

# The CORNELL-DUBILIER CD Capacitor



Vol. 9

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No. 7

CORNELL-DUBILIER ELECTRIC CORP.  
HAMILTON BOULEVARD  
SOUTH PLAINFIELD, N. J.

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# WANTED: Signal Corps Equipment

You may have Radio-Amateur and Photographic equipment that is urgently needed by the Army Signal Corps. The Army will buy the following from private individuals.

Radio: Standard and commercial built short wave transmitters (such as Hallicrafters HT-1, etc.; Temco and Collins Model 32 and 30) and Standard and commercial built short wave receivers (such as Hallicrafter, National, RCA, RME, Hammarlund or Howard); AC and DC Voltmeters, Ammeters, Milliammeters, Radio Frequency Meters and Volt-ohm, milliammeters; Oscilloscopes, 2-3 inch; Audio sig. gen. 30-15,000 cycles; RF sig. gen. 15-215 megacycles; late model Tube Checkers, and other test equipment.

Photographic: 35 MM Motion Picture Cameras (such as Mitchell (all models), Bell & Howell - Standard Professional, Akeley-Professional (all models) and Eyemo (all models) Bell & Howell Mfg., etc., and 16 MM Motion Picture Cameras (such as Cine-Kodak Special, Magazine Cine-Kodak, Filmo 70.D or Filmo Auto Master); Tripods; Lenses, all types for 35mm and 16mm equipment; Exposure Meters; and Cameras (such as Speed Graphic 4" x 5", and Speed Graphic 2 $\frac{1}{4}$ " x 3 $\frac{1}{4}$ " with or without flash synchronizers) and Leica Model III (F) or 11B (C), or equal; Range Finders; Pack Adaptors and Cut Film Holders.

If you have this type of equipment, you can assist the war effort materially by selling it to the Army. Write to:

**EMERGENCY RELIEF SECTION  
PHILADELPHIA SIGNAL CORPS PROCUREMENT DISTRICT  
5000 WISSAHICKON AVENUE, PHILADELPHIA, PA.**

briefly describing the equipment you have and stating the price at which you can offer each item, FOB Philadelphia. Do not ship any material without specific directions from that office.

Price consideration is based upon your net cost less reasonable depreciation for use, age, and condition of equipment. Inasmuch as all equipment is being purchased FOB Philadelphia, cost of packing and shipping can be shown separately so that an allowance for the costs can be made when material is accepted.

# LOUD SPEAKER RESPONSE MEASUREMENTS\*

## PART II

Basically the equipment required for loud speaker response measurements comprises an audio-frequency oscillator, a driving amplifier for the speaker, the speaker under test which is located in a designated acoustic space into which it is to radiate, a microphone suitably located in the acoustic space as a means of indicating the sound pressure, microphone amplifier

curve recording is employed in the system illustrated, but fully automatic recording equipment is also used. Although speaker and microphone are shown located in a dead room, the acoustic space for particular measurements may be outdoors, a free-space room, or a live room depending upon the nature of the performance characteristic to be determined.

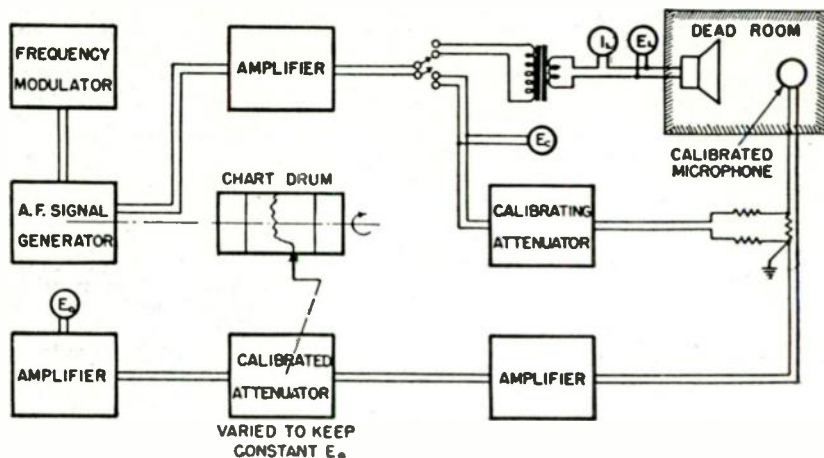


Fig. 5. Diagram of loud speaker measuring system employing semi-automatic recording.

ing equipment, and an output meter. Important auxiliary elements of the measuring system include voltage and current meters to determine the input to the loud speaker, a calibrating circuit with which to measure the voltage generated by the microphone, and recording means to eliminate the necessity for tediously plotting the point-by-point response curve. A schematic diagram of one of the measuring systems used in the Jensen laboratory is shown in Fig. 5. Semi-automatic

Axial response frequency measurements for design and development purposes are conveniently made in a small dead room measuring 18 feet 9 inches long, by 15 feet 6 inches wide, by 12 feet high. Direct-radiator speakers may be mounted in an end wall so that only the front side radiation is involved, or in a suitable cabinet or special enclosure when the performance of the complete acoustical system of the reproducer is under study. The microphone is usually

\* Courtesy "Radio News."

placed 24 inches from the speaker to minimize room effects.

For indoor measurements involving considerable distance between microphone and speaker (a necessity in the case of reproducing devices of large size), an unusually large "free-space" sound room is provided in the Jensen laboratories. This room has a total volume of 77,574 cubic feet and affords an interior working space measuring 41 feet 8 inches long, by 44 feet 4 inches wide, by 42 feet high. The room is sufficiently large to permit the determination of the directional characteristics of large low-frequency horns such as are used in theater reproducing systems.

In making outdoor measurements, it is desirable that the speaker and microphone be as high above the ground as possible and well away from walls or other reflecting surfaces. This is especially important when measurements are to be made at considerable distance from the speaker, a necessary condition when studying the performance of speakers with large-dimension radiating surfaces. This is accomplished at the Jensen laboratories by suspending speaker and microphone from a long beam projecting from a tower atop the free-space sound room building. The speaker is pointed diagonally away from the building and is located out from the corner a considerable

distance. The usual height of speaker above ground is approximately 50 feet.

Living room conditions are approximated in a laboratory room measuring 20 feet long, by 18 feet 6 inches wide, by 11 feet high, having average absorption characteristics. A number of procedures are possible in determining loud speaker performance in such a room. The effect of various combinations of location of loud speaker and listener within the room can be obtained by response curves with speaker and microphone placed to simulate the desired conditions. Such response curves are highly irregular due to room effects, but these effects are likewise present when listening under the same conditions. Curves obtained in this manner are characteristic of the particular room and do not hold for a different, even though similar, room. Another procedure which is routine in live-room measurements in this laboratory involves the use of an 8-microphone array. These microphones are mounted at selected positions in a plane parallel to the floor and at approximately the same height as that of a seated listener's ear. Motor-driven switches connect each microphone in rapid sequence to the input of the measuring system with the result that an average of the sound pressures over the array space is indicated. This method, though providing a purely arbitrary

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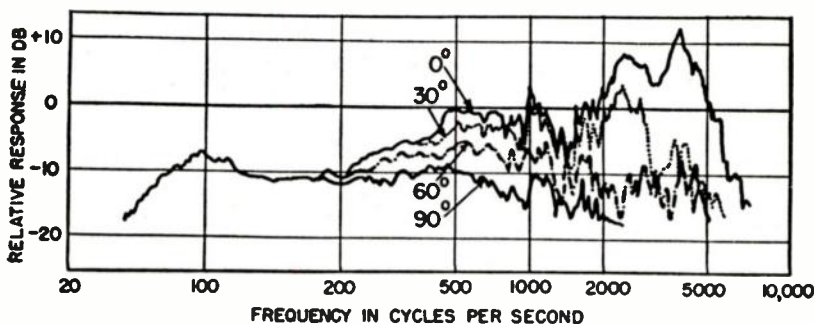


Fig. 6 Outdoor response curves at various azimuth angles.



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These advertisements are listed FREE of charge to C-D readers so if there is anything you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

**WANTED**—Precision EV-10 V.T.V.M.; 3" oscilloscope; Precision 920 tube & set tester. Must be new or in new condition. State price. Vital Radio Service, 209 Linden St., Camden, N. J.

**WANTED**—Riders Voltohmyst Junior or senior. Highest price for one in A1 condition. Southern Radio service, 124 E Jackson St., Thomasville, Ga.

**WANTED**—Triplett vibrator tester, appliance tester, adding machine and new radio receiving tubes. State condition, model, and price. L. M. Mick, 424 2nd Ave., Dixon, Ill.

**FOR SALE** — New electric Radio Service Sign; automatic mechanism, can be used for other purposes. \$2.00 complete. Order from this Adv. M. Levengood, Palmyra, Pa.

**WILL TRADE**—One pair homing pigeons for 1 1H56T and 1 1A76T. Charles L. Culley, Melville, La.

**WANTED**—Speed-key for man in Air Force. State make and lowest price. Chas Flater, Bloomfield, Ind.

**FOR SALE OR TRADE**—Philco 088 All-Wave Signal generator, 32v DC to 110v AC; 100w Kato converter with filters; "C" Melody Saxophone. WANT Solar "CB" or "CE" Capacity Analyzer or equal. University P.M. Units and projectors. Make offers. Harbert's Radio-Electric, York, Nebr.

**FOR SALE**—4 filter condensers 2,000 working voltage 2 mmfd, new, condition guaranteed, price \$1.25 each or will swap for pair of 75Ts or pair of neutralizing condensers NC-75 National or N-15 Hammarlund; will pay cash difference. Geo. E. Christophers, 194 Lemuel St., Fall River, Mass.

**FOR SALE**—Meters—Weston DC 7v; Splitdorf DC 20v; Jewell MA 100v; Jewell OHMS in series with 4.5v, 5000OHMS 15000 OHMS; Weston DC 5v others. Arlington Radio Service, 158 Jamaica Ave., Brooklyn, N. Y.

**URGENTLY NEEDED** — Complete set or part set Rider's Manuals; new, used or in any condition as long as no pages missing. Buford Brown, Box 190, Trion, Ga.

**FOR SALE**—Tubes. Write for list. Cross Radio, 901 W Touhy, Park Ridge, Ill.

**FOR SALE OR TRADE**—G E Transformer—250 MA (heavy duty) 2200/4400v—110v primary. Make cash offer or will trade for Rider's 8-11-12-13. Day and Night Electric, 6209 Santa Monica Blvd., Hollywood 38, Calif.

**FOR SALE**—Rider's Manuals 1-8, \$40, f.o.b. Quinton Biegert, 708 Topeka Blvd., Topeka, Kansas.

**WANTED**—Tube tester in good condition for cash. State make, model and price. George Pidherny, 3415 31 Ave., Astoria, N. Y.

**WANTED**—6v genemotor 275 or 300v at 80 or 100 ma or 6v vibrator power supply 300v at 100 ma. Single button carbon microphone; small portable volt-ohm meter. L. S. Coleman, 428 Delaware St., Syracuse 4, N. Y.

**FOR SALE**—Readrite tube tester model 430 and Ranger Examiner Signal generator model 557 with new batteries. Any reasonable offer accepted. The Modern Home appliances, 4A Mechanic St., Webster, Mass.

**WANTED**—Late model signal generator. State lowest price and full particulars, Columbia Radio & Electrical Service, 71 East 183rd St., Bronx 53, N. Y. C., N. Y.

**FOR SALE**—Power transformers; UTC S40; Kenyon K59 with 220v pri; Scott, in chromium shielded case. New amperite Kontak mike, SKH-H. Imp. with shielded lead. Also tubes, audio transformers, chokes and misc. parts. C. L. Goebel, 221 W 233 St., N. Y. 63, N. Y.

**FOR SALE** — Used harmonicas; Hohner Chromonica and tenor School Band, both "C"; Minevitch Chromatic, "G"; Vega Little Wonder tenor banjo with case. C. L. Goebel, 221 W 233 St., N.Y. 63, N. Y.

**FOR SALE**—New Radio Tubes at 30% off list. 2A6; 4S; 6A4/LA; 6A6; 6B7; 6SH7GT; 7V7; 12A; 37; 59; 2A3H. Ralph Hunter, 12 North St., Catskill, N. Y.

**WILL TRADE**—Philco model 088 battery operated signal generator and a Superior signal generator AC model GNT, for any three Rider Manuals except 1 and 2. Roy H. Bender, 260 S. 5th St., Columbia, Pa.

**WANTED**—Superior tester model 1280 or a Triplett tester model 1604. Will pay cash. State condition and price. Louis Mackay, R.F.D. 1, Box 19, Perth Amboy, N. J.

**WANTED**—Mallory or other make vibrator tester. Combination tester and tube checker. Also C-D or Solar condenser tester. Will pay your price. The Radio Shop, Galt, Calif.

**WANTED**—Tripod, good exposure meter and small radios. Will trade for tubes, filters or cash. Gerald Samkolsky, 527 Bedford Ave., Brooklyn, N. Y.

**FOR SALE OR TRADE**—3" Oscillograph, type 164, made by Dumont, and test oscillator No. 153 made by RCA. WANT signal tracer, Rider's Chanalyst, Hickok or Jackson. Olympic Radio & Refrigeration Service, 108 W Marcy Ave., Montecano, Wash.

**WANTED** — For cash—Hallicrafter S-20R Sky Champion or S19R Sky Buddy communications receiver. Must be in A1 condition. A. R. Green, 3921 Hampshire Blvd., Fort Worth, Texas.

**WANTED**—Rider's Manuals 6 to 13. Will accept single copy or set. Also other service material. State price and condition. George Pidherny, 3415 31 Ave., Astoria 3, New York.

**FOR SALE**—Vol. 1 to 7 incl. Riders Manuals, good condition, complete with index; Burton signal generator model 11, battery operated, range 100 kc to 70 mc. Make offer. C. F. McCracken, Hughes Park, Bridgeport, Pa.

**FOR SALE**—Complete tube stock; Input, output & power transformers; crystal cartridges; wire wound and carbon resistors; also condensers. Send stamped, self-addressed envelope for complete lists. Electronic Co., Hudson, Wis.

**WANTED**—Home recording set with playback in good condition. Reasonable. Lt. Leonard L. Stone, Army Office, Republic Aviation Corp, Farmingdale, L. I., New York.

**BURNED OUT TUBES REPAIRED**—From 2½/2 to 70v. Work guaranteed. Price 40c each. Returned C.O.D. W. H. Norman, 112 Douglas Ave., Rockwood, Tenn.

**WANTED** — Complete instructions for Weston tube checker model 674, either original or photostat. Will pay \$2.00. James O. Trauger, 18 Penna. Ave., Brookline, Upper Darby, Pa.

**SELL OR TRADE** — Bicycle brakes and brake parts. Can use radio tech. books, manuals, parts or test sets. W. J. Closson, 295 8th St., Troy, N. Y.

**WANTED**—Large scale set analyzer. Give full particulars. Will pay cash or trade for meters. Also want Riders Manuals. Sam Berenblum, Greenwich, Conn.

**WANTED**—Good signal generator. Give full particulars. Will pay cash or trade for meters. Sam Berenblum, Greenwich, Conn.

**TRADE**—35mm Univex "Mercury" 3.5 lens 1-1000 Sec. for reflex type with similar lens, test equipment, Rider Manuals or make offer. W. J. Closson, 295 8th St., Troy, N. Y.

**SELL OR TRADE**—Burton Rogers model 21 tube tester; Vacuum tube volt meter with Q-I MA meter; Dayrad all wave signal generator. WANT 100-1000 kc Crystal for frequency standard or complete unit. W. S. Crooks, Box 94, Kent, Ohio.

(Continued on page 11)

# LOUD SPEAKER RESPONSE MEASUREMENTS

(Continued from page 4)

integration of the pressure-space function, has been found advantageous in many respects. In the first place, it shows a probable sound pressure-frequency characteristic to which a listener within the array would be exposed. Secondly, it eliminates the more violent fluctuations in response

## Comparative Results

To illustrate in detail the comparative results obtained by the various methods of measurement discussed, and to demonstrate some of the acoustic phenomena involved in both listening and objective tests, a comprehensive series of measurements

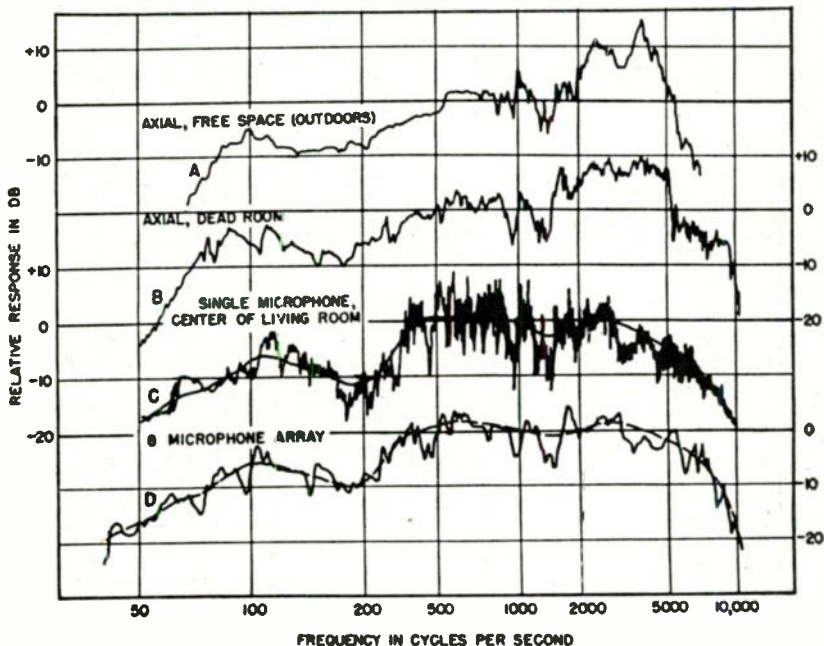


Fig. 7. Comparative response curves for the same speaker. measured under various indoor and outdoor conditions.

due to room modes which show up in single microphone curves and tend to confuse visualization of the general trend of the response characteristic. Lastly, a rough approximation of the total radiation characteristic is afforded because the array automatically takes into account speaker directivity.

was made on a loud speaker. The speaker consisted of an extended range 12-inch direct-radiator unit mounted in a total enclosure so as to provide the simplest type of radiation, i.e., from the front side of the diaphragm only. A Bass-Reflex enclosure would have improved the low-frequency response, but was not used

because such an arrangement provides two sources of sound at low frequencies.

To illustrate outdoor performance and the directional characteristics of the test reproducer, a group of four curves was taken at azimuths of 0 (on axis), 30, 60 and 90 degrees, using the outdoor tower. These are shown

stantially identical, indicating that the reproducer is non-directional in this range. For the extreme cases of 0 and 90 degrees, there is a difference in response at 2,000 cycles per second of about 18 db which would result in a considerable reduction in observed loudness, crispness, and intelligibility of speech, and brilliance of musical

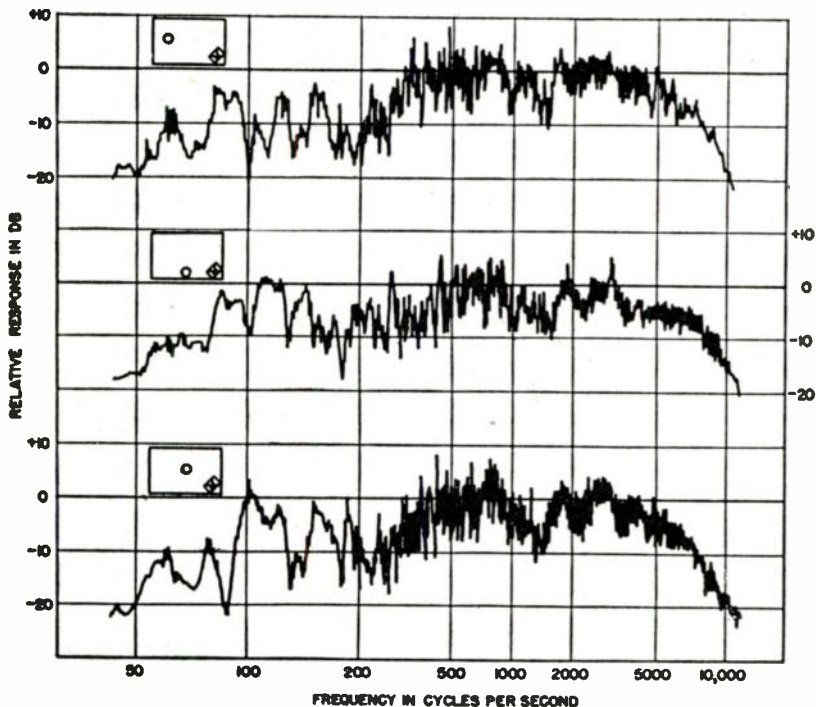


Fig. 8. Variation in response characteristic at different observation positions in a live room (speaker located in corner of floor with single microphone at designated position.)

in Fig. 6. The total ambient acoustical background level due to wind and noise prevented the extension of all curves to the same limiting upper frequency, but the trend is sufficiently well established to illustrate the progressive loss in response at the high frequencies with increasing azimuth angle. Below approximately 200 cycles per second, the curves are sub-

stantially identical, indicating that the use of this speaker to smaller angles, or require more speakers for wide angle coverage. This, of course, is under outdoor conditions. Indoors the situation would be quite different, for such angles between source and listener are improbable for the usual speaker locations, and multiple reflections and room effects have the effect



of increasing the sound energy density at probable listening positions.

Fig. 7 illustrates the kind of differences which were obtained between the outdoor and indoor responses determined under dead-room and live-room conditions. "A" is the outdoor response on the axis (0 degrees) at 10 feet from the speaker. "B" shows the dead-room indoor response measured on the axis at a distance of two feet from the speaker which is mounted on the approximate center of the end wall of the room. "C" and "D" show typical live-room results with the speaker mounted on an end wall midway between floor and ceiling; in "C" a single microphone located near the center of the room was used, while for "D" the 8-microphone array was employed.

The outdoor curve "A" shows the performance of the speaker under the simplest possible acoustic surroundings, that is, in essentially free spherical space in the practical absence of obstacles and reflecting surfaces. This is of interest to the loud speaker designer as it gives him an insight into the inherent electroacoustic performance of the speaker system itself.

If curve "A" is compared with the dead-room curve "B," a general similarity is at once apparent. Moreover, many of the individual irregularities apparent in "A" also show up in "B." The differences between the two curves are due to the room and to phase difference and diffraction effects due to the small separation between speaker and microphone in dead-room curve "B." The low noise level in the dead room made it possible to extend the measurements over a considerably wider frequency range than for the outdoor case.

Curve "C," taken in the live room with a single microphone centrally located, shows the preponderant influence of the room under conditions representative of those found in the average home. The normal room modes, relatively widely spaced at the low frequencies and increasingly closer spaced at the high frequencies, are

evident with their accompanying wide variation in response. A graphical average drawn through the record bears scant resemblance to curves "A" and "B." As will be illustrated later, the curve obtained will vary considerably with the position of the microphone in the room.

The smoothing effect of the 8-microphone array is at once apparent in curve "D." Because of the shifting pattern of sound within the room as the middle and higher frequency modes are successively excited, the individual microphones of the array are exposed to different field pressure conditions at any particular frequency in this range, and as would be expected, the integrated output of all the microphones eliminates many of the modes from the final record and the variations around the graphical mean are much less extreme. A curve of this type is rather easily interpreted visually and has been found to give good correlation with listening tests in the same room and for the same speaker location. The graphical means in "C" and "D" correspond rather closely, which tends to validate the premise that the array will indicate the general type of response characteristic to which a listener in the array region would be exposed. The actual point field conditions at the listening position are, of course, similar to those shown in "C." All of our indoor listening experience is acquired under conditions characterized by complex room behavior. This is one of the reasons why the satisfaction obtained from outdoor listening or indoor listening in highly absorbent acoustically-treated rooms, is considered to be relatively low and marked by an impression of lifelessness and lack of brilliance compared to that experienced in a relatively live room.

It is interesting to compare the axial pressure response curves "A" and "B" with the array curve "D" in the 2,000- to 6,000-cycle range. The axial response shows a relatively high rise in this region which is lacking in array curve "D" which is a measure of the total radiation. This illustrates

the point made earlier that the axial pressure must increase as the frequency is increased if the total radiation is to remain constant. The radiation is not maintained at high level above about 7,000 cycles in curve "D" but the characteristic has been found to be more than adequate for critical extended range listening with average listening test material.

The group of curves in Fig. 8 shows the rather considerable differences which were obtained in a given room with fixed speaker location as the listening position is shifted. No conclusions should be drawn as to the results which would be obtained in another room, even of approximately the same size, for the data holds for the test room only, with its particular ar-

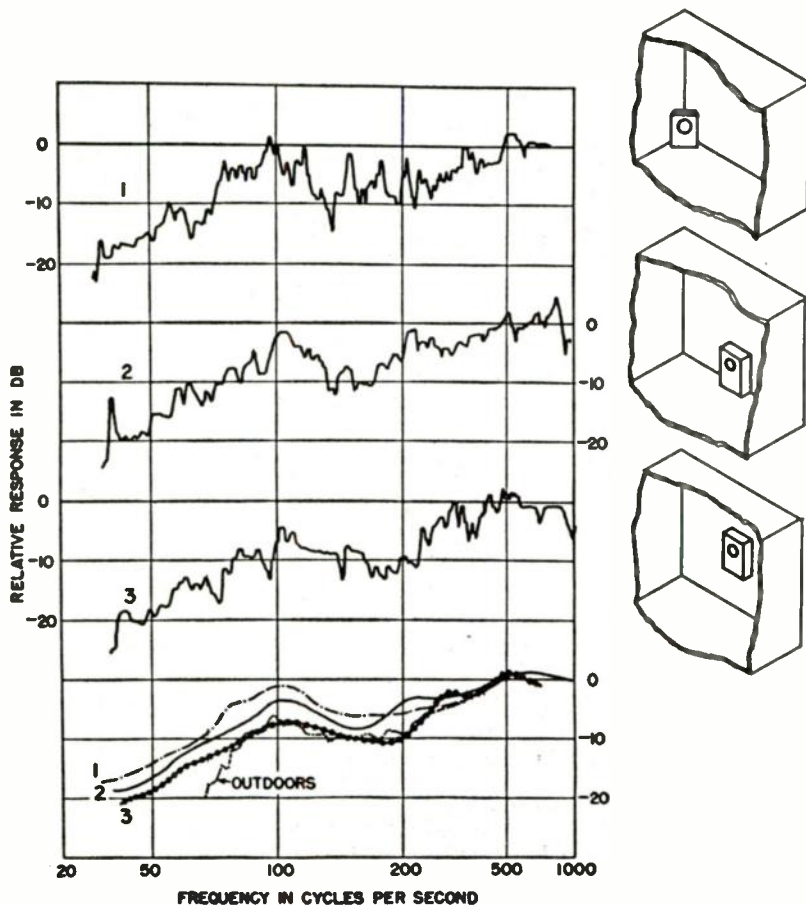


Fig. 9. Live room response for speaker in designated locations. Curves 1, 2, and 3 are 8-microphone array curves for indicated speaker location. Lower group of curves shows superimposed graphical means of curves above, to illustrate comparative efficiency of the various speaker locations.

rangement of reflecting and absorbing surfaces and other acoustical details. The most pronounced differences between the test positions show up in the low frequency region below 500 cycles per second. This would be expected, because at low frequencies, a change of position would greatly alter the relative predominance of the various room modes which influence the field conditions. Position differences of this sort are particularly important in listening tests, where it has been found essential to make observations at different points in the room in order to form valid judgments of loud speaker performance.

The last group of curves, illustrated in Fig. 9, shows the influence of loud speaker position on the low frequency efficiency as indicated by array measurements. The positions shown are commonly employed and were studied because of their practical aspects. Curve 1 is for the case of the speaker in a floor corner position; curve 2 is for location on the floor against an

end wall at its center; while curve 3 is for a speaker centrally mounted on an end wall. Only the portion of the response curves below 1,000 cycles is shown, because from the theory it is known that the influence of position on response through restriction of the solid angle of radiation is effective only in the region below about 800 cycles. The graphical mean of the curves for each individual position was drawn and these are shown superimposed in the lower group of curves. For interest and to aid in evaluating the amount of improvement introduced by the various speaker positions, the outdoor axial response is also shown. The corner position is definitely to be preferred, with an efficiency approximately 5 db higher than for the wall position. Position 2 (wall and floor intersection) is the next best with a gain in the order of 2 db. All three positions are definitely better in the extreme low frequency region than the outdoor response.

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## THE RADIO TRADING POST

(Continued from page 6)

**WANTED**—Superior tube tester mod. 1240 or late Supreme tube tester & ohmmeter comb. **SELL OR TRADE** N.R.I. Radio Snd & Tvan Course. Also small mica capacitors, odd coils for R.F. expts., coupling transformers—Desire tubes—what have you? Pesarchic's Electronic Serv., 123 McCormoughy St., Johnstown, Pa.

**FOR SALE**—Supreme No. 85 tube checker with adapters, \$20. — **WANTED**—Rider's Manuals from 6 to 13, and radio tubes. Castle Hill Radio, 2228 Newbold Ave., Bronx New York, 61.

**FOR SALE**—G M Delco auto radio and speaker, \$15. Remington p.a. rifle \$20. vice and parts data factory manuals. Also Arvin factory parts and service manuals. Paul Capito, 637 W. 21 St., Erie, Pa.

**FOR SALE OR TRADE**—Weston mod. 772, supersensitive analyzer and Triplett mod. 1200A, volt ohm millimeter for good med. sized camera or lenses or R.F. oscillator. E. O. Mueller, 3445 Narragansett Ave., Chicago 34, Ill.

**FOR SALE OR EXCHANGE**—Test Instruments, tubes, supplies. John Trowbridge, 7936 Parnell, Chicago, 20, Ill.

**WANTED**—Maytags or other makes washing machines; state price and condition. Have Stewart Warner receiver and cash. J. W. Akers, Box 96, Stone, Ky.

**FOR SALE**—Code practice osc., 8' AC fan, 6v genemotor, AC-DC phono amplifier with tubes and speaker, 2 amp charger, 200 pieces mica conds. Philmore crystal set, elect. clock, tubes 2B7, 224, 238, 57, 56, \$40. takes all Stanley J. Zuchora, 2748 Meade St., Detroit 12, Mich.

**WANTED**—Signal generator, V-O-M small battery charger. **FOR SALE** — Correspondence Radio Course, 1941 Diag Manual by Radcraft, all A-1. Royce Saxton's Radio Shop, R 1, Pontiac, Ill.

**WANTED** — Recorder and play back unit with two speed motor; also Ol ma. or O200 mma. meter. I Dowbin, 3211 N. 17 St., Philadelphia, 40, Pa.

**WANTED**—Precision E200 signal generator, Stencor dc. power pak, mod. 132 or 131. Cash. W. H. Carney, 170 Wool Ave., Portsmouth, Va.

**FOR SALE**—Radio tube tester, Jewell Pattern 209—110-120v—10 and 50 milliamperes meter, 5 4-prong and 1 5-prong socket, black bakelite case, in excellent condition. DePalma Service, Fancher, N. Y.

**WANTED**—9" oscilloscope; 60 cy gas driven generator; Xtals for 25kc, 50kc, 75kc, 100kc; 100w audio amplifier; 40w audio amplifier; RCA 833A tubes or equiv.; RCA 872A rect. tubes. H. N. Luke, 2113 Somerset Place, Oklahoma City 6, Okla.

**WANTED**—Triplett model 1600E VOM. Precision model E200 sig. gen. **FOR SALE OR TRADE** — Webster port. recorder, single speed motor and leather pickup complete in airplane luggage case, but no amplifier. Valley Radio, 867 Broad St., Central Falls, R. I.

**FOR SALE**—14w. new amplifier, new tubes. Has radio input, phono input, and mike input; \$25. Volt meter, new \$40. **WANTED**—the following tubes: 2 1A7GT-G, 2 1N5GT-G, 2 1H5GT-G, 2 12 SA7GT-GI, 2 50L6 GT-G, 2 1R5, 2 1S5, 2 1T4, 2 6A8 GT. C. Morgan, 2209 Edison Ave. Jacksonville, 4, Fla.

**FOR SALE**—Mod. 551 Supreme analyzer, used very little. \$35. Dundee Radio Shop, Dundee, Mich.

**WANTED**—Hickok 510X tube and set tester in good cond. for cash or part trade. What do you need? F. U. Dillon, 1200 N. Olive Dr., Hollywood 46, Calif.

**WANTED**—Fly rod and reel both in good condition. Will pay cash. F. A. Witkowski, 32 Daymond St., Trenton, 10, N. J.

**SERVICE**—Engineer will repair or revise your test equip. Will accept meters and parts towards payment. Also equipment designed and built at low cost. I. Dlugatch, 10 Ocean Parkway, Brooklyn 18, N.Y.

**WANTED**—Analyzer and tube tester for cash. J. A. Brown, 315 Santafe St., Waynoka, Okla.

**WANTED**—Superior Test Instruments, any type or age. RCP Analyst., also other make test instruments, radio parts, phono parts. Send list and prices. Radio Shop, 1504 La Baig, Los Angeles 28, Calif.

**WANTED**—Superior Model 1280 comb. tester with cover. State condition and lowest price. M. Seltzer, 223 Keap St., Brooklyn, N. Y.

**FOR SALE**—Various used communication receivers. Send for list. Gerald Sankofsky, 527 Bedford Ave., Brooklyn, N. Y.

**WANTED**—For Cash—Portable radio, battery and electric comb. in good condition batteries included Miss Angie Ciafui, 402 Genesee St., Trenton 10, N. J.

**SELL OR TRADE**—4-tube Philco, 2-77, 80, 42; phono amplifier from Rockola mach., 2 6B5 driven by 6A6 tube, 12" speaker; NEED K & E Slide Rule Log-Log Deciding or Vector and miniature camera with fast lens. Wm. Tucker, 393 Elizabeth Ave., Newark, N. J.

**SALE OR TRADE**—Clough-Brengle CRA 3" oscilloscope, audio osc., both perfect. 3" meters. Quantity Xmtng gear. Typewriters. WANT 16mm. movie equip., films, etc. Warren S. Gilman, Winter St., Tilton, N. H.

**WANTED**—Correspondence with radio men with parts, I.F. speakers or experiments or ideas in S.W., etc., Henry Ecklund, 290 E. Lawson St., St. Paul, Minn.

**WILL TRADE**—Oliver typewriter No. 9; also 1/4 h.p. motor for multimeter. Smith Radio Service, 132 S. 7th St., Steubenville, Ohio.

**URGENTLY NEEDED**—Philco 030 signal tracer and C.D.B.F.50, Solar, Sprague & Jackson or Aerovox LC condenser analyzer, Jack's Radio Service, 34 W. Hoffman Ave., Lindenhurst, N. Y.

**SELL OR SWAP** — Cathode Ray 5BP1.. Never used and 2 RCA 813. Best Offer. J. Middleton, 25 Hartford St., Newark, N. J.

**FOR SALE**—35 battery set chassis, over half parts steel mounted, \$1.25; with speakers \$2.; 6 auto chassis with speakers, \$2. A.K. "B" Pak with 607 rectifier tube, \$3. Several hearing aid parts and tubes left. Edwin Larason, Martinsburg, Ohio.

**WANTED**—Standard make 3" oscilloscope, signal generator, and either a Cornell-Dubilier Capacitor Analyzer, a Solar or an Aerovox. State make, condition and price. George J. Vervilos, 2180 Gerber Ave., Sacramento, California.

**WANTED**—Set of service manuals and signal generator. Must be good. Cash. R. E. Carr, Box 155, Harper, Kansas.

**URGENTLY NEEDED** — For cash—Communication receiver, 6 to 8 tubes, ac.-dc. operation. Echophone Ec-1 or Ec-4, Howard 445 or similar type receiver. Thec Folta, 300 Nichols St., Utica, N. Y.

- FOR SALE**—Misc. chemical equip and reagents; new and used radio tubes. Raymond H. Ives, RT 1c; Radio Lab. Bldg. 813; U.S.C.G. Base, Berkeley, Norfolk 6, Va.
- FOR SALE** — Webster phono-meter and pickup, \$17.50; over 1000 guaranteed tubes at list price; Meissner 9-1000 remote control with push buttons, list price \$26.50 now \$15. Can supply any tube wanted. Will trade 6-12-30v tubes. Goodwin Radio Shop, Rankin, Ill.
- WANTED** — Meissner high fidelity P.A. Tuner 101152 or foundation kit for same, consisting of 4-gang tuning cond. and TRF hand pass coils. E. J. Rome, 222 Coolidge St., New Orleans 20, La.
- FOR SALE**—Microphones, amplifiers, pickups, speakers, baffles, auto aerials, intercommunication wire (12 pr) Mallory 554 vibrapac and amplifier chassis. write for list. Fox Radio Service, 435 So 5th St., Richmond, Indiana.
- FOR SALE**—Tubes: HY75, HY615, 954, and 955. Fox Radio Service, 435 So. 5th St., Richmond, Indiana.
- FOR SALE** — Supreme Andiolizer model 562 recently overhauled by factory. Best offer—half down, bal. C.O.D., Henry House, 306 So. 2nd St., Guthrie, Okla.
- WANTED**—Late model dynamic tube tester and an all wave signal generator in A-1 condition. State model and price. George Shimamoto, 8-7-C, Relocation Branch, McGehee, Ark.
- TRADE OR SELL**—Radios, parts, tubes, test equip., meters, rectifiers, phono motors, pickups, electric drills, tools manuals, text books, neon bulbs, magazines, etc. Describe your goods fully. Stamp for list. Roby's Swapmart, 820 E. 61st St., Chicago, Ill.
- FOR SALE**—De Vry 35mm. portable motion picture projector in new condition, \$35. George Cannova, 40-13 Union St., Flushing, N. Y.
- TRADE**—Hallicrafter 5x16 receiver. Also rack and panel 250 w. Xmitter—both in A1 condition. **WANTED**—Test equipment, tube tester, oscillator, etc. Lew Daufman 233 S. Connecticut Ave., Atlantic City, N. J.
- FOR SALE**—Gevaert Superchrome 5x7 film, 3 dozen in package. Hammer Portrait Ortho 5x7 film, 2 dozen in a package. All in factory sealed packages—\$1. per dozen. Cannot sell less than full package. Big Sandy Maytag Co., Pikeville, Ky.
- WANTED**—Tube tester and signal generator. State price and condition. B. Sexton, 420 Hartman St., Missoula, Mont.
- HELP WANTED**—Experienced radio man, draft exempt or physical discharge good. Steady position or partnership. E. End Radio Service, 634 E. Pike St., Clarksburg, W. Va.
- FOR SALE**—3 Brunswick 9 tube superhet chassis. Majestic mod. 370 chassis superhet; Fada chassis; 2 RCA dc. superhet chassis; Majestic 90 power pk; Espey A eliminator. Louis A. Goldstone, 1279 Sheridan Ave., Bronx, N. Y., 56.
- WANTED**—8 mm. camera or projector or reflex type camera or F.M. converter SWAP—Stancor 440MB modulator, 1000 and 1200 v power supply and high freq. transmitter. Like new—all tubes incl. Al Hoffmann, 275 Woodbine St., Brooklyn, N. Y.
- WANTED**—Late Sprayberry or N.R.I. complete radio course. State condition and lowest price. Dr. C. H. Farnsworth, 561 E. Lafayette, Jackson, Tenn.
- WANTED**—Rider Chanalyst mod. 162, also Precision EV10MCP V-T multi-range tester and set of Rider Manuals. State condition and price. Houston Radio Service, Box 31, New Florence, Pa.
- WANTED**—Late mod. tube tester and signal generator. Also Voltometer ranging to 1000v ac.-dc. and measuring 3 megs. Will pay top price. V. Bashman, 1753 1/2 N. Highland Ave., Hollywood 28, Calif.
- WANTED**—Superior mod. 1280 set tester in good condition. Cash waiting. Forest Park Radio Service, 29 So. Euclid Ave., St. Louis 8, Mo.
- WANTED**—Tube tester, Precision 912 or equivalent in new condition. Dawson Radio Service, 11 Lisbon St., Providence 8, R. I.
- WANTED**—Phonograph motor 78 rpm. ac. self starting with mounting brackets, etc. State cond. and price. Also pocket V.O.M. similar to Triplett 666 or Supreme 542, and small condenser analyzer. Louis Fialkoff, 143-48 41 Ave., Flushing, N. Y.
- WANTED**—Will pay cash for copy of instructions and schematic diagrams for Clough-Brengle OMA or CRA oscilloscope. Vin Taverna, 16 Innis St., S. I. 2, N.Y.
- WANTED**—Hickok signal generator model OS10; will pay \$25 if in A-1 condition All letters answered. Pasquale Calabrese, 725 Elton Ave., Bronx, N. Y. (55)

**FOR SALE OR TRADE**—Supreme 5 in. fan meter from tube tester. Ol ma. WANTED .303 Savage rifle in good cond., Roberts Radio Service, Wheeler, Mich.

**WANTED**—Analyzer, volt ohm milliammeter oscillator, tube tester. New and standard models. Send particulars. R. H. Paul, Electrician, Southern University, Scotlandville, La.

**WANTED** — Hallicrafters S27 FM-AM receiver or S31 tuner Also two each high fidelity magnetic phono pickups RCA 70A or WE 9A. A. C. Brooks, 70 Gibbs Ave., Newport, R. I.

**FOR SALE**—Superior 1240 tube tester, Superior 1230 generator, Green Flyer phono motor and turn table, 1500v sign. transformer, tubes etc. Send for list or make offer. R. E. Rice, Fairchild, Wis.

**WANTED**—For cash, sm. VOM, 1" oscilloscope, sm. radios. State price and condition. H. Samkolsky, 527 Bedford Ave., Brooklyn, N. Y.

**FOR SALE**—64 Utah Z612 transformers at \$2.49 net; 55 Utah E6P speakers at \$3.15 net F.O.B. Springfield, Mass. Ralph D. Jones, Inc., 721 Worthington St., Springfield, (5) Mass.

**WANTED** — Following Victor Records: "Three Shades of Blue"; "Doll Dance"; "Blue Heaven"; "Nala"; "Smoke Gets In Your Eyes"; "Broadway Melody"; also 16 mid 450, 475v Electrolytic condensers. Frank W. Jones, Gabbs, Nev.

**FOR SALE**—Used radio parts for building sets. Send stamp for list and price. Richard Wolf, Box 49, Route 2, Wishek, North Dakota

**FOR SALE**—Zenith Pocket radio with tubes \$10. Dictagraph earphones 3000 ohm \$1.75. JFD. radio battery adapter harness for Philco BO Paks, \$1. RCA Electronic Control model 41903, \$6.75. A.K. 12" 32v speaker, \$1.50. A.K. "B" Eliminator with 607 rectifier tube, \$2. Parmak 6v fencer, accessories, display rack, \$15. Edwin T. Larason, Box46, Martinsburg, O.

**WANTED**—RCA television signal generator, RCA or Dumont 3 or 5" oscilloscope, Hickok or Rider signal chaser, RCA, GE or Dumont television receiver, Riders Vol. X. State condition and price. Will trade Philco 45-2926 Dipole antenna kits and 45-2928 reflector kits. Richard G. Devaney, 216 South 60th St., Philadelphia 39, Pa.

**WANTED**—15 to 100W amplifiers, turn tables, microphone stands, pickups and intercommunication units. Fox Radio Service, 435 So. 5th St., Richmond, Ind.

**FOR SALE**—Inverter from 32v d.c. to 110v a.c. 110v port. light plant like new, suitable for operating mobile PA system.

**WANTED**—Voltomyst Jr., perfect cond. Also test equip. and P M speakers. W. S. Frank, R. Rt, 3, Chippewa Falls, Wis.

**FOR SALE OR TRADE**—6 tube Western Electric mod. 4D receiver; also one tube WE regenerative receiver, both in working order with all tubes (215A types) WANT test equip. or ham receiver. George S. Maxey, 174 Taurus Ave., Oakland 11, Calif.

**FOR SALE**—Ultra-High Frequency Techniques, by Brainerd, Kohler, Reich and Woodruff, \$4. Frequency Modulation by John Rider, \$1. General Radio Service, 1203 Eckart St., Fort Wayne 5, Ind.

**WANTED**—Rider's Manuals, vol VI and all later issues. Cash or radio merchandise in exchange. E. D. Cook, Radio Dept., 1071 Union Ave., Memphis, Tenn.

**FOR SALE**—Portable Diathermy mach., "Elec" & Violet ray; Port. Health mach. for Sinusoidal and Faradic and Violet ray treatments; 2 Brunswick 9 tube Supers with or without sprgs; 4 Kolster radios, mod. K20; 1 Temple chassis and power pk. good job. Louis A Goldstone, 1279 Sheridan Ave, Bronx, New York 56.

**FOR SALE**—Complete N.R.I. Course incl. advanced course. \$15. Arthur Kruger, 1316 Morgan Ave., North, Minneapolis, 11, Minn.

**WANTED**—For Cash—Good used televisn receiver. Also 8mm. movie camera and projector. Give details. Michael A. Petko, 4322 Wayne Ave., Philadelphia 40, Pa.

**SELL OR SWAP**—Model Craftsman, Radio, Popular Photography, Minicam magazines, radio parts, miscellaneous photographic accessories, lenses. **WANTED**—Model Engineer and Electrician magazines, Hornet Engine, Kodaslide projector. Write your wants; all letters answered. Fred J. Gomme', 46 N. W. 94 St., Miami, 38, Florida.

**WANTED**—Any quantity—must be perfect and boxed—1A7GT, 7A8, 7B7, 5Y3, 5Y4, 5U4, 12SA7, 12SK7, 12SQ7, 12A8, 12K7, 35A5, 35Z3, 35Z4, 35Z5, 25L6, 35L6, 50L6, 43, 47, 50Y6, 50Z7, 45Z5, all 117v series. Give full particulars first letter. Leading Radio, 114 East 3 St., Mt. Vernon, N. Y.

**FOR SALE**—Hallicrafter Sky rider Commercial 11 tubes, 5 bands, 110Kc to 11,500 Kc. in metal cabinet for table or rack mounting. 6" speaker with metal cabinet to match. Complete and perfect with tubes, \$105. Harry M. Boone, Radio WFBR, 10 E. North Ave., Baltimore, Md.

**TRADE**—0-1 milliammeter, Rider Manuals, test equip., tubes, radio equip., etc. **WANT** K&E Engineer's slide rule or equal, LC checker, Jr. v-ohmist, old watches and jewelry. Robert G. Browning, 552 Eleventh Ave., Prospect Park, Pa.

**WANTED**—Wireless phono oscillator, 1, 2 or 3 tube, in working order. Also 35 mm. candid camera or 127 size for cash. Have sound picture supplies; projectors, lamp houses, generators, rectifiers, sound heads. John Arnold, P. O. Box 84 Bluffs, Ill.

**FOR SALE**—One 5AP4 5 in. White C.R. Television tube, unused, orig. carton; 1 Philco signal generator, good condition. **WANTED**—All types high-grade laboratory equipment in any condition. Charles C. Littell, Jr., 308 W. High St., Piqua, Ohio.

**WANTED**—Capacitor Analyzer, also 776 Weston A C Oscillator, 504 Supreme tube and St. tester. Must be in first class condition and lowest cash price. Rudolph's Electric Service, 33-35 E. Jackson St., Wilkesbarre, Pa.

**FOR SALE OR TRADE**—1/10 hp Emerson synchronous motor, 110v single phase, 900 rpm, non-self-starting, reversible, with 1" dia. hollow outside threaded shaft. Dexter Kurs, 4525 45th St., Long Island City 4, N. Y.

**WANTED** — Automatic record changing, record player unit. Prefer Garrard or Capehart. State full details and price. Dexter Kurs, 4525 45th St., Long Island City 4, N. Y.

**WANTED**—Colt .22 cal. Woodsman automatic pistol. Also Rider's Manuals 5 to 13 incl. State condition and price. G. T. Iler, P. O. Box 71, Fanwood, N. J.

**WANTED**—Late model portable tube tester of good standard make and condition and have neon short test. State price and description. Big Sandy Maytag Co., Pikeville, Ky.

**FOR SALE**—Radio tubes (many hard to get) or will trade for late test equipment. Send for list. Roxy Radio Repair, Mitchell, S. D.

**WANTED**—Supreme model 561 and Supreme model 560A. in excellent condition. will pay \$225. cash F.O.B your place. R. L. Bradford, 712 6th Ave., W., Decatur, Ala.

**FOR SALE**—Starrett O 1 in. Vernier micrometer No. 238—best cash offer. Walter Kryger, 912 W. 151 St., East Chicago, Ind.

**TRADE** — 3 asst. power transformers, 3 chokes, 2 output transformers, 3 asst. speakers, 2 radio chassis, 25 asst. 2F R.F. Ant., 2 osc. coils., 25 asst. bypass condnrs., 25 asst. resistors, 1 lb. radio hardware—for just ONE Rider Manual, 8 to 13. Troch, 413 Hummel Ave., Lemoyne, Pa.

**FOR SALE**—Complete stock of Radio tubes. NEED Mobile PA systems, Xtal mikes with rubber-covered shielded cable—best price for burnt out Cathode ray tubes—also 83 tubes..V. Kozma, 3104 Wilkinson Ave., N. Y. 61.

**FOR SALE**—Service magazine—Feb. 1932 to Mar. 1942, incl.—122 copies. \$5. takes lot. Ira I. Walker, 1612 Cent Ave., Great Falls, Mont.

**SELL OR SWAP**—Control units for most cars and sets: Univex 8mm. movie camera, orig. pkg.—**WANT**—phono motors, crystal pickup, tubes or cash—what have you? Leo Stein, 7 Monroe St., Mt. Vernon, N. Y.

**FOR SALE** — Clough Brengle OC signal generator, re-aligned with chart—factory pack. and bill. \$50. cash. Supreme Mod. 89. excel. work. cond., with chart and extra tube testing charts. \$30. Precision Radio Service, 40-13 Union St., Flushing, N. Y.

**WANTED**—Meissner FM chassis, Solar CB analyzer, Carron AF oscillator, RCP signal generator, Superior channel-analyzer. Equivalents considered. State price. Soundways, 560 Walnut St., Fall River, Mass.

**FOR SALE**—2 metal cabinets for transceivers. H15 1/2" W8" D6" back plates but no panels—1 metal stand for meter (3" hole) D4 1/2" W4 1/2" back height 4 1/2" front height 2".—3 Ceramic ribbed coil forms, 2 Jewell and 2 Weston meters. John Archibald, 1722 Melville St., Bronx, N. Y.

**WANTED**—Garrard RC30 record changer or GI C125L. Also other makes. State age, condition and price. Leonard C. Pochap, 2930 Upton St., N. W., Washington 8, D. C.

**WILL BUY**—Used crystals, 20c ea., any quantity—must be intact and not opened. Cash by return mail. Leading Radio Service, 114 East 3 St., Mt. Vernon, N. Y.

**FOR SALE**—Meissner Analyst Model 10-1154 in perfect electrical condition. Price \$75. C.O.D. Mathews Radio Service, P.O. Box 387, Bloomingdale, N. J.

**WANTED**—Amphenol connectors type 93C, 93M, and co-axial cable No. 72-12. Frank J. Polinski, Warren, N. Y.

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