The Call Letter

August 2017
Vol 43, #8

Carol Veelle's Radio Cake

The Northwest Vintage Radio Society

Post Office Box 82379
Portland, Oregon 97282-0379

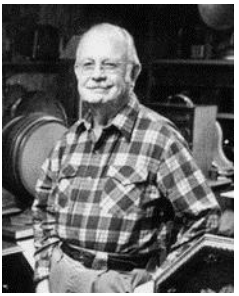
The Northwest Vintage Radio Society is a non-profit historical society incorporated in the State of Oregon. Since 1974 the Society has been dedicated to the preservation and enjoyment of "Vintage Radio" and wireless equipment.

Membership in the Society is open to all who are actively interested in historic preservation. The dues are $25.00 for domestic membership, due on January 1st of each year (prorated quarterly).

The Call Letter has been a monthly publication since 1974. It was originated with the founder, Bob Bilbie, and our first president, Harley Perkins. Through several editors and with the assistance of numerous society members, the Call Letter has continued to be a publication that informs members of the society's business and that supports the hobby of collecting, preserving, and restoring vintage radios.

Society meetings are held the second Saturday of each month at the Abernethy Grange Hall at 15745 S. Harley Ave. in Oregon City, Oregon. They convene at or about 9:30 AM for the purpose of displaying radios, conducting Society business, and exchanging information. Guests are welcome at all Society meetings and functions (except board meetings).

Other Society functions include guest speakers, auctions, radio shows, and radio sales which are advertised in the Call Letter and are held in and around Portland.



With each issue of the Call Letter, we remember Jim Mason, a charter member of the society who remained active until his death in 1999. A generous bequest from Jim's estate ensures the vitality of the Northwest Vintage Radio Society, and continued publication of the Call Letter.

Society Officers for 2016:

President	Pat Kagi (360) 694-6149	kagi.pat@con-way.com
Vice President	Brian Wegener (nnn) nnn-nnnn	spudweg@gmail.com
Treasurer	Ed Tompkins (360) 573-3895	edtomp@Q.com
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Board member at large	Mike McCrow (503)730-4639	tranny53@frontier.com
Librarian	Damon Vandehey (503) 459-1777	
Call Letter Editor	Don Hanson	vanguard4@lycos.com

On the Cover

Carol Veelle's July Picnic Cake Photography by Carol Veelle

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August Meeting

Our August meeting will be on Sat. August 12 and starts at 9:30 AM.

Announcements

Trash Bash: Bring your surplus junk and take some of mine.
Monthly Feature: Antennas and related equipment.
Tech Talk: Gary Sanders will speak about the history and design of Zenith Wave Magnet Antennas.
NWVRS has an opportunity to participate in the Maker Faire at OMSI on September 16-17. If you would like to volunteer to share your knowledge with the public and get more people interested in NWVRS, contact Brian Wegener at spudweg@gmail.com or 503-936-7612.

Editor's Note

Please have next month's Call Letter Contributions in by **August 26.**
Due to scheduling conflicts we do not have July Picnic pictures.

Visit our web site at: www.nwvrs.com
Find us on Facebook: www.facebook.com/nwvrs

Calendar of Events

August 12. Arctic ARC Hamfest. Fairbanks, AK. *This is an ARRL sanctioned event.* http://www.kl7kc.com . Contact John S Slater, KL1AZ, (907)488-5209. hamfest@hughes.net

August 19. 7th Annual Clark County Amateur Radio Club (CCARC) Ham Fair, Vancouver, WA. *This is an ARRL sanctioned event.* Salmon Creek American Legion Hall, 14011 NE 20th Ave, Vancouver, WA 98686. 9am-1pm. Contact Vanessa McCoy, KE7UBB, 360-601-7408 or 360-818-4807, clarkcountyhamfair@w7aia.org . www.w7aia.org/hamfair.htm Flyer in PDF. (3.5 MB)

August 20. PSARA Antique Radio Swap Meet. Puget Sound Antique Radio Association. Shoreline Community College, 16101 Greenwood Avenue North, Shoreline, WA 98155. http://www.pugetsoundantiqueradio.com/index

August 27. Ham Happenings. James Street, Duncan BC (Island Savings Centre) Vendors: 8AM, Public: 9AM. Admission $5, Tables $15 (includes one admission). Contact ve7jh@rac.ca or (250)715-8634

September 8-10. 20th Annual Northwest APRS/Digital Summer Gathering. Valley Camp, North Bend, WA. http://valleycamp.org/ . 2015 Photo Gallery

September 9. Hamfest 2017. Gallatin Ham Radio Club. Gallatin County Fair Grounds, Bozeman MT. http://gallatinhamradio.com/?page_id=494

September 23. Washington State Convention (Spokane Hamfest) Spokane Valley, WA. *This is an ARRL sanctioned event.* Flyer in PDF. (287K) 2016 Photo Gallery. Contact, Mike Grounds, KE7PG, (509)924-6377 ke7pg@comcast.net .

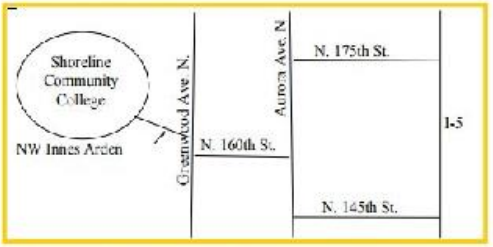
September 23. Northwest Citizen Corps EXPO. Renton, WA. Flyer in PDF. (922K)

PUGET SOUND ANTIQUE RADIO ASSOCIATION

PSARA >>

Radio Sale/Swap AUG 20, 2017

SHORELINE COMMUNITY COLLEGE
16101 GREENWOOD AVE. N.
SHORELINE, WA 98133



9 AM—1 PM

FREE to the Public

Sellers: $15 entry 6 AM

:Buyers: Free 9 AM—1 PM

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TACOS EL GUERO food truck for breakfast, lunch and snacks

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Have Fun

Vintage electronics, radios, tubes, parts, speakers, hi-fi gear, audio equipment, books, literature, test equipment, phonographs, records telegraph, ...more cathedral radios, battery and AC sets, transistors, catalin,,

http://www.pugetsoundantiqueradio.com

DAVE EATON HRO-60

By David Wise

NWVRS member Dave Eaton acquired a National HRO-60 that is complete except it has only one coilset. I won't say the price but I am envious. He had it sort of working, then the fuse blew, and he asked me to step in.

All circuit callouts below come from the late manual for serial prefix SM-500, which can be downloaded free from several places. Don't use BAMA, the scan there has very poor resolution.

POWER SUPPLY

The PO (Previous Owner, generic collective term for everyone who's worked on it before me) replaced the power transformer with something that probably came out of a TV set. Instead of 250-0-250, it has a single 150V winding. He rewired the rectifier socket and made a plug-in solid-state full-wave bridge to eliminate the voltage drop from the old 5V4. The primary has a 110V tap besides 120V, and by using the tap, he got about 230V out, instead of the usual 280V. Until the diodes shorted.

Why? Inrush current. That TV transformer is a brute; the HV winding is only a few ohms DC resistance. If you turn on the power when the AC mains waveform is near the peak of its sinusoidal cycle, there will be a microseconds-long surge of maybe 100A as it tries to instantly charge the first filter cap.

Semiconductor diodes have a surge current spec on the datasheet. For diodes this size (2A), it's a few tens of amps. Poof! We fix it by limiting the inrush current. This can be done several ways. Series resistor, maybe with a cutout relay. NTC thermistor. Zero-cross switching. I noticed that by using the tap, the PO had also been subjecting the heaters to overvoltage. Except he wasn't. The heaters were actually undervoltage, 5.7V instead of the normal 6.3V. The transformer has two 6.3V windings, one light (probably to run a 5U4), the other heavy, and he was using the light one and overloading it. (The HRO-60 pulls about 6A, while a 5U4 only takes 3A.)

This just didn't sit right with me. I wired in the heavy one. Oh oh, 6.8V now. Go back to the full 120V primary, now we get 6.3V out. But if I stuck with the 110V tap and added 10V drop through a resistor, I could kill two birds with one stone, limit the inrush and get the correct heater voltage.

Eight ohms to the 110V tap makes 6.3V on the heaters and 150V on the HV. Theoretical maximum inrush is 21A (sqr (2) * 120V / 8 ohms) on the primary side and 17A on the secondary. (21 * 120/150.) 1N4007's can handle this easily. I rebuilt the bridge using them, but we get only 210V of B-plus instead of 280V. The only fix that's both easy and cheap is a booster transformer. Mouser sells the Bel 241-5-56 (56V), which can handle the 140mA current, for $12. It's three inches long, one and a half high and wide. We could fit it in a couple places, all awkward. With primary in parallel with the main primary (downstream from the surge limiting resistor) and secondary in series and in phase, boosting 150V to 200V, we will get 280V out just like normal.

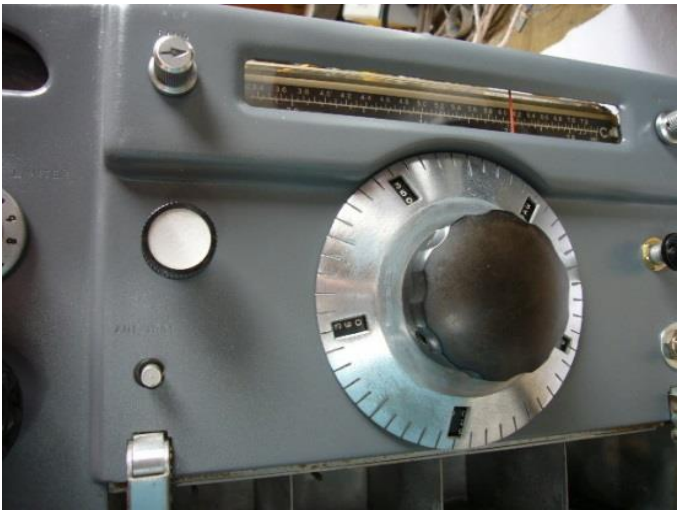
What about doing nothing? Just getting along on weak B-plus... I tested the radio both ways, using an external power supply. I was surprised.

Although gain increases with B+, so does noise. Sensitivity - the amount of RF needed to make 30% modulation sound 10dB louder than dead air - is exactly the same!

Now understand, I did this on Band C, 3.4-7.3MHz. The RF, oscillator, and mixers might be more stressed at 30MHz and be at their best only at full juice, but C is the only coilset the owner has. Anybody got an A-band coilset to loan? Any HRO model will work, from the 1934 version onward, the coilsets are all compatible, although pre-60 A's and B's will use single conversion instead of double.

Speaking of which, I cannot align the second converter, since I don't have a double-conversion coilset. Oh well. I shunted a resistor across R-26 to boost gas regulator V-16's current up to normal. They don't like running starved. This must be removed if you ever set B+ back to 280V. The push-pull 6V6's don't thunder quite as loud, but it's no big deal. One last thing. SS rectifiers make RF hash. I picked it up on a separate radio tuned to 150 kHz and near the HRO-60 chassis underside. The fix is a small cap across each diode. 10nF is a good value, but I didn't have any small enough to fit in the octal plug the PO used, so I used 1nF instead. Ceramic disc, 1kV. It cut the hash to a fraction of its original amount.

MECHANICAL



Micrometer dial -- There's a superb writeup on the web at

https://aa7ee.wordpress.com/2015/02/09/servicing-a-national-pw-d-micrometer-dial-and-pw-gear-drive/ .

The grease was dead. The dial springs were missing. The dial was out of registration. I fixed all that.

Tuning cap -- I treated the rotor contacts with polyphenyl ether. I noticed that when I reversed direction, the capacitance would continue to change in the original direction for a couple of degrees before reversing. I tracked this back to a wobble caused by a loose end bearing. Just loosen the jam nut, snug up the bearing screw, and retighten the jam nut. It doesn't have to be very tight, all it does is keep the screw from turning.

Antenna Trimmer - I think the knob got hit hard enough to break the ceramic base of the cap. It's 8-25pF, of the style made so popular by Hammarlund's APC series that "APC" became a generic term for any air trimmer using a two-screw mount. And that's how I searched eBay for a replacement. Nothing exact popped up, I adapted a similar part. The new one was 10-50pF. I sawed off plates until it maxed out near 25. Sawed them off with a Dremel with cutoff wheel.

Band display selector -- This is not a band switch! It only rotates the correct scale into view. (To change bands you swap plug-in coilsets.) The knob works an O-ring friction drive against the scale frame's endplate. An E-clip is supposed to keep the shaft from pulling out but it was missing. Not having the right size clip, I improvised with an internal star washer.

Phasing brace -- The Crystal Phasing control shaft is a little wobbly, and National added a bracing plate that fastens behind the front panel. Either they used elves to assemble it, or the PO hacked a replacement, because it's almost impossible to hold the nuts in place while getting the screws started. I took it apart again and glued the darn things to the bracket. Works better.

AVC switch-- The PO didn't have enough large nuts to furnish all the threaded control bases with backings, so he improvised a couple of foam-rubber disks which gave the switch a queasy, spongy feel. I kindly donated one of my extra nuts, as the PO definitely needed one here. Anybody else got spares? I'm short now.

COMPONENTS

All electrolytic caps were replaced by PO. Nothing to see here, move along. All paper caps were replaced by PO. One was incorrect. C-110, a 0.25uF part bypassing the RF GAIN line, was actually a 0.25uF/150 ohm snubber. With 150 ohms in series, the capacitance might as well not have been there. I put in a real cap.

Some mica caps had been replaced, probably needlessly. Three molded micas remained. Two are in places where leakage or noise could be a problem. They were very good parts when new, but you can't always trust them anymore.

C-58 (10nF) couples VFO V-4's cathode to mixer V3's grid. To test it, remove V-4 and the coilset. It measured less than 100 megohms Insulation Resistance on my Sprague TO-6 and I replaced it even though that amount of leakage will not disturb this circuit - it would only get worse as time passes. I replaced it with an axial-lead polyester since Q is not important here.

C-8 (10nF) bypasses the AVC line at the 1st RF section of the tuning cap. It's literally inside the tuning cap and tough to get to. I replaced it with a short-lead ceramic disc which I selected for low Dissipation Factor. Q is not critical here either, because it's not part of the tuned circuit. I don't know why National used mica. Probably because it's hard to reach, so they picked something that would last "forever".

Most resistors had been replaced. I tested the stragglers. Most are out of tolerance, but not drastically. Some can only be tested by special methods. For example, R-37 needs LIMITER ON, and R-33/R-36/R-67 require that, plus "guarding". What's guarding? When the RUT (Resistor Under Test) is in series with another one which in turn has a

sneak path back to the other end of the RUT, a straight resistance measurement will see the two paths in parallel. But if you elevate the second resistor, no current will flow through it, and the RUT will appear to be out of circuit. Instead of replacing them, I simply marked them as a cue to the next guy. I drew an axial stripe with a fine-point Sharpie. It's easy to spot.

Sometimes you can use an in-circuit part to test other parts. For example, R-23 is the AVC filter, and every path downstream ends in a capacitor. If you elevate the upstream end of R-23 and look for voltage across it, you test all AVC bypass caps for leakage simultaneously. That's what tipped me off about C-8. Measuring across the various downstream decoupling resistors let me home in on the offender. It was down to about 20 megohms.

Note that even though the PO shotgunned every paper cap, he didn't catch all the leaky caps. Test after you fix!

WIRING

When the TONE control was switched in, I got a squeal in the audio. This is usually a feedback problem, especially when the circuit employs it on purpose. In this case, the 8-ohm tap of the output transformer talks to Audio Amp V-13's cathode via divider R-43/R-44. The tech had swapped them while replacing them, resulting in excessive feedback which violated gain and phase margins. My experience has been that any instrument that's had most components replaced stands about an equal chance of contracting some new malady due to wiring mistakes. Only replace what you must.

CALIBRATOR

It's not the official XCU-50-2, it's a homebrew. It mounts over the NBFM adaptor socket using an added standoff, and plugs into the calibrator socket via a short cable. It's 100 kHz only. It worked, once I remembered to throw the ON switch on the calibrator as well as the front panel.

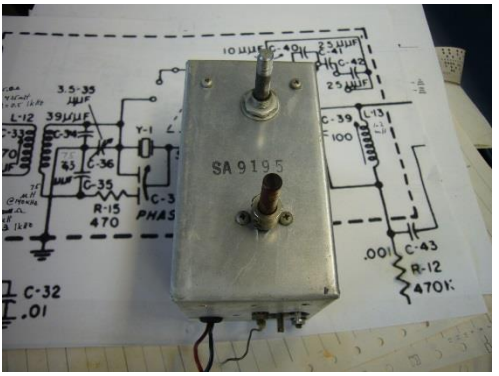
CRYSTAL FILTER

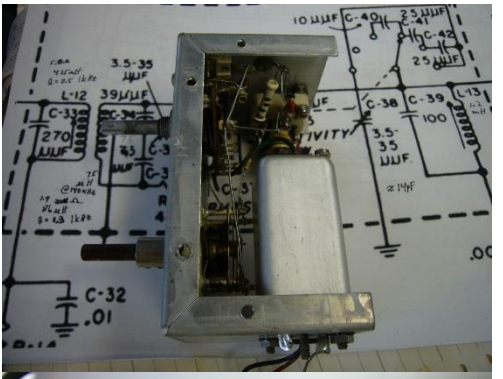
Nothing wrong per se, but ever since I got my RAO-3 in high school, (which has the same filter) I've wondered about C-36. The manual says to adjust so the PHASING control electrical centers are exactly 180 degrees apart. C-36 can't get this one anywhere near that. I removed the filter assembly - two knobs, two screws, a nut, and four wires - and opened it up. I discovered a discrepancy between the assembly and the manual. C-34 was 25pF instead of 35pF. I added 15pF but it didn't help much. I'm chalking it up to the PHASING cap, C-37. It looks a little bent. I'm not going to try anything. I have set C-36 to give equal voltage from the on-phase and anti-phase legs. As you'd expect, that happens when C-34 + C-36 equals C-35 (75pF). And some National models with this filter are hardwired that way, with no adjustment at all.

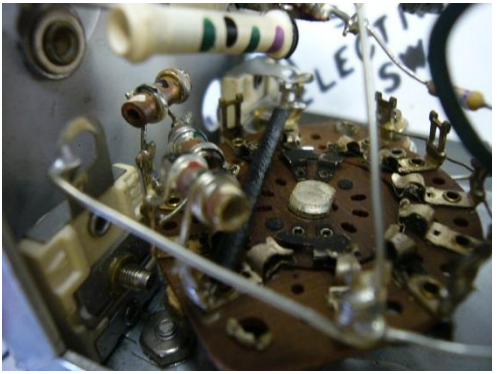
It's also odd how National says to set L-13 2 kHz above the crystal series-resonant peak. Why not right on, like Hammarlund? After all, in SELECTIVITY position 1, the two circuits are virtually identical. (By the way, the Hammarlund circuit is in QST, December 1938.)

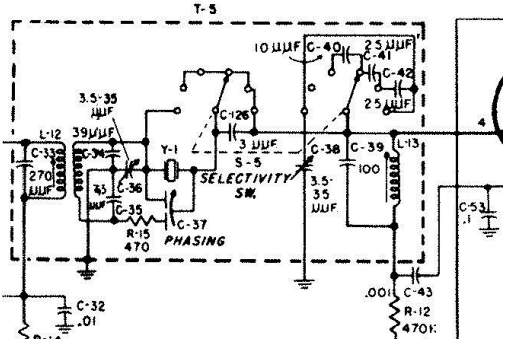
Using a spectrum analyzer and tracking generator, I swept the filter while twiddling L-13, and I saw something that still bends my head. The broadest response (what we're shooting for in position 1) indeed occurs around 2 kHz above crystal. (Actually about 1.5 kHz on this radio. And on either side of crystal, not just above.) Go further either side and it sharpens up. (And that's exactly what we expect, since advancing the SELECTIVITY switch tunes L-13 down, down, down, further off crystal.) But as you tune closer and closer to crystal, the response sharpens up too, hitting maximum when you are right on crystal. With L-13 set like that, all positions are sharp, and equally so. I am stumped. So I set it back to 1.5 kHz and called it good.

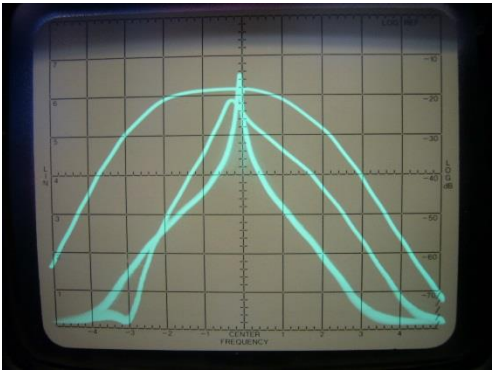
If you want to read the original writeup on this filter circuit, look in QST, December 1940.











National HRO-60 IF Passband --

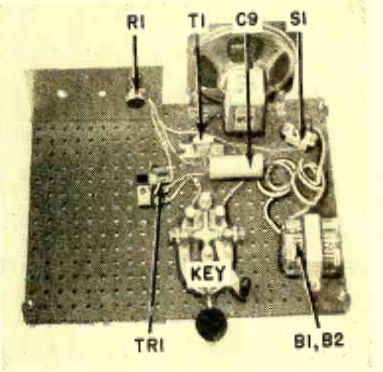
Crystal peak at 453.7kHzApproximate performance, interpolated from a recent spec and screenshot OFF 3kHz @ 3db, 4kHz @ 6dB, 6.5kHz @ 20dB, 12kHz @ 60dB, shape factor 3:1

1 0.5kHz @ 3dB, 0.7kHz @ 6dB, 3.2kHz @ 20dB, 8.5kHz @ 60dB, shape factor 12:15

0.1kHz @ 3dB, 0.2kHz @ 6dB, 0.6kHz @ 20dB, 7kHz @ 60dB, shape factor 35:1

Transistor Experiment No. 15

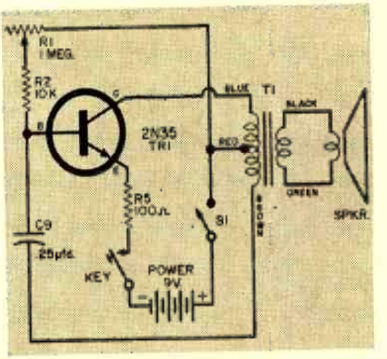
Code Practice Oscillator



THIS is another experiment in the series that started in the March, 1956, issue. The last experiment, No. 14, appeared on page 85 of the January, 1957, issue.

If you assemble the circuit shown in the wiring diagram, you won't have to wear a headphone to practice your "dits" and "dahs." You and your friends may even want to work in a group when learning code, since the output volume of this code practice oscillator is ample for a small class.

Except for the usual care regarding battery polarity, there are no special precautions which you must observe when wiring the oscillator. Be sure to connect the proper transformer leads, however—these are color-coded to facilitate identification.



With the wiring completed, install the transistor and close switch *S1*. Close the "KEY" and adjust *R1* for the tone you prefer. Once these simple steps are completed, you're ready to practice! You can "dit" and "dah" to your heart's content, for battery life is quite long, and penlite cells are inexpensive.

The transistor is connected in the common-emitter circuit configuration, with audio transformer *T1* serving a dual purpose. Its center-tapped primary winding provides the feedback necessary to sustain oscillation while the transformer itself serves to match the impedance of the transistor to the impedance of the loudspeaker's voice coil, insuring a good transfer of audio energy.

Feedback provided by the transformer between *TR1's* collector and base circuits is more than is needed for oscillation. As a result, "blocking oscillator" action takes place, with the rate of blocking depending on the *RC* time constant in the base-emitter circuit, and hence on the value of capacitor *C9* and resistors *R1* and *R2*. With *C9* and *R2* having fixed values, the setting of *R1* determines the blocking rate and hence the frequency ("tone") of the output signal.

Emitter resistor *R5* serves to protect the transistor against damaging current surges as the oscillator is keyed. Except as a protective measure, it is not essential to the operation of the circuit.

Power is supplied by the 6-cell 9-volt supply used in earlier projects, controlled by s.p.s.t. switch *S1* and the "KEY." —*Louis E. Garner, Jr.*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