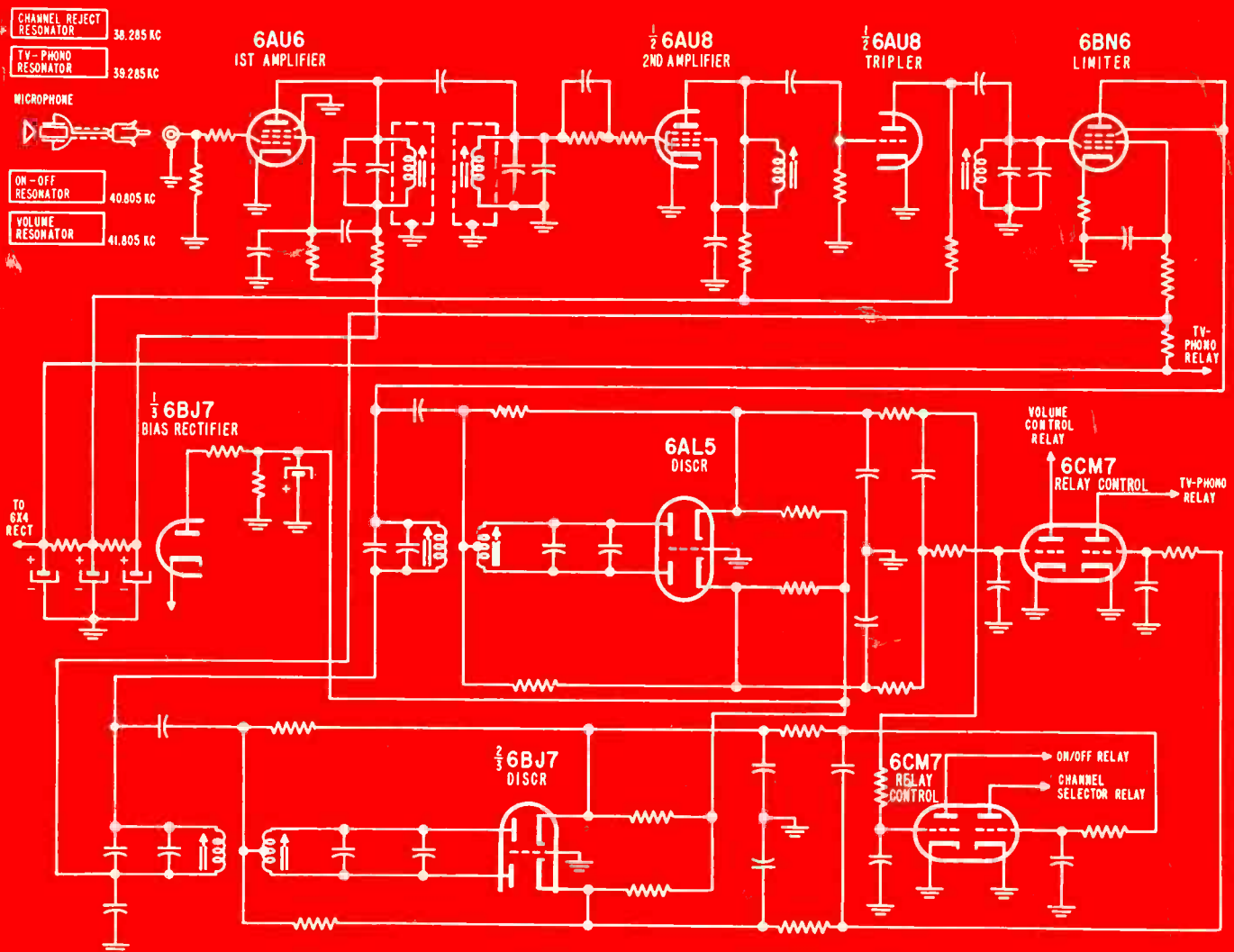


SERVICE

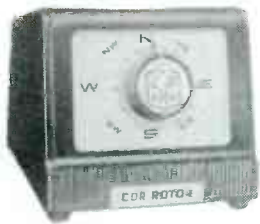
THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE



Radio-TV-phono remote-control amplifier operated by a four-channel ultrasonic transmitter-tuner.

See circuit analysis, this issue

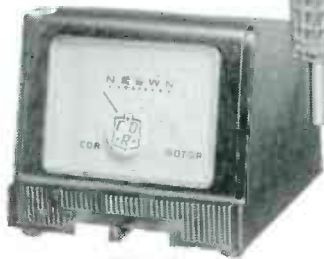
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T L DILLON
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AR-22



TR-2



TR-4

5-star feature...



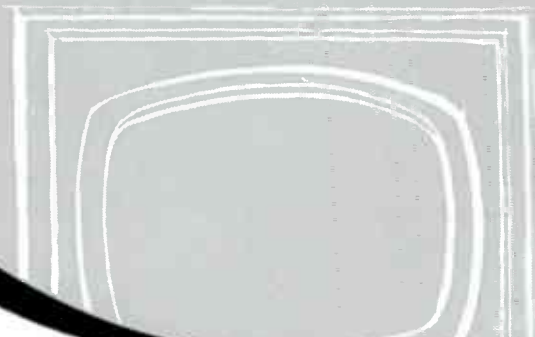
the best color TV picture

the growth of color TV means an even greater demand for CDR Rotors for pin-point accuracy of antenna direction.



a better picture on more stations

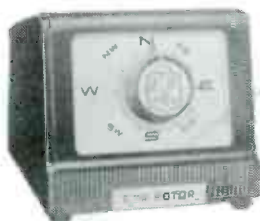
CDR Rotors add to the pleasure of TV viewing because they line up the antenna perfectly with the transmitted TV signal giving a BETTER picture . . . and making it possible to bring in MORE stations.



CDR ROTORS



TR 11 and 12



AR 1 and 2



tested and proven dependable

thousands and thousands of CDR Rotors have proven their dependability over years of unflinching performance in installations everywhere in the nation. Quality and engineering you know you can count on.



pre-sold to your customers

the greatest coverage and concentration of full minute spot announcements on leading TV stations is working for YOU . . . pre-selling your customers.



the complete line

a model for every need . . . for every application. CDR Rotors make it possible for you to give your customer exactly what is needed . . . the right CDR Rotor for the right job.



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THE RADIART CORP.
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**PURE CLEAR POLYETHYLENE TV WIRE USUALLY
SHOWS ONLY 1.2% DB LOSS**

**TV WIRE MADE WITH INFERIOR
MATERIALS SHOWS 3% TO 6% DB LOSS**

**JSC PURE POLYETHYLENE TV WIRE
ASSURES USERS A LOW DB LOSS**



We challenge you to test JSC wire to prove to yourself that it's the low-priced wire with low DB loss . . . because it is made with pure polyethylene. We challenge you to test any other low-priced wire, made with inferior materials — see that the DB loss is as high as 6%!

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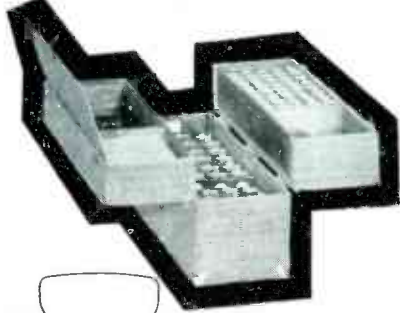
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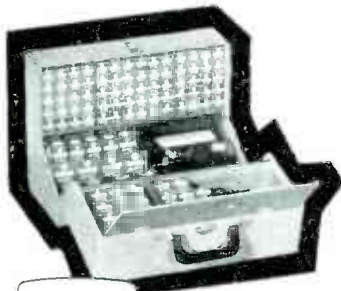
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26th YEAR
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THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE
Including RADIO MERCHANDISING and TELEVISION MERCHANDISING
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COVER CIRCUIT

Four-Channel Ultrasonic Remote-Control Amplifier (Admiral 8F1) 20

FEATURES

This Month in SERVICE	14
Editorial	17
Field Service Experiences With Color-TV Receivers W. H. Powell, R. Scattergood and J. W. Mills	18
Ultrasonic Remote Control for TV-AM-FM-Phono Chassis (Cover: With Complete Circuits)	Perry Sheneman 20
Troubleshooting Multivibrator Horizontal Oscillators	Jess Dines 22
Remedies for Intermittent Hum and Sound in Picture ... Troubleshooting Tips for TV Tuners, Gated-Beam Detectors and Transistor Squegging ..	32
A Field Progress Report on Latest Audio Developments:	
A Packaged 4-Speaker Hi-Fi Radio-Phono	Roy S. Fine 34
A Guide to the Selection of Phono Replacement Cartridges G. A. Morrell, Jr.	38
Sound Is King	Maurice E. Swift 40
Diamonds Are a Record's Best Friend	Robert G. Walcutt 42
Features of New Types of Tone Arms and Pickups	44
Servicing Commercial and Home Hi-Fi Systems	Ernest A. Dahl 46
How to Develop an Antenna Replacement Program	48
Latest Application Information on Transistors for UHF, VHF and AM Receivers, and Auto-Radio and Audio Power Tubes	49

CIRCUIT DIAGRAMS

Admiral Resonator Remote-Control Functional Schematic	20	Test Equalization Setup for Tuners	33
Admiral 8F1 Remote-Control Amplifier (Cover)	21	Signal-Test-Source Coupling	33
Admiral 23A1 Horiz Sync	22	IF Loading Circuitry	33
Admiral 4S2B Audio Amp With Remote Control	24	Westinghouse V-2345 Gated-Beam Detector	33
Admiral Remote Circuitry for Power, Phono, Radio, Amplifier and TV	27	RCA 16-Watt Amplifier for Mark IVD Radio-Phono	35
		RCA Mark IVD AM-FM Tuner	36
		RCA UHF-VHF Tuner for 800 Series Color-TV Chassis	50

DEPARTMENTS

Test Instruments	28	Service Engineering	46
Association News	30	TV Antenna Digest	48
Ten Years Ago in SERVICE	30	Transistor-Tube News	49
Catalogs and Books	31	Accessories	60
Transistor-Radio Service Notes	32	Bench-Field Tools	62
Audio Installation and Service	44	Radio-TV Components	63
		Personnel	64
Index to Advertisers			63

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Note the improvement

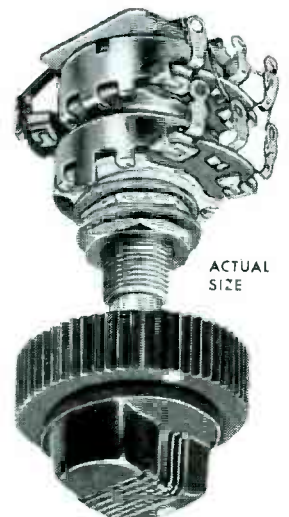


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Put Centralab Compentrol in your customers' hi-fi sets, and *presto!* Sound satisfaction! That's because this remarkable control picks out the trills and rolls out the drums that are beyond the range of less sensitive controls . . . lets your customers enjoy them with true concert-hall clarity right in their living room.

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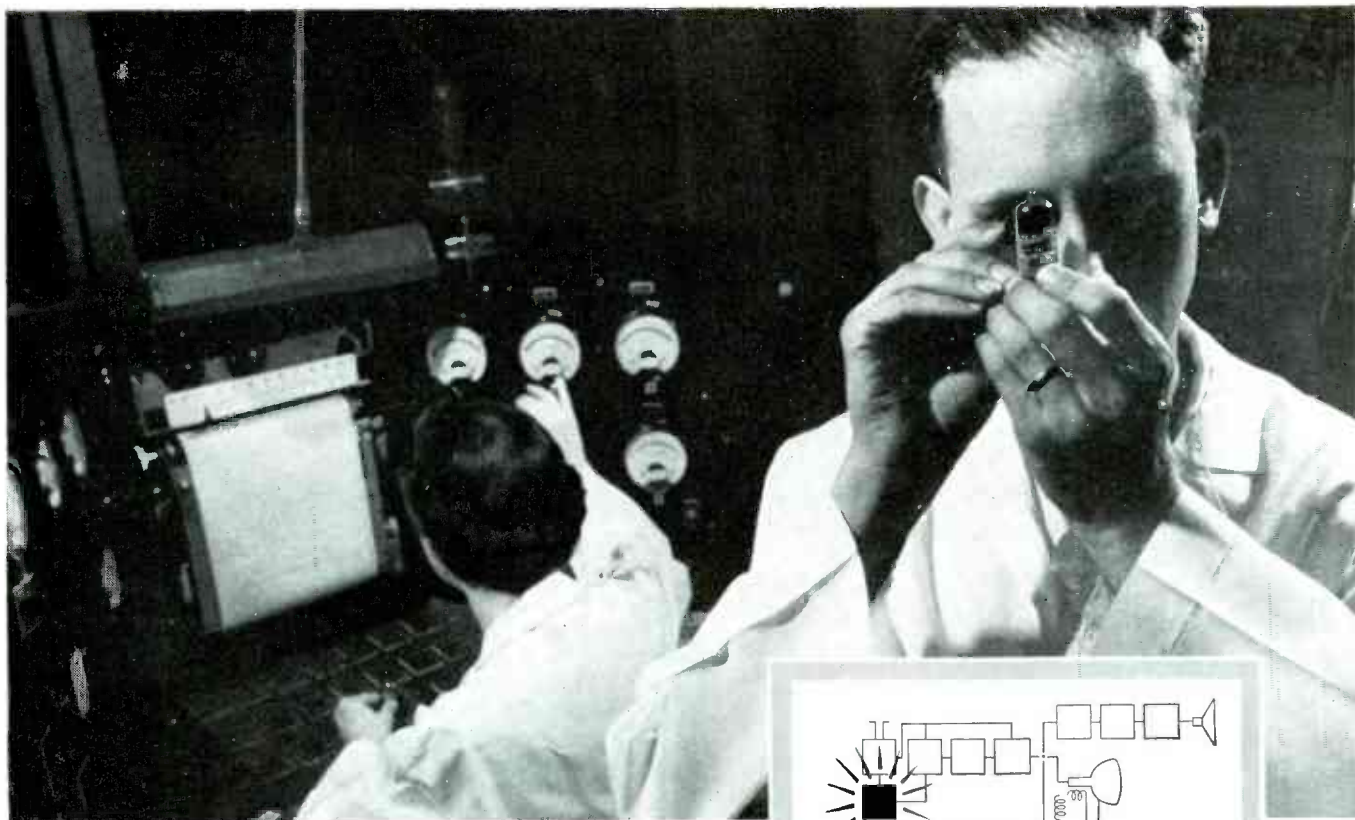


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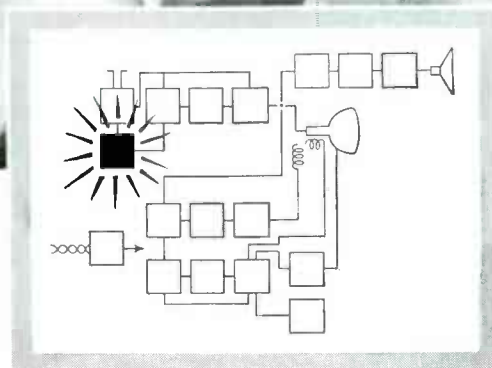
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B-4958



G-E DESIGN ENGINEER M. W. LeClear examines the structure of a 6U8 through a magnifier. Characteristics of the tube have been plotted by the two-axis recorder in background. Outstanding quality of G-E oscillator-mixer tubes—consequently, their popularity as replacements—comes from a balanced application of advanced design principles, precision manufacture, and careful testing.



Superior quality of G-E oscillator-mixer tubes proved by their high gain and uniform electrical characteristics!

Time is your most valuable commodity. Any replacement that conserves your working time and makes it more productive, puts extra dollars in your pocket.

The case for General Electric oscillator-mixer tubes rests on that benefit. These quality types—such as the 6U8, 6X8, 6CL8, 6CG8—have uniform tube-to-tube electrical properties. Install them as head-end replacements, and no adjustment of the coarse oscillator frequency control normally is needed.

Add the saving in call-back time that comes from first-class performance of customers' receivers! For high-gain General Electric oscillator-mixer tubes reduce noise. Their low microphonics mean minimum streaking and similar picture disturbances.

Complete redesign of the pentode section was neces-

sary to obtain the high tube gain you require for top performance. Rigid tube structure and precision control of grid-rod and mica-aperture diameters keep down microphonics. Uniform electrical characteristics of G-E oscillator-mixer types are a product of (1) the industry's most advanced methods of manufacture to high-quality standards, (2) testing and retesting.

Install General Electric tubes for superior performance you can count on . . . every time, from every tube! Your G-E tube distributor makes fast deliveries. Phone him! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

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161-1A11



**10 years of ceramic cartridge pioneering
Sonotone started it... Sonotone leads in it!**

Ten years ago Sonotone created and introduced the first ceramic cartridge—to bring exciting new sound to more people at a better price than ever before.

Today Sonotone still leads the field. More than 50 leading manufacturers have insisted on Sonotone Ceramic Cartridges for their

top-of-the-line high fidelity sets!

It pays to make the industry's choice *your* choice. Sonotone Ceramic Cartridges are easy to work with, easy to stock, easy to sell.

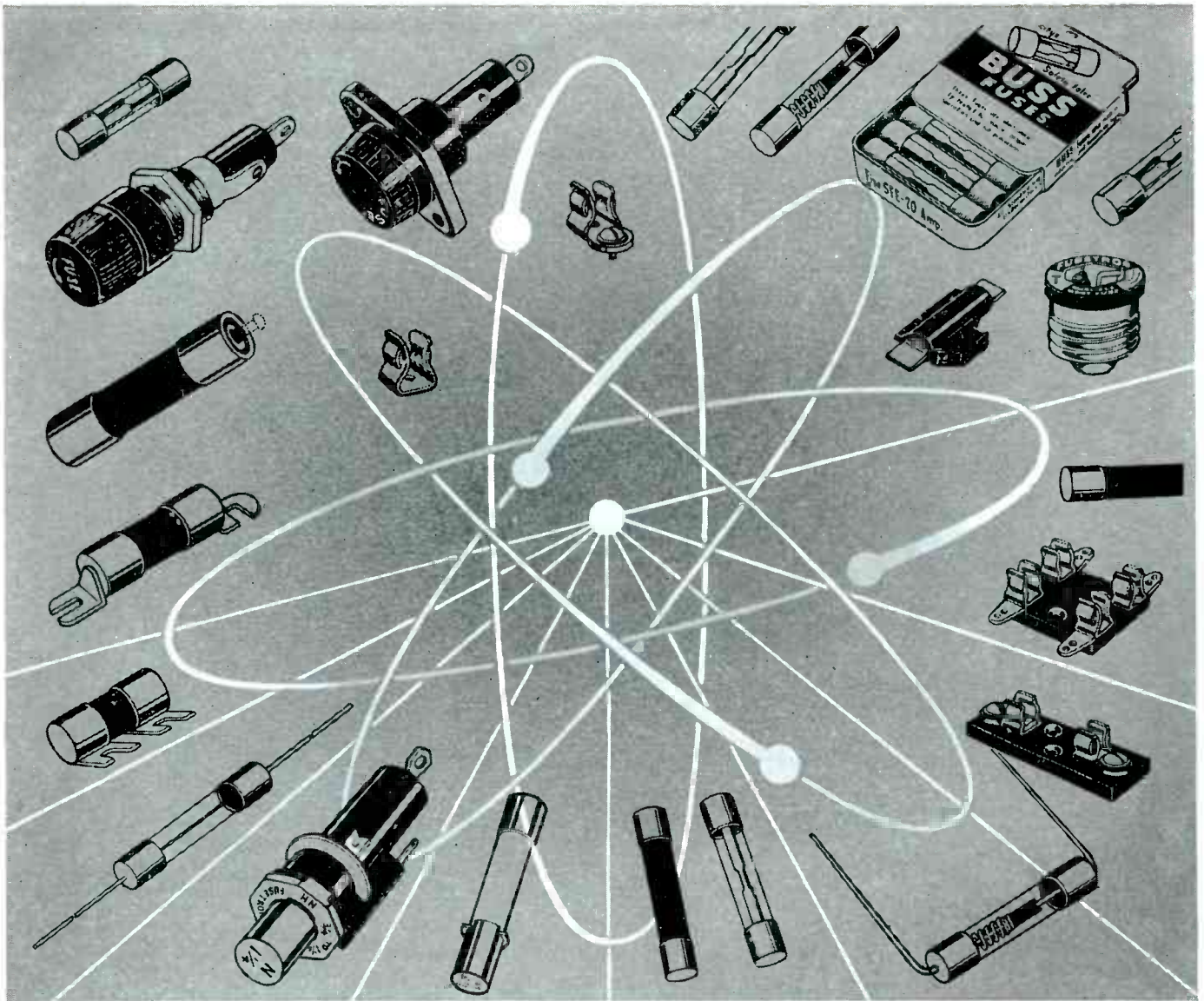
Promote Sonotone. You (and your customers) will be mighty glad that you did!

Electronic Applications Division

SONOTONE® CORPORATION

ELMSFORD, N. Y.

SERVICE, NOVEMBER, 1957 • 5



To assure proper operation *under all service conditions* Every BUSS and FUSETRON fuse is Electronically Tested

You can rely on BUSS and FUSETRON fuses for dependable electrical protection because . . . every fuse is tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

By standardizing on electronically tested BUSS and FUSETRON fuses, you are providing equipment with maximum protection against damage

due to electrical faults. And, you are guarding against the possibility of faulty fuses blowing needlessly and causing unnecessary shutdowns.

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Complete Line: To meet service needs, there is a complete line of BUSS and FUSETRON fuses in sizes from 1/500 ampere up . . . plus a companion line of fuse clips, blocks and holders.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders . . . Write for bulletin SFB. Bussmann Mfg. Division McGraw-Edison Co. University at Jefferson, St. Louis 7, Mo.

BUSS fuses are made to protect - not to blow, needlessly

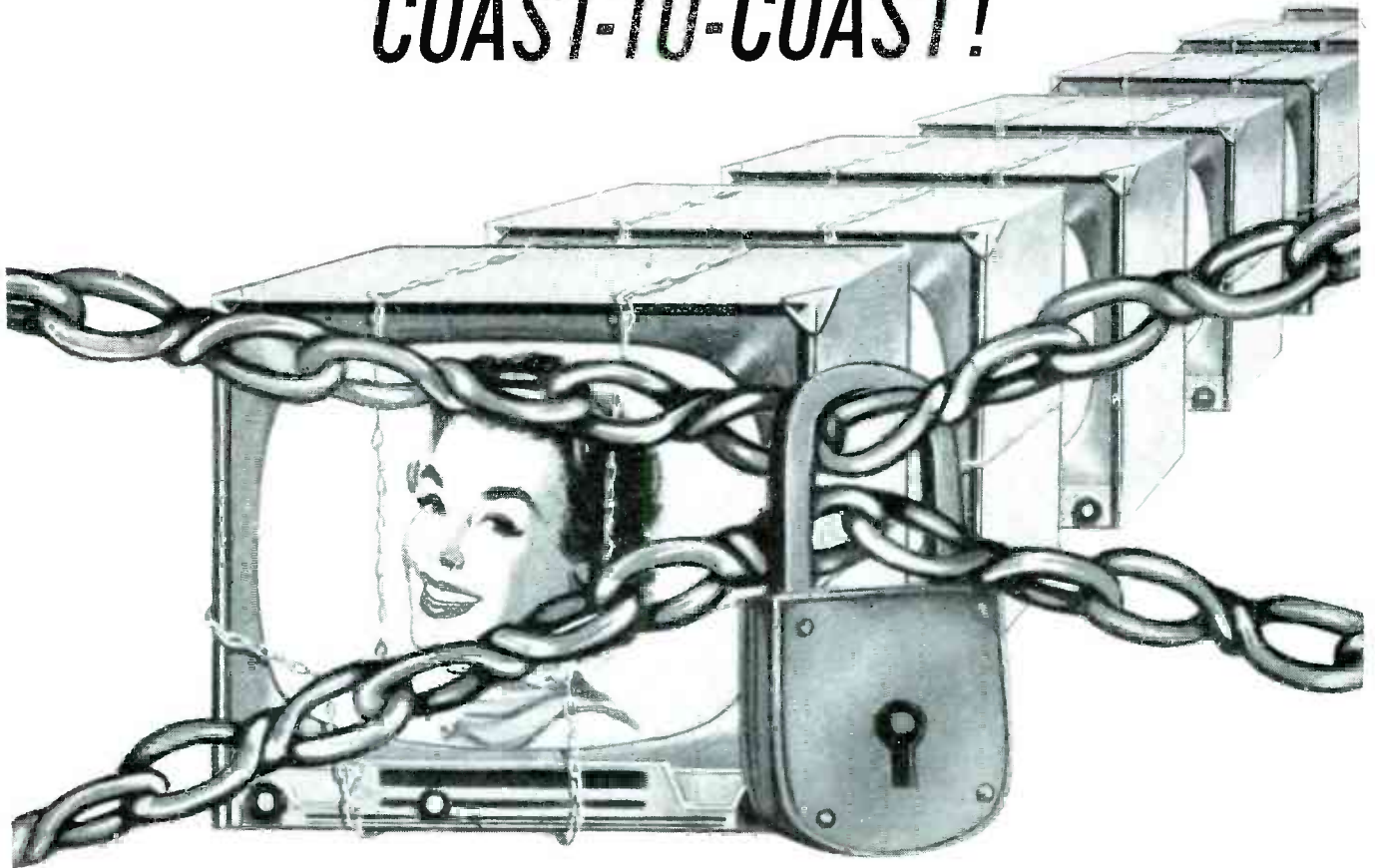
S-1157



MAKERS OF A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRONIC, AUTOMOTIVE AND INDUSTRIAL USE.

103 TV TUBE "TORTURE TESTS"

COAST-TO-COAST!



"Locked TV" prove WESTINGHOUSE tubes work better, cut call-backs!

RIGHT NOW leading Electronic Parts Distributors across the nation are giving Westinghouse RELIATRON® Tubes the most grueling test in TV history!

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Electronic Tube Division • Elmira, New York

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**new luxury
for**

7 fabulous **DAYS**

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You've bought more Federal rectifiers than all other brands combined . . . your loyal support is sincerely appreciated and this is our way of saying thanks:

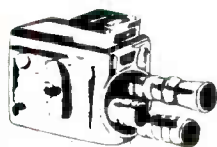
1. WIN a free luxury vacation

7 days, all expenses paid to Acapulco . . . Puerto Rico . . . Miami . . . Las Vegas. Just tell us why you've bought more Federal rectifiers than all other brands combined. Get contest entry forms at your Federal distributor. Contest expires December 31, 1957.

2. Plus a new profit sharing plan

Choose from 1600 bonus gifts. Each time you spend a dollar for Federal rectifiers your distributor will give you three (3) Federal Profit-Sharing Bonus Coupons. Save them and get valuable gifts of your selection. There is no limit.

Start saving these valuable coupons *now*



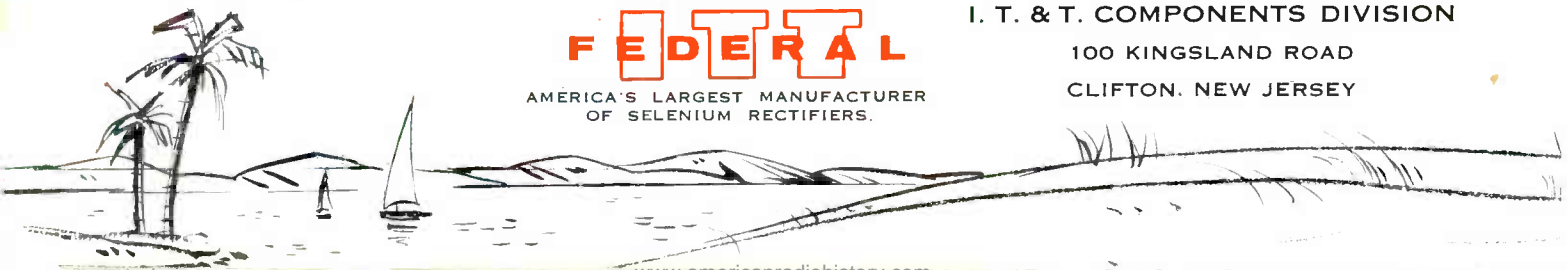
Some of the gifts shown in the "Gift Catalog" you can select with Federal Profit-Sharing Bonus Coupons.



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AMERICA'S LARGEST MANUFACTURER
OF SELENIUM RECTIFIERS.

I. T. & T. COMPONENTS DIVISION
100 KINGSLAND ROAD
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Federal selenium rectifiers are your assurance of satisfied customers. See your Federal distributor for complete Contest and Profit-Sharing Bonus Plan details.

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1. High reliability, ideally suited for computer requirements.
2. Highest purity aluminum used.
3. Molded terminals for tight permanent seal.
4. Low leakage current.
5. Long shelf life.
6. Low equivalent series resistance.

Computer circuits require electrolytic capacitors of the highest reliability. Pyramid type CQM capacitors fill this requirement. They are made with electrodes of the highest purity aluminum obtainable (99.99%) and specially formulated electrolytes. Carefully inspected materials, coupled with controlled manufacturing methods, produce a capacitor capable of meeting the most exacting computer specification.

The capacitors are made in high purity aluminum containers hermetically sealed with molded tops held in place by rolling the can rim securely over a buna rubber gasket. The terminals are molded into the top. These terminals and the buna rubber gasketing insure a tight, permanent seal.

Two types of terminals are available: (1) a screw type terminal with tapped inserts, (CQM); (2) a lug type terminal, with anti-rotational locks, swaged to solid aluminum inserts, (CQML).

Internal connections to the aluminum inserts are made with straps of the same high purity aluminum as the electrodes. This feature contributes to low leakage and long shelf life.

Pyramid type CQM capacitors may be ordered in various capacitance and voltage combinations ranging from 45,000 mfd at 5 WVDC to 850 mfd at 400 WVDC. Container diameters are 1 $\frac{3}{8}$ " , 2" , 2 $\frac{1}{2}$ " and 3". The height for all units is 4 $\frac{1}{8}$ ". Other sizes, or units for special applications may be obtained by inquiring of Pyramid's Engineering Department.



NEW FROM PYRAMID

PYRAMID TQ

1. Designed for high reliability electronic equipment, telephone networks, and industrial control systems.
2. Wide temperature range: -20°C. to +85°C.
3. Hermetically sealed aluminum can.
4. Low leakage current.
5. Long life, trouble free operation.
6. Manufactured under quality controlled conditions.

Present day electronic equipment, telephone network systems, and industrial control systems, where a high degree of reliability is essential, require capacitors having a long life.

Pyramid Electric Company introduces type TQ, a high quality electrolytic capacitor which will meet the requirements of design engineers today and for some time to come.

From raw material to finished product, the Pyramid type TQ is manufactured under controlled conditions and constant supervision.

Type TQ Capacitors are available in single, dual and triple capacitances. They vary in voltage range from 6 to 450 working volts DC. Can sizes are available in 1" diameter x 2 $\frac{1}{2}$ " length, 1" x 3", 1" x 3 $\frac{1}{2}$ ", 1" x 4", 1 $\frac{3}{8}$ " x 2 $\frac{1}{2}$ ", 1 $\frac{3}{8}$ " x 3 $\frac{1}{2}$ " and 1 $\frac{3}{8}$ " x 4".



For complete specifications write for technical bulletin.



PYRAMID ELECTRIC CO.

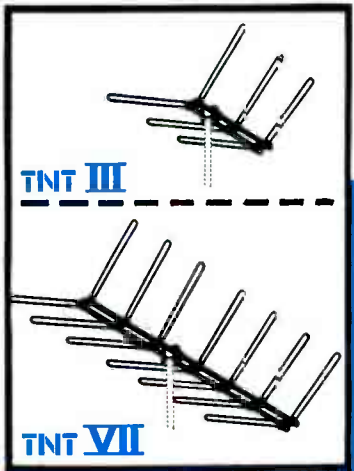
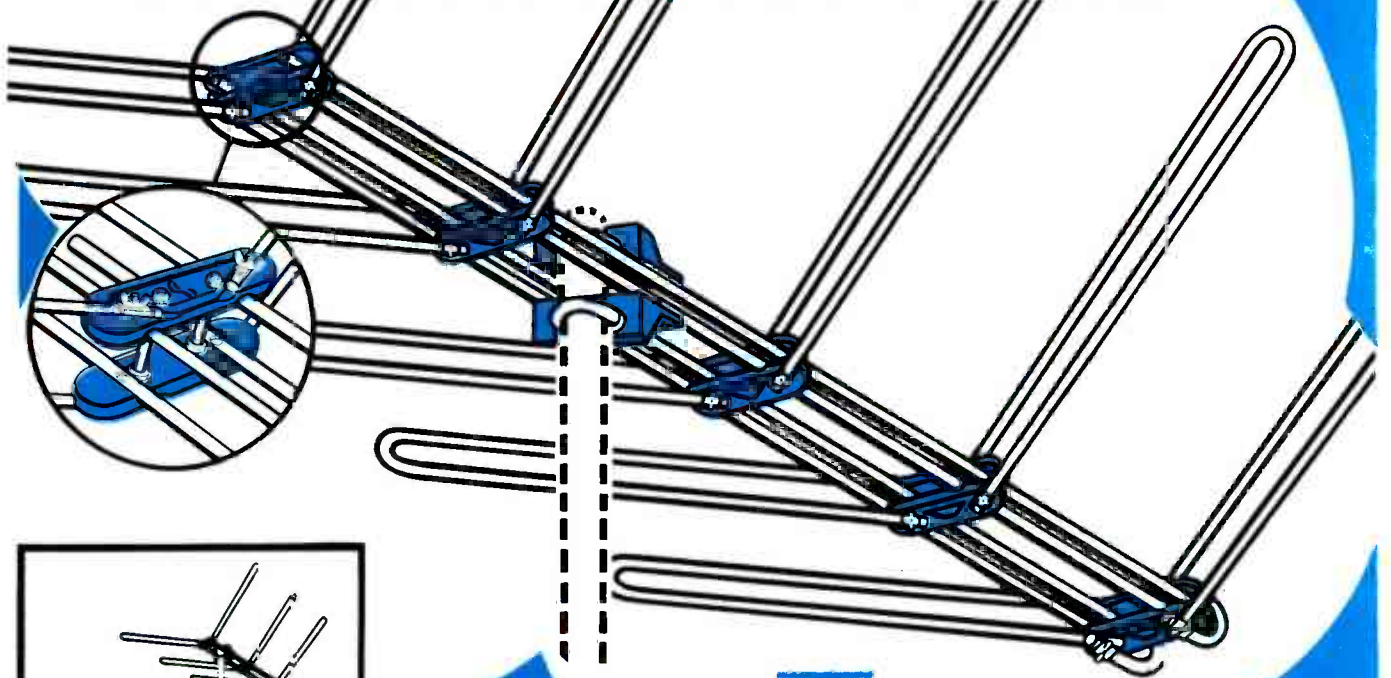
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PHILADELPHIA

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GREATER PROFITS

ALSO AVAILABLE IN
"DO-IT-YOURSELF"
KIT PACKAGES

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MATCHED TV FROM GENERAL

for that smart, efficient,

- Exclusive with General Electric tube dealers!
- Your prestige with customers will rise sharply.
- Same modern two-tone styling for all your equipment.
- Everything conveniently at hand for television repairs.
- Expertly organized to save your working time.
- Be first with the newest in home-service equipment!



SERVICE CASES ELECTRIC--

professional look



SERVICE TOOL CASE. 16" by 8" by 6 3/16". Weighs 5 1/2 lbs. without contents.

SPECIAL "160". Holds over 160 tubes. 17 7/8" by 8 3/8" by 11 7/16". 8 lbs. without contents.

SERVICE MASTER "240". Holds over 240 tubes. 22 1/8" by 9 9/16" by 12 3/4". 9 1/2 lbs. when empty.

These new matched service cases are a G-E "first". You can get them nowhere else. They are built just as strongly as their smart appearance indicates . . . with rugged construction, heavy-duty hardware, craftsmanship in every detail. And planned by service experts! You carry with you—compactly—everything you need for home service calls.

The cases are fully matched in design and in their attractive orange-and-gray colors. The

leatherette-type finish is scuff-resistant for plenty of hard wear. You will be proud to carry these handsome cases into the finest home. Their smart, up-to-the-minute appearance stands for the quality television service you offer.

Waiting for you . . . now . . . is your set of matched service cases. Your General Electric tube distributor will tell you how to obtain them. Phone him! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

161-1A22

THIS MONTH IN SERVICE

ASSOCIATIONS CAMPAIGNING TO HALT CABLED-TV MOTION-PICTURE INSTALLATIONS--A number of associations in the east are now waging a campaign via bulletins, circulars and letters to local administrations protesting against line piping of motion pictures to TV receivers. . . . Noting that such systems will not only be costly to install and maintain, the associations add that pay-see cables will also destroy beauty of avenues because of the clutter of feed lines from poles, crowd the channels with toll programs which will interfere with free program choice and particularly reduce shopping traffic, thus cutting into store and local tax income. Bulletins also stress the fact that free enterprise will suffer, since most of the tie-system owners--not independent shop operators--will have full control of all repairs and maintenance.

UHF RADIO-CONTROL TRAFFIC SYSTEM DESIGNED--The country's first radio-controlled traffic-light system, activated for the 960-mc band, will soon be in operation in Wayne County, Michigan. . . . The system features the use of audio-tone combinations incorporated in a traffic-light programmer control. . . . With this new type of control, it will be possible to change traffic patterns instantly from central traffic headquarters, adjusting to rush hours, bad weather or other conditions affecting traffic flow.

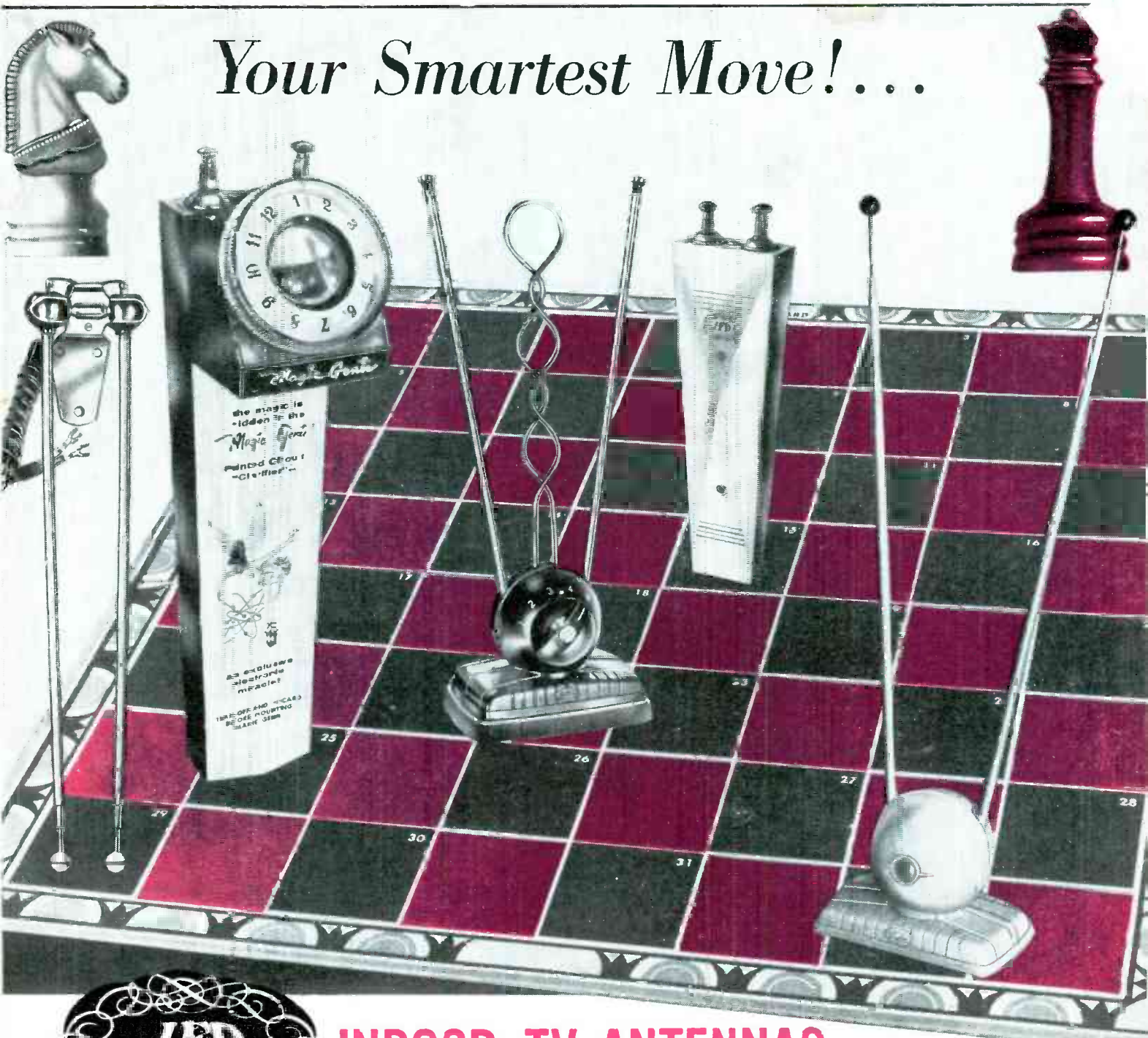
AUTOMATIC-FINE-TUNING SYSTEM DEVELOPED TO PROVIDE LOCKED-IN PICTURES--An automatic-fine-tuning technique, using a neutralized triode and diode, which permits the oscillator to provide continuous correction of frequency drift as the set operates or is switched from one channel to another, has been invented. A differential signal fed back from the intermediate-frequency stage circuits of the TV receiver serves to prevent the tendency of the oscillator to drift above or below the correct frequency. . . . Warmup oscillator drift at 250 mc with the stabilized oscillator is said to be less than 150 kc; the long-term oscillator drift at 250 mc is said to be less than 100 kc. . . . The system is expected to be included in remote-control tuning units, since it provides pre-tuning of channels through stabilization of the receiver's oscillator.

CLOSED-CIRCUIT TV MAKES DEBUT ON WALL STREET--What is believed to be the first major use of an intercom TV chain for the stock market was made recently in the heart of the financial district in New York City by a brokerage firm to keep its members abreast of news and market trends. . . . Twin TV cameras, pointed at market wires and news tickers all day long, now transmit to a dozen strategically-placed receivers, so that principals of the firm, traders, salesmen, cage personnel and even secretaries can see what's happening. . . . Since seconds count in the stock-market business, it was said, TV now provides that instantaneous accurate contact with the busy Wall Street trading operations.

FOUR-POINT TRANSISTOR-AUDIO-TAPE-COLOR CLINIC PROGRAM ANNOUNCED--A 2-day four-point clinic program which will provide the latest service information on transistors, tape recorders, high fidelity and color-TV, for the benefit of distributors, dealers and Service Men, was announced recently. . . . The clinics, to be held in scores of major cities throughout the nation, will feature slide-projector lectures, demonstrations and workshop sessions. . . . Service Men attending the clinics will receive a special service booklet detailing each of the consumer products covered in the talks and demonstrations.

VARIETY OF TAPE DICTATION MACHINES NOW ON MARKET--Over a dozen types of dictation machines, using tape in the form of belts or discs, are now being made. . . . A number of the models are extremely small and use printed-wiring board amplifiers with transistors. . . . Since Service Men are familiar with the basic designs involved in these machines, they are in an excellent position to render competent service. This fact has prompted many dictation-machine manufacturers to call on Service Men to set up repair and maintenance depots for their equipment.

Your Smartest Move!...



INDOOR TV ANTENNAS

For King-Sized Indoor Antenna Profits—
Go JFD across the board!

You sell *more* and make *more* when you standardize on JFD Indoor TV Antennas. The reasons make solid sense.

With the *complete* JFD line of 26 models (the industry's largest) you can satisfy every customer on price and model preference. From the deluxe Magic Genie to the popular-priced Venus you get

advanced styling and matchless performance backed by a prestige name that clinches *every* sale ... earns you a handy profit.

See your distributor today and *move* with JFD—the indoor TV antenna line America knows best. Rest assured *you* will get the most out of today's rich and booming indoor antenna business.



MAGIC GENIE



VENUS



DIALAMATIC



PERISCOPE



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The Booming Interest In Audio

TODAY, AUDIO is a striking headliner in industry. Almost in all directions we now find the accent on sound, particularly in phonos which feature a parade of new developments.

The enthusiasm has developed unprecedented opportunities for the Service Man in installation and repair to maintain the quality performance built into the equipment.

Every phono owner — ranging from those who have portables to those who own consoles with high-fidelity features — is a prospect for service. For in the phono—whether it be packaged or assembled—every component from the needle to the loudspeaker is highly vulnerable to damage and requires not only periodic inspection, but repair and replacement.

THE NEEDLE is an excellent example of the expendable nature of the phono's complement of parts and the close attention required to insure continuing top results.

Regardless of the type of needle used, it eventually must be replaced. All needle materials wear; the softer ones wear rapidly.

There is no such thing as a permanent needle. The length of service depends on the material from which it is made and the circumstances under which it is used. Even a diamond needle, though made of the hardest and smoothest substance known, will begin to wear and damage records if kept in service after its optimum life is over. Service Men should be able to recognize a worn needle and to suggest its replacement as part of a complete service package.

THE CARTRIDGE is another vulnerable component which demands inspection often. Due to the wide variety of pickups used, one must be well schooled in types and their exact function.

MANUFACTURERS HAVE developed a number of aids to simplify cartridge installation-repair; cross-reference listings, adaptors, special tools, replacement kits, and particularly, improved types of pickups.

THE LOUDSPEAKER, which has also played a vital role in the audio renaissance, can also become faulty in the sound chain and thus must be checked carefully during an overall inspection.

Often buzzes and rattles occur in the air-gap area. Clearances here are small; .005" to .010" for most speakers. Relaxation of the cone or spider allows the voice coil to drift off center. Small particles, which can pass through the spider or dust cap, can lodge in the air gap and generate loud noises.

IN ADDITION TO THE BASIC COMPONENT problems, there are other suspect areas, such as the amplifiers, which must be carefully screened for possible defects.

The tone compensation and feedback circuits, in general use today, can develop serious phase-shift problems due to defective components or tubes.

Here, as in all chassis troubleshooting, a complete assortment of test equipment is a must for the service shop. For the audio checks, shops should also be equipped with such special test instruments as wow meters and audio signal generators. The latter are helpful in measuring intermodulation distortion, frequency response of tone controls and phono equalizers and the resonant frequency of loudspeakers.

THE SPIRALLING ACTIVITY in audio is a boon to service. A number of the outstanding developments which have contributed to this boom are described for the first time in this issue—pages 34 to 46—in an exclusive series of field reports.

Color-TV On The March

THE INCREASING NUMBER of color programs now on the air daily—day and night—and the simplified, yet extremely efficient, receivers, which have become available recently, are developing a mounting acceptance of color-TV receivers.

In one area in the midwest, where viewers have more than 100 hours of colorcasts available a month, substantial increases in color-TV sales have been recorded. In other cities, with regular color

programming on tap, the boosts in sales have been notable, too.

Alert to this trend, more and more Service Men are becoming color specialists—a move which has proved most profitable to shop operators in color-TV service, and in addition stimulated more business for black and white-TV service.

A revealing report on the experiences of color specialists appears in this issue on pages 18 and 19.

Field Service Experiences

Installation And Repair Notes On Early And Current Color-TV

by W. H. POWELL, R. SCATTERGOOD



WHEN COMPATIBLE COLOR TELEVISION finally emerged several years ago from the laboratory to become a practical medium of home entertainment, the TV-servicing industry was confronted by numerous technical and educational problems. While the manufacturer could, and in many cases had overcome the problems of production and distribution, the average Service Man was caught without the necessary tools and knowledge. Service Men with years of experience in black-and-white were brought face to face with what seemed to be some entirely new concepts in TV instruments.

Their early efforts to learn in many cases slowed, while industry organized its educational programs. Some of the initial discussion and magazine articles, while good technically, did not speak the Service Man's language. Terms such as purity, convergence, screen temperatures, synchronous detection, etc., were thrown at them from all sides; and in many instances, seemed more to confuse than enlighten.

Industry had recognized the need for training on an extensive scale, and soon color lectures, magazine articles and training at the distributor level

were available. Home study courses appeared, and Service Men on an enormous scale made use of them. While training is still a problem, there are at this time a tremendous number of well-trained Service Men who are capable of successfully installing and servicing color television. The mystery has been removed, and the capable Service Man has found that original black-and-white fundamentals cover practically all of the so-called complex or new color circuitry.

Quality of a new type of product was a question. The ability of the color receiver to present a satisfactory picture both in color and in black-and-white was in doubt in the mind of the Service Man. Those with the foresight to accept the fact that the new color medium was interesting to the laymen realized that they must learn to understand the technical features in these new color models. In their investigation of this new receiver, Service Men found and learned by study from numerous publications, schools, lectures, and various other sources of information, that the color receiver was basically a black-and-white receiver. It still had to tune in a desired channel with both picture and sound. To do this, of

course, a superheterodyne type of intercarrier receiver was used, just as in conventional black-and-white practice. The intermediate-frequency circuits used in the color receiver were very similar to those in the familiar black-and-white chassis. A few additional traps were designed into the receiver to protect against signal interference in the high-gain amplifier stages. The sound stages in the color receiver were the same as the sound stages with which the Service Man had been familiar. Upon close investigation, the Service Man found that most of the rest of the receiver was also familiar to him. The horizontal and vertical oscillator, output and sync stages were the same, the *agc* and power supply circuits also were familiar. The video amplifier still did the same job as before; but, additionally, had separated and distributed the various black-and-white and color signals. The black-and-white portion of the signal goes on as before to the picture tube, presenting a black-and-white picture. When a color station break or program comes *on the air*, the new and unfamiliar circuits come into action. A section of the video amplifier is a *tuned* video amplifier, thus selecting those video frequencies containing the color signals. These signals are *rf* sidebands which are transmitted with the black-and-white detail, and the new circuit called *color demodulation* reinserts a 3.58-mc *rf* carrier, and phase detection takes place. The video signal thus recovered is fed to the picture-tube grids, and determines the color to be reproduced.

Phase; here is a word that the average Service Man had not previously had to know or consider. He had to learn that the phase or time relationship of these color sideband signals determine the color hue that would be seen on the color picture-

With COLOR-TV Receivers

Sets Based On Shop And Home Work-Sheet Reports

and J. W. MILLS, RCA Service Company, Inc.

tube screen at a given instant or point along the scanning lines, that before had only varied in brightness to give a black-and-white picture. Those Service Men who obtained a receiver or practiced *personally* in a school learned that the phase adjustment of a receiver was not as complicated or difficult as he had thought. He was to make certain colors from a color-bar signal generator. He could use a scope or the color picture tube, whichever method he found easier to apply. The color picture tube was another new device to understand. There are three guns in this picture tube and approximately a million dots of phosphor on the face plate. The phosphor dots emit colored light when struck by electrons. The light corresponds to the three primaries used in color television; red, green and blue. With a step-by-step procedure the control elements of the picture tube determine the amounts of each of three reference colors, and present on the picture tube screen the desired color reference signal or black-and-white signal.

Antennas have not proved to be a real field problem; existing antennas in most instances have proven entirely satisfactory for color reception. In some urban areas where multipath transmission is encountered, special antenna treatment has sometimes been necessary. Ghosts in color are generally more objectionable than in black-and-white reception, and are sometimes encountered in locations where they are not noticeable in black-and-white.

In extreme fringe areas, where in black-and-white reception it is common practice to detune the *rf* unit oscillator frequency to partially reduce snow, it has been found advisable to

replace some existing antennas with higher gain units for color.

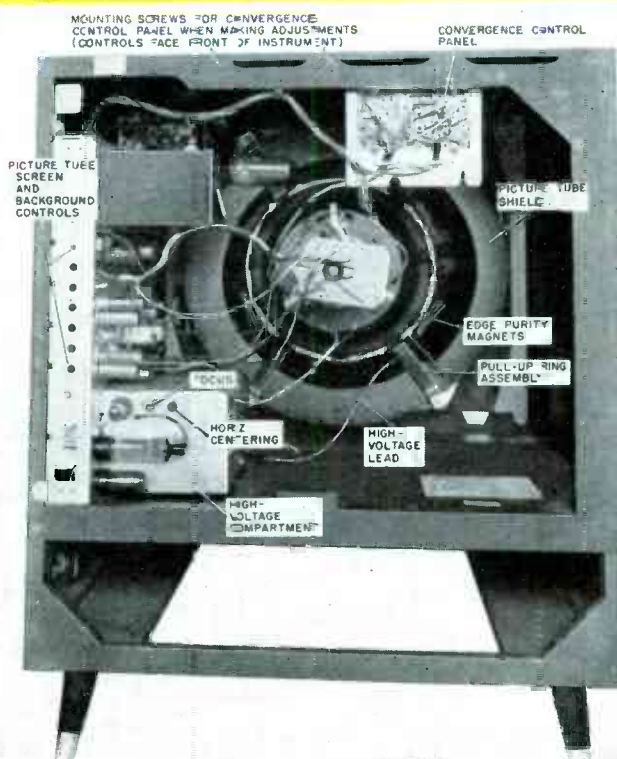
This is due to the color subcarrier frequency relationship to the black-and-white carrier. To receive color properly, the *rf* unit must be tuned to *best picture* position.

In those locations where narrow-band antennas have been used for one channel reception, it has been necessary to replace them with antennas with wide-band characteristics. Initial customer satisfaction is a *must*. He has spent a sum of money and expects to receive satisfactory performance. Customer education was and is a problem. The average viewer is entirely unaware of the proper use of the fine tuning knob provided on all black-and-white, as well as color instru-

ments. This means that the proper use of all controls must be explained to each prospective consumer; the hue control, color control and fine tuning, and any others with which the customer may not be familiar.

The fine tuning control for color reception must be set at or near the point for best black-and-white picture reception; the hue control must be set for best *flesh tones*; and the color control set for *smoothest* color. If adjusted for too much color, the picture will appear too colorful and unnatural. Nuisance calls for color service are a definite result of poor customer education as to proper use of these controls. On some early color receivers, this was accentuated by

(Continued on page 50)

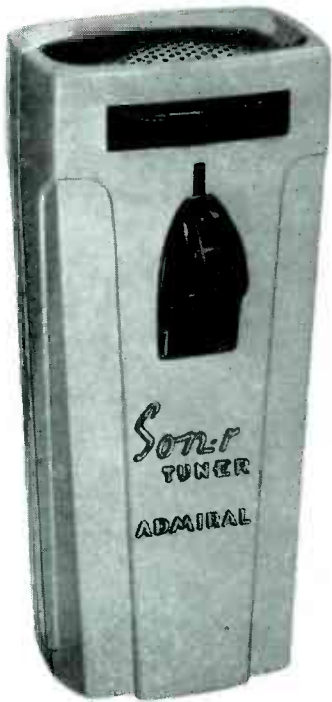


REAR VIEW of the RCA 800 series color-TV receiver.

Ultrasonic Remote Control

Complete Analysis of A 4-Resonator

by PERRY SHENEMAN, Admiral Corporation



THERE HAS BEEN AN INCREASING interest in remote controls for TV, radio and phono chassis which has prompted engineering to concentrate on this type of equipment. As the result of one remote-design program, the system diagrammed on the cover was developed to turn on a TV set, adjust volume to four different levels, change stations, turn on an automatic phono, reject records, turn on AM or FM radio, and turn off the radio-phono or TV receiver. All of these seven functions are controlled by a hand-held mechanically-operated device,* which operates through the use of ultrasonic vibrations. It does not contain tubes, transistors, batteries, wires, or connecting cables.

Located within the remote-unit's case are four solid metal resonator

*Son-r.

rods. Each rod is supported in a horizontal position within a circular wafer type holder by a retaining spring, which mates with a groove at the center of the resonator bar. The rods are $\frac{3}{8}$ " in diameter, vary in length from 2.429", 2.488", 2.582" to 2.652", and vibrate at specified frequencies of 41.805, 40.805, 39.285, and 38.285 kc, respectively.

A four-position selector knob rotates a circular-wafer holder to detent a resonator rod within range of a spring-powered actuating trip hammer. When the actuator is pushed forward, the trip hammer instantaneously strikes the resonator rod in position. The vibrations emitted by a resonator rod are picked up by a microphone in the receiver and converted into carrier signals (damped waves).

The carrier signals are amplified by a two-stage high-gain amplifier, consisting of a 6AU6 and $\frac{1}{2}$ of a 6AU8. Output from the two-stage amplifier is tripled in frequency by the remaining $\frac{1}{2}$ of the 6AU8. The signal is then coupled to a 6BN6 limiter which limits the ac amplitude. Output from the limiter is coupled to discriminator diodes of a 6AL5 or $\frac{3}{4}$ of a 6BJ7. Output voltage from the discriminators is coupled to the control grids of 6CM7 relay-control tubes

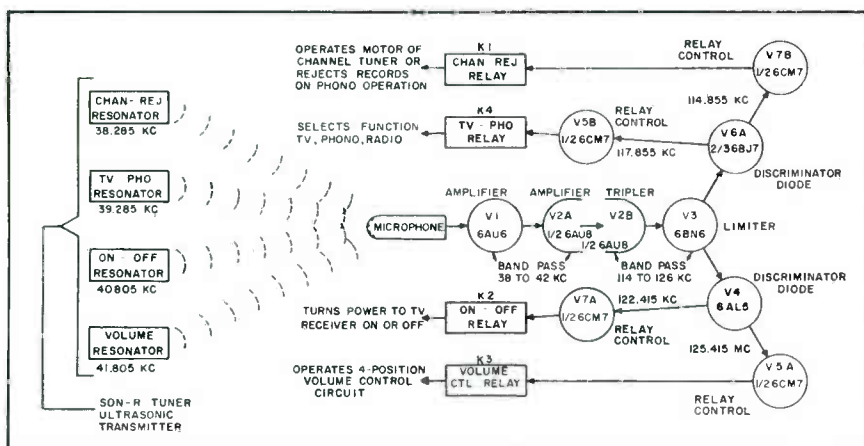
through an integrator network. This voltage functions to reduce (overcome) the high negative bias voltage present on the grid of each relay control tube. When the negative bias on the grid of a control tube is reduced sufficiently, the tube conducts and the plate current energizes the plate circuit relay.

One-half of the 6CM7 relay control tube operates a plate circuit relay (K_s).

Plate-Relay Operation

This relay actuates a ratchet which rotates a 12-position (volume) switch; the switch advances one step for each relay click (pulse) produced with operation of the tuner. Although the volume switch has twelve positions, it operates entirely as a four-circuit switch, since each fourth contact is connected in the same parallel circuit. When the volume switch is operated, it successively repeats itself in steps from mute, low volume, medium volume to full volume position.

Relay control tube V_{6B} ($\frac{1}{2}$ 6CM7) operates another plate-circuit relay (K_4), which actuates a 3-pole-double-throw *memory type* switch for setting the receiver function to either TV or radio-phono operation. The *memory-type* switch contacts of the relay alternately change position from TV to radio-phono and remain in that setting until another relay click (pulse) is produced with operation of the tuner. Switch contacts I_A and I_B complete a 6.3-volt heater circuit to the 12AX7 first and second *af* preamp, 6AV6 first *af* amp and EM34 tuning eye, and also energizes a TV-radio relay, K_{241} . Current through the magnet windings of relay K_{241} simultaneously closes switch contacts, changing the audio input of the sound (audio) amplifier from TV to the radio-phono



(Left)

FUNCTIONAL diagram of resonator remote tuner and Admiral 8F1 remote-control amplifier.

Troubleshooting Multivibrator Horizontal Oscillators

by JESSE DINES

How to Isolate Loss of Sync Trouble to Horizontal Oscillator or Horizontal Sync:

- (1) Horizontal-afc detector tube should be removed. If necessary the lead connecting the horizontal oscillator and horizontal-afc circuits should be unsoldered to separate them.
- (2) Now the horizontal-hold control (and horizontal-lock control, if set has one) should be varied while observing picture sync.
- (3) If the picture can be synced in (even, if only momentarily), then the trouble is in the horizontal-afc circuit. If horizontal sync cannot be obtained, then the trouble is in the horizontal-oscillator circuit.

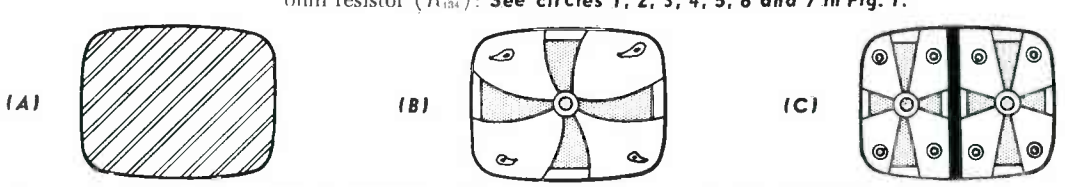
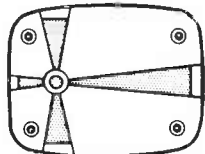
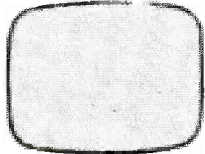
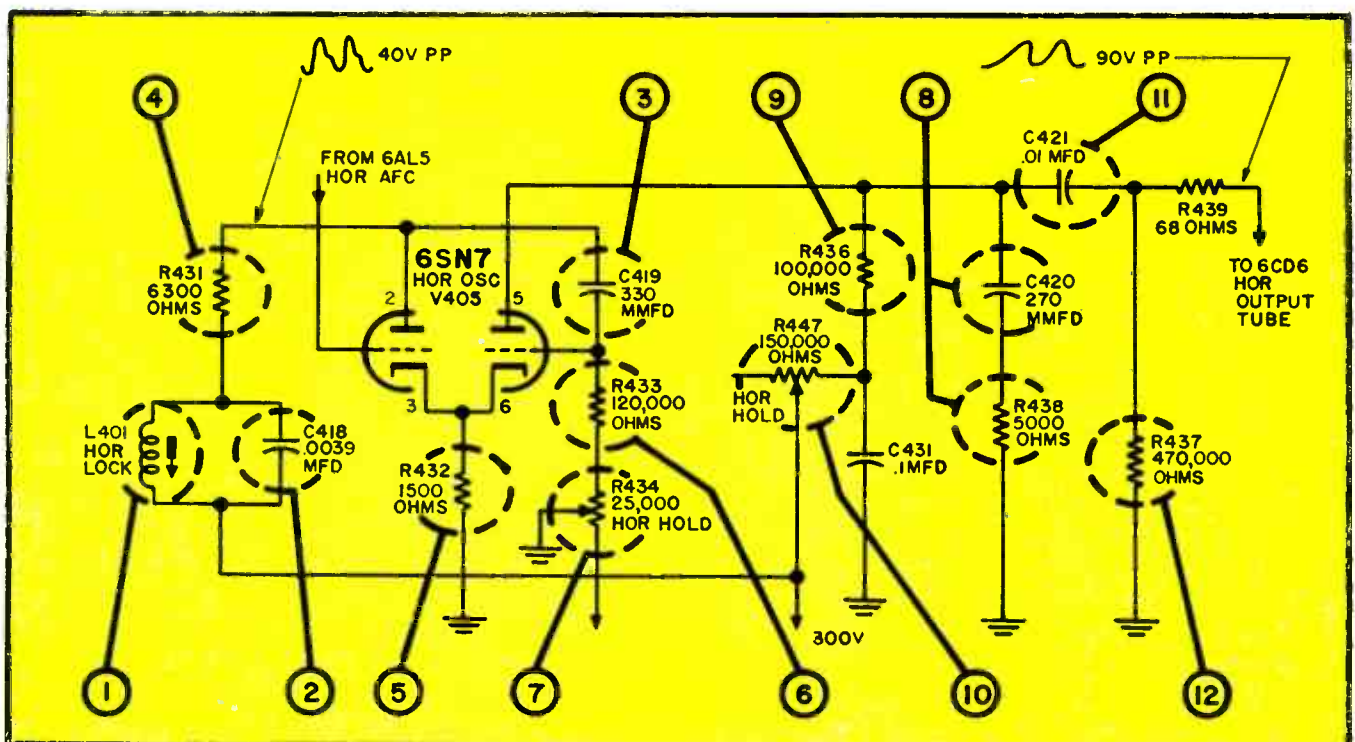
Trouble	Picture Indication	Cause	Remedy
Loss of horizontal sync; horizontal pulling, or two pictures (side-by-side).	A-B-C 	Condition can be caused by defects in following components: Horizontal-locking coil (L_{401}), .0039-mfd capacitor (C_{118}), 330-mmfd capacitor (C_{119}), 5600-ohm resistor (R_{131}), 1500-ohm resistor (R_{132}), 120,000-ohm resistor (R_{133}) and 25,000-ohm resistor (R_{134}): See circles 1, 2, 3, 4, 5, 6 and 7 in Fig. 1.	Replace or repair defective component.
Horizontal non-linearity; sometimes with reduced picture width, brightness or a drive bar.	(D) 	This problem can be due to leaks or changes in value of C_{120} (270-mmfd) or C_{121} (.01 mfd). Also changes in value of the following components: R_{230} (100,000 ohms), R_{137} (470,000 ohms), R_{138} (5600 ohms), and R_{117} (150,000 ohms): See circles 8, 9, 10, 11 and 12 in Fig. 1.	Replace or repair defective component.
No raster.	(E) 	Any condition which causes the oscillator to stop operating. This includes defects (shorts, opens or appreciable changes in value) in the components noted in A, B, C and D.	

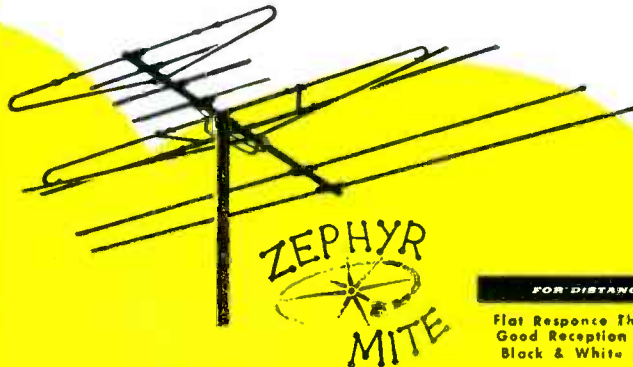
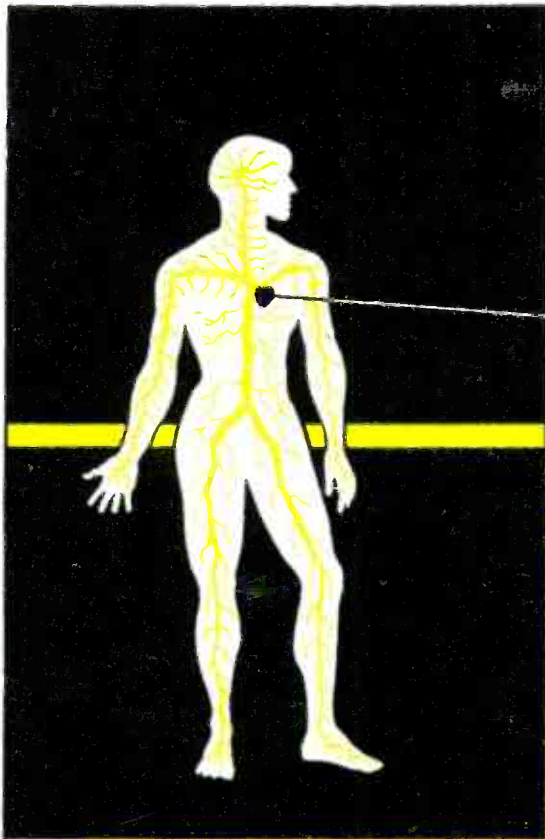
FIG. 1: HORIZONTAL sync circuit used in Admiral 23A1 chassis.





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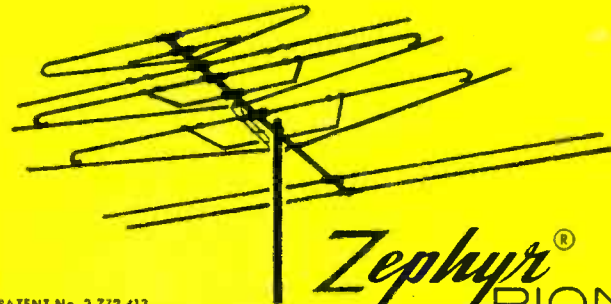


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chicago 50, illinois

Remote Control

(Continued from page 21)

(10 to 25 grams). A rough check for contact pressure can be made by inserting a piece of thin paper (such as a dollar bill) between the switch arm and contact surface. A slight pressure should be felt as the paper is withdrawn from between the switch arm and contact surface.

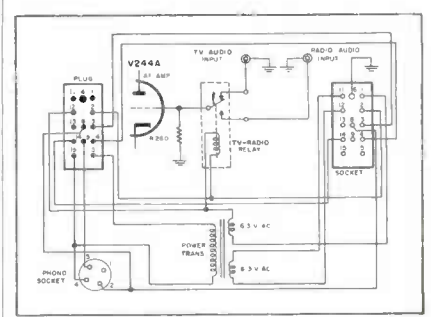
The operation of a relay control tube and its associate plate circuit relay may be checked by momentarily shorting the control grid of the tube to chassis ground. Shorting the control grid to chassis ground reduces the grid bias, thus allowing the tube to conduct. When the tube conducts, the plate current pulse energizes the plate-circuit relay for operating the associated switching circuit.

If momentary shorting of the control grid does not cause the associated plate circuit relay to operate, it will then be necessary to check the relay control tube, voltages at tube socket and mechanical action of the relay for possible cause of trouble.

Operation of the plate-circuit relay upon momentary shorting of the control grid is an indication that the cause of trouble lies in circuitry ahead of the control tube. This requires a check of the tubes in the preceding stages of the amplifier, the plug and socket connectors and the mechanical action of the tuner.

Use of Memory Switches

There are differences in operation of switches used with the various relays. Relays K_2 and K_4 operate *memory-type* switches having two operating positions. The pole contacts of *memory-type* switches alternately change position with each succeeding relay click (pulse). Relay K_3 operates a twelve-position stepper type switch which advances one step for each relay click (pulse). Relay K_1 operates



SIMPLIFIED diagram of Admiral 4S2B audio amplifier and remote-control hook-up.

a conventional single-pole switch whose contacts close momentarily, upon each relay click (pulse).

Although the TV, phono and AM-FM radio-audio volume may be changed by remote control to any one of four volume levels, to obtain the proper loudness at each of these sound levels, it is necessary to preset the highest volume level desired for each function. These adjustments prevent blasting or too low a volume level when switching from TV to radio or phono operation.

Other Remote-Control Functions

The remote control, in addition to adjusting the volume level of the TV, radio and phono, selecting the television channels, turning the TV, radio and phono *on* and *off*, will alternate the function of the receiver between TV and phono operation or between TV and radio operation. The choice of function, to be remotely controlled, is selected prior to the remote operation. If radio-remote operation is desired, AM or FM is selected and the station determined. If phono operation is desired, *phono* is selected. The records are placed in position, the correct record speed determined and the *on-off-rej* switch placed in the *rej* position.

The *manual-remote* switch is then set to *remote* position. Since the remote amplifier has an independent (from the TV chassis) *ac* power supply, the remote amplifier is turned *on* by pressing the *remote-off-on* push-button. The amplifier will remain *on* until turned *off* by the same control. While the remote amplifier is *on*, the manual *on-off* control is inoperative.

Servicing the Remote Unit

The hand held remote tuner is entirely mechanical. If the unit is dropped on a solid surface or subjected to other rough handling, the resonator bars may slip from their original position, and thus become inoperative or cause intermittent tuning.

Weak or intermittent operation may also be caused by the hammer spring being bent out of alignment. To realign hammer spring, the actuator button should be pressed forward. While in this position, a gap of .062" should exist between the hammer and the bar. If the hammer is located too far from the bar, weak signals will result. If the hammer touches the bar, damping action will result and

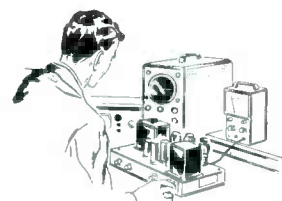
(Continued on page 26)

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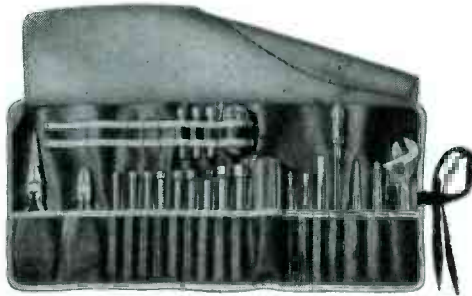
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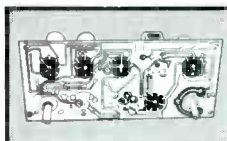
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Remote Control

(Continued from page 25)

operation may be weak or intermittent.

The remote volume switch is a twelve-position rotary component comprised of a phenolic board with printed circuit contacts. This switch (part of relay K_3) is operated by a ratchet leveler much like a stepper relay. Although the volume switch has twelve positions, it operates entirely as a four-circuit switch, since each fourth contact is connected in the same parallel circuit; one set of three alternate contacts remain unconnected to form an open circuit. When the volume switch is operated, it successively repeats itself in steps from mute, low volume, medium volume to full volume position.

Service Hints

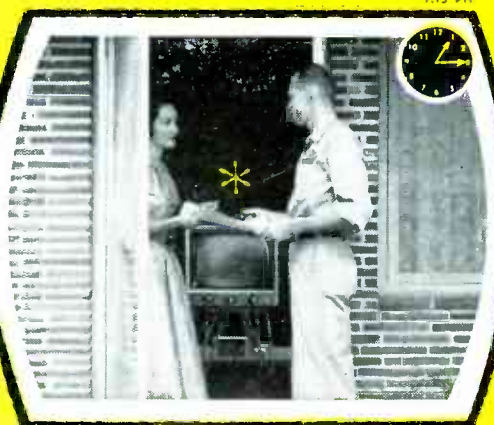
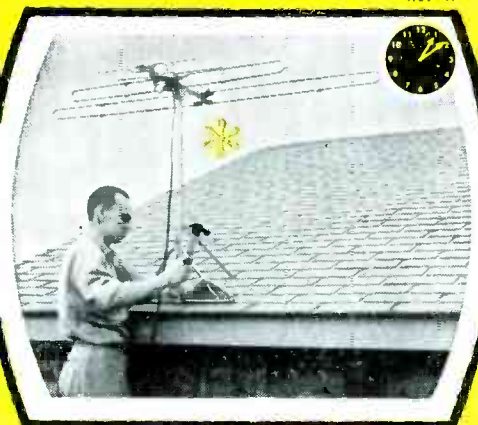
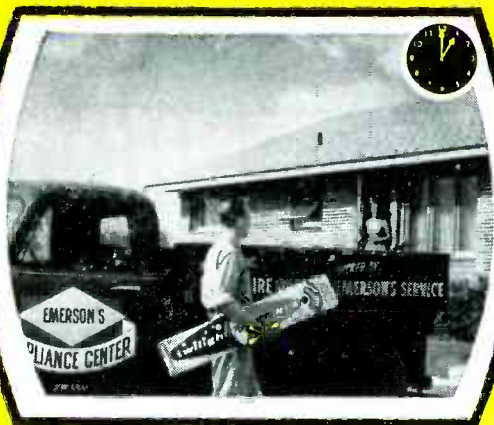
If the receiver operates manually but will not tune when operated with the remote, the following should be checked:

- (a) The remote-manual switch at rear of set and the remote on-off switch at front of set to see that they are in the remote position. The jewel light at right of the channel knob will light up when the switches are in the remote and on positions.
- (b) Tubes in the remote-control amplifier to see that they are lit and firmly seated in tube sockets; also plug and socket connectors on both the remote-control amplifier and television chassis to see that they are firmly seated and making good contact.
- (c) Operation of the tuner. If the tuner has been dropped, resonator bars may slip from their original position and result in weak, intermittent or non-operation. The resonator retaining spring must fit in the grooved surfaces at center of resonator rods.
- (d) Microphone. Intermittent or non-operation of remote control will result if the microphone cable connector is not plugged in or making good electrical contact. Poor operation will also result if the microphone is not seated fully forward within the fiber sleeve mounting it to the front of the receiver. To check seating of microphone, the screw on the microphone clamping band should be loosened and the microphone moved fully forward until the fiber sleeve fits firmly against raised surface (ridge) at rear of

1:00 PM

1:09 PM

1:18 PM



Picture of a smart TV technician making a dollar a minute on his way back from lunch

*
 "Naturally... it's the
GOLD Twilight Antenna
 by Winegard Co. Dept. E-11
BURLINGTON, IOWA"

Remote Control

(Continued from page 26)

microphone. Band should be tightened securely after moving microphone forward.

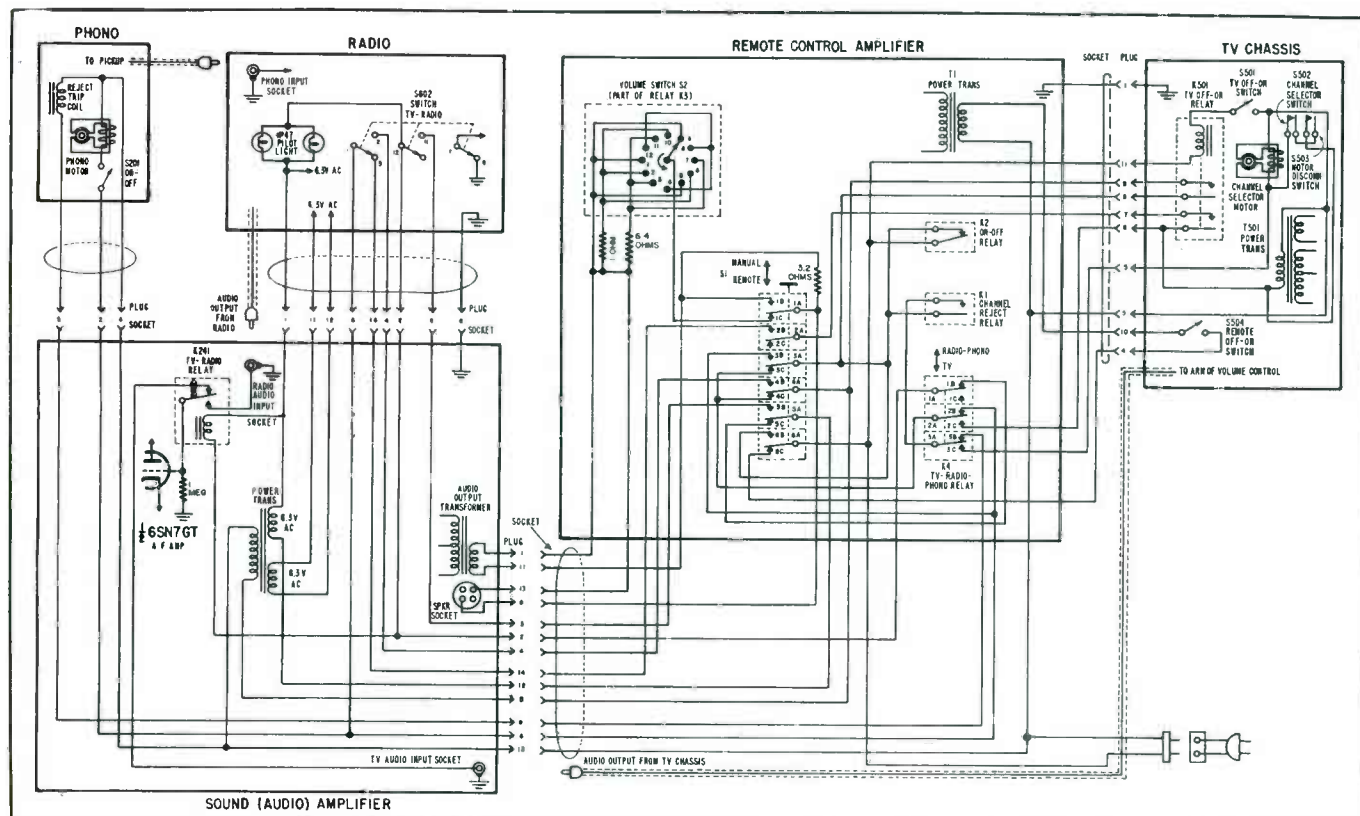
Erratic or continued tripping of relays within the remote-control amplifier may be due to any of the following causes:

(1) Regeneration within the amplifier due to an exceptionally high gain 6AU8 or a 6AU8 with greatly different interelectrode capacity.

If this trouble is encountered, the 6AU8 should be replaced with one which will provide most stable operation.

(2) Improper grounding of the amplifier bottom cover will induce regeneration within amplifier circuits, thus causing erratic operation of relays.

For proper grounding of the bottom cover, cover should be soldered to chassis for at least a 1/2" area.



SIMPLIFIED CIRCUITRY of Admiral remote system for power input and phono, radio, amplifier and TV chassis.



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A complete advanced TV servicing course, developed by the Radio-Electronics-Television Manufacturers Association. Shows how to use every conceivable type of test equipment, how to service every part of a TV receiver. Explains latest techniques. Soft cover, 8½x11".

MAIN TEXT, 192 pp., illus. #161 \$3.60
LABORATORY WORKBOOK, 32 pp. #161-2 \$.95

TV PICTURE TUBE-CHASSIS GUIDE by Rider Lab Staff

No busy service technician can afford to be without this easy-to-use TV tube type chassis guide. It covers all picture tube types used in TV receiver production from 1946 to February 1957—over 7,000 listings. This reference guide is organized by chassis number, and in some cases, by models so that the technician can immediately locate the correct picture tube type simply by knowing the chassis number.

#204 Only \$1.35

REPAIRING HI-FI SYSTEMS

by David Fidelman

This book deals with finding the troubles and repairing faults in hi-fi equipment with no test instruments—simple equipment—and elaborate equipment. Encompassing the repair of high fidelity equipment such as tape recorders, record players and changers, AM and FM tuners, preamplifiers, amplifiers and loudspeakers, the approach is in a gradual, easy-to-understand, down-to-earth manner. Typical troubles are analyzed and repaired through a system of logical steps.

Soft cover, approx. 170 pp., 5½x8½", illus. #205 only \$3.90

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HOW TO USE TEST PROBES

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8-11

TEST INSTRUMENTS

2-WAY RF SIGNAL GENERATOR

AN RF SIGNAL generator, TU576, for servicing land-mobile communications systems, has been announced by Motorola, Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.

Generator has six individually calibrated, direct-reading scales from 25-54, 140-175, 400-470, and 890-960 mc. Output voltage is continuously variable from .1 to 100,000 *uv*. Internal choke permits use of external audio source to amplitude modulate the *rf* with resulting incidental frequency modulation. Generator is terminated in a type N connector. Also included is a 2:1 voltage ratio pad and a 4' length of RG-55U coax cable. [SERVICE]

TRANSISTOR MULTI-RANGE AC VOLTMETER

A TRANSISTORIZED multi-range *ac* voltmeter, 15A, for bridging balanced circuits, has been developed by the Alectra Division of the Consolidated Electroynamics Corp., 325 N. Altadena Dr., Pasadena, Calif.

Unit measures *ac* voltages from 1 *mv* to 300 *v* full scale within the frequency range from 30 cycles to 300 *kc*. Further information in bulletin 7004. [SERVICE]

TUBE-TESTER ACCESSORY SOCKET PANEL

AN ACCESSORY SOCKET panel, 510, to extend use of the 500 *Dyna-Quik* tube tester, has been introduced by B&K Manufacturing Co., 3726 N. Southport Ave., Chicago 13, Ill.

Unit provides 50% more sockets to check many more old and new types. Fits inside cover of 500 *Dyna-Quik*. [SERVICE]

GENERAL-PURPOSE 'SCOPE

A GENERAL-PURPOSE 'scope, 466 *Handi-scope*, has been announced by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

Unit features a 5" screen, filter-type graticule and universal - fit bezel. [SERVICE]



JOHN F. RIDER PUBLISHER, INC. 116 West 14th Street, New York 11, N. Y.

6/12-VOLT VIBRATOR POWER SUPPLIES

Six or 12-v vibrator power supplies, VP-1-6 and VP-1-12 (kits), for supplying high-voltage B+ for most communication receivers, small *pa* systems or miniature transmitters, have been introduced by the Heath Company, Benton Harbor 11, Mich.

Each unit provides 260 *v dc* output up to 60 *ma*. Both supplies operate from storage batteries or battery eliminators. [SERVICE]

• • •

MULTI-PURPOSE PROBE

A MULTI-PURPOSE probe, *Probe-Master*, for testing circuits, tracing signals and voltages, and checking components in electronic equipment, has been developed by Kingston Electronic Corp., North St., Medfield, Mass.

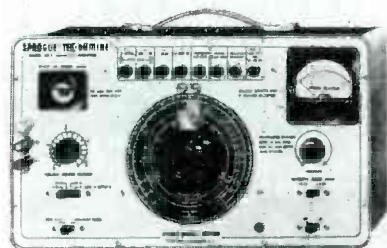
Unit combines a probe with a neon checker. Built-in capacitive network is said to permit bypassing stages; checking open capacitors; coupling signals from one stage to another in any circuit which self-generates a signal; isolating a defective stage without outside signal-generating equipment; and elimination of capacitor substitution. Voltage range of probe is 80 to 550 *v ac* or *dc*. Probe capacitance is .01 mfd. [SERVICE]

• • •

CAPACITOR ANALYZER

A CAPACITOR ANALYZER, *Tel-Ohmike TO-5*, for TV service work, has been announced by Sprague Products Co., North Adams, Mass.

Unit measures capacitance, power factor, leakage current, and insulation resistance of capacitors, and the turns ratio of iron-core transformers. Features include pushbutton range selection; extended capacitance ranges from 1 mmfd to 20,000 mfd, with improved accuracy in the low range for checking small ceramic and molded *gimmick* capacitors; direct meter reading of insulation resistance up to 20,000 megohms, for checking all types of electrostatic capacitors; direct leakage current readings of electrolytics at rated *dc* working voltage; and a three-range power-factor measurement of electrolytics for improved accuracy. Capacitors are automatically discharged upon release of range-selector pushbuttons. A *magic eye* tube simplifies bridge balancing for capacitance and power-factor measurements. [SERVICE]



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ASSOCIATIONS

ESDA, Western Pennsylvania

THE FIRST ANNUAL dinner-meeting of the Electronic Service Dealers Association of Western Pennsylvania was held recently at Holiday House in Pittsburgh.

Featured speakers at the conclave were *Karl Heinzman*, president of the Television Service Association, Detroit; *Hal Chase*, editor of *TSA News* and *John H. Hauser*, distributor sales manager of CBS-Ilytron.

Bert Bregenzer presented awards of merit to two local distributors for their cooperation in refusing to sell components and accessories retail at wholesale costs.

A certificate of merit was also awarded to TSA for its stand on captive servicing; the award was accepted by *Heinzman* on behalf of TSA. A certificate was also given to *Chase* for his outstanding work as editor of the *TSA News*.

RTA, California

RICHARD J. KELSO has been elected president of the Radio Television Association of Santa Clara Valley, Calif.

W. I. Smith has been named vice president and *Harold L. Kelly Jr.*, secretary-treasurer.

Members of the board now include *Kelso*, *Jim Davis* and *C. S. Dawson*.

At a recent meeting the board members approved a series of newspaper ads set up in the north end of Santa Clara County by a group of association members.

Also discussed by the board were uniforms and insignia for association member firm personnel making service calls, identification cards, and standard service forms.

TRT, Kansas City, Missouri

A SPECIAL course on transistors featuring three or four sessions of lecture and an equal number of sessions for lab work has been set up by the Television Radio Technician Association of Kansas City, Missouri.

The course was prepared by *L. A. Betros*, who is a member of the TRT executive committee and is also on the staff of the Central Technical Institute.

Based on the specifications drafted by a TRT committee headed by *N. T. Vilander*, the Kansas City Board of Education recently purchased one-hundred 24-inch TV sets for use in each of the school buildings in the city.

TEN YEARS AGO IN SERVICE

A NEW CODE OF ETHICS was drawn up by *Walter S. Koop*, chairman of the Philadelphia Radio Service Men's Association publicity committee, for distribution to members for display in their shops. . . . PRSMA also announced formation of a complaint investigating committee to call on dissatisfied customers and examine equipment repaired and bill of charges. Where evidence of faulty servicing appeared the committee said they would so notify the person responsible for the repair and ask that the trouble be corrected within three days. No response to request, it was noted, would result in repair at a member shop, with a bill for work submitted to member originally involved. Failure to honor the association bill would not only prompt dismissal from membership rolls, but an announcement of this action in PRSMA news. . . . At a meeting of the Hudson Valley Radio Service Men's Association, *Irving Einhorn* of Tung-Sol presented a lecture on tube manufacture. Also featured was a talk by *Ken Burkaw* of Cornell-Dubilier and *Hy Steinberg*, C-D manufacturers' rep, on the manufacture, usage and inventory control of fixed capacitors. . . . General Electric engineers presented an FM and TV servicing lecture at a meeting of the Long Beach (Calif.) Radio Technicians' Association. *Jack Meyers*, *Harvey Stephens* and *Wayne Williams* participated in the program which featured demonstrations of hi-fi equipment. Highlight of another RTA meeting was a discussion of the Philco projection TV receiver by *George Kornved* of Gough Industries and *Ray Robertson* of Philco. *Harry Ward* served as chairman of the first meeting; *Glenn Hollway* of the second. . . . The first complete technical analysis of FM cascade converters, limiters and squelch circuits appeared in SERVICE. . . . The Technical Appliance Corp. moved into its new plant at Sherburne, N. Y.

CATALOGS—BOOKS

THE RCA ELECTRON TUBE DIVISION, Harrison, N. J., has announced publication of a 24-page catalog describing and illustrating more than 130 sales promotion, business and technical aids for the Service Man. Items in the catalog range from a giant outdoor illuminated sign to decals. The catalog also gives details on an assortment of color-TV service promotional aids, display material, direct-mail and giveaway literature, newspaper ad mats, TV and radio commercials, technical literature and ad specialties. [SERVICE.]

CENTRALAB, 900 E. Keefe Ave., Milwaukee 1, Wis., has released a 12-page guide (No. 4) on packaged electronic circuits containing schematics and specifications on all 96 types of P.E.C.'s sold through distributors. Contains a cross-reference section which lists the manufacturer's part number of all the packaged circuits used by 130 radio and TV manufacturers since 1949, and the corresponding Centralab replacement. There is also a section containing the proper test procedure for checking all listed packaged circuits. [SERVICE.]

CBS-HYTRON, Danvers, Mass., has prepared a twelve-page booklet (PA-163), *The Independent Service Business and Your Future*, that shows the independent Service Man how he can put to work such promotional materials as decals, postal cards, ad mats, radio and TV scripts. [SERVICE.]

UNITED CATALOG PUBLISHERS, Inc., 60 Madison Ave., Hempstead, N. Y., have published the 22nd edition of *The Radio-Electronic MASTER* containing 1584 pages. Over 150,000 items of 350 manufacturers are included. [SERVICE.]

G. F. WRIGHT STEEL and Wire Co., 243 Stafford St., Worcester 3, Mass., has released a loose-leaf catalog detailing their wire products. [SERVICE.]

THORDARSON-MEISSNER, Mt. Carmel, Ill., have issued a TV replacement guide (supplement 9-57) which features fly-backs and yokes introduced in 1957 to date. Covers chassis made by Admiral, Crosley, DuMont, Emerson, G.E., Halli-crafters, Magnavox, Motorola, Muntz, Philco, Raytheon, RCA, Sentinel, Silver-tone, Sylvania, Westinghouse and Zenith. [SERVICE.]

JOHN F. RIDER PUBLISHER, INC., 116 W. 14th St., New York 11, N. Y., has announced publication of a text on Stereophonic Sound by Norman H. Crowhurst. Explained are the theory of stereophonic sound; what goes into making it successful; various systems available or likely to be available. Systems covered are binaural, two and three-channel stereophonic, stereosonic, coded-stereophonic, and the use of three systems with radio, disc and tape. Priced at \$2.25. [SERVICE.]



G2560

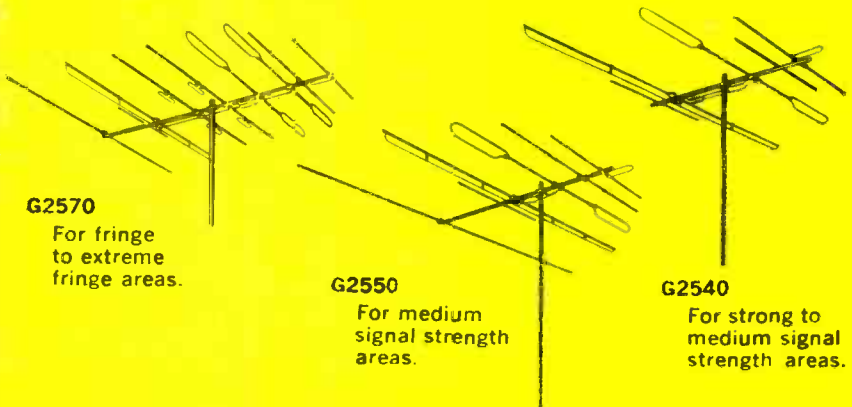
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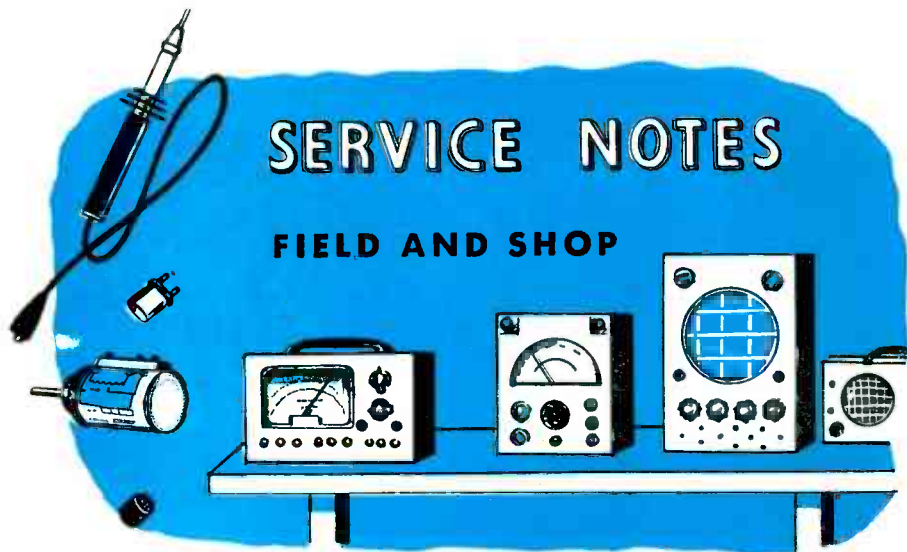
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In Canada: Hackbusch Electronics, Ltd., Toronto 4, Ont.



How to Curb Intermittent Hum and Sound in Picture . . . Troubleshooting TV Tuners . . . Transistor Squegging Remedies . . . Gated-Beam Detector Servicing

IN THE PHILCO 8L41 TV receivers, some chassis develop intermittent hum and sound in the picture. This problem has been found to be due to a bad electrolytic; the 100-mfd 200-v capacitor filtering the 140-v supply.¹

The defect is due to a fractured weld on the anode tab of the electrolytic foil. A surge current, brought about by connecting an external 100-mfd capacitor in parallel will often momentarily reweld the tab and cause the hum to cease. If the capacitor is at fault, an external 100-mfd capacitor in parallel with the 100-mfd section of the electrolytic bank will reduce the hum.

Weak Video Cures†

PROBABLY THE MOST prevalent trouble that points to a tuner unit is a weak snowy picture. Other than a bad antenna, the *rf* amplifier circuit is about the only place where snow will enter the picture on a normal strength signal.

The first check is the *rf* amplifier tube. If this proves good, then the next logical suspect is the input transformer. (It is assumed that socket voltage checks have been made.) If the input transformer is suspected, it can be isolated by bypassing it with a small capacitor between the input terminal and the grid of the *rf* amplifier.

¹This is one section of a four section can, part number 30-2590-21.

If the picture clears up and the gain increases five to ten times over, the transformer should be replaced.

If the input coil is open, of course only a continuity check is necessary. However, a shorted coil or off-value coil, cannot be found with an ohmmeter.

If the audio and video are both absent and the *if* system is working, the oscillator section should be suspected.

After checking the tube, the socket voltage should be checked. If the oscillator is functioning, the grid voltage will be -3 v or more. If not working, it will be below -1 v. In this event, the other voltages, coupling capacitors, etc., must be checked.

A defect in the *if* output coupling can also cause no audio or video.

Certain *rf* tube conditions and a grounded-*agc* circuit can cause an overload condition which may not immediately be thought of as a tuner problem.

Drifting of channels naturally is an oscillator problem and can usually be remedied by replacing either the oscillator tube or the feedback coupling capacitor.

Due to the compactness of the tuner unit, there is a constant threat of intermittent shorts due to lead dress and parts positioning. Therefore, care should be used when knifing coils or

†Based on repair notes prepared by G. E. TV Receiver Product Service Department on G. E. M3, Q2 and U2 tuners.

even adjusting cores, not to produce a short condition.

One must always be careful not to distort the tuning coils and not to overheat any component when soldering to it.

Tuner Test Equipment

Three instruments are required to check tuners: sweep and marker generators² and a 'scope.³

The signal source should be coupled through a balanced adapter with approximately 3' of 300-ohm line terminated with a 430-ohm square pad to the antenna terminals of the tuner.

The *rf* curve can be observed directly from the converter grid test point with the 'scope.

Oscillator alignment may be observed at the video detector test point if the tuner is aligned in the chassis, or at a jig detector assembly if the tuner is being aligned in an external jig.

If the tuner oscillator is to be aligned in the receiver chassis, it is necessary to have the *if* system completely and accurately aligned prior to tuner alignment.

This being done, the oscillator section can be aligned by adjusting the proper channel-adjusting slug on the oscillator wafer so that the picture marker will fall at the 45% to 50% point on the detector curve.

For jig alignment, an additional signal source, to produce a 41.25-mc signal, must be used to inject a reference frequency into the jig for oscillator alignment.

A -3 v bias is used for all *rf* alignments.

Transistor Squegging Remedies⁴

IN SOME RCA 8-BT-7/8 transistor chassis a 1-megohm resistor has been shunted across the oscillator coil (primary tuned circuit) to suppress parasitic oscillations (*squegging*) in the converter circuit when using type 2N140 transistors which have higher-than-normal gain.

If the converter-transistor should be changed, it may be necessary to add such a 1-megohm resistor or to remove the resistor which may already be present. The necessity for this change may be determined by measurement of the oscillator injection voltage at the base of the converter transistor with a 'scope or an *rf* type of *vtvm*. This voltage should be with-

²Such as G. E. ST-4A, ST-5A and ³ST-2A.

⁴From RCA Service Company notes.

A Packaged 4-Speaker

Consoled Unit Features Multiple-Input Amplifier,



FIG. 1: AM-FM RADIO-PHONO with 16-watt amplifier and 4-speed changer.

ALMOST EVERY radio manufacturer has several phono or radio-phono models in the line advertised as *high-fidelity* instruments. Since neither the government nor industry has settled on standards for high-fidelity reproduction, the term embraces practically the entire gamut of recording instruments. Most companies, however, prefer to use the term on their high quality phonos, and regardless of the pros and cons of the use of the term high fidelity, these packaged units are capable of extremely fine reproduction of music. It is the engineering design of the entire assembly that determines the excellence of its performance, not the application of undefined terms or statements that it must be built up of components.

A recently-designed packaged hi-fi radio-phono¹ featuring styling and component and construction quality is illustrated in Fig. 1.

The instrument consists of an amplifier (Fig. 2) with several inputs

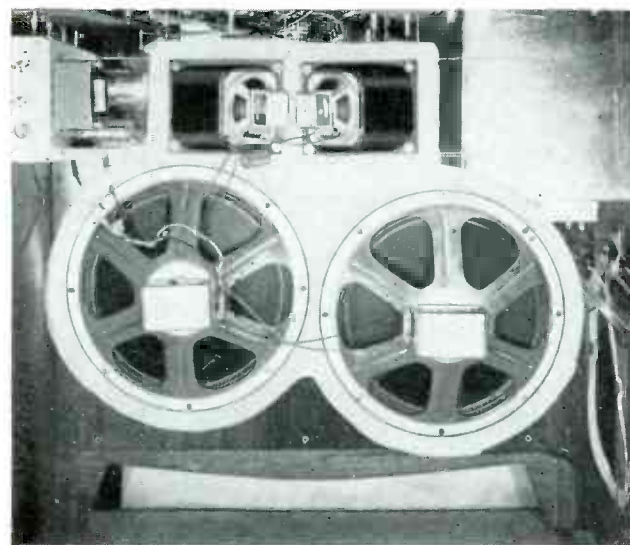
and controls, a separate AM-FM tuner, a 4-speed record changer, 4 loudspeakers, and a lift-lid cabinet.

The output stage is a conventional class AB, push-pull type using 6V6GT's. A split-load type phase inverter is used and a 100,000-ohm resistor serves to maintain a constant and balanced source impedance driving the output tubes to above 100 kc. This minimizes *blivets* (spurious oscillations) when full output is approached; 12 db of feedback is used and is fed from the secondary of the output transformer to the stage ahead of the phase inverter. A pair of cathode resistors (8200 and 5600 ohms) are in this stage; feedback is inserted in series with them, eliminating the use of coupling capacitor and its attendant low-frequency attenuation and phase shift. A 470-mmfd capacitor is used to cut the high-frequency response inside the feedback loop. This has the effect of reducing the feedback at high frequencies without cutting frequency response, but does give an in-

crease in high-frequency distortion. This makes possible the use of a conventional output transformer without costly interleaving of windings to cut down leakage resistance. Although the measured high-frequency distortion is slightly higher at nearly full output, it is not noticeable in listening, since the high-frequency energy in music is considerably lower than in the mid- and low-frequency ranges.

This amplifier is rated at its full output of 16 watts; at 10 watts output its distortion is below 1% from 50 cycles to above 4000 cycles, above which the distortion increases until at 10,000 cycles it is 2% at 5 watts. The foregoing comprises the power amplifier portion of the circuit. This is preceded by a voltage amplifier, loudness and tone controls, and another voltage amplifier. The loudness control circuit, of the two-tap type, is designed to give proper loudness control action at all levels including those low enough to be used for background music. There is no compensation for higher frequencies since the Fletcher-Munson curves dictate that none is required. The tone controls are of the single loss type; that is, there is a 20-db insertion loss for either or both controls. The bass control has a range of ± 11 db (total 22 db) at 100 cycles with a *normal* setting at mid-rotation. The treble control has a range of +8 db and -16 db (total 24 db) at 10,000 cycles with a *normal* setting at mid-rotation.

Four inputs are provided: (1) phono, (2) tuner, (3) tape, and (4) stereo. The record player and tuner in the instrument are connected to the first two. The tape jack is a playback input when the instrument is used with a tape recorder. Phono and radio signals are present at low impedance at this jack for tape-recording pur-



¹RCA Mark IVD.

FIG. 1A: REAR VIEW of radio-phono console illustrating positioning of four speakers.

Hi-Fi Radio-Phono

Separate AM-FM Tuners and Four-Speed Changer

poses when the instrument is functioning on these services. The stereo jack is connected to the input of the power amplifier section when the function switch is in the stereo position, for the purpose of using this section and the acoustic system as one channel of a companion stereophonic instrument. In all functions other than stereo, the voice-coil signal is present at the stereo jack for use with auxiliary speakers or sound systems.

The record equalization used in this amplifier is that specified by the *new orthophonic* or *RIAA* curves. The recommendations, of course, are for constant output from the reproducer. This is generally reverted to a voice-coil voltage which is modified by pickup characteristics and amplifier shaping to give the desired acoustical performance. The voice-coil voltage

on phono position is shown in Fig. 4 (p. 36). There are no additional equalization settings on this instrument except those afforded by adjustments of the tone controls. This is dictated by the fact that *RIAA* equalization characteristic is an average of all others, which deviate only slightly from it. Secondly, almost all record manufacturers have been using the *RIAA* characteristic since '53 or '54 and the addition of equalization switching is deemed an unnecessary cost burden to the customer.

Tuner

The tuner² is supplied in two different ways in this instrument; factory installed and ready to operate, and

²971. ³Mark IV.

separately for units without radios.³ The tuner comes with AM and FM antennas.

The circuit design of the tuner (Fig. 3; p. 36) is straightforward. It uses tubes of the series-string type for reasons of economy.

An isolation transformer is used to eliminate shock hazard, with its secondary tapped to provide a power source for the dial lamps. This system provides long lamp life and even illumination. The FM detector is a discriminator preceded by three *if* stages. The third of these functions as a limiter. A 19X8 serves as the mixer-oscillator with the mixer-section triode connected for superior signal-to-noise ratio. The antenna stage is broadly

(Continued on page 36)

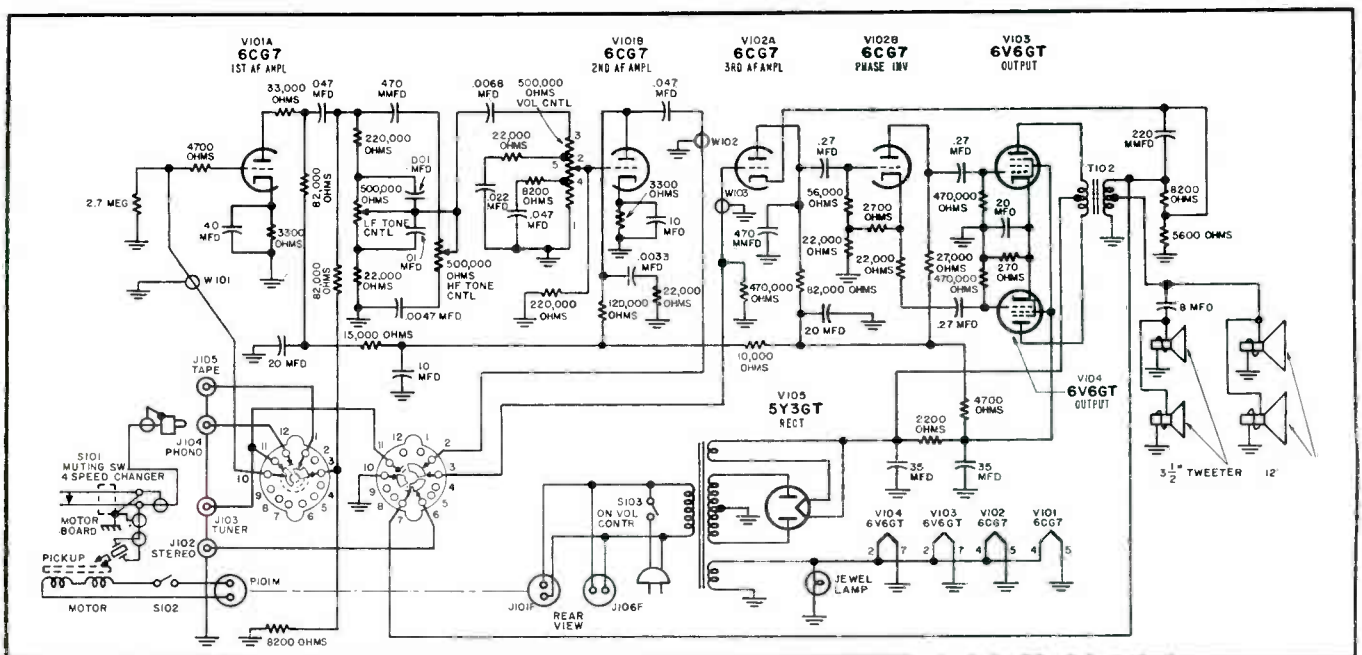


FIG. 2: SCHEMATIC of 16-watt amplifier used in RCA radio-phono.

RCA VICTOR ANNOUNCES NEW "FLIGHT-LINE" PORTABLE TV

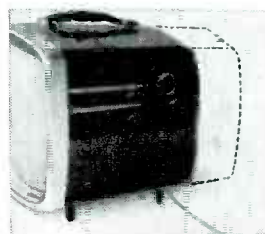


Hathaway. 262 sq. in.* viewable area. Ebony-and-gold. (21PD811) \$229.95. 156 sq. in.* viewable area. Choice of five finishes. (17PD809) \$189.95. **Nassau.** 108 sq. in.* viewable area. Ebony or bark gray. (14PT802) \$129.95.

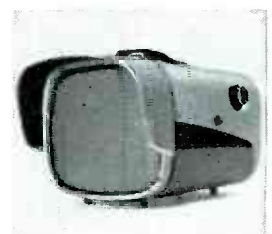
Compact new easy-to-carry design with "Mirror-Sharp" picture in every wanted size—from \$129.95

Here's portable TV with a slender, space-saving design that's breezy and easygoing as a southbound swallow. It goes anywhere, fits anywhere, plays on any 110 AC outlet. Your ideal second set.

There's powerful excitement in the new "Mirror-Sharp" picture, too. It's crisp and clear as the picture on a console. Yet "Flight-Line" prices (including all the important new extras) are really down-to-earth. See new "Flight-Line" portable TV in exactly the size and color you've been wanting. Come in today!



RCA's 110° tube makes tapered "Flight-Line" TV inches shorter. The already slim 14"† models have 90° tube.



New Sun Visor helps keep "Mirror-Sharp" picture, even in bright sunlight. Optional extra on 14"†, 17"† models.

 **RCA VICTOR** 
TM&©® RADIO CORPORATION OF AMERICA

Manufacturer's nationally advertised VHF list prices shown. UHF optional, extra. Slightly higher for West and South. *Picture tube, overall diagonal (inches) | 14 | 17 | 21
 Prices, specifications subject to change. RCA Victor Factory Service available in most areas, but only to RCA Victor owners. †Square inches of viewable picture area | 108 | 156 | 262

A Guide to the Selection of

MOST SERVICE MEN are aware of the increasing number of phonographs in use today. Probably most Service Men are aware also of the wide variety of types of pickups used in these phonographs. The increase in the number and variety of pickups has been brought about partly by the rapid development of the phonograph art, such as the advent of long playing and 45 rpm records, and high-fidelity. Along with these developments, vigorous competition in industry has stimulated the efforts of pickup designers, with the result that new and improved pickup models have been appearing more rapidly in recent years.

The wide-spread use of phonographs makes it necessary for the Service Man to be well informed and adept at cartridge replacement. A number of aids are available. Most pickup manufacturers offer various replacement helps in the form of cross-reference listings and service data. Pickup manufacturers have also developed replacement cartridge kits, cartridge adapters, special tools, and the like. They have also prepared distributor helps, such as cartridge dispensers and various merchandising aids to help the Service Man obtain quickly and easily the replacement cartridges he needs. Certain radio service manuals also contain helpful information regarding cartridge replacement.

It is always to the Service Man's advantage to use the direct replacement cartridge when servicing phonographs. Use of the direct replacement

insures that the job can be done quickly and easily, thus making possible a fair profit. Use of direct replacement also helps to insure restoration of original performance and customer satisfaction.

However, exceptions may arise where it is impossible to determine what replacement cartridge should be used. For example, one may encounter a discontinued cartridge model. In other cases, the defective cartridge cannot be properly identified because of loss of the label or model number identification. In Fig. 2 we have a chart designed to help Service Men identify cartridges in question.

In some situations where it is desired to maintain a minimum stock of replacement cartridges, an attempt will be made to handle all replacement requirements with a limited number of models. This policy must be used with caution. Replacement of a given cartridge with a new one having totally different characteristics could result in unsatisfactory operation. Service Men may have to spend extra time making adjustments or corrections, both mechanically in the pickup assembly and electrically in the phono circuit, to obtain correct operation. This procedure can endanger one's profit and can result in customer dissatisfaction, unless one has the specialized knowledge and experience required to handle such cases. Those who feel capable of this type of service operation may find the accompanying chart, when used in conjunction with cartridge specification data, helpful in locating a re-

placement cartridge whose characteristics are as close as possible to those of the original cartridge.

In attempting to modernize a phono by replacing its cartridge with a different model, the Service Man faces similar problems to those outlined in the preceding paragraph. In addition, one should keep in mind that a phonograph consists of several major components: pickup, amplifier, speaker and cabinet. In a well-designed phonograph the manufacturer has carefully chosen and designed these components to give the highest possible level of performance obtainable at a given cost. Each component is carefully matched to all the others in the system. You might say that each component is capable of about the same performance level. Therefore, replacement of one component, such as the cartridge, with a new one having improved performance would not necessarily bring about improved overall performance, because of the limitations of the other components. The foregoing is not intended to discourage the Service Man from attempting improvements; it is intended to point out the importance of being well informed about the principles governing phonograph design and selection of replacement cartridges.

Hi-Fi and the Service Man

A word about high-fidelity: The term high-fidelity at one time had a rather specific meaning. It usually was applied to a special type of phonograph in which extra care was taken in designing for better performance, and more money was spent to obtain better components. Recently, however, the term high-fidelity has become so widely used that many people in the trade feel that it has lost its original value as a descriptive term for the better types of phonographs. Nevertheless, the Service Man, through experience, has learned to differentiate between the ordinary phonograph and the high quality or true high-fidelity phonograph. Extra care should be exercised in selecting a replacement cartridge for a high-

**See page 44 for additional information on cartridge design and installation.*

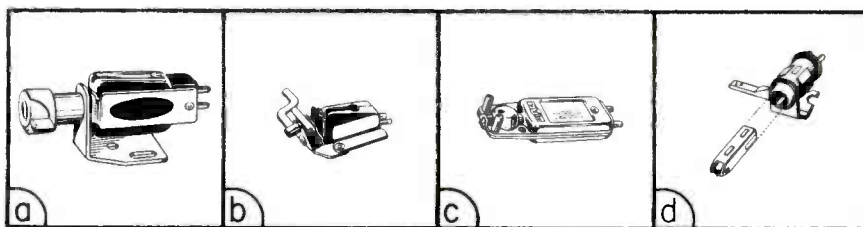


FIG. 1: FOUR TYPES of cartridges referred to in Fig. 2: Two-needle turnover (a); stationary with movable needle assembly (b); stationary with a single needle (c); and plug-in with one or two nonreplaceable needles (d). (Illustrations courtesy Astatic).

Phono Replacement Cartridges*

fidelity phonograph. The wider frequency range and lower distortion characteristics of most high-fidelity phonographs makes them much more sensitive to incorrect replacement parts.

The accompanying cartridge identification chart is intended principally

as a guide in identifying cartridges where the model number can not be determined. However, it can also help in a general way to recognize the major characteristics which must be taken into consideration in all cartridge replacement work. The chart should not be considered as an air-

tight listing of specifications and other details. It has purposely been simplified for easier use. Some exceptions to the data in the chart may be found but they will be comparatively rare.

The major identifying characteristics are listed in order of importance, (Continued on page 54)

Major Identifying Characteristics		Examples and Remarks
Class of service	(a) 33 $\frac{1}{3}$, 45, 78 rpm or 16 $\frac{2}{3}$, 33 $\frac{1}{3}$, 45, 78 rpm	Cartridge has selectable 1 and 3-mil tip radius needles or single compromise needle with 2-mil tip radius.
	(b) 33 $\frac{1}{3}$ or 45 rpm	Cartridge has single 1-mil tip radius needle.
	(11) (c) 78 rpm	Cartridge has single 3-mil tip radius needle.
Physical class of cartridge	(a) Two-needle turnover cartridge	Usually has two separate needles; 1 and 3-mil tip radius.
	(b) Stationary cartridge with movable needle assembly	Needle assembly may have two tips (1 and 3-mil radius) selectable by rotating, sideways shift or other means.
	(c) Stationary cartridge with single needle	Cartridge may use conventional type needle, fastened by thumbscrew or setscrew, or may be of the <i>matched-needle</i> type; may use 1, 2, or 3-mil radius tip, depending upon class of service.
	(12) (d) Plug-in cartridge with one or two nonreplaceable needles	This type may be in a stationary holder for single-needle service or in a rotating holder for two-needle service.
Electrical class of cartridge	(a) Rochelle-salt crystal	Most common type, especially in low priced phonos with one tube amplifier, where maximum cartridge output is needed.
	(b) Ceramic	This type, originally favored for severe climates, now becoming popular for general use. It is also found in wider-range phonos.
	(c) Magnetic	Used in wider-range phonos.
	(13) (d) PN crystal	Seldom encountered except in coin phonos and special equipment designed for high temperature.
Output level	(a) High output	Rated output 2.5 to 4 volts, used in low priced phonos with one-tube amplifier.
	(b) Medium output	Rated output .5 to 1.5 volts, used in medium-priced phonos with two stage amplifier, phono-radio and phono-TV combinations.
	(14) (c) Low output	Rated output .01 to .05 volt, usually magnetic type, used in wider-range phonos.
Frequency range	(a) Wide range	20 to 10,000 cps or better, required in all high-fidelity phonos.
	(15) (b) Standard range	50 to 5000 cps, approximately, used in low-cost phonos.
Weight	(16) No standard classifications	Cartridge weight may be from about 4 to 30 grams, depending on type.
Needle pressure	(a) Low pressure or light weight	Recommended values could vary from about 1 to about 12 grams depending on type.
	(17) (b) Heavy	Recommended values vary from about 1 to 3 ounces, depending on type; usually older models.
Needle type	(a) Matched	Designed for use in a given type cartridge; may have 1, 2 or 3-mil radius tip or combining 1 and 3-mil in a double-needle assembly.
	(18) (b) Conventional	Straight or bent shank, jewel or precious metal tip, fastened by thumbscrew or setscrew; usually 2 or 3-mil tip radius.

FIG. 2: CHART FOR identification of phono cartridges.

A Field Progress Report on Latest Audio Developments

by MAURICE E. SWIFT, Philco Corporation

Sound Is King

A Comprehensive Review of the Advancements in Pickups, Speakers and Circuitry Which Have Placed the Spotlight on Sound

MANY OF THE PRINCIPLES of good audio reproduction have been known for more than thirty years. During the late twenties many commercial domestic receivers were produced which incorporated techniques similar to those in vogue today. As the pressure became stronger for smaller and less expensive designs during the thirties, the speakers and cabinets were reduced in size with a resultant loss in sound quality.

Only recently has the success of the improved phono records and their reproducers stimulated the designers toward re-examining the acoustical systems for the table radios and TV sets. The result has been an upgrading of the better class of these sets.

Today sound is king. Almost in all directions you will find improved sound performance. The console phono and tape players lead the way, of course, followed closely by FM radio sets. In general, the program material for these units is superior in range and quality to that supplied by AM radio and TV broadcasts. These improvements have been brought about by better pickups, loudspeakers, tone compensation and feedback circuits.

Phonograph pickups are now designed with light record pressure and wide-range frequency response. A first class pickup will have a response which is essentially flat within extended limits. The ceramic, crystal and magnetic types are all capable of superior reproduction with proper design.

Loudspeakers have benefited in several directions. They have im-

proved in quality and in quantity. Today, multiple speakers are common on systems with extended frequency range. The electrostatic loudspeaker has made possible a major improvement in listening pleasure. The smooth, clean performance of this speaker coupled with its excellent transient response gives a life-like character to program material. The semi-cylindrical models have an excellent distributional characteristic.

Cabinet design has also contributed to our new sound. Recently we have seen a return to sound out the front for TV table models. This has been made possible by new *slim* speaker designs as well as major improvements in older types. The use of infinite baffles, (back enclosed cabinets), has given us improved bass response. The acoustic lens provides for better distribution of the higher frequencies and a smoother mid

range. It is a new tool for the cabinet designers as well as the acoustician.

Tone compensation and feedback circuits are in more general use today than in any previous period. The modern designer uses tone compensation to round out the system. Good bass from small cabinets is one result of tone compensation. Inverse feedback is better understood now than when it was first introduced. We are now able to obtain adequate output power with negligible distortion and good efficiency as a result of intelligent use of degeneration.

These improvements have brought their problems to the Service Man. The tone correction and feedback circuits can be troublesome in that phase shifts and other failures here are sometimes difficult to detect. However, it is in pickups and loudspeakers that the new sound requires the Service Man to review his techniques.

Phono reproduction starts with the record and the needle. The micro-groove system, which is wide spread, has a needle tip with one one-thousandth inch radius. The area of contact between the needle and the record is small; pressure at this point is high. All needle materials wear; the softer ones wear rapidly. Every Service Man should have a low power microscope to examine needle tips. A large percentage of those in use should be replaced. The damage caused by worn needles is well known. The needle must be tight in its chuck, or it will chatter.

Mechanical damage is another common pickup trouble. This is usually

(Continued on page 56)

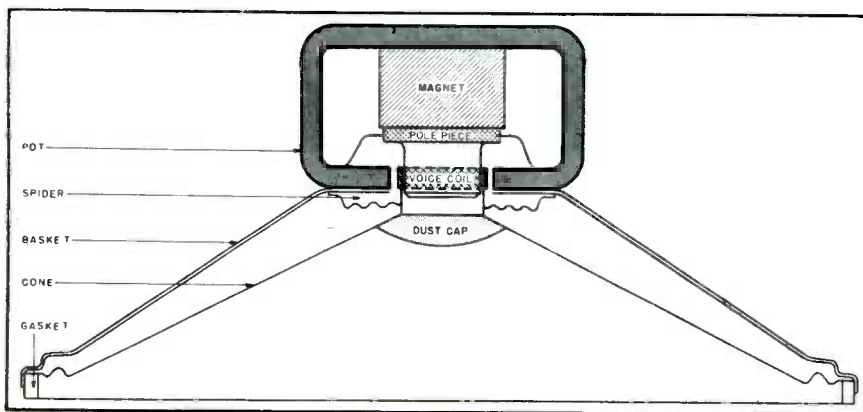
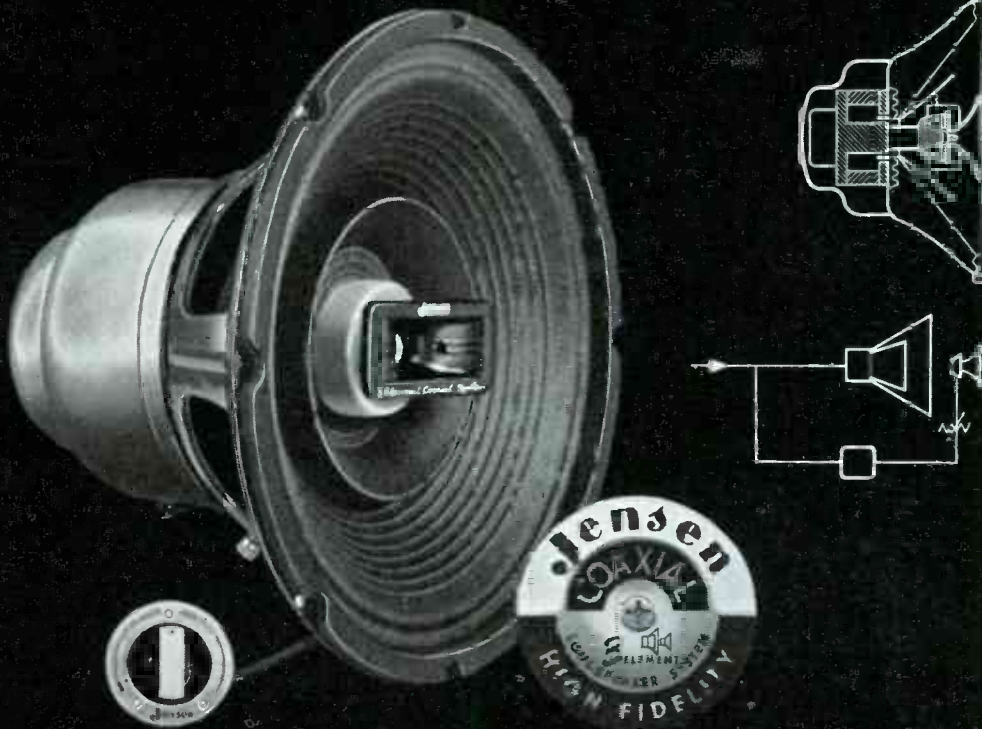


FIG. 1: CROSS-SECTION of a typical dynamic speaker illustrating areas where operating problems could occur and affect reproduction.



NEW Jensen COAXIAL 3-ELEMENT HI-FI LOUDSPEAKERS

You'll spend less for more performance
... get traditional Jensen quality!

If you're looking for hi-fi performance outclassing anything remotely similar on the market today... with more performance... more easy-on-the-ears listening quality... at less than you'd expect to pay, then don't fail to investigate Jensen's 4 new Coaxial 3-Element models.

There are three radiating elements driven by two voice coils. H-F unit is a compression driver super-tweeter 4000-15000 cycles; woofer-midchannel is a separately driven dual cone unit, with the small cone dispersing and smoothing the 2000-4000 cps. region. The whole skillfully blended combination rates at 30-15000, low end depending on enclosure. H-F control tunes it up smoothly to suit the ear. Choice of 12-inch CX-120 (1 lb. magnet) at \$49.50 or CX-225 (1 3/4 lb.) at \$99.50; 15-inch CX-150 (1 lb.) is \$66.50. CX-255 (1 3/4 lb.) only \$76.50. Write now for free complete condensed Catalog 165-B.



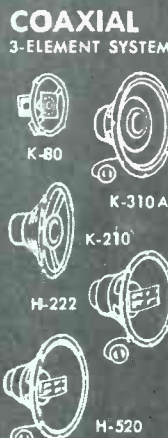
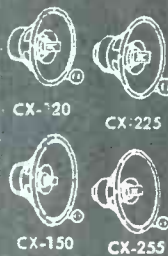
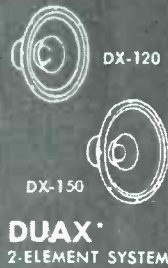
KTX-3 "STEP-UP" KIT

If you have the urge to improve your speaker later, you can have a full 3-way system by adding this compression horn midrange unit (600-4000 cps). Net \$62.50.

Jensen MANUFACTURING COMPANY

6601 South Laramie Ave., Chicago 38, Illinois

Division of The Muter Co. In Canada: J. R. Longstaffe Co., Ltd., Toronto.
In Mexico: Radios Y Television, S.A., Mexico D.F.



TRIAxIAL and
TRIAx
3-WAY SYSTEMS

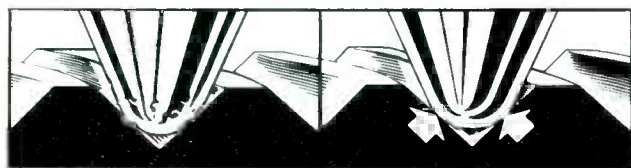
THE
WORLD'S
MOST
COMPLETE
HIGH
FIDELITY
LOUDSPEAKER
LINE

* M. Reg.

by ROBERT G. WALCUTT, Walco Products, Inc.

Diamonds Are A Record's Best Friend

What a Service Man Should Know About Replacement Needles



POORLY POLISHED tips (as illustrated at left) have surface flaws which can shear grooves and distort sound. The perfect tip (right) touches groove walls at two tiny areas only.

THE ULTIMATE TEST of a Service Man is the sound of the equipment he repairs. No matter how efficient one is or how good a job one may do, there's one factor—frequently ignored—that can mean the difference between a satisfied customer and one who thinks you didn't do the job.

Given a hi-fi set in perfect operating condition plus a new factory-fresh record, what can go wrong? The answer is simple; the customer's needle. The needle is the only link between phono and record. If the link is faulty, sound reproduction must suffer.

The alert Service Man interested in keeping his hard won reputation for quality work should include a needle check in his preliminary survey of every phono brought in for repair or overhaul, or every phono serviced in the home. Although the needle industry and the record companies have devoted considerable time and space to needle-education programs, too many still ignore or forget the important role the needle plays.

The needle is the only point of contact between the set and the record. Friction between the needle point and the record surface causes wear, changing the shape of the needle from a smooth ballpoint tip to a wedge-shaped chisel which gouges out the sides of the record grooves. A worn needle wears out records, interferes with sound reproduction, and slowly but very

thoroughly destroys an entire record collection unless it is replaced.

There is no such thing as a permanent needle. Every needle eventually begins to wear, its length of service depending on the material from which it is made and the circumstances under which it is used. The average metal or osmium point will last for about 20 playing hours. Sapphire points give satisfactory service for about 50 playing hours.

The diamond tip needle, the most lasting and most durable, should give peak performance for about 1,000 playing hours.

Even a diamond needle, however, though made of the hardest and

smoothest substance known, will begin to wear and to damage records if kept in service after its optimum life is over. Service Men should be able to recognize a worn needle and to suggest its replacement as part of the complete service package offered.

How to Check Needles

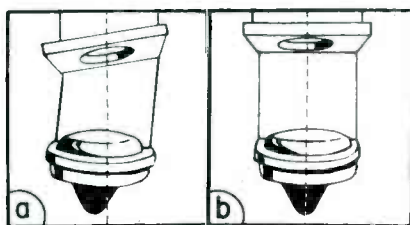
Inspection with the unaided eye cannot distinguish a good needle from a worn one. Variations in shape invisible even under very close inspection can cause great record damage and interfere with tone quality.

Generally one can tell whether or not a needle should be replaced by simply asking the customer how long the needle has been in use. If it is a sapphire or osmium point and has been in use for six months or longer, chances are that it needs replacement.

Only microscopic examination can determine the amount of wear on a diamond needle. One should suggest such an examination, pointing out that a needle checkup can mean extra years of record life. To facilitate this examination, there are available 90-power microscopes, plus large scale models of perfect tips for comparison.

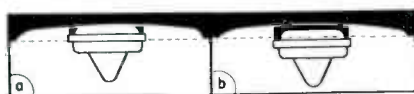
The advantages of purchasing a diamond needle can be explained in terms of extended playing hours, less record wear, and better tone. One diamond needle will outlast 20 sap-

(Continued on page 55)



HOW NEEDLE ALIGNMENT can affect output. A stylus improperly mounted (left)—tilted instead of vertically aligned—can cause needle to jump groove and develop distortion.

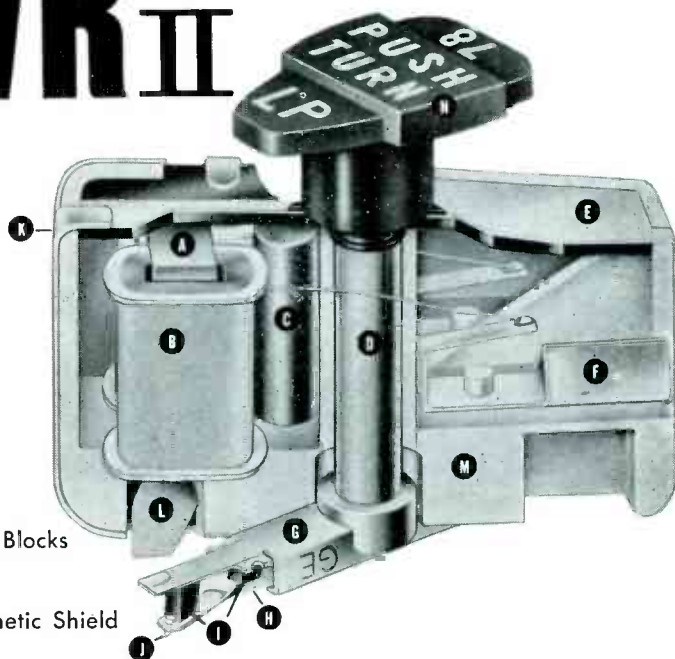
IF THE NEEDLE does not protrude far enough from cartridge (left) the tone arm will slide across record causing record damage, intermittent sound and distortion.



TO BRING OUT THE BEST
IN EVERY HI-FI SYSTEM...



Sell and install the NEW G-E VR_{II} cartridge



- A Highly permeable laminations
- B Hum-cancelling wound coils
- C Alnico V Magnet
- D Pivot Post
- E Electrostatic Shield
- F Plug-in Terminals
- G "T"-Channel
- H VR II Clip-In-Stylus
- I Special G-E Damping Blocks
- J Stylus Jewel
- K Mu-Metal Electromagnetic Shield
- L Magnetic Pole Pieces
- M Plastic Body
- N Triple Play Knob

Only a genuine G-E VR II gives your customers all this:

New Full-Range Reproduction—General Electric's new VR II makes faithful reproduction from 20 through 20,000 cycles a glorious reality!

New 4-Gram Tracking Force—Lateral compliance has been extended to 1.7×10^{-6} cm per dyne, permitting a tracking force of only 4 grams to minimize record and stylus wear.

Instant Clip-In-Tip Stylus—Stylus replacements can be made at home without removing cartridge from tone arm. There's no need to discard an entire dual assembly when only one tip is worn.

New Electrostatic Shielding—New shield prevents pickup of electrostatic interferences and hum; also

grounds stylus assembly so that electrostatic charges cannot build up from record surface.

New Lightweight Construction—Reduced in size and weight—with new stylus guard, terminals and knob—the General Electric VR II will withstand continued use under the most exacting conditions.

The new G-E VR II cartridge is being announced to the public in a heavy schedule of advertisements now running in major Hi-Fi and general magazines. Do you have enough stock to meet the demand?

Progress Is Our Most Important Product
GENERAL  ELECTRIC

Specialty Electronic Components Dept., General Electric Company
Section HF5E11, West Genesee Street, Auburn, New York
Please send me FREE booklet on G-E VR II Cartridges.

Name _____

Address _____

City _____ Zone _____ State _____



the standard 1-mil stylus. A 78-rpm head also is available.

The pickup may be connected to any hi-fi preamp and is designed to operate into a load of 10,000 ohms or more.

Aluminum Tone Arm

The tone arm is made of light high-strength aluminum in the form of a column tapering toward the front and reinforced at midpoint for greater strength. Because of this construction, the arm is devoid of resonance. A groove-oriented stylus assembly provides the correct offset angle for proper tracking.

Balance Beam Mount

The cartridge is mounted on a balance beam which has a cross shaft pivoting in a sleeve-and-cap ruby bearing at either end. The main arm bearing is a convex ruby thrust bearing. These bearings are claimed to provide an almost frictionless pivot.

A newly developed dynamic damping system is employed in the pickup. A counter-balance is floated on a suspension bar imbedded in special elastomer damping material. Any tendency of the arm to resonate is

(Continued on page 53)

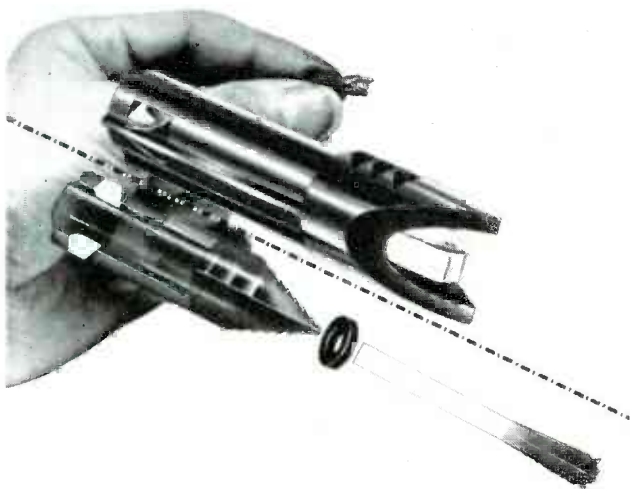
Features of New Types of Tone Arms and Pickups

A PHONO tone arm with pickup (*Studio Dynetic*), which is said to place one gram pressure on a record, is now being made by Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

Features a stationary coil with a moving magnet in the cartridge, jeweled bearings and a control

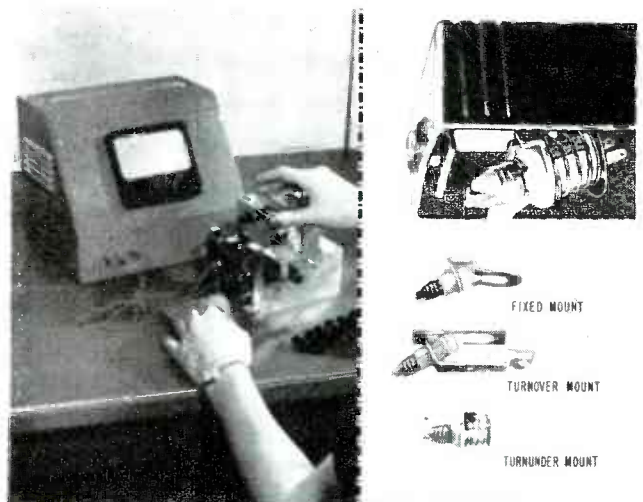
button to lift the tone arm from the record to move it to any desired point, where it will set down when the button is released.

The arm has been designed for use with standard turntables. It is supplied with a .7-mil stylus for long-playing records; this is smaller than



ABOVE (top): A MINIATURE COMBINATION needle and cartridge* designed so that it can be installed as a single unit.

ABOVE (bottom): DETAILED VIEWS of unit which features an indestructible nylon case which houses a ceramic generating element on which two needles are mounted. The silver blades in the rear act as contacts between the generating element and the mounting device, and also serve as the rear anchor for the element. The rubber pad in the center supports the generating element assembly, centers it, and establishes high compliance.



ABOVE, LEFT: SAMPLE TESTING of both vertical and horizontal compliance of cartridge to check performance standards.

ABOVE, RIGHT: MINIATURE cartridge mounted in an arm, and basic types of single-unit cartridges designed to provide the correct styli for combinations of 45, 33 $\frac{1}{3}$, and 78 recordings.

*Power-Point; Electro-Voice, Inc., Buchanan, Mich. [SERVICE.]

PROOF
UNIVERSITY
SPEAKERS
STAY SOLD!

To insure valid statistics, this tabulation covers the largest selling brands, based on a four-year survey (April 1953 to March 1957) of classified and "Swap or Sell" ads for used high fidelity loudspeakers. All ads authenticated as placed by private individuals in Audio, High Fidelity and Music At Home

PERCENTAGE OF TOTAL INSERTIONS IN "SWAP OR SELL" COLUMNS			
SPEAKER "A"	SPEAKER "B"	SPEAKER "C"	UNIVERSITY
46½%	23¼%	16¼%	13%

**Fewest number of ads offer University equipment
 ... outstanding testimonial of user satisfaction.**

We have always believed that the tremendous volume of University speakers sold in the past to hi-fi enthusiasts attested to the genuine listening satisfaction designed into all our products.

We think that all legitimate hi-fi loudspeakers sound pleasing, but the acid test of listening satisfaction is a speaker's "staying power". Does it grow with your hi-fi tastes, continue to please year after year . . . or is it obsolete before its time . . . ready for swap, sale or discard?

Yes, in the "Swap or Sell" columns of the leading audiophile magazines, you soon know which of the prominent brands of loudspeakers readers out-grow . . . and, by the absence of such ads, which of these leading loudspeakers remain in the home!

The record speaks for itself. This accurate survey, taken over a span of four years, shows that speaker "B" has almost 50% more "for sale" listings than University . . . while speaker "A" is offered more than three times as often! Here is indisputable unsolicited testimony from average hi-fi users themselves that University *stays sold*, continues to serve year after year as a source of rich musical pleasure.

LISTEN *University sounds better* 

UNIVERSITY LOUDSPEAKERS, INC., 80 SOUTH KENSICO AVENUE, WHITE PLAINS, N. Y.

**University offers
 the largest selection
 of loudspeakers to gratify
 every need and budget**



WOOFERS



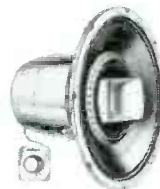
TWEETERS



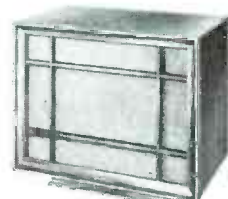
MID-RANGE



NETWORKS



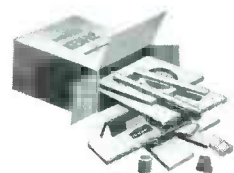
DIFFAXIALS



SYSTEMS



ENCLOSURES



KWIKITS

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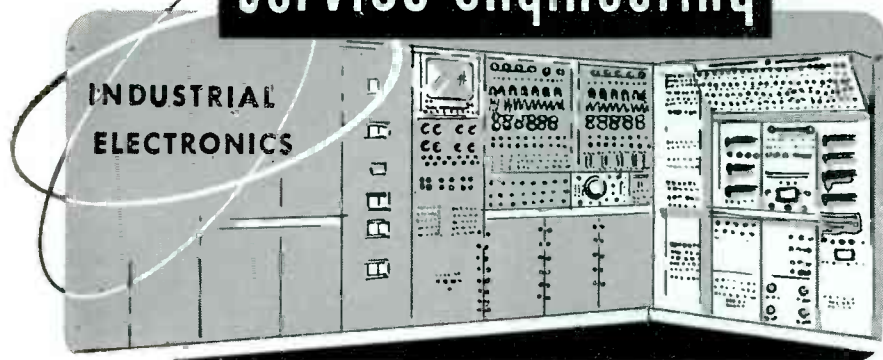
- Complete Speaker Systems
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City..... Zone..... State.....

service engineering



Servicing Commercial and Home Hi-Fi in Southern Calif.

by ERNEST A. DAHL, Hi-Fi Shop, Riverside, Calif.

OUR SHOP, which recently celebrated its fourth birthday, specializes in servicing and selling commercial sound and hi-fi equipment. We custom-build home and commercial sound systems and have made installations in railroads, colleges, universities, laboratories, and many large homes.¹

We engineer every system we sell and guarantee all equipment except needles and voice coils unconditionally for one year. We have been devoting about 20% of our efforts to improving the performance of existing systems. Our service and engineering staff (two who handle planning and layout and two who make the instal-

lations) are electrical-engineering graduates.*

All installations are planned after a study has been made of the acoustics

**Some of the sound-distribution system installations recently completed were made for the Rock Island Railroad, Northwest University, Billy Sunday Tabernacle, North Central College in Naperville, Ill., and National Bureau of Standards in Corona, Calif.*

**In addition, there is a 3-man sales staff. The shop is owned by Richard Helsing, an audio consultant, and Dahl, a consulting engineer, who was formerly with the Bureau of Standards.*

of the room, location of equipment, control location and audience positioning. All systems are tested in the shop on a laboratory basis to insure guaranteed performance. Because of the warm climate in our area, forced air cooling is often provided to afford maximum equipment life.

To permit ceiling mounting of speakers, we use a ducted, port-type base-reflex enclosure developed in our shop. These housings are set in the ceiling between studs. This enclosure has been found to afford good distribution of music—with excellent quality—in homes and commercial installations. The enclosure, which uses 8" speakers, has a range of from about 40 to 12,000 cps.

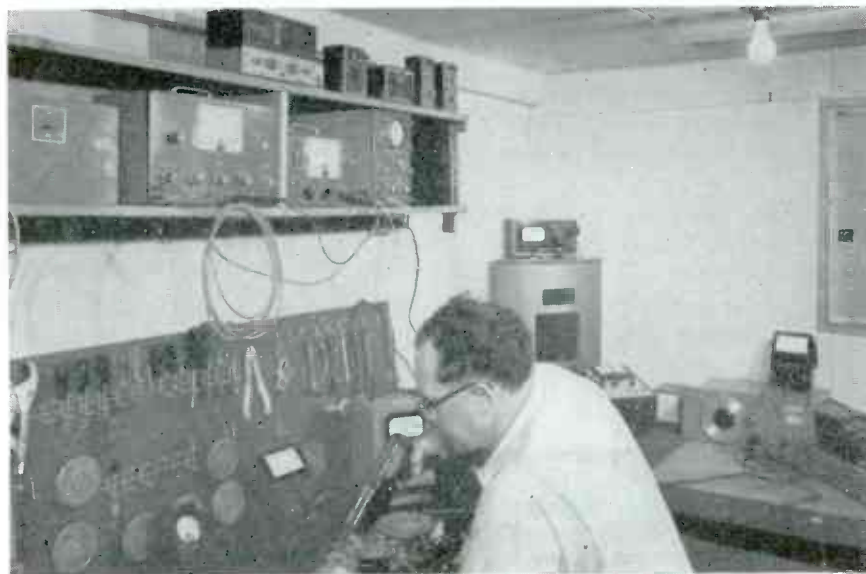
Our shop includes a sound room separated by sliding glass doors from the equipment section; this allows maximum front display, yet provides a large closed room where our customers can select the equipment they prefer based on how it really sounds.

After an installation has been completed it is carefully checked out. A series of frequency runs are fed in the amplifier section from an oscillator,² and the sound from the speakers is picked up by a microphone³; the balance of the output of the woofer-midrange tweeter is adjusted for best full-range performance in the area of installation.

Our shop is situated east of the Los Angeles metropolitan area, not far

(Continued on page 55)

¹Hewlett-Packard type 200 C. ²Altec Lipstick condenser microphone.

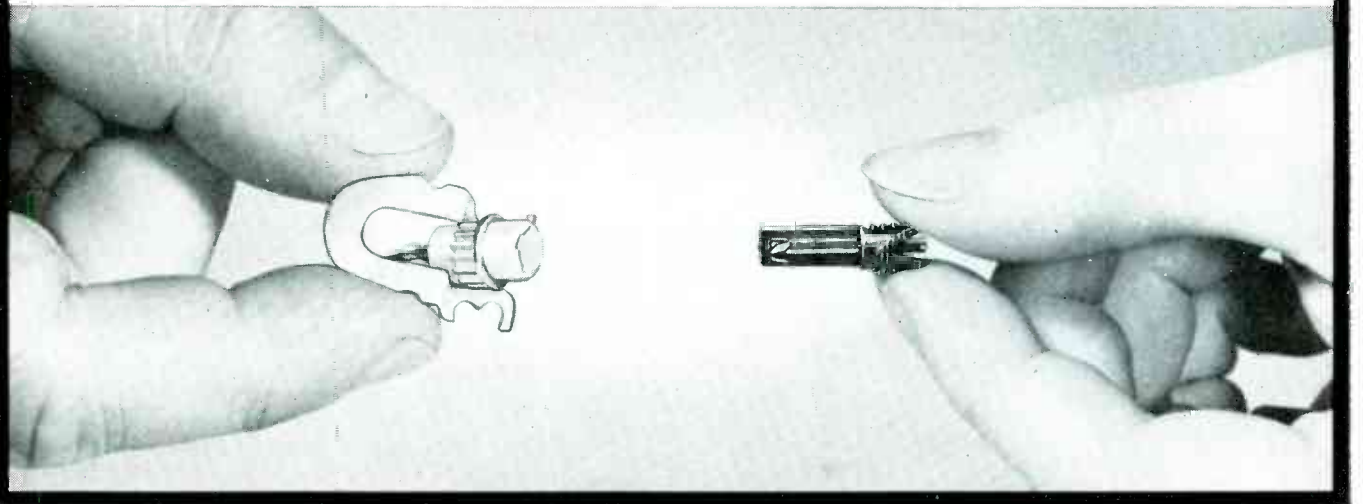


ABOVE: A SOUND-SYSTEM installed by the Hi-Fi Shop. Dark rectangles on the ceiling are built-in bass-reflex speakers.

LEFT: DAHL at service bench of his audio shop in southern California.

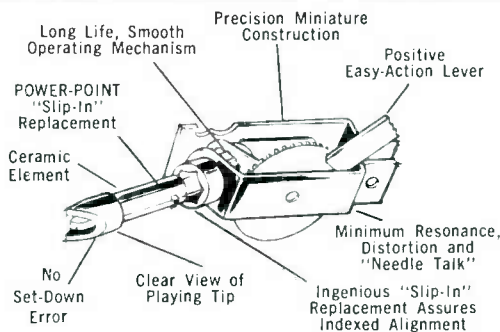
Electro-Voice® POWER-POINT

For Profit and Customer Service Without Problems!



POWER-POINT is the unique, easily installed, miniaturized unit containing BOTH a fresh ceramic cartridge and jeweled playing tips. You sell **POWER-POINTS** for LESS than the cost of a separate cartridge or two comparable phono needles alone! Most models \$3.95 list. Only 3/4" long and less than 1/2" in diameter, they're in color-coded nylon cases, blister-packed in plastic to keep them clean, factory-fresh, easy to handle.

YOU install the mount. Once that's done, the **CUSTOMER** can remove and replace units in a matter of seconds. You get the replacement business but none of the grief. You stock just three types of mounts and seven types of **POWER-POINT** units to service virtually all modern phonos. You save on inventory costs, conserve shelf space, take no risk of obsolescence.



Typical **POWER-POINT** and Turnover Mount
POWER-POINT
 Case—Nylon
 Element—Ceramic
 Tip Material—Superior Synthetic Sapphire or Natural Diamond
 Tracking Force—5 to 8 grams
 Net Weight—300 milligrams
 Terminals—Beryllium Copper, Self-cleaning Type
 Load—1 meg. 100 mmfd
 Compliance— 1×10^{-6} cm/dyne
 Average Output Voltage at 1000 cps
 Test Record RCA 12-5-49V. 85 Volt Col. 10004M 1.75 Volt
 PT1 Mount
 Material—Steel and Nylon
 Finish—Cadmium Plate
 Connector Size—.050"

THE MARKET IS BIG: OVER TWO MILLION NEW PHONOGRAPHS USE **POWER-POINTS** AS ORIGINAL EQUIPMENT! THE PROFITS ARE BIG—AND E-V HELPS YOU SELL WITH THESE MERCHANDISING AIDS.



Fact-drammed folder tells the full **POWER-POINT** story. Ask for Bulletin No. -223. Colorful, compelling envelope stuffer for mailing. Bulletin No. -225. Write Dept. S711.



Plastic-sealed blister-packed **Power-Points** are always in perfect condition. Package gives model identification, color-coding and instructions.

These are the color-coded **POWER-POINT** units, actual size



RED
 Model 51-1,
 two 1-mil
 sapphire tips,
 \$3.95 list.



GREEN
 Model 52-2,
 two 2-mil
 sapphire tips,
 \$3.95 list.



BLACK
 Model 53-3,
 two 3-mil
 sapphire tips,
 \$3.95 list.



BLUE
 Model 56,
 one 1-mil,
 one 3-mil
 sapphire tip,
 \$3.95 list.



ORANGE
 Model 56DS,
 one 1-mil
 diamond,
 one 3-mil
 sapphire tip,
 \$16.50 list.



WHITE
 Model 76S,
 one 1-mil
 diamond,
 one 3-mil
 sapphire tip,
 \$4.25 list.



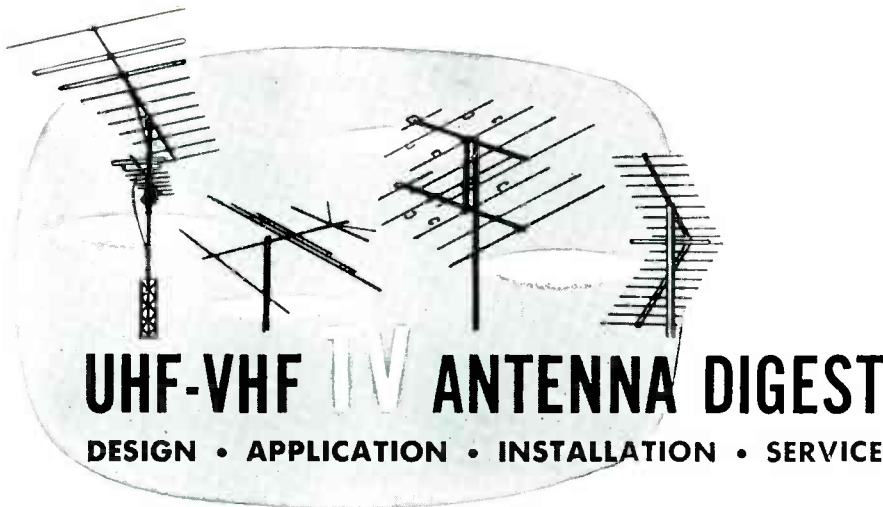
PINK
 Model 76DS,
 one 1-mil
 diamond,
 one 3-mil
 sapphire tip,
 \$16.50 list.

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How to Develop an Antenna Replacement Program*



TOO MANY SERVICE MEN would rather limit their operations to home and shop radio and TV chassis service, and shun the problems which revolve about the entire receiver system; the set's location, the ground, and particularly the TV antenna. There are unlimited opportunities in antenna installations, be they for original or replacement purposes, if a concerted drive is made for the business.

A look at the outdoor antennas in most communities reveal arrays aimed in all directions, missing element arrays, hay-wire-supported signal catchers, feed lines flapping in the breeze and many with glaringly imperfect lightning protection. Actually, one will find so many defective antenna systems, in urgent need of attention, that one could be baffled as

to a practical solution to the problem. Some definite plan of approach is necessary.

One method has been found to be very effective in private-house type areas; it involves a careful study of each area on a block-by-block house-by-house basis, with a detailed report on antenna conditions found. Such a probe does take time, but it is well worth the effort. For not only are we able to set a lively prospect list for antenna sales, but other service work surely needed in most cases. Incidentally names of home owners or tenants are usually available from not only telephone directories, but lists of voters compiled by local agencies.

With this information one can chart

*Based on a report by *Walter S. Rogers.*

a campaign in a very definite manner and keep records. Colored symbols or even keyed marks can be used to identify not only antenna conditions, but whether they are connected to shop-installed or repaired chassis, or belong to new prospects. Items in need of repair or replacement which can be noted on the map or chart are: antenna, lead-in pole or tower, hardware and guys. Other information which can be listed is the actual condition of the installation, noted during the study, such as: missing antenna elements, broken elements, bent poles, loosened rooftop mounts, swinging leads or corroded contacts at antenna or in house feed. Value of house (available from local records) should also be noted to establish extent of physical damage which could obtain if repairs are not made.

Timing of the repair campaign is important, too. The value of a TV set always soars during athletic events, election time, or during the months when lavish shows are aired.

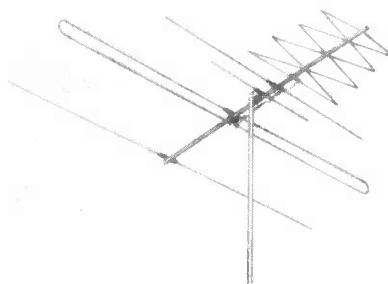
Selling Service

With this background of material, you are well equipped to sell your services by phone, direct mail or personal visits. Since you are thoroughly familiar with the antenna's condition and can support every statement because of your investigation, your judgment will be respected. Customers like to deal with those who are interested and are usually flattered when properly directed inquiries are

(Continued on page 51)



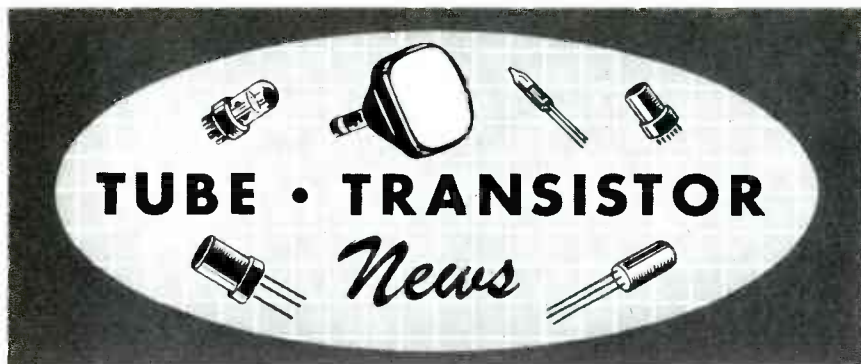
INDOOR TV ANTENNA featuring a slide-rule tuner which inductively matches the antenna to channel frequencies for fine picture adjustment. Transformer coupling matches antenna to set impedance. Can be mounted on top or behind the set.—Vi-Fi: Amphenol Electronics Corp., 1830 S. 54th Ave., Chicago 50, Ill. [SERVICE].



GOLD ANODIZED TV antenna said to be impervious to weathering and fading. Anodizing, called Alumilite, employs a selected electrolyte to obtain a dense adherent coating of aluminum oxide. The hard transparent coating, as initially formed, has a minutely porous structure to accept the gold impregnation.—JFD Manufacturing Co., Inc., 6101 16th Ave., Brooklyn 4, N. Y. [SERVICE].



WOOD-SCREW standoff which acts as a machine-screw mast standoff. Point can be broken off with a pliers or wrench when it is used as a machine-screw standoff on a mast, so that it will not slide off the center of the mast.—iE Manufacturing, 325 N. Hoyne Ave., Chicago 12, Ill. [SERVICE]



Latest Application Information on Transistors Designed for UHF, VHF and AM Chassis . . . Auto Radio and Audio Power Tubes . . . TV Replacements

A NEW CLASS of *field-accelerated* transistors said to be capable of operating through the entire very-high frequency and part of the ultrahigh frequency spectrum has been developed.¹

These transistors, called *madt*, are of micro-alloy diffused-base design, which can operate at switching speeds comparable to the speed of light. Their characteristics make it possible to use them in wideband video amplifiers and other critical high performance circuitry.

Drift Germanium Transistors

Other new transistor developments include a *drift* germanium *pnp* type, designed for short-wave battery portables²; 2N370 (*rf amplifier*), 2N371 (*oscillator*) and 2N372 (*mixer*). Each type is supplied with four flexible leads.

The transistors are hermetically sealed in metal cases with diameters of .360" and body height of .375". One of the flexible leads, situated between the collector lead and the base lead, and internally connected to the metal case, provides shielding to minimize both interlead capacitance and coupling to adjacent circuit components.

Also available is a hermetically-sealed drift transistor (2N384) for use as an oscillator up to 250 mc, as an *rf* amplifier in compact mobile communications equipment, or as an *if* and low-level video amplifier and as a pulse amplifier.²

The 2N384 features an alpha cutoff frequency of 100 mc, a collector transition capacitance of 1.3 mmfd

and a base resistance of 50 ohms.

Also included in the 2N384 is a base region in which the impurity distribution is controlled to produce a built-in accelerating field which propels the charge carriers from emitter to collector to reduce base resistance and the collector transition capacitance. The transistor also has a fourth lead between the collector and the emitter leads and internally connected to the metal case, which serves a shield to minimize interlead capacitance and to minimize coupling to adjacent circuit components.

Eight junction transistors of the germanium *pnp* type have also been announced for compact home receivers; 2N405, 2N406, 2N407, 2N408, 2N409, 2N410, 2N411, and 2N412.²

The 2N405 and a flexible-lead version, 2N406, are intended for class

A *af* driver service. They have a collector voltage rating of -12 (maximum), a collector current rating of 35 ma (maximum) and a collector dissipation of 150 milliwatts (maximum). In a common-emitter circuit with a *dc* collector voltage of 6 and a *dc* emitter current of 1 ma, these types have a current ratio of 35 and can provide a power gain of 43 db.

The 2N407 and its flexible-lead counterpart, 2N408, are intended for class A and B audio service. They are similar to the 2N109 and 2N217, respectively, but have a maximum *dc* collector cutoff current of 14 microamperes and a maximum *dc* emitter cutoff current of 14 microamperes. In class-B amplifier service they have a *dc* collector-to-emitter voltage rating of 18 (maximum), *dc* collector-to-base voltage rating of 20 (maximum), and a current transfer ratio of 65.

The 2N409 and its flexible-lead version, 2N410, are intended for 455-ke *if* amplifier applications. They are similar to the 2N139 and 2N218, respectively, but have a minimum *dc* collector voltage of 12 (for a *dc* collector current of 10 microamperes with emitter open) and in *if* amplifier service, a *dc* collector-to-base voltage rating of 12 (maximum).

The 2N411 and its flexible-lead version, 2N412, have been designed for converter and mixer-oscillator applications in the standard AM broadcast band. They are similar to the 2N140 and 2N219, respectively, but have a minimum *dc* collector voltage of 12 (for a *dc* collector current of 10 microamperes) and in converter and mixer-oscillator service, a *dc* collector-to-base voltage rating of 12 (maximum).

Auto-Radio Tubes

FOR HYBRID auto receivers operating directly from 12-v storage batteries a 9-pin twin-diode miniature-type high-perveance power tetrode (12DL8) has been developed.²

In such receivers, in which tube and transistor electrode voltages are obtained directly from a 12-v storage battery, the power-tetrode unit (of the space-charge-grid type) is especially useful as the driver tube to supply high input power at low distortion to the transistorized *af* power-output stage. The diode units are used in AM detector and automatic-volume-control circuits.

Space-charge-grid operation of the tetrode unit is accomplished by operating grid 1 at a positive potential and utilizing grid 2 as the control

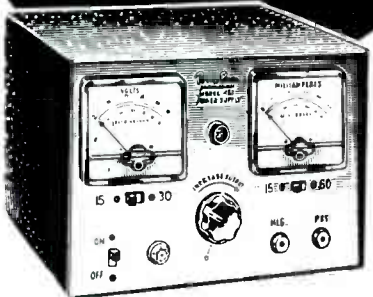
(Continued on page 58)



AT CEREMONIES CELEBRATING production of 15,000,000th TV picture tube by Sylvania in the Seneca Falls (N. Y.) plant. On hand for the production milestone were (left to right) Donald W. Gunn, general manager of the company's electronic products sales department; Matthew D. Burns, vice president-electronic tube operations and W. Herbert Lamb, general manager of the TV picture tube division.

¹Philco. ²RCA.

Prima-Power MODEL A-400
TRANSISTOR POWER SUPPLY



Especially designed to operate, service and test transistor portable radios and low power transistor circuits. Features: • Continuously adjustable output using variable autotransformer control • Two output voltage ranges (0-15 volts and 0-30 volts) for accurate setting of all transistor battery voltages • Two output current ranges (0-15 MA and 0-60 MA) monitor current for single transistor or entire set • Extremely low ripple (less than 500 uV — .002% of full load) for testing lowest level transistor circuits • Very low internal impedance (less than 20 ohms DC to R. F., including 7 ohm removable meter fuse) providing excellent regulation • 2% Precision D'Arsonval meters provide laboratory accuracy • Milli-ampere protected by front panel fuse; additional internal line fuse • Output isolated from line and case • Attractive Slope — Front, Maroon Hommerloid Cabinet — Rubber feet.

\$64.50
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 There's Always Something NEW Being Developed by Prima-Power

BEWARE OF IMITATIONS

There Is Only One Original, Dependable **NO-NOISE** TUNER-TONIC with PERMA-FILM

Cleans, lubricates, restores all tuners, including wafer type. Won't change or affect capacities, inductance or resistance. Won't harm insulations or precious metals, nor attack plastics. Eliminates all noise, oxidation and dirt indefinitely. For television, radio and FM. Non-toxic, non-inflammatory, insures trouble-free performance. Extra economical because a small amount does the job!



6 oz. Aerosol Can. **\$3.25**
 Net to servicemen.

Cleans, lubricates, protects... NOT A CARBON-TET SOLUTION. Still available in the new 6 oz. spray can. **\$2.25**
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2 oz. bottle. Net to servicemen. **\$1.00**
ELECTRONIC CHEMICAL CORP.
 813 COMMUNIPAW AVE., JERSEY CITY 4, N. J.

Color-TV Experiences

(Continued from page 19)

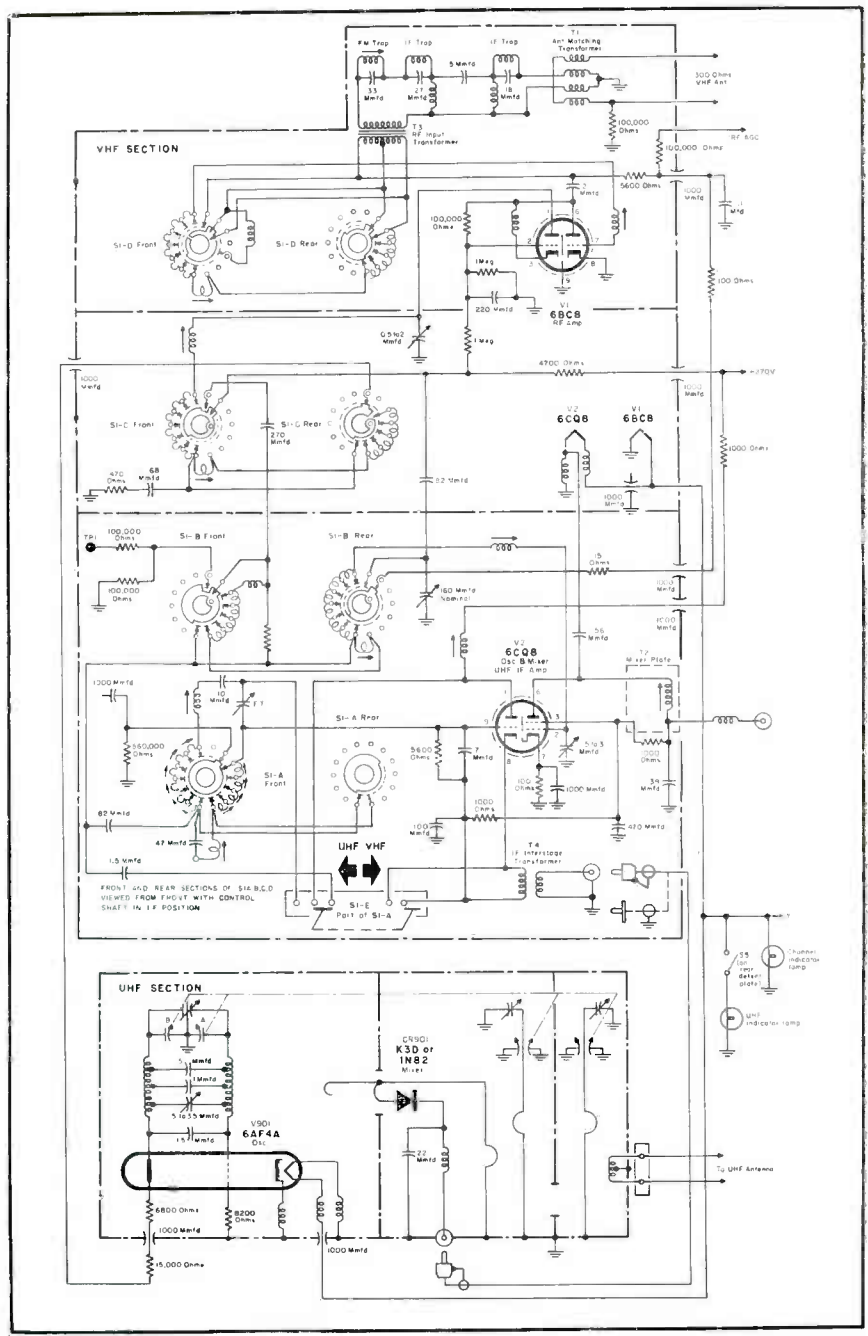
sharp tuning of hue and fine tuning controls. This has, in general, been improved in later designs, and customer acceptance has improved accordingly. In fact, statistics seem to indicate that general public acceptance of the present color television receivers is far ahead of the acceptance of color by the average dealer and Service Man. This is rapidly changing, as the numerous training facilities are proving to more and more Service Men that the so-called mysteries of color servicing and in-

stallation now simply do not exist.

The Service Man must be able to understand the set-up of purity, static center convergence, dynamic vertical and horizontal convergence. Progressive improvements in circuitry and picture tubes have greatly simplified this operation.

Color television receivers generally arrive from the factory in ready-to-operate condition. Very few adjustments normally are required. The touch of a few internal controls, the wave of a degaussing coil, and you have another happy customer. This initial installation is most important. Efficient, complete installation will re-

(Continued on page 51)

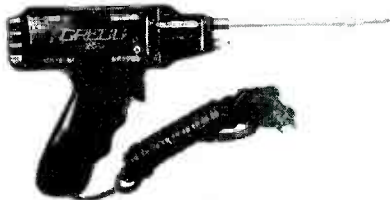


CIRCUITRY of the uhf and vhf tuners used in the RCA 800 series color-TV models.

FIRST from GREGG

A printed-wiring soldering tip kit designed for printed-board servicing.

- ★ Features 4 interchangeable screw-in tips for G250A soldering gun.
- ★ Eliminates damage to printed-circuit boards.
- ★ Saves repair time.



G250A—Soldering Gun



5206

Tip for removal of difficult components such as ifs, etc. Split ring opening is adjustable.



5207

Tip for removal of standard sockets found in printed-circuit equipment. Heats in 7 sec.



5208

Tip for multiple connections requiring simultaneous removal. Quick heating.



5209

Tip for removal of straight line circuits. Quick heating.

Printed-circuit Board Tip Kit—
\$4.95 Dealer Net
G250A—Soldering Gun—
\$11.95 Dealer Net

GREGG ELECTRIC CO.

Dept. S11, 2 S. Broadway, Lawrence, Mass.

Color-TV Experiences

(Continued from page 50)

sult in customer confidence and favorable publicity for you. Remember, a satisfied customer is your best advertisement. The public is ready, are you? Distributors are ready to help you with all manner of training. If possible, one should purchase a color-television receiver and the necessary test equipment. No one can tell you how to service a color receiver. You must practice with actual equipment to become proficient; but don't practice on your customer's living room floor.

TV Antennas

(Continued from page 48)

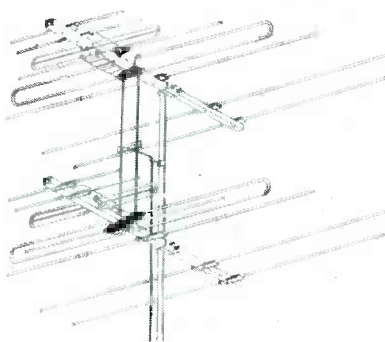
made. And what we learn from some jobs will probably help with others.

TV antenna service can open the door not only to the sale of antenna systems, but to all types of repair which shops are able to render.

Street No.	Name	Requirements	Condition
2	Smith	Repair	Bad leadin and ground.
4	Jones	Repair	Bad lead.
6	Martin	New antenna	Badly broken antenna.
12	Donald	New antenna	Broken and missing elements.
16	Peters	Repair	Falling antenna.

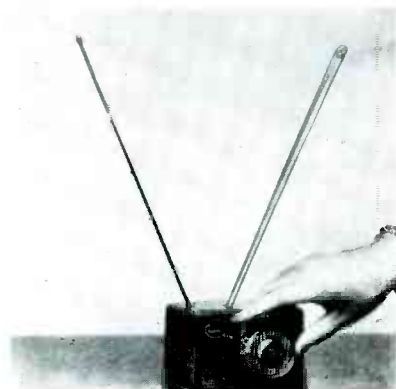
DATA which can be compiled after an investigation of an area for antenna-system defects.

TV Antenna Developments



TV ALL-ALUMINUM ANTENNA designed to operate in vhf fringe areas and uhf primary areas. Completely preassembled, antenna features snap-lock construction—Invader (type A8111): Telco Electronics Mfg. Co. (a division of General Cement-Textron), 400 S. Wyman St., Rockford, Ill. [SERVICE]

INDOOR ANTENNA which extends and retracts at turn of a dial. Retracts out of sight when not in use.—Marjo Technical Products Co., 1150 East Henry St., Linden, N. J. [SERVICE].



HICKOK

LABORATORY SIZE VACUUM TUBE Volt Ohm Milliammeter



MODEL 209A

- ★ Large 9" Meter Scale
- ★ Zero-Center DC Scale
- ★ Polarity Reversing Switch

RANGES

Volts, AC-DC and mils DC: 0-1200 in 6 ranges.

Volts, AC, Peak-to-Peak: 0-300 in 5 ranges.

Resistance: 0.1 ohm to 10,000 meg. in 8 ranges.

Capacity: 1 mmf to 1000 mf in 7 ranges.

Current, DC: 5 microamps to 1200 milliamps.

Input Impedance: AC, 3 meg. on 1200 VAC scale. 1200 meg. (shunted by 6 mmf). DC, 12 megohms.

Inductance: 50 mh to 100 henries.

Frequency: 30 cps to 300 megacycles.

Decibels: -20 to +25, in 3 ranges.

13 1/4" H. x 16 1/4" W. x 7" D. 18 1/2 lbs. net wtg.

The versatile Model 209A is a laboratory instrument of highest quality, accuracy and dependability. Ideal for the radio-television manufacturer or service engineer. Designed to meet the large number of applications in the electronic or industrial laboratory. Provides the sensitivity and range for quick and accurate measurements of sine or complex waves of TV or industrial devices. Write today for complete information, or see your nearest HICKOK jobber.

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New exclusive method

So simple . . . it's like magic!"

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Write for details, before
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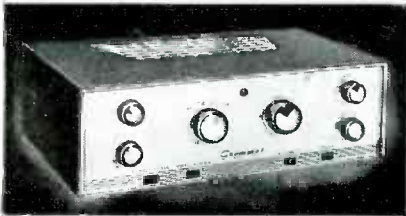
Before you build another kit see this new method of Kit Assembly. Each kit is complete with all parts and the new exclusive "Little Genie" Instruction Book.

LJ6-K—(Little Jewel) 10 Watt Amplifier with built-in preamplifier. Net **24.95**

207A-K—Hi-Fi Preamplifier (Self-Powered) Feedback circuit with 10 controls. Net **44.50**

250-K—60 Watt Basic Amplifier for use with a preamplifier (such as 207A-K). Net **79.50**

NEW PG SERIES HI-FI AMPLIFIERS



20PG 20 Watt High Fidelity Amplifier

The new 20PG has greater flexibility of controls, new advanced circuitry and the highest quality components. Features: Feedback throughout, separate turnover and roll-off record compensators, new loudness control, wide range bass and treble controls, rumble and scratch filters and six inputs including tape head. Net Price **89.50**

15PG8 15 Watt High Fidelity Amplifier. Has less power but the same advanced circuitry, the highest quality components and greater flexibility of controls. Net Price **69.50**

10PG8 10 Watt High Fidelity Amplifier. Here is new styling with a full set of controls providing exceptional flexibility in a moderately priced amplifier. Net Price **55.00**

See your dealer or write . . .

Grommes Div. of Precision Electronics, Inc.
Dept. S-11, 9101 King Street, Franklin Park, Ill.

- Send details on "Little Genie" kits.
- Send Free Hi-Fi Equipment Brochure.

Name

Street

City Zone State

Packaged Radio-Phono

(Continued from page 36)

These operations are instrumental in keeping rumble at a low level. Low flutter, wow, and rumble performance of this changer has been achieved primarily by good design and by maintaining close tolerances in production. A rubber mat, rather than flocking, is used on the turntable to cushion the record drop, increase friction, and provide a lint free surface upon which the record rests. The tone arm has been designed to keep resonance low in frequency and amplitude; no sharp low frequency peak is present.

Acoustic System

The four speakers used include two 12" and two 3½" models. The large speakers are not *woofers*, but cover the audio spectrum to 20,000 cycles. However, their high-frequency dispersion angle is narrow and the tweeters are used to broaden the sound distribution pattern. The smaller speakers are mounted on special cups in such a way that an angle

of 90° between them is achieved. This results in uniform distribution of high frequency sounds in front of the set.⁴ The cabinet, constructed of solid ¾" lumber, has an open back and is large enough to give satisfactory low-frequency performance.

Summary

The overall frequency response on phono operation from record to acoustic output is from 45 to 20,000 cycles. It is the same on FM, but the AM performance is limited by the *if* response necessary for selectivity to about 5000 cycles.

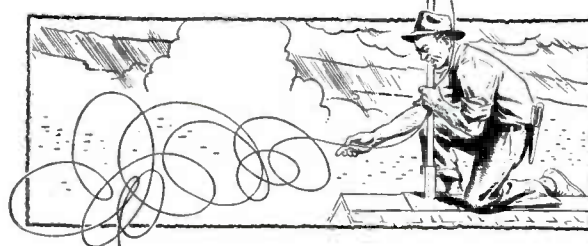
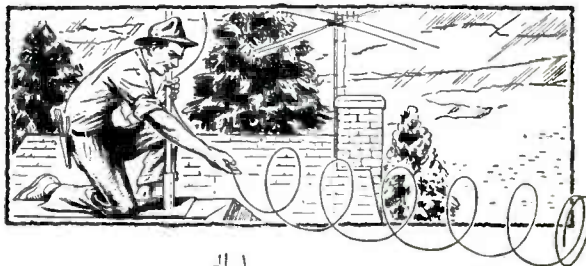
The frequency response on tape position is limited by the performance of the particular tape recorder used.

The *hum* in the set has been reduced to inaudibility by choice of proper circuit design, components, and lead dress. The FM sensitivity is 10 microvolts for 30 db of quieting, and on AM the sensitivity is 28 microvolts per meter for .5 watt output.

The name Panoramic Speaker System has been applied to this configuration.

Are You Getting Your Share of Replacement?

WRIGHT Wire Strand uncoils like this →



WRIGHT unique process prevents this ←

Non-Snarling, Pre-Measured Wire Strand

Besides the important factor of no snarling, **WRIGHT TV GUY WIRE** is pre-measured. Every concentric coil measures two feet—time and money saver in guying antennas. **WRIGHT TV GUY WIRE** has great flexibility and is heavily galvanized . . . continuous connected coils.

Prompt deliveries from stocks in Worcester, Chicago, Atlanta, New Orleans, Houston, Dallas and Los Angeles.

G. F. WRIGHT STEEL & WIRE CO.

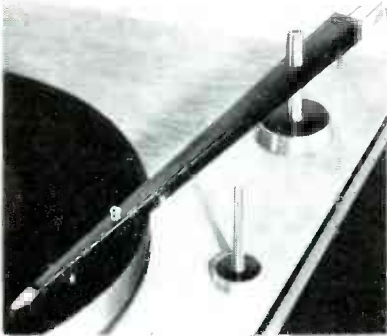
249 Stafford St. • Worcester, Mass.

Tone Arms—Pickups

(Continued from page 44)

damped by this member, helping to keep rumble and boom to a minimum. [SERVICE.]

Below: Shure moving-magnet 1-gram pickup.



Ceramic Cartridge-Needle Units

A CERAMIC cartridge-needle unit (below), the V-8 line, has been announced by Webster Electric Co., Racine, Wis.

Needles are synthetic sapphire tipped, one and three mil diameter. Available also in all models are a combination one-mil diamond and three-mil sapphire.

Supplied with mounting brackets which swing under to selected needle size (one or three mils).

Response is said to be 30 to 15,000 cps; tracking pressure, 8 to 10 grams; output—up to one volt. [SERVICE.]



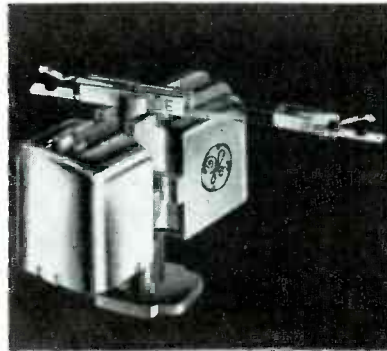
V-R Cartridges

A LINE OF four-gram tracking-pressure magnetic variable-reluctance cartridges (VR-11; below) with a 20-20,000 cps range is now being produced by the specialty electronic components department of the General Electric Co., West Genesee St., Auburn, N. Y.

The new cartridges are said to have 33 per cent less tracking pressure and 40 per cent greater compliance than RPX-type. They also incorporate a grounded electrostatic shield designed to eliminate electrostatic hum from such external electrical fields as fluorescent light fixtures, and pops during playback from buildup of electrostatic charges on the record.

Four single-stylus (single play) and three dual-stylus (triple-play) types, all with clip-in-tip stylus assemblies, are in production.

The cartridge has been designed to work with 6200-ohm RIAA equalization. Mounting is either standard 1/2" or 7/16". [SERVICE.]



Record-Changer Cartridge-Needle Replacements

FOR THE MOTOROLA VM14RC or VM15RC record changers, Sonotone 2TS cartridge and N-2TS (dual sapphire) stylus are available as replacements.

To renew the stylus, the tone arm and retaining latch are lifted, and (Continued on page 54)

"I just go weak all over when you play those records with a JENSEN NEEDLE."

New! **COLOR**
& **BLACK & WHITE**
LAB & TV SERVICE
5" SCOPE

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- Flat from DC to 4.5 mc to reproduce 3.58 mc sync burst and oscillator signals in color TV sets.
- V amplifier direct-coupled and push-pull thru-out; gradual roll-off beyond 4.5 mc, useful at 10 mc.
- High V sensitivity: 25 mv/in.
- Choice of direct coupling (DC) or capacitive coupling (AC).
- 4-step frequency-compensated attenuator in both AC and DC positions.
- Built-in calibrator permits peak-to-peak voltage measurement.
- Automatically syncs anything visible on the screen.
- Preset TV V & H sweep positions (30 cps & 7875 cps).
- Edge-lit lucite engraved graph screen with dimmer control; filter; standard bezel fits standard photographic equipment.
- 5UP1 CRT. Prices 5% Higher on West Coast

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Hush comes in a 6 oz. pressure can with sufficient pressure to reach all contacts to wash-away that dirt, leaving clean and positive contacts, protected with a lasting lubricant film.

\$2.25 net

Hush also available in 2 oz., 8 oz. and 32 oz. containers.

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Since 1949 the Original Volume Control and Contact Restorer

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon. Will not affect inductance, capacitance or resistance.

6 oz. Spray can **\$1.59**
2 oz. and 32 oz. sizes available. Net



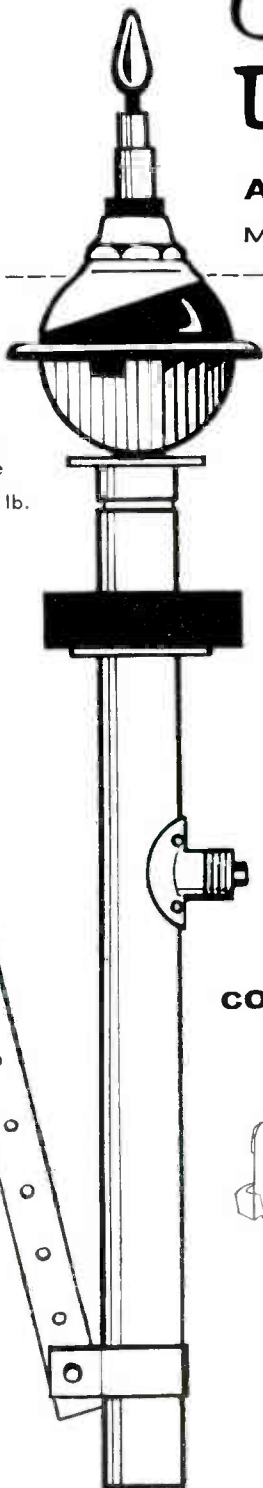
See your distributor or write to

CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

Ward's New Complete Disappearing

AUTO ANTENNA MODEL DCF-3C

Model DCF-3C
54" lead cable
Shipping wt—1 lb.
12 to master
carton, 12 lbs.



NEW flame tip for streamlined appearance and better reception.

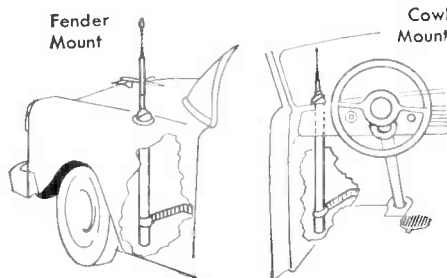


NEW water-seal grommet for double fender...the *ONLY* disappearing antenna specially designed to fit Chevy and other cars with double fender.

NEW lightweight aluminum shield tube for easier handling and better reception characteristics.

NEW lead take-off for much easier installation.

COLLAPSES FROM 45" TO 1"



It's a new, fast-selling model; car owners will demand on sight. Makes car washing easier. Adds a top-quality appearance to any car. Avoid disappointment—order *NOW!*

NEW ▶
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bracket for
sturdy mounting

Ward PRODUCTS CORP.

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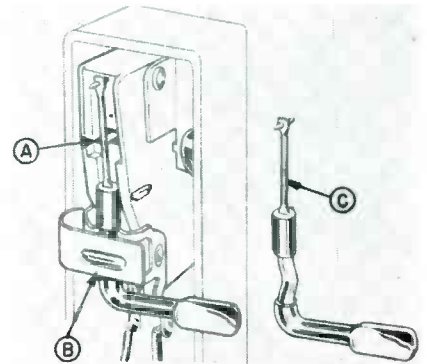
1148 EUCLID AVE. • CLEVELAND 15, OHIO

IN CANADA, ATLAS RADIO CORPORATION • 50 WINGOLD AVE • TORONTO, ONTARIO

Tone Arms—Pickups

(Continued from page 53)

the stylus and selector bar are removed as a single unit. When reinstalling the new stylus, the stylus must rest in the V notch, as illustrated below. The same style stylus originally used should be used as a replacement. [SERVICE.]

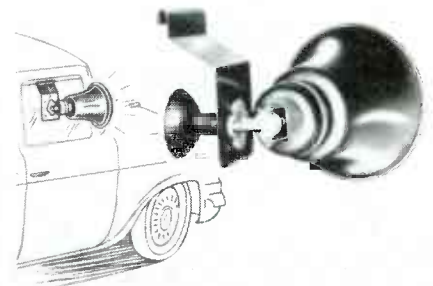


ABOVE: HOW TO remove a stylus from a Sonotone 2TS pickup in a Motorola VM14RC chassis. A—stylus rest; B—retaining latch; C—stylus and selector bar.

Replacement Cartridges

(Continued from page 39)

the most important characteristics being at the top of the chart. In using the chart the Service Man should begin with *item 1* and identify the characteristic of the cartridge in question under each item. After obtaining the identifying characteristics in each item, one can then consult a replacement cartridge catalog and choose a replacement cartridge whose characteristics most closely match those of the original.



CAR-WINDOW SPEAKER support which attaches to automotive window by means of a rubberized cork-lined channel. Channel slips over the window glass top and locks against the window glass slot when the window is raised shut. Support is constructed of sheet steel and finished in grey enamel.—WM-1; Atlas Sound Corp., 1451 39th St., Brooklyn 18, N. Y. [SERVICE.]

Service Engineering

(Continued from page 46)

from the Mojave desert and such resorts as Palm Springs and Lake Arrowhead.

Our location, while ideal from the standpoint of climate, puts us at a considerable distance from the FM stations in Los Angeles so that we encounter fringe reception conditions. Multipath reception contributes distortion which is corrected by using directional FM antenna arrays. With FM receivers of 1.5-microvolt sensitivity, reception is fine, but when a receiver falls off 6 db to only 3-microvolt sensitivity, trouble is encountered. The answer is, of course, to use only the best tuners and then keep them properly serviced.

We have built our business on service. To illustrate, when a customer plans a big party we loan extra speakers for the occasion to provide wider sound coverage. When a customer sends us a new client, we send a thank-you note and give the original customer an 8-inch extended range speaker as a gift.

Recently, we started a weekly evening meeting for our customers and prospects to demonstrate and analyze new equipment. We also discuss specific installation problems and throw the floor open to questions.



A RECENTLY-DESIGNED custom-hi-fi system which includes a Zenith TV receiver, an Altec 604C speaker, a Pilot tuner and amplifier.

Diamonds and Records

(Continued from page 42)

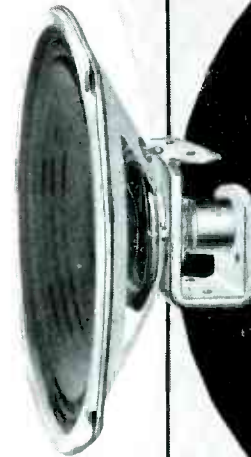
phire needles; the arithmetic is quite simple.

To complete needle checks, one should use a stylus pressure gauge and a level to check the levelness and the weight of the tone arm. Improperly distributed weight will make a needle wear irregularly and cut down on its life. Condition of the records is also a factor in needle care. Records with dust or lint in the grooves wear out more quickly and cause additional needle tip wear each time they are played.

You'll find that Quam speakers are heavier than other speakers of equivalent size and magnet weight—because they are built of stronger, finer quality materials.

Quam speakers have heavier gauge metal baskets . . . larger and more efficient magnetic structures . . . more insulating and impregnating materials.

The result is a more rugged, longer lasting speaker that is sure to be in perfect operating condition when you take it out of its factory package. Quam speakers are always shipped in individual protective cartons . . . never in bulk!



**COMPARE
THE WEIGHT
of a**

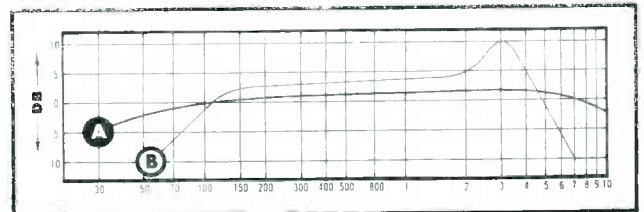
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SPEAKER

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ask for QUAM, the quality line for all your speaker needs

REPRODUCTION effect of stylus with inferior material in a poorly assembled setting (b) compared to quality needle in an accurately designed assembly (a). Curves represent response for a G. E. RPX-052 cartridge.



Needles are a ready source of extra profit to the Service Man. On some needles, there is as high as 50 per cent profit and more on others. Recommendation of a periodic needle check will also bring customers into your store more frequently.

Customer satisfaction is the Service Man's key to success. And a complete service job is the key to a satisfied customer. In return for the few minutes devoted to checking a needle, you can build good will and profits at the same time.



Unidyne? OR Slendyne?

UNI-DIRECTIONAL DYNAMIC

OMNI-DIRECTIONAL DYNAMIC

HOW TO CHOOSE THE RIGHT MICROPHONE FOR YOUR APPLICATION

SHURE

engineers recommend Unidynes for best performance and Slendynes where versatility is essential.

In selecting a microphone, you must be careful to analyze your needs very carefully. Microphones are highly specialized equipment, and for full satisfaction it is important that you consider, in advance, the uses to which your microphone will be put. Otherwise, you may be paying for features you don't need, and losing advantages your microphone should have.

Wherever feedback is a problem, the choice of a directional microphone is virtually automatic. Only the directional pickup pattern can effectively reduce or eliminate feedback. Furthermore this pickup pattern greatly reduces the pickup of distracting random noises. For floor stand usage, the directional microphone, with its ultra-cardioid pickup pattern, provides far greater freedom for the performer. In the moderate price range, the UNIDYNE is the perfect microphone choice among directional microphones. It is a uni-directional dynamic microphone, and it reduces the pickup of random noise energy by 67%. It is the ideal selection for use with fine-quality public address systems, and its high output permits its use even with low gain public address systems and tape recorders. It has a smooth frequency response from 50 to 15,000 cps.

For applications where versatility is important, the omni-directional probe microphone is the recommended choice. A night club performer, for example, who roams around a large area while he performs, would find such a unit more convenient. The SLENDYNE, for example, can be used in the hand, on a floor or desk stand, or worn around the neck, and can easily be changed—in seconds—from one application to another. Its unobtrusive design permits it to be held close, yet it remains in the background, leaving the spotlight to the performer. It offers a choice of impedance, an optional on-off switch, and a frequency range from 60 to 13,500 cps.

UNIDYNE or SLENDYNE? Choose the one that best suits your particular purpose. Both are fine quality microphones, similar in price, and the choice between them is conditioned by the circumstances in which the microphone will be used. Your Shure dealer will help you evaluate your needs . . . or further information may be had by writing Shure Brothers, Inc.

UNIDYNE Model 55S, List Price \$83.00 SLENDYNE Model 535, List Price \$72.50

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SHURE BROTHERS, INC., 204 HARTREY AVE., EVANSTON, ILL.

Sound Is King

(Continued from page 40)

of such a nature that it is not subject to local repair. A listening check on a continuously variable frequency record, together with measurement of the output voltage with a vacuum-tube voltmeter, will detect mechanical damage. Wide-range systems require better pickup performance. The pickup check should be made with equipment of unquestionable quality, especially with respect to distortion. If it is necessary to replace this pickup it is essential that the new one be exactly like the old one. Some manufacturers make several units which are interchangeable mechanically, but which have vastly different electrical properties.

Recently, we introduced a *micro-stabilizer* mounted on a tone arm.³ This is a low-Q mechanical damping circuit tuned to 20 cps which has been found to be effective in reducing rumble and microphonics. It ordinarily requires no maintenance, but should be checked to see that the lead mass is free to move.

Loudspeakers have played an important part in the audio renaissance. For a given performance level, loudspeakers today are generally one to two sizes smaller than they were thirty years ago. The resonant frequency has been reduced over the years and at the same time the power handling capacity has been increased. In other words the loudspeaker is working harder than it used to work.

The extra excursion required of the modern speaker makes it more susceptible to failure from dirt and fatigue. While dust proof construction is the general rule throughout the industry, the dust barriers must have some openings for the passage of air to permit free motion. These openings prevent the dust proofing from being 100% effective. This reduction in the margin of safety has been partially offset by better production techniques.

It is essential that Service Men have good audio oscillators and power amplifiers for loudspeaker tests. An accurate method of measuring the power fed the voice coil must be part of the setup. Voltage is commonly read across the voice coil and the input power calculated from the relation: $P = E^2/Z$, where Z is the voice coil impedance. This test arrangement will prove invaluable in detecting

³Installed on model F-1900, Phonorama IV.

5 ways to sell more Walco Diamond Needles ...

The most profitable items
per square foot of inventory area
are Walco Replacement Needles.

1. Nine out of ten

service customers can be sold a new needle. Point out the diamond's longer life as compared to the original sapphire needle in their tone arm.



2. Walco's new low price

through automated, electronically monitored production is another strong selling point.



3. Walco identification charts

and handy take-home data sheets help close the sale *fast!*



4. In-store merchandising

and Walco national advertising condition the customer for a profitable sale.



5. Walco quality

backed by a 1-year guarantee against defects in materials and workmanship, assures customer satisfaction with every Walco Diamond Needle.



MORE PROFITS...
LESS TIME...LEAST SPACE

See your Walco Distributor or write:

Walco

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ELECTROVOX CO., INC.
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flaws in speakers as well as in tracking cabinet rattles. A particular frequency at a given volume level will reoccur in program material only after long intervals. These conditions can be quickly arranged with the amplifier oscillator combination. For maximum usefulness the test equipment should have low distortion (less than 1%) over the ranges of interest.

A test level of $\frac{1}{2}$ to 1 watt is adequate for most speaker and cabinet work. Higher power levels confuse the tester. Of course, the speaker or cabinet should be given a check at maximum power to determine its action at that level. However, most of the common troubles will show up at low level.

It is important that the speaker be tested in *free air*; that is in an unmounted condition, in order that the tester differentiate between speaker and cabinet rattles.

The sensitivity and frequency response of a dynamic speaker do not ordinarily change with age. Little will be gained by having test equipment to check these parameters.

A cross-section of a typical dynamic speaker is illustrated in Fig. 1 (p. 40). Most buzzes and rattles occur in the air gap area. Clearances here are small; .005" to .010" for most speakers. Relaxation of the cone or spider will allow the voice coil to drift off center. Small particles which can pass through the spider or dust cap can lodge in the air gap and generate loud noises.

Modern speakers are cemented together. This has been found to give additional life and to result in optimum performance. It is impractical to repair medium and small size speakers in the field, in as much as they must be re-cemented to correct most troubles. If a large speaker with a heavy magnet is in trouble its cost may make a field repair advisable. This work should be undertaken only by trained personnel; those thoroughly familiar with speaker repair.

When it is necessary to replace a loudspeaker, it is of the utmost importance that one with identical characteristics to the one removed be installed. Every manufacturer of quality equipment devotes much time and energy to the selection of the loudspeaker. Its frequency response, impedance, resonant frequency, sensitivity and phasing are an integral part of the sound system and must be carefully coordinated with the cabinet and amplifier. Installation of a random speaker of the same size from general stock can only degrade the system performance. We do not mean to im-

(Continued on page 58)

"OUTPERFORMS THEM ALL"



I. J. Saltzman, *Globe Sound Service, Jamaica, N. Y.*, experienced commercial sound engineer, says: "On side by side comparison test, the CJ-44 outperforms them all."

NEW!
ATLAS "King Cobra-Jector"
CJ-44



Shown with GB-1 Universal Mounting Bracket

Complete with "Acousti-Match" Built-in Driver Unit

List \$72.50
NET \$43.50

A wide-angle, all-purpose, all-weather Public Address Speaker, complete with integral high-power super-efficient "Acousti-Matched" driver unit. "Acousti-Matched" means "Controlled Response" within the frequency limits most useful in P. A. and high level music reproduction. "Controlled Response" offers conversion efficiency never before obtainable in high-powered speakers. "Controlled Response" results in *smooth* reproduction — free from peaks which so often create and sustain acoustic feedback.

The CJ-44 conserves costly amplifier output power — fewer speakers do a complete job. The speaker horn is easily rotated for horizontal or vertical dispersion patterns.

The CJ-44 is the only high-powered P. A. speaker that can be equipped with the new Atlas Universal Mounting Bracket, permitting quick and secure directional adjustment on both planes. Simple to make a horizontal or vertical adjustment as a final "touch-up" to the installation.

The CJ-44 is designed for the "tough jobs." No gimmicks, no fluffs, no wild claims — just a reliable super-efficient speaker for all applications.

Input Power: 30 watts constant
50 watts peak
Input Impedance: 16 ohms
Response: 150-9,000 cps
Dimensions: Bell 23" x 13";
Over-all length 19"
Net Weight: 16 lbs.

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Sound Is King

(Continued from page 57)

ply that stock speakers are inferior in construction. But, they have not been designed specifically for a particular piece of equipment and cannot give the performance that the customer purchased originally.

Many equipment manufacturers maintain a stock of exact replacement loudspeakers. These should be used where possible when repairing first grade equipment.

The difference between good tone quality and mediocre or poor tone quality is usually a number of small changes, each almost indiscernible in itself, yet each complementing the other, and the whole resulting in a pleasing ensemble.

Tube-Transistor News

(Continued from page 49)

electrode. This method of operation together with the high perveance of the tetrode unit, enables the tube to supply high plate current with only 12.6 v on the plate.

AF Power Pentode

A NINE-PIN, miniature power pentode (6BQ5A) has been designed for use as a class-B power amplifier in audio equipment of over 20-watt capabilities.³

The tube is said to deliver 24 watts output with only 4% distortion.

Radio-TV Miniatures

FOUR MINIATURES for radio and TV replacements (10DE7, 12DK7, 12DQ6GA and 17D4GT) have been announced.⁴

The 10DE7 is a heater-cathode type double triode with dissimilar sections. Section 1 is intended for use as a medium-mu vertical deflection oscillator and section 2 serves as a low-mu vertical deflection amplifier. The tube is identical to the 6DE7 except that it has a 600-milliamperere heater rating.

The 12DK7 is a 9-pin combined detector, *avc* diode, and a tetrode with a common unipotential cathode. The tetrode section is intended for use as a power amplifier where the heater, plate, and screen grid potentials are

³Amperex. ⁴Raytheon.

obtained directly from an automotive battery.

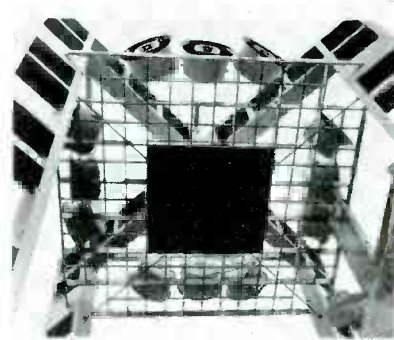
The 12DQ6A is a heater-cathode high-perveance beam power tube designed for use as horizontal-deflection amplifier in high-efficiency deflection circuits. It is identical to the 6DQ6A except that it has a 600-milliamperere heater rating.

The 17D4GT is a heater-cathode type diode for damper use in horizontal-deflection circuits. This tube is identical to the 12D4 except that it has 450-milliamperere heater rating.

On the Audio Front



SILICONE-TREATED record sweep phono tone-arm attachment, said to remove static charge from records as they are playing.—Jensen Industries, Inc., 7333 West Harrison, Forest Park, Ill. [SERVICE].



TWELVE-SPEAKER soundcasting system used during recent religious ceremony at the Yankee Stadium in New York attended by over 50,000 persons. Speakers were mounted in a 17' square atop a specially built canopy raised 48' above the altar located on the field at second base. Although capable of handling 30 watts of power each, the twelve speakers only required a total of 6½ watts to achieve sound coverage. The low-level sound served to blanket the area with higher quality loudspeakers, eliminating echo effects and blasting. In addition to the twelve speakers placed over the altar, forty-seven paging speakers were mounted under the grandstands for the purpose of organizing and directing choir members and church dignitaries taking part in the religious procession.—Models WLC and 13-8: University Loudspeakers, Inc., 80 South Kensico Ave., White Plains, N. Y. [SERVICE].

Service Notes

(Continued from page 33)

narrower, and vice versa.) A .0015-mfd integrating capacitor (C_{208}) fills in the gaps between pulses, to develop an average voltage across the plate-load resistor. This voltage represents the demodulated audio signal.

Adjustment

The quadrature coil is adjusted for maximum sound; the quieting (or buzz) control is adjusted to eliminate sync buzz, noise and hum.

A signal generator, with modulated 4.5-mc fed through the sound if stages, or an air signal may be used. A scope or speaker can serve as an indicator. Adjustments are made on both strong and weak signals.

It should be noted that misadjustment of the quieting control will cause reduced volume or loss of sound. Also, a misadjusted quadrature coil will produce the same symptoms. When adjustments are to be made, the quieting control is first set at its mid position, then the quadrature coil is adjusted for maximum sound. The quieting control is then readjusted for minimum buzz, noise and hum. With a strong signal being received, noise may not be noticeable as the quieting control is varied. The quieting control adjustment is more important on weak signals.

The voltage between plate (pin 7) and ground depends upon the setting of the quieting control, which varies limiter grid bias. The voltage may vary between 25 and 165. If this circuit is under suspicion, as a possible cause of audio trouble, the quieting control should be varied as plate voltage is checked. The bias voltage measured between limiter grid (pin 2) and cathode (pin 1) varies between zero and -4 v, also depending upon the setting of the quieting control. The voltage between the accelerator grid (pin 5) and ground is about 85-v positive.

The preceding data represent typical operating voltages and are, of course, approximate.

Troubleshooting

To check for normal operation of the gated-beam detector, earphones may be used. One earphone lead should be connected in series with a capacitor to the detector plate, pin 7; the other earphone lead should go to ground. If sound can be heard in the 'phones when a channel is tuned

in, all sound circuits up to, and including the detector, are okeh. An audio signal tracer may be used instead of 'phones.

Some of the possible causes of loss of sound are: C_{201} open or shorted, C_{204} (.0047 mfd) shorted, or quadrature coil L_{202} open. In some receivers, an open quadrature coil will cause the sound to be slightly audible and very distorted. If R_{202} (600 ohms) increases in value, sound level will be reduced, with some distortion; if this resistor changes to a high value, no sound will be heard. Similarly, R_{204} (22,000 ohms) will cause low sound level if increased in value and loss of sound if the resistance becomes sufficiently high. If L_{201} opens, the symptom is hum and loss of sound.

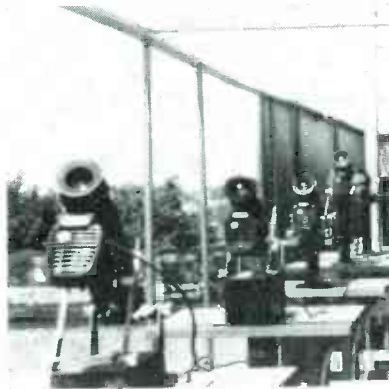
Because C_{203} forms part of a tuned circuit, its value is critical; if defective, an exact replacement must be used.

Stylus-Mounting Screw Dragging on Record

IF ONE FINDS that the stylus mounting screw on Magnavox phonos drags on any record in a stack, one should check to make sure that the cork spacer is in place. This serves to tilt the front of the cartridge down. If missing, the spacer should be replaced with a thin piece of cork tape or suitable substitute.

If the cork tape is in place and the stylus mounting screw still drags, the mounting bracket on the cartridge should be bent so that the front end of the cartridge is tilted down at the proper angle.

Satellite-Watch Microphones



BATTERY OF 12 MICROPHONES mounted on telescopes and fed into recording tapes at Moon Watch Station, Allegheny Observatory, Pittsburgh, Pa. Installation was set up as part of artificial satellite observation program for International Geophysical Year.—Shure Brothers, Inc., 222 Hartley Ave., Evanston, Ill. [SERVICE].

8 NEW



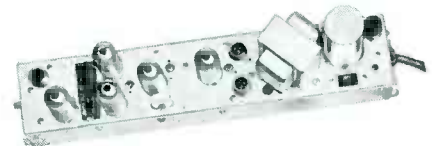
PRODUCTS

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Model MUC: UHF to VHF converter.

Extremely stable, self-powered with two matched 75 ohm outputs. All channel VHF mixing network. Flat within 1/2 db over full 6 mc output. For color and black and white TV.

4 INDOOR TV SYSTEM TAPOFFS

Easy to install, matched low cost tapoffs

Model TO1-75: single isolated tapoff for recessed mounting. For RG-11/U or RG-59/U, with 75 ohm jack.

Model TO1-300: has 300 ohm terminals.

Model TO2-75: two 75 ohm outlets from RG-11/U or RG-59/U cable.

Model TO2-300: two 300 ohm isolated outlets from RG-11/U or RG-59/U cable.

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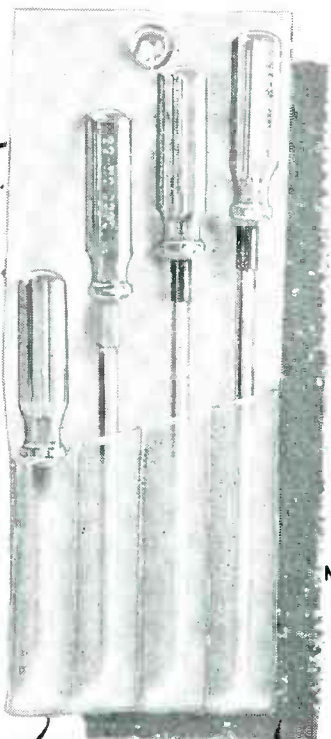
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Division of Textron Inc.

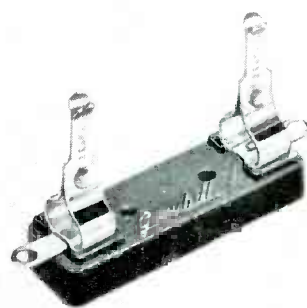
400 South Wyman Street • Rockford, Illinois

ACCESSORIES

TEST CLIP ADAPTER

A SCREW-MOUNT test-clip adapter, for fixed panel mounting, has been announced by Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.

Unit is equipped with solder terminals at each end, and holes for No. 8 screws on $\frac{3}{8}$ " centers. Testing of pig-tail components is said to be greatly simplified by spring action of clips which permits positive contact without manual opening or closing of jaws. Has nickel-plated clips and plugs mounted on a phenolic board. [SERVICE.]



TUBE SOCKET CONVERSION ADAPTERS

DUO-DECAL base picture-tube socket adapters, 110-S and 110-R, designed to plug into existing test equipment to permit testing of narrow-neck 110° tubes, have been announced by Pomona Electronics Co., Inc., 1126 W. Fifth Ave., Pomona, Calif.

Model 110-S has a .820" pin-circle diameter (7 pins, .093"-diameter) similar to 17BVP4, etc.; 110-R has a .600" pin-circle diameter (.040" pins) similar to 17BZP4, etc. [SERVICE.]

Replacement Vibrators



HIGHLANDER line of replacement vibrators recently introduced by P. R. Mallory & Co., Inc., Indianapolis, Indiana. Packaged in a 10-pack—ten units in a carry-carton. [SERVICE.]

Fixed-Tuned 5-Channel Receiver

A **FIXED-TUNED**, five-channel radio receiver for use in plant, school and institution sound systems as a program source. Receiver may be pre-tuned to five different AM broadcasting stations selected by a knob on the front panel. Designed for continuous operation, 24-hours-per-day. The receiver, which employs a circuit with an rf stage, is equipped with an electronic alarm circuit which turns on a lamp on the front panel in the event the incoming radio signal or the receiver itself fails. The alarm circuit may also be used to actuate external alarms or signals. —117R905; Kaar Engineering Corp., P. O. Box 1320, Palo Alto, Calif. [SERVICE.]



PLASTIC FUSE KIT

A POCKET-SIZED fuse kit, featuring 60 of the most frequently-used replacements packaged in a variety of clear plastic boxes (4½" l x 3½" w x ¾" h), has been announced by Sightmaster Corp., 111 Cedar St., New Rochelle, N. Y. [SERVICE.]



AEROSOL TUNER CLEANER

AN AEROSOL tuner cleaner and lubricant, *Injectorall*, featuring a long injector needle to reach hidden wafer contacts and get inside welded tuners, has been introduced by the Injectorall Co., 2081 Shore Parkway, Brooklyn 14, N. Y.

Features a wax-free lubricant used in non-toxic cleaner. [SERVICE.]



CARBON RESISTOR COLOR CODER

A 3" x 3¼" CARBON-RESISTOR color coder, 5230, featuring slide-rule operation, has been made available by General Cement Manufacturing Co., 400 S. Wyman St., Rockford, Ill.

Indicators on slide face are set opposite colors in their order. Value of resistor is read through associated windows in the center of the card. Back side of coder has scales for EIA 10% standard values, Ohm's Law formula chart and a formula for computing parallel resistance. [SERVICE.]

CHEATER CUBES

TWO CHEATER CUBES for plugging into TV set after the back has been removed, have been announced by R-Columbia Products Co., Inc., Highwood, Ill.

Units provide a three-way source of electric power. Available are model A for RCA-type interlock and model B for Zenith-type interlock. [SERVICE.]

NO NEED

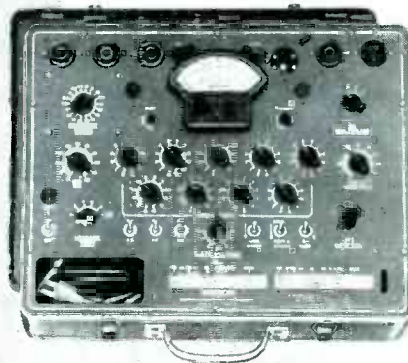
to Compromise!



**WESTON Model 980
VOM**

Unapproached for accuracy. Self shielded. Spring backed jewels for ruggedness. Dependable Weston etched circuit, with 28 functional ranges available through one simple dial.

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**WESTON
Model 981
TUBECHECKER**

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only \$19950



WESTON

TEST EQUIPMENT

The Quality Line

Component Sales Conference



AT DISTRIBUTOR-REP component conference in Excelsior Springs, Mo., (left to right): Archie Anders, iE Manufacturing; Dean Bunce, Iowa Radio Co., and Carmine Vignola, iE Manufacturing. [SERVICE.]

Indoor Antenna Patented



INDOOR CONCEALABLE telescoping TV antenna recently granted a patent. (Magic Genie; JFD)

Another Sencore Time-Saver

the **ALL NEW SENCORE Align-O-Pak TV BIAS SUPPLY**



For **BLACK and WHITE and COLOR**

Just Dial any DC Voltage from 0 to 18 volts positive or negative—For AGC trouble shooting and alignment—Do away with messy bias batteries.

Completely isolated. Recommended by TV manufacturers. Wire wound control for calibration accuracy. For AGC trouble shooting, connect to AGC buss and vary voltage from 0 to 18 volts negative. If picture stabilizes at any voltage, AGC is defective. Complete with test leads.

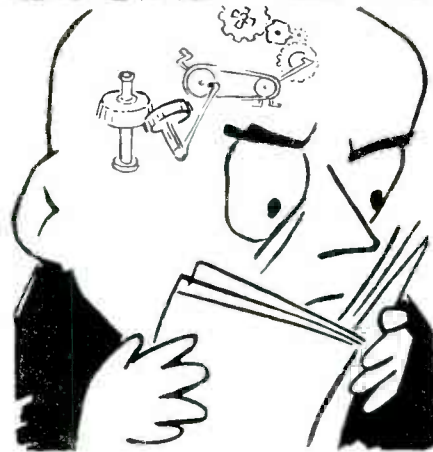
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- Leakage Checker
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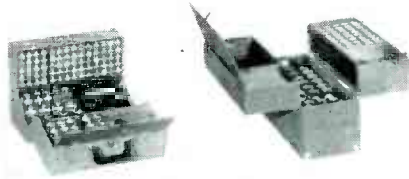
Name _____ Please Print!
 Address _____
 City _____ Zone _____ State _____
 My occupation or job title is _____

BENCH-FIELD TOOLS

TUBE-TOOL CARRIERS

TWO TUBE and tool carriers, TC-100 and TC-200, have been announced by Argos Products Co., Genoa, Ill.

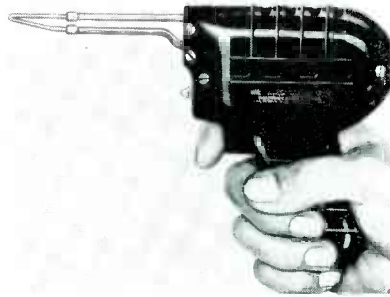
TC-100 (*Pacemaker*) has a capacity of 262 tubes (less with tools and meter). TC-200 (*Pacemaker Jr.*) holds 143 tubes (less with tools and meter). [SERVICE]



LIGHTWEIGHT SOLDERING GUN

A LIGHTWEIGHT 100-w soldering gun, model 100, said to develop full power in 2½ seconds, has been announced by Wen Products, Inc., 581 Northwest Highway, Chicago 31, Ill.

Unit weighs 19 ounces and is 1¼" thick. Features replaceable long steel-nosed tip and built-in spotlight angled to focus on work. [SERVICE]



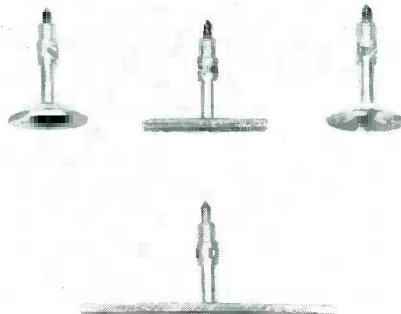
SOLDERLESS TEST PRODS

SOLDERLESS AUTOMATICALLY-CONNECTED test prods, 7381 (red) and 7382 (black) *Trigger Qwik*, featuring tips of molded styrene to facilitate use in most standard test sockets, have been introduced by General Cement Manufacturing Co., 400 S. Wyman St., Rockford, Ill. [SERVICE]

P-W BOARD SOLDERING TIPS

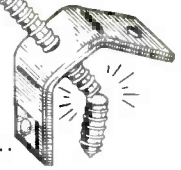
FOUR SOLDERING TIPS (quick-heating type), specifically designed for printed-wiring boards and developed for use with the Gregg G250A soldering gun, have been announced by the Gregg Electric Co., 2 S. Broadway, Lawrence, Mass.

Tips can be used for straight-line and multiple-connection work, and socket and component installation and repair. [SERVICE]



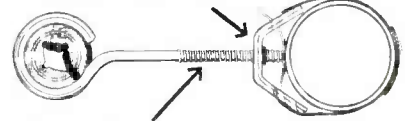
NEW! iE
WOOD SCREW PLUS MACHINE SCREW
STANDOFF

Only iE has the PLUS "break-off" feature! Break off point—it acts as machine screw. With point on—a wood screw.



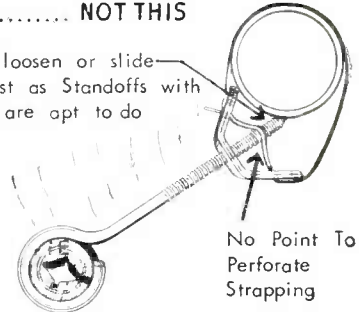
THIS.....

Heavy Steel Bracket



Deep Threads in Screw & Buckle NOT THIS

Won't loosen or slide off mast as Standoffs with points are apt to do



No Point To Perforate Strapping

iE MANUFACTURING

IN CANADA:
 ATLAS RADIO CORP.
 50 Wingold, Toronto, Ont.

325 North Hoyne Ave.
Chicago 12, Illinois

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233), SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF SERVICE, published monthly at New York, N. Y., for October 1, 1957.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher: Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. 17, N. Y.; Editor, Lewis Winner, 245 W. 107th St., N. Y. 25, N. Y.; Managing Editor: None; Business Manager: B. S. Davis, Ghent, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. 17, N. Y.; B. S. Davis, Ghent, N. Y.; M. T. Davis, Ghent, N. Y.; Lewis Winner, 245 W. 107th St., New York 25, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)—None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) LEWIS WINNER, Editor
 Sworn to and subscribed before me this 30th day of September, 1957.

(Seal) Beatrice E. Earley, Notary Public

ADVERTISERS IN SERVICE

NOVEMBER, 1957

	Page
American Television & Radio Co.....	64
Amphenol Electronics Corp.....	24
Argos Products Co.....	2
Atlas Sound Corp.....	57
Blonder-Tongue Laboratories, Inc.....	58, 59
Bussmann Manufacturing Co.....	6
Centralab, A Div. of Globe-Union, Inc.	3
Chemical Electronic Engineering, Inc..	53
H. G. Cisin	63
Cornell-Dubilier Electric Corp.	62, 63
Inside Front Cover, 62, 63	
EICO	53
Electronic Chemical Corp.....	50
Electro Products Laboratories.....	30
Electro-Voice, Inc.	47
Electrovox Co., Inc.....	57
Federal I. T. & T. Components Div.....	8, 9
General Cement Manufacturing Co.....	60
General Electric Co., Electronic Components Div.....	4, 12, 13
General Electric Co., Specialty Electronic Components Dept.....	43
Gregg Electric Co.....	51
Heath Co.	25
The Hickok Electrical Instrument Co...	51
iE Manufacturing Co.....	62
Jensen Industries, Inc.....	53
Jensen Manufacturing Co.....	41
Jersey Specialty Co.....	1
JFD Electronics Corp.....	15
Kester Solder Co.....	26
P. R. Mallory & Co., Inc.....	29
Ohmite Manufacturing Co.....	64
Perma-Power Co.....	50
Precision Electronics, Inc.....	52
Pyramid Electric Co.....	10
Quam-Nichols Co.	55
The Radiart Corp.	62, 63
Inside Front Cover, 62, 63	
Radio Corporation of America, Electron Tube Div.....	Back Cover
Radio Corporation of America.....	37
Raytheon Manufacturing Co.....	16
John F. Rider Publisher, Inc.....	28
Service Instruments Corp.....	62
Shure Brothers, Inc.....	56
Snyder Manufacturing Co.....	11
Sonotone Corp.....	5
Technical Appliance Corp. (TACO).....	31
Trio Manufacturing Co.....	23
Triplet Electrical Instrument Co.....	Inside Back Cover
University Loudspeakers, Inc.....	45
Waage Manufacturing Co.....	63
Ward Products Corp.....	54
Westinghouse Electric Corp., Electronic Tube Div.....	7
Weston Electrical Instrument Corp., A Subsidiary of Daystrom, Inc.....	61
Winegard Co.....	27
G. F. Wright Steel & Wire Co.....	52
Xcelite, Inc.....	26

COMPONENTS

METALLIZED MYLAR CAPACITORS

A METALLIZED Mylar capacitor, RLR, for use in potted assemblies and commercial applications, has been developed by Astron Corp., 255 Grant Ave., East Newark, N. J.

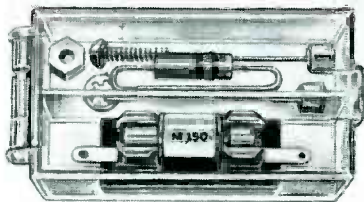
Unit is uncased, with a protective Mylar wrap and epoxy-end seal for humidity protection. Available in standard and continuous voltage rating at 200 working voltage *dc*. Complete specifications in bulletin RM 375. [SERVICE]



SILICON RECTIFIER REPLACEMENTS

A SILICON RECTIFIER kit, M-150, said to afford replacements in a wide range of radios and small electronic equipment, has been announced by the rectifier division of Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind.

Kit is packed in a plastic box with holder, optional pigtailed, mounting hardware and instructions. A 10-ohm resistor is included to drop the B- voltage to safe values for tube complement. Further information in service note bulletin 4. [SERVICE]



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enjoyed by Radio-TV shops handling small appliance repairs. These jobs picked up on regular service calls and repaired at the shop during slack periods.

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FIND TUBE — CURE TROUBLE With H. G. Cisin's NEW 1957 TV TUBE LOCATOR

Just off the press, Vol. 2 has copyrighted Trouble Indicating Tube Location Guides for over 5000 TV models of the 45 leading makes from Admiral to Zenith. 1957, 1953, 1955 Models
Vol. 2.....Only \$1.50 Postpaid

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These two volumes are a "Must" for every TV service bench. A storehouse of TV tube servicing information.

Each **TV TUBE LOCATION** volume shows not only location and type of all tubes, but also actually indicates the exact location of the particular tube or tubes which must be replaced. Picture tube types are given on all guides and where series string heaters are used, this fact is noted.

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PROTECT ALL ELECTRONIC TUBES

WITH



Electronic Tube PROTECTOR

Designed To Protect All Electronic Tubes in TV or Hi-Fi Sets, Amplifiers, and Similar Electronic Equipment. Will Double or Triple Tube Life Including Picture Tubes.



List Price \$495—DEALER NET PRICE \$330



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ATR Electronic Tube Protectors will double or triple the life of all electronic tubes including picture tube in TV or Hi-Fi Sets, Amplifiers, Electronic Organs, and other similar electronic equipment. The ATR Electronic Tube Protector utilizes a thermal cushion-action principle which also protects all other components by eliminating initial damaging surge currents. The ATR Electronic Tube Protector can be used with any electronic equipment having input wattage of 100 to 300 watts.

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PERSONNEL

MORT A. MAURER has been named to a newly created post of manager, RCA electronic instruments and parts marketing.

ROLLAND L. SHOEMAKER has been appointed manager, commercial service, RCA Service Company, Inc.



Shoemaker



Silverstein

ROBERT SILVERSTEIN has become president of Ungar Electric Tools, Inc. . . . Leon B. Ungar is now vice president; Davis Factor, Sr., treasurer, and Davis Factor, Jr., secretary.

ALBERT GOLDSTEIN and Cornelius Van Ostenbridge have been appointed divisional sales directors of Jersey Specialty Co., Inc.

FRANK HADRICK, formerly chief TV field engineer for Admiral, has joined Simpson Electric Co. as chief field engineer—test equipment.



Hadrick



Pezman

A. L. PEZMAN has been named sales manager of the Trio Manufacturing Co., Griggsville, Ill.

ROLLAND V. ROBISON has been appointed product manager—semiconductor sales—for Sylvania Electric Products, Inc..

JOHN PRUTTON has joined the capacitor sales section of Centralab.

EMIL NICHOLS has been appointed manager of test equipment sales of Weston Electrical Instrument Corp., a subsidiary of Daystrom, Inc. . . . Paul M. Heilman is now distributor sales manager.



Nichols



Heilman

E. L. BRADON has been named to the newly created position of trade news editor for RCA.

industrial
electronic
servicing

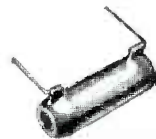
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Fully insulated.

sure grip battery contacts

Balanced double-spring tension grip assures permanent contact

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tests AC-DC Volts (DC at 20,000 O/V); DC Microamperes, Milliampers, and Amperes; Ohms (to 100 Megohms); Decibel and Output. Its easy-to-read scales are the longest in this type tester."

streamlined design

No protruding knobs on switch or ohms control—both are flush with the panel.

king size recessed knob

—Only one switch; (fully enclosed) selects both circuit and range. Just turn the switch and make your reading.

for most efficient meter use

—With every Model 630 you receive complete, simplified instructions on how to use and maintain most efficiently.

no slip feature

Four rubber feet furnished as standard equipment fit in back of the case to prevent slipping on smooth surfaces.

advanced engineering

—Molded mounting for resistors and shunts allow direct connections without cabling. No chance for shorts. Longer life and easy-to-replace resistors in their marked positions.

for quick positive connections

—Banana jacks and plugs on test leads are best. Alligator clips are provided to slip on test prods for extra convenience.

for convenience in reading

—Available as an extra (only 50c), this special stand tilts meter at best angle for easy reading


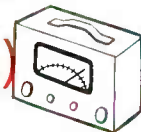



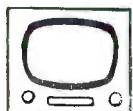
MODEL 630 \$44⁵⁰

TRIPPLET ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio



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Combination
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- 630-NA**
For Best Testing
Around The Lab,
Production Line
or Bench
- 630**
The Popular
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V-O-M
- 630-A**
Good Lab and
Production Line
V-O-M
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The Smo Test
Complete V-O-M
With Switch
- 630-T**
For Telephone
Service
- 666-AM**
Medium Size
For
Med. Testing
- 625-NA**
The First V-O-M
With 10,000
Ohm, Volt AC
- 666-R**
Medium Size
With
690 Pictures

Here's how to make picture tube profits: First, you need your everyday tools  plus good test equipment (RCA) , plus your skill  and knowledge . Then, you need top-quality, dependable RCA Silverama  Picture Tubes that rejuvenate nearly any make of set,  and make friends of your customers. And, finally, you need the sales "tools", too. And these RCA makes available to you in abundance. See your Authorized RCA Tube distributor for the most powerful merchandising aids available, including these two brand new headliners:



ILLUMINATED SERVICE SIGN. This new, compact, TV Service Sign with flasher, tells 'em you handle the best TV tubes on the market, the brand they know best—RCA Silverama.



SAFE-TV MAT. This "how-did-I-ever-do-without-it-before" heavy rubber protective mat prevents face plate damage to out-of-chassis picture tubes.

Put these and a world of other new, fresh RCA promotion aids to work for you. With all these aids to help you sell the top picture tube brand in the industry, plus RCA newspaper and magazine ads, TV commercials, booklets, folders, ad mats, seals, and other hard-hitting promotional items, you can't miss making those big ticket, big mark-up, easy-to-make picture tube dollars.



PICTURE TUBES

RADIO CORPORATION OF AMERICA

Electron Tube Division, Harrison, N. J.