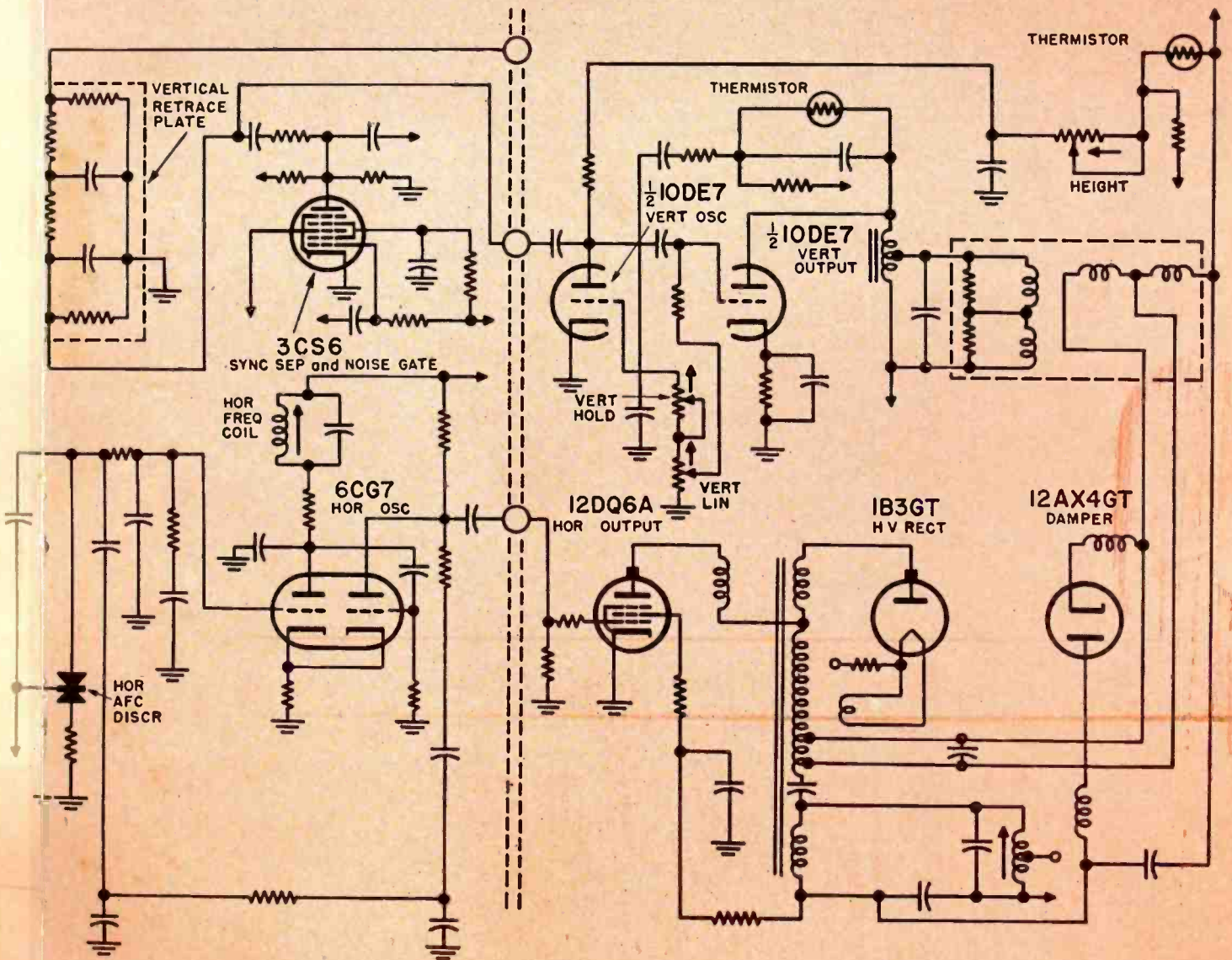


SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE



Cathode-coupled horizontal multivibrator and di-triode vertical-deflection circuitry of 21inch TV chassis using 110° picture tube.

See circuit analysis, this issue

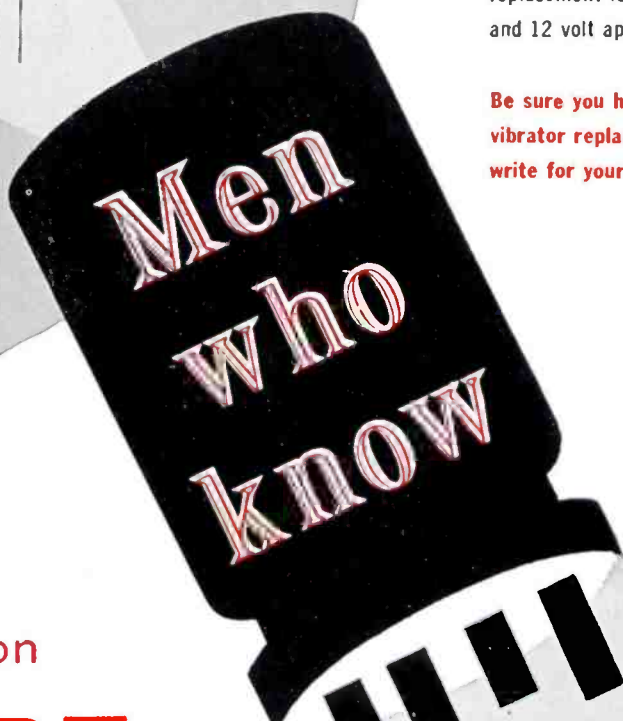
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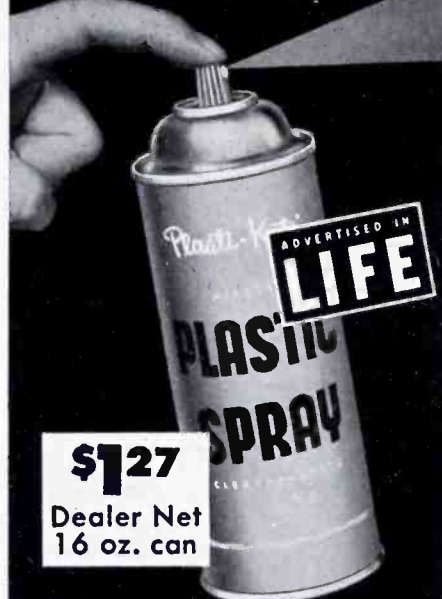
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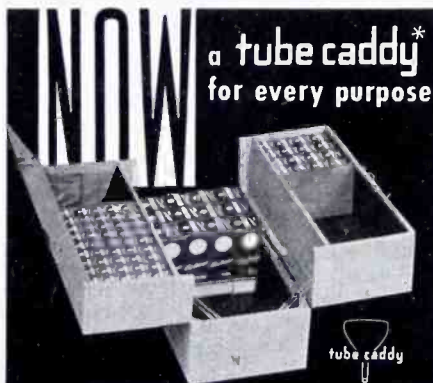
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COVER CIRCUIT

110° 21-Inch Horizontal-Vertical Deflection Circuitry (Sylvania S110) 11

FEATURES

This Month in SERVICE	7
Fixed-Frequency Low-Band FM Mobile Receiver (With Complete Circuit)	Warren M. Seeley 8
21-Inch TV Chassis Using 110° Picture Tube (Front Cover; With Complete Circuit)	Don Winters 10
Servicing Transistor Radios (Service Notes)	14
Marine-Mobile Radio Installation-Servicing in San Pedro, Calif. (Service Engineering)	15
TV-Antenna Replacement Field-Investigation Report (TV Antenna Digest) ..	16
B-W/Color-TV VHF Tuner Mixers-Oscillators	Wayne S. Rial 19
Alignment of TV Chassis Using Marker-Adder Techniques ..	Rhys Samuel 20
Audio: Outdoor Amplifiers for Commercial Sound ..	Norman Crowhurst 26
Audio: Changing Needles in Phonos ... Mechanical-Feedback Vibration- Distortion Cures ... Crystal-Ceramic Pickup Replacement With Magnetic Types	36

CIRCUIT DIAGRAMS

Seeley 30-50 Mc FM Chassis (Complete Circuit)	9	Basic Colpitts, Ultraudion and Push-Pull Oscillator Circuits	19
Sylvania S110 21-Inch Set (Complete Circuit)	11	Tuner Coupling Circuits	19
Picture-Tube Flux-Cancellation Schematic. TV-Horizontal Output Showing Current Flow	12	Alignment Test Setups	20
Sylvania S110 Vertical Scan	12	RCA WR-70A Marker-Adder (Complete Circuit)	21
RCA 8-9 BT-9 Con-IF-Det Transistor Stages 14		RF-IF Alignment Setup With Marker-Adder	24
		Output Transformer Tapping	26
		Twin-T-Feedback Slot Amplifier Circuit	26

DEPARTMENTS

Transistor-Radio Service Notes	14	Catalogs and Books	28
Service Engineering	15	Radio-TV Components ... Accessories	23
TV Antenna Digest	16	Test Instruments	30
Association News	25	Bench-Field Tools	31
Ten Years Ago in SERVICE	25	Audio Installation and Service	36
Audio Developments	26, 36, 37	Personnel	40

Index to Advertisers

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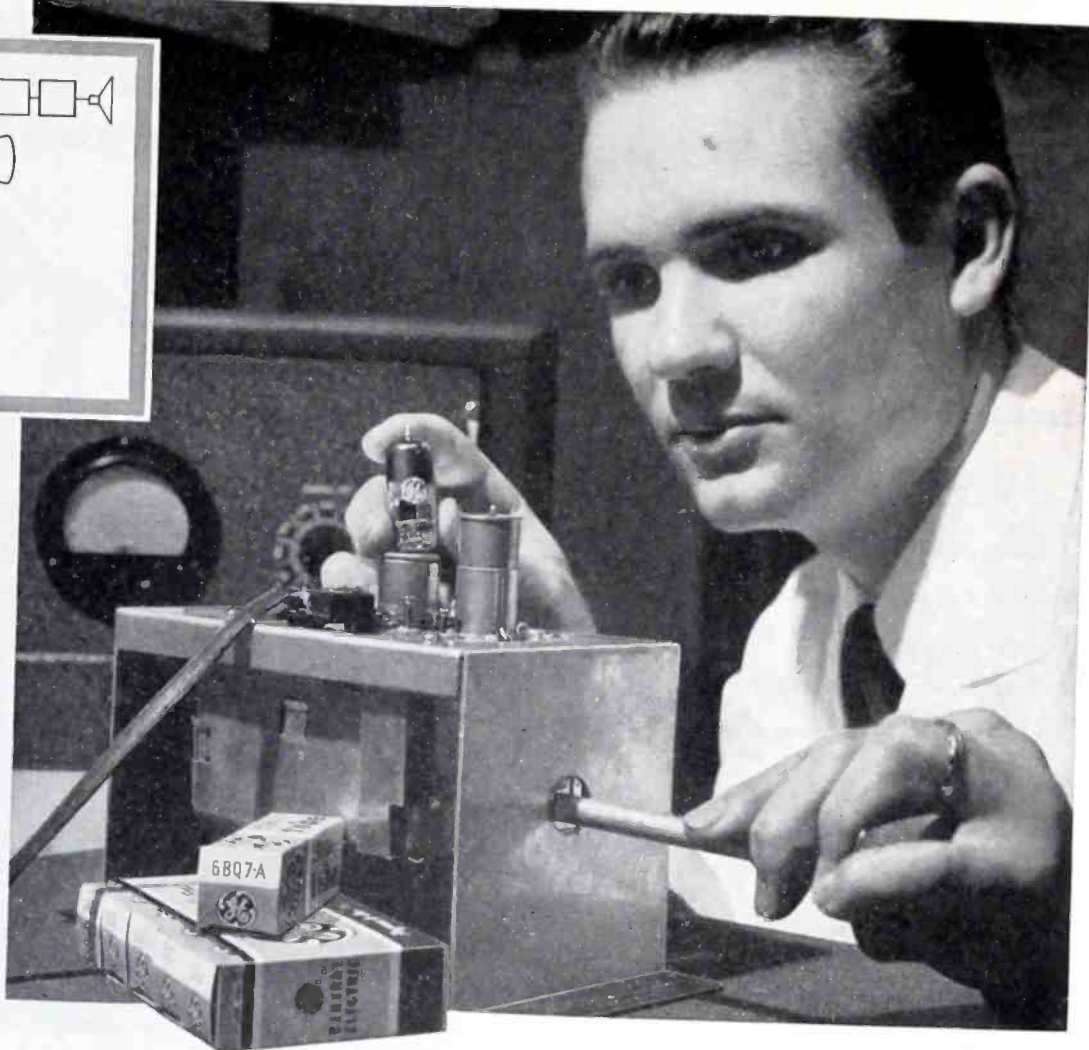
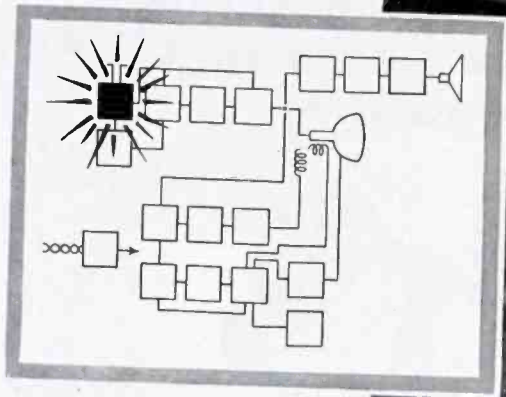
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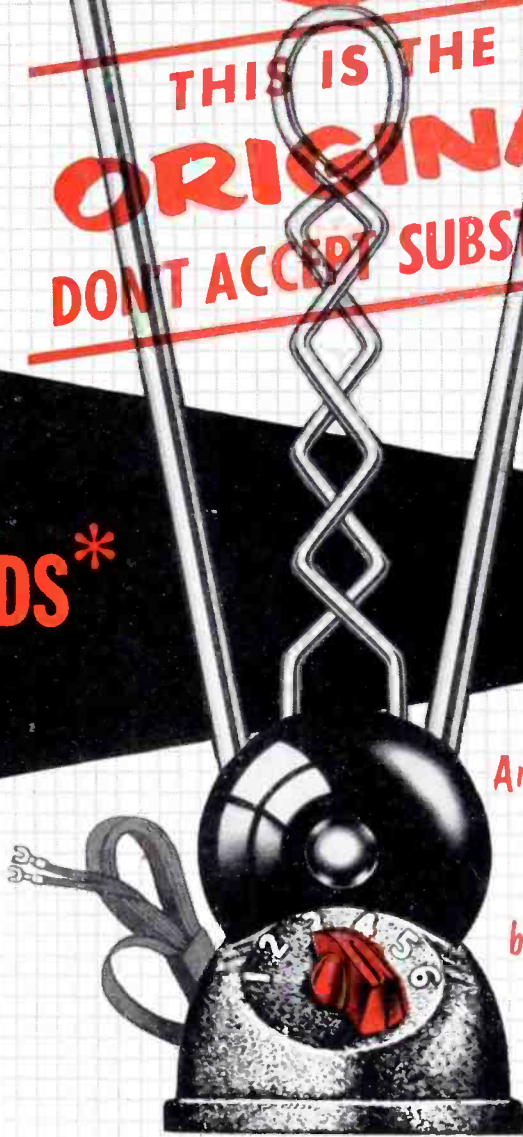
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THIS MONTH IN SERVICE

NATIONWIDE TV-RECEPTION STUDY UNDER WAY--TV set owners across the country are now participating in one of the most unusual reception investigations ever undertaken, to determine veryhigh- and ultrahigh-signal conditions in all types of areas. The project, under the direction of members of the field test panel of the Television Allocation Study Organization (TASO), and manned by transmitting and receiving experts from television broadcasting stations and consulting-engineering firms, involves visits to homes to inspect antennas, observe receiver operation and make inquiries regarding set performance and service requirements. . . . Study specialists are detailing the information on questionnaires which will be carefully analyzed and subsequently reviewed in a special report for the FCC. Questions reveal the date and time of visit and the prevailing weather; exact location of household (identified on a field map of area); type of site (urban, rolling country, hill top, etc.); type and height of antenna system (uhf or vhf) and transmission lines used; age of the antenna system; direction of the antenna; mounts used for antenna and method used for rotation (if any); type and size of receiver; type of tuner and converter (if any) used; age of receiver and converter; date of last servicing job, and relative picture quality. . . . To maintain complete impartiality in the tests, only the set owners are being asked to turn on their receivers and tune in each of the local stations, while technical observers make notes. These observers do not touch the receiver nor any part of the television installation. . . . All observers are carrying TASO identification cards. . . . This special study of television performance, which will last several months, has for its object the ultimate establishment of more TV broadcasting stations and the improvement of reception throughout the country. Through the cooperation of TV broadcasters, equipment manufacturers, Service Men, distributors and the public, TASO expects to achieve this objective.

ALL-SEMICONDUCTOR (TRANSISTOR-DIODE) TV CHASSIS NOW BEING DEVELOPED--Completely transistorized TV receivers, which will include from 17 to 28 transistors and from 8 to 15 diodes, are now being engineered. Specifications released by the research and development section of one manufacturer indicate that from 2 to 4 transistors might be required for the amplifier and local oscillator of the tuner and 1 diode for the mixer; 4 to 5 transistors for the video if amplifier and 1 diode for the detector stage; 1 to 2 transistors for the sound if amplifier and 2 diodes for the detector; 2 to 3 transistors for the audio amplifier; 1 to 3 transistors for the video amplifier and 1 diode for dc restoration; 2 to 4 transistors for sync and agc, and 2 diodes in the clamping circuits; 2 to 3 transistors for vertical deflection and 1 diode as a pulse clipper; 3 to 4 transistors in the horizontal deflection and high-voltage stages, and 4 or 5 diodes for the phase control, damper, clamping and high-voltage rectifier circuits; and 1 or 2 diodes as rectifiers.

FM ACTIVITY INCREASING--There are more FM stations on the air today than a year ago, and during the next six months the total number of stations is expected to rise to 600, the highest in several years. . . . In Los Angeles and New York, according to the FCC records, there are more applicants for FM channels than there are channels available. Five have asked for three channels in Los Angeles and five have also asked for two in New York. At present, New York has 18 FM stations allocated, and 16 are taken, while Los Angeles has 20 channels, with 17 on the air. There are only five vacancies in Chicago, which has 18 channels and 13 operating stations.

COLORCASTS PLANNED FOR WORLD SERIES GAMES THIS FALL--Improved color cameras, the development of higher gain and better signal-to-noise ratio amplifiers for lenses, plus new pickup techniques, have prompted NBC to announce that this fall they plan to transmit in color, at least two world-series games from an American League ball park, using the facilities of a special mobile colorcasting unit. And if the National League ball park is close enough to the American League park, so that the color van can be set up quickly and efficiently, additional series games may be telecast in color.

Fixed-Frequency Low-Band

Circuitry Report On A 30-50 Mc Model Designed

MOBILE PAGING by way of FM receivers is an important factor in 2-way operation. Today, paging networks are used extensively in conjunction with two-way mobile services in the 30 to 50-mc band, such as police, ambulance, fire, utilities, petroleum, trucking, towing and forestry.

For this purpose crystal-controlled, fixed-frequency receivers which operate on either 6 or 12 v are available. One model,¹ recently developed, can be operated directly from the regular auto radio antenna without affecting the operation of the auto radio. A squelch circuit, adjustable from the front panel, is included for quieting of the receiver between calls.

The *if* transformers are high-Q types designed to give optimum selectivity without sacrificing image rejection.

Standby Switch Operation

A standby switch not only turns off the vibrator supply by disconnecting the 6 or 12 v going to the vibrator transformer, but it also serves to disconnect the antenna from the input of the receiver and connects it back to the extra socket on the rear apron of the receiver. By connecting an external coax jumper cable from this extra socket (nearest the side of the receiver on the rear apron) to the antenna input socket on the auto radio and connecting the auto radio antenna to the inside socket on the rear apron of the *car-call* receiver, both receivers can be operated from the auto-radio antenna.

When the *car-call* receiver standby switch is *on*, the auto radio will be dead and the *car-call* receiver will operate. When the switch is *on standby*, the *car-call* receiver is dead and the auto radio plays normally.

A reversible vibrator is used so that the receiver can be operated on either 6 or 12 v. The filaments are changed from 6 to 12-v operation by throwing a switch on the chassis (behind the speaker) to the proper

position. The vibrator supply is connected for the proper voltage by reversing the vibrator in its socket, so that the arrow on the power transformer points to the correct voltage on the top of the vibrator.

A printed circuit² is employed in the audio portion. A 220-mmfd capacitor in this printed circuit, which is normally used as an *rf* bypass between the detector transformer and ground, is used instead of the grid of a 6AQ5 to ground to provide additional high-frequency cutoff. If this printed circuit is replaced it must be reconnected in the same manner. If the 220-mmfd capacitor is used as originally intended to bypass *rf* at the detector, the stray internal capacity of the printed circuit will be found to tend to impair the proper action of the noise-limiter circuit.

The ratio-detector circuit is somewhat unorthodox in that the output of the 6AL5 is not directly grounded, but is returned to a variable positive potential obtained from a potentiometer in the cathode circuit of the 12AX7 audio tube. This potentiometer varies the *dc* voltage appearing on the grid (pin 2) of the 12AX7 squelch tube. The incoming signal normally develops negative *dc* voltage across the 2-mfd capacitor connected across the 6AL5 diodes. This voltage, when applied to the grid (pin 2) of the 12AX7, biases the tube to cutoff and allows the audio half of the 12AX7 to operate normally. When the squelch control is moved away from the ground end (counter-clockwise), the positive voltage derived reduces the negative voltage on the grid (pin 2) of the 12AX7, causing it to conduct. A 4.7-megohm grid resistor on the audio half of the 12AX7 then acts as a plate resistor for the other half of the tube. The resultant voltage drop across this resistor biases the audio

section to cutoff and quiets the receiver. The cathode and grid return of the audio section of this tube are operated at a fixed positive voltage of 70, obtained through a 220,000-ohm resistor to B+. The cathode of the squelch section obtains its 5 v of fixed positive bias from the cathode of the 6AQ5 through a pair of 15,000-ohm dropping resistors. This provides a very simple one-tube squelch circuit which it has been found will operate with an incoming signal as weak as .5 microvolt, if desired.

The *car-call* receiver can be used with a standard auto-radio antenna (extended as far as possible) without appreciably affecting the operation of the automobile radio. However, for maximum sensitivity and best operation at a distance from the transmitter, a quarter-wave antenna should be installed on the vehicle. The length of this whip antenna, figured from tip to metal mounting bracket, can be obtained from the following formula: Length (inches) = $2775/\text{frequency (mc)}$. To illustrate: $2775/35.58 \text{ mc} = 78"$. The antenna should be insulated from the car body. A 53-ohm coax cable, such as RG-58/U, should be used to connect the antenna to the receiver.

For maximum sensitivity, the squelch control should be turned just far enough counter-clockwise to quiet the receiver when no signal is present. Turning the control too far counter-clockwise will not permit the squelch to open on weak signals.

Tuning Adjustments

A quality signal generator should be connected to the receiver's antenna socket (which is near the center of the receiver) and adjusted to zero beat with the transmitter frequency. The output of the signal generator should be set to approximately 10 microvolts without modulation. The squelch control should be open all the way (clockwise).

The *dc* probe of a *vtvm* should then be connected to pin 7 of the

¹Seeley Electronics FM Car-Call model F receiver.

²Centralab PC150.

Mobile FM Receiver

by WARREN M. SEELEY

For Radio Paging

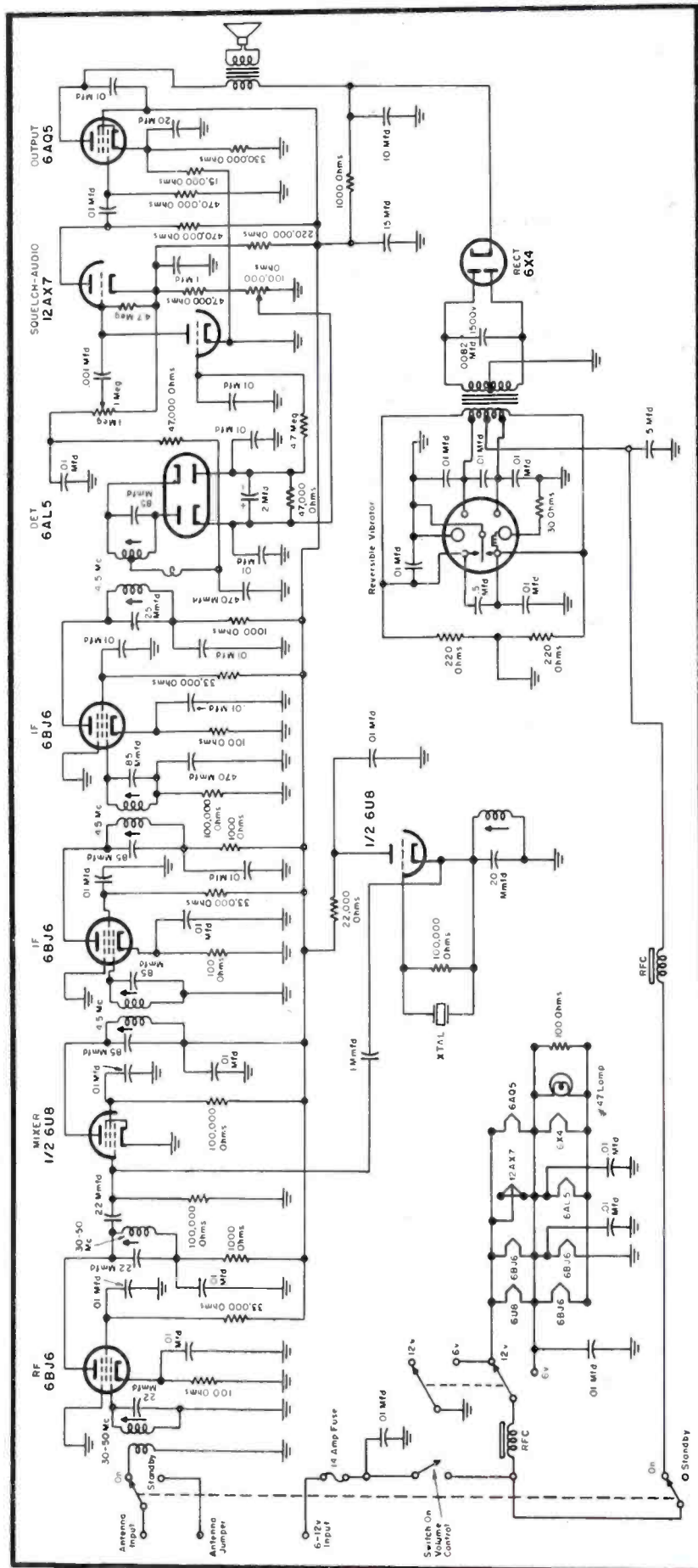
6AL5 tube socket and the top and bottom screws on each of the two 4.5-mc *if* transformer cans nearest the power transformer adjusted for maximum negative voltage on the meter. The bottom screw on the 4.5-mc ratio detector transformer can (nearest the 12AX7) should then be adjusted for maximum voltage. To align the secondary of the ratio detector, a carefully matched pair of 100,000-ohm resistors should be connected in series and across pins 5 and 7 of the 6AL5 socket (across the 47,000-ohm resistor). The *v_{om}* should be connected from the center of these two resistors to the tie point nearest the ratio-detector transformer. The top screw on the ratio-detector transformer should then be adjusted for zero voltage on the meter, with the signal input increased to about 10,000 microvolts.

In the absence of a signal generator, the tuning adjustments may be made during installation of the receiver in the vehicle. One should choose a location where the signal from the transmitter is as weak as possible. The location should be well away from traffic, since moving vehicles tend to reflect radio waves, causing the signal strength to vary. With the receiver turned on and the antenna connected to the socket nearer the center of the receiver, a *v_{om}* should be connected to pin 7 of the 6AL5 socket. (A 20,000-ohm-per-volt meter may be used in place of the vacuum-tube voltmeter, if desired.)

Ignition Noise

Ignition noise and other electrical interference (caused by the auto generator, voltage regulator, etc.) will be particularly noticeable at frequencies between 30 and 50 mc. Ordinarily this noise will be suppressed to such an extent that it can hardly be noticed; however, occasionally a stub-

(Continued on page 32)



COMPLETE CIRCUIT of the Seeley Electronics FM 30-50 mc mobile receiver, designed for radio paging, which can operate on 6 or 12 v. in the ratio-detector, the 6AL5 is not directly grounded, but returned to a variable positive potential obtained from a potentiometer in the cathode circuit of the 12AX7 audio tube.

21-Inch TV Chassis Using

Complete Analysis of Horizontal and

by DON WINTERS

Service Engineer, Radio and TV Division
Sylvania Electric Products, Inc.

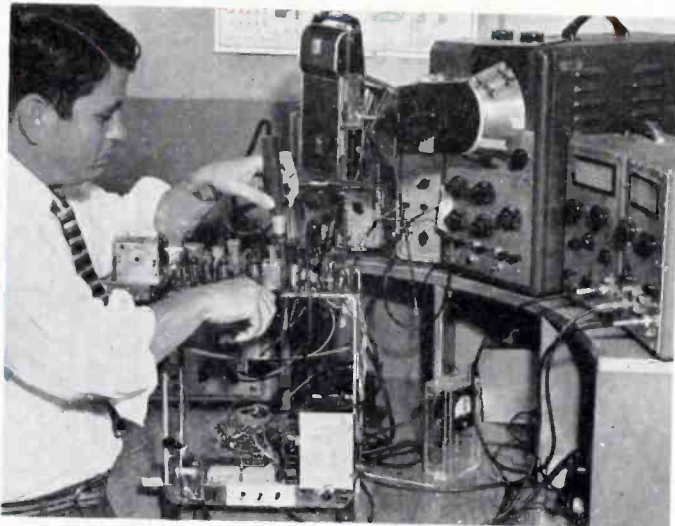


FIG. 1: DON WINTERS setting up 110° chassis for waveform photos. A shelfless console is used to house the new model; the chassis is mounted on a metal rail that extends across back of receiver.

IN VERY EARLY DAYS of TV there were three, five and seven-inch receivers, all of which were static-deflection units. The pictures were small, although sometimes quite good, but the intensity, focus, quality and general definition were not comparable to what is available in current chassis. The small static-deflection tubes employed were acceptable when used with accelerating potentials of less than 10,000 volts. To increase the size of the picture it was found necessary to increase the high voltage to get good brilliance. However, as

mathematical computation will show, as the high voltage on any type picture tube is increased, scanning becomes a much more difficult problem. The largest static-deflection picture tube that was put to any practical use was a nine-inch size introduced over ten years ago. To develop brilliance in this tube, a rather high second-anode voltage was necessary. This meant using push-pull output stages to generate sufficient power for scanning the tube, both horizontally and vertically. These high-potential problems also caused many of the coupling capacitors to break down in the deflection system. In other words, circuit design of the early static-deflection tubes was good as long as the size of the tube did not get much above seven inches.

Public demand required a larger tube to be developed. With the advent of larger tubes, circuit requirements became so difficult that a different method of deflection was required. Magnetic deflection was the only answer and the early ten and twelve-inch tubes were developed. The horizontal-deflection angle of these early tubes was approximately 50°. Even then, due to poor circuit design, the non-availability of good deflection transformers, and the poor sensitivity of deflection yokes, terrific power requirements were necessary to give ample deflection. In addition, the high voltage was developed separately, not in the conventional circuit as we know it today.

As time went by, circuit refinements were developed, resulting in improvements in scan transformer and yoke efficiencies. Eventually the

early 50° deflection tubes were being scanned quite efficiently with a single 6BG6. The new design of the flyback circuit enabled the development of high voltage from the same scanning tube. As more and more time was spent in the development of new circuits and new scanning techniques, the deflection angle was changed to 65°. This proved to be an advantage to the dealers, as well as the manufacturers, the shorter deflection angle allowing the receiver to be built in a more compact cabinet. It was found, as far as circuit design was concerned, that changing the deflection angle from 50° to 65° made no appreciable difference in the amount of drive necessary to give proper scanning.

About this time, with the development of the 21 and 24-inch receivers, it was evident that a receiver using 65° deflection in a 24-inch tube would be too deep. This meant that the receivers had again become too large physically, necessitating an increase in the scanning angle, to make a more compact unit. It was decided to settle around the 90° horizontal deflection angle, but this large angle began to develop additional problems.

Something had to be done to enable the receiver to give a better focus picture across the entire face. At this time, it was thought that a correcting focus voltage might even be used to correct the focus as the beam was scanned. However, engineers were not satisfied with this method, and instead, turned toward

(Continued on page 12)

RIGHT: Circuit of Sylvania S110 chassis with 110° picture tube.

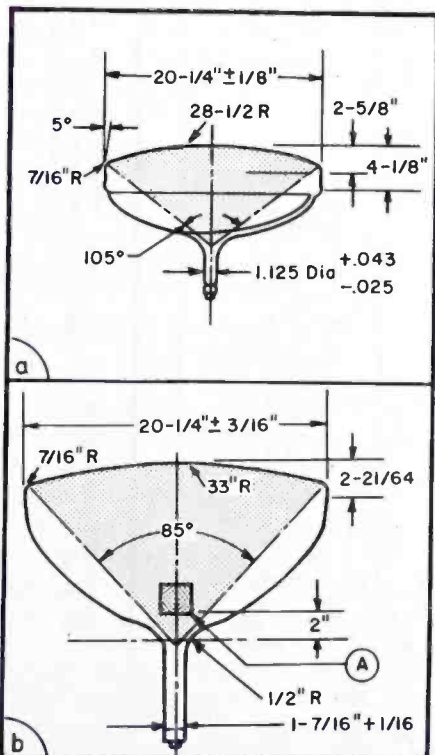
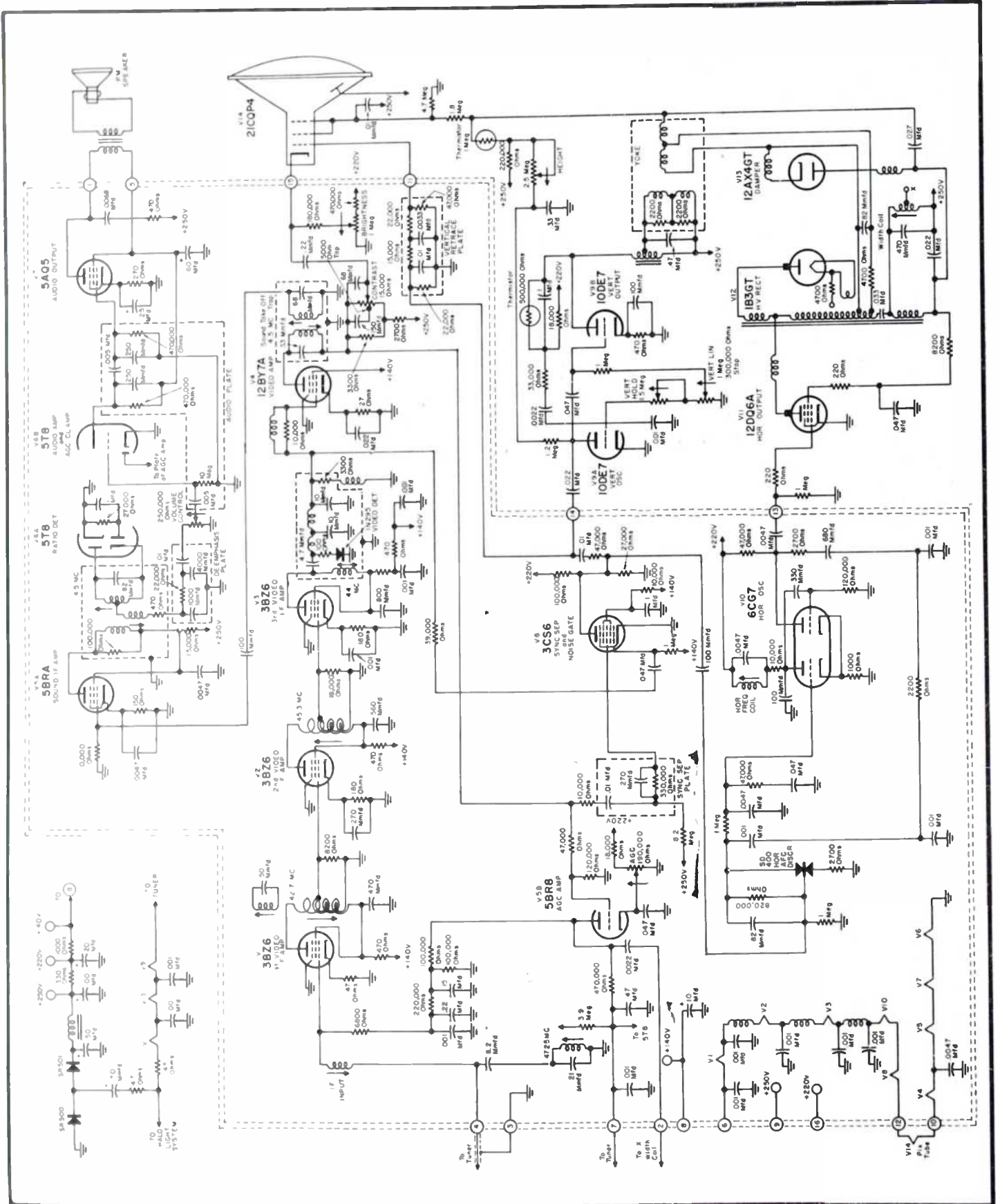


FIG. 2: COMPARISON of 21ATP4 (90°) picture tube and the new 21CQP4 (110°) model.

110° Picture Tube

[See Front Cover]

Vertical Deflection Circuits Used In Latest Wide-Angle TV Model



21-Inch Wide-Angle TV Chassis

(Continued from page 10)

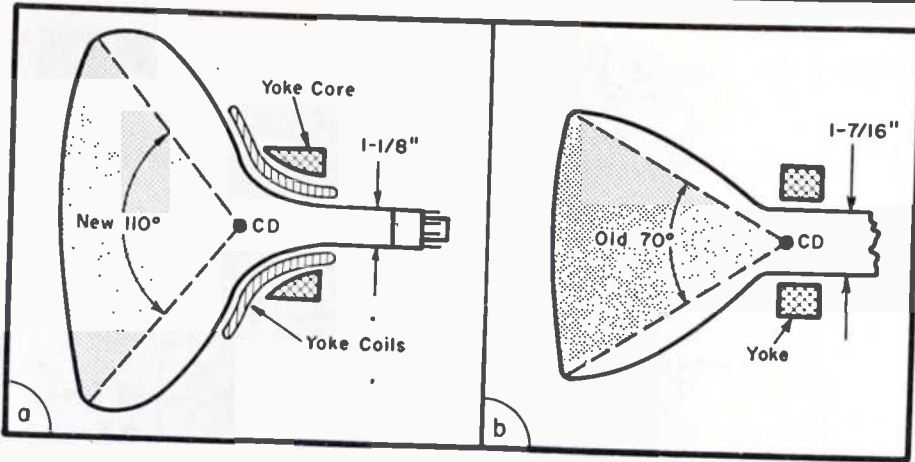


FIG. 3 (left, below): CROSS-SECTIONAL drawings of 110° and 70° tubes and their yokes. Note how 110° deflection yoke fits up on bell moving the center of deflection forward into the tube.

a new type of scanning yoke called *cosine*. Even today most engineers are not exactly sure what is happening in this yoke to give the perfect focus in the standard 90° picture tubes. Suffice to say that it develops a deflection field in such a manner that the beam, both horizontally and vertically, will stay in focus and the beam spot size will stay the same across the entire face of the picture tube. With the development of the *cosine* yoke the focus problem was minimized. However, it was found that the 90° tube required additional drive to give proper scanning. Many of the early 24-inch receivers had to use 6CD6's or 6BQ6's in parallel, to get proper scan. Later, as the art advanced, it was again found that, by improving efficiencies in the horizontal-scanning system, a single driver tube could be used.

Several years ago, when the portable TV market began to develop, it

was felt that the time had come to make an even more compact receiver. Work was started on a 17-inch 110° picture tube. In conjunction with this, experimental work was also started on a 21-inch 110° picture tube. It was found that these new scanning angles could again cause trouble with focus and scan. New circuits had to be found to overcome these obstacles.

This new tube was very compact; in fact, so compact that due to the possibility of smaller cabinet dimensions there was little room left to mount a chassis. With this in mind a new chassis had to be developed; one composed of two decks.¹ The lower deck across the bottom was designed to contain the tuner, low and high-voltage power supplies and vertical and horizontal scanning. The deck across the top was arranged to contain all other circuits; *if's*, sound, etc.

A comparison of the standard 21ATP4 picture tube and the 21CQP4

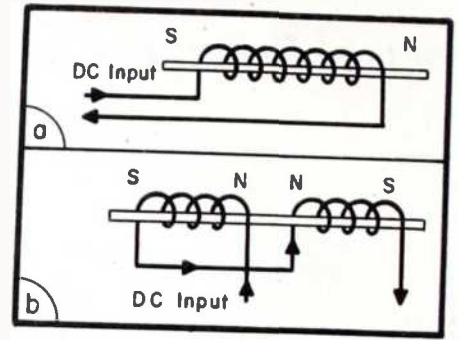


FIG. 4: FLUX-CANCELLATION principle is illustrated in this schematic.

110° picture tube appears in Fig. 2 (p. 10). It will be noted that the diagonal measurement on the face of the picture tube is exactly the same. This shows that there has been no decrease in the amount of square inches on the face of the new 110° picture tube, but the shorter depth of the new picture tube is quite evident from the dimensions shown. The tube itself is aluminized, and is of the non ion-trap type. Therefore, the only component on the neck of the picture tube is the deflection yoke. A centering device is incorporated on the rear of the deflection yoke for simplicity, as far as service is concerned.

A photograph of the rear of a 110° chassis is shown in Fig. 1 on page 10. In previous TV models employing either a vertical or a horizontal chassis, it was common practice to mount the chassis on a shelf located mid-way between

(Continued on page 33)

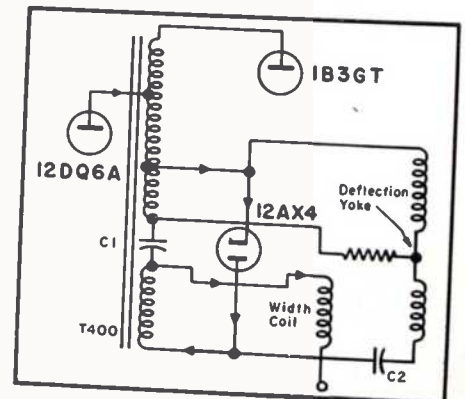
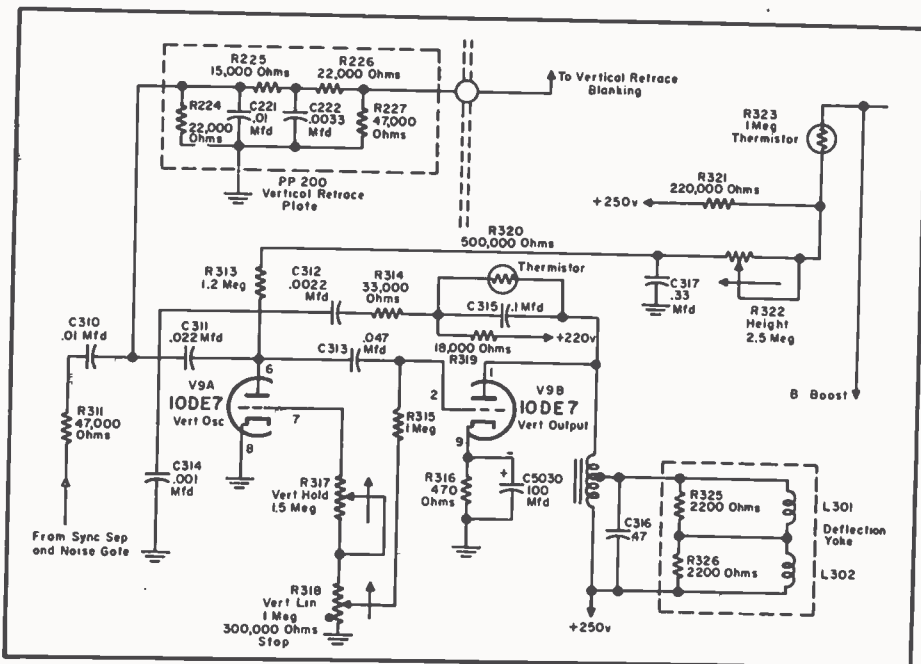
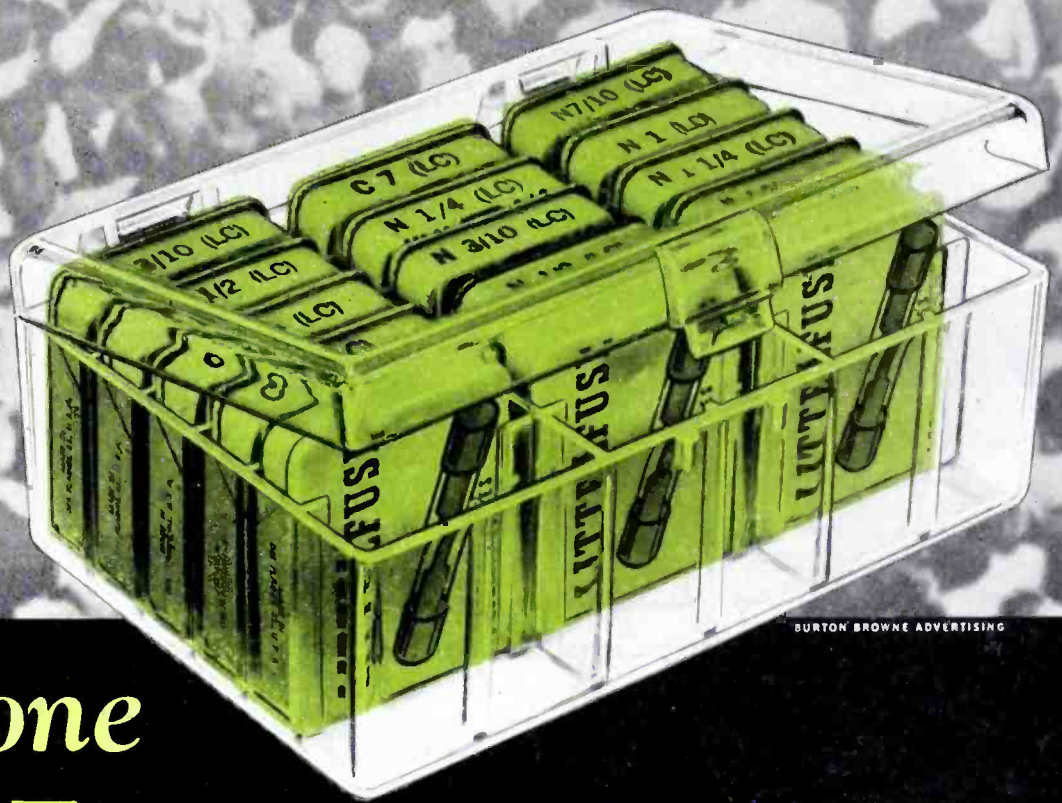


FIG. 5: SIMPLIFIED HORIZONTAL output circuit showing direction of current flow.

(Left) FIG. 6: PARTIAL SCHEMATIC of vertical-scan circuit in 110° chassis.

¹Sylvania S110.



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SERVICE NOTES

FIELD AND SHOP



Servicing Transistor Radios†: Signal Tracing . . . Voltage, Resistance and Current Measurements

SIGNAL TRACING or similar methods of signal injection are well adapted to the servicing of transistor radios.

Because of the extremely low signal voltages present at the base input of transistors a high-gain 'scope (with .03-volt-inch vertical deflection) or equivalent should be used for gain measurements. And because of frequent distortion problems which have been encountered, a 'scope is also desirable to observe waveforms.

When using signal tracing in a transistor radio, it should be remembered that all transformers, from the antenna coil to the output transformer, are step-down type and a

great reduction in signal voltage can be expected between the collector of one transistor and the base of the following transistor.

Measurement of *dc* terminal voltages is just as important and just as applicable to the servicing of transistor radios as to the servicing of vacuum tube radios. The most important difference is in the magnitude of the voltages to be measured. The maximum terminal voltage which will be encountered in RCA transistor radios is 9 v. Bias (*base-emitter*) voltages are in the order of .05 to .2 v. The operation of a transistor with .1-v bias will be unsatisfactory

if .2 v is specified. Just as with vacuum-tube radios, meter sensitivity is also quite important. Voltmeters used in servicing transistor radios should have a sensitivity of 20,000-ohms-per-volt or better and a low-range scale which will enable reading of bias voltages to an accuracy of $\pm .03$ v.

One very important voltage condition which should be noted is in connection with bias voltages. The term *forward bias* is used in connection with transistor operation. With no potential difference between emitter and base, there will be no current flow in the collector circuit. As the bias is increased, the current increases.

In normal operation there will be a *forward bias* of between .1 and .2 v between the base and emitter.

In most circuits both base and collector voltages are negative when referred to a common positive emitter. With some transistors these voltages are positive in reference to a common negative emitter.

In some transistor circuits, the terminal voltages on one transistor may be so dependent on the currents of another transistor that the first transistor will be inoperative if the second were removed.

A simplified diagram of the converter-if amplifier-detector section of RCA models 8-BT-9 and 9-BT-9 shown in Fig. 1 illustrates the emitter voltage problem. It will be noted that if Q_2 were removed, the Q_1 emitter voltage will be less negative, because of less current through R_1 , the 1200-ohm resistor. An emitter voltage which is less negative reduces the bias and reduces collector current; in this circuit it will be reduced to cut-off. In the opposite direction, if Q_1 were removed, the emitter of Q_2 would become less negative and the collector current of Q_2 would increase.

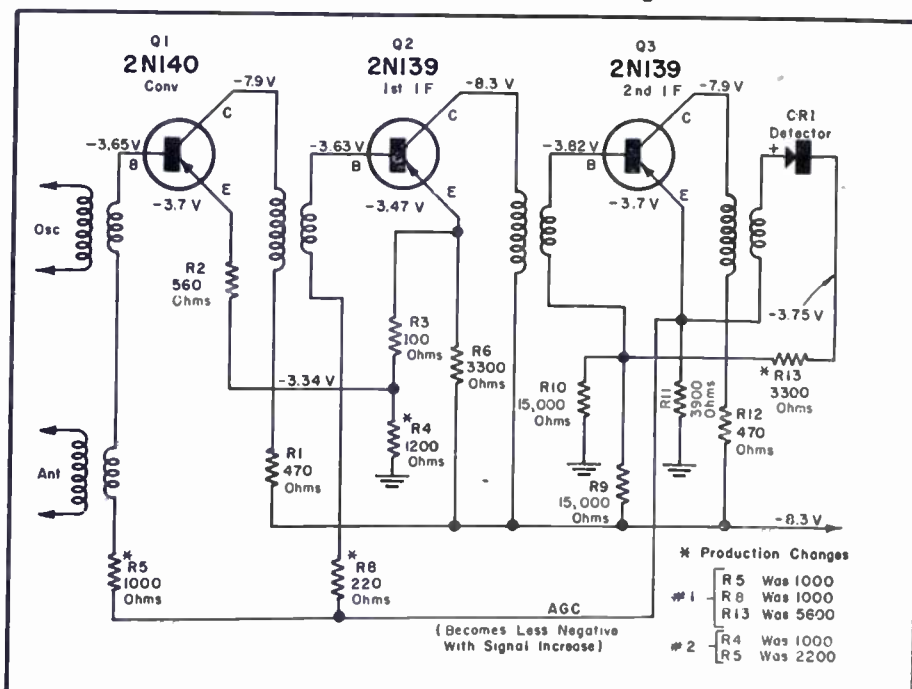
Although servicing by resistance measurement is one of the most common testing methods used with vacuum-tube radios, this method has severe limitations when applied to the testing of circuits which contain transistors.

Transistors will conduct on electric current when the terminal voltage is supplied from an ohmmeter, just as readily as when the voltage is supplied from the battery used for normal operation. Because of this transistor conductivity, the resistance

(Continued on page 32)

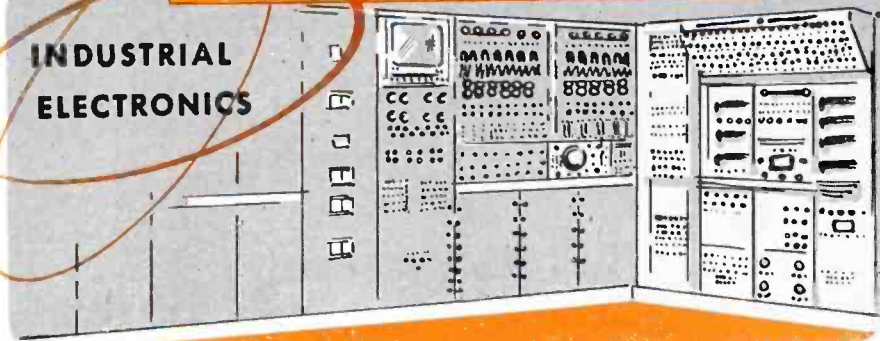
†Based on information prepared by the commercial service department of RCA Service Co.

FIG. 1: CONVERTER-IF-DETECTOR STAGE circuitry of RCA 8-BT-9 and 9-BT-9 transistor radios illustrating no-signal voltage condition



service engineering

INDUSTRIAL ELECTRONICS



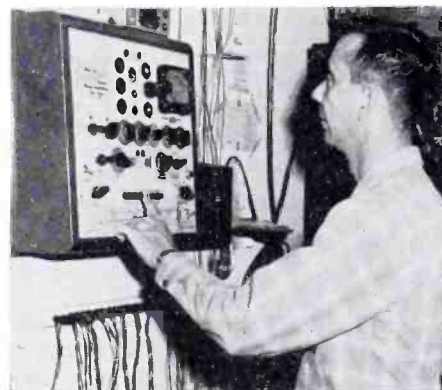
Marine-Mobile Radio Installation-Servicing In San Pedro, California

important to meet rigid FCC performance requirements.

Most service calls are charged for on a per-call basis.

In spite of a healthy amount of marine business, mobile two-way radio has accounted for a number of new installations. By selling and installing two-way gear, Marine Radio has developed a continuing service business. And selling two-way requires more than just knowing how to select the right equipment for specific jobs. The prospects must know what radio will do for them, in terms of dollars and cents and performance.

A few years ago, typical boat owners bought simple marine radiotelephones so that they could keep in touch with land. But today, many boats are equipped with better radio-



CHECKING TUBES for electrical merit and shorts on a master tester and for grid emission with a grid circuit checker.

telephones, depth finders, portable electronic megaphones and even radar sets. One boat which Marine Radio Service recently outfitted has over

(Continued on page 39)

By LOCATING IN San Pedro, the port city of the growing Los Angeles area, which is not only a major industrial center, but a center for year-round pleasure boating, and concentrating on sales and servicing of both marine and mobile radio equipment, Marine Radio Service has developed into one of the largest independent operations of its kind on the Pacific Coast.

The shop and salesroom of Marine Radio Service is on the San Pedro waterfront adjacent to the berthing spaces for the area's multitude of pleasure craft.

The company was formed in May, 1950, by William R. Rocker. Sales and service are under the direction of Jack E. Sanders, who has been with the company for two years.

In addition to hundreds of yachtmen, the company services electronic gear for the major steamship lines, the U. S. Navy, commercial fishing boats, oil companies, the U. S. Department of Justice and the State of California Fish and Game Commission. Activities include installation and maintenance of electronic equipment on off-shore drilling rigs and for industrial plants in the Los Angeles metropolitan area.

The shop's staff consists of ten, of whom six are full-time Service Men, plus one who works on a part-time basis. Besides servicing, the company sells and installs marine radar, depth finders, and marine and mobile radiotelephones.

The shop is provided with a complete assortment of test instruments, plus specialized apparatus for accurate checking of transmitter frequencies and spurious transmissions. These special devices are extremely

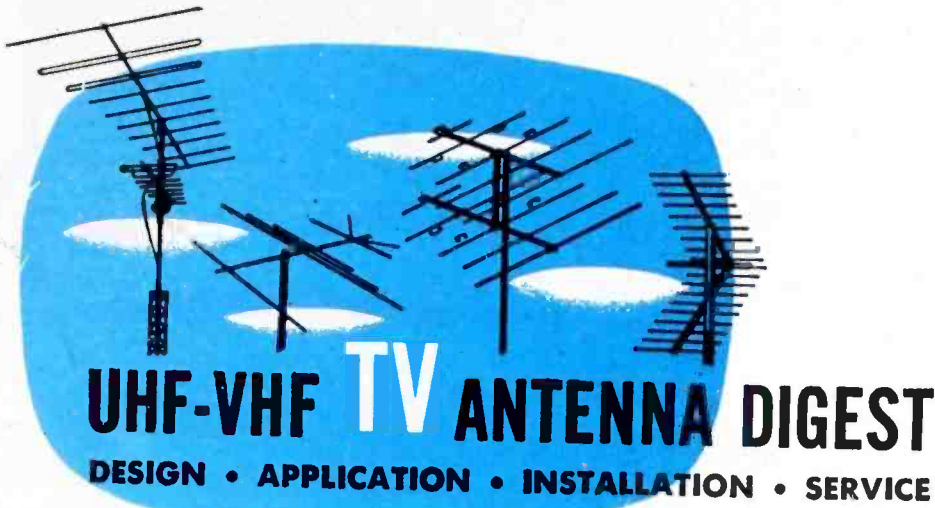


ONE OF THE FIELD TRUCKS used by Marine Radio Service for marine and mobile repair and installation.



OPERATING one of the fixed two-way installations recently completed by Marine Radio Service.

Exclusive Report On Results of Field Investigation Of Performance Improvements Available When Old TV Antennas Are Replaced



checked) and a series of readings were taken from a controlled signal to provide a final check. When the engineers had satisfied themselves that they had as many readings as would be necessary to provide this control, the complete antenna assembly was replaced with not only new antennas of the same models, but new transmission line, standoffs and other required components.

Upon completion of this new installation, another series of identical tests were conducted, with respect to the control antenna and the new antenna using signals from the TV station, and the control signal from the mobile laboratory. Also pictures of the TV picture received with the new antenna system were taken, as shown in accompanying illustrations; the pictures were brighter, with increased detail, in view of a substantial boost in signal strength. Comparative readings under all conditions mentioned appear in table 1; p. 38.

Some may ask why were these tests made under both actual operating conditions and also from the mobile laboratory. The double set of readings were taken because of the propagation variables which exist in hilly country and to double check the results. These checks emphasized the fact that installations deteriorate through the years; the rate of deterioration is often slow so that set owners do not notice any perceptible difference in the picture results.

Service Men can conduct similar tests using a field strength meter. In such a study one should select some installation which has been *up in the air* for years, where the transmission line is in bad condition and where

(Continued on page 38)

DURING THE PAST FEW years Service Men have been alerted to the fact that there are millions of ancient rooftop TV antennas which should be replaced. Many Service Men have taken heed and installed new antennas, but a number have questioned the degree of improvement which would be noted if a new outdoor installation were made.

To prove that a new antenna installation can provide solid improvement in all-round performance, one manufacturer¹ recently conducted a fact-finding investigation.

Engineering was told to locate an installation which, on the basis of appearance, had outlived its usefulness, but to the set owner was apparently still satisfactory.

Furthermore, the installation was to employ antennas which could be duplicated with antennas which are still in production. This was particularly important to permit a controlled test of the installation.

Such an installation was found; employed were two cut-for-channel

8 antennas² and one³ cut-to-channel 3.

To provide the *control* test ingredient, a new antenna⁴ was installed and beamed at the Syracuse stations, fifty air miles away from the pickup point. Direct readings were taken on all of the stations and by instantaneous switching from the control antenna to the existing antenna, comparative readings were recorded. At the same time photographs were taken of the pictures received on the existing antenna. Photos of received pictures, accepted as satisfactory by the set owner, were taken. Unretouched prints of these photos are shown below.

Mobile Lab Tests

In addition to the comparative readings referred to, another series of readings were taken by a control signal force. A mobile laboratory was set up in the backyard (in order to line up with the antennas to be

¹Taco. ²Taco 1850. ³Taco 1325.

⁴Taco Trapper.

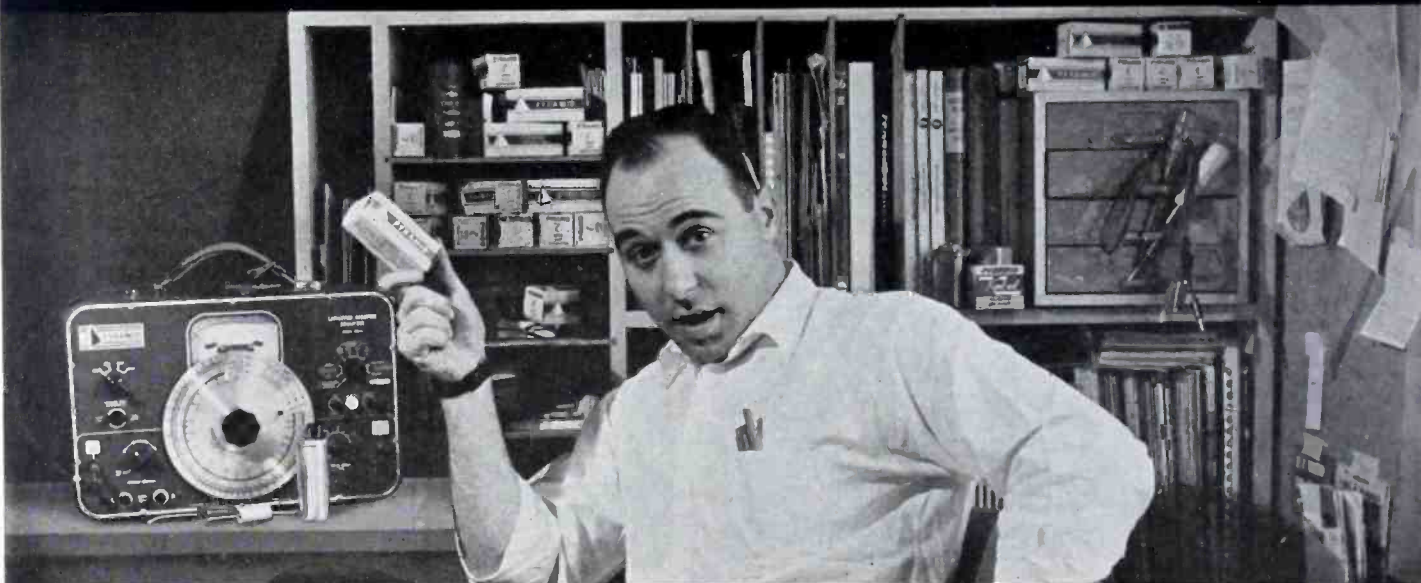


SNOWY-PICTURE results on channel 3 on original antenna installation; caused by low signal-to-noise ratio. (This is an unretouched photo.)



ABOVE: LEFT—RIGHT . . . IMPROVED PERFORMANCE obtained on channel 3 after installation of new antenna which provided a higher signal-to-noise ratio and cleaned up picture. (These are unretouched photos.)

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B-W / COLOR-TV VHF Tuner Mixers-Oscillators

by WAYNE S. RIAL, Application Engineer
Electronic Tube Division, Westinghouse Electric Corp.

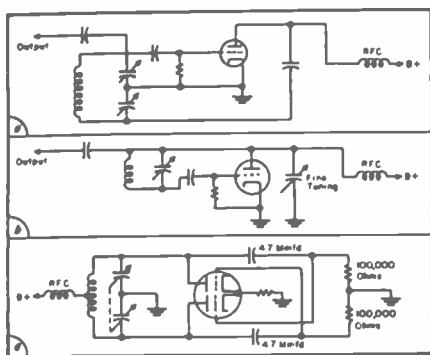


FIG. 1: THE BASIC Colpitts (a) and ultraudion (b) oscillators are illustrated in these circuits. In (c) is a push-pull oscillator circuit.

THE LOCAL OSCILLATOR stage of present *vhf* tuners is required to produce a constant output voltage of about 3 *r* peak, and a variable frequency over the ranges of 101 to 139 and 221 to 257 mc for a 44-mc *if*. Also, it is desirable that the frequency stability be less than 500-ke variation under normal operating conditions. This means that the local oscillator stability is very critical for black-and-white receivers and is exceptionally critical for color receivers.

The local oscillator circuit used most frequently in *vhf* tuners today is the *ultraudion* circuit which is a modification of the Colpitts oscillator. In the Colpitts oscillator, actual physical capacitors are used to provide the proper voltage distribution across the oscillator tank circuit as in the circuit in Fig. 1a.

In the *ultraudion* oscillator (Fig. 1b), *rf* voltage distribution across the oscillator tank circuit is accomplished through the grid-to-cathode and plate-to-cathode capacities of the tube. Feedback capacity necessary to sustain oscillations is obtained by the tube's grid-to-plate capacity.

Sometimes additional external capacitors are placed between grid and plate in this circuit to insure oscillator stability.

Another circuit which has been successfully used in the past is the push-pull oscillator using two triodes with a common cathode (the 6J6).

The local oscillator invariably operates above the incoming channel frequency to reduce the frequency range to which the oscillator must

time. In the split-sound *if* receiver system, it was necessary to operate the oscillator frequency above the incoming channel frequency to maintain the proper position of the sound and video carrier frequencies at the output of the mixer stage.

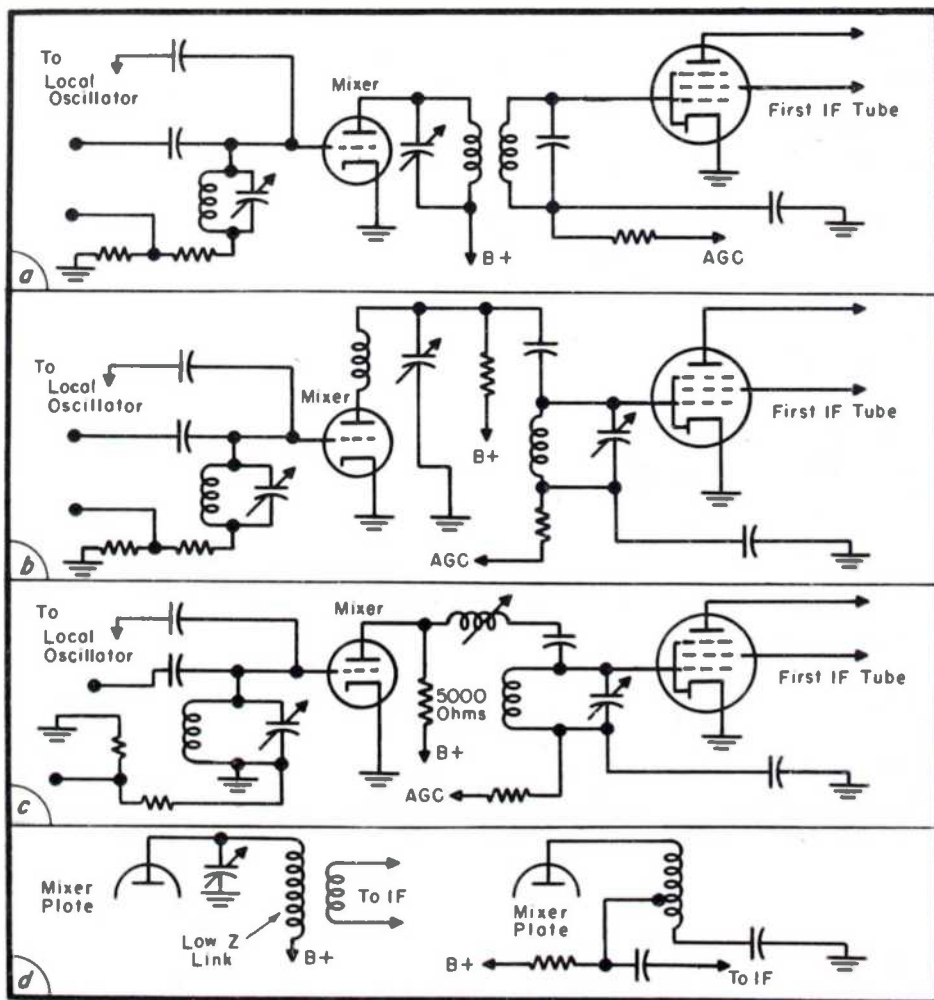
Thus, in an intercarrier-sound TV receiver with a 44-mc *if* operating in the *vhf* bands, the local oscillator must operate between $54+44=98$ mc and $216+44=260$ mc, which is a frequency range of $260/98=2.66:1$. If the oscillator was to operate below the incoming channel frequency with a 44-mc *if* in the same bands, the oscillator stage would operate between $54-44=10$ mc and $216-44$

$=172$ which is a frequency range of $172/10=17.2:1$.

One of the advantages of the present *ultraudion* oscillator circuit, other than circuit simplicity, is the fact that the cathode of the oscillator tubes is at *rf* and *af* ground. A grounded-cathode stage is less susceptible to hum modulation (at 60 cps) than is a circuit whose cathode is above *af* ground, especially if there is appreciable heater-to-cathode leakage within the tube. For the same reason, the cathodes of most *vhf* tuner mixer tubes are also grounded.

The most critical tube parameters for *ultraudion* oscillator usage are the

(Continued on page 22)



(Right)
FIG. 2: FOUR TYPES of coupling circuits. Mixer-coupling-transformer system is shown in (a). The direct coupling system appears in (b). In (c) we have a direct-coupling circuit which contains a pi network, which has excellent spurious signal rejection. Two coupling systems frequently used are illustrated in (d). Low-impedance link refers to secondary of (d).

Alignment of TV Chassis Using

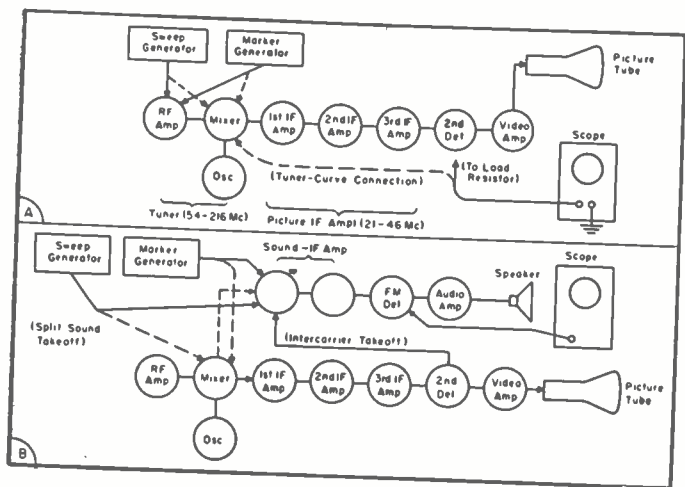
A Report on The Procedures Developed

by RHYS SAMUEL

Commercial Engineering, Components Division, RCA

(Left)

FIG. 1: TYPICAL TEST setups for conventional alignment: (a) Tuner and picture-if amplifier test setup; (b) sound-if amplifier and FM-detector test setup.



ALTHOUGH THE PRINCIPLES of the marker-adder system of TV alignment have been known for many years, they were not too widely applied. Recently the need for the technique has become more apparent and a growing number have begun to use this method to align their chassis. To simplify the operation, individual marker-adder units have been developed. Such devices permit calibrating pips from the marker generator to be added to the sweep-response curve after the sweep signal has been taken out of the receiver under alignment.

This system of marking a response curve has been found to offer many advantages, including elimination of

all of the sweep-curve distortion caused by markers when they are fed through the receiver. Alignment of traps is also facilitated because marker *suckout* does not occur when the marker signal is added to the trace after the sweep signal has passed through the trap. One marker-adder,^o developed recently, also provides a choice of marker shapes and sizes.

Conventional Alignment Test Setups

One typical setup used for *rf*-alignment is shown in Fig. 1a. The *rf*-output cables shown as solid lines from both the sweep and marker generators are connected to the antenna terminals of the receiver. The sweep generator is set to sweep the full width of one of the TV channels, and the marker generator is tuned to deliver a calibrating marker or markers which fall within the channel frequency band.

With this setup, it is possible to observe the bandpass characteristics of the tuner on each of the 12 *chf* TV channels by connection of the 'scope into an appropriate signal takeoff point in the tuner. On some tuners,

a demodulated signal is available from a test point; on other tuners, it is necessary to use a demodulator probe in conjunction with the oscilloscope.

If it is desired to make an overall bandpass check of the receiver, the 'scope can be connected across the load resistor of the second detector. The response curve observed at this point will be affected by the bandpass characteristics of the circuits in the tuner and the picture-if amplifier.

Alignment of the picture-if amplifier can be checked by connection of the sweep and marker generators as shown by the dotted lines. Both generators are set to deliver output signals in the intermediate-frequency region used by the receiver under test; the 'scope probe must be connected to the second-detector load resistor. The response curve displayed with this test arrangement will include the effects of all the tuned circuits, including traps, located in the picture-if amplifier.

Alignment of the sound-if amplifier and FM detector can be checked in similar fashion, as shown in *b* of Fig. 1. Here, the sweep and marker generators are set to the sound inter-

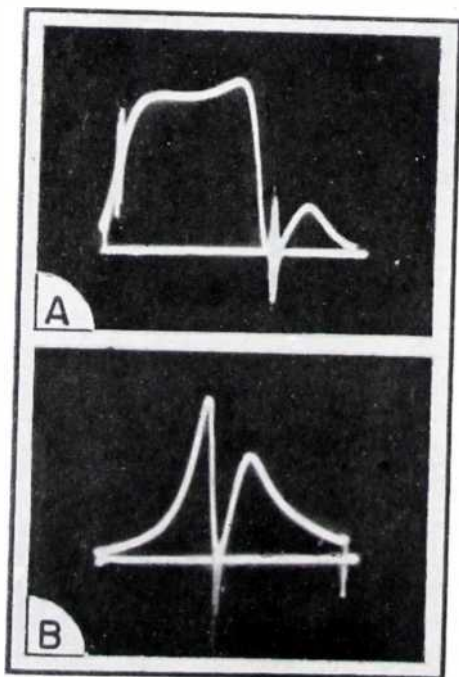
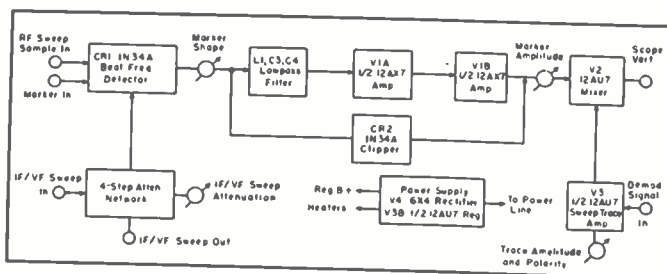


FIG. 3: TRAP NOTCHES: Overall response curve with dual markers from marker adder is illustrated in (a); note high-amplitude marker in trap notch at right. Response curve at sound takeoff transformer showing sharp hole provided by if picture-carrier trap, is shown in (b). Use of positive-clipped marker does not obscure trap notch.

^oRCA WR-70A
RF/IF/VF Marker-Adder

(Below)

FIG. 2: BLOCK DIAGRAM of RCA WR-70A *rf/if/vf* marker-adder. The marker-adder contains four tubes, including the power-supply rectifier and a specially designed attenuator system for use on *if* video signals. The instrument is equipped with three coax jumper cables and a coax pickup cable for connection to other test equipment and to the TV receiver.



Marker-Adder Techniques

For The RF and IF-VF Stages of TV Chassis

mediate frequency, usually 4.5 mc, and the scope is connected across the output load resistor of the FM discriminator or ratio detector.

In all of these familiar setups, both the sweep and marker signals pass through the circuits under test. This arrangement, however, is a primary source of distortion of the response curve, and in these applications, the calibrating marker rides on top of the sweep curve. Unless great care is taken during the initial adjustments of equipment, too much signal injected into the receiver will cause overloading of the receiver circuits and result in distortion of the sweep and marker traces. In addition, it may be necessary to apply a high-amplitude marker signal to override the hash on the curve. If the marker must be positioned on the slope of a curve, it may also be necessary to use so much signal that the curve is distorted.

A high-amplitude marker is characterized by a relatively wide base which can obscure a considerable portion of the sweep curve. Markers

of this type project both above and below the sweep-trace line, making it difficult to identify the contours of curve notches and slopes.

Another problem occurs when the foregoing method is used during trap alignment. Traps are hi-Q tuned circuits which require fairly precise adjustment. If the trap is set correctly, it should be impossible to feed a trap-frequency signal of normal voltage through it. To resolve this problem the marker generator is tuned back and forth through the trap frequency and one must estimate at what point on the dial the marker pip completely disappears. Another method consists of feeding the maximum signal through the trap and producing a marker pip by brute force.

In the marker-adder system of alignment the foregoing problems do not obtain. To illustrate, the unit, diagrammed in block form in Fig. 2, affords a choice of marker shapes to permit selection of the type of marker best suited to the response curve under observation: Negative clipped, positive clipped, positive and neg-

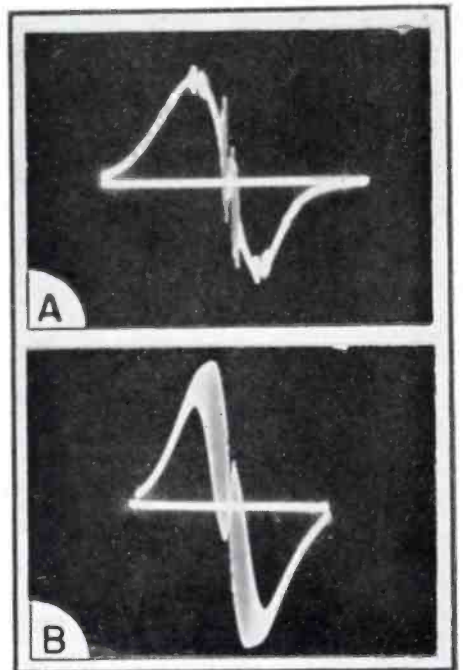


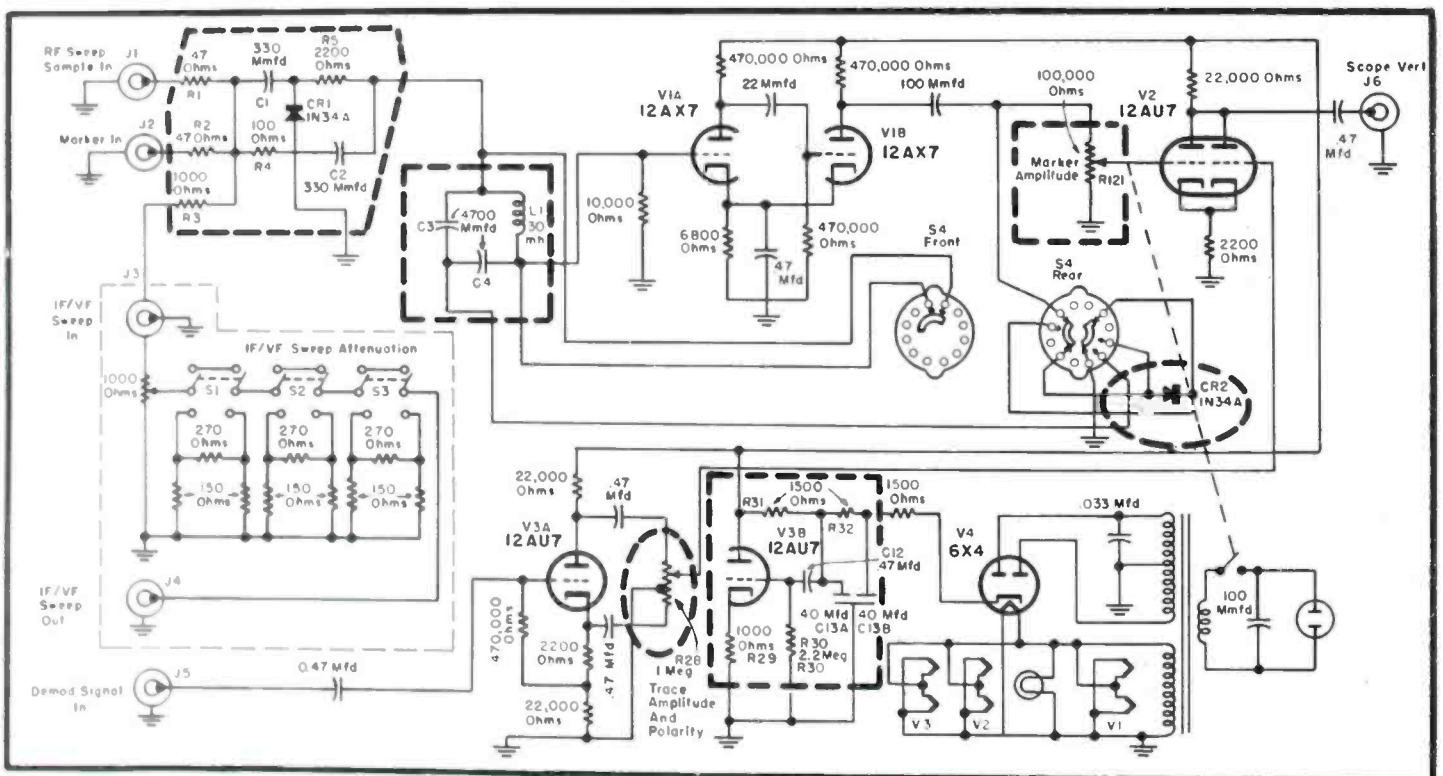
FIG. 4: EFFECTS of narrow and wide-band markers on discriminator S curve. Trace in (a) is that of a narrow-band-diamond marker with 150-kc sideband markers on peaks of curve. Distortion produced by use of wide-band marker appears in (b) trace.

ative peaks (wide band), and positive and negative peaks (narrow band).

The amplitude of any of the markers can be adjusted over a considerable range by means of a marker amplitude control without seriously

(Continued on page 22)

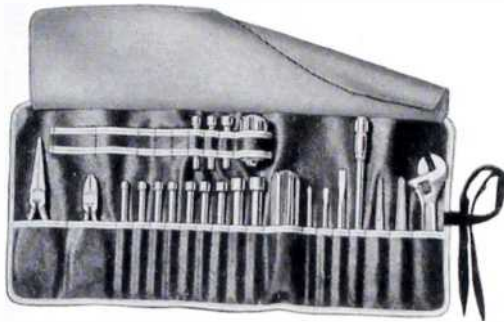
FIG. 5: COMPLETE CIRCUIT diagram of RCA marker-adder. Circled portions of the schematic are analyzed in text.



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Tuner Mixers-Oscillators

(Continued from page 19)

tubes' interelectrode capacities, transconductance, low-line voltage transconductance, and microphonism. The tube transconductance is important in tuner local-oscillator applications, because this determines the oscillator-output voltage which subsequently establishes the grid bias of the mixer stage. Mixer-stage grid bias determines the operating point on the mixer transfer curve which further determines the mixer's conversion gain.

Other Mixer-Oscillator Considerations

Several important tuner mixer and oscillator circuit features are the methods of coupling the mixer stage to the grid of the receiver's first *if* amplifier, the methods of coupling the local oscillator to the mixer stage, and the types of mixer-oscillator tube combinations used.

Two popular methods of mixer output coupling are used at present. One is the coupling transformer and the other is the direct coupling system; Figs. 2a, b (p. 19). A coupling circuit which contains a *pi* network with excellent spurious signal rejection is illustrated in c of Fig. 2. Two other coupling systems frequently used are shown in Fig. 2d.

Oscillator injection to the mixer stage may be accomplished in one of three principle ways: (1) capacitive coupling through the channel selector switch in the mixer grid circuit; (2) inductive coupling between mixer grid coil and oscillator tank coil; and (3) capacitive coupling using a physical capacitor.

The last two coupling methods stated are widely used today. The inductive coupling method can be easily used with strip-type turret tuners.

Marker-Adders

(Continued from page 21)

changing the width of the marker base on the sweep trace. Also available is a *trace amplitude* and *polarity* control to adjust the amplitude of the sweep trace displayed on the scope; this control has no effect on the amplitude of the marker pip. The sweep-response curve may be displayed in an *upright* or *inverted* position, depending upon the setting of this control. As the control is rotated from the *normal* to *reversed* settings, the sweep trace will vary in amplitude from maximum in one vertical direction to maximum in the opposite vertical direction. The polarity or the displayed trace at any setting of this control will depend upon the polarity of the sweep signal taken from the receiver.

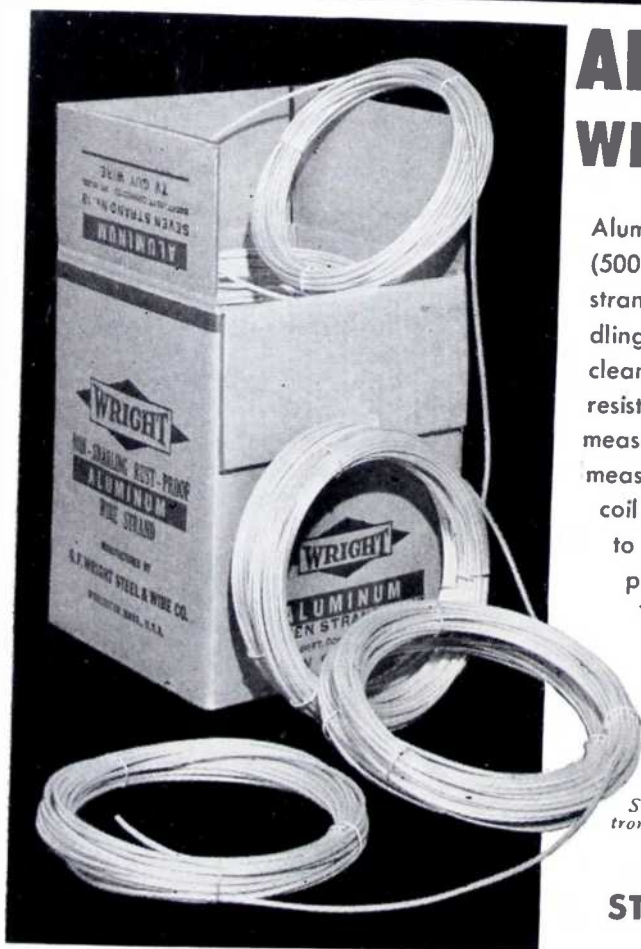
When the marker-adder is used in an *rf*-test setup, a sample voltage is fed first from the *rf* sweep generator into the beat-frequency detector circuit, consisting of a crystal diode and associated components, through a *rf*-sweep sample in connector. This *rf*-sample voltage must be taken out of the *rf*-sweep generator ahead of the attenuator circuit to insure a constant voltage level at the input to the marker adder, regardless of the setting of the attenuator control on the generator. A sampling terminal is provided on

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 WORCESTER, MASS.



some sweep generators and can be added on others.°° The rf-marker signal at the desired marker frequency is taken directly from the rf-output connector of the marker generator and fed into a marker-in terminal. The sweep and marker signals are mixed in the crystal-diode-detector circuit and a beat-frequency (difference) signal is obtained. The beat-frequency differences between the sweep and marker signals will vary from zero to the maximum swing of the sweep excursion. Only a limited band of beat-frequencies is selected to form the marker signal.

12AX7 Amp Stages

The beat signal is applied to 12AX7 amplifier stages, which amplify the signal. The output from the 12AX7 is then applied to a mixer stage, (12AU7), through a marker-amplitude control which adjusts marker height. Marker shape and polarity are determined by a 30-mh inductor and a pair of 4700-mmfd capacitors, which comprise a low-pass filter, and a 1N34A, which provides clipping. A rotary switch in this circuit provides a choice of the markers. In the first three positions of the switch, the 30-mh coil in the switch network is shorted out and the 4700-mmfd coil-bridging capacitors are disconnected from ground. In the fourth position, the beat signal is passed through the low-pass filter which filters out high-frequency components of the signal, resulting in a narrow marker on the scope trace. The filter also serves to keep low-frequency modulation on the marker signal, such as 150-ke sideband-marker harmonics, from modulating the trace during FM-detector alignment. In positions 2 and 4 of the switch, the 1N34A is disconnected and no clipping occurs. In position 1, the crystal clips the lower half of the marker; in position 3, polarity of the crystal connections is reversed and the top half of the marker is clipped.

Demodulated Sweep Traces

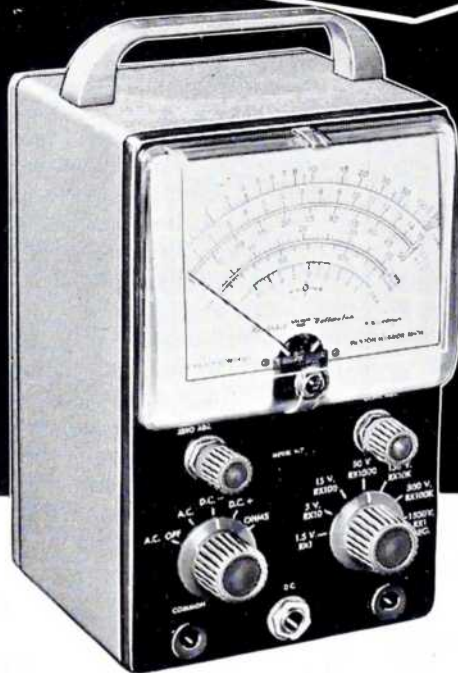
The demodulated sweep trace is taken from the receiver at a demodulated-signal point in the tuner, at the second detector, or at high-frequency test points through a demodulator probe. The demodulated signal is fed to a 12AU7 sweep-trace amplifier through the demod-signal-in connector. This tube provides a small degree of amplification of the sweep signal and, in conjunction with the 1-megohm trace amplitude and polarity control, provides a means of adjusting polarity and amplitude of the trace displayed on the scope screen. The sweep signal is coupled from the 12AU7 sweep-trace amp to the 12AU7 adder stage, where the marker pip is superimposed on the sweep trace. The output signal from the adder stage is available at the scope-cert connector for application to the vertical-amplifier section of the scope.

Freedom from bounce, jitter, and other undesirable scope-trace effects is provided by a voltage-stabilizing circuit consisting of one-half of a 12AU7 and associated resistors and capacitors. The component values were chosen to provide a long time constant. Any variation, such as a line-voltage surge, in the output voltage from the power supply, is applied to the grid of the 12AU7 tube.

(Continued on page 24)

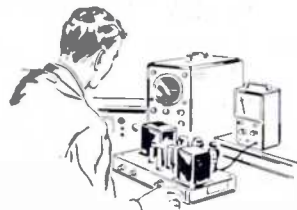
°°Such as the RCA WR-59-series TV sweep generators.

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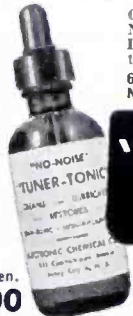
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Marker-Adders

(Continued from page 23)

Then an out-of-phase signal at the plate causes cancellation of the surge voltage and a high degree of trace stability is obtained.

Operation During IF/Video Alignment

The advantages of the marker adder and the method of generating the marker signal described are the same for *if/vf* alignment except that the *if/vf* signal from the sweep generator must be handled differently. For generation of an *if/vf* marker, it is necessary, as in the case of an *rf* marker, to apply part of the *if/vf*-sweep signal to the beat-frequency detector circuit. Because most *if/vf*-sweep generators are not equipped with a sample voltage terminal located ahead of the *if/vf* attenuator, it is necessary to feed the full *if/vf*-output voltage from the sweep generator to the marker adder and to provide an additional means of attenuation before the sweep signal is applied to the receiver undergoing alignment. Part of the full *if/vf* signal is sampled out in the marker adder and fed to the beat-frequency detector. These requirements are met by feeding the maximum *if/vf* signal from the sweep generator directly into the marker adder through a *if/vf* sweep-in connector. Part of the sweep voltage is fed to the beat-frequency detector circuit through a 1000-ohm resistor. The sweep signal is taken out of the marker adder through the *if/vf* attenuator section. The output sweep voltage is available at the *if/vf* sweep out connector for application to the receiver. The demodulated sweep signal from the receiver is then fed into the *demod-signal-in* terminal.

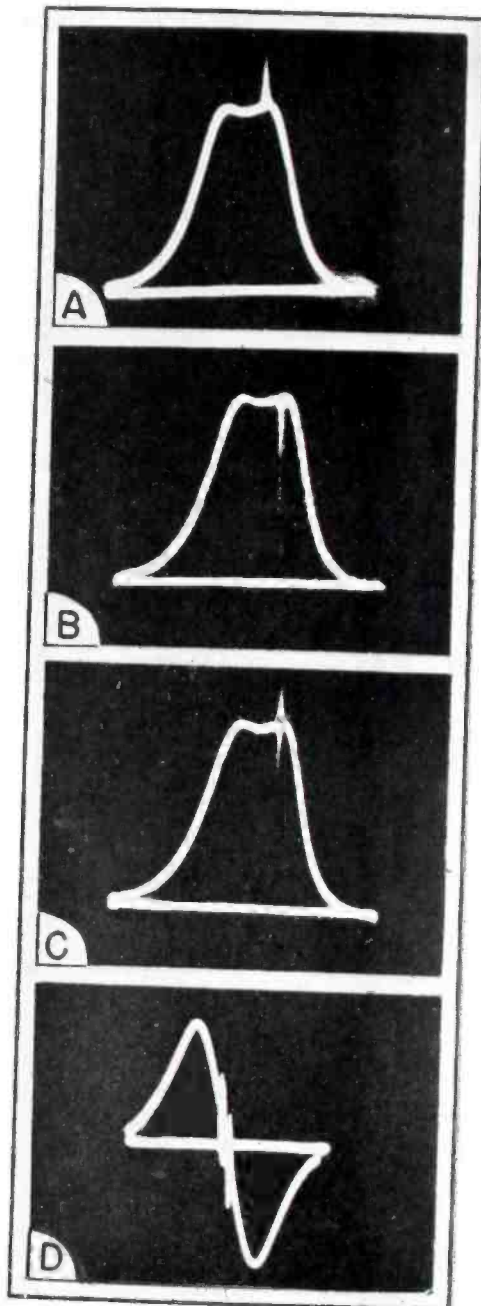
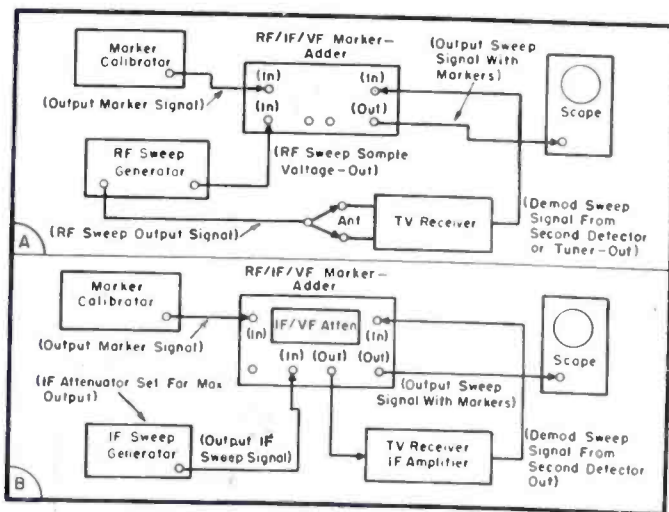


FIG. 6: FOUR DIFFERENT TYPES of markers produced by marker-adder: (a) Negative-clipped marker; (b) Positive-clipped marker; (c) Positive-and negative-peak marker (wide band); (d) Positive-and negative-peak marker (narrow band).



(Left)

FIG. 7: RF-IF alignment test setups with marker-adder. The rf arrangement is shown in (a); the if in (b).

ASSOCIATIONS

TSA, WASHINGTON, D. C.

AT THE FIRST ANNUAL meeting of the Television Service Association of Metropolitan Washington, D. C., Robert Peters was elected president; Bernard Bognovitz, vice president, and Carl Johnston, treasurer. Robert Trollinger and George B. Sharpe were elected to the board of directors.

Hymie Nussbaum is executive secretary of TSA.

Bernie Bognovitz is also serving as editor of *TSA News*. Assistants include Robb Peters and Herman Gainen. Carl Johnston is in charge of the advertising department. Contributors to *TSA News* include Norman Selinger, James Crane and Hymie Nussbaum.

TRT, KANSAS CITY, MO.

P. A. Scott, chairman of the executive committee of the Television and Radio Technician Association, Kansas City, Mo., and instructor at the Central Technical Institute, resigned recently to accept a temporary transfer to CTT's California Air College, Hollywood, Calif.

Scott's new assignment will include the setting up of an electronics division in the California school.

By a unanimous vote TRT's executive committee selected L. A. Betros to complete Scott's term for 1957.

TEN YEARS AGO IN SERVICE

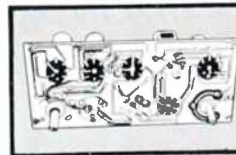
INCREASING PRODUCTION and sales of TV-FM receivers boomed installation-repair-clinic activity. . . . A record breaking production of over 700,000 AM-FM receivers for the year was forecast by industry heads. . . . One manufacturer announced a nationwide lecture program, covering 23 major cities throughout the country, featuring demonstrations and talks on sight and sound chassis. . . . Associations in the east detailed plans for a fall symposium headlining television and FM developments. . . . Instrument manufacturers revealed designs of antenna locators and field-strength meters for use with TV and FM antennas. . . . The first exclusive report on FM antennas and transmission lines was published. . . . Highlights of first multiple TV-antenna system for apartment houses, demonstrated in New York City, were disclosed. . . . Projection type TV receivers, providing 15" x 20" images in lid of console, were shown in a field test. . . .

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FIG. 1: OUTPUT TRANSFORMER tapping arrangements. (a)—basic connections; (b)—connections for 4, 8 or 16 ohms, with one side grounded; (c)—connection for 16 ohms with center-tapped ground. (Bogen)

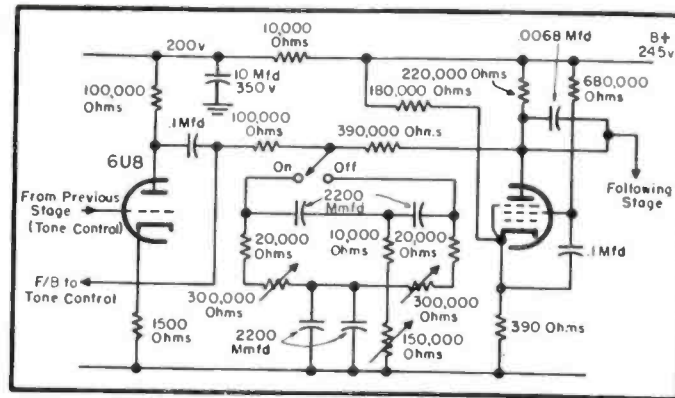
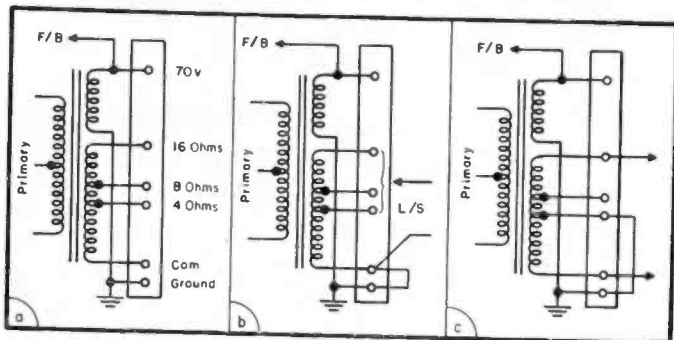


FIG. 2: SCHEMATIC FOR twin-T-with-feedback slot circuit that provides anti-acoustic-feedback action. (Bogen)

Outdoor Amplifiers For Commercial Sound

Output Requirements . . . Feedback Control Systems

by NORMAN CROWHURST

FLEXIBLE OUTPUT is extremely important in an outdoor system. In flexible-output-type amplifiers the normal 4, 8 and 16-ohm winding with a common at one end, is not directly connected to ground. The 70-v winding is isolated from this output winding and does have the side connected to ground; it also provides the connection for negative feedback. This arrangement has been found to give the best possible operation for the 70-v winding, which is the output connection likely to get the greatest variety of impedances connected to it. Normally the 16-ohm tap will be connected to a 16-ohm loudspeaker, or accordingly on the other taps.

A strap is provided on these models, so that the common terminal of the 4, 8, 16-ohm winding can be strapped to ground, or else the center tap of the 16-ohm winding can be grounded, by connecting to the 4-ohm tap. This provides a lower voltage output than the 70-v line with a center-tapped ground.

Bypassing Requirements

Failure to use bypass capacitors with separate resistors in low-level distortion amplifiers¹ not only reduces gain by regeneration; it reduces output. If a single resistor is used, it is best, in achieving a good output with a smooth overload characteristic, not to use a bypass capacitor. The low-level distortion may be a little higher, but any overload will invariably initiate serious crossover

distortion due to momentary over-biasing, which sounds a lot worse.

If separate resistors are used, it is best to bypass one cathode to the other, rather than both to ground. This can be done in two ways: With

a reversible electrolytic, in which case only one is required, or with a pair of non-reversible type, in which case a relatively high resistor is used for polarization.

Anti-Feedback Controls

Another feature that is convenient for *pa* work is anti-feedback control; a twin T-network, the circuit of which is shown at Fig. 2. Here we find a 6U8, with the triode section operating as part of the preamplifier, while the pentode section provides feedback for the twin-T. In the *off* position, this combination acts as a straight amplifier.

Variable-Frequency Adjustments

When the control is turned to the *on* position, a three-ganged variable resistance adjusts the frequency of the twin-T to provide a sharp rejection filter that will absorb the frequency at which acoustic feedback first commences. This enables the amplifier to be turned up a little higher until the next feedback point is encountered. Negative feedback over the twin-T, from the plate of the pentode section, using the 390,000-ohm resistor, serves to sharpen the rejection response so that, apart from a very narrow band slot, the amplifier response remains flat.

¹Outdoor Amplifiers; June, 1957, SERVICE.



OUTDOOR-INDOOR SOUND system amplifiers designed for store, club, church, office, school, warehouse, factory, auction and entertainment applications. Available in 10, 15 and 30-watt types. When used with trumpet speakers 10-watt amplifier is said to cover up to 20,000 square feet; 15-watt model up to 50,000 square feet and the 30 watt, 100,000 square feet. Phono tops are available for both 15 and 30-watt models. (Precision Electronics Inc., 9101 King Street, Franklin Park, Ill.)

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Model PA-HF



Model SA-30



Model SA-HF



Model MA-25

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Response: 70 to 10,000 cps. Power Capacity: Full Range 50 watts, Adjusted Range* 100 watts. Impedance: 16 ohms. Transformer Impedances: 100/165/250/500/1000/2000 ohms, 70 v. Line Power Taps: 50/30/20/10/5/2.5 watts. List Price: \$57.50.

Model PA-HF - Without question the finest driver unit ever offered. For applications requiring the greatest power handling capacity, maximum sensitivity, widest range frequency, response, plus rugged lifetime construction. Features completely die-cast aluminum housing. Water-tight voice terminals are located at base of housing for added convenience. Increased sound output cuts amplifier requirements in half!

Response: 70 to 10,000 cps. Power Capacity: Full Range 50 watts, Adjusted Range* 100 watts. Impedance: 16 ohms. List Price: \$47.50.

Model SA-30 - High efficiency and response of Model SA-HF, plus "battleship" construction for maximum durability against abuse or in hazardous environments. Completely die-cast aluminum housing and built-in matching transformer for connection to high impedance lines or "constant voltage" systems. Exclusive water-tight dural gland nut cable entrance. Shockproof bi-sectional speaker construction.

Response: 80 to 10,000 cps. Power Capacity: Full Range 30 watts, Adjusted Range* 60 watts. Impedance: 16 ohms. Transformer Impedances: 45/165/250/500/1000/2000 ohms, 70 v. Line Power Taps: 30/20/10/5/2.5 watts. List Price: \$47.50.

Model SA-HF - Often called "the workhorse of the sound industry." Meets most p.a. and industrial requirements. Response to 10,000 cycles and more efficient than the Model MA-25. Will deliver that extra punch needed to cut through heavy noise. Use for speech or high quality music. Tropicalized and hermetically sealed for continuous top flight performance even under adverse weather conditions.

Response: 80 to 10,000 cps. Power Capacity: Full Range 30 watts, Adjusted Range* 60 watts. Impedance: 16 ohms. List Price: \$36.00.

Model MA-25 - Use this rugged, weather-proof driver unit where response to 6500 cycles is adequate or to preserve "balance" when used with high cut-off frequency trumpets. Low in cost, high in quality, featuring high efficiency magnet, tropicalized 2" voice coil, "rim-centered" breakdown-proof bakelite diaphragm.

Response: 85 to 6500 cps. Power Capacity: Full Range 25 watts, Adjusted Range* 50 watts. Impedance: 16 ohms. List Price: \$27.50.

*Program response adjusted to horn cut-off.

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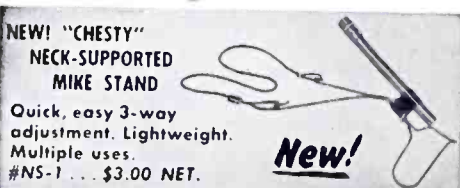


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CATALOGS—BOOKS

JOHN F. RIDER PUBLISHER, INC., 116 W. 14th St., New York 11, N. Y., has announced publication of the third supplement to the *Receiving Tube Substitution Guidebook* by H. A. MIDDLETON, which contains more than 200 European to American tube substitutions and over 230 American to European tube substitutions. The book details the necessary wiring changes. Volume also provides 830 receiving tube and over 200 picture tube substitutions as well. Priced at \$1.35.

BELDEN MANUFACTURING COMPANY, Chicago, Ill. has released an electronic wire and cable catalog (857) containing information on audio and mike cables, and hookup wire.

ELECTRO PRODUCTS LABORATORIES, 4500 N. Ravenswood Ave., Chicago 40, Ill., have prepared a 4-page folder, explaining the construction and operating principles of filtered *dc* power supplies which utilize a choke input-type filter circuit and are designed for testing transistor auto radios, transistor portable radios, and tube auto radios. The unit operates on *ac* and handles 6/12-v tube radios, as well as transistor models.

UNITED MOTORS SERVICE, division of General Motors, Detroit 2, Mich., has announced publication of a 60-page illustrated Delco electronic parts catalog. Listed are tubes, vibrators, auto antennas, speakers, auto radio components and all parts for the Guide *autronic eye* automatic headlamp control. Parts are alphabetically listed by make of car, and are indexed for application reference by distributors, dealers and Service Men.

McGraw-Hill Book Information Service, 327 W. 41 St., N. Y. 36, N. Y., has announced the publication of *Small-Appliance Servicing* by P. T. BROCKWELL, Jr.

The book offers basic appliance principles, testing and servicing techniques. It deals with the seven types of appliances most often brought into the repair shop: irons, toasters, mixers, roasters, coffee makers, waffle and sandwich grills, and rotisseries. Details fundamental constructional and operational knowledge that can be applied to repair of all makes and models. 225 pages; priced at \$4.50.

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ACCESSORIES

VIBRATOR POWER SUPPLY

A VIBRATOR-power supply, *Supreme 175*, featuring a fan-cooled vibrator, is now available from Terado Co., 1068 Raymond Ave., St. Paul 14, Minn.

Unit rating of 175 to 200 *w* is said to be ample for all requirements from a 12-v battery source. Supply can be used for operation of portable TV sets, power tools and tape recorders.



LINE VOLTAGE ADJUSTER

A LINE-VOLTAGE adjuster, *LA 350*, for boosting or reducing voltage to assure best operation at approximately 115 *v*, has been introduced by Anchor Products Co., 2712 W. Montrose Ave., Chicago 18, Ill.

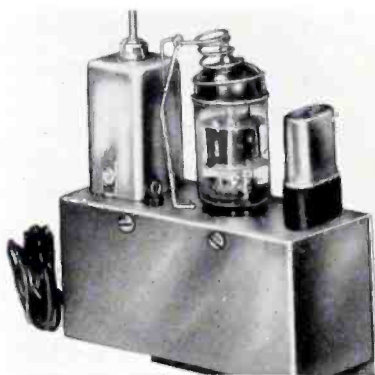
Unit, it is said, can increase or decrease voltage approximately 10%. Four-position switch permits selection of *off*, *normal*, *10-v up* and *10-v down*. Input ranges from 100 to 130 *v*; output from 110 to 120 *v*. Designed for 60-cycle *ac* 3-amp operation. For use with units rated up to 300 *w*.

COLOR-AUDIO-SCAN ADAPTERS

TWO ACCESSORIES FOR ADDING color and sound to the B&K model 1000 Dyna-Scan video generator have been announced by B&K Manufacturing Co., 3731 N. Southport Ave., Chicago 13, Ill.

One item, the model *C15 Color-Scan* (shown below) adds crystal-controlled rainbow display (orange, red, magenta, blue, cyan, green). Permits testing of color sync circuits, checking hue-control range, alignment of color demodulators.

The second unit, model *S16 Audio-Scan* adds FM sound transmission 4.5-mc above video carrier, with modulation from any available audio source. Enables one to combine speech or music with video display. Can be modulated with built-in 400-cycle tone generator for test signal or from external signal source.



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MODEL 737A



SEMI-DIRECTIONAL

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"GRADIENT"

MODEL 315



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you can rely on these SHURE Microphones**

**FOR PUBLIC ADDRESS • HOME RECORDING •
COMMUNICATIONS • PAGING AND INTERCOM
SYSTEMS**

MODEL 737A "MONOPLEX": Uni-directional, moisture-proofed crystal microphone—reduces feedback by 67%! Can be used under adverse conditions of background noise where conventional microphones would be practically useless. "Humi-seal" Crystal for trouble-free operation even in humid climates. High impedance unit with excellent response to 10,000 cps. Output -54.0 db.

LIST PRICE \$46.00

MODEL 51 "SONODYNE": Semi-directional, dynamic microphone. Switch for low, medium, or high impedance makes it three microphones in one! Ideal for recording and "close-talking" applications. Frequency response is 60-10,000 cps. Output -52.5 db. Unusually rugged microphone; can be used in any climate, indoors or outdoors.

LIST PRICE \$49.50

MODEL 315 "GRADIENT": Bi-directional high fidelity microphone with multi-impedance switch. Picks up sound equally from front and rear; is "dead" at sides. Ideal for interview broadcasting or group recording. Frequency response 50-12,000 cps. Provides exceptional voice and music reproduction. Particularly useful in installations where feedback is a problem. Output -57 db.

LIST PRICE \$85.00

All three units have rugged, die-cast metal cases and are finished in a rich satin chrome.

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Microphones ~ Electronic Components

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It's as basic as knowing your ABC's... that C-D vibrators are your best buys your 'round... day in and day out! Look for the famous C-D seal... it is your guarantee of quality combined with skilled engineering and controlled manufacture!



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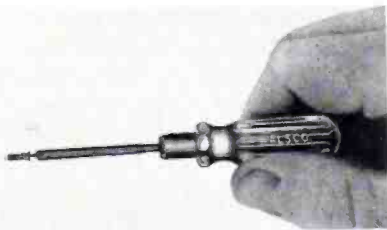
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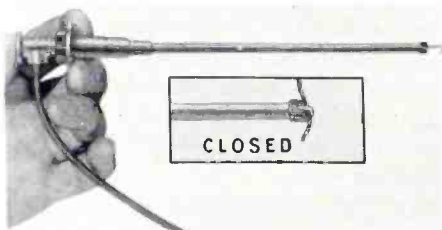
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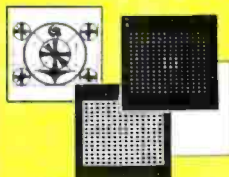
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TRANSPARENCIES
ARE SUPPLIED**

1. Indian Head Pattern
 2. White Dot Pattern
 3. White Line Crosshatch
- Plus One Clear Acetate

These are broadcast quality and assure high-definition TV images. You can also transmit slides of any subject you wish.

Simplify and speed servicing with this unique, new, COMPLETE FLYING SPOT SCANNER. Produces composite video and sync signal that operates any standard VHF black and white or color TV receiver. Easily reproduces standard Indian Head test pattern or any other pattern—in home, shop or store—for proper TV set alignment; enables you to make all color TV static and dynamic convergence adjustments with stable White Dot and White Line patterns. Can be used with one or more standard TV receivers or fed into master antenna system. Reproduces from any film transparency. Transmits messages typed or written on clear acetate. Size: 16 1/2 in. long, 10 3/8 in. high, 9 1/2 in. wide. Net wt. 28 lbs. **\$199⁹⁵** NET

EASILY ADD COLOR OR SOUND

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PERFORMANCE: Good TV pictures depend upon the reliability of the entire set installation—AMPHENOL Twin Lead is the strongest link in any system, a guarantee of better picture quality!

CUSTOMER SATISFACTION: Complete customer satisfaction is your key to repeat sales—AMPHENOL Twin Lead provides you with this key to better business, better profits!

GREATER PROFITS: As every Dealer and Serviceman knows, AMPHENOL Twin Lead provides plus profits on every sale—fair mark-ups to fair list prices!

EASY-TO-USE-HANKS: Complete customer satisfaction is your key to repeat sales—AMPHENOL Twin Lead Hanks make selling and installing easier. Popular lengths of 25, 50, 75 and 100 feet; also reels of 500 and 1000 feet.

Over 5,000,000 AMPHENOL outdoor Twin Lead Installations Have Shown The Way to Quality!



AMPHENOL ELECTRONICS CORPORATION
chicago 50, illinois



FM Mobile Receiver

(Continued from page 9)

born case of interference will require special attention.

With the receiver installed in the car and the antenna connected, the car motor should be started. Ignition noise can be distinguished by its popping sound at idling speed. This noise may be reduced by installing a suppressor in the main high-voltage lead; preferably the type which is contained within the wire itself. The spark plugs should be replaced with resistor-types, or quality suppressors can be added at each spark plug. A shielded type .5-mfd capacitor with a short lead should be connected to the armature terminal of the generator to correct generator noise. A similar capacitor can be used at the voltage regulator and other points of interference.

Service Notes

(Continued from page 14)

indication will be materially different when the ohmmeter test prods are reversed.

Not only will misleading indications be obtained, but the transistors themselves can be permanently damaged by resistance measurement.

If resistance measurements are to be made in a transistor radio, the transistors should be removed from the circuit to be tested. If the transistors are soldered in on a printed-circuit board, it will be best to unsolder one terminal of the component to be tested.

Current measurements are seldom made in the servicing of radios because of the difficulty in making such measurements.

However, transistor circuit design is based primarily on current flow and not upon voltage. Although current measurements are not readily made, the *dc* voltage drop across circuit resistors can sometimes be used to provide a reasonably accurate indication of current.

In RCA models 8-BT-9 and 9-BT-9 the *no-signal* emitter currents are as follows:

Q_1 (2N140) .65 ma	Q_2 (2N109) 1.2 ma
Q_3 (2N139) .52 ma	Q_4 (2N109) 1.8 ma
Q_5 (2N139) .95 ma	Q_6 (2N109) 1.8 ma

The collector currents in other models are of similar magnitude with the exception of models 8-BT-7 and 8-BT-8. The audio amplifier of these two models is class A and the single output transistor has a rated *no-signal* emitter current of 10.7 ma; the current has little variation with audio output variation.

110° TV Chassis

(Continued from page 12)

the top and the bottom of the cabinet. In the console for this set, the chassis is mounted on a metal rail extending across the back of the receiver. The chassis is prevented from falling forward by two small extensions, one beneath the tuner, and the other extending towards the right rear of the cabinet. Screws from the back cover go through these rails and through the metal extensions locking the chassis in place.

Horizontal Deflection Circuit

Cross-sectional views of the new and the old 70° yokes appear in Fig. 3 (p. 12). It will be noted that the windings of the 110° yoke are attached to the bell of the picture tube, the core material of the yoke is attached in a similar manner. The extra turns added to the smaller diameter add up to a yoke inductance superior to that of the present 70° deflection yokes. In addition, the windings are flared at the yoke, the center of deflection is moved forward into the bell of the picture tube. This design enables us to get a 110° deflection without corner-cutting. The design with any deflection yoke itself must be fully adapted to the bell of the picture tube for proper operation.

A coupled multivibrator is used to produce the horizontal signal. It consists of a coupled multivibrator similar to the popular 6CG7. The design idea of the horizontal system was to produce a scan with approximately the picture tube deflection and well adapted to the picture tube.

To do this, the horizontal vibrator was fed with a horizontal output tube which is output tube is sized, but very efficient. Efficiency is dependent upon the service Men are aware of, is whether the core saturate into the core.

4 (p. 12) are through a

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GENERAL CEMENT MFG. CO.

Division of Textron Inc.

400 South Wyman Street, Rockford, Illinois

Increased magnetic flux will be developed with an increase of applied electrical power. At this point the core of the transformer is considered to be saturated. In the lower section of the drawing, we see the same electromagnet, except that an additional winding has been added. By following the current flowing through the winding, it can be observed that the current is flowing in opposite directions through the two windings; therefore, the magnetic field being developed by the two windings will cancel.

In conventional-scan transformers, the core is partially saturated by the

dc flowing in the windings. This *dc* is the B+ for the plate of the driver tube. This means that only a limited amount of *rf* power can be handled by the core material. To be conventional, simply enlarging the size of the core material would overcome this problem. Engineering did not want to do this as it would lead to other problems in the transformer itself. Instead, it was felt that the portion of core material, that was being *lost* due to the *dc* flowing in the horizontal scan transformer, should be eliminated. To do this, an additional winding was placed on the horizontal scan

(Continued on page 34)

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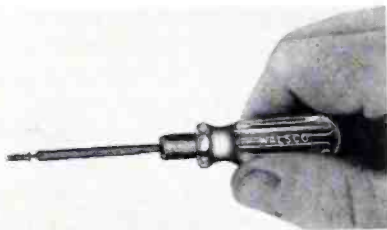
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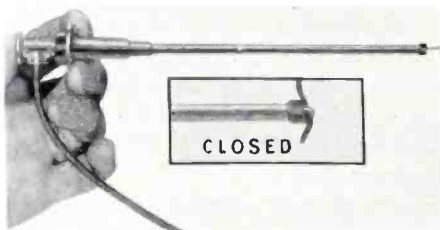
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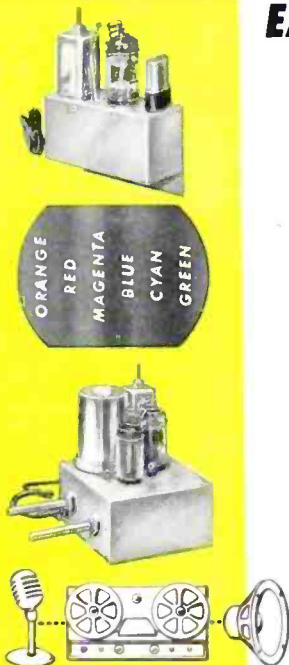
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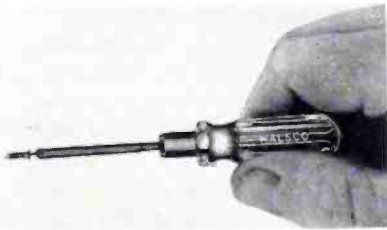
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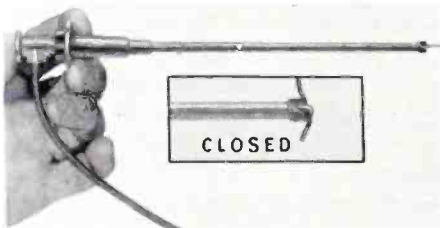
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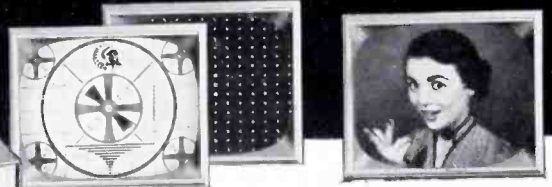
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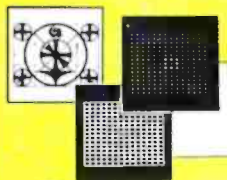
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Simplify and speed servicing with this unique, new, COMPLETE FLYING SPOT SCANNER. Produces composite video and sync signal that operates any standard VHF black and white or color TV receiver. Easily reproduces standard Indian Head test pattern or any other pattern—in home, shop or store—for proper TV set alignment; enables you to make all color TV static and dynamic convergence adjustments with stable White Dot and White Line patterns. Can be used with one or more standard TV receivers or fed into master antenna system. Reproduces from any film transparency. Transmits messages typed or written on clear acetate. Size: 16 1/2 in. long, 10 3/8 in. high, 9 1/2 in. wide. Net wt. 28 lbs. **\$199⁹⁵** NET

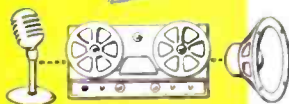
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Adds crystal-controlled full color rainbow display (orange, red, magenta, blue, cyan, green). In conjunction with the White Dot and White Line patterns, it makes the Model 1000 a complete color test instrument. Enables you to test color sync circuits—check range of hue control—align color demodulators, etc. Easy to install on chassis. Just 4 wires to connect. Net, **\$199⁹⁵**

NEW MODEL S16 AUDIO-SCAN

Adds FM sound transmission exactly like a TV station. 4.5 megacycles above video carrier, with modulation from any available audio source. Enables you to combine speech or music with the video display. Can be modulated with built-in 400 cycle tone generator for test signal or from external signal source such as microphone, tape recorder, FM-AM tuner, or audio oscillator. Can be used for aligning sound I.F. stages of intercarrier television set. Full 25 KC deviation similar to TV station. Has built-in audio amplifier and volume control. Input takes audio signals from .01 to 5 volts, low or high impedance. Simple to install on chassis. Net, **\$299⁹⁵**



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TWIN LEAD



More than 25% of all outdoor tv installations—more than 5,000,000 installations in the United States alone—have been made with AMPHENOL Twin Lead! These tremendous sales figures reflect the popularity of AMPHENOL Twin Lead with Dealers, popularity founded on these important advantages:

PERFORMANCE: Good TV pictures depend upon the *reliability* of the entire set installation—AMPHENOL Twin Lead is the *strongest link* in any system, a guarantee of better picture quality!

CUSTOMER SATISFACTION: Complete customer satisfaction is your key to *repeat sales*—AMPHENOL Twin Lead provides you with this key to better business, better profits!

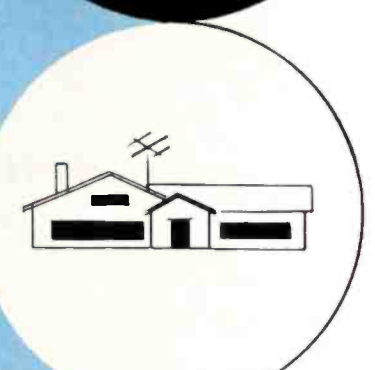
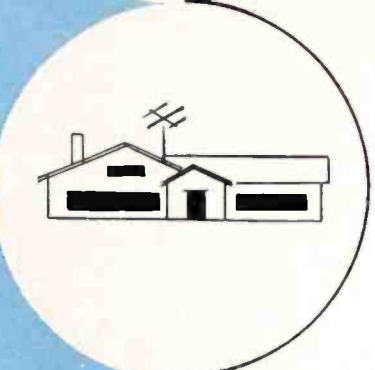
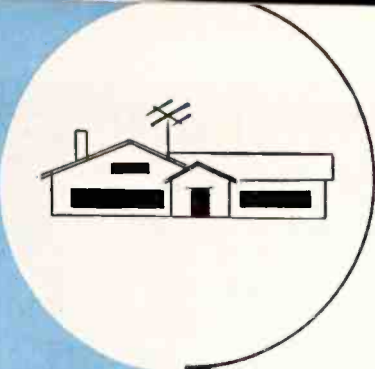
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EASY-TO-USE-HANKS: Complete customer satisfaction is your key to *repeat sales*—AMPHENOL Twin Lead Hanks make selling and installing easier. Popular lengths of 25, 50, 75 and 100 feet; also reels of 500 and 1000 feet.

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Installations Have Shown The Way to Quality!



AMPHENOL ELECTRONICS CORPORATION
chicago 50, illinois



FM Mobile Receiver

(Continued from page 9)

born case of interference will require special attention.

With the receiver installed in the car and the antenna connected, the car motor should be started. Ignition noise can be distinguished by its popping sound at idling speed. This noise may be reduced by installing a suppressor in the main high-voltage lead; preferably the type which is contained within the wire itself. The spark plugs should be replaced with resistor-types, or quality suppressors can be added at each spark plug. A shielded type .5-mfd capacitor with a short lead should be connected to the armature terminal of the generator to correct generator noise. A similar capacitor can be used at the voltage regulator and other points of interference.

Service Notes

(Continued from page 14)

indication will be materially different when the ohmmeter test prods are reversed.

Not only will misleading indications be obtained, but the transistors themselves can be permanently damaged by resistance measurement.

If resistance measurements are to be made in a transistor radio, the transistors should be removed from the circuit to be tested. If the transistors are soldered in on a printed-circuit board, it will be best to unsolder one terminal of the component to be tested.

Current measurements are seldom made in the servicing of radios because of the difficulty in making such measurements.

However, transistor circuit design is based primarily on current flow and not upon voltage. Although current measurements are not readily made, the *dc* voltage drop across circuit resistors can sometimes be used to provide a reasonably accurate indication of current.

In RCA models 8-BT-9 and 9-BT-9 the *no-signal* emitter currents are as follows:

Q_1 (2N140) .65 ma	Q_4 (2N109) 1.2 ma
Q_2 (2N139) .52 ma	Q_5 (2N109) 1.8 ma
Q_3 (2N139) .95 ma	Q_6 (2N109) 1.8 ma

The collector currents in other models are of similar magnitude with the exception of models 8-BT-7 and 8-BT-8. The audio amplifier of these two models is class A and the single output transistor has a rated *no-signal* emitter current of 10.7 ma; the current has little variation with audio output variation.

110° TV Chassis

(Continued from page 12)

the top and the bottom of the cabinet. In the console for this set, the chassis is mounted on a metal rail extending across the back of the receiver. The chassis is prevented from falling forward by two small extensions, one underneath the tuner, and the other extending towards the right rear of the cabinet. Screws from the back cover go through these rails and through the metal extensions locking the chassis in place.

The Horizontal Deflection Circuit

Cross-sectional views of the new 110° and the old 70° yokes appear in Fig. 3 (p. 12). It will be noted that the windings of the 110° yoke are flared onto the bell of the picture tube, and that the core material of the yoke itself is flared in a similar manner. These features added to the smaller neck diameter add up to a yoke efficiency superior to that of the previously-used deflection yokes. In addition, since the windings are flared on the 110° yoke, the center of deflection is now forward into the bell of the picture tube. This design enabled engineering to get a 110° diagonal scan without corner-cutting. Of course, as with any deflection yoke, the yoke itself must be fully forward against the bell of the picture tube for proper operation.

A horizontal multivibrator is used to develop the horizontal signal. It is a cathode-coupled multivibrator using the new popular 6CG7. The basic design idea of the horizontal scanning system was to develop a 110° scan with approximately 17,000 v for the picture tube by utilizing conventional and well known driver tubes. To do this, the output of the multivibrator was fed to the grid of the horizontal output tube, a 12DQ6. This output tube drives a new small-sized, but very efficient output transformer. Efficiency of this transformer is dependent upon cancellation of flux. Service Men are familiar with the core material used in a horizontal scan transformer. But what they may not be aware of, is that with all electromagnets, whether they be *dc* or *ac*, the core will saturate if the amount of power put into the windings is greater than the core material can handle.

This point is illustrated in Fig. 4 (p. 12), where two electromagnets are shown. If *dc* is caused to flow through the windings on the upper magnet, a point will be reached where no in-

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creased magnetic flux will be developed with an increase of applied electrical power. At this point the core of the transformer is considered to be saturated. In the lower section of the drawing, we see the same electromagnet, except that an additional winding has been added. By following the current flowing through the winding, it can be observed that the current is flowing in opposite directions through the two windings; therefore, the magnetic field being developed by the two windings will cancel.

In conventional-scan transformers, the core is partially saturated by the

dc flowing in the windings. This *dc* is the B+ for the plate of the driver tube. This means that only a limited amount of *rf* power can be handled by the core material. To be conventional, simply enlarging the size of the core material would overcome this problem. Engineering did not want to do this as it would lead to other problems in the transformer itself. Instead, it was felt that the portion of core material, that was being *lost* due to the *dc* flowing in the horizontal scan transformer, should be eliminated. To do this, an additional winding was placed on the horizontal scan

(Continued on page 34)

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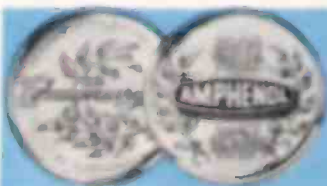
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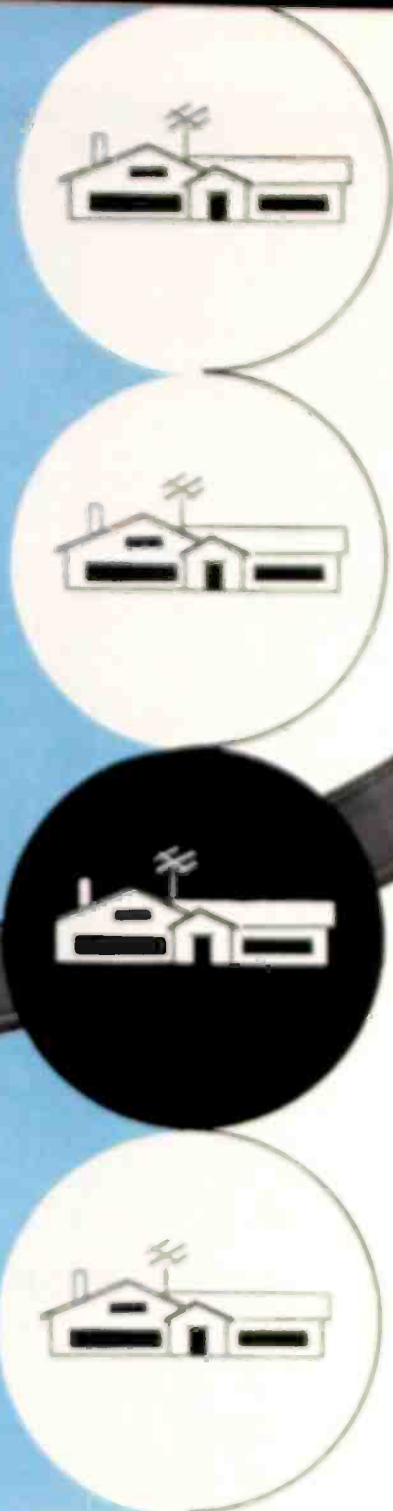
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Chicago 26, Illinois



FM Mobile Receiver

(Continued from page 9)

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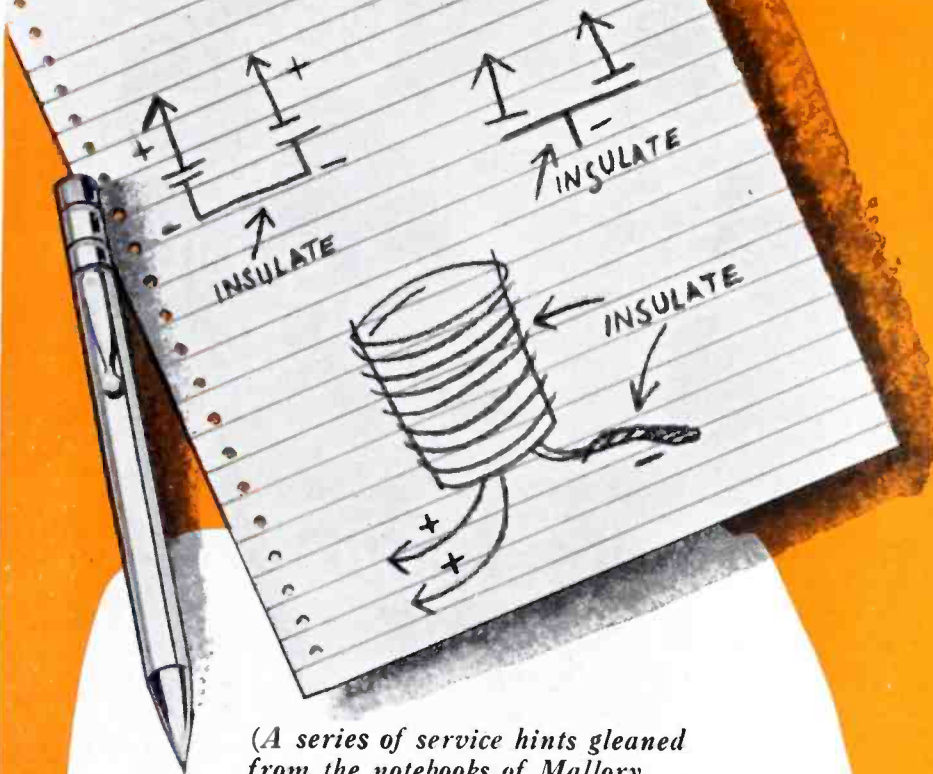
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(Continued on page 34)

MALLORY Clippings



(A series of service hints gleaned from the notebooks of Mallory design and application engineers)

Once in a while, on some special service job, you're apt to need a *non-polarized* capacitor. Here's a way to make temporary repairs until you can get down to your distributor's for a Mallory replacement.

Use a common negative dual capacitor, each section having the *same* voltage rating and *twice* the capacity rating as the unit being replaced. Use the two positive leads *only*—don't connect the negative lead (or the can) to anything, just insulate them well!

Assuming sufficient physical space, the same thing can be done with two single capacitors—by connecting the negative leads together and insulating them, and the cans, carefully. Use the two positive leads.

Of course, for an exact replacement or temporary repairs such as above, you ought to use Mallory FP Capacitors. They're tougher, longer lived, and plenty dependable—but, you probably know that from experience. See your Mallory Distributor today—lay in a working replacement stock.

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110° TV Chassis

(Continued from page 33)

transformer in the same direction as the main auto-winding. By proper circuit connections, the B+ current for the horizontal output tube is made to flow in one direction through the additional winding, and in the other direction through the main auto-winding. In other words, the B+ is flowing in one direction for one winding, and in the opposite direction for the other winding. This opposite *dc* flow will cause field cancellation of the *dc* component. Therefore, all the core material can be used to handle the *rf* energy; this is shown in Fig. 5 (p. 12). This means that a much smaller core material can be used over conventional transformers. This increased efficiency, in conjunction with the new high sensitivity yoke, eliminated the scan problem that was anticipated.

The Vertical Deflection Circuit

The vertical deflection circuit (Fig. 6, p. 12) incorporates a dual-triode tube. This is a new type tube, the 10DE7, specifically designed for this application. It is a dissimilar triode; that is, one of the triode sections has a lower plate dissipation than the other.

Although we have a plate-coupled multivibrator circuit, one triode is developing considerable power to drive the yoke. The feedback circuits to maintain this oscillator are from plate pin 1 back through C_{310} , R_{314} , and C_{312} to grid pin 7. The other feedback circuit is from plate pin 6 through C_{313} to grid pin 2. The free running frequency of this oscillator is controlled by adjusting R_{317} which changes the rate of discharge of C_{314} and C_{312} . These capacitors are charged each time V_{6A} draws grid current. By decreasing the resistance of R_{317} , the discharge time is shortened and the oscillator speeds up.

Some of the B+ voltage for V_{6A} is drawn from boost through the height control in series with thermistor R_{320} . This thermistor is in the circuit to control picture size change during warmup time. This is necessary as the *dc* resistance of the yoke changes as it warms up. This upsets the circuit in such a manner that the picture would change height if this thermistor were not in the circuit. At the same time, this change in resistance of the yoke could cause the vertical speed of the circuit to change. In order to prevent this, thermistor R_{320} is located in the feedback circuit from plate pin 1 to grid pin 7. These thermistors will prevent any change in picture size or hold during warmup.

The left triode section of the 10DE7 (V_{6A}) receives its plate supply voltage from two different sources, both of which

go through the height control R_{222} . The primary source is through R_{221} to the 250-V B+ source. The other source is through the thermistor R_{223} to B boost. If V_{01} were not returned to B+, the oscillator would be slow in starting as B boost is the last voltage to be developed after the receiver is turned on. Therefore, no protective grid bias would be available for V_{01} . This bias voltage is developed across the RC network in the grid of V_{01} . With B+ available immediately to both sections, the oscillator will start, developing its protective bias, even though it may be running at reduced amplitude. When boost voltage is available from the h_v supply, the oscillator will lock in at the proper amplitude and linearity. In addition a small amount of protective bias is incorporated in the triode output section by R_{216} which is bypassed by C_{209} .

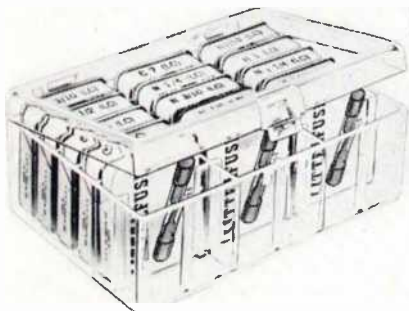
C_{216} , a .47-mfd capacitor, is located across the deflection coil. This prevents pulses from the horizontal winding being coupled back into the vertical output tube. This large capacitor has a very low reactance at 15,750 cps, and acts as a short circuit to pulses of this frequency. However, the reactance is high enough at 60 cps to prevent severe loading. If horizontal pulses were allowed to feed back into the vertical oscillator circuit, it would disrupt interlace.

Retrace blanking is accomplished by developing a pulse in the vertical retrace plate PP_{206} . This pulse is developed by the discharge of C_{211} through R_{224} and C_{221} . This negative-going pulse is coupled to grid pin 5 of the 21CQ4 picture tube and is used to drive the picture tube into cutoff during vertical retrace time.

PLASTIC FUSE CADDY

A PLASTIC caddy, designed to fit into a compartment in a tube caddy, has been announced by Littelfuse, Inc., Des Plaines, Ill. Contains an assortment of 15 LC (limited current) fuse types said to cover 94% of service requirements for this new type of fuse. Caddy has 3 spare compartments for carrying of additional fuses.

LC fuses have been developed to make it physically impossible to fuse equipment at a higher rating than the manufacturers originally intended.



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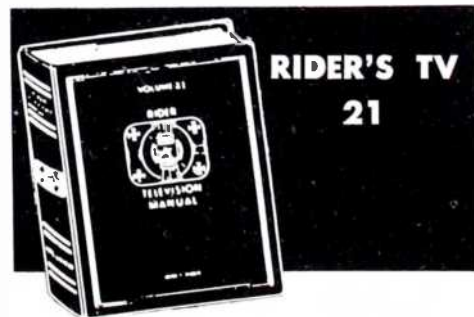
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FAILURE to replace promptly the sapphire stylus, which begins to deteriorate after approximately 100 hours of normal usage, can result in loss of the high frequencies, excessive noise or hiss. If the stylus is very bad, distortions will be evident which will usually result in record deterioration.

To replace either the 78 or lp stylus in DuMont phono models the small screw holding the stylus to the

cartridge should be removed, the new stylus placed in position, and the small screw replaced.

If the phono is being played rather extensively, it may be more economical to use a diamond lp stylus replacement.

Cures for Drift in Radio-Phonos

SOME ISOLATED field complaints have been received regarding oscillator

drift in DuMont RA-349 Tanglewood models, experienced when tuned to the high end of the AM radio dial.

It has been found that this condition can be corrected by replacing the oscillator coil with an improved type, which provides a larger oscillator injection voltage, thereby increasing AM sensitivity.

This replacement coil has been incorporated in all production units, with the exception of approximately the first hundred units.

It is recommended that where the foregoing complaint is encountered, and tube and component tests fail to uncover the defect, the oscillator coil should be physically inspected to determine if it is the original part, which is approximately 2" high (the replacement is only 1" high) and is mounted to the chassis on a wooden dowel (the replacement is mounted on the chassis by direct soldering). If the original part is used, the replacement (part 21008121) should be installed.

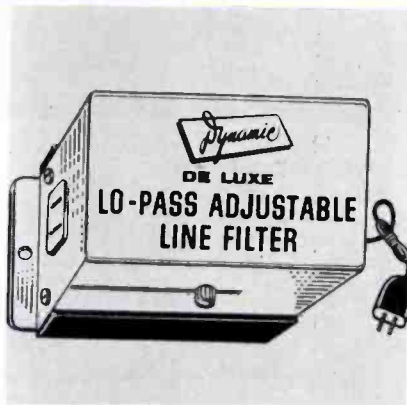
Vibration-Distortion Remedy

WITH BASS in DuMont RA-335 Governor Winthrop phonos set from 70% to full, and the volume at 50%, it has been found that loud vibration and distortion, which occur in the sound, vibrates the changer so badly that the tone arm does not stay on the record. This fault due to acoustical (mechanical) feedback, can be remedied by checking the changer to be sure it is floating freely; i.e., the two changer shipping bolts (Phillipshead bolts on changer face plate) have been fully loosened.

If vibration continues, the two changer shipping bolts should be re-



CAST ALUMINUM BIDIRECTIONAL speaker baffle that is 11" in diameter, weighs 2 pounds and accommodates 8" speakers. Mounts to ceiling or wall. (Lowell Manufacturing Co., 3030 Laclade Station Road, St. Louis 17, Mo.)



ADJUSTABLE LO-PASS line filter designed to eliminate noise picked up through ac or dc lines; automatic attenuation above 10 kc. Features a dual ferrite filter, and a variable filter adjustment control. (Model DAF300; Dynamic Electronics, Inc., 73-39 Woodhaven Boulevard, Forest Hills, L. I., N. Y.)



ALL-WEATHER wide-angle (30 w cont; 50 w peak) pa speaker with an acousti-matched built-in driver (reproducer) unit. Has a one-piece main flare and unit cover; a pressure moulding of reinforced polyester fibreglass. (Model CP-44 King Cobra-Jector; Atlas Sound Corp., 1451 39 St., Brooklyn 18, N. Y.)

moved completely, and the changer seated properly in position. (These bolts may then be reinserted providing they do not touch the side of the holes in the changer mounting board).

In some sets a cloth tape, 1" wide, has been used to secure the changer during shipment. This tape must also be removed to permit the changer to float freely.

Speaker Grille Vibration Checks

UNDER CERTAIN conditions, metal speaker grilles can produce annoying vibration when the phonos are in operation.

To eliminate this possibility, Magnavox has introduced several production modifications. To check the source of the trouble the phono should be played at maximum bass and high volume with either a test or an organ record. The spot causing the rattle may be located by moving the hand around the edge of the metal grille. When the correct location is determined, a small piece of sponge rubber or an equivalent sound-deadening material should be inserted between the metal grille and the trim.

In the Magnavox 293C and 294C, if the rattling is caused by the metal grille vibrating against the baffle board itself, it may be necessary to remove the metal grille and bow it from the sides about two inches. The grille should be replaced with the bow towards the baffle board.

In the 295C, if the rattling is caused by the metal grille vibrating against the baffle board, the metal

grille should be removed and bowed inward from the sides about two inches. Also two sponge rubber strips (part 440993-2) should be cemented to the baffle board. These strips should be seven inches from each end of the baffle and cemented vertically. The metal grille should be replaced with the bowed side toward baffle board. Edges of the grille should be checked for rattles and eliminated by damping as set forth in the foregoing paragraph.

Handling Magnetic Head Shields

THE TR-2-5 TAPE mechanism used in RCA 7-HFR-1 and the TR-2-6 tape mechanism used in models 8-STP-1 and 8-STP-2 use head shields made of nickel-iron alloy.

These shields are hydrogen annealed after fabrication to impart the desired magnetic shielding properties.

The effectiveness of these shields is greatly reduced when subjected to shock, hammering or any other physical mistreatment. Extreme care must be exercised to prevent any rough handling. The shields must not be dropped.

If physical mistreatment occurs, it will show up as hum caused by magnetic radiation to the head; the effects of mistreatment can be overcome only by reannealing.

The metal covering of the head used in models 7-TR-2, 7-TR-3 and

{Based on information supplied by W. E. Whitacre, Service Manager and Jerome Roth, Service Publications, Allen B. DuMont Laboratories, Inc.

C-TRC-1 is made of mu-metal and requires the same handling precautions as the head shields.

Crystal-Ceramic Pickup Replacement with Magnetic Types

IN TRYING to substitute magnetic or variable-reluctance cartridges in place of crystal and ceramic pickups excessive hum often occurs.

This hum is mainly due to induction from the magnetic field of the drive motor. Crystal and ceramic pickups are unaffected by this magnetic field. Magnetic and variable-reluctance pickups must be provided with a preamplifier to obtain the equivalent output from the speaker. The hum is also amplified by the preamplifier.

To minimize hum when using magnetic pickups on RCA three and four-speed record changers (930409, 930800, RP-197 and RP-205 models) a four-pole motor and a heavy turntable should be used.

To minimize hum when using magnetic pickups on 45 record changers (RP-168 and RP-190) shielding must be provided and can be accomplished by either of two methods.

The motor can be shielded with a metal box, preferably of .020" steel. An inner box of non-magnetic metal will provide additional shielding. When such a box shield is added, it will also raise the impedance of the motor and reduce its torque. To overcome this difficulty, it will be necessary to raise the voltage applied to the motor. The power consumption of the motor should be measured

(Continued on page 39)



BASS REFLEX ENCLOSURE said to replace one standard acoustical tile when used in ceiling installations. Unit consists of a plaster ring, bass reflex enclosure and spiral sound faceplate which incorporates directional ports to provide a 360° dispersion pattern. Present model accommodates 8" speaker. (SBR 8 DS; Fourjay Industries, 2360 West Dorothy Lane, Dayton 9, Ohio.)



COMBINATION AM - FM - INTERCOM system which features an 8-tube ac-dc receiver with a phono-jack, a master station, separate control box for remote stations, three 5" interior speakers and one 4" front-door speaker-mike. All speakers have a volume control and a spring-controlled talk-listen switch. (Model 676M; Musical Corporation, Los Angeles, Calif.)



TRANSISTORIZED PREAMP with a matched function output switch which controls the output levels, giving one a choice of either 1 or 3-v output, to provide optimum matching to any basic amplifier, both from a hum and noise standpoint, as well as to provide sufficient signal to drive a basic amplifier. (PR45; Madison Fielding Corp., 863 Madison St., Brooklyn 21, N. Y.)

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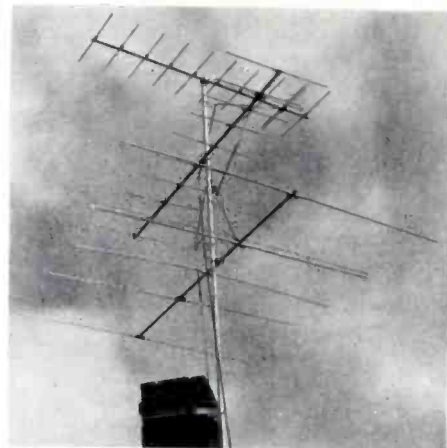
(Continued from page 16)

the antenna shows visible indications of old-age.

Then one can mount a control antenna (this need not be a permanent installation) and run a transmission line from the control antenna to a central point where immediate switching between the existing antenna and the control can be made. You will find that the set owner will be very much interested in observing this test.

By recording these readings on a direct basis, and taking similar readings after the antenna has been replaced, the set owner will be readily convinced of the need for a new antenna and will become an excellent advertisement for future antenna installations.

It is not necessary to recommend

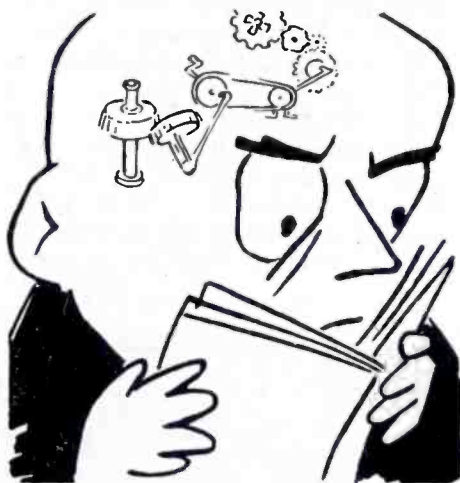


NEW INSTALLATION in which new antennas identical to those used in the original installation were employed. Improved pictures obtained with these antennas are shown on page 16.

the replacement of the existing antenna with one of the same design. There are many areas where cut-for-channel antennas can be replaced (Continued on page 39)

Channel	Field Strength Meter Readings		Db Gain
	Old Installation	New Installation	
3	42	99	7 (measured using standard broadcast signal.)
8	55	85	
3	35	88	8 (measured using mobile laboratory signal.)
8	50	80	

TABLE 1: COMPARATIVE READINGS obtained for new and old antennas. See page 16 for installation data.



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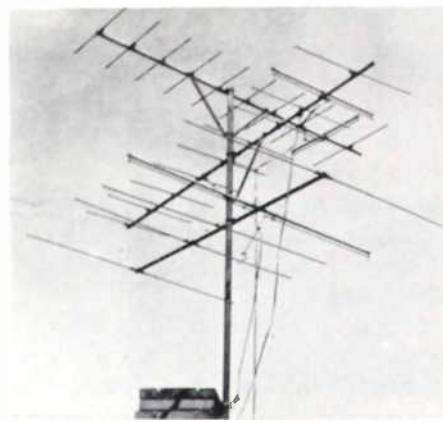
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TV Antennas

(Continued from page 38)



ORIGINAL ANTENNA installation consisting of models cut-for-channels; Taco 1850 and 1325.

with an all-channel antenna to provide full coverage of the stations now in the area.

Service Engineering

(Continued from page 15)

\$1,000 worth of electronic gear on board.

Besides commercial gear, many boats are equipped with TV sets installed and serviced by Marine Radio. When riding the Pacific waves, TV stations can be picked up when 100 miles out to sea. The Los Angeles area amateur mariner has a choice of the seven TV stations in Los Angeles plus those in San Diego and Santa Barbara.

Audio

(Continued from page 37)

before and after adding such a box shield.

Another method is to add a steel plate approximately $\frac{3}{8}$ " thick between the mechanism and the motorboard.

In most all applications, a pre-amplifier must be used to provide amplification and equalization; a variable reluctance pickup is lower in output and impedance than crystal and ceramic pickups.

The pickup arm must be changed to accommodate the physical difference in pickups. In most cases, the mounting screws for ceramic and crystal pickups are $\frac{3}{8}$ " apart and for reluctance pickups they are $\frac{1}{2}$ " apart. Stylus type will depend on cartridge design; *turnover*, *slipunder* or *turn-around*.

The counterbalance spring must provide the correct stylus force. This force should be 7 to 9 grams on three and four-speed changers, or 5 to 7 grams on 45-changers.

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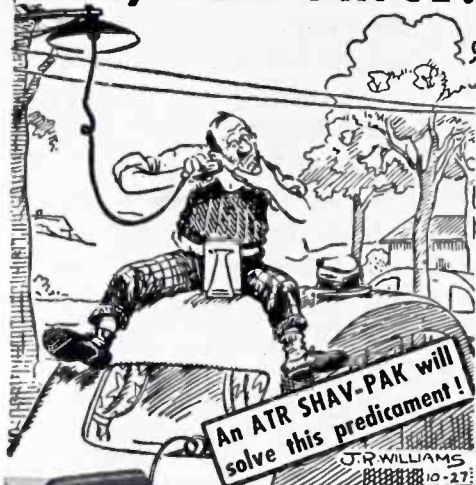
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PERSONNEL

L. F. HOLLERAN has been appointed manager, distributor products of the RCA electron tube division. JOHN B. FARESE is now manager of entertainment tube products, and C. E. BURNETT has become manager of industrial tube products in the tube division.



Holleran



Farese

WARREN HOWE has been appointed market analyst of the Belden Manufacturing Co., Chicago.

JOHN MESSERSCHMITT, formerly in the renewal tube sales division of Amperex Electronic Corp., 230 Duffy Avenue, Hicksville, L. I., has been made assistant to FRANK RANDALL, vice president and general sales manager.

ROBERT BEEBE has been named head of the communications antenna sales division of Ward Products, a division of Gabriel Co.



Beebe



Burroughs

LOUIS R. BURROUGHS has been elected vice president for broadcast and recording equipment at Electro-Voice, Inc., Buchanan, Mich. Burroughs, former E-V chief engineer, has been with E-V since its inception in 1927.

SAM W. ARCHER has been promoted to assistant general sales manager-merchandising of the United Motors System division of General Motors Corp., Detroit 2.

SYDNEY W. MORRELL is now vice president in charge of public relations of International Telephone and Telegraph Corp., 67 Broad St., New York 4, N. Y.

ROBERT I. MENDELS has been elected president of Electronic Devices, Inc., 429 12th Street, Brooklyn, N. Y.

HERBERT A. BODKIN has been appointed sales manager of Electrovox Co., Inc., 60 Franklin St., East Orange, N. J.

8 NEW



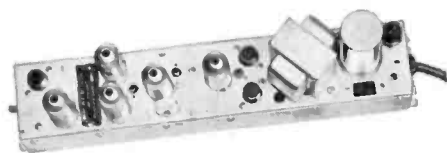
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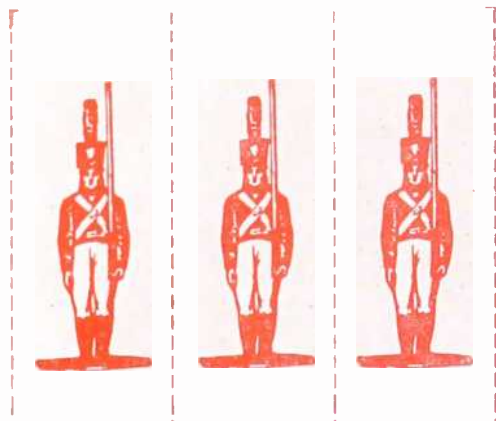
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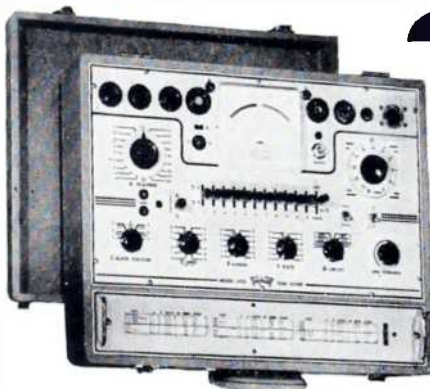
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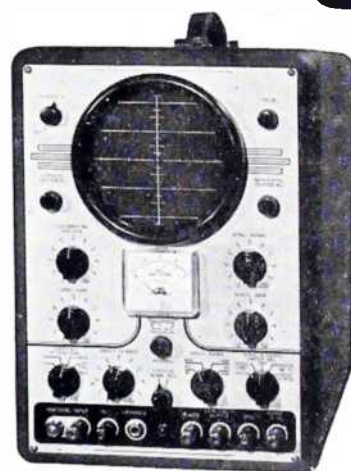
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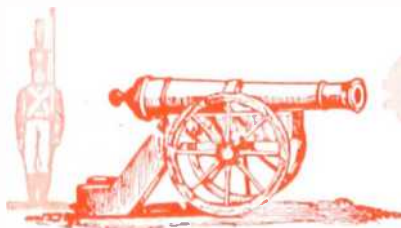
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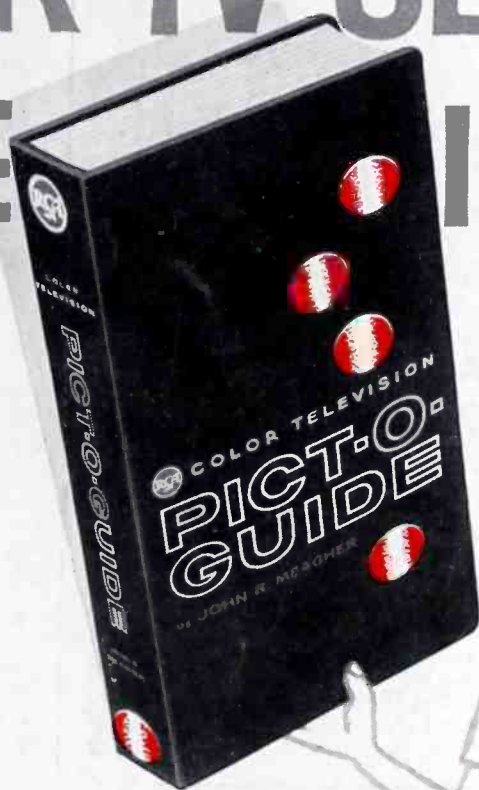


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