FEBRUARY, 1958

TST PROCEDURES
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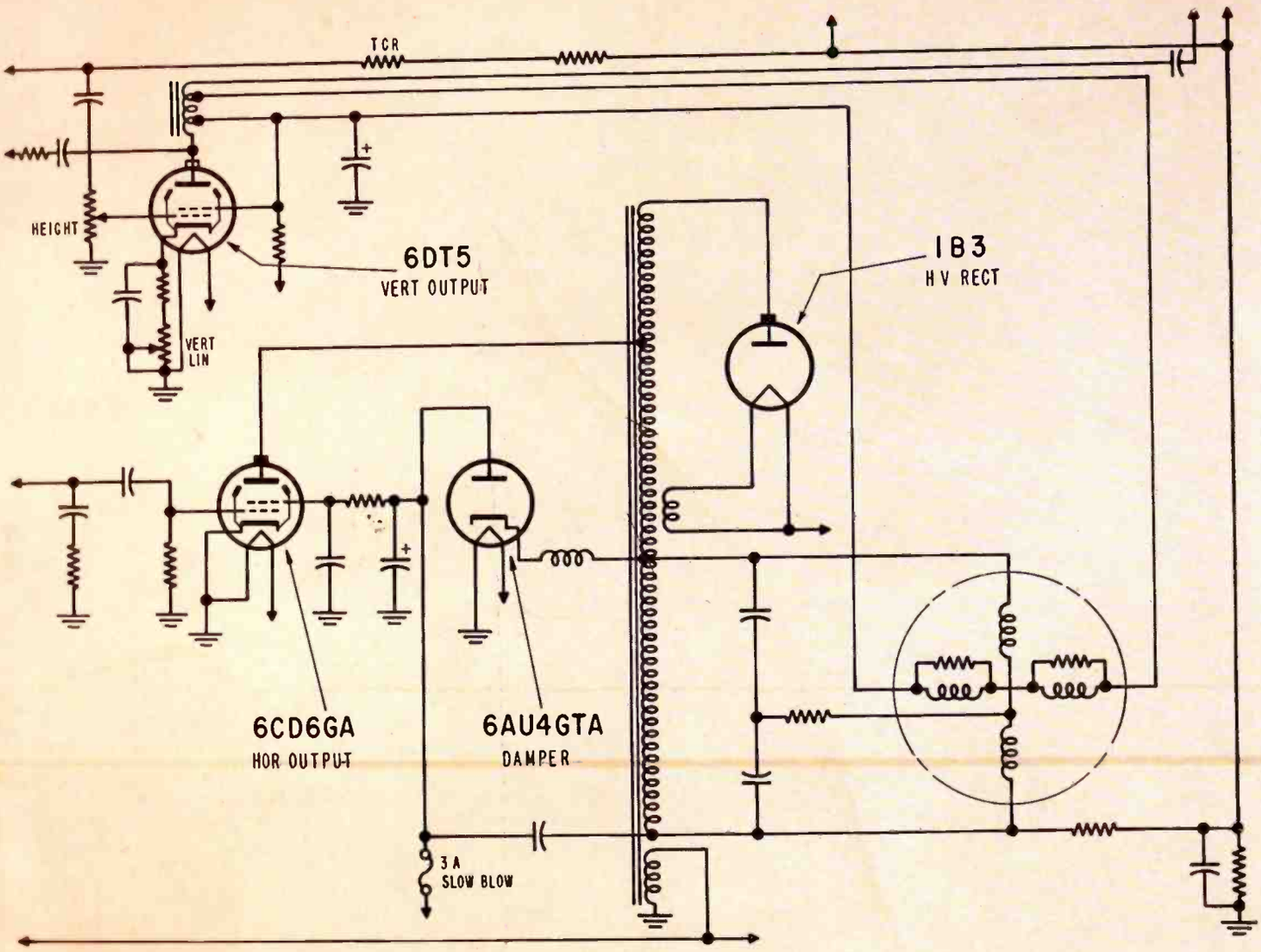
SOUND SYSTEM
ISTALLATION

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE



Deflection circuitry for wide-angle 24-inch 110° picture-tube chassis.

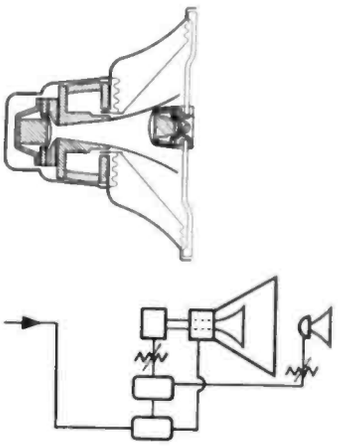
See circuit analysis, this issue

NEWEST

NEWEST

NEWEST

Jensen TRIAXIAL*



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High Fidelity Loudspeaker
. . . With Superb Performance!
Only $129.50

Jensen, the only maker of true 3-way unitary loudspeakers (with 3 separate radiating systems, each independently driven), now brings you the G-600 TRIAX* at half the cost of the famous G-610A! Now you can enjoy the advantages of a true 3-way speaker . . . solid bass, full middles and smoothly extended highs out to the limits of audibility, with ultra *low* distortion, ultra *high* listening quality . . . at this new low cost.

Lows from 30 to 900 cps are handled by the heavy duty 15" 3½ lb. magnet edge-damped woofer. Midchannel is a compression driver horn-loaded thru-bore unit for 900-4,000 cps. New compression horn supertweeter with phase balancing covers the range from 4,000 cps to limits of audibility (very high indeed by our standards). Power rating is 35 watts. Separate network with MF and HF Controls is included. Write for free Catalog 165-B

THE FAMOUS TRIAXIAL...JENSEN G-610A. Easily rated the world's most wanted speaker, the G-610A is "tops" in a unitary 3-way speaker assembly. It has the advantages of higher efficiency, higher power rating (40 watts). Desirable very low first crossover of 600 cycles is achieved by using the entire woofer cone as the final section of the midchannel horn. Priced at $252.75, complete with crossover network and controls.

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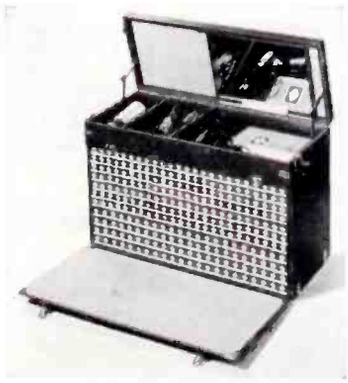
Let *all* the CBS tools help make *your* work easier, faster, more profitable.



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For the best in entertainment tune to CBS

Vol. 27 No. 2 FEBRUARY, 1958

27th YEAR OF CONTINUOUS PUBLICATION

SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE
Including RADIO MERCHANDISING and TELEVISION MERCHANDISING
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COVER CIRCUIT

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CIRCUIT DIAGRAMS

DEPARTMENTS

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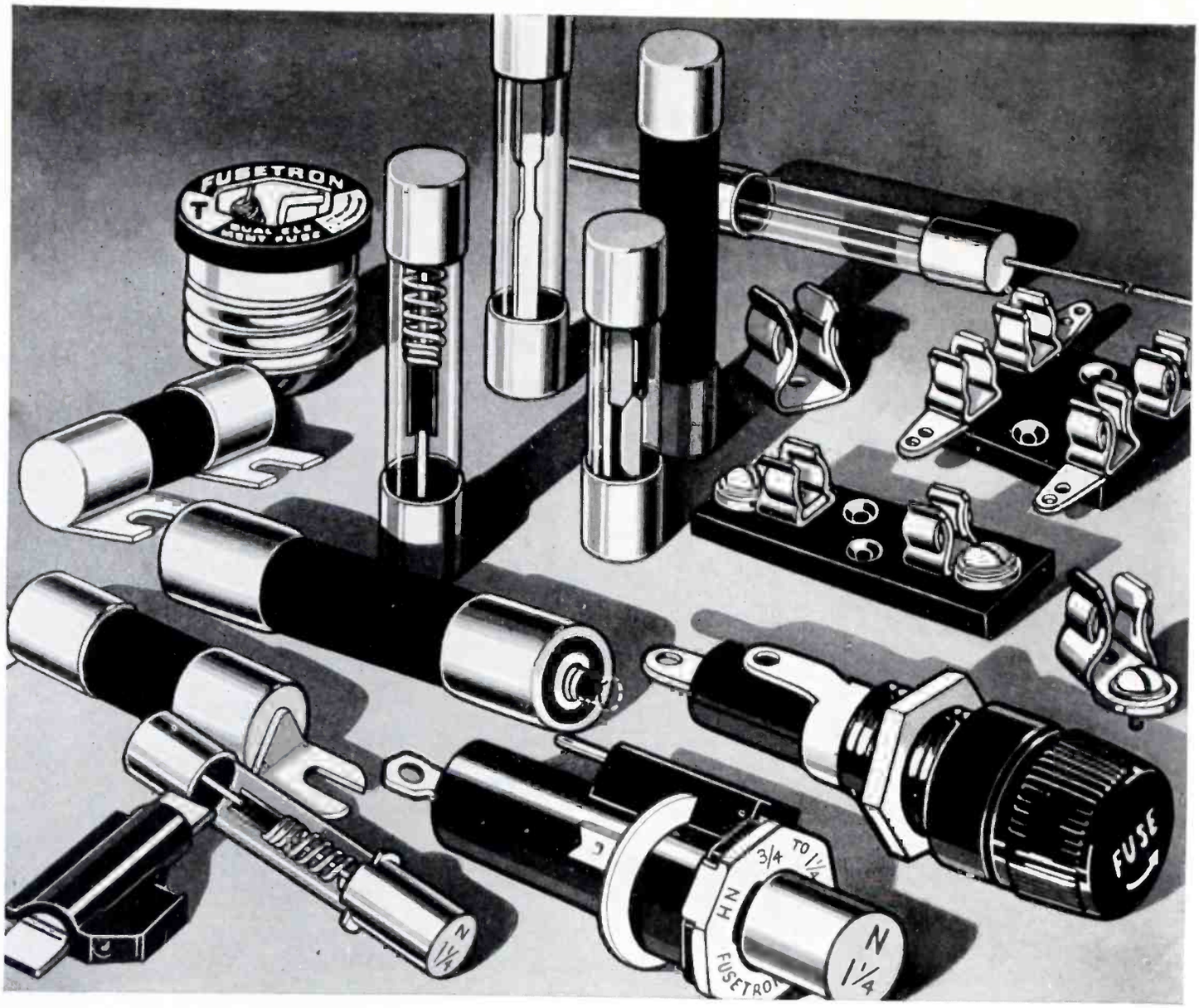

You can rely on BUSS FUSES to operate as intended.

Here's why— With BUSS fuses, dependable electrical protection isn't left to chance. BUSS fuses are tested in a sensitive electronic device. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected.

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S-258

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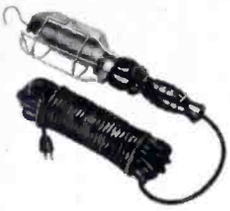

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Gives you all three!... performance... adaptability... low cost

MAN! These Scotch Stamps Are Worth Money to You! Get Free Antennas, tool sets and other valuable nationally advertised merchandise.

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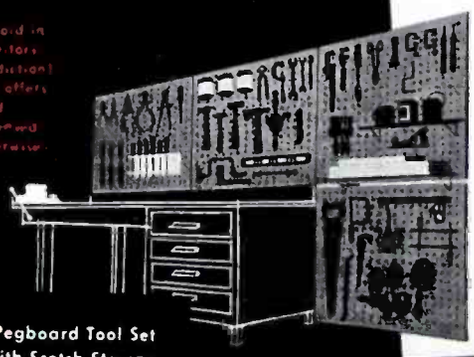

This Free Pegboard Tool Set is yours with Scotch Stamps—Start Saving Scotch Stamps Now!

There's a Winegard Scotchman antenna for every signal area . . . for every installation . . . for every budget! With just four basic Scotchman models (priced as low as $6.95 list) you can now solve just about any reception problem you run into.

In most of your installations, you will find that one or a stack of the four basic antennas is all you need. But for those tough reception problems, where you need more gain—or have severe interference, you can tailor-make a special Scotchman as needed, simply by using the new plug-in attachments shown on the opposite page. And you can do this at no more cost than your competitors charge for ordinary, less effective antennas.

Economy and adaptability are not all you get in the Scotchman! You get quality, too . . . the kind of quality features you are proud to point out to your customer . . . like: unbreakable TDM styrene insulators, special fatigue-resisting aluminum tubing, closed element and boom ends to eliminate windwhistle and vibration, precision die-cut elements . . . features usually found only in the highest priced antennas.

And, of course, all Winegard Scotchmen are completely factory preassembled. Elements lock into place automatically when you unfold them. Absolutely no antenna installs easier or quicker . . . and they're wonderfully compact and rugged.

On your next installation, do this: *Try a Scotchman antenna in the only place it really counts* . . . on one of your own customer's homes. See for yourself that the Scotchman can't be beat for performance and adaptability at such low cost!

A NOTE FROM JOHN WINEGARD

As an addition to our popular line of gold anodized Color'ceptors and Twilights, I am pleased to announce this new Scotchman series to give you a complete price range of quality all-channel Winegard antennas. You'll find valuable Scotch Stamps in each Scotchman carton which we will redeem for free antennas and other valuable premiums. This is our way of saying "thank you" for your business.

Sincerely,

John R. Winegard

John R. Winegard
President, Winegard Co.

MODEL 503: Near fringe and suburban area, all-channel 5-element antenna with new improved Vee driven elements. Can be used with attachment Kits A, B, C or D. Ideal for stacking.

$14.95 list

Priced as low as

$6.95 LIST

MODEL 504: All-channel, high performance, 7-element fringe area antenna. Exclusive impedence-compensated Vee driven elements and patented* Electra-Lens design. Easily converted to 13 element antenna for tough reception areas with Kit A.

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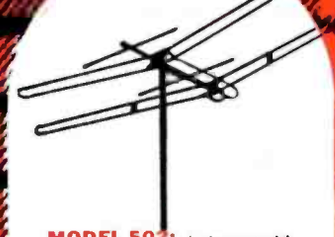

MODEL 502: 4-element with new improved Vee driven element design for city and suburban areas. Exceptionally good reception on the high channels . . . almost bi-directional on low channels. Higher gain and better ghost rejection than conicals. A natural with Kit D.

$9.95 list

MODEL 501: 3-element antenna recommended for use in place of conicals. New Vee driven element design. Smooth forward response lobes and accurate impedence match on both high and low bands. Cuts ghosts. No finer antenna for city and suburban areas at this low price.

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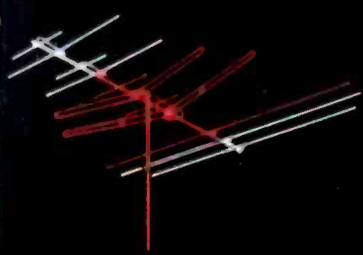
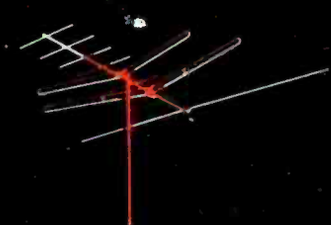
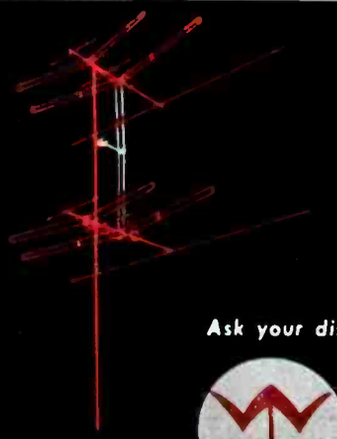
4 BASIC SCOTCHMAN TV ANTENNAS AND 4 ATTACHMENT KITS COMBINE TO MAKE MORE THAN 30 DIFFERENT COMBINATIONS! YOU CAN INCREASE THE GAIN OR FRONT-TO-BACK RATIO OF ANY MODEL



KIT A: HI-LO BOOST for higher gain and co-channel suppression. Adds two reflectors for extremely high front to back ratio. Adds 4-element patented* Electra-Lens director for increased gain on all channels. Use with models 503 (illus.), 501 and 504. Gives up to 22% more gain.

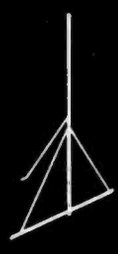
KIT B: HI-BAND BOOST for peaked gain on channels 7 through 13. Gives antenna sharper directivity. Reduces ghosts. Adds 3 high band director elements to front of antenna. Fits all Scotchman models 501, 502, 503 (illus.) and 504.

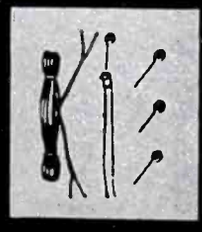




KIT C: STACKING BAR KIT consists of two stacking bars, heavy duty support bracket and terminal insulator. Stacking two antennas of the same model increases sensitivity up to 40%. Can be used with all Scotchman models 501, 502, 503 (illus.) and 504.

KIT D: INSTALLATION KIT (pat. pend.). Universal tripod mount fits any gable, pitched or flat roof. All aluminum. Can't stain roof. No guy wires. 5½ ft. tall. One man can install. Includes, mount, mast, lead-in wire, stand-offs and lightning arrestor. Can be used with rotor. Works well with all Scotchman models.





Ask your distributor or write for details on the money-making Winegard Scotchman line.

Winegard Co.

3000 SCOTTEN BLVD. BURLINGTON, IOWA

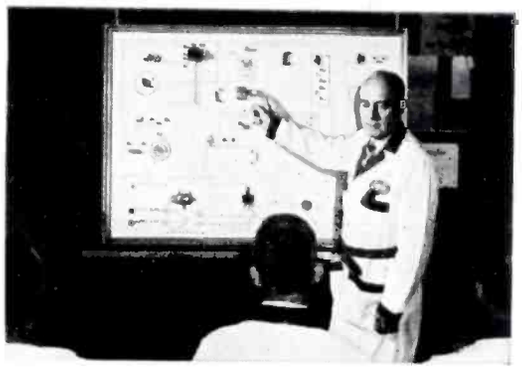
*U S Patent 2,700,105

GUIDE

AUTRONIC-EYE®

TRAINING COURSES MEAN MORE BUSINESS FOR YOU!

Courses for experienced service technicians provide latest repair information—enable you to do the job faster and more efficiently.



Jumbo-size operotionol ponel of Guide's Autronic-Eye Circuit puts all ports out front for better, more efficient instruction.

Quick, accurate circuit diagnosis and repair to factory specifications boosts your profits. That's why so many qualified auto technicians attend these Guide training courses at no cost other than transportation and living expenses.

The Guide Lamp diploma, awarded only to those who successfully complete the course, is proof that you're equipped to give more and better service to more people—and that means business.

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Makes Money for Servicemen Everywhere

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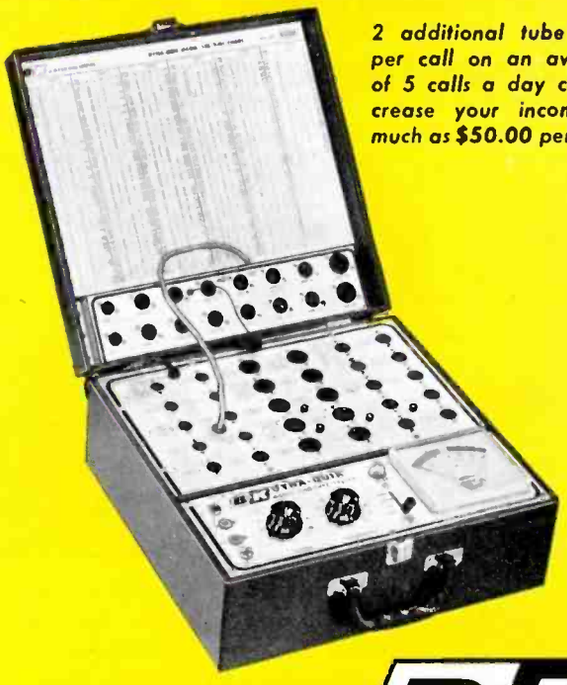
- ***Sells more tubes right on-the-spot***
- ***Cuts servicing time, wins customer confidence***
- ***Saves costly call-backs, brings more profit***

One extra tube sale on each of 5 calls a day pays for the Dyna-Quik in a few weeks.

NEW MODEL 650

Fastest, Most Complete, Portable
DYNAMIC MUTUAL CONDUCTANCE TUBE & TRANSISTOR TESTER

Checks over 99% of the tubes most widely used in television receivers, plus popular home and portable radio tubes. Tests over 500 tube types. Lists over 125 tube types, with settings, on socket panels for maximum operating speed. Complete listing in fast telephone-index type selector. Includes 16 spare sockets and sufficient filament voltages for future new tube types. **Tests each section of multiple tubes separately** for Gm—Shorts—Grid Emission—Gas Content—and Life. Provides instantaneous Heater Continuity check. Shows tube condition on "Good-Bad" scale and in micromhos. Special bridge assures automatic line compensation. No multiple switching—No roll chart. Includes pin straighteners. **Transistor Tester** checks junction, point contact and barrier transistors, germanium and silicon diodes, selenium and silicon rectifiers. Net, **$169.95**



2 additional tube sales per call on an average of 5 calls a day can increase your income as much as $50.00 per week

NEW MODEL 500B *Money-Making Portable*
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

Thousands of the famous B&K Dyna-Quik are in profitable use today by service technicians everywhere. **Servicemen say:** *"Best tube tester I've ever owned for speed and dependability." "Makes money. Really indispensable." "Have two...one for the shop and one for house calls."*

Now, with more tube sockets, the new Model 500B makes it easy to test more tubes faster and make more money. Accurately quick-checks most of the TV and radio tubes usually encountered in everyday service work. **Tests tubes** for shorts, grid emission, gas content, and leakage. Measures true dynamic mutual conductance with laboratory accuracy in the home or shop. Makes complete tube test in seconds, tests average TV set in a few minutes. Quickly detects weak or inoperative tubes. Shows tube condition on "Good-Bad" scale and in micromhos. Life Test shows customer the tube life expectancy. Makes it easy to **sell more tubes** right-on-the-spot.

One switch tests everything. No multiple switching. No roll chart. Automatic line voltage compensation. 7-pin and 9-pin straighteners. New tube reference charts are made available by the factory at regular intervals. Net, **$129.95**

See your B & K Distributor, or write for Bulletin AP10-S

B&K

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Helps you to maintain a profitable, INDEPENDENT position in the Servicing Industry

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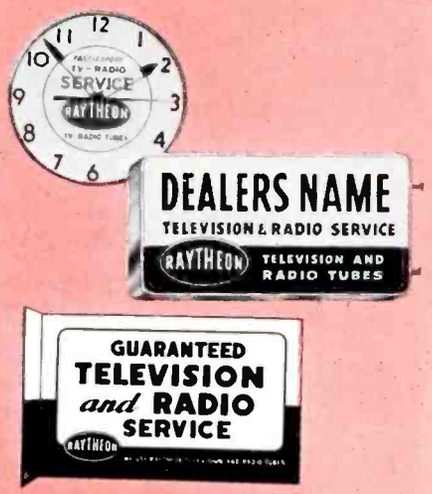
NEW! 1958 Edition of the Raytheon Receiving Tube Data book. 1000 types — 600 individual basing diagrams — all you need to know about Receiving Tubes.

TECHNICAL DATA

Technical Data — Receiving Tube Data Book; Semiconductor Products Books; Picture Tube Books

SIGNS



Signs — Indoor, outdoor, illuminated, metal, thermometers, "Will Return" Signs, clocks.

DISPLAYS

Displays — Counter, Window, Transparent Banners, and Window Streamers, Decals.

SHOP AIDS

Shop Aids — Uniforms, Tube Carrying Cases, Triplicate Invoice Sets and Pocket Cases, Job Repair Tags, Clocks, Tape and Dispensers, Stationery, Matches, Labels and Holders, Rubber Stamps and Pads, Drop Cloths, TV Screen Polishing Cloths, Tube Shelf Labels, Phone Call Registers.

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Advertising Helps — Advertising Mats and Post Card Mailers — Television and Radio Spots, Dummy Tube Cartons, Door Knob Hangers.

All these profit building items are available through your Raytheon Tube Distributor. Ask him for a free copy of Raytheon Business Builders booklet that describes them in detail.

RAYTHEON MANUFACTURING COMPANY

Receiving and Cathode Ray Tube Operations

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Excellence in Electronics

THIS MONTH IN SERVICE

PHONO BOOM SPIRALS RADIO SET OUTPUT AND SALES--The increasing interest and popularity of phono discs intensified listening-in to the latest recordings, setting a 10-year high in radio sales during 1957, according to a recent survey of industry market specialists, and another record output is expected in '58. . . . Electronic Industries Association revealed that 15.4-million radios were made during 1957. Of this quantity, said EIA, 1.6-million were transistoried portables and 2.9-million were transistorized auto chassis; 49 per cent of all portables were transistorized and 51 per cent of all auto receivers were transistoried.

SHARP RISE IN TRANSISTOR PRODUCTION REPORTED--Manufacturers sold more than double the number of transistors during 1957 than during the previous year, EIA also reported recently. . . . Over 28-million transistors were sold during '57; during '56, the output was 12,840,000.

N. Y. C. NEIGHBORHOOD COMMUNITY LINKED BY CLOSED-CIRCUIT TV--A public school, a neighborhood settlement, a city housing project and a health center in the Chelsea area of Manhattan have been networked by closed-circuit TV. . . . The project, involving the use of forty 21-inch Admiral TV receivers, covers a four-square-block area, with programs originating at seven locations in four separate buildings. . . . Pupils at the school can see the morning programs on a movie screen in the auditorium and on TV sets in the classrooms. Parents can pick up the telecasts on their home sets on channel 6, not in use at present in New York City.

CENTRALIZED SOUND CALLED INVALUABLE TEACHING AID--School sound-system consoles, using a centralized intercom and program control center, were described during a recent sound symposium as a basis of an electronic curriculum, which in the hands of progressive educators can provide important and invaluable teaching aids. . . . Such units, it was said, can help in speech correction, develop interest in the fine arts and the drama, encourage literary efforts, stimulate and foster better understanding of civics, politics, the social sciences and current events, and offer an excellent aid to efficient administration by establishing closer liaison between teachers, administrators and students.

BREGENZER REELECTED PRESIDENT OF FTRSAP--Bert A. Bregenzer has been elected to his fourth term as chairman of the Federation of Television-Radio Service Assocations of Pennsylvania. . . . Other officers selected include Charles R. West, vice chairman; Adam Deets, recording secretary; Dan Holter, corresponding secretary and L. B. Smith, treasurer.

SAN FRANCISCO TV SERVICE BILL LEVELED--A city and county TV service licensing measure, submitted recently in San Francisco, was so sharply criticized by association representatives during a hearing that the bill was shelved indefinitely. . . . Objectors declared that the bill gave the license board--a seven-man group--too much authority; allowing them to recall a shop's license because of one customer's complaint. Also, it was noted, the measure ignored the practice in the Bay area of a four-year apprentice period before approval for a journeyman; instead the board would have been allowed to determine who is an apprentice or a journeyman. . . . In addition, critics pointed out, the proposed ordinance would have permitted anyone to become a licensed Service Man, regardless of experience, completeness of shop facilities, place of business, or time spent on the job.

Servicing Printed-Wiring Board

An Exclusive Field Report On the Use of Special Tools, Test Equipment and

by LEROY WOLFF, Field Service Engineer, Motorola, Inc.

A NUMBER of radio and TV receivers now use new types of chassis in which wiring has been accomplished by bonding fixed conductive bands to an insulator board. This technique has been classified under the all-inclusive term *printed-wiring*.

We produce these boards[1] by applying copper leads on triple *xp* bakelite board with a fibreglass laminate. The application is made by a technique that permits complete plating of the holes in the board, allowing unbroken continuity of a conductor from one side of the board to the other, and also positive contact and strong mechanical connections to any lead soldered to the hole because the solder fills and adheres to the plated surface inside the hole.

In servicing *p-w* board chassis, one must have an assortment of good tools.

Since soldering is an extremely important factor in *p-w* board repair, the tools required here are vital items. We have found that low-wattage irons can cause the type of damage its use was designed to prevent, i.e., burnt boards or lifted plating. This can come about because its low heat output makes it necessary to keep the tip of the iron to the point being heated for a considerable period of time before the solder becomes molten. It is this long, continued application of heat which, of course, is conducted into the board and along the leads of components, that causes the damage. A good sized iron (100 or 150 watts) can be applied for a very short time to heat the actual point of operation adequately so that the heat transferred by conduction to the surrounding area is negligible, and certainly not enough to cause any damage. Therefore, the use of a 150 or 100-watt iron is recommended; however, it is extremely important to bear in mind that the tip of the iron should be applied for the shortest possible time necessary to flow the solder.

The tip of the iron should be dressed to a tapered point to permit its exact application to the desired connection in close quarters. Keeping the iron tip well tinned and clean is also very important.

A soldering pot, intended specifically for the removal of multi-lug components, is a necessity for a high degree of efficiency. The pot should be a controlled-temperature type which will minimize the possibility of board burns and lifted plating. Also, the solder well should be so shaped and sized, and the thickness of its edges designed to provide maximum usefulness in the close spacing encountered in *p-w* board servicing.

Solder wells designed to fit into the tip recess of a 150 or 200-watt iron are available in different shapes and are intended for special uses, as, for instance, the long slender shape for the removal of certain multi-connector *res-caps*, too long to be accommodated by a regular soldering pot.

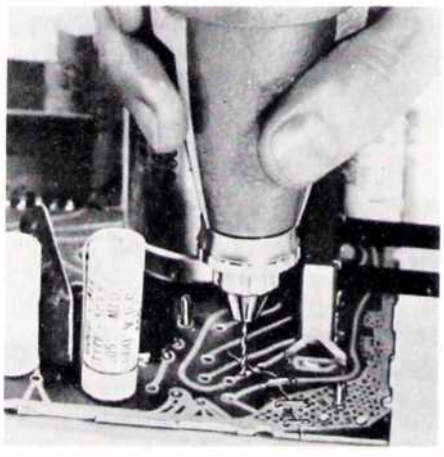
Solder pots or wells containing molten solder should be protected against the possibility of water dripping into them, because a single drop of water dropping into molten solder can cause a minor explosion which will scatter the molten lead over a fairly wide area. Also, hot solder pots, not in actual use, should always be placed in one area of the bench and so noted by everyone working in the shop. Indiscriminate placement of hot soldering pots is sure to give rise to dangerous, costly and painful accidents.

Any soft absorbent tissue should be used to clean off any oxidation scum which forms on the surface of molten solder; the scum should be skimmed off before the pot is used.

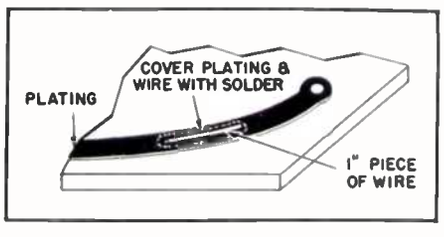
Other Tools

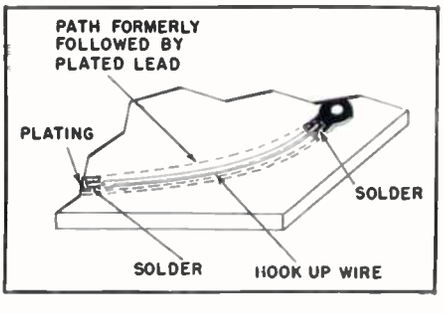
Also required are diagonal, and particularly flush-cutting pliers having transverse end cutters. Also soldering aids are handy to have around to facilitate the installation and removal of leads and connectors which are

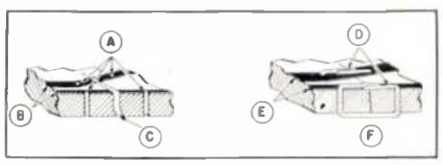
[1] *The Motorola technique used in the manufacture of these chassis is known as the* Placir *method. Motorola introduced* Placir *chassis in '52 in the 52R series of home radios and expanded its use to embrace portable, clock and car radios.* Placir *chassis was incorporated in a 17" TV set in '56.*



DRILLING HOLES in a p-w board with a high-speed power unit so that a hookup-wire clamp can be mounted to repair a board break.







(Left and above)

TECHNIQUE developed to repair fractured lead on a p-w board. Two holes are drilled about ½" each side of fracture (c) as indicated at (a); plated wiring leads are illustrated at (b). Then plating and wire are clamped with solder (d) and wire clamp is installed and soldered at (f).

Radio, Phono and TV Chassis

Miniature Components Required to Repair and Maintain P-W Equipment

soldered in place. These include a stainless steel brush to clean away debris from a connection prior to soldering in a tight place.

Circuit Tracing and Troubleshooting

The Motorola Placir chassis carries wiring on both sides. Since the board is translucent, the circuit can be traced if a lighted 60-watt lamp, in its reflector mounting, is placed behind the board. Connections to various components can also be traced.

Possibly the greatest aid in following circuit connections is the use of a duplicate, stripped board as a reference, because no leads or junctions are partially hidden by components, and both sides of the stripped board are instantly available. Also, holding the board in front of the lamp clearly reveals the path of any lead, even though it may be transferred from one side of the board to the other several times in completing a series of junctions.

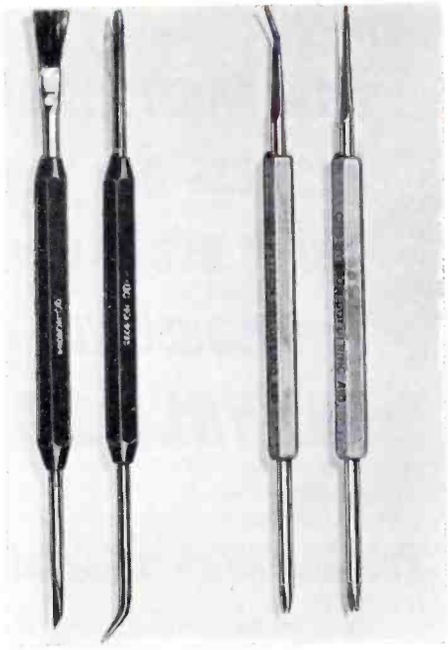
Lacking the spare board, the next best reference would be illustrations of the circuit boards found in service manuals.

Voltage and resistance measurements from point-to-point can be made conventionally, with small variations. One of the test leads should be equipped with a chuck-type of probe which accepts a steel phono needle. This is useful in making good contact to a plated lead covered with epoxy resin, since the sharp point easily penetrates the coating without damaging the lead, if reasonable care is used.

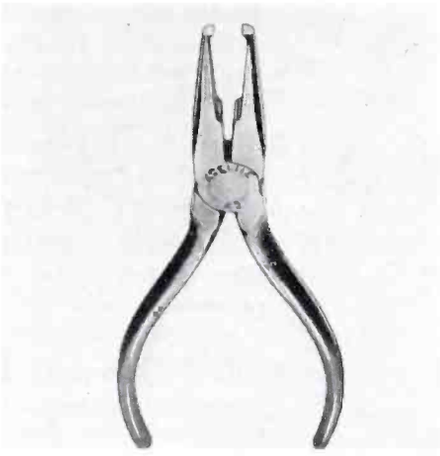
The common lead should terminate in a clip when measurements to ground are being made. In most cases, the grounded side of one of the components will furnish a suitable point to attach the clip without danger of damage. If the clip must be attached to the ground point on the plating itself (usually found near the edge of the board), care should be used to avoid tearing the plating. In making point-to-point checks to discover breaks in the leads, which may have been caused by excessive flexing of the board, a pair of probes of the phono-needle chuck type should be used. It is then rather simple to check a suspected lead by placing the points of the probes at the extreme ends of the lead for a continuity check. With the two probes in place, one can flex the chassis gently, while watching the meter. If the meter needle fluctuates, one of the probes should be brought nearer the other and again the chassis can be flexed gently. This should be repeated until the actual point of fracture is found. This method is effective because these breaks are so minute as to be almost invisible unless their exact location can be found. A magnifying glass will also be found helpful.

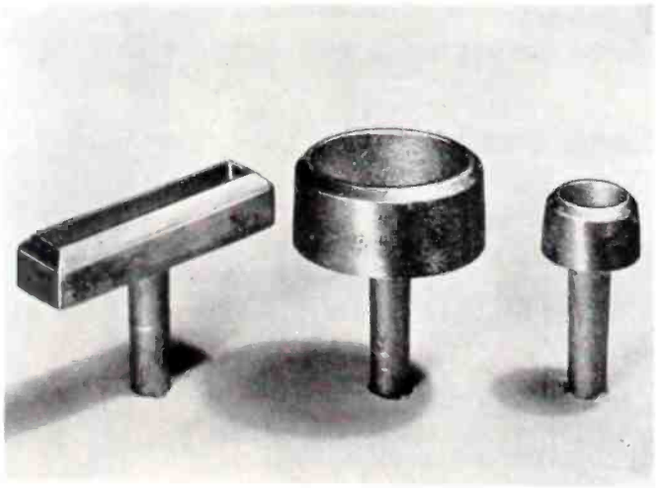
In *p-w* board circuit tracing and troubleshooting, leads of suspected components may, of course, be dis-

(*Continued on page* 28)



TOOLS designed for printed-circuit board servicing.





AVAILABLE SOLDERING-IRON tip wells for repairing printed-wiring boards.

TEMPERATURE-CONTROLLED soldering pot designed to remove multi-connector component in a printed-wiring board chassis.

YOUR INSTALLATION VOLUME CAN BE GREATER!

If you're *not* a Channel Master Dealer you are probably not getting your share of the *really profitable* antenna installation business. Hundreds of dealers have doubled and even tripled their antenna sales *in less than one year* when they switched to Channel Master and featured the famous T-W antenna. In fact, far more T-W antennas are bought than any other fringe area antenna. There must be good reasons for this. Below are listed but a few of them.

How much installation business are you losing every week? ...because you don't feature the CHANNEL MASTER® T-W

7-element
model no. 350
5-element
model no. 351
3-element
model no. 352

Put these extra selling advantages to work for you!

Superior PERFORMANCE! Outperforms any all-channel antenna ever made! Revolutionary "Traveling Wave" design delivers highest front-to-back ratios (better than 10:1) — — top gain over the entire VHF range.

Stronger CONSTRUCTION! Super-strong in every detail of construction: Twin-Boom— the only antenna with 2 full length crossarms; 2 Super-Nests — the most powerful grip that ever held an antenna to the mast; Line-Lok — absorbs all transmission line tension; 7/16" dia. elements.

Bigger NATIONAL ADVERTISING! More than 75,000,000 advertising messages in America's leading national magazines. Now saturation coverage with big-space ads blanketing 173 prime outdoor antenna markets.

LIVE LEADS galore! Tens of thousands have already responded to Channel Master's Free "Antenna Check-Up Kit" offer — **repeated** in new national ads. Based on experience, 50% — and more — of these leads are converted into actual sales

Local CO-OP ADVERTISING! The most liberal advertising allowance in the industry — so you can run your own local promotions. Channel Master dealers have the widest array of mats, radio and TV spots, and display materials.

Promoting ANTENNA REPLACEMENTS!
Channel Master's national advertising hammers home the theme of antenna obsolescence — opening new markets for you!

Call your Channel Master distributor now!

model no. 354-1

Including: • 2-element T-W • Combination 4 ft. x 1¼" aluminum mast and Universal Tripod Mount • 3 Mounting Nails with Neoprene sealing washers • 50' 80 mil wire • 6 - 3½" Standouts • 1 Standout Strap.

A COMPLETE ANTENNA INSTALLATION IN ATTRACTIVE 3-COLOR DISPLAY CARTON

NEW "INSTALL-IT-YOURSELF" ANTENNA KIT
featuring new 2 ELEMENT T-W ANTENNA

Designed for top performance in suburban and metropolitan areas. Powerful "Traveling Wave" principle provides the 2-element T-W with better all around performance than a stacked conical.

Promotionally Priced at $29.95 list

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

WORLD'S LARGEST MANUFACTURER OF TV ANTENNAS AND ACCESSORIES

service engineering

Closed-Circuit, TV-System Installation, Maintenance and Servicing: Training, Component Supply and Test Equipment Requirements

by G. W. VASS, Supervisor, Communications Field Eng., General Electric Co.

ELECTRONIC SERVICE through independent service engineers has grown faster and encompassed a greater number of products than most of the other service industries. The fundamental explanation is simple. The service industry is tied directly to a rapidly-growing manufacturing business whose products are relatively complicated and require service almost from the time they reach the consumer. This service may be one of installation or merely the replacement of a blown fuse or tube. The immediate service requirement for electronic products make it advantageous to both the manufacturer and the user to have local service available. Many other advantages obtain when local independent service organizations are used. For example, it tends to keep money flowing locally, which strengthens local business conditions. The local business climate is understood more clearly and, of course, there is always local business pride and community relations which cannot be fully appreciated by a factory engineer whose home interest may be hundreds of miles away. With equal technical competence, the user has a tendency to select the local specialist.

We have found the *local-service-by-local-businessmen* principal very effective for our mobile line of communication and microwave equipment, and now are setting the stage for entrance of independent *service engineers* into the closed-circuit TV business.

Several independent service organizations have already entered the closed-circuit field which is an extremely diversified activity. For example, in Nassau, N. Y. one shop[2] is maintaining a system used in an educational institution, another[2] is maintaining a utility system, and still another[3] has a contract with a religious institution. Elsewhere, shops are serving the lumber industry,[4] and other industries for closed-circuit TV service.

Closed-circuit TV equipment, like other industrial electronic equipment, is designed for high reliability, simplicity, and ease of maintenance. In our monochrome chain[5] a plug-in type of chassis is used to permit quick isolation and repair of any difficulties which may occur. Components, selected for stability and common to many types of industrial electronic equipment may be obtained locally.

Service Men can enter into the closed-circuit TV service business with only a small additional capital investment.

The test equipment requirements for closed-circuit TV are 'scope, sweep generator (flat to 10 mc for monochrome, 20 mc for color), TV receiver or signal generator to produce 15.75 mc, *vtvm*, marker generator and a multimeter.

Many service stations already have this equipment, and will find that their initial expense or investment will be one of training. At present, training sessions are being conducted on an individual basis and tailored to the requirements of a service shop. For ex-

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[1]*Hudson Associates.* [2]*Kansas Electronic Service.* [3]*Circle Communications.* [4]*Smith Radio Communications.* [5]*G.E. 4TE3A1.*

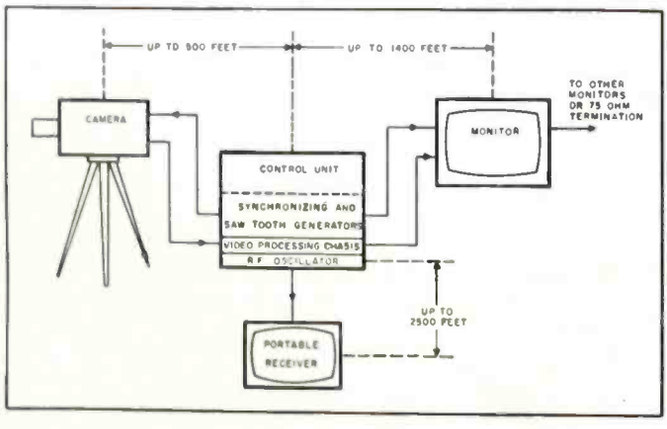

FIG. 1: BLOCK DIAGRAM of three basic components in a closed-circuit-TV system.

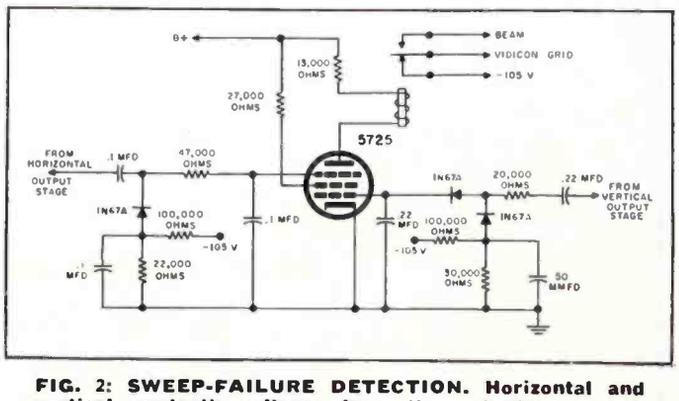

FIG. 2: SWEEP-FAILURE DETECTION. Horizontal and vertical sawtooth voltages from the output stage are rectified. These rectified voltages overcome a fixed +105 volts. Should either sweep fail, the 5725 control tube is cut off and the grid of the vidicon is grounded cutting off the beam of the vidicon.

24-Inch 110° TV Chassis With 10-Watt

by RAY S. GUILCHARD, Service Publications Manager, The Magnavox Company

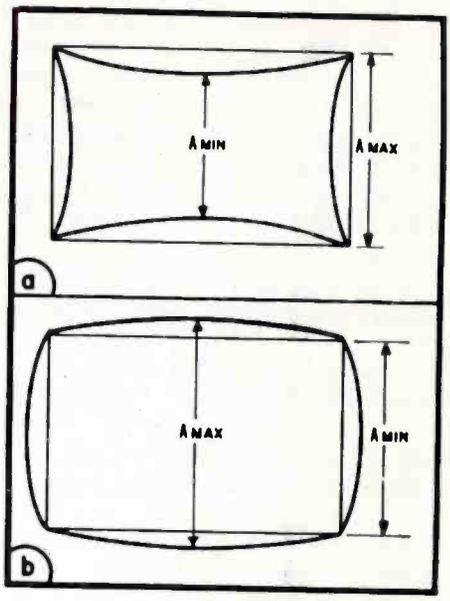

FIG. 1: EXAGGERATED illustration of pincushion effect is shown in (a); barrel effect is illustrated in (b).

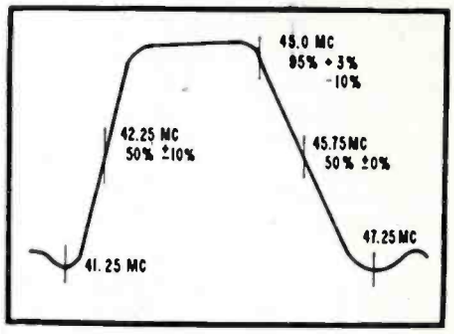

FIG. 2: OVERALL IF response.

RECENT TECHNOLOGICAL ADVANCES have brought about some radical changes in picture tubes. The 110° deflection picture tube, with its advantages of reduced space requirements and reduced weight is the latest commercial result.

We have developed a wide-angle chassis[1] using a 24AHP4 (24-inch) tube which is 5¼" shorter than its 90° 24-inch counterpart and 8 pounds lighter.

The reduction in space requirement has made it possible to design a more compact chassis.

Deflection Sweep Circuits

Generally speaking the sweep circuits in our 110° chassis are similar to the circuits used with modern 90° picture tubes with the exception of certain necessary changes to handle the higher power requirements of the wider angle deflection.

The vertical sweep circuit consists of a 6C4 as a blocking type oscillator working into a 6DT5 beam-power tube serving as the vertical-output stage. The 6DT5 takes the place of the usual triode stage here to meet the increased power requirements for vertical deflection. The vertical output transformer is similar in design to its 90° counterpart; however, it is physically larger and has a considerably larger current rating. A separate winding is provided on the vertical-output transformer for development of a vertical blanking pulse which is then capacitively coupled to the picture tube first anode to provide positive elimination of retrace lines.

[1] *Magnavox 26 Series.*

The horizontal oscillator is a conventional sine-wave stabilized multivibrator using a 6SN7GTB dual triode. The frequency of this multivibrator is controlled automatically by a *dc* voltage developed in a phase detector (horizontal *afc*) circuit employing a dual selenium diode. The horizontal-output stage uses a 6CD6GA *heavy-duty* output tube in conjunction with a high efficiency auto-transformer flyback. The 6CD6GA has a maximum cathode current rating of 200 *ma*, which is considerably higher than the rating of the tube used in most 90° horizontal-output circuits. This circuit supplies a picture-tube second-anode potential of 18 *kv* under normal operating conditions. Careful consideration in design and close adherence to component tolerances have eliminated the need for linearity or width controls in this circuit. This results in more uniform performance with no chance of irregularity or abnormal operating conditions due to control misadjustment. A 6AU4GTA is used as the damper. A boosted B+ potential of 500 volts is developed in this circuit and is supplied to the picture tube first anode and vertical sweep circuit. A 1B3GT is used in the high-voltage rectifier circuit which utilizes the capacitance between the inner and outer aquadag coating of the picture tube as its filter capacitor.

The 24AHP4 picture tube, in addition to being shorter, also differs from 90° tubes in the contour and physical dimensions of the bulb and diameter of the neck. The flare of the bulb is noticeably greater to permit the 20° increase in deflection. The nominal diameter of the neck is 1 1/8" compared to 1 7/16" for 90° tubes. This decrease in neck diameter places the deflection yoke windings closer to the electron beam; thus the amount of power that the yoke field must exert on the beam, for a given amount of deflection, is reduced. This is an important factor which has contrib-

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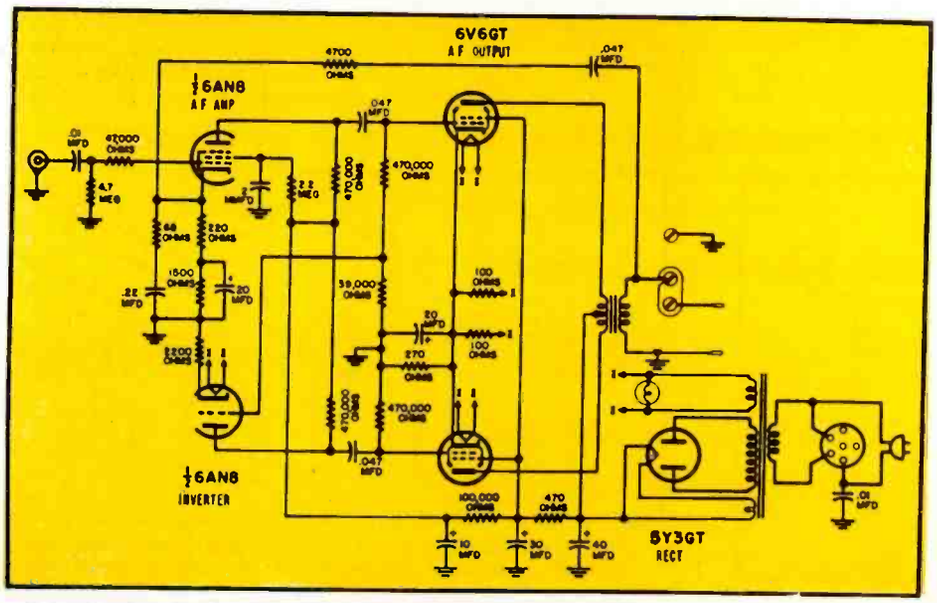


FIG. 3: Push-pull 10-watt Magnavox amplifier (model 169) available for 26 series TV chassis. Degenerative feedback couples voice-coil winding of the output transformer to the cathode of the amplifier to reduce harmonic distortion.

Matched-Speaker Audio

[See Front Cover]

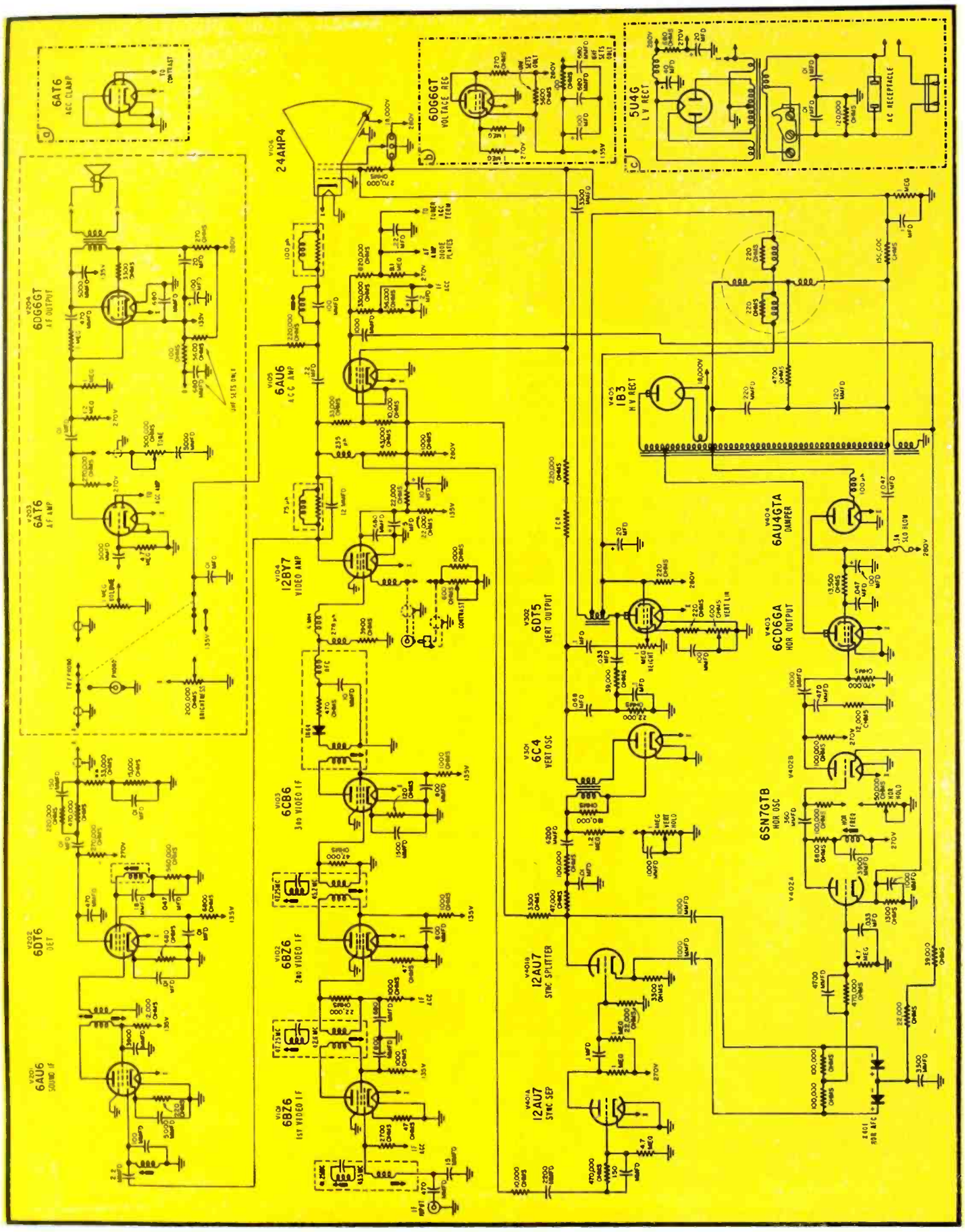
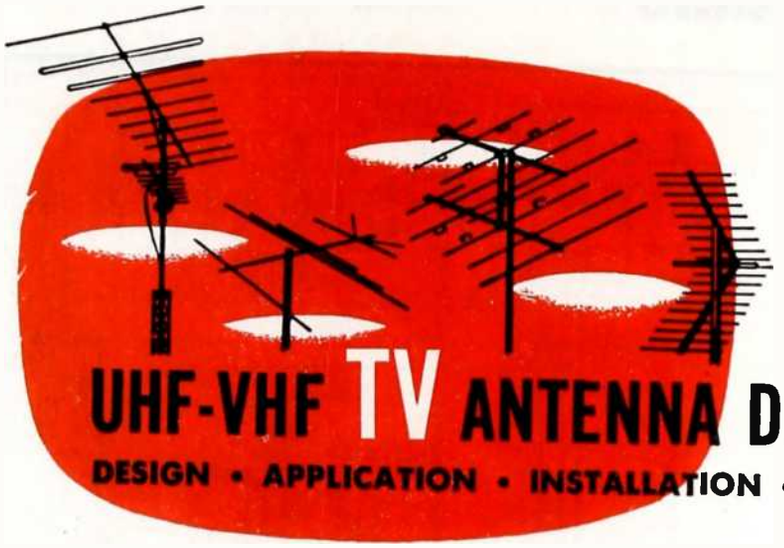


Fig. 4: CIRCUIT DIAGRAM of Magnavox 26 series 110° chassis. An agc-clamp and voltage regulator circuit (a-b) is used in the 26-02AA/03AA/04AA series.

The Portable-TV Antenna Repair and Replacement Market



by S. HOLZMAN, Chief Antenna Engineer, JFD Electronics Corp.

A QUARTER-MILLION portable TV sets were purchased on the retail level in 1955; in 1956 the total rose to 1,500,000, and in 1957, 2,400,000 units were sold. Today, 35% of all TV receivers manufactured and sold are portables. This thriving market, which will continue to grow in the coming years, offers an opportunity to earn markedly increased indoor TV antenna sales—both orignal and replacement.

With the advent of portable TV receivers in February, 1955, only the standard type top-of-the-set rabbit ears antennas were available. These outdated *model T* indoor antennas could not command any higher selling price than in the past. Instead of boosting profit, their sale merely fell in line with the then current overall low mark-up on portable TV receivers. There was no selling reason why the buyer should pay anymore for the *rabbit ears* than was customary in the past.

But the radical engineering advances and styling innovations of portables soon affected the design of the indoor antenna needed for its performance. Industrial designers discarded all former outside-of-the-set antenna types, demanding that the indoor antenna be integrated into the cabinet to present as unbroken a silhouette as possible. To effect this major change, receiver engineering called on the antenna producers for assistance.

The request prompted the development of compact, back-of-the-set, out-of-sight indoor antennas that really *belong* with respective models—each custom-designed to match the cabinet in style, color and size.

Today many cabinets even embody cutouts in the rear to accommodate the antenna; an example of this design is illustrated in Fig. 1. By virtue of this new look, prospects no longer classify the portable-TV indoor antenna as a hybrid appendage, but as a necessary and complementary part of the equipment for the receiver; very much like the relationship of an auto radio to the auto itself.

Portable-TV antennas are considerably easier to install than those used for auto sets. They are equipped with at least three mounting holes; one pair near the top of the antenna housing and a single hole near the bottom. These permit convenient positioning and mounting to the perforated hardboard back of the cabinet. Machine bolts and nuts are recommended for the job.

Care must be exercised in the selection of the indoor antenna for its respective TV receiver. Reference should be made to the manufacturer's catalog which lists the receivers by model number and the back-of-the-set indoor antenna model designed for it. It is also important to bear in mind that such antennas are supplied in two different dipole lengths i.e., 28″ and 38″, to satisfy metropolitan and suburban reception requirements. Owners should be queried as to their particular location conditions before an antenna is installed. The only other additional installation operation is the connection of the short length of twin lead to the set terminals.

Repairs and replacements of portable indoor antennas tripled in 1957. This is to be expected in light of the

(*Continued on page* 38)

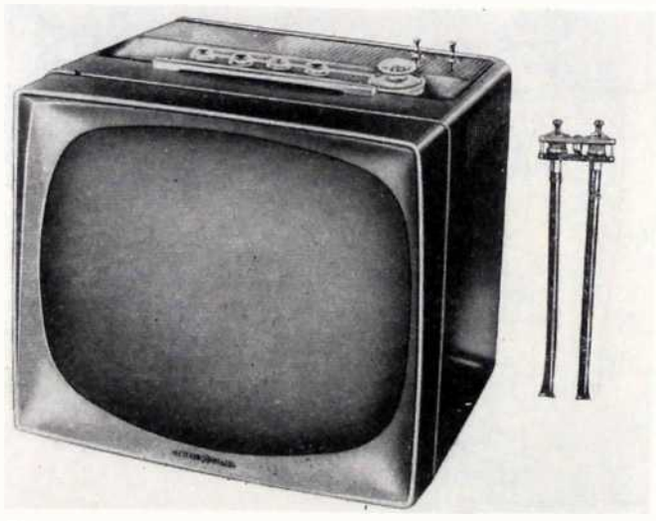


FIG. 1: PORTABLE-TV SET which employs a self-contained antenna (JFD model TA360), shown at right.

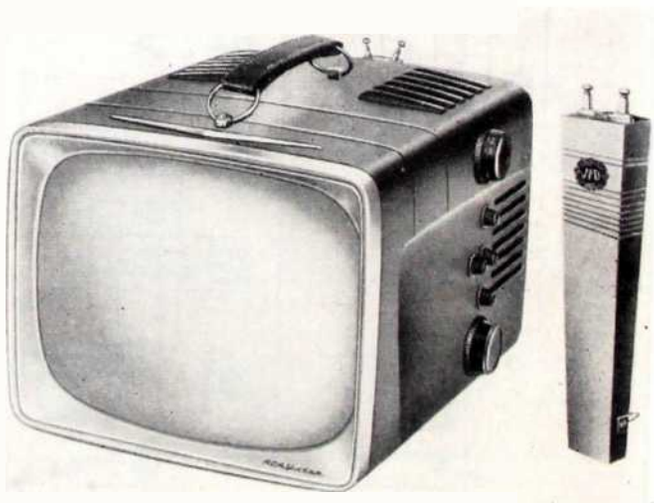


FIG. 2: A 14-INCH PORTABLE TV with the direct replacement indoor antenna specified for this model; JFD TA356. This antenna employs internal pin contacts and automatic indoor-outdoor antenna cutout to match chassis circuitry.

STREAMLINED MODEL TD-55 TESTS TUBES IN LESS TIME THAN IS REQUIRED TO SET UP AND ADJUST STANDARD MODELS!

Superior's New Model TD-55

TUBE TESTER

THE FIRST REALISTIC APPROACH TOWARDS SOLVING THE PROBLEMS OF QUICKLY TESTING THE EVER INCREASING NUMBER OF TUBE TYPES USED IN RADIO, HI-FI, MONOCHROME AND COLOR TV.

Speedy, yet efficient operation is accomplished by:

1. Simplification of all switching and controls.
2. Elimination of old style sockets used for testing obsolete tubes (26, 27, 57, 59, etc.) and providing sockets and circuits for efficiently testing the new Noval and Sub-Minar types.

You can't insert a tube in wrong socket
It is impossible to insert the tube in the wrong socket when using the new Model TD-55. Separate sockets are used, one for each type of tube base. If the tube fits in the socket it can be tested.

"Free-point" element switching system
The Model TD-55 incorporates a newly designed element selector switch system which reduces the possibility of obsolescence to an absolute minimum. Any pin may be used as a filament pin and the voltage applied between that pin and any other pin or even the "top-cap"

Checks for shorts and leakages between all elements
The Model TD-55 provides a super sensitive method of checking for shorts and leakages up to 5 Megohms between any and all of the terminals. Continuity between various sections is individually indicated. This is important, especially in the case of an element terminating at more than one pin. In such cases the element or internal connection often completes a circuit.

Elemental switches are numbered in strict accordance with R.M.A. specification.

One of the most important improvements, we believe, is the fact that the 4 position fast-action snap switches are all numbered in exact accordance with the standard R.M.A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

The Model TD-55 comes complete with operating instructions and charts. Housed in rugged steel cabinet. Use it on the bench—use it for field calls. A streamlined carrying case, included at no extra charge, accommodates the tester and book of instructions.

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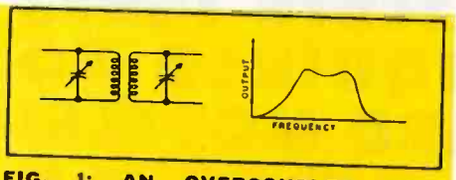

FIG. 1: AN OVERCOUPLED transformer produces a double-humped response, as shown, which ordinarily requires point-by-point checks in alignment.

FIG. 2: THE FIRST STEP in alternate loading; the secondary is shunted with a resistor to get a peak response from the transformer.

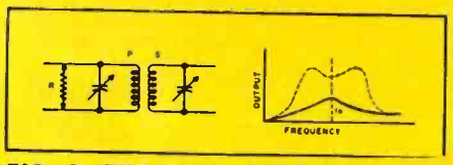

FIG. 3: THE NEXT STEP in alternate loading; the loading resistor is connected across the primary, and the secondary is peaked to f_o.

FIG. 4: GENERATOR designed to make alternate loading alignment adjustments.

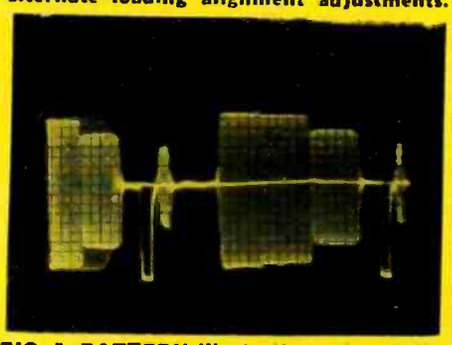

FIG. 5: PATTERN illustrating pulse width, revealing fact that a 63-microsecond time factor obtains from pulse to pulse.

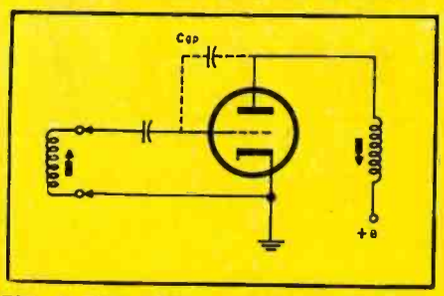

FIG. 6: THE TOTAL GRID-PLATE capacitance, as illustrated, is the sum of the interelectrode capacitance, and stray capacitance between terminals and leads.

Practical TV-Test Shortcuts

How to Align by Alternate Loading, Measure Pulse Width Without a Calibrated Sweep and Check for Mixer Regeneration.

by WALTER J. CERVENY
Chief Engineer, TV Equipment, Hickok Electrical Instrument Company

ALIGNMENT BY ALTERNATE loading is not new, but neither is the method as widely known as it should be. This method permits the rapid and accurate alignment of an overcoupled amplifier stage with a simple signal generator. It is a method which converts the double-humped response of the overcoupled stage to a single-humped response which can be peaked.

In Fig. 1 we have an overcoupled transformer, with its normal double-humped response. To align such a stage with a simple signal generator requires a point-by-point frequency check, and several back-and-forth adjustments of the primary and secondary trimmers. Alternate loading eliminates point-by-point checking.

Fig. 2 shows the secondary shunted by a resistor of several thousand ohms. Here we see the change in response which is caused by the resistive loading. The double-humped response has become a peak response, with the peak frequency at the center frequency of the normal double-humped response. Hence, we can quickly and easily align the primary by merely adjusting the primary for maximum output at frequency f_o.

Secondary Peaking

After peaking the primary, the resistor should be clipped across the primary, as shown in Fig. 3, the secondary peaked in the same manner. Then, the transformer is in proper alignment. The coupling is fixed, and hence the bandwidth will be correct. This is a very useful technique for receivers which utilize overcoupled transformers. In this test one should remember that the resistor across the primary must be removed.

A word of caution should be added. There are some receivers which obtain the desired stage bandwidth by a combination of overcoupling and stagger peaking. In this case, the only practical method of alignment is to use a sweep generator and 'scope.

Measuring Pulse Width Without a Calibrated Sweep

In setting up a color-bar generator, it is necessary to measure the width of the horizontal sync pulse and the color burst. In nearly all shops, this job must be done with the usual wide-band service 'scope, which does not have a calibrated horizontal sweep.

A simple method can be used to measure the pulse width. Fig. 5 shows a chroma video waveform displayed with two sync pulses and bursts; there are 63 microseconds from the start of one pulse to the start of the next pulse. Adjustment of the horizontal gain control serves to reduce or increase the horizontal length of the pattern.

First, the horizontal gain control is turned to make the pattern occupy a convenient number of squares. If the screen shows 21 squares from the start of one sync pulse to the start of the next pulse, each square then indicates 3 microseconds. Now, we can measure the pulse width by seeing how many squares are occupied by the pulse between its leading and trailing edges.

The standard width for a horizontal sync pulse is 4.75 microseconds. The burst normally occupies 8 or 9 cycles of 3.58-mc signal, and hence has a width of 2.5 microseconds.

Checking for Mixer Regeneration

Sweep alignment is customarily done step-by-step. That is, the *rf* response curve is checked and made correct. Then, the *if* response is checked and necessary alignment ad-

(*Continued on page* 39)

Troubleshooting Horizontal-Sweep Circuits With a System Analyzer

by FRANK HADRICK, Chief Field Engineer, Simpson Electric Company

THE HORIZONTAL SWEEP system of TV receivers is one of the most critical and time-consuming to service.

Service Men have long been accustomed to using the TV receiver itself by viewing the screen to determine what section of the TV receiver is at fault. If this method reveals that trouble appears to be in the horizontal sweep section, one usually has 3 or 4 stages to consider. This is particularly true in cases of *loss of high voltage* or *blank screen*. In these cases, it may be necessary to replace a high-voltage fuse or damper, after using the screwdriver technique of unsuccessfully drawing an arc from the high-voltage rectifier or horizontal-amplifier tubes. A few more tubes in the system may be replaced, after which it becomes a search for the faulty stage, and finally the faulty component.

But, obviously enough, not all horizontal faults result in loss of high voltage or a blank screen. Horizontal *foldover*, ringing, snivets and many other symptoms of horizontal sweep faults can present themselves in such a manner as to require considerable troubleshooting time.

If the horizontal oscillator proves to be operating satisfactorily, the Service Man must then check the horizontal amplifier and deflection components. To provide rapid checks of the deflection components a *horizontal system analyzer*[1] has been developed. This instrument has been designed to permit checking of the overall condition of the entire horizontal deflection system, as well as the flyback transformer (individual coil checks) and horizontal deflection yoke, and measurement of capacitance values from 10 mmfd to .1 mfd.

The current brand of horizontal-deflection systems operate at higher efficiency than the older types and have relatively high Q figures.

The Q (relative quality) of any inductive circuit is the numerical ratio of its inductive reactance to its resistance; $Q = X_L/R$. A shorted turn in the horizontal-flyback transformer, for example, would reduce the overall Q of the circuit quite sharply. A fault of this nature could be quite difficult to detect. With a *horizontal-system analyzer*, such a condition is indicated on the meter.

A simplified block diagram of a horizontal sweep circuit and the connections for testing is illustrated in Fig. 1.

In the three positions shown, the tester will detect whether the circuit is normal, shorted, open, or has a low Q. By process of elimination, the faulty component can be located by testing in the order shown with the TV receiver turned off.

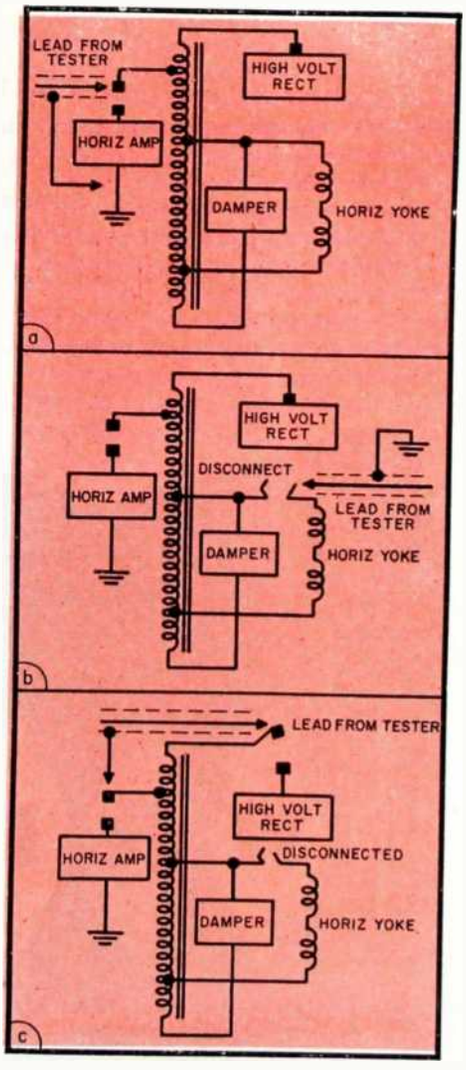

Fig. 1: HOW HORIZONTAL SWEEP circuits can be connected to troubleshoot overall horizontal circuit (a); deflection yoke system (b); and flyback-transformer coil (c).

When testing for relative Q or shorts, the circuit under test is connected in parallel with an oscillator grid coil in the tester. A low Q or a shorted circuit will affect the operation of the oscillator circuit which will be indicated by the meter.

When checking capacitors, the tester will reveal a directly shorted capacitor as well as the value of a good capacitor. In capacitor-value checks, the tester measures current flow through a circuit in which the capacitor is connected in series to complete the circuit. With a constant frequency,[2] various capacitor values will naturally have different reactances, resulting in different current values. The meter is calibrated in capacitance values and accordingly it can be read directly.

Horizontal drive and linearity controls are disappearing from present-day TV receivers. Thus, any indication of faulty drive or linearity is not a mere adjustment of a control; it's either a component or tube. Quickly eliminating the associated tubes, a search for the component can begin. The flyback transformer, in some cases, is a likely suspect. But just a resistance check of the windings may not indicate a fault. A shorted turn, for example, would cause only a very negligible change in resistance, but as mentioned earlier, this condition would greatly reduce the inductive reactance. With high-efficiency deflection circuits now being used to meet wider-angle deflection requirements, it is quite possible that a slight defect in the flyback or yoke is the troublemaker for such problems as *snivets*, and some forms of *ringing*.

[1] *Simpson model* 382.

[2] *A frequency of* 60 *cps is used in the model* 382.

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FIG. 1: QUALITY TEST circuit for single-purpose tubes.

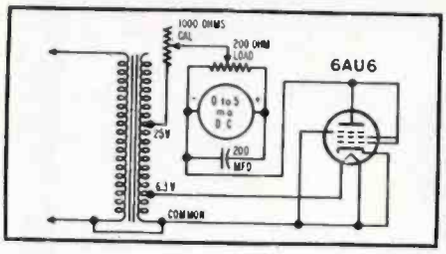


FIG. 2: QUALITY TEST circuitry for multisection tubes. Tube will test good only if both sections are good.

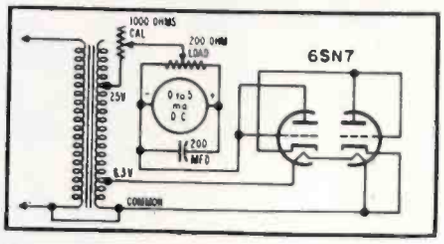
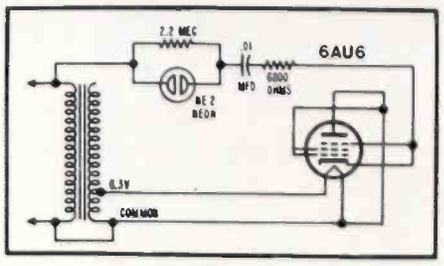


FIG. 3: SHORT TEST circuit in the multiple-socket tube checker.



Multiple Socket Tube-Testing

Rapid-Check Technique Developed to Determine Quality, Shorts and Life Expectancy

by WILLIAM KELVIN
Chief Engineer, Century Electronics Co., Inc.

To EXPEDITE the testing of tubes a number of techniques have been probed. In researching this problem recently an answer was found in multiple socket testing.

In other words, it was found that one octal socket could be used for all octal tubes with similar pin connections, and a second octal socket for a second group of octal tubes with a second type of pin arrangement; all sockets could be permanently wired for that group of tubes. Using this approach, the tube tester[1] diagrammed in Fig. 5 was designed. It incorporates two controls; a filament selector and load-setting adjustment.

Quality Test

The *quality* test employed is of the dynamic-emission type; cathode current with an *ac* signal input.

For this test an *ac* signal is applied to the grid or plate (or to both) which causes the tube to rectify and to conduct in a forward direction. For single-purpose tubes (such as the 6AU6) the current path is simple, as illustrated in Fig. 1.

The *load* control selects the proper division of the plate current. A *calibration* control on the tester is factory preset, but can be reset for line voltage compensation. A 200-mfd electrolytic filters out *ac* components by passing them around the meter. This serves to prevent meter demagnetization and annoying needle quiver.

For dual-purpose tubes (such as the 6SN7), a special circuit has been included to permit the current to flow through both sections *in series*. This shows the quality of a multisection tube which has one good section and one bad section. In this case, the instrument will test the tube according to the *weakest* section. In other words, if one section is dead, the entire tube will read *bad* (no output at all) on the meter scale. This method of testing is illustrated in Fig. 2.

The series arrangement is used wherever possible. Separate cathodes must be available for the sections to be tested in series. But the sections do not have to be identical for this

(*Continued on page 40*)

FIG. 4: QUALITY test circuit for special-purpose tubes, like the OZ4. Transformer primary and secondary voltages are additive.

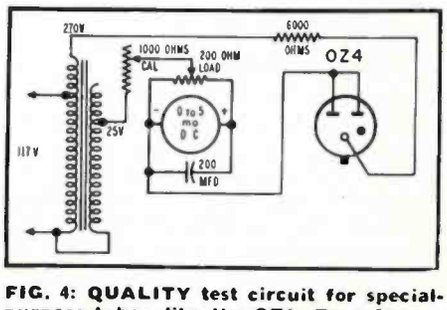
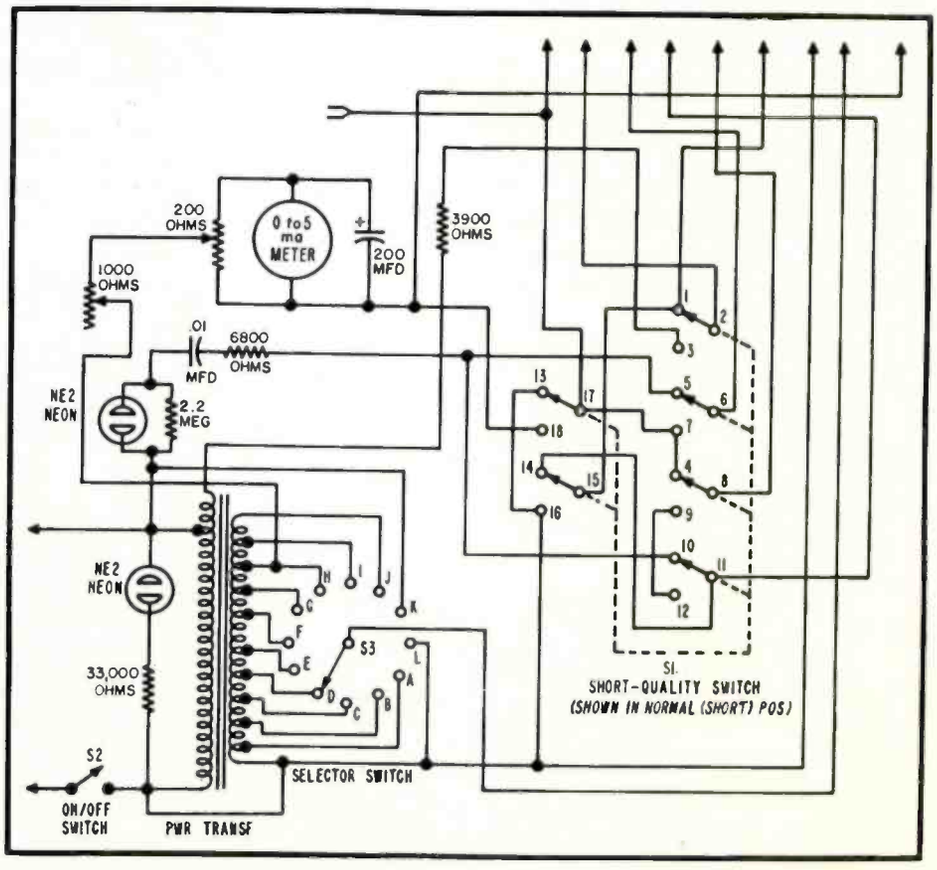


FIG. 5: CIRCUIT OF multiple-socket tube tester.



[1] *Fast Check model FC-1.*

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Servicing P-W Boards

(*Continued from page* 15)

connected or clipped for check purposes in much the same way as with standard pan type chassis. However, indiscriminate clipping of component leads should be avoided because replacement of these loose leads, especially if they are clipped too close to the board, can be a problem. It is far better to pinpoint the faulty component by careful analysis of the circuit and study of the symptoms.

Up to the present, no components, such as resistances, inductances or capacitors, have been included as an integral part of the plated circuit on any Motorola board.

Repair or Replacement of Damaged Boards

Broken Leads—Board Itself Not Cracked: The most common cause of fractured plating is excessive flexing of the board after its removal from the regular mounting. However, such a break can also be caused by attempts to insert a replacement tube having bent pins, or into a socket where careless replacement of a component has caused solder to flow into a socket receptacle which, of course, prevents seating of the tube. No undue force should ever be used on these boards. If more than reasonable pressure is needed, one should investigate to find the cause rather than risk an additional service job.

If a fracture is discovered in a lead, it may be repaired by first removing the coating on the lead for a distance of ½" on each side of the break, either with a solvent or by careful scraping with a soldering aid tool.[5] One should hold a 1" length of tinned hookup wire against the tip of the soldering iron to heat it to the point where it will flow solder, and then place the wire across the break—keeping the iron tip in contact to hold it in place—and instantly apply just enough resin core solder to cover the wire and the cleaned portion of the plated leads. The hank of wire solder should be dropped and the stainless-steel soldering aid picked up so its tip can be used to hold the wire instead of the iron; the iron must be removed as quickly as possible after application of the solder. The soldering aid should be used to hold the wire in place until the solder sets. A few practice runs will enable the operator to perform such a repair

[5] *Such as General Cement* 9094.

neatly and so quickly that the danger of lifting the plated leads is eliminated. *During such a repair, the chassis should be firmly supported.*

Simply flowing solder on the cleaned plated leads will also bridge such a fracture. However, the addition of the small piece of wire to act as a bonding agent is a more reliable repair and is, therefore, recommended.

Broken Leads—Board Also Cracked: If a crack in a board runs for a considerable distance, or if more than one fracture is involved, it is generally more practical and time-saving to replace the entire board rather than attempt its repair.

Simple cracks in an area of the board not subjected to extra strain by mounting brackets or the support of heavy components, can sometimes be repaired easily enough to warrant the effort, thus avoiding replacement of the board. Repair of broken leads across such a fracture in the board cannot be done reliably unless the crack in the board is first repaired. This may be done by applying cement (any good grade, fast-setting plastic cement) to the fractured edges. In some cases, the fracture can be strengthened by cementing a supporting strip of plastic over the crack. This is possible only if there is enough clear space on one side or the other of the board to fit the strip in place. Another method, which will usually lend sufficient support, is the installation of several clamps, made of hookup wire, across the crack through holes drilled in the board. Drilling such holes, without further damage to the board, can be done with a very fine drill bit used in one of the high-speed power units designed for fine etching, carving and grinding operations. (Fine drills are usually among the accessories sold with such a tool and the tool itself is useful in many other applications around a service shop.) If possible, the holes for the clamps should be drilled through plated leads which cross the crack after the leads have been cleaned as previously described; one hole should be about ½" back from the break and on each side of it. One must be sure to see that there is nothing on the other side of the board which will interfere with drilling of the holes. The wire should be formed into a *U*-shaped clamp to fit the holes exactly and installed with the solid wire on the side opposite from the plated lead.

[To Be Continued]

Wiring A City For Sound: The Success Story of Ed Kunze, Sound Specialist in Racine, Wisconsin

THE KUNZE SHOP in his home town in Racine. The Kunze's have had to make several additions to the back of their house to keep pace with growth from a few hundred dollars to $100,000 annual volume in five years. Kunze (shown here working on a flush-mounted intercom unit) does a good part of the service work himself, although he now has three assistants. It's from this shop that Kunze also pipes constant tape recorded music to customer restaurants and hotels.

FRESH FIELDS for sound and intercom installation and service make themselves known behind practically every door you knock on. So says Ed Kunze who has literally wired a city for sound.

Drive down any street in Racine, Wisconsin, and you can hear the results of Ed Kunze's labors.

"There's the plant of a brake manufacturer with sound everywhere," he gestures enthusiastically. "John Batten's president. He and his wife Katherine are avid hunters. Been everywhere. We have an extensive intercom system in their beautiful home, too."

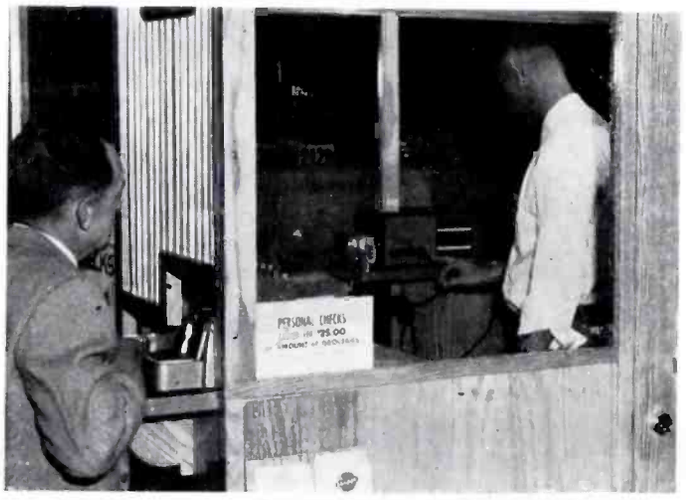
"A big printing operation is back there. Intercoms are in every one of their plants. We'll be going by the plant designed by Frank Lloyd Wright with the globe of the world in front of it. A real special job had to be done there to coincide with Mr. Wright's design."

One can almost hear the static of civic pride crackle in Kunze as he surveys the city, feel the current of pleasure he draws from his contribution to Racine's efficiency in business, its enjoyment of the music he distributes everywhere.

And the sound of Kunze *is* everywhere.

He has run enough wire across streets, through mains, between walls, down chimneys and into parks in Racine to circle the globe 50 times. He has installed sound in *at least* 100 homes, more than 50 factories including the giants in Racine who make tractors and print and publish books and magazines, practically all

(*Continued on page 44*)



SUPERMARKET in Racine which uses intercom to hasten orders from customers. When customer asks for a product not on shelves, a quick call to the stock room adds a sale. Kunze wired intercom to check-out counters as well.

AN IMPORTANT PART of the city wired for sound is its school system. Kunze was responsible for the installation of this modern school console sound system in Racine's Washington Jr. High School.

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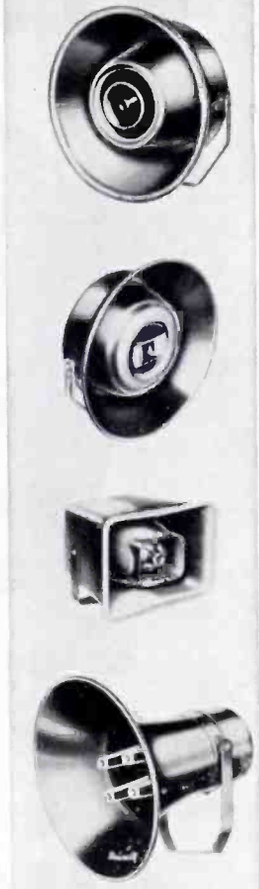

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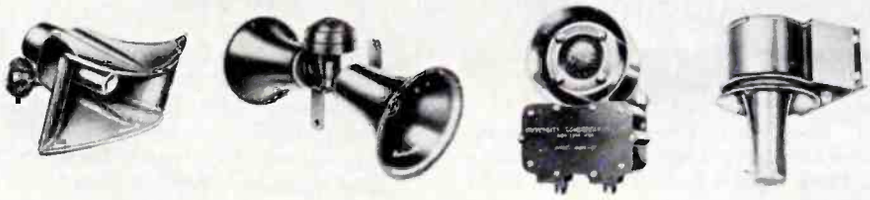

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ASSOCIATIONS

RTG, Long Island, N. Y.

ROBERT LARSEN has been elected president of the Radio-TV Guild of Long Island. He succeeds *Christopher Stratigos*.

Bob Barasch was elected vice president; *Bob Henderson*, recording secretary, *John Holland*, corresponding secretary, *Manny Greene*, treasurer, and *Fred Strickland*, sergeant-at-arms.

Elected to the RTG board of directors were: *Art Cry*, *Bob Bloom*, *Murray Barlouce*, *Ralph Milne*, *George Volkens*, and *Jack Wheaten*.

• • •

WNYEG, Buffalo, N. Y.

WILLIAM HARRINGTON has been reelected president of the Western New York Electronics Guild, Buffalo, N. Y.

Other officers named include *Fred Ditondo*, vice president; *Clarence Thielke*, treasurer, *Elmore L. Bement* secretary, and *Michael Squitieri*, sergeant-at-arms.

Elected to the executive committee were *Lester Marschall* and *James Archibald*.

An installation dinner was held at Mc-Van's in Buffalo. The Guild meets on the first Monday of every month.

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CSEA, Calif.

LARRY SCHMITT, president of the California State Electronics Association, Redwood City, California, was a guest speaker at a recent joint meeting of the St. Paul and Minneapolis (Minnesota) TV and Radio Servicemen's Association.

Schmitt talked on pay-TV and licensing. He revealed that CSEA has received a letter from Skiatron noting that neither Skiatron nor any operating licensee intends to now, or in the future, sell, service or maintain TV receivers. In addition, it was said, Skiatron does not wish to involve itself in the physical problem of installing the necessary equipment for its system in a subscriber's household, preferring that this be left to a *contracted* CSEA member or any other reliable independent Service Man.

TEN YEARS AGO IN SERVICE

DAVE KRANTZ was elected president of the Federation of Radio Servicemen's Associations. *A. B. Guild* was named vice president and *John G. Rader*, secretary-treasurer. . . . Associations affiliated with the Federation were Philadelphia Radio Service Men's Association, Mid-State, Reading, Scranton, Wilkes-Barre and Williamsport. . . . *Larry Oebbecke* was elected president of the Philadelphia Radio Service Men's Association. He succeeded *Dave Krantz*, who was named to the board of directors. *William Poole* was named vice president, *Walter Koop*, corresponding secretary, *Frank B. Guthrie*, recording secretary, and *Stanley W. Myers*, treasurer. . . . Among those attending a PRSMA banquet held during the Town Meeting of Radio Technicians in Philadelphia were ye editor, *John F. Rider*, *Harry Kalker*, *Harry Bridge*, *Howard W. Sams*, *B. K. French* and *W. S. Trinkle*. . . . *John E. Lackman*, president of the Indiana Radio and Electronic Technicians' Association, Inc., announced that the group had 30 members serving an area of 150,000 persons. To gain membership in the association an examination had to be passed. Group initiation fee was $10, annual dues were $24, payable $2 a month. . . . *George Cohen* was appointed general manager of the parts, sales and service departments of Emerson Radio and Phonograph Corp. . . . *Bob Karet* formed R. M. Karet Associates, Inc., manufacturers representatives.

Field-Shop SERVICE NOTES

Test Equipment Accessory Aids . . . FM Service Tips . . . Troubleshooting Tape Equipment . . . Pix-Sound Cures

THE IMPROPER USE of tools and poorly soldered connections can play havoc in chassis repair.

Often, in haste, leads are cut too short for proper contact, and it becomes difficult to make further tests on the components; or new capacitor and resistor leads are wrapped about existing terminal strips to the point where additional soldering can ruin the terminal connectors.

To remedy chassis repaired in this manner it is usually necessary to add some form of connecting link to the various parts to provide a good contact. This can be done with solid tinned connector wire wound into a coil with the aid of a small diameter nail. While the link idea is excellent, this type of coil jumper is a makeshift arrangement. In reviewing the problem, a solution was found in spiral-wound coils[1] using different diameters to accommodate various-size components. Tinned copper wire is wound spirally upon and inside a diameter form which will correspond to the diameter of the wire to be spliced; with sizes ranging from .030" to .045" inside diameter. It has been found that .045" inside diameter will handle capacitors in the .1 to .5 mfd range; .038" will handle those of the .01 to .05-mfd range and .030" inside diameter will best fit capacitors in the .001 to .005-mfd range, as well as the small micas, ceramics and diodes. These same size wire connectors will also fit the various sized lead wires of resistors.

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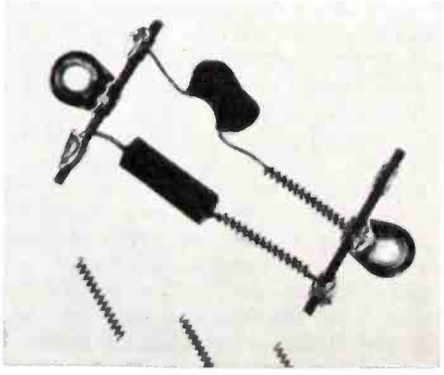

WIRE CONNECTORS linking components.

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FM Tuner Service Notes

ON MOTOROLA FM tuners, one must not free the dial cable pulley located on the tuner unit, as this can result in an audio howl. This is due to core vibration caused by acoustic feedback from the loudspeaker at certain frequencies. Some chassis, however, do not have this pulley securely anchored and some means must be used to prevent this pulley from rotating. This can be done by installing a 1/64" thick *C* washer[1] under the pulley, and then applying silicon grease at the junction of string and pulley (black pulleys only). This grease is used to insure smooth tuning action with all *black* frozen pulleys and must not be removed. Chassis using *light*-colored pulleys (teflon) do not require any grease or locking *C* washer under pulley. Therefore, whenever the tuning action is not smooth or is erratic, one should check for proper use of grease. Also affecting tuning action is the angle of the pulley bracket with respect to the takeup shaft. Bracket should be positioned until tuning action is as smooth as possible.

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WNYEG, DeSoto, N. Y.

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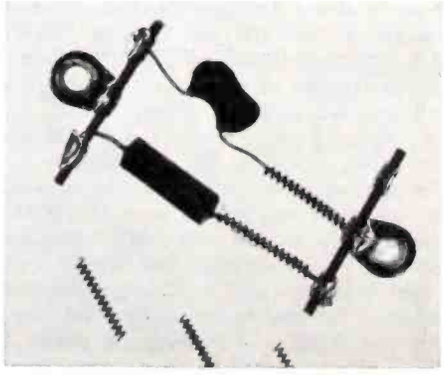

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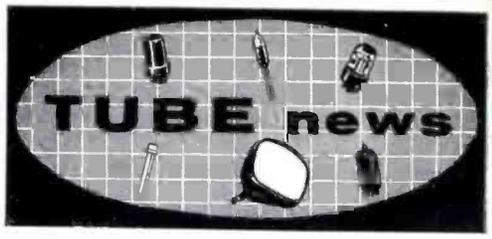


Hybrid Auto-Radio Tubes . . . B-W and Color-TV Replacements

Two HYBRID auto radio tubes, two series-string tubes, a *vhf*-tuner tube, and a color-TV high-voltage rectifier have been announced by CBS-Hytron.

The hybrids, types 12AL8 and 12DL8, operate directly from a 12.6-*v* battery. The 12AL8 includes a triode for detector or voltage-amplifier service and a space-charge grid-power amplifier to drive the transistor output stage. The 12DL8 offers a duodiode for AM detector and *avc* service and a space-charge grid power amplifier in one envelope.

The series-string types, 3AF4A and 4AU6, have 450-ma heaters and are identical to 6.3-*v* counterparts, the 6AF4A and 6AU6, respectively, except for heater characteristics.

The *vhf*-tuner tube, 6CY5, is said to offer a high signal-to-noise ratio, transconductance, and input impedance.

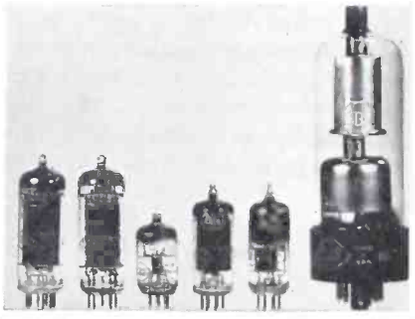
For use in color-TV receivers, as a high-voltage flyback rectifier, a 3B2 has been developed. The tube features a peak inverse plate voltage of 35 and a minimum *dc* output of 1.1 *ma*. It has an octal base and top cap.

TV Replacement

A TV replacement tube, type 3DK6, has been added to the Raytheon line.

The 3DK6 is a heater-cathode sharp-cutoff miniature pentode designed for use as wide-band *if hf* amplifiers.

The tube, identical to the 4DK6 except that it has a 600-*ma* heater rating, is being used in the '58 Zenith TV chassis.



NEW CBS receiving tubes (left to right): 12AL8 and 12DL8 hybrid auto radio tubes, 3AF4A and 4AU6 series-string tubes, 6CY5 vhf tuner tubes and 3B2 high-voltage rectifier for color television.

Small Appliance Service Opportunities

by E. A. MUELLER
Electric Sweeper Service Co.

THERE ARE CHIEFLY TWO important service industries in the electrical life of most homes today. One revolves about *major* appliances, such as washing machines, dryers, stoves, refrigerators, air conditioning, etc.; the other concerns *small* or *portable* appliances, such as power tools, vacuum cleaners, polishers and the multitude of kitchen appliances. Probably radio-TV occupies a top ranking spot in either industry, although it has certainly overlapped into both.

In recent years a strong radio-TV-*small* appliance trend has been developing because of the service requirement similarities involving training, retail experience, type of personnel, and similarity of tools.

Despite the fact that it has had but a fraction of the publicity enjoyed by other service fields, the *portable* appliance industry is several times as large as any other consumer service field. The proof is in everyone's home. One need only compare the number of appliances now in use; irons, toasters, fans, percolators, mixers, waffle irons, deep fryers, skillets, roasters, broilers, blendors, fans, vacuum cleaners, floor polishers, portable power tools, and dozens of similar items.

Despite the size of the industry, no trade or public school repair courses have ever been offered; some correspondence schools offer special courses. Thus there exists an actual shortage of trained repairmen who are capable of performing appliance service. The majority of those in appliance repair (excluding the limited number of factory authorized service station men) were originally general handymen or appliance salesmen; some are legitimate Service Men, lacking, however the technical training.

Of the two requirements for appliance service, mechanical and electrical, radio-TV men with their electronic background more closely meet the needs of the portable appliance service field; those in major appliances normally only have mechanical experience.

The retail business experience, tool investments, and specialized training possessed by the radio-TV Service Man makes the adoption of portable appliance service as a supplementary

(*Continued on page* 45)

TV Antennas

(*Continued from page 20*)

more active use of increasingly popular portable-TV sets. Broken or bent dipoles can be replaced individually. Most Service Men, however, find that the added labor and time required cost more than the low price of a complete unit replacement—of the type shown in Fig. 2—which also assures better performance over the long run.

In several of the '57 and '58 portable-TV models the antenna is an integral part of the cabinet and telescopes entirely within the set itself, as illustrated. The repair or replacement of a broken element is relatively simple. The unit is easily accessible from inside the cabinet. Once the top plate that insulates the antenna circuitry from the mounting surfaces is loosened, the ball clutches are released freeing the dipole rods for replacement by a new pair.

This shift in indoor antenna merchandising and consequent consumer attitude opens wide two avenues to greater profits for indoor-TV antenna merchants: (1) more indoor antenna tie-in sales and (2) more portable-TV indoor antenna replacements.

When a portable TV set owner returns to the shop or the store to replace his broken or damaged antenna, he expects to pay as much as it cost him originally—perhaps even more. He considers the *built-on* portable TV antenna replacement in the same class as the repair or replacement of a yoke or tube or transformer—and is prepared to pay anywhere from $6.00 to $10.00 for it—not 99¢, the price of conventional table-top indoor TV antennas. When you stop and think of the frequency of such portable TV antenna breakage (their average life is approximately 14 months) and multiply it by the 4-million portables now in use, you can begin to appreciate the potential. And, its going to *snowball* as the ratio of portable to other type monochrome-TV receivers sales continue to soar; today, it is estimated at 35 per cent and industry statisticians expect it to reach 40 per cent in three years.

Now imagine the tremendous portable TV antenna dollar volume ahead. In tie-in sales with new sets—approximately $20,000,000 in 1958 (figuring on 2,500,000 units at an average retail of $8.0 each). In replacements—$16,000,000 for the year (based on 2,000,000 units at an average retail of $8.00 each). And it's only the beginning.

Portable-TV antenna business is good business—business that helps keep you ahead—business that's free of headaches and call-backs—business with bright promise in tomorrow's television aftermarket.

TV-Test Shortcuts

(*Continued from page 22*)

justments are made. This method alone leaves us with a missing link. It does not tell how the *rf* and *if* circuits work together as a team.

However, it is quite easy to check the combined *rf/if* response curve. We do this by applying an *rf* sweep and marker signal to the antenna-input terminals of the receiver. The 'scope is connected at the output of the picture detector. This gives us an overall *rf/if* response. If operation is normal, we find the same shape of overall response curve as obtained in the *if* check by itself. But when we do *not* obtain a good overall response, we must proceed to correct the difficulty.

One reason for poor overall responses is mixer regeneration. As shown in Fig. 6 (p. 22), triode tubes (in particular) have substantial grid-plate capacitance. This causes grid-plate feedback when the resonant frequency of the plate circuit is in the vicinity of the resonant frequency of the grid circuit. The feedback causes regeneration in the mixer circuit. The total effective grid-plate capacitance is a combination of the interelectrode, lead and socket-terminal capacitances.

It is quite easy to test for mixer regeneration, using a sweep generator and a 'scope. To do so, the sweep signal should be coupled into the mixer (or oscillator-mixer) tube with a floating tube shield. This provides loose coupling from the generator to the plate of the mixer; loose coupling is required to make a regeneration test. The 'scope should be connected at the output of the picture detector. The local oscillator must be disabled, preferably by use of a dummy tube; grid pin cut off from oscillator section of the tube.

To check for the presence of mixer regeneration, one merely rotates the channel-selector switch through its range, while watching the response curve on the 'scope screen. If mixer regeneration is present, its greatest effect is usually apparent on the low channels, such as 2 and 3, and on the highest channels, such as 12 and 13. Small amounts of mixer regeneration can be disregarded; bad cases cannot be.

It is not practical, in most cases, to troubleshoot or modify a poor tuner for a regenerative mixer. It is advisable to replace the tuner with a better type. Some modern tuners have special neutralizing circuits to minimize the curve distortion caused by mixer regeneration.

Capacitor Service Contest

A SPECIAL PRIZE contest to acquaint radio and TV Service Men with Tobe service capacitors has been announced by Tobe Deutschmann Corp., Indianapolis, Ind. Service Men will be asked to state why they prefer Tobe capacitors in their work. As an aid in preparing a statement in 25 words or less, official entry blanks will list the main features of the capacitors. Entry blanks will be made available through Tobe distributors. As a condition of entry, blanks must be accompanied by a Tobe box top or envelope sleeve.

A total of 50 prizes will be awarded for the best entries. A 1958 Ford Ranch Wagon is first prize.

Transistor Lecture Series

A SERIES OF FIVE LECTURES on transistor principles and transistor radio servicing will be given from February through June at the New York Trade School, 310 E. 67th St., New York 21, N. Y.

Paul B. Zbar, technical training director of the Electronic Industries Association, and *Sid Schildkraut*, a member of the EIA teaching staff, will conduct the series.

The program is being sponsored jointly by the New York Trade School and the Certified Electronic Technicians Association.

All graduates of the EIA advanced TV servicing course held recently at the school are eligible for this program.

Multiple-Socket Testing

(*Continued from page* 26)

method to be employed. It is equally effective with a triode-pentode (such as a 6U8) or a diode-pentode (such as a 6AS8).

Short Test

The *short* test provided by this tube tester centers on a cathode-to-any-other-element check. Interelement leakage of 3 megohms or better can be detected. In cases where gas content is high, weak cathode current is shown as a result of *leakage* through ionized gas in a tube. This will show all but a few gassy conditions where only a grid circuit tester would be effective.

This is the principle used in the *short* test (Fig. 3; p. 26). If an *ac* signal is applied to a tube in a manner so that no *dc* return path exists, the tube will *block* and no current will flow. If leakage does exist, the tube will not *block*, but will conduct and the neon indicator will glow.

The sensitivity of the neon indicator is 3 megohms. Filament current does not flow through the leakage path, nor does any leakage current flow through the meter. A 6800-ohm resistor serves for current-limiting in case of a dead short in a tube.

Short-Quality Switch

The *short-quality* switch is a 6-pole double-throw push-button type that is normally held in the *short* position by spring action. It performs the following functions:

(1)—Changes the connections to the sections of dual-purpose tubes from parallel for a *short* test to series for a *quality* test.

(2)—Switches the meter out of the circuit for safety during short tests to prevent accidental meter burnout.

(3)—Switches the *short* indicator out of the circuit during *quality* tests.

(4)—Switches in a higher voltage (300) for *quality* tests on special tubes such as 0Z4, etc.; see Fig. 4; p. 26.

Tube Test Troubleshooting

The following represent examples of the use of the multiple-socket tester for troubleshooting.

Chassis: RCA 21T6082 TV.

Complaint: Sound and raster okeh, but no video.

Test Procedure: Substantial sound was available; thus the tuner could be eliminated as a possible source of trouble, and also the sweep and power tubes. This left six tubes that could cause the condition: three *ifs*, two video and a sync tube. A check disclosed that the 6AS8 (detector–first video amp tube), showed no output. It was replaced, the set adjusted and the call completed.

Here is an example of picture-tube troubleshooting.

Chassis: Zenith

Complaint: No video; raster present and sound okeh.

Test Procedure: The symptoms indicated a bad picture tube; bright raster, poor focus, no video, no control of brightness or contrast. This condition usually indicates a K-G or K-H short in the picture tube. The temptation was strong to quote on a new tube, but it was decided to check the tube to be sure. With an adaptor° plugged in, the picture tube was found to be fine. The trouble was in a .05-mfd capacitor coupling the video to the picture-tube grid which had shorted and applied plate voltage on the grid. No need to tell the strong psychological effect on a customer who has just been told he does *not* need a new picture tube.

°*Century AD-1.*

Service Engineering

(*Continued from page* 17)

ample, a plant may assign a complete closed-circuit TV chain to a service station for a period of time along with training instructions. In this case, the initial phase of the training is on a self-taught basis and scheduled by the service station during its off-peak hours. The basic familiarization with adjustments and circuits is obtained during this period. A manufacturer's service-engineering representative can be called on, at the end of this training period, to answer any installation, operational or service questions. This initial training can also be followed by actual field training under the supervision of the factory engineer, with the service station participating in a field installation.

This approach to training has developed a number of excellent service-engineering representatives with a minimum of lost time and overhead expense.

Standard type tubes and components are used in the closed-circuit setup, with the exception of the *eye* (vidicon type camera pickup tube) of the system. This tube is the most expensive component and carries an industrial tube warranty. It is an industry practice to handle this tube as a separate item on a service contract.

Service stations may offer the customer two vidicon-replacement plans. The customer may purchase the vidicon separately if it should fail, or the vidicon can be supplied as part of the contract. In this latter case, the price of the contract reflects the price of replacing the tube. In either case, the service station is protected, and stocking such a tube is not a liability.

Our closed-circuit TV chain consists of three packages; camera, control unit, and picture monitor. The monitors may be any of several commercial video types or a conventional home type TV receiver; the control unit has an *rf* output on one channel that may be selected between channel 2 to 6.

A closed-circuit TV system is fundamentally the same as a TV broadcast system, except that the picture signal information is carried on coax cable rather than through the air.

The camera contains the vidicon tube, the vidicon scanning components, a blanking amplifier, and a video-preamplifier chassis. There are no normal operating adjustments on the camera itself as it is usually mounted in some remote area. The only adjustment necessary is on the lens; it must be focused properly on the vidicon's screen.

24-Inch 110° TV Chassis

(*Continued from page* 18)

uted to the design of an efficient, compact deflection yoke. The yoke used on the 110° chassis is about the same physical size as present 90° yokes. There is a more pronounced flare in the yoke windings which permits the windings to extend further up on the bell of the tube. The ends of the yoke winding have a relatively small effect in the deflection process; therefore by providing a greater flare the yoke may be moved further up so that the center of the yoke windings (which determines the effective center of deflection) is closer to the picture tube screen resulting in a reduction in the deflection current requirements.

The yoke employs anti-pincushion magnets (small *pm* magnets) which are positioned on the yoke assembly to reduce the pincushioning or barreling effect which is associated with increased deflection angles. The yoke has been designed to provide a linear raster with good edge-to-edge focus and a minimum of pincushion or barrel. Allowable pincushion or barrel is specified to be not more than 3%. This is computed separately for vertical and horizontal dimensions on the basis of maximum and minimum height and width. Expressed mathematically, this is: $A_{max}-A_{min}/A_{max}$ x 100%, where A is the measured height dimensions of the raster. The same formula is used to determine the per cent of pincushion or barrel in the horizontal direction, using the measured width dimensions as A. Fig. 1 illustrates how these measurements are made.

High-Definition Picture Circuit

A new *strip-type* turret tuner is used for *vhf* reception and on all-channel models; this *vhf* tuner functions in conjunction with a separate *uhf* tuner. The *vhf* tuner uses a neutralized triode (neutrode) *rf* amplifier stage employing a 6BN4. The 6BN4 was designed specifically for this application and combines good signal-to-noise ratio with excellent stability. A 6CG8 serves both as a pentode mixer stage and triode oscillator. The *vhf*-only models may be adapted for *uhf* reception by replacing one or more of the *vhf* strips with individual *uhf* channel strips. On the all-channel models the *vhf* tuner is equipped with a 13th-position strip which functions as a 41-mc *if* strip, disabling the *vhf* oscillator and converting the *rf* amplifier and mixer stages to a 41-mc *if* preamplifier for use with a separate *uhf* tuner.

The output of the mixer stage is coupled through a double-tuned circuit to a three-stage, stagger-tuned video *if* system. The first stage is tuned to 42.6 mc, the second stage to 45.2 mc and the third to 44.3 mc. Inductively-coupled adjacent channel (47.25 mc) traps are provided in the first and second-stage transformers. A 41.25-mc co-channel sound trap is provided in the first *if* grid coil. Alignment specifications hold the 45.75-mc picture *if* carrier frequency to the 50% point on the alignment curve without variation. On the low-frequency side of the curve the 42.25-mc marker is held between the 60% and 40% points. Tilt, valley and slope specifications are equally close, thus providing an *if* system with a 3.5-mc bandwidth and excellent adjacent and co-channel interference rejection. The overall *if* response curve is shown in Fig. 2 (p. 18). The first and second *if* stages are *agc* controlled by the bias developed in a keyed-*agc* circuit employing a 6AU6. An *agc* clamp diode (part of a 6AT6 audio amplifier) is utilized to provide delayed *agc* for the *rf* amp.

The video detector is a 1N64 germanium diode mounted inside the third *if* transformer shield can, the top of which is removable for easy access in the event replacement is required. Mounting the diode in this manner has been found to provide

excellent shielding and eliminate *tweet*. Approximately 5 volts of peak-to-peak signal is developed across the detector load and applied to a broad-band video amplifier which uses a 12BY7.

Earlier design receivers with sound take-off in the video-amplifier stage were subject to the complaint of *sync-buzz*, audio detection and amplification of the 60-cycle sync pulses in the video signal. This is no longer a problem with the excellent AM rejection provided by the *gated-beam* sound detector circuit. The 6DT6 is a special purpose tube which provides, in addition to FM detection, limiting and audio amplification. Operation of the 6DT6 FM detector is similar to the earlier 6BN6 quadrature-grid detector; however, improved noise immunity under weak signal conditions is obtained with the 6DT6 circuit. Sufficient audio is available from this stage to drive an output stage directly. However, to obtain high-fidelity sound the output from the detector is fed into a separate 10-watt audio-amplifier chassis. The amplifier uses a 6AN8 as an audio amplifier and phase inverter feeding a pair of push-pull 6V6's. The amplifier employs degenerative feedback from the voice coil winding of the output transformer to the cathode of the audio amplifier to achieve reduction in harmonic distortion. A compensated volume control and individual bass and treble tone controls are provided in a separate control and input compensating circuit which connects between the audio output of the 6DT6 circuit and the amplifier chassis. This control circuit also includes an audio input switch which permits the output from a record player to be fed into the amplifier. The *ac* circuits have been so designed that the entire TV chassis may be turned off, when using the instrument with a record player, to conserve power and prolong the life of the TV tubes. The amplifier has its own power supply and is completely independent of the TV chassis.[2]

On one model,[3] a deluxe console TV, two 12" bass speakers and two 5" *tweeter* speakers are used. The 12" speakers each have a 6-ohm voice coil impedance and are connected in parallel to match the impedance of the output transformer secondary. The *tweeters* are connected through a crossover network which channels only frequencies above 4500 cycles to the *tweeters*. Other models employ different speaker systems; however, all models using the 110° TV chassis use multiple bass speakers and one or more *tweeters* with a crossover network.

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[2]*The 26 Series chassis is also used in 3-way combination models. In these models a separate AM/FM tuner is employed along with an amplifier chassis.*

[3]*MV325.*

Audio

(*Continued from page* 30)

of the commercial garages in town, all three hospitals, half a dozen supermarkets, 13 schools with capacities ranging from 20 to 200 stations, hotels, banks, country club, 25 churches, several convents and countless stores and restaurants.

"Yet the surface of the sound business hasn't begun to be scratched even in this city of less than 80,000," he stoutly maintains. "If I had the time to go out and knock on *every* door, I wouldn't know what to do with all the business. Opportunity is almost unlimited."

Kunze apparently knocked on several doors these past four years. His sales record shows that he's not the type to sit and wait for orders to come in. His gross volume increased from $23,000 in '54 to $50,000 in '55 to $100,000 in '56. "My '57 figure is *substantially more*," said Ed after a quick check with his auditor.

"There isn't a plant that should be without sound, both for reasons of tremendously increased efficiency and enormous economy in time, steps and money."

"There isn't a school with 10 rooms or more that isn't a good prospect."

"Yet, you know," Ed mused, "the ones that need it the most are the hardest to sell."

It's obvious, however, that he has done a lot of hard selling since he opened his shop—Edward's Sound Engineering—for business about five years ago. Kunze started with a used amplifier which cost him $75.00

"We started servicing picnics, band concerts, and parties. Later on, we got the horse shows at Lake Forest, Illinois, and Wayzata, Minnesota, which we still have, and the big parties like the one they hold at Johnson's Wax each year."

Gradually, the business grew and the Kunze home grew right along with it. He started his shop in his home and that's where it still is, along with his office presided over by his wife and business partner, Adele.

Kunze not only sells and installs intercoms,° but record players, sound projectors and high-fidelity equipment. "We have garages rented all over the neighborhood which we use as storehouses," laughed Mrs. Kunze.

Sound advice on door knocking, according to Kunze, is to pass up no lead. You might have to knock on the same door many times, but you'll be surprised how suddenly a "no" can turn into a "yes."

"We dickered for one job for more than two years. Then one night one of the executives was listening to one of our sound systems at a party and asked me, 'Ed, why can't we have a sound system that sounds like that?' They have one now."

More sound advice: "Once sold, you have to give your customers immediate service. We discovered that previously some of our customers had to wait as long as two weeks before they had service. Actually if they have to wait a full day, they complain. We sell with the guarantee that we will provide immediate service on a 24-hours-a-day, seven-days-a-week basis."

"You must have a good Service Man or be it yourself. That's the backbone of this business. We built our business on the foundation that we put in the time to do a thorough job correctly no matter how long it takes us."

"We sell a service contract with our intercom systems. It doesn't run very much. Some of the sets have been operating for as long as 20 years without requiring any major servicing.

We come in and check and clean every set at least once a month.

(*Continued on page* 45)

°*Kunze has an exclusive dealership with Webster Electric Co.*

(*Continued from page 44*)

Almost every system is tailored to the place that uses it. For example, there's a fish place that requires special attention. The oil from the fish clogs the keys and we have to go in and clean the keyboard once a month."

"Service is what will sell sound to the people that need it and almost every plant and office does. That and the personal contact. In a plant you can explain exactly what a system does, how much time it will save, how big a savings in money will be effected."

More sound advice: Factory sound engineers and product men are paid to help their dealers. Don't be afraid to call on them. You may save that sale.

Kunze stresses the fact that he has not foresaken the business which gave him his start. Wherever there's a big picnic, party or other event in Racine needing a public address system, you'll see Kunze's brightly painted panel truck nearby.

Kunze, who now has a panel truck, two station wagons and three assistants, besides his wife, is hoping for that extra time to (1) take his first vacation and (2) knock on every door.

Appliance Servicing

(*Continued from page 37*)

enterprise a more normal expansion than any other related activity.

To many the foregoing sounds like a suspiciously rosy picture, and there are those who will cry it down because of the depressive impact of the discount market on any service at all and the restriction of potential service dollars per unit of work, because of the comparatively low unit replacement cost. What other allied service line can one enter with so little additional investment in equipment and inventory? And what other line offers such possibilities—with impulse sale items as mixer beaters, mixer bowls, cord sets, percolator pumps—baskets—tops, plastic and glass parts, mixer and rotisserie accessory items, vacuum cleaner belts—hose, etc.?

One can break in experimentally by just carrying a few popular and much needed non-service replacements at the counter for the customer's convenience. Actual repair need not be attempted until investigation is complete—and one is good and ready—and still the market is not lost.

Your own electrical background and good horse sense, plus repair diagrams which most manufacturers will supply, and a good source of parts supply, (not too far away), can start you on your way. If there is difficulty in locating a major factory authorized service center or parts supplier in your area, the editors of SERVICE will be glad to help you.

TEST INSTRUMENTS

SWEEP/MARKER/ALIGNMENT GENERATOR

A SINGLE-UNIT VHF-UHF sweep-marker-alignment generator, 615, has been developed by The Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 8, Ohio.

Amplitude modulation is said to be less than .1 db per mc; marker frequency accuracy less than .5% at any setting. Frequency ranges are 2.5 to 5.5 *mc*, 19 to 50 *mc*, 54 to 108 *mc* and strong harmonic 108 to 216 *mc*. Has built-in retrace blanking controllable from front of panel and zero reference base line. Variable sweep width from 0 to 15 *mc*. Built-in 4.5-*mc* crystal controlled by panel switch provides simultaneous sound and picture markers, dual markers for *if* or *rf* alignment and 4.5-*mc* signal for intercarrier sound alignment.

Both marker and crystal oscillators may be amplitude modulated approximately 30% by a self-contained 900-cycle internal modulator. [SERVICE]

° ° °

VACUUM-TUBE VOLTMETER

A MULTIPLE-USE VTVM (model 77) has been introduced by Superior Instruments Co., 2435 White Plains Road, New York 67, N. Y.

Designed for use as a *dc* voltmeter, an RMS and peak-to-peak *ac* voltmeter and electronic ohmmeter. Can also be used for db measurement and is equipped for zero center discriminator alignment. Measures *dc* up to 1500 v.

As an electronic ohmmeter, instrument will measure from .2 ohm to 1000 megohms. Utilizes a 12AU7 as a *dc* amplifier, two 9006's as peak-to-peak voltage rectifiers, and a selenium-rectified power supply. [SERVICE]

° ° °

DYNAMIC PIX-TUBE TESTER

A PORTABLE DYNAMIC picture-tube checker, *Check N' Tell*, has been developed by the Circuit Manufacturing Co., Inc., 923 Shadeland Ave., Drexel Hill, Pa.

Unit is said to disclose following defects: Continuity, emission, control grid and cathode opens and shorts, and focus grid leakage.

Reference chart provides a detailed list of tube trouble.

NATIONAL TV SERVICEMEN'S WEEK

THE FOURTH ANNUAL National Television Servicemen's Week will be observed this year from March 24-29.

A campaign to promote the week will utilize magazine, television, radio and local newspaper advertising, as well as special contests and sales promotion aids.

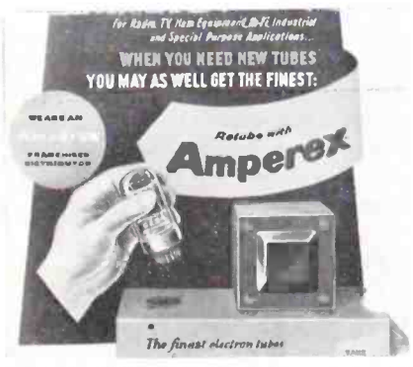
The promotional material consists of paper hangers and streamers for in-store and window displays; an easel-back counter-card showing a typical NTSW advertisement; gummed stickers for promotional literature; plastic buttons for Service Men; a booklet, *Newspaper Advertising Pays*, written especially for those planning local newspaper ads; TV servicing stories for local publicity, and suggested scripts for spot radio and TV.

A highlight of the campaign is a *Mystery Shopper* contest leading to 192 awards. To enter the contest, Service Men must write a statement of fifty words or less telling how they believe National Television Servicemen's Week benefits the independent TV service industry. Contestants will be ranked in each of RCA's eight sales regions in the order of merit of their entries. Between April 1 and April 30, each contestant will be visited by a *Mystery Shopper* who will ask a question about RCA Silverama picture tubes or RCA receiving tubes. The first Service Man in each of the eight sales regions who answers the question correctly will receive the grand award, an MGA sports roadster.

ADVERTISERS IN SERVICE

FEBRUARY, 1958

Tube Motion Display



THREE DIMENSIONAL battery-operated, motion display of a tube being plugged into and out of a socket. — Amperex Electronic Corp., Hicksville, L. I., N. Y.

ACCESSORIES

MULTIPLE SELECTOR SWITCH OUTLET

A HEAVY-DUTY MULTIPLE-SELECTOR switch outlet with four outlets, each controlled by a switch, has been announced by CBC Electronics Co., Inc., 2601 N. Howard St., Philadelphia 33, Pa.

Each switch and outlet pair is in a contrasting color for quick identification. Equipped with a 10′ neoprene heater cord and a fused plug. Sockets and switches are replaceable. Rated at 15 amps, 115 *v*. [SERVICE]

° ° °

PICTURE TUBE REJUVENATOR

A PICTURE-TUBE rejuvenator, *Rejuvatube* RE-2, featuring a *cube socket* selector and cable as a one-piece assembly, has been introduced by Central Electronics, Inc., 1247 W. Belmont Ave., Chicago 13, Ill.

Unit has an illuminated meter and TV interlock power cord. *Cube socket* and switch assembly is said to enable testing and rejuvenation of each gun in a color tube; 110° short tubes with miniature or medium bases and conventional b-w tubes. Gas content of tubes can also be checked.

Cube socket selector and cable, CS-2, are available separately as an accessory for model RE-1 tube rejuvenator. [SERVICE]

° ° °

110° HARNESSES-ADAPTERS-SOCKETS

A LINE of 110° harnesses, adapters and sockets to permit testing of wide-angle tubes in conventional picture-tube checkers has been announced by Eby Sales Co. of N. Y., 130 Lafayette St., N. Y. 13, N. Y.

Types are available for RCA and Sylvania 110° picture tubes. [SERVICE]

° ° °

ELECTRICALLY-OPERATED ANTENNA

AN ELECTRICALLY-OPERATED disappearing-type auto radio antenna is now being marketed by The Tenna Manufacturing Co., 7580 Garfield Blvd., Cleveland 25, Ohio.

Designated the TM-1 Tennamatic, the unit has a universal mounting and utilizes a thrust-limiting clutch, said to prevent *motor burnout*.

Motor operates on 12-*v dc* and draws a maximum of ten amperes. Housing is treated with a waterproofing compound. Equipped with quick mount leads and fast disconnect plugs. Designed for front and rear mounting. [SERVICE]

PERSONNEL

DOUGLAS THATCHER has been named sales manager of the newly formed international division of Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis. . . . *Bruce Vinkemulder* has been promoted to assistant general sales manager . . . *Gerry Mills* will assume responsibility for distributor division sales . . . *John Prutton* has been appointed sales manager of the ceramic capacitor division . . . *John LeFeber* will continue to have full responsibility for piezoelectric ceramics and will assume responsibility for the sale of semiconductor products.

Le Feber, Thatcher, Vinkemulder and Prutton

° ° °

WILLARD J. RUSSELL has been appointed advertising and promotion manager of Philco Corp. Accessory Division.

Russell

Burns

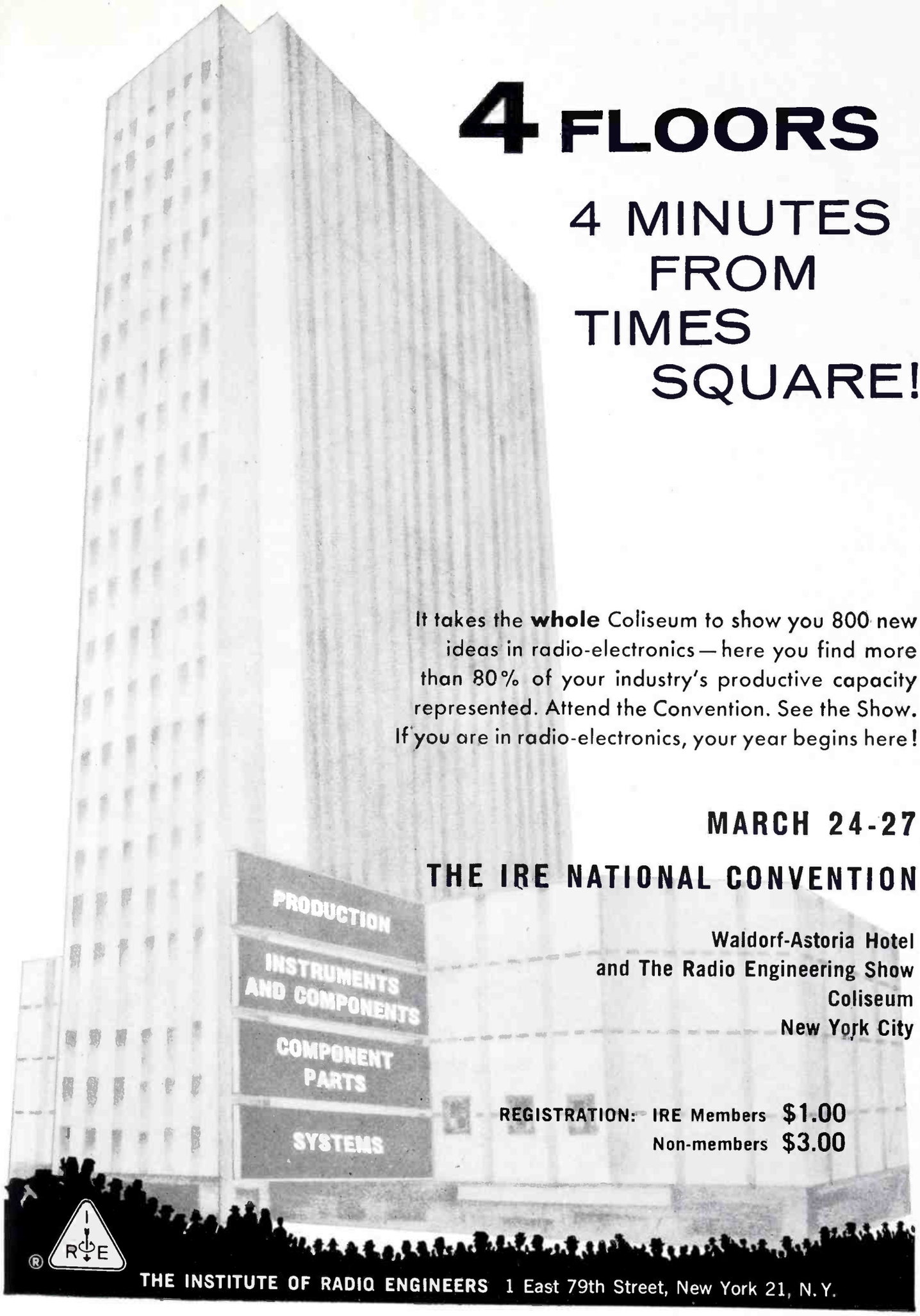
MATTHEW D. BURNS has been named senior vice president of Sylvania Electric and appointed president of Sylvania Electronic Tubes, with headquarters in Emporium, Pa., and *Frank J. Healy* has also been appointed a Sylvania senior vice president and president of Sylvania Lighting Products, with headquarters in Salem, Mass. . . . Six other senior vice presidents were also elected: *Bennett S. Ellefson*, engineering and research; *W. Benton Harrison*, finance; *Robert E. Lewis*, Argus cameras and semiconductor products; *Marion E. Pattegrew*, home electronics, chemical and metallurgical products, and parts; *Howard L. Richardson*, electronic systems and special tubes; *Barton K. Wickstrum*, marketing.

° ° °

MORTON MENDES has been promoted to the post of executive vice president of Tenna Manufacturing Co., Cleveland, O. . . . *Harvey Ludwig* has been appointed vice president in charge of sales and advertising. . . . *Stanley B. Goss* is now electronic distributors sales manager. . . . *Max Bauer* has been named assistant sales manager.

° ° °

RICHARD G. BRADBURY has been named factory sales representative for New York state by Winegard Co., Burlington, Ia. . . . *Vincent Allstaedt* will cover California.



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