OSCILLATOR

DELAWARE VALLEY HISTORIC RADIO

The Official Newsletter of the DVHRC *Vol. 7. No. 6, June 1999*

July Meeting

The July meeting of the NJARC will be held at 7:30PM, July 13 at the Telford Community Center. Information on the meeting program was not available at press time, but there a better-than-even chance it will be a good one. As usual, an informal auction will follow the meeting.

DVHRC June 1999 Meeting Notes

by Dave Snellman

Well it's hard to believe that the June meeting is history. It was a warm evening with plenty of activity. Members are still renewing their memberships. We'd like to welcome our newest member, Dale Bortz, of Whitehall, PA to our ranks. We'd also like to note that we had some unexpected visitors – Jim and Ruth Whatenby – all the way from Apex, NC! Glad to have you join us.

Lewie Newhard brought a nicely restored tombstone radio made by the Triangle Electrical Company in to show. A great restoration job and the radio sounded great. I believe the label on the front read "Imperial Radio." A very nice set. (Too bad it didn't get in the auction!)

Dave Abramson pointed out that there was an article in a recent *Philadelphia* magazine issue about "S and G Electronics." Better known to some people by the "battery ladies." Check it out if you get a chance.

We had a couple of reports on the success of the Kutztown meet. But the BIG news for this month was our first "High End" auction. We did without a technical presentation and jumped right to the auction after some quick business details and the usual refreshments.

The auction was billed as a "high end" auction where we asked sellers to bring some of their better items to auction and we asked buyers to bring more of their hard earned money to spend. We had many good items that did draw some of the highest auction prices I've seen at our regular monthly meetings. We also had some of the "normal" items in the auction, too. The nice thing for the seller is their auction commission is never higher than five dollars ($5.00) on a single item – regardless of the selling price. The usual commission is 10 percent of the selling price – seller pays.

Here are some of the auction results. A Lafayette Bakelite AM/SW sold for $85.00. A Pilot TV went for $160.00. RCA Radiotron Designers Handbook, 4th ed. sold for $30.00. A Grunow Chrome grilled table radio went for $180.00. A Zenith TO (tube) sold for $55.00. A Westinghouse console went for $100.00. Some really nice gear found new homes. There was a nice selection of tube-type communications gear (Hammarlund Comet Pro, Collins S-line gear, Hallicrafters SX-23, and an Eddystone VHF receiver) that didn't sell. Guess we didn't have many boat anchor fans in the audience. All in all, the first "high end" auction was successful. Look for announcements of future such auctions in *the Oscillator*.

In addition to some extra commission money, the club took in about $40.00 on items donated to the club that sold at the auction. Thanks to all who donated the items, and thanks to the buyers.

That's all for this month. See you all at the next meeting, July 13th at the Telford Community Center.

Well that about raps up this month's meeting. Please note that at the June meeting we will be having our first "High Line Auction." For this auction we're asking sellers to

COMING EVENTS

July 9	NJARC Meeting, Freehold, NJ
July 11	Hamfest, Kimberton Pa.
July 13	**DVHRC Meeting, Telford**
July 18	Sussex Cty. (NJ) Hamfest
July 31	**NJARC Radio Meet, Freehold, NJ**
Aug 7	Swap Meet, Lewistown, Pa.
Aug10	**DVHRC Meeting, Telford**
Aug 13	**NJARC Radio Meet, Freehold, NJ**
Aug 15	Hamfest, York, Pa.
Aug 22	Hamfest, Mullica Hill, NJ
Sep 1-4	**AWA Conference, Rochester, NY**

THE OSCILLATOR

Newsletter of the
Delaware Valley Historic Radio Club
P.O. Box 847
Havertown, Pa. 19083

The *Oscillator* is published monthly by members of the non-profit DVHRC. Its purpose is to provide a forum to educate, inform, entertain, and communicate with collectors and preservers of vintage radio technology.

We welcome and solicit information relating to radio history or collecting. Submissions should be carefully researched, typed and accompanied with clear photographs or diagrams. Material on-disc (3-½" DOS/Win95) is particularly welcome.

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Personal views, opinions and technical advice offered in this newsletter do not necessarily reflect those of the members, officers or Board of Directors of the DVHRC, nor is the organization responsible for any buying or selling transaction incurred.

To join: DVHRC dues are $15 per year. The membership year runs January-through-December. Please mail to the club PO box above.

Meetings are held the second Tuesday of the month at 7:30 PM

OSCILLATOR ARTICLES & MEMBER ADS

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COPY DEADLINE: The 20th of each month.

bring along some of their top-shelf stuff along with the usual items AND we're asking buyers to bring along lots of cash to spend on these items. Let's make this a really successful auction. See you all on June 8th in beautiful downtown Telford.

Testing Transformers

From REC.ANTIQUES.RADIO+PHONO 1/4/97

Transformers are not quite so mysterious as some people think, but there are some limits on what and how to test parameters in the field unless you have proper instrumentation and know how to use it.

The type of test needed for the audio driver transformer is a simple ohmmeter "go/no-go" test. Check that each of the coils in the transformer is continuous. Generally, readings will be on the order of tens to hundreds of ohms. High resistance (megohms) is a "fail" condition. Make sure that each coil is disconnected from other circuits, then test each coil for continuity.

Transformers are made with all windings insulated from the core laminations and case. In a few cases, you will find a transformer that has a center tap on a coil that is internally connected to the case, but this is not common. Generally, ohmmeter measurements between any coil and the transformer core-case should show megohms of resistance. In manufacturing, a "hipot" (high potential) test is used, checking for leakage with several hundred volts between the coil and case. However, most coil-frame insulation failures will show up on a low-voltage VTVM ohmmeter, which should show "infinite" resistance on its maximum sensitivity. Note that when making measurements over a few megohms, holding the probes in your hands, and other leakage paths, may affect the measurements. All coils should be insulated from each other as well.

The above tests will not show shorted turns or leakage in the windings themselves. A simple test for this is to connect a 6.3 volt filament transformer or similar to one of the coils and measure the voltages on other coils. On a 10:1 turns ratio interstage transformer, you should see around 63 volts, if you energize the short winding, or 630 millivolts, if you energize the long one. Magnetizing current with the transformer coils open-circuit should be milliamperes, and you can put a small resistor (say100 ohms) in the driving circuit and use the voltage across it to determine magnetizing current. If the coil under test loads the resistor with significant voltage drop, you've got shorted turns. Losses introduced by shorted turns in the windings are dramatic, so this will be essentially a go/no-go test.

The impedance ratio and inductance of transformer windings is a function of the square of the turns ratio. Thus, a transformer that has a 10:1 turns ratio has an impedance ratio of 100:1. One significant ratio to keep in mind is that the ratio of a center-tapped coil in total to that of one side to the center tap is 4:1. Impedance and inductance measurements on audio units are made a 1000 Hz. To make these measurements, you need either a suitable impedance/inductance bridge such as a GR 650 or1650, or a test setup of some sort that can make measurements

at 1Khz. and resolve the inductive reactance. I suspect that most of the readers here either don't know what I which case, don't try making such measurements) or have the equipment to do this and know how to use it, so I won't go into detail.

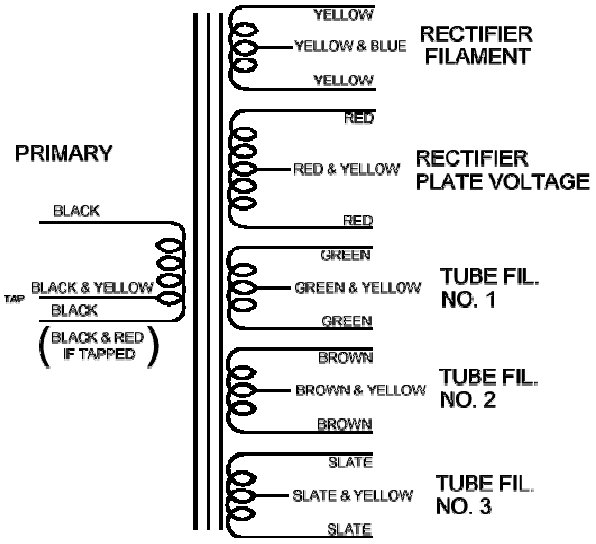
NOTE that DC resistance measurements of coils DO NOT correlate to the turns ratio or impedance ratio. Coils are wound with different sizes of wire, and the DC resistance will vary as a unction of wire size and length, not the number of turns. Inductance and impedance are a function of the number of turns and the magnetic characteristics of the core, and measurements to get these values MUST be done using AC. Measuring input and output voltage ratios will give you the turns ratios. On a balanced center-tapped winding, the DC resistance of one side to the center tap will be different from the other side, if the winding is large. Reason is that the bobbin size increases, and it takes more wire length to get the same number of turns on the outside part of the winding than on the inside.

You can check out AC power transformers similarly. Coils should be continuous, and all coils should be isolated from the frame. 6 or 12 volts connected to the 120 volt primary should produce outputs from the rectifier plate winding and each of the filament windings. For example, a typical old radio with an 80 has plate windings typically 500 to 600 volts center tapped, to supply around 225-275volts of B+ With 6.3 volts on the primary, you should read 25-30 volts on the whole secondary, and half that from each side to the center tap.

Hank van Cleef

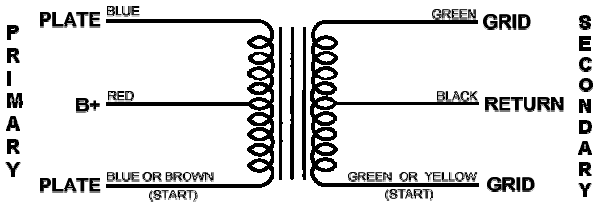
RMA POWER TRANSFORMER
LEAD COLOR CODE

POWER TRANSFORMER LEADS IN RADIO RECEIVERS MAY BE IDENTIFIED BY THE FOLLOWING COLORS (OR COLOR PATTERNS) ON THE LEAD COVERING.



RMA AUDIO TRANSFORMER
LEAD COLOR CODE

INTERSTAGE AND OUTPUT AUDIO TRANSFORMER LEADS IN RADIO RECEIVERS MAY BE IDENTIFIED BY THE COLORS ON THE LEAD COVERINGS AS SHOWN.



The Racal RA.17

By the late 1940's it had become obvious that, in order to improve the performance of HF communications receivers, something more elaborate than a "straight" single-conversion superheterodyne was in order. Even the best of these sets, like the HRO's and Super Pro's, were lacking in the areas of frequency accuracy and stability, image rejection, and IF selectivity.

The answer, of course was the multiple conversion superhet. Build a good, stabile receiver that tunes a limited frequency range at a modest frequency, say 2-3MHz. Then use a crystal controlled converter as a front end to select the frequency band of interest. In the simple case, one needs a separate converter crystal for each 1-MHz band tuned.

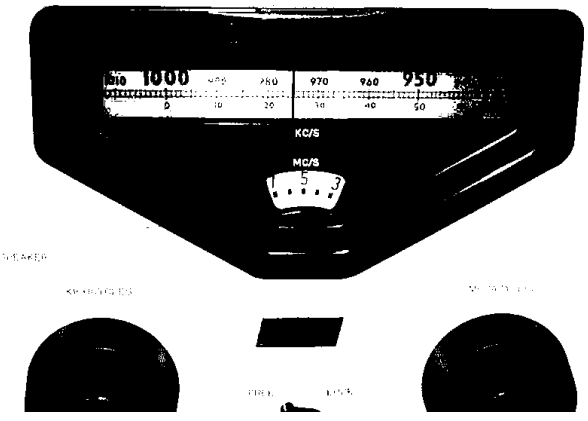
The Collins 51J, introduced in 1949, pioneered this sort of architecture in commercial HF receivers. It tunes 0.5 to 30.5 MHz in 30 1-MHz bands. Through a high degree of mechanical and electrical complexity, and a few annoying compromises, it accomplishes this with only 10 crystals.

Ray, Raymond Brown, and Cal, George Calder (Jock) Cunningham established Racal Ltd. in 1950. This led to the formation of Racal Engineering Ltd. in 1951 and a move to a 5000 square-foot building in Isleworth, near the London Airport.

Early in 1953, Racal hoped to acquire the rights to manufacture in Britain the new Collins 51-J HF communications receiver. On the basis of this, Racal was awarded a contract with the Royal Navy for the supply of 200 of these receivers. For the manufacture of the Collins receiver, Racal proposed to use a substantial portion of British components. Unfortunately, Collins insisted that only US components be used, and after a visit to Racal's primitive facilities at Isleworth, Collins decided that Racal was too small to undertake manufacture of the radio, which was probably true at that time.[i]

The problem facing Racal was to produce a receiver with the same general characteristics as the Collins sets to fulfill their Royal Navy contract.

Meanwhile, in South Africa, Dr. Trevor Wadley, who had worked for the Telecommunications Research Establishment in England during the war, was developing a communications receiver based on an extremely accurate and elegant frequency control scheme that he had developed for use in test equipment. Racal and Wadley eventually got together. The result was one of the world's great communications receivers. The design work on the RA.17 was started in late 1954, and production continued until 1967.



The RA.17 occupies 10 3/4 inches of rack space, which was pretty much standard communication receiver size in this era. The diecast aluminum chassis pushes the weight to 67 pounds versus 43 for the 51J. The receiver uses 22 miniature tubes plus a rectifer. The commonly available "C" models use US tubes. Tuning range is 0.5 to 30 MHz in 30 1-MHz bands. The approximately $1000 introductory price crept up to $2400 before production ended.

The front panel is dominated by the clearly Collins inspired tuning dial bezel and two large tuning knobs. The "MEGACYCLES" knob is the band selector. It tunes 0 to 29 MHz in a turn and a half, has no detents, and turns easily. You tune so the frequency you want is in the middle of the small window and peak the noise or signal. The flywheel-weighted "KILOCYCLES" knob does the tuning across the selected 1-MHz band. It has a very light and precise feel; perhaps not as smooth as a Hammarlund SP-600, but exceedingly satisfying none the less.

The "KILOCYCLES" knob controls the best part of the receiver, a 6-foot piece of 35mm film that serves as the killocycle readout. It has about 20 1-KHz divisions per inch. The manual proudly points out that the 0.5 to 30-MHz tuning range is effectively spread across 145 feet! The RA.17 is my pick for the best SWL "band cruiser" of all time, offering the smooth unencumbered tuning of a high-end Hammarlund and the frequency accuracy associate with the Collins products.

The signal path through the RA.17 may be seen in the upper half of figure 1: The antenna input is low-pass filtered (30MHz), amplified, and upconverted to a first IF of 40MHz. Upconversion allows the receiver to achieve an extremely high degree of image rejection because the image is separate from the desired signal by twice the first IF, i.e. 80 Mhz. After passing through a 1-Mhz-wide filter at 40 MHz, the signals are down converted to a tunable IF of 2-3MHz. The signals are then converted to a 100KHz final IF for amplification, filtering, and detection.

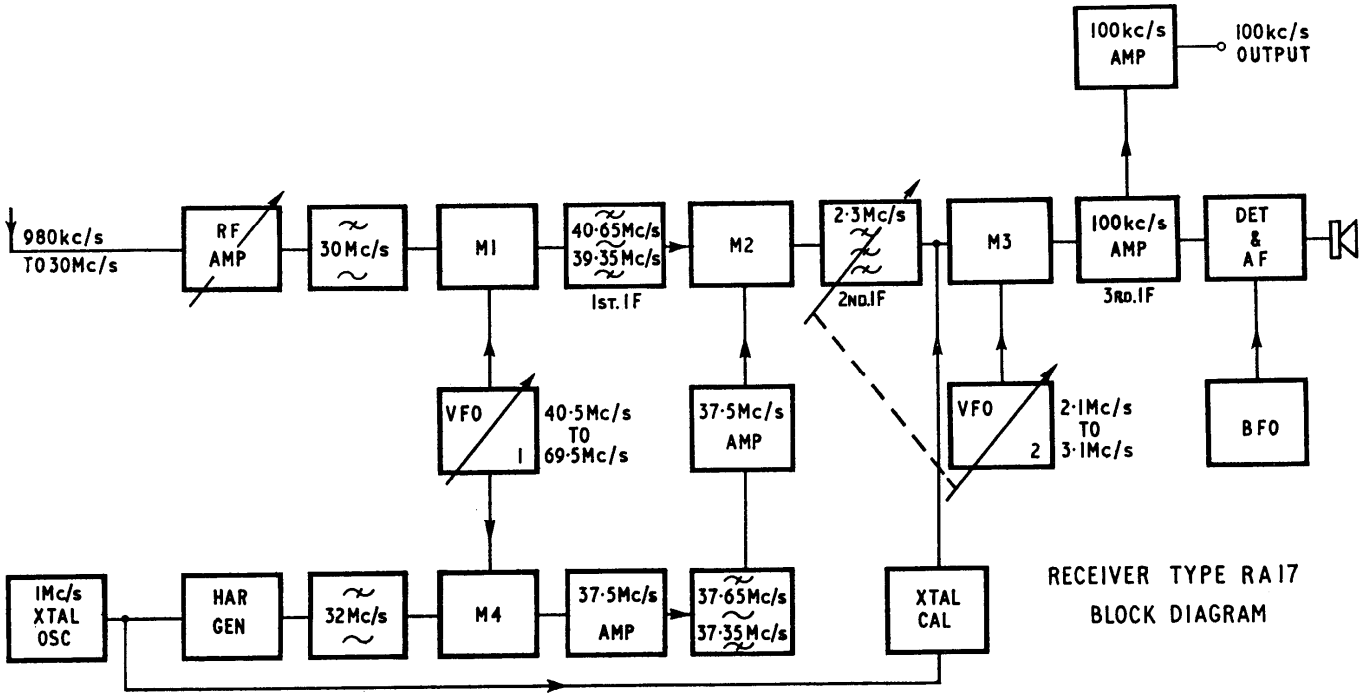


FIG. 1 BLOCK DIAGRAM OF THE RECEIVER TYPE R.A17

The local oscillator for the first mixer is provided by a fairly conventional variable-frequency oscillator (VFO-1). Because of the up-conversion scheme, this oscillator can tune the entire 29MHz input range buy providing an injection signal in the fairly limited range of 40.5 to 69.5MHz.

In a conventional design, such a free-running oscillator would be hopelessly unstable. Here's where the magic of the Wadley error-cancelling "loop" comes into play. Follow along in the lower half of figure 1.

A harmonic generator and low-pass filter driven by a 1MHz crystal oscillator creates a "comb" of frequencies at 1MHz intervals from 1 to 32 MHz. Mixer M-4 translates this comb upward in frequency by an amount determined by the signal from VFO-1. If VFO-1 is tuned within 150KHz of an "even" half megahertz, one of the comb frequencies will pass through the 37.5MHz filter and amplifier and be applied to mixer M2 to converts the desired signal from the 40MHz first IF down to the 2-3MHz second IF.

The important point is that the net accuracy of the up-conversion-down-conversion process is established by the **offset** between the first and second local oscillator signals, and this offset will always be an exact multiple of 1MHz as established by the crystal oscillator. Furthermore, this wide range of tuning in 1MHz steps is accomplished with a single variable capacitor and a single oscillator coil.

Bah - Hum Bug(s)!

From Colorado Radio Collector's "The Flash!", David Boyle 3/97

In over forty years of "dinking and dorking" around with old radios I've had my share of trying to solve "hum" problems. In fact right now I'm working on a Airline chairside with a apparent 60 Hz. hum in the audio. The hum is more pronounced after the chassis is installed in the cabinet -- the wood cabinet affords a significant bass boost and GREATLY accentuates the problem!

I thought I would take the time to share some hum trouble shooting hints with my fellow radio collectors and restorers. I've loosely classified the hum into two categories; 60 Hz problems and 120 Hz problems (or CPS for you 'ole guys!) 60 Hertz Hum

- The detector tube is too close to 60 Hz source (power transformer, power switch or AC line). Use a shield around tube and/or power switch.
- Ground bonding problems; This is where ground current is carried through the rivets of tube sockets and terminal strips. Millivolts of 60 Hz voltage drop, due to loose and corroded rivets and screws, can cause substantial hum. Run a separate ground wire for the heater circuit -- and don't forget the pilot lamps. Also, you can move ground connections away from the detector and first audio tubes to a grounding at common locations where the circuit is naturally referenced to ground such as a tube cathode or cathode bias resistor.
- In an AA5 set, the 12SQ7 should be the last tube in the series string with one end of its heater at the same potential as the cathode.
- Be sure that the center tap of the power transformer's filament winding is at a "good" ground.
- Remember if its 60 Hz hum, then its probably heater voltage hum. Double check this by cutting off the heater 6.3 volt supply with the power on. If the hum immediately goes away before the tubes cool off you've found it!
- If it buzzes (60 Hz but lots of harmonics) then its probably some RF interference coming through the antenna or nearby fluorescent lights, etc.
- Tubes with heater/cathode leakage -- substitute to isolate.
- Pull tubes one at a time working from the RF, Osc, IF, Detector, 1st. audio to assist in isolating the source.
- Also, remember that many times there may be multiple causes of hum.
- Try .02-.05 mfd caps on the AC input side to the power transformer. Tie them to ground. Put bypass caps to ground on the filament string.
- Try grounding the power transformer. Try shielding all or various tubes.
- 120 Hertz Hum
- Poor power supply filtering. Time for that "recap" job in the filter network. The capacitance of 20-40 mfd is usually OK, But watch that DC working voltage -- keep it at 450 v. AC/DC sets use higher mfd's, but a lower DC working voltage. Keep it at 200-250 WVDC.
- Capacitor installation wiring errors are classic, like when one negative leg of a paired filter cap does not go to ground. Use a schematic and don't assume the last guy did it right! Some older radios generated negative bias by using negative lead filtering with the speaker field coil connected between chassis ground and power transformer B+ winding center tap. These various circuits require two separate or individual filter caps.
- Try replacing the rectifier tube (Substitution) Use a 'scope to check the AC ripple voltage at various points in the power supply system. Add more filter capacitance and study the ripple reduction affect. Don't add too much capacitance, especially before the choke (In-rush current considerations). Also some circuits are sensitive to too high capacitor value -- adding some unwanted low-frequency gain that may push the circuit into motor-boating or oscillation. That will do a number on your ear drums!
- Some radio circuit designs and component/tube layouts require the use of metal tubes. Possibly true if the audio and rectifier tubes are too close. Watch for glass substitutions as a cause for hum.
- The electrodynamic speaker hum bucking coil leads may be reversed. Try them the opposite way. See which way produces less hummmm. Does the hum vary with the volume control audio output setting - or is it constant? There could be important clues here!
- Go around with a sharp test probe who's other end is attached to a "GOOD" ground. Check for hum (both 50 R 120 Hz) reduction when checking various grounding lugs and ground tie points.

That's about all ideas I've got for now. I want to thank George Gonzalez and Henry van Cleef, contributors to rec.antiques.radio+phono, the antique radio newsgroup, for unknowingly allowing me to use some of their posted info.

Bahhhh Hummmmm Bug!

BUY SELL SWAP

WANTED: The May 1966 issue of *Electronics Illustrated.* Richard C. Yingling, 2 S. Locke Ave., Yeagertown, Pa. 17099, (717) 242-1882

WANTED: Ballast Tube #17A485459 for Motorola TVS-4. Alton Dubois, Jr., 67 Peggy Ann Road, Queensbury, NY 12804, Phone 518-792-3130

WANTED: Information on "Lang" radios: literature, pictures, pricing, etc. Charles J Dreitleio, 515 Elizabeth St., New Milford, NJ 07646, 201-384-3862

FOR SALE: Assorted: 3 Home brew amplifier chassis with UTC and Acrosound transformers- tubes- and meters (SEE: http://www.netaxs.com/~am004d/equipment for pictures), Amprobe RS3, AKG D109mic, EV 660A mic, Sony VP2011 3/4U matic-NR, Simpson 371 AC voltmeter, Simpson 260 manual, RCA T2K radios(2),12" Jensen speaker from floor console radio-with field coil, Triplettfrequency counter Model 7000 - Mike Muderick-610-449-6970, or Mike@Muderick.com

WANTED: Gernsback's Official Radio Service Manuals: 5, 7, 8. **RCA Victor Service Data**: '47, '48, '49, '51.
Mike Tannenbaum, 215 540-8055, k2bn@agtannenbaum.com A.G. Tannenbaum, POB 386 Ambler PA 19002, Phone 215 540 8055 Fax 215 540 8327, Web URL www.agtannenbaum.com, e-mail k2bn@agtannenbaum.com.

FOR SALE: Old radios and 78 RPM records from an estate. Includes **Zenith #5614**, **Silvertone** radio/disk recorder, and **RCA ACR-175** communications receiver. Contact: George Rottina, 17A Lumberjack Cir., Horsham, Pa. 19044. Phone: 215-675-9055.

FOR SALE:: **7JP4 CRT**, good filament, screen looks OK, make offer. Alton Dubois, Jr., 67 Peggy Ann Road, Queensbury, NY 12804, Phone 518-792-3130

HELP: Would the person who sold Marc Ellis the Philco 70 cabinet please contact him at PO Box 1306, Evanstan, Ill 600204-1306; ellis@interaccess.com; 847-869-5016.

HELP WANTED: Need someone to repair a Philco 4654 Predicta TV. Ray Casper (609) 695-8312

WANTED: Emerson AU-190 chassis; FADA 659 dial glass; Chelsea ZR-4 audio transformer; Sentinel 400 Television; Plastic CRT cover (front) for 17" Philco Predicta; Pilot TV-37 tuning knob (wood). Frank Johnson, 530 Elford Rd., Fairless Hills, PA 19030-3624 (215) 943-8295

FOR SALE: Parted out Stromberg Carlson model 19-20 AC. Power transformer appears O.K. IF's are O.K. Electrodynamic speaker is electrically O.K., needs cone repair. Make offer. Alton Dubois, Jr., 67 Peggy Ann Road, Queensbury, NY 12804, Phone 518-792-3130

WANTED: Sales literature, service manuals, and equipment for theatre sound / broadcast use by RCA Photophone, Century Sound, Motiograph, Altec, Western Electric, etc. Theatre catalogs by Jay Emmanual Publications, Philadelphia. Scott Stillwell, 2328 Cambridge Circle, Hatfield, PA 19440 (215) 393-1833 pager: (800) 717-9306

JVARC Hamfest & Antique Radio Swap Meet

Sponsored by the Juniata Valley Amateur Radio Club
August 7, 1999, 8:00 AM
Decatur Township Fire Company
Route 522, 8 miles North of Lewistown Pa.
General admission: $1.00, Tailgating $5.00, Indoor Tables $10.00
For information contact: Richard Yingling, WB3COB, 717-242-1882