a special pattern which creates interference. The pattern, called the Interference Generating Pattern (IGP) is used essentially to create a box through which radio signals can pass only at very much reduced strength. This reduction of strength makes communications ineffective. Amen!
In the January 2007 issue of the Broadcaster, we ran an article on the club’s acquisition of an RCA BTA-250L AM transmitter and supporting console from station WMID AM (1340) in Atlantic City. The club hopes to some day use these components as a basis for a simulated AM broadcast station at InfoAge. But what was probably more inspiring than the transmitter itself was the dedication and the enthusiasm a few NJARC members to move a very large piece of heavy and cumbersome equipment in order to preserve a little piece of radio history.

Since I wasn’t present for the move, I asked those involved for some photos and a short summary. But it was a nice surprise to receive some personal impressions in addition to the material I requested. I’d like to share these thoughts with you.

"At one point, most of the 1300-pound transmitter came down on my right middle finger. I swore to God that I would never give anybody the finger again. Ouch!

Sal (Brisindi) deserves most of the credit. He found someone willing to donate the transmitter, coordinate the move and provide transportation (a landscape trailer that worked out very well). Ray (Chase) and Ray (Facinelli) handled pulling the big iron (plate, filament, modulation transformers and maybe a filter choke) to try to lighten the beast. Me? I tried to stay out of the way, unless called upon to lend a hand. It was a lot of fun and good camaraderie.

You can really see how the radio business has changed. There were four generations of obsolete formats at the station: 78s, 45s, LPs, 4-track cartridges and CDs. Now everything is MP3. I guess you could store the station’s entire collection on a good-sized Ipod!

The station’s new AM transmitter was a small, rack-mounted unit that looked like a large, fancy microwave oven. Times really have changed - the station was like a trip back through radio broadcasting, 1940s thru 1980s.”

John Ruccolo

"I volunteered for this because I knew it would be an experience that I will re-member for the rest of my days on this planet. I met with Ray Chase at his home and drove to the station in A.C. The transmitter was in the back room of a ranch type house with a hall in the middle and rooms on both sides where the radio people worked. Ray, Steve and I removed 4 large transformers from the inside of the unit to lighten it up. We then moved it off the wooden platform it was on, laid it on its side onto a dolly and moved it through the hall onto the trailer. It was a little bit of a struggle, but with big John and Sal, it was a piece of cake.

No one stays at the station except for a visit by the engineer once a week. What is really funny is the transmitter they have - solid state, about 18 inches by 2 feet square. They also have a standby unit the same size as the one we removed.

I tell my story of the rescue of a piece of history to all the hams that I talk with on 80 meters and everyone shows great interest. Too bad this world is moving so fast. Who needs it?

Ray Facinelli

John Ruccolo, a strict environmentalist, tells us to “watch out for those PCBs.”

Station WMID

Left-Steve Goulart pulls some heavy iron. Right-Pattern for the side dimensions of the transmitter to determine how many file cabinets needed moving for maneuvering the transmitter out on its side. Ray Chase got the original dimensions from a tech manual; his scheme worked perfectly!
HOW BEAUTIFUL ARE THOSE BLACK BEAUTIES?
By Marv Beeferman

It started with a Reflector posting by Dave Sica for one of those ridiculous eBay auctions for overpriced Black Beauty "bumble bee" capacitors. Dave suggested that "if you buy these caps, I suppose you also have to use Western Electric solder to install them." Nick Senker followed up with a suggestion that someone comment on these capacitors. "I've seen them and have some but don't know anything about them."

John Ruccolo posted the following reply:

"These caps were known in the trade as Sprague "Black Beauties." Some have the color-coded bands (the "bumble bees"); others have normal markings. They were decent-quality (but not top-quality) in their day. Some may have been made by manufacturers other than Sprague (not sure). Dave Sica is correct - they are original equipment in vintage guitars and amps and are very sought after today, depending on the value. Frankly, the prices have reached really ridiculous levels. There's even a market for used ones!

Today, they are notoriously leaky and frankly, really are not that good. But don't tell that to the audiophiles! I suppose NOS (New Old Stock) ones will work well...for a while. My advice: sell 'em. I strongly recommend modern Vishay/Sprague "Orange Drop" caps in any serious piece of vintage audio gear. I've always gotten excellent results with them."

After doing a little research on the topic, John's advice, for the most part, would be well-taken. One source (Rod Elliot, The Audio Pages - Capacitor Characteristics) noted the following with regard to Black Beauties: "...these are notoriously unreliable (especially NOS), sometimes unbelievably over-priced and should be avoided for anything more technologically advanced than land-fill."

If you examine audio electronics, test instruments or consumer electronics from the late 1950s, chances are you'll encounter one or more "Black Beauty" capacitors. Introduce by Sprague Electric sometime in the 1950s, these capacitors originally featured a molded Bakelite case surrounding a foil/paper-wound capacitor. A filling of oil added through a brass tube, later soldered shut around an inserted wire lead (identified by a solder blob at the end of the capacitor), provided extra insulation. Over the years, these capacitors earned a reputation for poor reliability. Traces of acid in the dielectric paper provoked electrical leakage, and the brass filling tube leaked oil. When overloaded, this model's Black Beauty case would crack open like a peanut shell.

Two early Black Beauties. Note the solder blob and fill tube at the left lead of each capacitor-prime paths for dielectric leakage.

Later-model Black Beauties didn't include oil-filler tubes, which reduced oil leakage and thus improved reliability. However, they were still constructed of Mylar and paper with a mineral fill. Descriptive terms such as "Telecap" and "Difilm" (also applied to the Sprague "Orange Drop") were also added to the Black Beauty name.

A later model Black Beauty, distinguished by red markings and lack of a filler tube.

Still, those of us who restore vintage radios, audio equipment and test instruments routinely replace, or "shotgun," every Black Beauty capacitor we find. So, why do new and used Black Beauty capacitors sell at auction on Ebay for as much as $4 each (or more)?

Let's start with one example that puts the issue in a historical perspective. The tone capacitors for all Gibson Les Paul "goldtop" model guitars prior to 1955 used a brown, waxy looking tubular Sprague capacitor called the "gray tiger." By 1956, this changed to Sprague's "bumble bee," which was black and covered with colored value stripes. These capacitors were used from 1956 until 1960 for all pre-SG Les Paul models (Juniors, Specials, Standards and Customs). In 1968, the same capacitor was again used on the single cutaway Les Paul standard reissues, but, by this time, Sprague had changed the marketing name of the capacitor to Black Beauty.

Today, some electric-guitar players and audiophiles swear that Black Beauties lend desirable sonic coloration to amplified sound. A great deal is made of the "sound" of capacitors. When pressed, they offer subjective comparisons with modern capacitors. One can agree that, when used for input or interstage coupling, certain capacitors can introduce audible distortion, but not when serving as AC-line bypasses! It is true that designers of low-performance consumer goods can easily get away with choosing barrel-of-nails capacitors and audiophile-grade equipment does demand better, but one can easily draw the line at idiosyncratic comparisons of Black Beauties to any other type of capacitor.

There are some sites on the Net showing that different caps have different properties, and this is often used as "proof" by many people that the differences are audible. Some sites make wild claims of irreparable damage to the signal by using the wrong type of cap. In some cases, you can read things like "listening tests have indicated..." But no mention is made of where the data is, who conducted the test, how it was conducted...or was the test really conducted at all. It appears that most claims of this nature indicate a hidden agenda.

Dielectric losses (dissipation factor, dielectric absorption) are featured heavily in most claims. Dissipation factor (DF) is the ratio of the effective series resistance
I discovered a bunch of early 60s NOS "Difilm" Black Beauties in their original plastic display boxes and wondered what condition they were in. All capacitors were rated +/-10% at 600 volts, except for the 1 and .047 mfd values (1000 volts) and the .15 mfd value (400 volts). Using a Sencore LC102 AUTO-Z dynamic capacitor tester that I use at work, I randomly selected one capacitor from each value and tested it at its working voltage. The results are found in Table 1.

<table>
<thead>
<tr>
<th>Value (mfd)</th>
<th>Tested Value (mfd)</th>
<th>D/A(%)</th>
<th>Leakage (uamps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.001</td>
<td>.0022</td>
<td>5</td>
<td>.30</td>
</tr>
<tr>
<td>.01</td>
<td>.0101</td>
<td>8</td>
<td>.26</td>
</tr>
<tr>
<td>.002</td>
<td>.0033</td>
<td>20</td>
<td>.01</td>
</tr>
<tr>
<td>.03</td>
<td>.0392</td>
<td>32</td>
<td>.08</td>
</tr>
<tr>
<td>.003</td>
<td>.0042</td>
<td>37</td>
<td>.00</td>
</tr>
<tr>
<td>.01</td>
<td>.0138</td>
<td>25</td>
<td>.05</td>
</tr>
<tr>
<td>.15</td>
<td>.1563</td>
<td>27</td>
<td>.02</td>
</tr>
<tr>
<td>.047</td>
<td>.0482</td>
<td>9</td>
<td>.10</td>
</tr>
<tr>
<td>.005</td>
<td>.0065</td>
<td>11</td>
<td>.10</td>
</tr>
<tr>
<td>.001</td>
<td>.0022</td>
<td>.02</td>
<td>.01</td>
</tr>
</tbody>
</table>

D/A = dielectric absorption

As you can see from the data, the Black Beauties performed quite nicely with regard to value and extremely well with regard to leakage. The results for dielectric absorption were expected. Aluminum and tantalum electrolytics are considered failures at values above 15% and ceramics at 10% which are associated with high leakage. However, for this type of capacitor, its low leakage characteristics makes the D/A test effectively meaningless.

But, as I have discovered through many years of test experience, the only way to verify the reliability of a NOS capacitor (especially one that has been sitting around for some 45 years) is to test it after applying its working voltage for a number of hours. The results for three .01 mfd, 600 volt black beauties are found in Table 2.

<table>
<thead>
<tr>
<th>Value (mfd)</th>
<th>D/A(%)</th>
<th>Leakage (uamps)</th>
<th>Time of applied voltage (600V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.01378</td>
<td>29</td>
<td>0.00</td>
<td>Initial</td>
</tr>
<tr>
<td>.01343</td>
<td>33</td>
<td>0.00</td>
<td>16 hours</td>
</tr>
<tr>
<td>.01385</td>
<td>27</td>
<td>0.00</td>
<td>Initial</td>
</tr>
<tr>
<td>.01380</td>
<td>28</td>
<td>0.00</td>
<td>9 hours</td>
</tr>
<tr>
<td>.01393</td>
<td>31</td>
<td>0.00</td>
<td>Initial</td>
</tr>
<tr>
<td>.01378</td>
<td>32</td>
<td>0.00</td>
<td>6 hours</td>
</tr>
</tbody>
</table>

Notice that these NOS black beauties performed quite respectively. So what kind of conclusions can be drawn? Well, based on the information offered on the web and a very unscientific test:

1. In general, standard capacitors are perfectly acceptable for audio, and will rarely (if ever) compromise sound quality unless used beyond their ratings or a completely inappropriate type is selected for the application.
2. Always replace Black Beauties with filler tubes.
3. If it’s going to involve quite a lot of work, think twice about replacing Black Beauties produced in the late 50s (no filler tube) or using NOS for replacement applications. But if someone wants to offer you $4 each for your used or NOS Black Beauties, I’d jump on it.
LOOK at the critical points in any TV set. That's where you'll find Sprague Black Beauty Telecaps. Over 250 million of these molded tubular capacitors have been made since 1947 and demands are still increasing ... thanks to their unprecedented failure-free record.

Sprague's unique patented design and "dry assembly" processing make these the first tubulars made just like more expensive metal-encased oil capacitors. Every Black Beauty Telecap from 200 to 12,500 volts is molded dry in non-flammable phenolic. After molding it is impregnated thru an eyelet under high vacuum; the lead is then inserted and the capacitor solder sealed.

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March 2007

HOW MANY JARS IN YOU RADIO?
Or More Esoteric Facts About Capacitors

By Ray Chase

For those of you who subscribe to the Tube Collectors Association reflector, you know that it is peopled by many knowledgeable engineers, physicists and other "boffins", (definition of a "boffin" supplied upon request) who are ready and willing to debate almost any technical subject. Recent discussions of the relative merits of the International SI based measurement systems over CGS, English or other conventions have presented some revealing and interesting comments and discussions.

In relating some prior ancient and odd units of measurement such as gills, ells, grains, minims and halves, the subject of using JARS as a unit of capacitance finally came up. This was serendipitous as Al Klase and I were at the Ft. Monmouth museum a short time ago and observed a WW I era European style tube amplifier (possibly used by Major Armstrong himself) that had a paper schematic in its lid on which the capacitors were labeled in JARS.

Now I had heard of the use of JARS to denote capacitance values, but had not seen any examples. Al was also aware of the term JARS and also wondered how capacitance could be defined in cm's which he also had heard of. Well, from the panel of experts on the Tube Collectors forum, I'm here to reveal all to you.

JARS go back to the primordial days of electricity when the only capacitors were Leyden jars. Incidentally, I'll use the term capacitors synonymously with condensers, which was the terminology used in the "early days". Leyden jars would be connected in series or parallel as needed and most early spark transmitters used banks of Leyden jars to store energy for the spark. If you do not know what a Leyden jar looks like or how it is constructed, I suggest you Google the words and a wealth if pertinent information will be forthcoming.

Actually, one forum commentator called that some British Navy textbooks continued the use of the term JARS almost up until just before WWII; those Brits are stubborn to change. The value of a JAR is equal to 1/9 x 10 to the minus 8 F or about 1.1 nF. Therefore, 1.0 uF would equal about 900 JARS. Also, a JAR = 1,000 cm.

Now how the heck does a centimeter relate to capacitance? Well, early physicists determined that one cm = the capacitance of a one cm diameter sphere in free space. In the electrostatic system, a charged body has unit capacity if its potential is one ESU of potential when it is given a charge of one ESU. The unit is called the centimeter.

More trivia: The Leyden jar is certainly the original capacitor and Pieter van Musschenbroek in Leiden, Holland, invented it around 1725. In Dutch it would be a "Leidsche flesch" or a bottle from Leiden.

Nowadays, we just want to keep our capacitors from leaking, shorting or changing value and be thankful that they can be made smaller than the original Leyden jar devices!
New Jersey Antique Radio Club's  
--- SPRING SWAP MEET ---

Parsippany PAL Building  
Smith Field  
Route 46 & 33 Baldwin Road  
Parsippany, New Jersey 07054

Saturday, April 14th, 2007

Walk around auction  
starts at 11:30 am.  
Bring in your attic  
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(8:00 am to 1:00 pm)  
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