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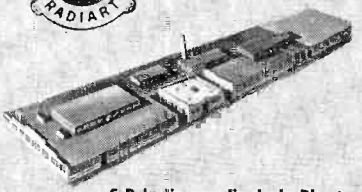

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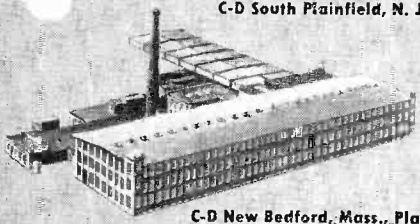

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Vol. I8 JULY, 1953 No. 7

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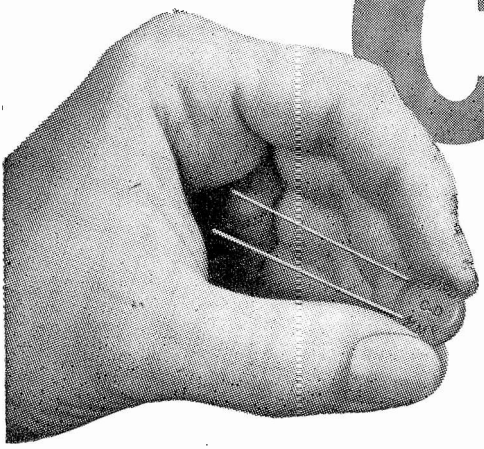

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RAPID CHECKOUT METHODS IN TV SERVICING

In any repair business, the fast trouble-shooter makes the most money per job-hour and gives his customers the best service. Rapid, accurate diagnosis is the keynote of all successful servicing. In television servicing, it is particularly important to reach the true cause of trouble quickly, because the complex interdependency of the circuits in a t. v. receiver can arouse confusion when guess remedies are applied.

A doctor who has interned in a busy hospital or who has had considerable experience afterward often recognizes many ailments at a glance and does not need to use step-by-step methods. The same is true in t. v. servicing. Certain troubles appear often enough to be spotted at once by their symptoms. But usually it is only the specializing technician working on the same make and model of set all the time who can count on this good fortune. All others who work on many varieties must settle on a systematic method which has been streamlined to eliminate all false starts and lost motion. The systematic procedure is faster and surer in the long run than are haphazard tests which yield occasional dramatic successes.

The following studied program is offered as a rapid checkout sequence for troubleshooting. Study the program carefully until its steps are memorized. Then practice it often enough in the shop until it becomes so habitual that you can move rapidly through its steps. When evidence of trouble appears during one step, pause to fix the trouble and then proceed to the next step — but do not omit any succeeding step. More trouble is apt to be present farther along. The strong argument in favor of an inflexible step-program is that it actually speeds up troubleshooting by eliminating backtracking and confusion. We invite those technicians who rebel naturally against system to give the organized step procedure a fair trial before pronouncing judgment.

1. Briefly Survey the Layout

As quickly as possible, familiarize yourself with the set. Inspect the block diagram and circuit schematic, as obtained from the manufacturer's literature, Rider's manuals, or Photofact sheets. Naturally, your speed of movement will depend upon knowing where the particular tubes and other major components are located and how the arrangement differs from the basic layout of a typical receiver circuit. It is not necessary to dwell long at this step. You should take no more time than is necessary to gain a general acquaintance with the layout, unless there are "foreign" circuits which require some study on your part to understand.

From this point on, keep the block diagram, top-of-chassis layout, and below-chassis layout drawing or photograph in front of you for ready identification of stages and components. Tube placement guides[1] are invaluable.

2. Make Preliminary Sight-and-Sound Inspection.

If the set is operating at all, learn all you can from the picture and sound reproduction. Make notes (mental or written) of what you see and hear. Complete absence of picture, raster, sound, or all three will point immediate-

ly to the channels in which trouble definitely is present (failure of video channels, sound channel, front end, low-voltage power supply, high-voltage power supply, deflect on circuits, etc.).

For this inspection, it is helpful to pick up an actual t. v. broadcast, preferably a test pattern. In the absence of a test pattern or broadcast program, use a bar generator or feed an amplitude-modulated signal into the antenna input terminals of the receiver. The horizontal or vertical bars which then appear on the screen and the modulation tone reproduced by the loudspeaker will indicate the condition of several of the circuits and how they are behaving (See "Emergency TV Troubleshooting with Common Test Instruments," C-D CAPACITOR, June 1951).

Abnormalities of the picture reveal certain troubles directly. Examples are (1) **Vertical white lines:** leaky capacitors, defective flyback transformer, breakdown in high-voltage circuit. (2) **Vertical black or gray lines:** Barkhausen oscillations. (3) **Black horizontal lines:** power supply hum coupling. (4) **Picture non-uniformity:** Failure of linearity circuits. Inexpensive pictorial guides [2], [3], [4] are available which show photographically how a picture is degraded by certain troubles, and one or more of these guides should be as much of a technician's working equipment as circuit diagrams until such time as he learns them by heart.

Certain troubles are self-evident from the state of the picture or sound. For example, **perfect sound but no raster nor spot** point to failure of the high-voltage power supply (or picture tube). But not more than one attempt should be made to correct one evident trouble at this time. It is more advisable to proceed with the organized program. Functional controls (tuning, brightness, contrast, volume, sync, etc.) should be adjusted throughout their ranges, while noting the effect of their adjustment upon both picture and sound.

3. Check All Tubes

The complete tube test is imperative and the time required to check every tube should be included in every t. v. service charge estimate. Include the picture tube in this set of tests.

Replace each tube shown defective by the tube tester, except where it appears obvious that the tube has been ruined as a result of failure of some other circuit component and that a new tube also would be wasted. (An example would be a completely blown-out low-voltage rectifier tube where the cause of failure very likely is a shorted filter capacitor. Check the d. c. circuit for shorts and grounds before inserting the new rectifier tube.) In critical circuits, use a substitution tube for an additional corroborative test when the tube tester shows the original tube acceptable but trouble is suspected in the circuit. An example is the 6SN7 horizontal multivibrator tube in many sets. This tube will fail to operate properly, although giving a perfect reading in a tube tester and performing satisfactorily in other types of equipment such as audio amplifiers. The final criterion is whether or not a given tube will operate in the circuit.

Carefully note the positions in which replacements are made, since replacing the tube may require additional work, such as realignment in the video i. f., sound i. f., and sound discriminator or ratio detector stages.

In connection with tubes, it is wel to remember that trouble centered about tubes often is not inside the tube but

in the socket. Service technicians are reporting increasing instances of loose contacts, broken joints, intermittent soldered connections, and insulation breakdown in sockets. While working with the tubes, it is advisable, therefore, to wiggle the tubes in their sockets and to tap them lightly after insertion in order to spot electro-mechanical faults. Loose tube shields also contribute to intermittent operation.

If germanium diodes are used, disconnect each temporarily from the rest of the circuit and check for rectification efficiency and reverse-current magnitude.

4. Check Both Power Supplies

Check the low-voltage power supply first and then the high-voltage unit. This is the logical procedure, since the high-voltage power supply derives its drive from the low-voltage unit.

The entire load of the set should be on during this test, otherwise valid data will not be obtained. Use a d. c. vacuum-tube voltmeter and compare the full-load d. c. output voltage (at the output of the low-voltage filter) with the value indicated in the service literature. If there is a 10 to 20 percent drop in voltage from the published value, look for excessive drain in the receiver, circuit defects in the filter (especially worn filter capacitors), or reduced secondary a. c. voltage at the power transformer.

If selenium rectifiers are used, disconnect these temporarily from the circuit and check for rated forward and reverse currents.

5. Check All Circuit Voltages

This step is associated closely with Step 4 with which it should be integrated.

This is a static test which usually is confined to d. c. voltage measurements. Check each plate, screen, and cathode voltage, using the d. c. vacuum-tube voltmeter. Set the brightness and contrast controls at maximum and, preferably, have a station tuned-in with test pattern. Compare the measured voltages with tabulated values in the service manual and suspect any d. c. voltage which has changed more than 20 percent from rated values.

Pay particular attention to the d. c. potential at the high-voltage anode of the picture tube. Use a suitable high-voltage probe with the d. c. vacuum-tube voltmeter or with a 20,000 ohms-per-volt non-electronic d. c. voltmeter

Check the a. c. voltage at the tube heaters. This should not be lower than 5.67 v. nor higher than 6.93 v. in a nominal 6.3-volt system. Either an a. c. vacuum-tube voltmeter or a non-electronic a. c. voltmeter can be used for this test.

6. Make Dynamic Tests

Under the heading of dynamic tests are included all measurements involving actual signals in the receiver circuit. These tests include oscilloscopic examination of signal and sync waveforms throughout the circuit, signal injection, signal tracing, and realignment. Dynamic tests are made most suitably only at this point in the program; that is, after all static tests, tube replacements, and preliminary inspections have been completed.

With a station tuned-in (preferably with test pattern), video and sync waveforms should be examined in each applicable stage of the receiver. Both the shape of the signal and its peak-to-peak amplitude must be checked with a wide-band oscilloscope and suitable input probe, and compared with data given

in the circuit diagram or service literature.

Signal tracing and signal injection long proved themselves invaluable yet simple tools for the dynamic testing of radio receivers but have been overlooked to a large extent. by t. v. technicians. An effective form of signal tracing is the inspection of the signal systematically at the input and output of each stage, using a wide-band oscilloscope, while the set is receiving a t. v. broadcast (preferably a test pattern). In t. v. servicing, signal injection is not so easy a matter, except in the audio, video amplifier, video detector, and tuner stages where a suitable signal conveniently may be coupled-in.

Several issues of the C-D CAPACITOR have been devoted to instructions in various phases of dynamic testing of t. v. receivers. See References 5 to 12 inclusive at the end of this article.

One of the handiest simple aids is an ordinary amplitude-modulated test oscillator or signal generator, which fed into the antenna input terminals of the receiver will give both visual and aural indications from which much useful qualitative data regarding the conditions of the set can be determined quickly (See "Emergency TV Troubleshooting with Common Test Instruments," C-D CAPACITOR, June 1951).

Square waves afford the most rapid dynamic test of the important video amplifier channel of a t. v. receiver. For this test, a good square-wave generator (or sine-to-square wave converter) and a wide-band oscilloscope are required. Two square wave repetition rates should be chosen — one at a relatively low frequency; the other in the near supersonic range. A suitable choice is 60 cycles and 50 kc. Square waves at both frequencies should be reproduced with good faithfulness after passing through the video amplifier.

The technique is similar to that of checking an audio amplifier with square waves. With a low-frequency square wave, overshoot of the trailing edge of the output wave and a left-to-right tilt of the tops and bottoms are caused by defective coupling and bypass capacitors. The picture on the t. v. screen under these conditions usually exhibits horizontal variation in shading. With the high-frequency test signal, rounded trailing edges of the output square wave is an indication of degraded high-frequency response which gives rise to poor picture detail and is caused by defective peaking coils or by stray capacitances (often the result of disturbed lead dress). Damped-wave oscillations on the horizontal tops and bottoms of the output square waves will produce vertical stripes, both black and white, in the picture and are caused by overemphasized high-frequency response — overcompensation traceable to defective peaking circuits.

An important technique in dynamic t. v. testing which, although not widespread at this writing, gives signs of increased adoption is the use of substitution channels. The substitution units employed are actual self-powered receiver channels which can be patched around inoperative corresponding channels in the set under test. Two purposes are served: (1) to verify quickly that the "bridged" channel is defective, and (2) to restore operation through the rest of the receiver in order that troubleshooting may be carried on in other parts of the set. Substitution channels include the following: front-end tuner, video i. f. amplifier, video amplifier, video detector, sound i. f. amplifier, discriminator or ratio detector,

audio amplifier, vertical oscillator, horizontal oscillator, sync separator, picture tube, etc. Several technicians have reported that successful use of a second, standby t. v. receiver as a substitution test unit has been obtained. Provision is made for the low-capacitance connection (usually by means of flexible coaxial cable) in and out of the various channels of the second set so that each may be patched at will into the receiver under test.

For maximum efficiency and safety, each separate substitution channel must be separately powered with a transformer-type power supply. AC-DC power supply should not be employed in these units because such power supplies do not permit the required degree of isolation. They also give rise to hum difficulties and constitute an electric shock hazard.

7. Realign Where Necessary

As a final step in the checkout, the alignment of each stage should be inspected and realignment made in each case where required. The visual method must be employed, using a good sweep signal generator and wide-band oscilloscope. Because of the inherent frequency variation in some of the best service type signal generators, a final touch-up of alignment adjustments should be made with a picure (preferably a test pattern) picked up from the air. This is the proper chronological point for alignment operations. It is futile to align stages earlier in the program only to have the adjustments upset by the readjustments of voltages and replacements of tubes and other components at other points in the checkout program.

Program Logic and Advantages.

Because of the complexity of the t. v. receiver and the resultant fact that the cause of one particular trouble may be rooted in faults in several circuits or components, a complete checkout should be performed on each receiver. This should be done regardless of the apparent trouble. It is important to make the complete checkout a rule even when a single repair operation would seem to correct an immediately visible fault.

The fastest complete checkout is the organized and streamlined series of steps resulting from a procedure such as the one outlined in this article.

REFERENCES

1. TV Tube Location Guide. (Volumes 1, 2, and 3). Howard W. Sams Co.
2. TV Patterns. Sylvania Electric Products, Inc.
3. TV Pict-o-Guides (Volumes 1, 2, and 3). Radio Corporation of America.
4. TV Troubleshooting and Repair Guide Book. Rider & Middleton. John F. Rider, Publisher, Inc.
5. Technique of High Voltage Measurements. C-D CAPACITOR, March 1951.
6. Emergency TV Troubleshooting with Common Test Instruments, C-D CAPACITOR, June 1951.
7. Servicing Video Amplifiers. C-D CAPACITOR, July 1951.
8. Supersensitive Signal Tracer for Radio and TV. C-D CAPACITOR, February 1952.
9. Probes for Radio-TV Troubleshooting. C-D CAPACITOR, April 1952.
10. Marker Production for Visual Alignment of Radio and TV. C-D CAPACITOR, June 1952.
11. TV Field Strength Meters. C-D CAPACITOR, September 1952.
12. Television Interference (TVI) Filters. C-D CAPACITOR, January 1953.

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FOR SALE—Precision model 920 portable hardwood case tube tester and volt ohmmeter up-to-date tube charts like new, $50. George S. Oakford, 125 Argyle Ave., Uniondale, L. I., N. Y.

TRADE—SX-25 (no spkr.) for tape recorder or RME VHF-152 converter for 2-6-10 meters. Stan Cokas, 1 Acorn St., Lynn, Mass.

FOR SALE—Sun Radio CR-10P all triode Hi-Fi amplifier. Magnetic cartridge tuner, TV inputs. All transformers Peerless incl. S-240-Q ouput. Dual tone controls 1-6SC7, 1-6C5, 2-6SN7, 1-5U4, 2-6B4's included. Fine shape. $45 fob. Hal Magargle, 4812 Cooper Lane, Hyattsville, Md.

SELL OR TRADE—Two-stage booster Channel Chief model AT-1, $25; 2 13 channel TV front ends, $10 each. Trade for good camera or ? Want sound head and silent films for 16 mm. movie projector. John Arnold, P. O. Box 84, Bluffs, Ill.

CASH OR SWAP—Need code records, 78 RPM, 5-13 words per min., schematic for comm. receiver "Echophone" model EC-1A. Have pair 2000 ohm earphones, coin changers, radio magazines. Joseph Di Tucci, 234 Parkway, Rochester 6, N. Y.

FOR SALE—Triplett tube tester model 1213 good cond., $12 — frieght collect. About 200 relays in orig. boxes. Send 35c for sample. David Boord, 90-40 148 St., Jamaica 35, N. Y.

FOR SALE — Set of Greeley Knockout punches for conduit ½", ¾", 1", 1¼", 1½", 2" and 2½", good cond., $20; Solar C-160 condenser analyzer, good cond., $25. John E. Loraine 211 Summer Ave., Newark 4, N. J.

SELL OR TRADE—SX-28, S-39, BC-453-B, EE8, Collins 32RA8 XMTR, 110 v. 60 cy. Selsyns, Weston analyzer and tube tester, Jackson tube tester, Supreme 3" O' scope, Precision VOM RCP VTVM. Robert Townsley, 5919 Almaden Lane, Oakland 11, Calif.

WANTED—Instruction manual and schematic for McMurdo-Silver model 909 sweep gen. Anthony Meizis, 84 Haven St., New Haven 13, Conn.

SWAP—T19/MK II 40-80 mtr. XCVR, PWR supply; variometer, etc.; BC 645 XCVR converts to 420 mc. need freq. mtr., amateur equip., parts. Bob Short, 1236 Woodbourne Ave., Pittsburgh 26, Pa.

WANTED—Used monitoradio mobile FM radio, 30-50 mc., or FM ac/dc 30-50 megacycle band radio. Antenna? State cond. and price. Duke, Ferry Hill, Marshfield, Mass.

WANTED—RCA radio receiver, ACR-111, must be in operating cond. Carl M. Lang, 3619 Riverside Ave., Cleveland 9, Ohio.

TRADE—Like new Seth Thomas Metronome for good coin radio. Leo Teply, Geddes, S. D.

WANTED—H. Sams 144 and up, good sweep gen., Hickok 450 VOM. G. H. Swiska, 109 East School St., Woonsocket, R. I.

FOR SALE—Riders 2 thru 8, Sams 1 thru 36 in binders complete, like new, $40; coin operated radios, good cond., $15. Brown Taylor, 1307 Vultee Blvd, Nashville, Tenn.

WANTED—Hickok model 156A, model 620, model 292X and 610A testers in new cond., also complete set of G. M. Radio & TV Service and Parts Manuals. Paul Capito, 637 W. 21st St., Erie, Pa.

FOR SALE—6-tube AC Howard Mod., 435 Comm. Rcvr, $20 (local area only). Joseph Janata, 2510 — 21st St., Astoria, L. I. C. 2, N. Y.

SWAP OR SELL—4x5 professional DeJur Enlarger with cold-light head and condenser head plus extra cold light grid, master timer, trays, tanks, electric drier, etc., or sweep gen., sig. tracer. Blake TV Service Co., 97 Sutter Ave., Brooklyn, N. Y.

FOR SALE—Deluxe Vocatron Wireless Intercom model CC25. In original carton. Set of two list at $97.50, will ship c.o.d. for first $45 money order. Thomas E. Scholler, 126 Fountain St., Pittsburgh 12, Pa.

FOR SALE — Webster 3-speed 356-27 changer, GE turnover pickup, $25 f.o.b.; Sun Radio CR-10 Triode Amplifier (6J5, 6SC7, 2 6SN7GT, 2 6B4G, 5x4, Peerless Transformers), $50 f.o.b. Both excellent. Pat Phillips, 311 Penfield, Rockford, Ill.

SELL OR TRADE—RCA home study TV servicing course, latest edition, 43 lessons in 10 vol., complete, good cond. Make offer. Alfred B. Witzl, 1645 Campbell Ave., Des Plaines, Ill.

FOR SALE—NC125 receiver and spkr., in new cond., $125. Millen 90800 Exciter, tubes, coils, power supply, in desk panel cabinet rack; a key and crystal, $50. John J. Wos, 146 Madison Ave., Clifton, N. J.

WANTED—New 7JP4. Must be cheap. A Brace, 32-09-44th St., L. I. C. 3, N. Y.

WANTED—Cabinet for model 758 Olympic TV, state price and cond. Frank Marino, 566 Fourth St., Apt. 6, Buffalo 1, N. Y.

FOR SALE—Radio test equip. 7 pieces; Rider's radio manuals 1-20, TV 1-3; Sams and factory data, parts listing at $3750. Will sell everything for $1500. Write Franck's for details, 1349 Park St., Alameda, Calif.

FOR SALE—Like new Dynamic arc welder. Will weld 1/4" steel stock, complete with helmet, clamps, cables, transformer type $30. Morris Reader, 362 Powers Ave., Bronx 54, N. Y.

SELL OR SWAP— Heathkit R. F. gen. model SG-6. Triplett Load-chek, model 660. Tubes. Need Heathkit battery eliminator BE-3 and condenser checker C-3. Nelsons TV Sales and Service, Mahnomen, Minn.

FOR SALE—Zenith Trans-Oceanic rcvr., $62.50 f.o.b.; Hallicrafter model S-53-A rcvr, $45 f.o.b. I. Allen Hanover, 47 Bay 26th St., Brooklyn 14, N. Y.

TRADE LOCALLY—RCA manufactured Navy RAK-7 receiver with separate RCA power supply (regulated). Covers 05-600 kc. Want S-40, BC-348 etc. Jack Margolis, 721 N. Fuller, Los Angeles 46, Calif.

SELL OR TRADE—NRI radio or TV course, except experimental kits. Want test equip., Rider's or Sams Manuals or 10" or 12" TV Carl Dawson, 330 Chestnut St., Paris, Ill.

FOR SALE—Manuals on aircraft maintenance such as Airplane Propellers, etc. Also some NRI booklets, complete list on request. Louis Porsetsky, 137-16-169 St., Queens 34, N. Y.

FOR SALE—Rider Radio Manuals 1 thru 14; Sylvania 3" scope model 131; Sparx model 905 sig. tracer; 2 7JP4 CRT, like new. Best offer. Bud's Radio and TV Service, 5912 Hampton Ave., St. Louis, Mo.

WANTED—BC-344 in good cond. Will trade BC-342 in exc. cond. Also want good Marlin, or Mossburg .22 rifle. Will swap German "P-38" automatic pistol in perf. shape. Bill Ryan, 209 Coor's Blvd. SW., Albuquerque, N. M.

SALE—Webster model 106-27 3-speed changer, GE ER-A-M9H Preamp and GE RPX-040 and 041 Mag. Rel. changeable cartridge pickups. Exc. cond., all for $50. Wm. I. Huyett, 1415 Cleveland Ave., Wyomissing, Pa.

FOR SALE—Like new 3 National MB-150 tanks at $15 each. Milton Kakashian, 2 Congress St., Newburyport, Mass.

FOR SALE—Slightly used Soprano "B" Flat Saxophone, $75 or trade for Hallicrafter's SX 25 or 24 receiver. J. P. Hyde, Manassas, Va.

FOR SALE—Model A200 signal gen., Approved Electronic Instrument Corp., $18; Model CA12 signal tracer, less bat, superior instrument, $18; Model 615 Jackson meter, $12. Wilfred G. Bolduc, 10 Brier St., Fitchburg, Mass.

WANTED—.22 single-shot Hornet rifle or rifle of equivalent fire power. Interested in swapping odd radio parts and instruments. Send list. Earl Nichols, West Point, Ill.

FOR SALE—Like new link 25 w FM xmtr in metal box with acc., $50; BC-654 used with all acc., $55. Philip D. Greenway, 1740 North Ave. NW, Atlanta, Ga.

FOR SALE—LM7 Freq-meter, like new; Babcock 14-30MC/S Preselector, exc.; SCR522 exc., Hi-Fi 35-watt all-purpose amplifier, exc.; 60 coils all bands for NC100X-NC100ACN-NC101X; tubes, guaranteed. No reasonable offer refused. Collins, 6 Histella St., Santurce, P. R.

FOR SALE—Heathkit Oscilloscope with new picture tube, $60; Eico Products VTVM, $25; tube tester, $30; sig. gen., $30; TV sweep gen., $25; sig. tracer, $15. All like new. Need cash. Theodore Plawski, 354A 20th St., Brooklyn 15, N. Y.

WANTED—Schematic drawing and instruction book on Test Craft Inst. Co. model TC-75. R. R. Linville, 2818 Glenn Ave., Winston-Salem, N. C.

TRADE—Electrical engineering course on meters and instruments by Fort Wayne School for a course on refrigeration or air conditioning by I. C. S. Fred Vicente, 114 E. 102 St. Apt. 1, New York City 29, N. Y.

SELL OR SWAP—Browning bandswitching preselector 5-160 mtrs., $15; Motorola model 400 under dash car radio, one year old, like new, $20; pair new 814's, $5, 829's, $10. Want Gonset 10-11 converter. R. Schilling, 9 Zeliff Ave., Little Falls, N. J.

FOR SALE—Fansworth 10" TV, table model, 29 tube; Pilot FM converter; model 438 Howard SW receiver; T10-1199 Meissner receiver; model 8773 RCP servishop. W. E. Fuller, 4620 Stafford Rd., Lansing, Mich.

WANTED—50-w. public address speakers. (For use with RCA M1-4288-J 50-w. amplifier.) State cond. price, etc. Richard L. Evans, Jr., Box 156, Ambler, Pa.

FOR SALE—Stancor ST 202A all-band CW rig wih 40 meter coils ready to go on air, $75; VTVM RCA Volt-Ohmyst, $30; Millen oscilloscope 90300, $37.50. W. L. Baird, 3811 Ridgeway Dr., Los Alamos, N. M.

SWAP—Bud 80 meter osc. coil, B&W JEL80 final coil, plus crystals or 3678, 3690 and 3786 kc. for small U.S. or Canadian stamp accumulation. No common 3c issues, please! W. G. Milnes, Jr., 27 Becker Ave., Manton 9, R. I.

WANTED—Motor unit, base, keyboard, type-bar carriage for TG-7 or TG-37 (Model 15) Teletype; all or any part. Have parts, equip., cash, Royal Typewriter. W. H. Bauer, 119 North Birchwood Ave., Louisville 6, Ky.

FOR SALE—Novice Transmitter "Jewel from the Junkbox" described and illustrated in November 1952 CQ $30. Also 75 w. ten-meter fone rig similar in appearance, a sacrifice at $50. C. W. Gwyn, Box 34, Seneca, S. C.

SALE—Garrard 201-A turntable, $15; Garrard 3-speed changer, $25; terrific amp. buy, $50; RCP 802 tester $20; 2 GE cartridges, extra 3-mil stylus, LP arm, $15. Joseph D. Copeland, 66 Clark St., Portland 4, Me.

WANTED—Vol. 1 of Rider's radio manuals. Must be complete, and low-priced. Have Echophone EC-3 comm. receiver, practice code-oscillator, Vomax 900 VTVM, swap or sell. Max Raffer, 485 East 42nd St., Brooklyn, N. Y.

WANTED—Table model or portable 8" or 7" TV receiver. State cond. and price. Walter Baer, 247 E. Frederick St., Lancaster, Pa.

TRADE—A1 Navy RAK 7 receiver, complete with power supply and spare parts; kit for good 35 mm. camera or projector. Prefer local deal. W. B. Louis, 7015 Ridgewood Ave., Parma 29, Ohio.

FOR SALE—HT-17 Transmitter, all coils and meter, $25; Lysco mobile VFO, nonswisher, $15; Sentinel 7" TV, needs HV condenser, $10. R. J. Lurie, 221 East Sixth St., Plainfield, N. J.

FOR SALE—Philco 070 Gen., fair cond., $10; Triplett 3433 FM-AM Gen., good cond., $60; Rider Chanalyst, fair cond., $25. Home Electronics, St. Albans, Vt.

FOR SALE—25 year's established radio and TV repair shop, plentiful supply of stock: WO56A oscilloscope, WR59B RCA Sweep Gen., WR39C RCA TV Calibrator, Sams Photo Facts 1 thru 19, Riders Radio Manuals 1 thru 22. Mrs. Vern H. Smith, Box 183, Durant, Okla.

TRADE—Hallicrafter Super Skyrider, Echophone EC-1, 2 converters 115 v., AC-DC, 250 w., and misc. radio parts. Swap for 8mm. movie equip., 35 mm. or folding cameras. Omar's Radio, 9714 Dodge Lane, Franklin Pk., Ill.

FOR SALE—Riders Manuals 8 thru 15 in exc. cond., $50; '49, '50 Chevrolet custom automatic radio, good cond., $27. Broadway Radio, 693 Broadway North, East Providence, R. I.

SALE—Supreme Tube Tester 589-A, $30; Electronic Designs VTVM 100, $35; AEI Sig. Gen. A200, $22; Craftsman ¼" electric drill, $15. All exc. cond. with original instructions. E. Summers, 5728 5th St. NE, Washington 11, D. C.

SELL OR TRADE—Coyne's Practical TV and Troubleshooting Manual Vol. 5; Coyne's Electrical and Radio Troubleshooting Manual, like new. Want 7" or 10" TV set. Will pay difference on best offer. C. H. McFadden, 2720 Spring St., Little Rock, Ark.

FOR SALE—Eldico T-75 transmitter, complete with 40 meter coils, crystals, tubes, and antenna matching coil. Self contained power supply 600 v. Ready to go on the air, $35. O. F. Griffith, Jr., 613 Brent St., Winston-Salem, N. C.

SELL OR SWAP—Precision 912 tube tester with novel adapter, perf., $27.50; same model without cover or adapter, $18 f.o.b., each has 1952 roll chart. Want good quality VOM, VTVM, Sams or Rider's. Van H. Ferguson, Box 911, Tallahassee, Fla.

FOR SALE—5BP1, 5BP4, 5CP1, one shield each 5B and 5C tubes. Sockets for each. Waltner Electric, Box 93, Moundridge, Kan.

WANTED—Good latest model tube checker, sig. gen., and volt ohmmeter. Must be in good working cond., and priced right. W. R. O'Neal, 324 Wine St., Mullins, S. C.

SELL OR SWAP—Converter, Elec. Lab. model 261 115-v DC to 115-v AC, 75 w.; Audels Refrig. and Air Cond. Volume. Need good 10 X or 20 X binocular or telescope. Robert Young, 4104 Ave. J, Brooklyn, N. Y.

SELL OR SWAP—Matched pair of Japanese combat telephones, each housed in hardwood case, stainless steel trimmings, leather carrying case, operate on standard 6 v. battery. Want Hallicrafters S40 or reasonable offer., c.o.d. or p. p. William J. Levy, 3935 No. 8th St., Philadelphia 40, Pa.

FOR SALE—Hand printing press, man's bike, typewriter, small lathe, table radios. Need mirror scale meters (laboratory type) or lab test equip. Donald Pallatz, 942 Kings Highway, Brooklyn 23, N. Y.

SELL—7" TV $30; 10" $40; 12½" $50 up, all table models complete and working; Crosley 12½" TV-FM combination, $65; 14" Teletone $65; Millen single sideband selector, $50. Charles E. Spitz, 1420 South Randolph St., Arlington, Va.

SELL OR SWAP—Like new two 50-51-52 Chevrolet auto radios, 1 automatic, 1 manual; factory rebuilt Everhot automatic roaster; pair Wheeler sound powered phones for TV installation. Oher items. Slim's Radio, 1147 Sunkist Ave., Waukesha, Wis.

FOR SALE—Like new two Geiger counters, $15 ea.; Williamson Amplifier and 225 ma. power supply, $35; two 15" Electro-voice dynamics, A1, $10 ea.; Jewel portable with batteries, $10. J. Bourke, 127 Great East Neck Rd., Babylon, N. Y.

WANTED—Low freq. rcvr.; VTVM; 1-106A, and other test equip; MB-150. Have ham components and surplus to trade or will buy. C. J. Hinkle, Tyler Subdivision, Fredericksburg, Va.

FOR SALE—Brush tape recorder in green leatherette case, size 8" x 22" x 13" with new SHUR mike and stand. 3 one-half hour tapes. $45 c.o.d. G. Stutzman, 2741 Fairlawn Ave., Adrian, Mich.

FOR SALE—522 Rec. conv. to 2 meters, $15; 6 v. Carter Genemotor 350V-150M, like new, $15, also 400V-200M, A1 cond., $20; Monitor Crystaliner model 201 complete Xtals, cable, instr. xtal con. sig. gen. for FM-AM. Like new, $25. Mack M. Spizer, 6017 Mayflower Ave., Maywood, Calif.

TRADE—For 10" or 12" TV set one U. S. Mint stamp collection in two leather loose-leaf albums. Stanley Radwanski, 1605 Indiana Ave., Vincennes, Ind.

FOR SALE—SX42 Hallicrafters, exc. cond.; B-221 freq. meter with calibration charts. G. E. Howarth, 216 First Ave. E., Oskaloosa, Iowa.

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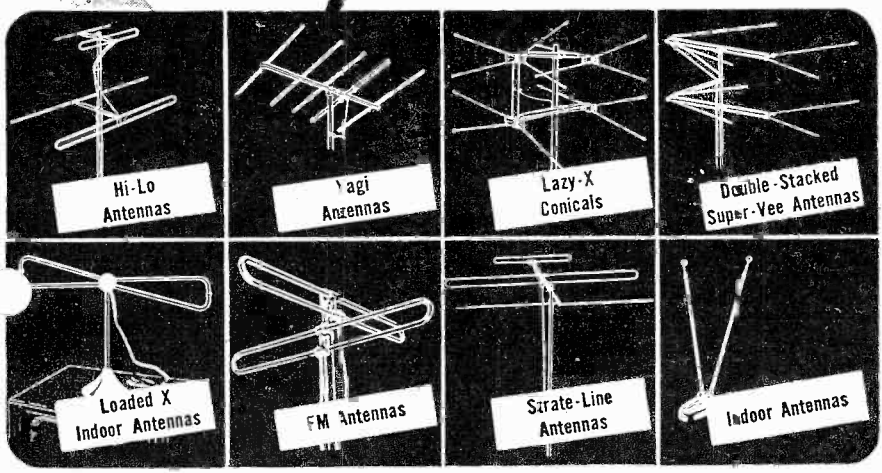

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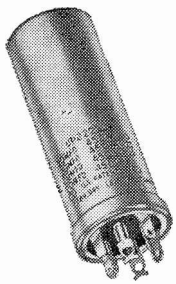

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