PF PHOTOFACT

INDEX

AND TECHNICAL DIGEST

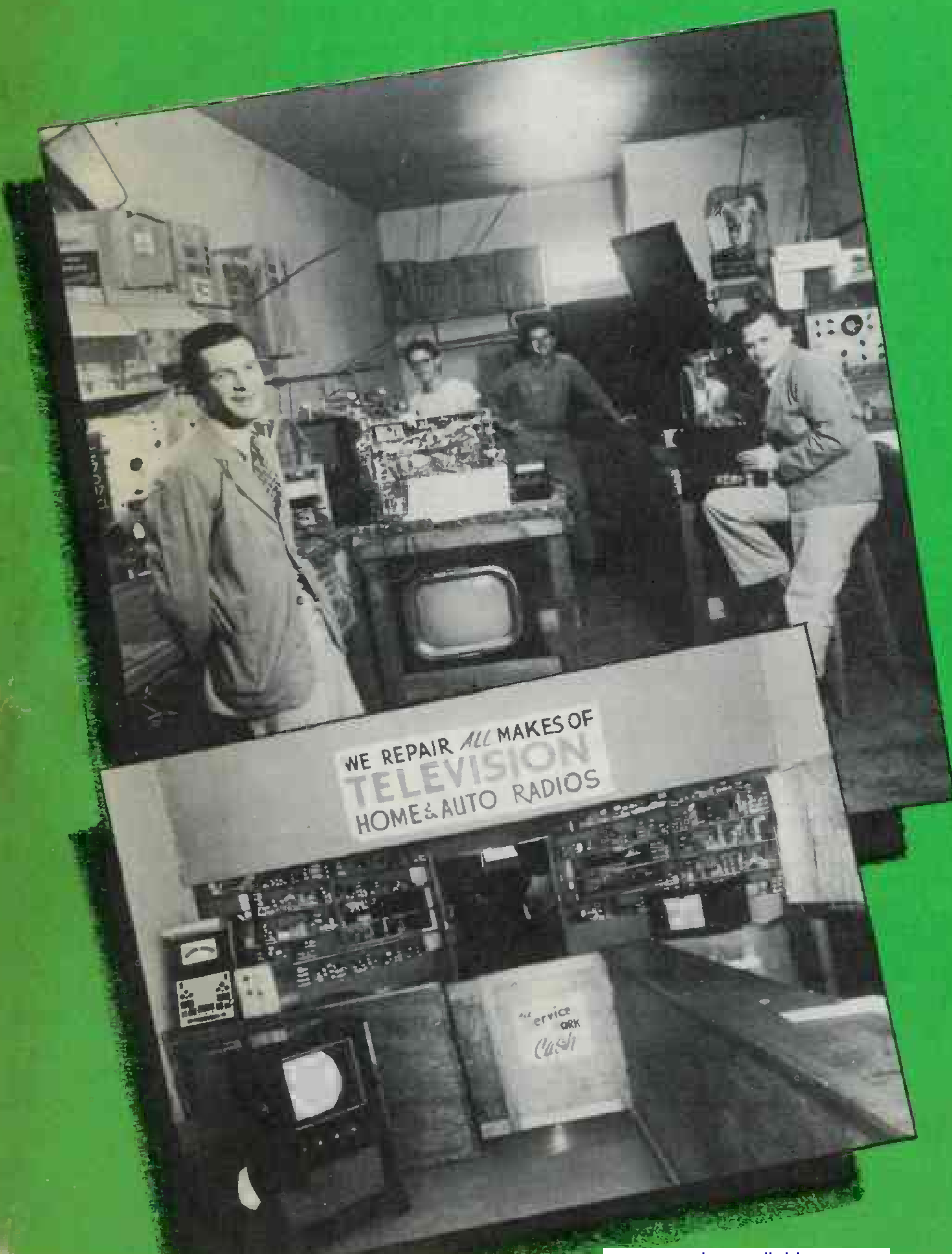
Jan. • Feb. • 1952

including

INDEX No.

30

COVERING PHOTOFACT FOLDER SETS 1 THRU 158



CONTENTS

Pick of the Trade

Use of the gyro compass in World War II was limited because of the size and weight of the unit. It weighed 550 pounds. Now a lightweight gyro that weighs only 67 pounds has been developed.

Standardization is expected within two years.

★ ★ ★

End of TV Freeze

Here's the way the timetable looks to Curtis B. Plummer, chief of FCC's Broadcasting Bureau:

Sometime between February 1 and March 1, 1952, the freeze probably will be lifted.

Somewhere around April 1, 1952, FCC will begin granting new station permits.

By July, 1952, some 80 stations will probably have been authorized.

By mid 1953, these 80 stations should be on the air.

Regarding the 80 new stations Plummer said, "As a wild guess, the division of VHF and UHF stations might run about 50-50."

In giving his forecast Plummer added a few cautions. For one thing, the timetable will be thrown off if any serious legal entanglements develop during the hearings. Also, these first new outlets will go into small communities—mainly in areas with populations of 50,000 and under—where there are apt to be few or no contests for permits.

★ ★ ★

The Crystal Ball For 1952

Directors and alternates attending the Nov. 16 meeting of the RTMA Board of Directors in Chicago conducted their customary informal poll of individual "guess-estimates" of 1952 set production and tabulations of their unofficial predictions produced the following "crystal ball" opinions:

TV-The average of all estimates was 4,440,000. The highest guess was 5,000,000 and the lowest 3,000,000.

Radio—(home sets, portables, and auto sets)—The average guess was 10,900,000 while the highest estimate was 12,500,000 and the lowest 7,500,000.

Electronic Markets—November, 1951

★ ★ ★

Transistor development will be worth watching, because this little device could, in the years to come, spell the demise of the vacuum tube and transformation of the multi-billion dollar industry which has been built up around electrons in vacuum.

Tele-Tech
Dec., 1951

★ ★ ★

U H F

Commercial UHF-TV will bring tube and converter/receiver manufacturers new headaches when it comes. One of the principal problems will be to obtain low-cost receiving tubes having high gain and low noise performance characteristics at these frequencies. This accounts for many of the current converter designs having the RF input feed directly into a crystal mixer. Lack of an RF amplifier stage is also not desirable from the standpoint of oscillator radiation, since any sizable amount of this will in turn raise interference problems.

The Radarscope, Tele-Tech
December, 1951

★ ★ ★

According to a survey recently completed by Tung-Sol, servicing, today, represents a $887-million market.

Home radios account for $385-million-worth of service work, spread over 77-million home receivers, with a $5.00 annual billing cited as the charge allowed for each set. In the car-radio category, with over 17-million sets in use, and about $6.00 spent annually for repair of each of the sets, the income possibilities lead to the staggering figure of $102-million. Television receivers were classified as substantial with $150-million as the repair-income bill and $250-million as the amount to be spent for installations. A distribution of 10-million TV sets, with a $15.00 annual service charge, was used as the basis of calculating the service income, while a market of 5-million sets was included in the installation picture, with a $50 per set charge indicated for each installation.

Servicing during checkup calls can not only contribute to the plus side of the ledger, but also serve as a profitable reference for other calls, since a satisfied customer is always anxious to advertise that fact and tell the neighbors that you're the man to call for that TV set repair or checkup.

Lewis Winner, Editor
Service, Nov., 1951

PF INDEX AND TECHNICAL DIGEST

VOL. 2 • NO. 1 JAN.-FEB., 1952

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HOWARD W. SAMS, *Publisher*

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The PF (PHOTOFACT) INDEX and Technical Digest is published every other month by Howard W. Sams & Co., Inc. at 2201 East 46th Street, Indianapolis 5, Indiana—and is included as a part of PHOTOFACT folders from PHOTOFACT Distributors without additional cost.

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ABOUT THE COVER: The photographs are of Dale Miller's Associated Television Service, Long Beach, California. In the top photo, left to right, are Dale Miller, his two sons, and technician Jack Andreasen. Mr. Miller writes: "Sams' PHOTOFACT Manuals are great, and we mean it. The editorial material contained in the INDEX has proved to be the most interesting, constructive and well assembled we have ever found."

MILTON S. KIVER

President, Television Communications Institute

Shop Talk

In the last issue of the Photofact Index we discussed the reasons why servicemen encounter difficulty in aligning television receiver circuits by the visual method. For these men, suggestions were listed and certain precautions outlined. This month, as a further aid toward the mastery of this operation, a group of typically distorted or incorrect curves are shown; curves such as the serviceman is likely to encounter when he has committed some error in his preparation for the alignment. The analysis of each curve is designed to help the technician avoid making the same mistake in any future alignment or, at least, if a mistake is made, to realize what has caused it.

Figure 1A shows a typical desired response. Specific frequency values are included to identify various points on the curves, such information being determined with a marker generator, one point at a time.

Figures 1B, 1C, and 1D show the effect of too little bias on the stages to be aligned. The correct bias should be -3 volts. At -2.5 volts the curve is not appreciably affected although there is a definite change in the contour of the curve along the top. The overall amplitude of the curve has increased, including that of the two smaller side peaks. The greater amplitude, of course, is a direct consequence of the bias reduction. With -2 volts bias, the curve has become distorted due to a certain amount of overdriving or saturation in the video IF amplifiers. This condition becomes progressively worse as the bias is reduced still further, (as in Figure 1D) and now the artificial flattening of both the main curve and its secondary side peaks is quite pronounced.

The next set of related curves are Figures 2A, 2B, and 2C and they show what can happen when the set oscillator is permitted to function during the alignment operation. Each of these curves was obtained by tuning the set to a different channel. Within any one channel, rotation of the fine-tuning control will cause the pattern shape to change.

Some injurious effects which can be caused by the marker generator are shown in Figures 3A, 3B, and 3C. In Figure 3A the marker generator is connected directly to the grid of the first video IF amplifier and the output of this generator has been turned up high. Result is a complete swamping of the response curve.

In Figure 3B the marker generator is still connected to the grid of the first video IF amplifier but its signal output has been considerably reduced. Now, some semblance of the video IF response curve can be seen, although the marker generator loading is still quite evident. The loading is due to the very low input impedance of the marker generator. In

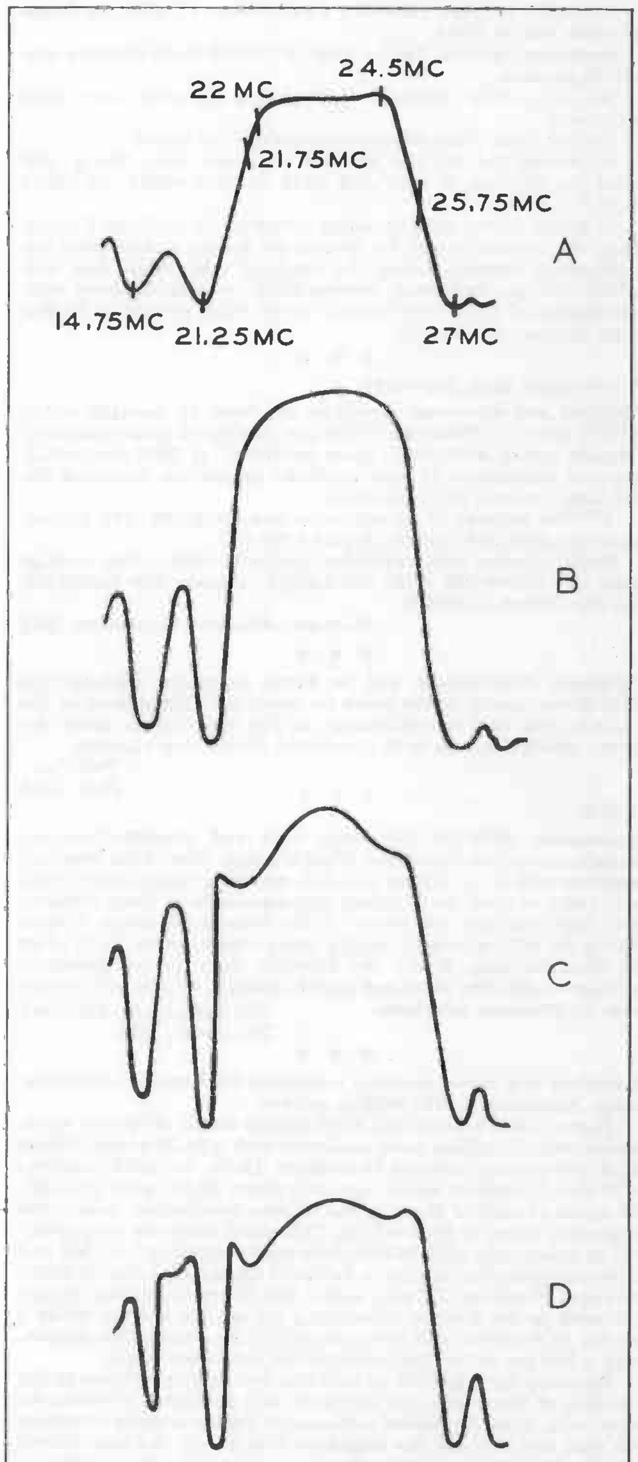

Figure 1. (A) Ideal Response Curve. (B) Bias at -2.5 Volts. (C) Bias at -2.0 Volts. (D) Bias at -1.5 Volts.

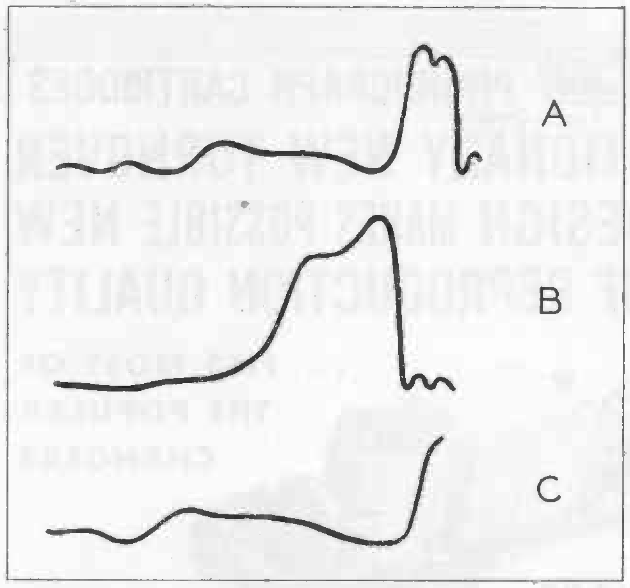

Figure 2. Curves Obtained by Tuning the Set to Various Channels.

this respect it is important to keep in mind that if the marker generator is connected into the circuit at a point which is closer to the video second detector than the sweep generator, that the impedance the marker generator shunts across the circuit will have a direct effect on the sweep generator signal passing through the system.

On the other hand, if the marker generator is placed ahead of the sweep generator (nearer to, or in, the mixer stage), its impedance will have no effect on any response curve seen on the scope screen. This would happen, for example, if we connected the sweep generator to the grid of the first video IF amplifier tube and the marker generator to the mixer

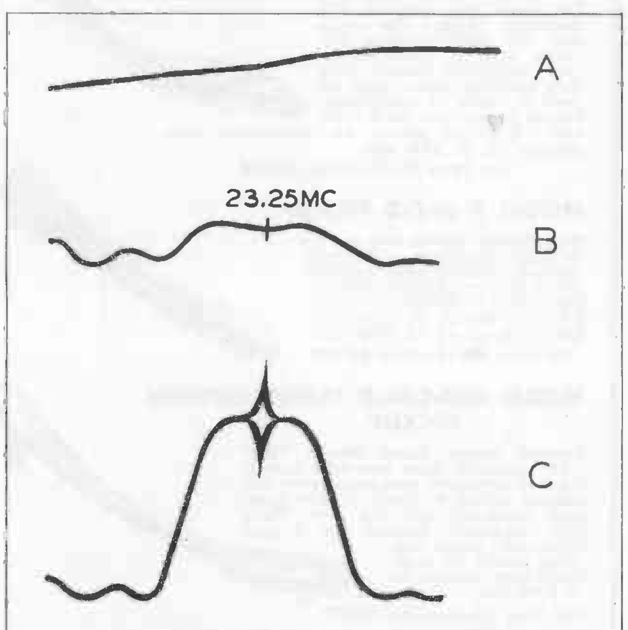

Figure 3. (A) Marker Generator Connected Directly to Grid of the 1st Video IF Amplifier. Strong Signal Output. (B) Marker Generator Connected Same as "A" but with Weak Signal Cutput. (C) Marker Generator Coupled to Grid of 1st Video IF Amplifier Through 75,000 Ohm Resistor. Strong Signal Output.

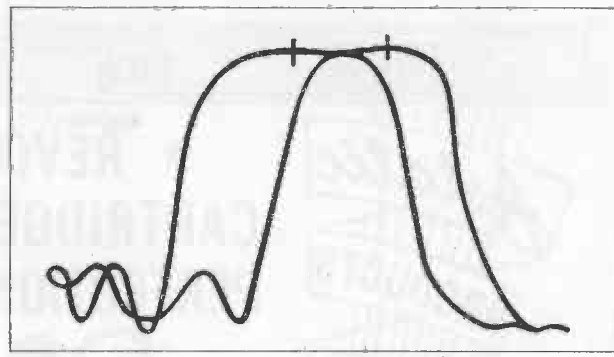

Figure 4. Sweep Generator Phasing Control not Properly Adjusted.

grid. Now, the only way that the marker can affect the response curve is by injecting too strong a signal.

In Figure 3C the marker generator is coupled to the grid of the first video IF amplifier through a 75,000-ohm resistor, thereby effectively isolating its low internal impedance from the video circuit. The big pip in the center of the response curve is now due to a strong output. If the marker generator output is reduced, the pip will attain its proper perspective and the response curve will be unaffected. All connecting leads should be kept as short as possible to minimize the effect of the inevitable shunting capacitance.

In Figure 4 the shape of the response curve is correct but due to an improperly adjusted phase control (on the sweep generator), two curves are seen. The control should be adjusted until the two curves blend into one. In Figure 5 we have the same situation except that it is not possible to produce one curve at any setting of the phase control. Reason: The sweep width or sweeping range is too small. Increase the sweep width (to at least 6 mc) and then a position on the phase control will be found where the curves will blend.

Incidentally, it should be noted that perfect blending is not always achievable. At some points the two curves will be discernible. This can be disregarded, being due to an unbalance in the generator circuit.

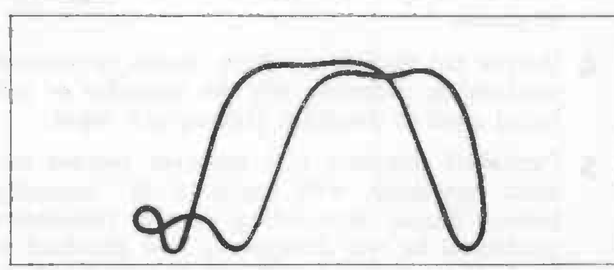

Figure 5. Insufficient Sweep Width for Phasing.

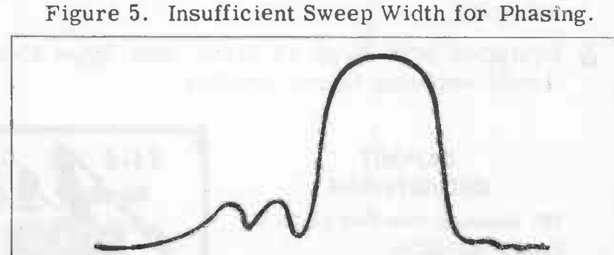

Figure 6. Curve Caused by too Great Sweep Range.

♦ ♦ Please turn to page 77 ♦ ♦

BOOS PICK MICRO PHONOGRAPH CARTRIDGES

Astatic PRODUCTS DATA

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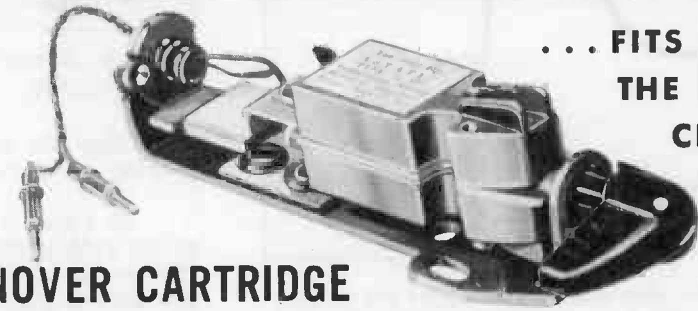

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NEW ASTATIC TURNOVER PICKUP ARM MODELS WITH "TWIN CAC" CARTRIDGE

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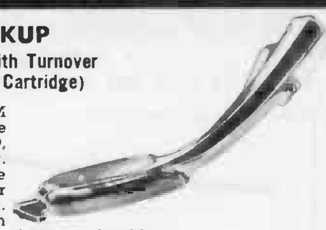

For speed and ease on V-M changers, replace the entire tone arm with Astatic's 9-D, using only a screwdriver. Costs negligible amount more than cartridge alone—pays for itself in speed of installation. Simple instructions with each unit. Sapphire needle on slow-speed side, osmium on 78 RPM side.

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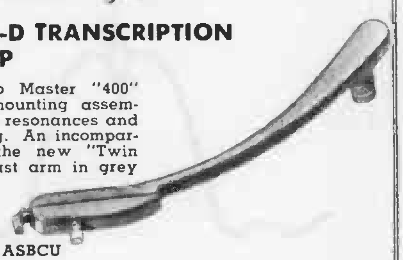

Famous Astatic Studio Master "400" with improved base mounting assembly that eliminates arm resonances and assures perfect tracking. An incomparable performer with the new "Twin CAC" cartridge. Die-cast arm in grey Hammerlin finish. Sapphire needle on slow-speed side, osmium on 78 RPM side.

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Astatic Crystal Devices manufactured under Brush Development Co. patents

UHF

A description of circuits and equipment for Ultra High Frequency reception.

by MERLE E. CHANEY

To meet the demand for additional television outlets the F. C. C. has assigned a band in the ultra-high frequency spectrum between 470 and 890 megacycles for commercial television broadcasting. This adds a total of 70 new UHF channels to the existing 12 VHF channels. UHF channels are numbered 14 through 83 with each channel occupying 6 megacycles. Eventually, it is expected that a total of around 2000 TV stations may be permitted to operate with the majority of stations on UHF channels.

The TV technicians approach to UHF in the main is chiefly concerned with gaining a working knowledge of methods, techniques and devices associated with UHF television reception. Experiments and research in the field of UHF have resulted in some practical solutions to the problems. Data is now being made available on UHF receiving devices and this article is offered to further acquaint the television technician with this new field.

To a large extent efforts are being concentrated upon the development of UHF converter units employing a double conversion system. These converters are designed to operate in conjunction with standard TV receivers and are connected to the TV receiver similarly to the way boosters are connected. Their function is to change the incoming UHF signal to a lower frequency that can be accepted by the VHF tuner in the TV receiver.

Other manufacturers have tuners so designed that VHF tuning strips may be replaced by UHF strips.

Information is available showing that one manufacturer has developed a tuner that covers the 12 channel VHF band and has additional switch positions for UHF. In UHF position the tuner becomes a two stage IF amplifier and an additional UHF tuner positioned above the VHF tuner tunes in the desired UHF signal. Specific information on this system will be described in further detail later.

Before going into a detailed description of individual UHF converters and tuning devices it might be well to discuss a few of the pertinent facts relative to UHF circuitry.

The following list of circuits employed indicates the present trend in UHF converter design.

1. Preselector circuits.
2. Crystal mixer.
3. Local oscillator.
4. Low noise IF amplifier.
5. Self-contained power supply.
6. UHF and VHF selector switch.

In Figure 1 is shown a block diagram illustrating a basic UHF converter unit. Note that a crystal mixer followed by an intermediate frequency amplifier is employed plus a local oscillator and power supply.

Preselector circuits are for the purpose of providing a maximum of selectivity consistent with required bandwidth. RF amplification is not employed for the reason that no relatively low priced RF tubes are available as yet which can provide gain with a low enough noise figure that can be adapted for this purpose.

Crystal mixers are used primarily because of their simplicity, low cost, and good noise figure. A crystal commonly employed is type 1N72. Performance of a crystal mixer is influenced by the uniformity and amplitude of the oscillator injection voltage. In addition the impedance presented by the RF tuned circuits must be correctly matched to the crystal input impedance, and the IF circuit impedance correctly matched to the crystal output impedance. Impedances presented by the crystal mixer also is a function of oscillator injection voltages. Conversion loss of a crystal mixer is about 8 or 9 db. Factors influencing crystal conversion loss and crystal noise are the selection of the IF frequency and the amplitude of the oscillator injection voltage.

A type 6AF4 tube, a miniature version of the 6F4, is generally employed as the local oscillator. Normally the oscillator is designed to operate below

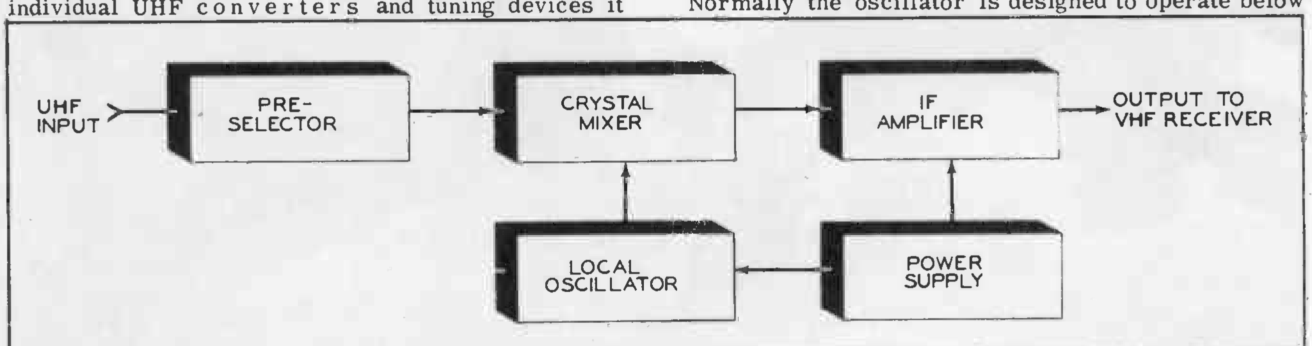

Figure 1. Block Diagram of a Typical UHF Converter.


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the frequency of the incoming signal in order to provide the correct relationship between the video and sound frequencies to the VHF tuner. Oscillator injection voltages to the crystal mixer can be maintained at a low level. This reduces radiation through the antenna and enables adequate shielding to minimize direct oscillator radiation.

An important condition that must be met by the local oscillator in UHF converters is that of stability. This condition is of particular importance when the converter is used in conjunction with a TV receiver employing separate sound IF. Drifting of the converter oscillator frequency would necessitate continual touching up of the receiver tuning, which would defeat the purpose. A small latitude of oscillator drift would be permissible when an intercarrier receiver is used. Since many of the converters are designed for all standard TV receivers, converter oscillators are designed for a maximum of stability.

Compensation for conversion loss resulting from the use of a crystal mixer and the absence of an RF stage is provided by an intermediate frequency amplifier. A common IF amplifier employs a type 6BQ7 tube with triode sections cascode-coupled with the first triode neutralized. This circuit when used is selected because of its good noise figure.

A self-contained power supply in the converter unit adds to its utility and simplifies the detail of installation. Power supplies may employ a tube such as a 6X4 or selenium rectifiers connected as a full wave or half wave rectifier. Power transformers are used to prevent hum difficulties and to provide filament voltages for the converter tubes. High voltage to the rectifier B+ filtering is obtained by conventional RC filter networks.

Another factor influencing UHF converter design is the choice of the intermediate frequency. An optimum intermediate frequency is the result of a compromise. Converters designed for use with all TV receivers generally have an output frequency on the low VHF channels, usually on channels 5 and 6. Other converters have output frequencies selected for specific applications.

It should be understood that since a freeze exists on UHF installations that a market for UHF units is quite restricted, and at the best, production is limited. However, a knowledge of current trends in the field of UHF should aid the television technician to readily bridge the gap between VHF and the ultra high band.

Figure 2. Crosley UHF Converter.

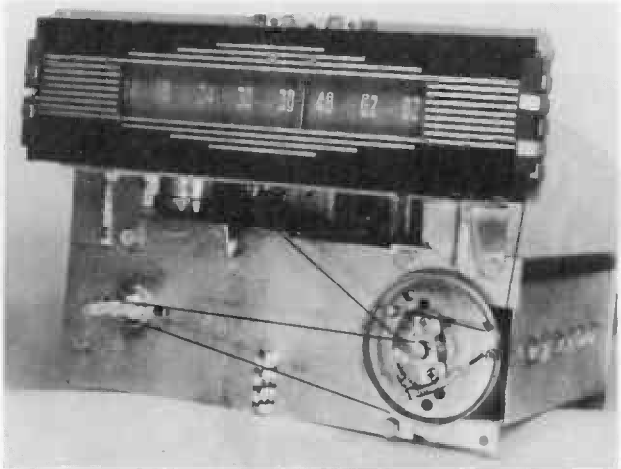

Figure 3. Chassis View of Crosley UHF Converter.

The following description of UHF devices was made from data provided by the manufacturers of the units.

CROSLEY ULTRATUNER

The Crosley Ultratuner is a UHF converter continuously tunable from 470 to 890 megacycles. When used with Crosley receivers signals may be received in the UHF band. The cabinet shown in Figure 2 measures 8-1/8" wide, 6-3/4" high, and 6-1/2" deep. Two operating controls are employed on the front of the cabinet. The tuning control operates a vernier drive of about 15/1 ratio with tuning indicated by a slide rule type dial and the other control functioning as a combination "OFF, VHF, UHF" switch. A chassis view of the converter is shown in Figure 3.

The tuning unit itself consists of a three-gang resonant line type with each line shaped for correct tracking.

Three tubes are employed, a type 6AF4 oscillator, a type 6BQ7 IF amplifier and a type 6X4 rectifier.

A schematic for the crosley Ultratuner is shown in Figure 4. The input system consists of a double tuned bandpass preselector circuit for maximum selectivity.

Excitation of the germanium crystal mixer is provided by coupling an oscillator injection voltage from the high side of the oscillator tube filament through a 2.2 mmf. capacitor. Maintaining the high side of the oscillator filament above ground for RF is accomplished by the use of a parallel combination of an inductance and a resistor inserted in series with the filament lead. Oscillator radiation is minimized by shielding both the oscillator resonant line section and the oscillator tube and circuits.

From the crystal mixer an intermediate frequency signal is fed to the input of a low noise cascode amplifier stage employing a type 6BQ7 tube. The first triode section functions as a conventional grid driven circuit employing neutralization. The second triode section operates as a grounded grid amplifier.

Both the input and output circuits of the cascode IF amplifier are designed to maintain desired

SHURE

2 New phono pickup cartridges to help simplify cartridge replacement

Model W22AB-T TURNOVER CARTRIDGE

WHAT IT IS:	A high quality extended range "Vertical Drive" Cartridge complete with positive turnover mechanism. Has sapphire tipped fine-groove and osmium tipped standard-groove needle.
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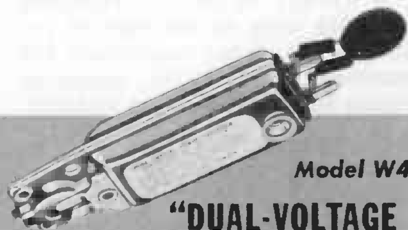
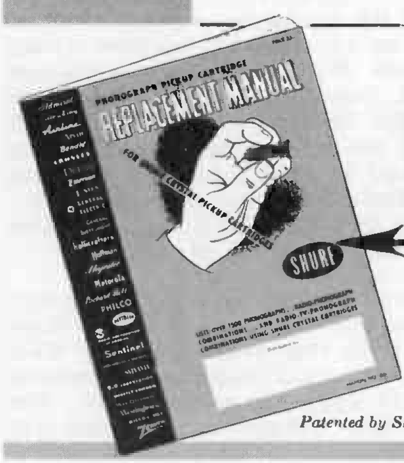


Model W42BH "DUAL-VOLTAGE CARTRIDGE"

WHAT IT IS:	A low cost "Lever Type" Cartridge for 78 RPM records. Equipped with unique "slip on" condenser-harness for dual-voltage output. 1.5 volts or 3.75 volts obtainable in one cartridge.
WHAT IT DOES:	Gives servicemen an ideal replacement for old style 78 RPM cartridges. A "leader" value — it modernizes the equipment at an extremely low price — only $4.95 list. It guarantees improved reproduction. Minimizes inventory problem. One cartridge with choice of two output voltages covers bulk of requirements.
SPECIAL FEATURES:	1. "Lever Type" construction assures improved tracking. 2. Specially designed needle guard which protects crystal from breakage. 3. Equipped with pin jacks and pin terminals. 4. If used for high output, the condenser may be used separately by the serviceman for other purposes. **MODEL W42BH — CODE: RUVUS LIST PRICE $4.95**



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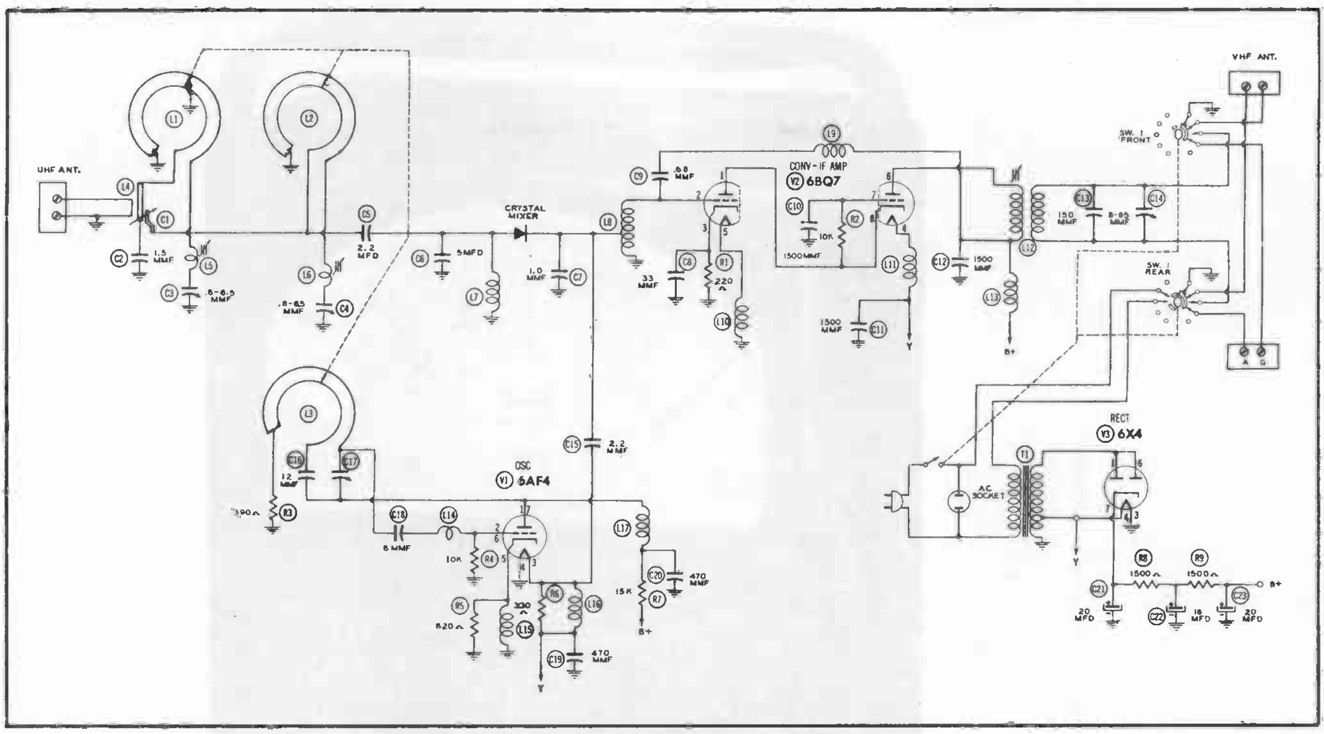

Figure 4. Schematic of Crosley UHF Converter.

bandwidth at a frequency of 127.5 $\pm$ 6 megacycles. Transformer coupling of the cascode amplifier to the converter output terminals through appropriate switching provides a balanced 300Ω output impedance. The balanced output eliminates picking up interference on the lead to the TV receiver.

The power supply consists of a power transformer and a type 6X4 tube operating as a half-wave rectifier. Conventional RC filtering is used in the rectifier output.

When the Crosley Ultratuner is installed, a UHF antenna is connected to terminals on the unit marked "UHF Ant." The VHF antenna leads are removed from the TV receiver and connected to the converter terminals marked "VHF Ant." A balanced 300 ohm line is then connected from the antenna terminals of the VHF receiver to the converter terminals marked "output." In order to utilize a single control to turn power on and off for both the converter and TV receiver, the receiver's power cord is plugged into the AC power receptacle on the converter chassis.

The combination "OFF-VHF-UHF" switch functions in the following manner:

In "OFF" position power to both converter and TV receiver is off.

In "VHF" position power is applied to the TV receiver, and the VHF antenna is connected to the receiver.

In "UHF" position power is applied to both converter and receiver and the converter output is now connected to the input terminals of the TV receiver.

One feature of the Crosley Ultratuner is that the converter output is not limited by the frequency of the VHF channels on the TV receiver. In other words it was thought possible to approach nearer optimum operating characteristics by employing an intermediate frequency of about 127 megacycles, which is higher than channel 6 (88 megacycles), and lower than channel 7 frequency (174 megacycles). This tuner therefore will operate with Crosley TV receivers since the VHF tuner is tunable through the entire frequency spectrum from channel 2 through channel 13.

We wish to acknowledge the cooperation of the Crosley Division of the Avco Corporation in supplying us with technical data which was used in this presentation.

DUMONT UHF CONVERTER

The DuMont UHF converter is designed to operate over the full UHF television band in conjunction

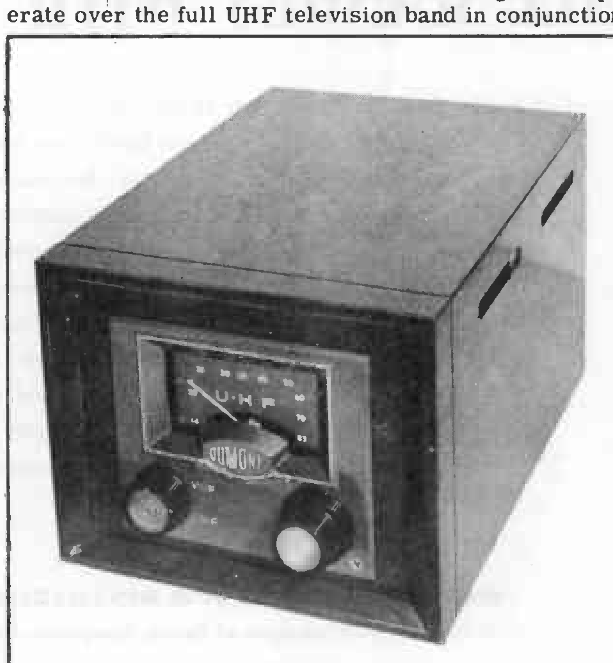

Figure 5. Dumont UHF Converter.


CAUTION ON HIGH VOLTS
OFF
6000
1200
300
60
12
3
12A
120
12
1.2
6000
ACV
60
μA
DCV
Ω
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X 100 000
V·Ω·A
MODEL 630

The Value of Waveform Analysis

by W. WILLIAM HENSLER and GLEN E. SLUTZ

Waveforms are becoming increasingly important aids to service technicians engaged in trouble-shooting TV receivers. These waveforms should not be confused with response patterns which are used in alignment procedures and depend upon a signal generated by a sweep frequency oscillator. The waveforms considered in this article are those actually present at selected points in the receiver when a standard television signal is being received. The practical value of waveforms lies in proper interpretation of these characteristics:

1. Amplitude
2. Shape
3. Frequency
4. Phase

All of these characteristics are illustrated in Figure 1. A description of the significance and usefulness of each is presented in the following text.

Amplitude

The amplitude of a wave pattern represents the peak-to-peak AC voltage at the test point. (See Figure 1.) This voltage, compared with voltages at other selected points, is a means of determining voltage gain. For example, a voltage at the output of the video detector of 2 volts peak-to-peak when compared with a 40 volt peak-to-peak signal at the output of the first video amplifier would mean that the voltage gain in the video amplifier stage was:

$$G = \frac{E\ out}{E\ in} = \frac{40}{2} = 20$$

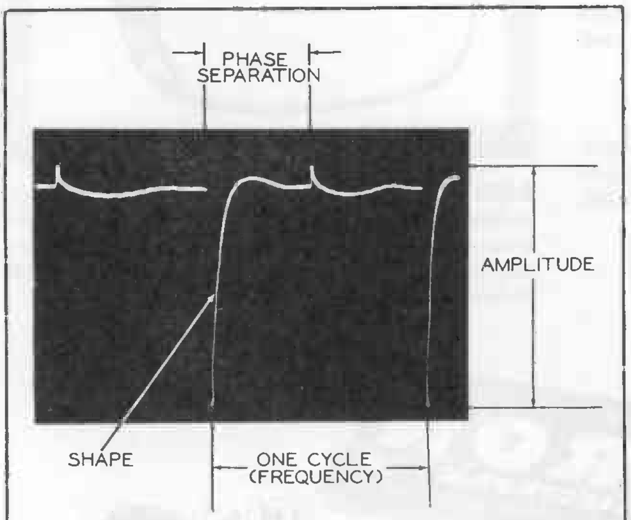


Figure 1. Waveform Showing Amplitude, Shape, Frequency, and Phase Separation of Pulses. (Horizontal Sweep - 30 cps.)

Amplitude may also be checked against the normal values given in service literature covering the receiver under test.

Shape

The shape of the waveforms is another important feature. This is especially true in the sync control circuits where pulse shape exerts a major influence on the smooth operation of the deflection system. As an example, the adjustment of the Synchroguide circuit requires an oscilloscope waveform of a definite waveshape as shown in Figure 2. If the broad and sharp peaks are not of equal height, poor noise immunity, slow synchronization when changing stations, and general sync instability may result.

Frequency

In Figure 1 the horizontal sweep frequency of the scope is set at 30 cycles per second. Thus the vertical field information, which reoccurs at the 60 cycle frequency established by the transmitter, is seen as a two-cycle pattern. The two-cycle pattern is selected because it permits one complete cycle to be visible, part of the other cycle being lost during retrace time. For the same reason, 7875 cycles per second or one-half horizontal line frequency is selected for patterns where horizontal information is desired. In synchronized receivers, the two scanning frequencies, vertical and horizontal, are established by the transmitter. If synchronization is not obtainable in the receiver, and it is desired, for example, to investigate the free-running frequency of the

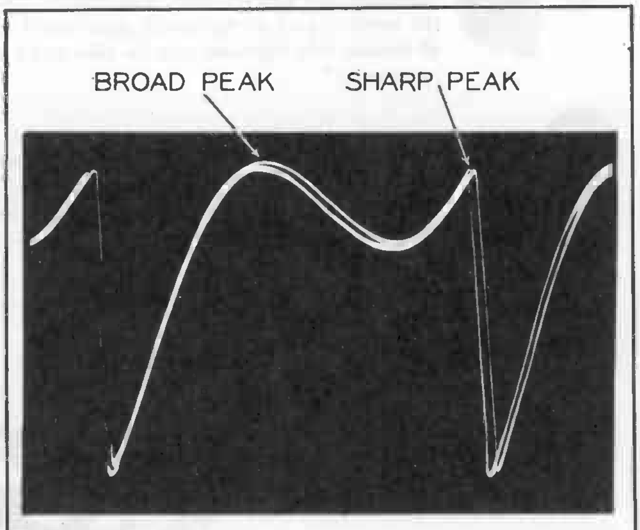


Figure 2. Waveform in Synchroguide Circuit Showing Broad and Sharp Peaks of Equal Height. (Horizontal Sweep - 7875 cps.)

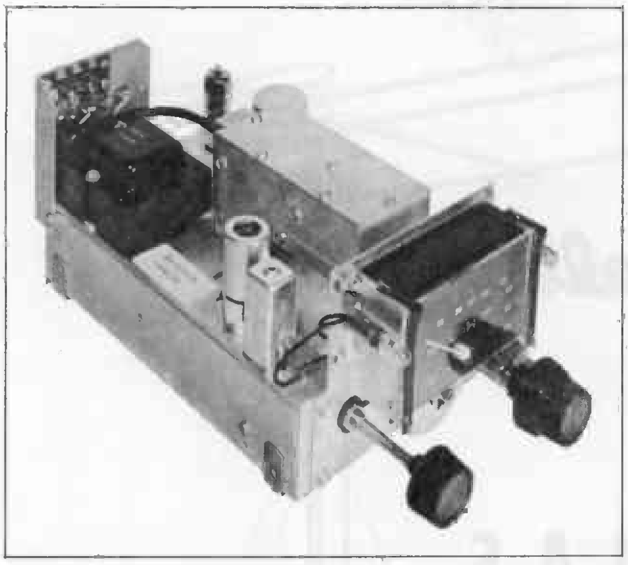


Figure 6. Chassis View of Dumont UHF Converter.

with any standard VHF television receiver. This is accomplished by making the converter output fall between 76 and 88 megacycles or on channels 5 and 6 of a television receiver.

Figure 5 is a cabinet view of the DuMont UHF converter employing two controls. On the right is the coarse and fine tuning control. The tuner drive reduction ratio is 6.6/1 on coarse tuning and 20/1 on fine tuning. The tuning dial is marked 14 to 83 for indicating UHF channels. On the left is employed a combination "ON-OFF, VHF and UHF" switch. When the VHF and UHF antennas are connected to appropriate terminals on the converter chassis, turning this switch to VHF position turns the converter power off and automatically connects the VHF antenna to the VHF receiver input terminals. With the switch in UHF position the VHF antenna is grounded, the power to the converter is turned on, and the converter output is connected to the VHF receiver input terminals.

Figure 6 is a top chassis photo of the DuMont Converter.

A schematic of the DuMont converter is shown in Figure 7. The UHF antenna is connected to a high pass input filter composed of an initial M-derived 1/2 section, two constant K T-sections, and a terminating M-derived 1/2 section. The input filter is designed to attenuate VHF signals. Cut-off frequency is 400 megacycles, with infinite attenuation by the M-derived section at 320 megacycles.

A double tuned preselector circuit follows the input filter. This circuit is designed to provide a maximum of UHF selectivity.

The output of the preselector is fed to a crystal mixer. An oscillator injection voltage obtained by a metal strip loosely coupled to the oscillator tank circuit is also fed to the mixer. The crystal mixer converts the UHF signal to an intermediate frequency which is fed to a low noise cascode IF amplifier. Neutralization of the first triode section of the IF amplifier is provided by feeding a signal from the first triode output back to the grid. The second triode section forms a cathode coupled grounded grid amplifier with the output tuned by an IF transformer L16. From the IF transformer the signal goes to the "UHF-VHF" switch and to a terminal board. The converter output impedance is designed for either 75 ohm coaxial or 300 ohm balanced output to correctly match any TV receiver.

A type 6AF4 is used as the local oscillator. This circuit is designed to provide a high degree of oscillator stability and to minimize oscillator radiation.

The power supply consists of a power transformer, a full wave voltage rectifier tube type 6X4, an RC filter network and two 6.3 VAC filament windings.

We wish to acknowledge the cooperation of the Allen B. DuMont Laboratories, Inc., in supplying us with data which was used in this presentation.

♦ ♦ Please turn to page 29 ♦ ♦

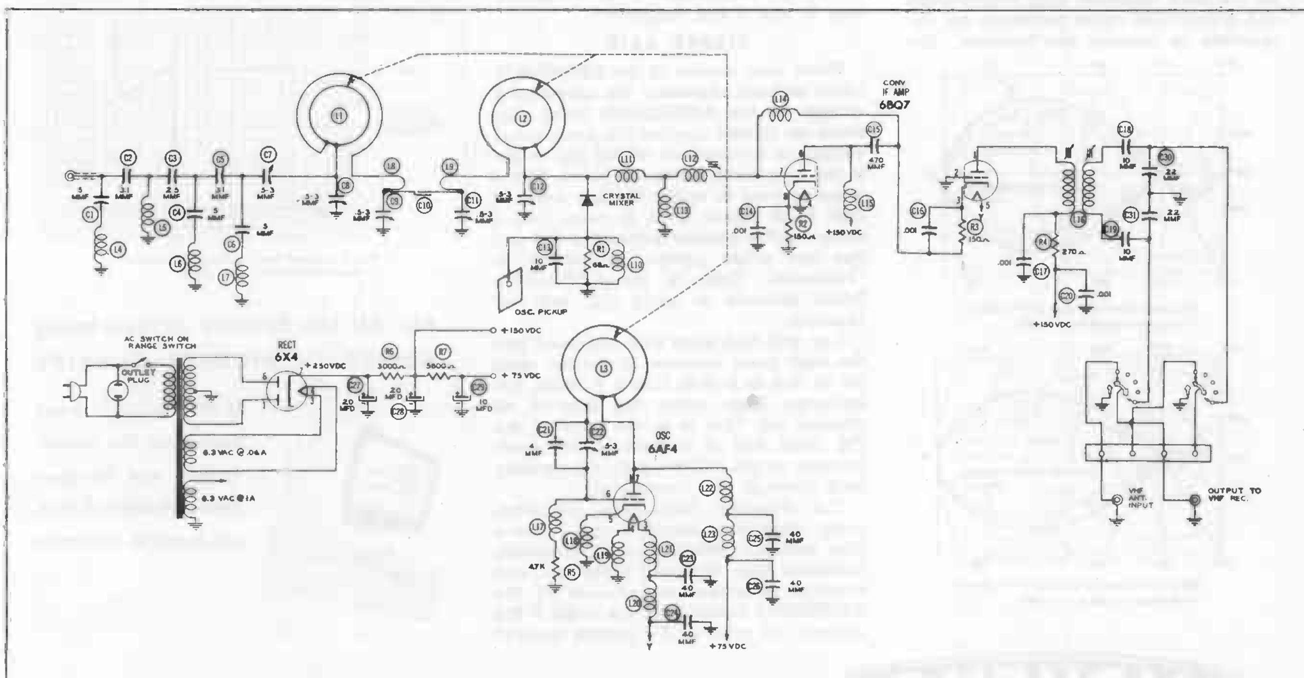


Figure 7. Schematic of Dumont UHF Converter.

FOR GREATEST TV PICTURE *Quality*

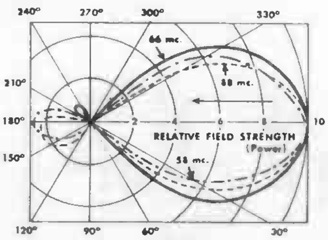
AMPHENOL INLINE TV ANTENNAS

OUTSTANDING MECHANICAL SPECIFICATIONS

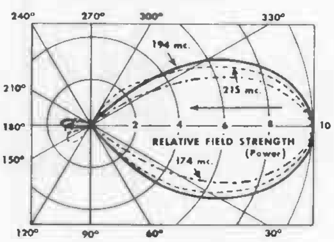
Part	Material	Yield Strength	Size	
		psi	o.d.	Wall
Mast (galv.)	¾" Thinwall Steel Conduit	32,000	0.922"	.049"
Large Folded Dipole	35 ½ H Al.	19,000	.500"	.049"
Small Folded Dipole	35 ½ H Al.	19,000	.375"	.049"
Reflector	35 ½ H Al.	19,000	.500"	.049"
Crossarm	35 H Al.	26,000	.875"	.065"
Center Support & T Casting	Al. Alloy 45,000 psi tensile strength			

EXCELLENT RADIATION PATTERNS

These are the radiation patterns of the AMPHENOL Inline antenna at 58 mc., 66 mc., and 88 mc., in the low band, and 174 mc., 194 mc., and 215 mc. in the high band. Notice the uniformity of these lobes at all frequencies. The lack of lobes off the sides and negligible ones off the back maintains high front-to-back and front-to-side ratios necessary for the rejection of various interferences. The presence of a single forward lobe is usually a very desirable feature, especially when it is wide enough to provide adequate interception area for some differences in transmitter location, changes in the wave front's direction of travel, or physical movement of the antenna in high winds. Furthermore, it is not too critical of orientation. It is necessary only to aim it and forget it.



Horizontal radiation pattern of Amphenol TV Antenna Model No. 114-005.



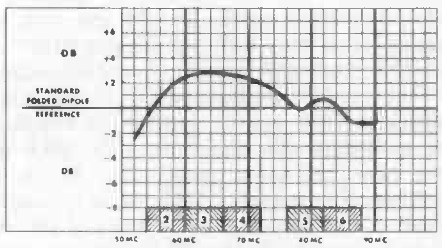
Horizontal radiation pattern of Amphenol TV Antenna Model No. 114-005.

HIGHER GAIN

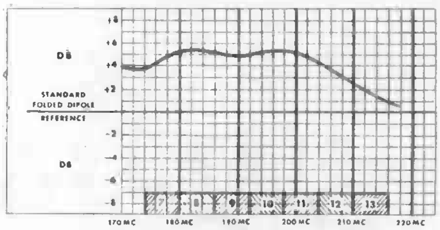
These gain curves of the AMPHENOL Inline antenna represent the intercepted voltage of the AMPHENOL Inline Antenna as plotted against the intercepted voltage of a reference folded dipole cut to the frequency being compared. There is no channel in either the low band or high band where there is more than a three decible change within the channel that can cause picture modulation or "fuzziness." Gain of the AMPHENOL Inline antenna is quite flat over all channels.

You will find more gain designed into the high band because of greater need for it, due to higher losses at these frequencies. Also, notice the drop-off on channel six. This is at the edge of the FM band and is subject to FM interference, so the Inline's gain is purposely held down at that frequency.

The excellent broadband characteristics, impedance match, single forward lobe radiation patterns on all channels, maximum gain, lightning protection, and superior mechanical features of the AMPHENOL Inline Antenna make it the antenna for greatest TV picture quality!



Gain of Amphenol Model No. 114-005 Antenna over a reference folded dipole, 54 to 88 mc.



Gain of Amphenol Model No. 114-005 Antenna over a reference folded dipole, 174 to 216 mc.

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Write for this book containing the characteristics and test performance data of various types of antennas.

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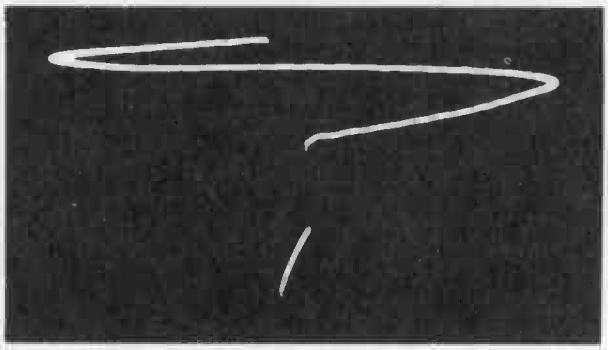

Figure 3. Lissajous Figure for Determining Frequency of Vertical Oscillator.

vertical oscillator, Lissajous figures may be employed. Connect the vertical amplifier of the scope to the grid of the vertical output tube and the horizontal amplifier of the scope to a frequency-calibrated audio oscillator. The audio oscillator frequency is varied in the region of 60 cycles until a figure similar to Figure 3 is seen. The audio oscillator is then operating at the same frequency as the vertical oscillator in the set.

Phase

Phase is important where more than one pulse of approximately the same frequency exists at a test point. Figure 1 shows the phase separation between two such pulses. This phase separation or phase difference is ordinarily expressed in degrees of phase shift. As an example, if the phase separation of Figure 1 were one-half of a cycle, the pulses would be "180 degrees out of phase."

The importance of phase in television can be illustrated in a horizontal phase discriminator. The phase relationship between the sync pulse and the horizontal oscillator wave controls the operation of the sync system. A slight drift in frequency of the horizontal oscillator results in a phase shift between its output and the sync pulse, and this in turn is detected by the discriminator which acts to bring the oscillator back in step with the sync pulse. This whole operation can be revealed through waveform investigation with an oscilloscope.

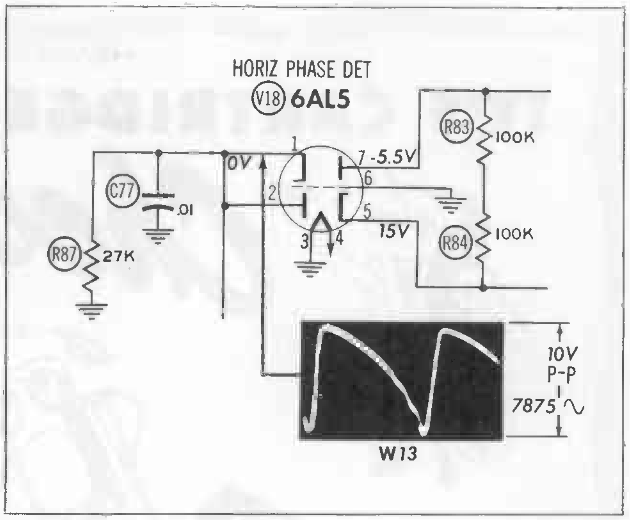

Figure 4. Sample Waveform from Photofact Folder.

A sample waveform taken from a Photofact Folder is shown in Figure 4. It is a reproduction of an actual photograph obtained with an oscilloscope and a camera attachment. Note that the sweep frequency is given as 7875 cycles per second, providing a two-cycle pattern. The peak-to-peak voltage is designated at the right of the waveform. A "W" (waveform) number is provided as a means of reference for any remarks or notes which may be made concerning the wave pattern at that point.

By connecting the oscilloscope to the point indicated in Figure 4, and adjusting the horizontal sweep frequency of the scope to the indicated frequency (7875 cycles), a waveform similar to W13 should be obtained. The shape of the waveform can then be studied. By means of a voltage calibrator the peak amplitude of the waveform can be measured. If the waveshape is essentially correct and the peak-to-peak voltage is within tolerance (± 20%), it can be assumed that the signal at that point is normal. The next step in a trouble-shooting procedure would be the observance of the waveform present in an adjacent stage.

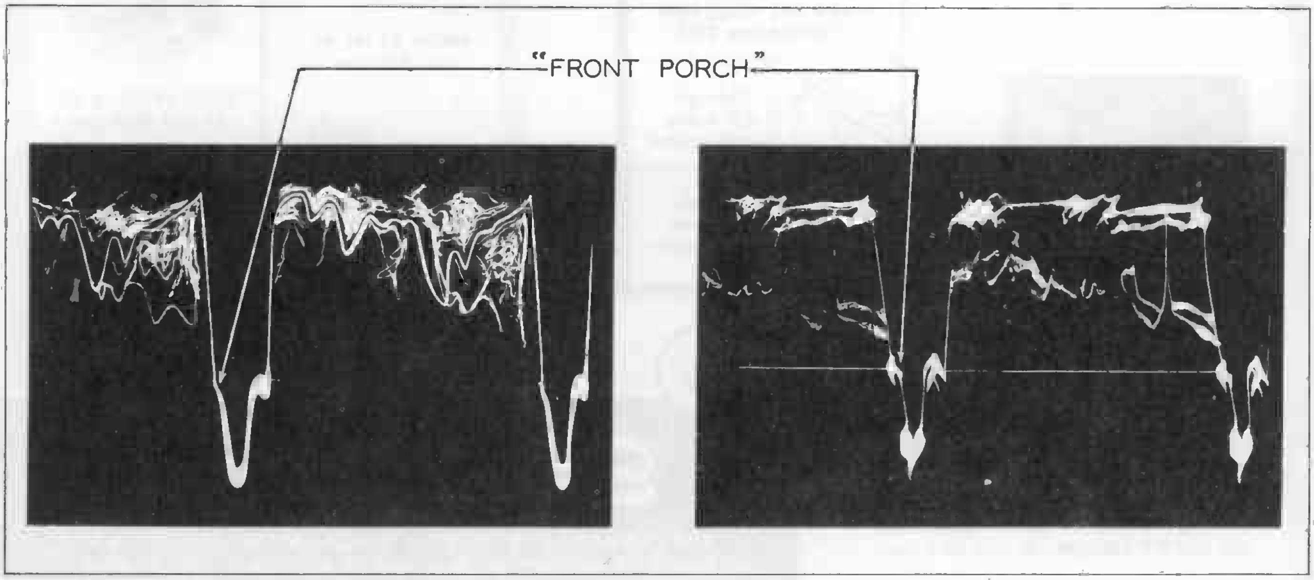

Figure 5. Composite Video Signal at Video Detector Load. (Horizontal Sweep - 7875 cps.) (A) On Narrow-Band Scope. (B) On Wide-Band Scope.

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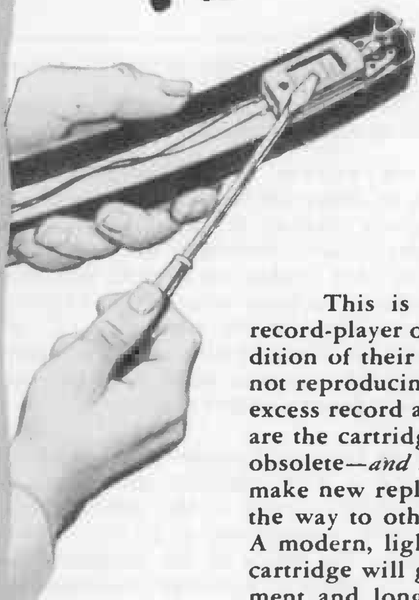
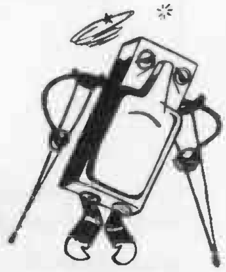
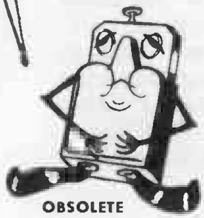
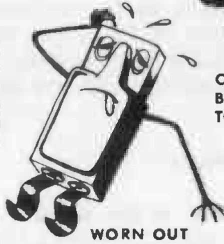




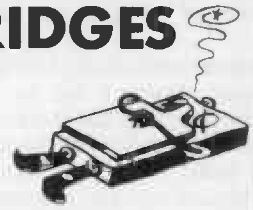
DETERIORATED



OBSOLETE



WORN OUT



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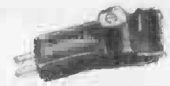
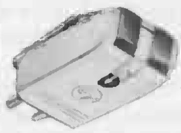
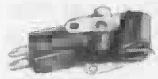
This is *a good time* to contact record-player owners and *check* the condition of their phono-cartridge. If it is not reproducing properly or is causing excess record and needle wear, chances are the cartridge has deteriorated or is obsolete—*and should be replaced.* You'll make new replacement sales, and open the way to other service business, too! A modern, lightweight, compliant E-V cartridge will give fullest record enjoyment and longer record life. *You can demonstrate the difference.* Remember, you can make most replacements with fewer E-V models!



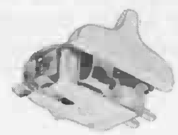
Model 32 for 78 rpm
Model 33 for 78, 45 and 33⅓ rpm



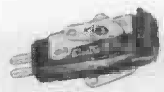
Model 12 for 78 rpm
Model 14 for 45 and 33⅓ rpm



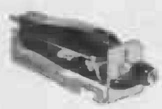
Model 34 for 45 and 33⅓ rpm



Model 16-TT for 78, 45 and 33⅓ rpm



Model 42 for 78 rpm
Model 44 for 45 and 33⅓ rpm
Model 43 for 78, 45 and 33⅓ rpm



Model 96-T for 78, 45 and 33⅓ rpm

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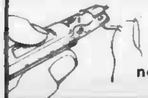
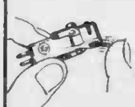


Old-style stiff-acting needle system



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The Oscilloscope

Obviously an oscilloscope is the principal piece of equipment in waveform signal tracing. There are three practical considerations which should be kept in mind when using the oscilloscope to check waveforms.

1. Frequency Response
2. Clipping of Peaks (Overload)
3. Loading Effects

Frequency Response

A uniform response over a wide band of frequencies is desirable in the vertical amplifier section of the scope. However, many oscilloscopes sacrifice bandwidth for greater gain per stage. With these scopes, allowances must be made when viewing waveforms in which high frequencies are present (as in the case of square waves and short-duration pulses). Figure 5A shows the horizontal line information at the video detector load of a test receiver as it appeared on an oscilloscope having high sensitivity but limited frequency response. Figure 5B is the same waveform as it appeared on a wide band oscilloscope. Note the appearance of distortion in Figure 5B which might have passed undetected on the narrow band scope. The "front porch" of the blanking pedestal, shaped by the higher frequency components of the signal, is more evident on the wide band scope than on the other.

Overload

The clipping or flattening of either negative or positive pulse peaks is sometimes encountered when checking waveforms. (See Figure 6.) This is caused by an overload condition in the scope or in the test receiver. Increase the vertical input attenuation on the scope or decrease the vertical gain control; if the clipping persists, the fault probably lies in the receiver under test and not in the oscilloscope. Ordinarily, overloading occurs in oscilloscopes because the vertical gain control and the vertical attenuation switch are improperly set.

Since the majority of the current model oscilloscopes employ a cathode follower at the vertical input, care must be taken to guard against overload in this stage. If it is necessary to decrease the vertical gain control too low, overloading may occur.

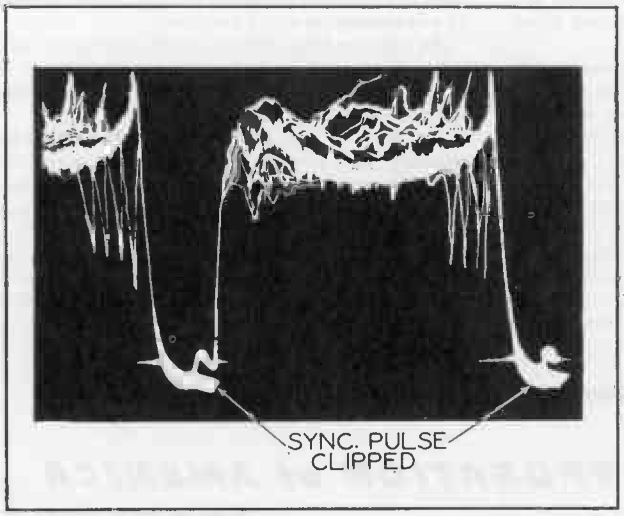


Figure 6. Video Signal Showing Results of Overloading. (Horizontal Sweep - 7875 cps.)

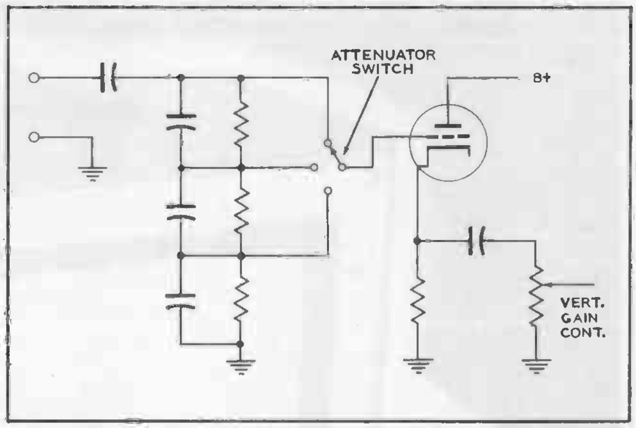


Figure 7. Typical Vertical Input to Oscilloscope Employing Cathode Follower Stage.

Figure 7 is a schematic of the cathode follower input of a typical oscilloscope. Note that the vertical gain control is in the cathode circuit of the cathode follower. The adjustment of this control does not affect the amount of signal applied to the grid. If it is necessary to set the vertical gain control to a setting less than 1/4 of its full rotation in order to obtain a useable pattern, the signal at the grid is probably great enough to cause overload. The attenuator switch should be turned to provide greater attenuation of the signal before it reaches the stage. The gain control can then be increased to provide a pattern of the desired size.

This precaution should always be followed on scopes having a cathode follower input. On any scope it is advisable to set the attenuator switch so that the gain control can be used in its middle range whenever possible.

Loading Effects

Another problem which frequently arises is the loading effect of the capacitance in the oscilloscope lead. This lead is usually shielded; and although the input capacitance at the scope terminals may be very low, the capacitance in the lead to the terminals is sufficient in many instances to vary the normal operation of the circuit under test. This is particularly true when the lead is connected across a high impedance network. A frequent example of this may be observed in checking horizontal sync control stages; the loading is often enough to "pull" the picture out of horizontal synchronization. Under such circumstances the pattern on the oscilloscope screen may not be a true picture of the normal waveform.

In addition to this loading effect, the lead capacitance may cause considerable loss of high frequencies in the waveform itself and thereby offset the advantages which might be gained through the use of a wide-band scope.

A Cathode Follower Attachment

A low-capacity probe provides one method of lessening the loading effect of the oscilloscope. Another method, and one which does not feature the rather high attenuation of the capacity probe, calls for the use of the cathode follower attachment similar to that described immediately following.

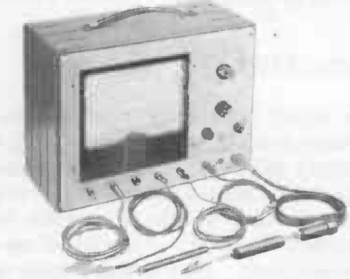
The characteristics of a cathode follower are such that it has an excellent high-frequency response

♦ ♦ Please turn to page 67 ♦ ♦

Announcing

The new RCA WV-87A *Master* VoltOhmyst*

$112.50 Suggested User Price



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RMS VOLTAGE: 0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
RESISTANCE: 0 to 1000 megohms in seven overlapping ranges
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- + Current Cable (Red)
- — Current Cable (Black)
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Accessory Probes Available on Separate Order

√ WG-264 Crystal-Diode Probe for measuring ac voltages at frequencies up to 250 Mc.

√ WG-289 High-Voltage Probe, with WG-206 Multiplier Resistor, for increasing dc-voltage range to 50,000 volts and input resistance to 1100 megohms.

FEATURING an 8½" meter, the new WV-87A Master VoltOhmyst is really the master of every testing application. Its peak-to-peak scales are particularly useful for television, radar, and other types of pulse work.

The WV-87A measures dc voltages accurately in high-impedance circuits, even with ac present. It also reads rms values of sine waves and the peak-to-peak values of complex waves or recurrent pulses, even in the presence of dc.

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On direct-current measurements, extremely low-meter resistance gives an average voltage drop of only 0.3 volt for full-scale readings on all ranges. Nine overlapping ranges provide dc readings from 10 microamperes to 15 amperes.

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TEST EQUIPMENT ***HARRISON, N. J.***

Insurance Protection in the Service Field

by GEORGE E. HOME

This article is not intended to cover the entire insurance requirements of a dealer or service shop; nor does it go into detail of the protection afforded by each class of insurance enumerated. It simply highlights the essential insurance coverages that a dealer or service shop should consider.

Workmen's Compensation and Occupational Diseases Insurance

All of the states in the United States and most of the provinces of Canada have enacted Workmen's Compensation Laws, and a majority have enacted Occupational Diseases Laws under which an employer of labor becomes liable for injuries to, or illness (including death resulting therefrom) of employees where such injuries, illness or death arise out of and happen in the course of employment.

The acts or laws of the various states differ as to the number of persons employed before the laws are effective, and as to whether the laws are elective or compulsory on the part of the employer, for example:

1. Florida - Elective on part of the employer employing three or more persons.

2. California - Compulsory on part of employer regardless of the number of persons employed.

3. Indiana - Elective on part of the employer regardless of the number of persons employed.

An elective Compensation or Occupational Diseases Act is one where the employer can elect to be bound thereby, or reject the act. An employer in most states who rejects the Act loses his common law defenses of:

1. Injury caused by acts of fellow servants.

2. Injury caused by negligence on the part of the employee.

3. The employee assumes the risk of employment.

The states of Washington, Oregon, Nevada, Wyoming, North Dakota, and Ohio have monopolistic state funds. No insurance can be provided the employer by private insurance companies; it must be purchased from the state.

The State Compensation Fund of the State of West Virginia is semi-monopolistic. Compensation insurance must be purchased from this fund unless the employer assumes his own risk upon permit granted by the industrial board of that state upon showing of sufficient financial responsibility.

Suggestion

If an employer is not automatically bound by the State Compensation or Occupational Diseases Act in the state in which he resides, it would probably be wise for him to elect to accept the acts and automatically bring his employee or employees within the provisions of the Acts as the election limits his liability to the benefits prescribed in the Acts. He can then insure his Compensation and Occupational Diseases liability as provided by the Acts.

The Compensation Acts are presumed to be conclusive as to liability. That is to say, the injured employee cannot go beyond the Acts for the recovery of damages. There is, however, that most infrequent case where the employee elects to sue for damages at common law. This liability is protected in the Standard Workmen's policy in use in all states under Section "B" of the policy.

Liability for Injury of Employees Under Common Law

Employers who are not automatically bound by the Compensation Act of the various states are in the same position as they would have been if the Compensation Acts had not been passed. That is to say, they can be sued for damages arising out of injury to employees, but the employer retains all of his common law defenses recited above; and insurance protecting the legal liability of the distributor, dealer or service shop can be written on this basis.

This type of insurance is known as "Employer's Liability" and provides defense without limit, and also provides for judgment payments that are legally assessed against the employer. Limits of liability should not be less than $25,000.

Liability for Injury to Persons Other Than Employees

The television or radio dealer or service shop is always open to claims and demands made by persons alleging injury caused by a negligent act on the part of the dealer or shop owner or their employees.

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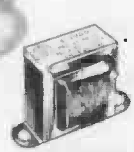

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*Merit is meeting the TV improvement, replacement and conversion demand with a line as complete as our advance information warrants!

The injury may be alleged to have taken place in the shop or place of business (commonly termed "premises"), or in the home where an installation or repair work is being performed, or caused by automotive equipment used in the service, or by the work that the employee has performed in an alleged negligent manner, or by an employee in alleged assault.

In a recent case, a television installation was being made in a home, and it was alleged that the employee making the installation failed to ground the lightning arrestor; and, as a result, the home burned to the ground and two of the occupants were seriously burned and demanded damages in excess of $50,000.

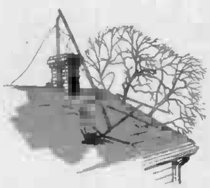
Insurance should be purchased to protect the dealer or shop owner against such claims and demands. The insurance coverage should provide:

1. Defense without limit.

2. An agreement to pay damages arising out of such demands which are legally assessed against the distributor, dealer or shop owner.

Generally speaking, insurance companies write this type of insurance coverage with a limit of liability per person, and an over-all limit of liability for all injuries arising out of one accident, and these limits are available for each accident. It is impossible to standardize the limits of liability that should be carried; but from the size of many judgments that have been rendered by courts in recent years, a minimum limit of $25,000 per person and $25,000 as an over-all limit is indicated.

The Comprehensive Public Liability form of policy offers the greatest protection, and should include all hazards to which the dealer or service shop is even remotely exposed. Liability for injury to persons caused by automotive equipment can be included or written under a separate Automobile policy.



Products Liability

Products Liability should definitely be included in the Comprehensive Public Liability form to make absolutely certain that injuries alleged to have been caused by faulty workmanship or material are covered. The Products Liability coverage should extend to cover all completed work or installation, and as a precaution the Completed Operations Endorsement should be attached to the policy.

Liability for Damage to, or Destruction of, or Loss of Property not in the Care, Custody or Control of the Dealer or Service Shop

When employees are sent to the premises of others to make an installation or repair at the customer's request, they are permitees; but, nevertheless, the employer as a dealer or service shop may be held liable if the employee damages the customer's premises or equipment as the result of a negligent act on the part of the employee, or if the employee makes away with property of the customer.

In a recent case, an employee of a service shop entered a residence as a licensee and it was alleged that while there, he appropriated to his own use certain money that he found on the premises. A case of this type will be covered under the crime section of this article.

Liability for damage to, or destruction of property can be included in the Comprehensive Public Liability policy form and should include Products Liability.

Liability for Damage to, or Destruction of, or Loss of Property of Others in the Care, Custody or Control of the Dealer or Service Shop

When the employees of a dealer or service shop enter the premises of a customer and with the permission of the customer remove property therefrom, such as radios and television sets, for the purpose of taking them to his shop for repair, or accepts in his shop such articles for repair or sale, he automatically becomes a bailee for the property under most state laws as it is presumed that the property will be returned to the customer in as good condition as it was when accepted by the dealer, or shop owner and that he will return the property upon demand.

Failure of the dealer or service shop to deliver the property makes the dealer or service shop liable for damages for recovery; and insurance should be procured under a Bailee Form which is practically all risk in scope.

This form of insurance is usually written on a Reporting Form of values taken in for repair or upon the gross receipts derived from such work.

Fire and Extended Coverage

Fire and Extended Coverage insurance should be carried on the dealer's or service shop's buildings and stock of merchandise.

Under this form of insurance, the insurance companies generally become liable for damage to or destruction of property of others provided the insured is legally liable therefor.

If a Coinsurance Clause is used in the form of the insurance, then the dealer or service shop may find himself a contributor unless the values of property of others in his care, custody or control, is taken into consideration. This contingency is, of course, practically eliminated if the dealer or service shop carries the proper form of Bailee insurance.

If Fire and Extended Coverage insurance is carried by the dealer or shop owner on his buildings

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Examining DESIGN FEATURES

by MERLE E. CHANEY

During the preparation of material for Photofact Folders, the actual observation and analysis of each unit brings to light many unusual or novel design features. The following is a description of some of the features used in RCA Chassis KCS66 and KCS66A, and Sylvania 1-260 Chassis.

RCA CHASSIS KCS66, KCS66A

Noise Suppression Circuit

A noise suppressor circuit is employed in the RCA KCS66A chassis to reduce vertical jitter on the screen of the picture tube in weak signal areas. This circuit is dubbed a "noise suicide" circuit because noise pulses are effectively eliminated at the grid of the vertical sync separator. A schematic of the noise suppressor circuit is shown in Figure 1. Following is a brief description of how the circuit operates.

The design of the 4th video IF stage is such that under normal conditions the received signal will not drive the 4th video IF control grid positive. Strong noise pulses, however, will drive the grid positive resulting in a large negative pulse across the screen dropping resistor. This pulse develops across the screen load because of the poor regulation of the screen circuit. The negative voltage pulse across R5 is applied through C4, R6 and R25 to the grid of the vertical sync separator tube.

At the same time the noise signal produces a negative going pulse in the plate circuit of the 4th video IF amplifier. The signal passes through the video detector diode and the video amplifier tube which results in a positive polarity pulse across the output load. This positive pulse is now applied through R22 and R25 to the grid of the vertical sync separator.

Since both a positive and a negative pulse voltage are applied to the vertical sync separator grid, the net result is zero. Thus the action of this circuit suppresses noise pulses which might otherwise cause erratic operation of the vertical oscillator.

Input Circuit to KRK11 Tuner

The input circuit to the KRK11 Tuner is contained in an antenna matching unit sub-assembly. (See Figure 2.) This sub-assembly contains an antenna matching transformer, for accommodating either 72Ω or 300Ω lead-in, an FM trap for rejecting signals from FM stations, and in addition, contains an input filter network for attenuating all signals whose frequencies are below 47 megacycles.

Figure 3 is a schematic of the antenna matching transformer or elevator coil. The input filter consists of L2, C1, L3, C2, L4, C3 and L5. L3, C2 and L5 form an intermediate pi section, while L2 and C1 form one M-derived end section, and L4 and C3 the other end section.

Alignment of the input filter is very critical and requires the use of accurate equipment since slight misadjustment could cause attenuation of a

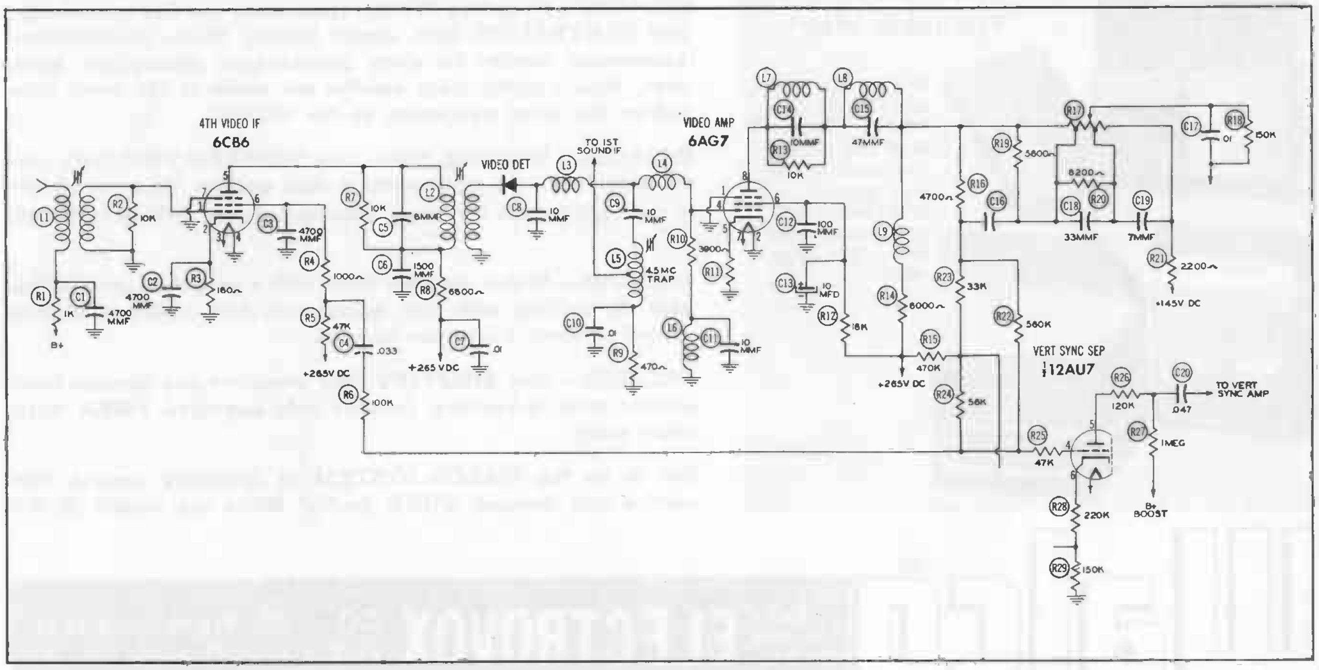

Figure 1. RCA Noise Suppression Circuit

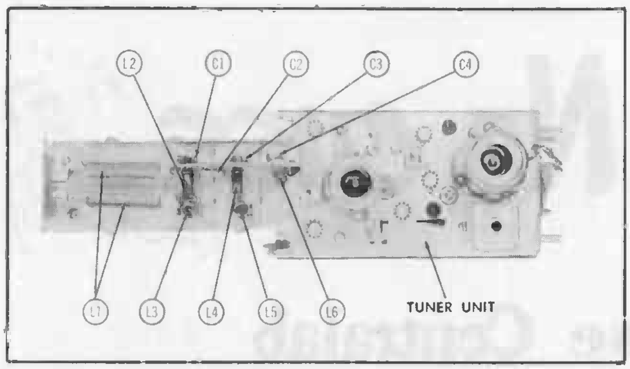

Figure 2. Antenna Matching Unit Sub-assembly

channel 2 signal. Coils L2 and L4 are tuned to 41.25 megacycles and 45.75 megacycles respectively for achieving maximum rejection of an incoming signal at the sound and video intermediate frequencies. L3 and L5 are adjusted to obtain the required response curve. Adjustment of the FM trap, L6, does not require the use of test equipment and may be adjusted for maximum rejection of an interfering FM signal.

Signals such as those from police transmitters which occur below 47 megacycles will be attenuated by the input filter. However, it should be understood that harmonics of these signals might fall within the television band in which case the input filter would not reject them.

B+ Power Supply

A full wave voltage doubler circuit is used in the B+ power supply. The power supply consists of a line isolation transformer with three 6.3 volt filament windings, two selenium rectifiers, two 150 mfd. voltage doubler capacitors, a filter choke and a 100 mfd. filter capacitor.

Figure 4 is a schematic of the power supply. On one alternation of the voltage in the transformer secondary winding, SR1 conducts, charging C1 to the peak AC voltage of the winding. The next alternation charges C2 when SR2 conducts. Since C1 and C2 are in series across the rectifier output, the two capacitor voltages are additive, achieving voltage doubling.

Focus Supply

The picture tube employed is a type 17GP4. This tube is designed for electrostatic focusing. A potential of about 3000 volts required by the focus anode is obtained by rectifying the voltage pulses present at the plate of the horizontal output tube.

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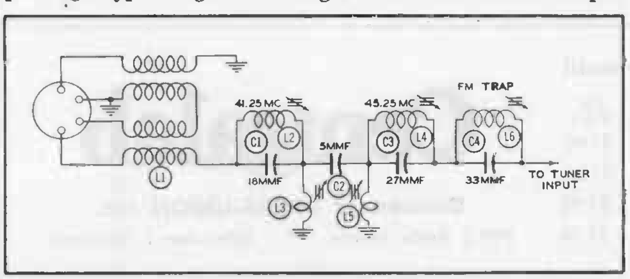

Figure 3. Schematic of Antenna Matching Unit

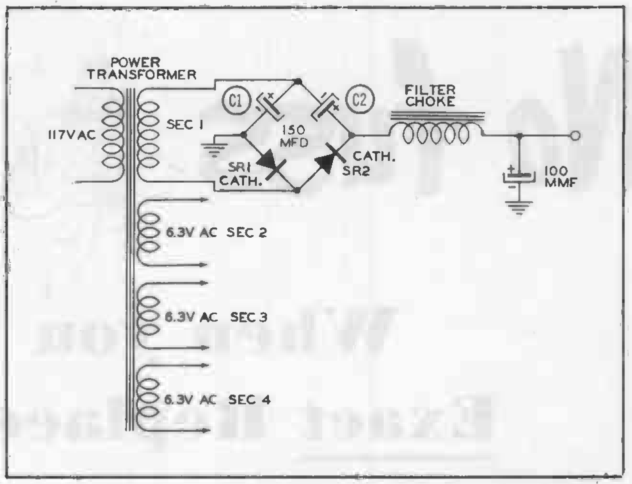

Figure 4. Full Wave Voltage Doubler Supply

assembly. This assembly is mounted on a molded plastic form and contained in a metal shield above the chassis which also forms the mounting support for the focus unit and deflection yoke brackets. (See Figure 5.) The plastic form is held in place in the metal shield by four ears which clip into slots stamped into the sides of the shield. On the back of the unit is an insulated cover for reducing shock hazard and which is easily removed for checking the high voltage rectifier tubes. Figure 6 shows these tubes mounted in recesses in the plastic form. Two subminiature type 5642HV rectifier tubes are employed.

These tubes, measuring about 3/8" diameter and 2" long, operate as voltage doublers to provide about 13,000 volts to the picture tube anode. Corona and arcing difficulties are minimized through the use of these tubes since short leads directly from the glass envelope to the appropriate circuits are employed.

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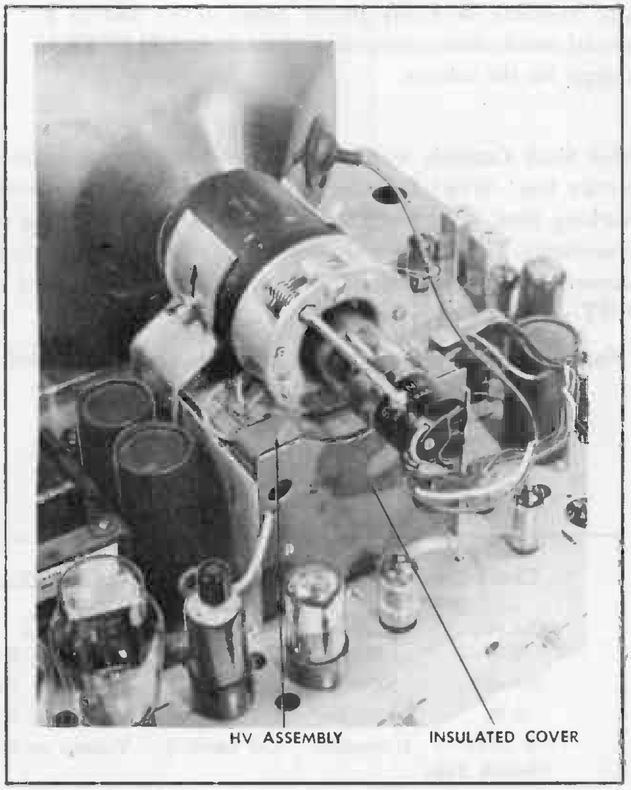

Figure 5. Packaged High Voltage Assembly

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*Switch Type

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"UHF" (Continued from page 13)

Figure 8. G. E. Model UHF-101 Translator.

G. E. MODEL UHF-101 TRANSLATOR

The Model UHF-101 Translator developed by General Electric is a UHF converter and provides full coverage for all UHF channels. It is designed to operate with any standard TV receiver switched to channel 5 or 6.

The Translator (shown in Figure 8) measures 7-1/2" high, 6-7/8" wide and 13-3/8" deep, and has a power consumption of 20 watts. Two operating controls are provided on the front of the panel. On the right is the tuning control. Tuning is indicated on a dial scale calibrated in frequency with a logging scale for added tuning convenience. On the left is a combination "OFF-VHF-UHF-Light" switch.

Since the converter operates in conjunction with a TV receiver there are three ways in which power may be applied to both units. The TV receiver line cord may be plugged into an AC receptacle on the back of the converter (provided the receiver power requirement is less than 300 watts); the converter line cord may be plugged into an AC receptacle on the TV chassis if this outlet is available; or the line cords from each unit may be plugged into a wall socket - in which case both units must be turned on and off individually. In the first instance, power to both units is controlled by the converter. If the converter is plugged into the TV set then the television receiver "ON-OFF" switch controls both units.

Additional requirements of the converter necessitate the use of a UHF antenna connected to appropriate terminals, and the connecting of the VHF antenna to terminals on the converter. A 300 ohm lead is connected between the TV receiver antenna terminals and the converter output terminals. This completes installation of the unit.

With the converter installed, normal reception of VHF signals by the TV receiver is provided by turning the function switch to VHF position. In this position the VHF antenna is connected to the receiver antenna terminals, and the receiver power is turned on if the receiver line cord has been installed in the AC receptacle on the converter.

UHF signals are received when the function switch is turned to UHF position. In this instance the converter power is turned on and the converter output is connected to the receiver antenna input terminals. The TV receiver channel selector is turned to channel 5 or 6 position. Two factors de-

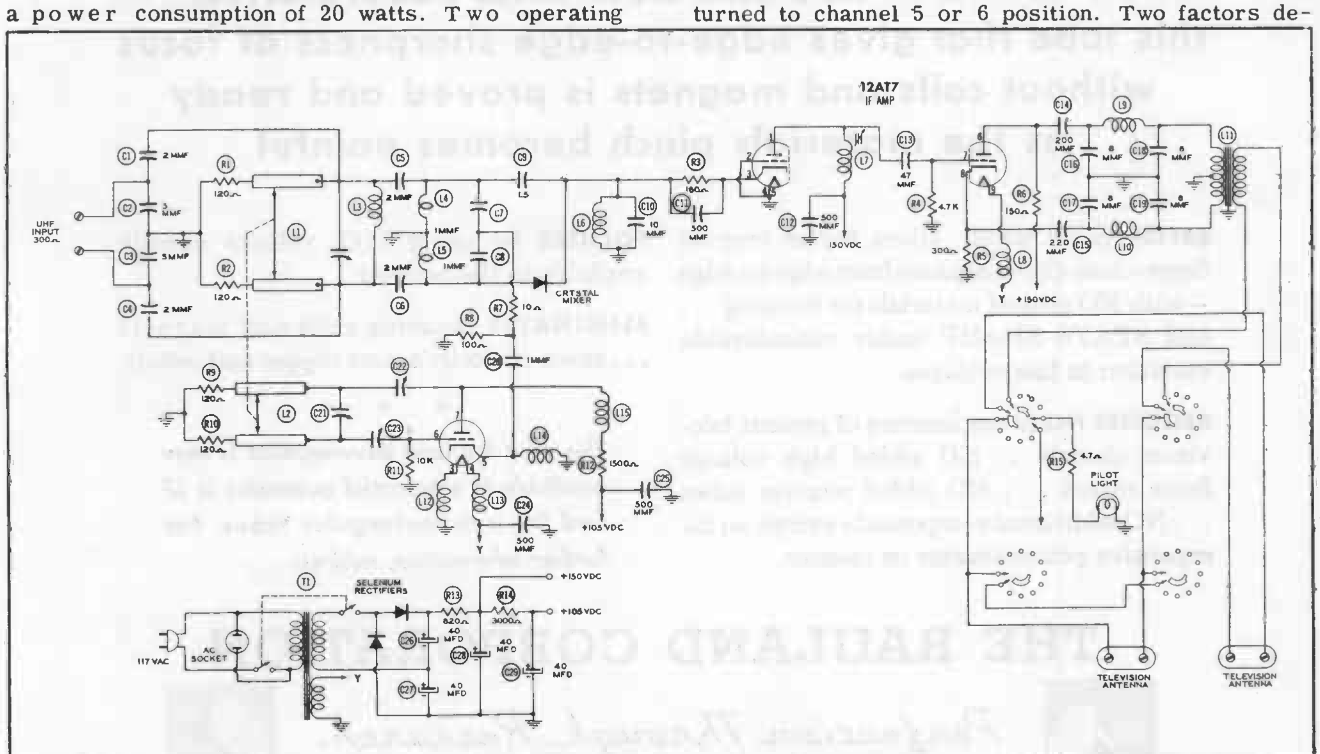

Figure 9. Schematic of G. E. Model UHF-101 Translator.

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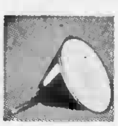

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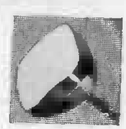

termine to which channel the receiver should be tuned for accommodating the converter output. The channel to which the converter output is tuned is stamped on the back of the converter chassis. In instances where a strong VHF signal is received by the TV receiver on the channel to which the converter output is set the other channel should be employed. Shifting the tuner output 6 megacycles to fall on the unused channel is accomplished by adjusting L7 located on the back of the converter chassis for best picture.

A schematic for the General Electric Model UHF-101 Translator is shown in Figure 9. A high pass input filter for rejection of VHF signals is incorporated. Following this is an RF preselector circuit for achieving a high degree of selectivity consistent with passband requirements. Preselection aids in image rejection, and reduction of cross modulation in the mixer caused by strong UHF signals. The output of the RF tuned circuits is fed to a crystal mixer type 1N72.

A low level injection voltage obtained from a type 6AF4 oscillator tube provides crystal excitation to effect frequency conversion. The local oscillator is designed to operate below that of the incoming signal, thus providing the correct relationship between video and sound carriers to the VHF receiver.

From the crystal mixer the converted signal is applied to an IF amplifier circuit designed for low noise characteristics and employing a type 12AT7 dual triode tube. The input triode section is a cathode driven grounded amplifier. An inductance in the first triode output is adjustable for shifting the signal 6 megacycles to cover either channel 5 or channel 6. The second triode section functions as a grid driven amplifier supplying balanced push-pull output to a coupling transformer. The secondary of the coupling transformer is connected through appropriate switching for providing an IF signal to a VHF receiver.

The power supply consists of a power transformer for providing converter filament voltage and higher voltages to a voltage doubler type rectifying circuit. A switch in series with the primary of the power transformer applies power to the converter power transformer and to the AC receptacle on the converter chassis. This switch is closed when the function switch is in "VHF, UHF and Light" position.

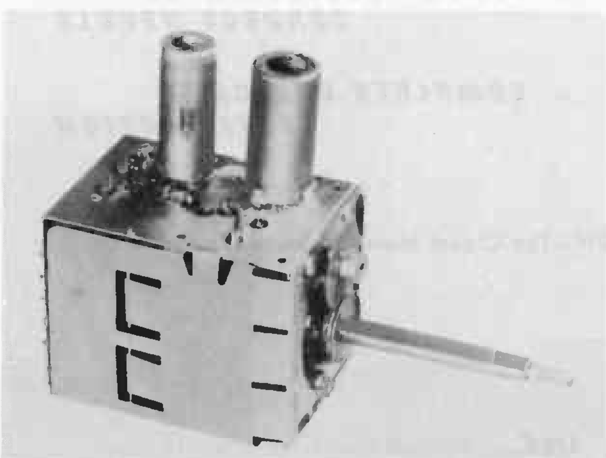

Figure 10. Sarkes Tarzian Type TT16 Tuner.

Therefore, in VHF position the converter filaments are lit. A warm-up period then is not required when switching from VHF to UHF position.

Another switch operated by the function control is in series with the high voltage secondary winding and remains open on VHF position, removing voltage from B+ circuits in the converter. In "VHF, UHF and Light" position the switch is closed, thus applying B+ to appropriate circuits.

We wish to acknowledge the cooperation of the General Electric Company in supplying us with data which was used in this presentation.

SARKES TARZIAN UHF TUNER UNITS

A method for the inclusion of UHF in the tuner without sacrificing any of the VHF channels now required has been developed by Sarkes Tarzian. This new tuner type TT16 shown in Figure 10 is essentially a VHF tuner that has three additional positions for UHF reception.

The input circuit of the TT16 tuner is very similar to that used in Tarzian's latest VHF tuner. A 6AK5 is used as the RF amplifier and a 6X8 as the mixer-oscillator tube. The 6X8 is a combination triode-pentode tube and was especially designed for this application. Through the use of this tube a high conversion gain can be obtained with a low noise figure. In order to provide the additional switch positions for UHF, a 16 position switch is used instead of the 12 position switch. This provides for service on the twelve VHF channels and three UHF positions, while the sixteenth position has no tuning significance and is not used. The reason for the three UHF positions will be explained later.

For operation in conjunction with the TT16 tuner a separate UHF tuner is employed. The UHF tuner itself is continuously tunable over the entire UHF range from 470 to 890 megacycles. A three-section tuning element is employed, two sections for bandpass input and the other for oscillator tuning. A type 6AF4 is used as a local oscillator. This tube is a triode which was specifically designed for use as an oscillator in UHF receivers. A crystal is used as a mixer, the output of which is fed to the proper terminal in the TT16 tuner. This system is not of the double conversion type. Therefore the output of the mixer is an intermediate frequency signal for a 41 megacycle IF system.

The versatility of the TT16 tuner is illustrated by the fact that switching to one of the two UHF positions located between channel 2 and channel 13 position changes the TT16 tuner to a low noise 41 megacycle amplifier. Compensation, therefore, is provided by the IF amplifier for conversion loss of about 9db, resulting from the use of crystal mixer in the UHF tuner. A signal, then, is provided to the receiver's IF stages of a level that is comparable to that normally available during VHF reception.

Physically the UHF tuner is designed to mount on the television receiver usually above the TT16 tuner by means of brackets. B+ and filament supply voltages for the UHF tuner are available from terminals on the TT16 tuner.

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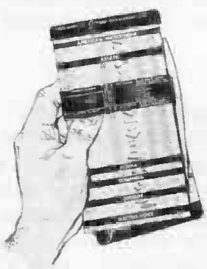

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If the TV receiver comes equipped with a TT16 tuner, it is possible to install a UHF tuner in the field.

Additional controls are not required to operate the UHF tuner. A pulley arrangement between the fine tuning shaft of the TT16 tuner and the UHF tuning shaft permits tuning of either unit from a common control.

The TT16 is supplied for either 21 or 41 megacycle IF systems. For 21 megacycle IF systems double conversion is employed. The UHF tuner then provides a 130 megacycle output to the TT16 tuner. Switching the TT16 to the UHF position located between channel 6 and channel 7 changes the TT16 tuner to a 130 megacycle amplifier. In this position a double superheterodyne system is used for providing a tuner output at 21 megacycles for receiver IFs operating at this frequency.

There are several reasons why a double conversion system is used when a 21 mc IF system is employed. One is the fact that considerable "pulling" is exerted upon the oscillator since it is operating so near the incoming signal. If the oscillator "locks in" with the incoming signal, no output is obtained.

Another very important disadvantage to the use of a 21 mc IF in a UHF receiver is the loss of selectivity. By providing a 130 mc IF signal out of the UHF tuner, both of these disadvantages are overcome. This signal is then accepted by the VHF tuner and converted to the 21 mc IF.

Another UHF approach taken by Sarkes Tarzian was the development of a single channel pretunable tuner unit. Designed for installation in receivers employing a TT16 tuner in areas where only a single UHF station is available, its particular merit lies in its simplicity and moderate cost. It may be connected on the back of the receiver with supply voltages provided from terminals on the TT16 tuner. A photograph of this UHF unit is shown in Figure 11. The output of this UHF unit is accommodated by turning the TT16 channel switch to one of the UHF positions between channel 2 and channel 13. With the unit pretuned at the time of installation, operation is automatic and is governed by the TT16 channel selector switch. The two UHF positions between channel 2 and channel 13 make it possible to accommodate the output of two pretunable UHF units should it be desired to receive either of two available UHF stations. This unit, designed for full UHF performance, is offered in two models. One model is available for receiving signals in the lower half of the UHF band,

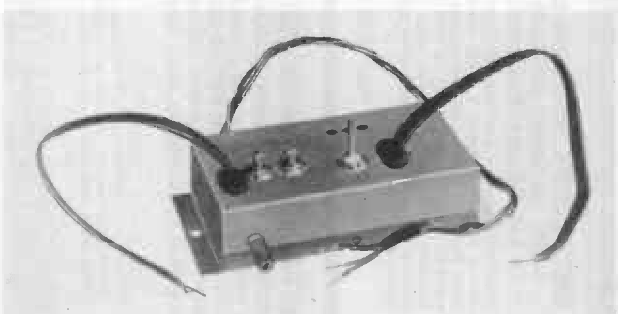

Figure 11. Sarkes Tarzian Single Channel UHF Tuner Unit.

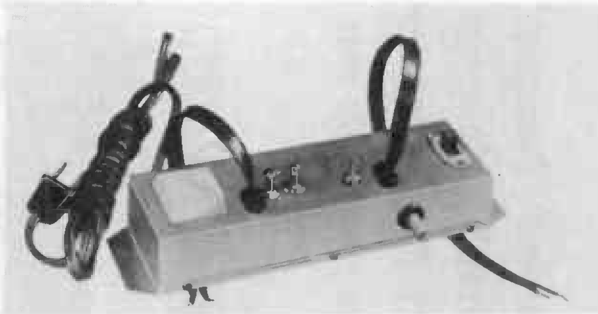

Figure 12. Sarkes Tarzian Single Channel UHF Tuner Unit with Self Contained Power Supply.

while the other model provides reception from stations lying in the upper half of the band.

Another version of the pretunable UHF tuner unit is one containing its own power supply. This unit is shown in Figure 12. It is designed to have equal performance to the above described units.

It is claimed that a number of variations are possible with the tuning devices described. It is further understood that the TT16 tuner and associated UHF unit are adaptable for specific requirements. In these instances simplification of the TT16 tuner is possible for providing the desired service by limiting the channel selector switch to twelve VHF positions and only one UHF position.

We wish to acknowledge the cooperation of the Sarkes Tarzian organization in supplying us with data which was used in this presentation.

STROMBERG-CARLSON UHF CONVERTER

A UHF converter developed by the Stromberg-Carlson Company provides full 70 channel UHF tuning. This converter is designed to operate on all Stromberg-Carlson television receivers as well as the modern designs of other manufacture.

Physically, the unit shown in Figure 13 is contained in a cabinet styled in green leatherette and measures 8" wide, 4" high and 6" deep. Figure 14 shows a top chassis view of the converter unit. The weight of the unit is 5-1/2 pounds and the power consumption is about 10 watts.

Figure 13. Stromberg Carlson UHF Converter.

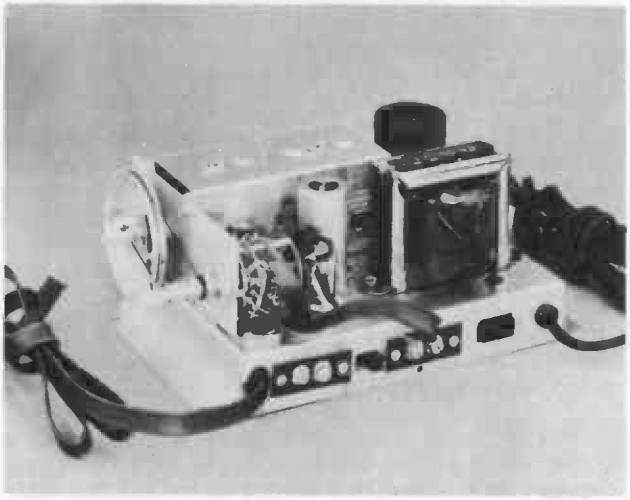

Figure 14. Chassis View of Stromberg UHF Converter.

Setting up the converter for operation is performed by a few simple procedures. The AC plug to the VHF receiver is inserted in an AC receptacle at the back of the converter unit. Then the AC cord to the UHF unit is plugged into an AC wall socket. The lead from the UHF converter marked "TV Input" is connected to the VHF receiver antenna input terminals, after first disconnecting the VHF antenna. The VHF antenna is connected to the UHF converter terminals marked "TV Antenna." During the converter installation it should be determined whether channel 5 or 6 on the VHF receiver will be used to receive the converter output. Since adjacent channels in any one metropolitan area will not be occupied by TV stations the non-used channel should be employed to pick up the converter output. If signals are normally obtained on both channels, select the channel with the weakest signal. A switch at the rear of the converter is used to shift the IF output 6 megacycles to accommodate either channel 5 or channel 6. This is accomplished without loss of tracking since the preselector circuits are designed for a bandwidth of 12 megacycles.

With the converter set up for operation the power switch on the TV receiver may be left in "ON" position and power to both converter and receiver is controlled by the converter "OFF-ON" switch.

The following combinations are then provided by the three position function switch on the front of the converter unit:

In "OFF" position power to both converter and TV receiver is turned off.

In "VHF" position power to the TV receiver is turned on, the VHF antenna is connected to VHF receiver and filament voltage to the converter tubes is provided.

In "UHF" position power is turned on for both TV receiver and converter with a choice of either UHF antenna, VHF antenna, or built-in cabinet antenna, depending upon signal conditions.

A schematic of the Stromberg-Carlson UHF converter is shown in Figure 15. The UHF signal, from a balanced 300 ohm line connected to the converter input terminals, is capacitively coupled to a double tuned preselector circuit.

Inductive padding is employed in both the antenna and mixer circuits to provide the desired tuning range. Required bandwidth of 12 mc in the preselector is provided by a combination of high-side capacitive and inductive coupling between the antenna and mixer tuned circuits. Grounding of the low fre-

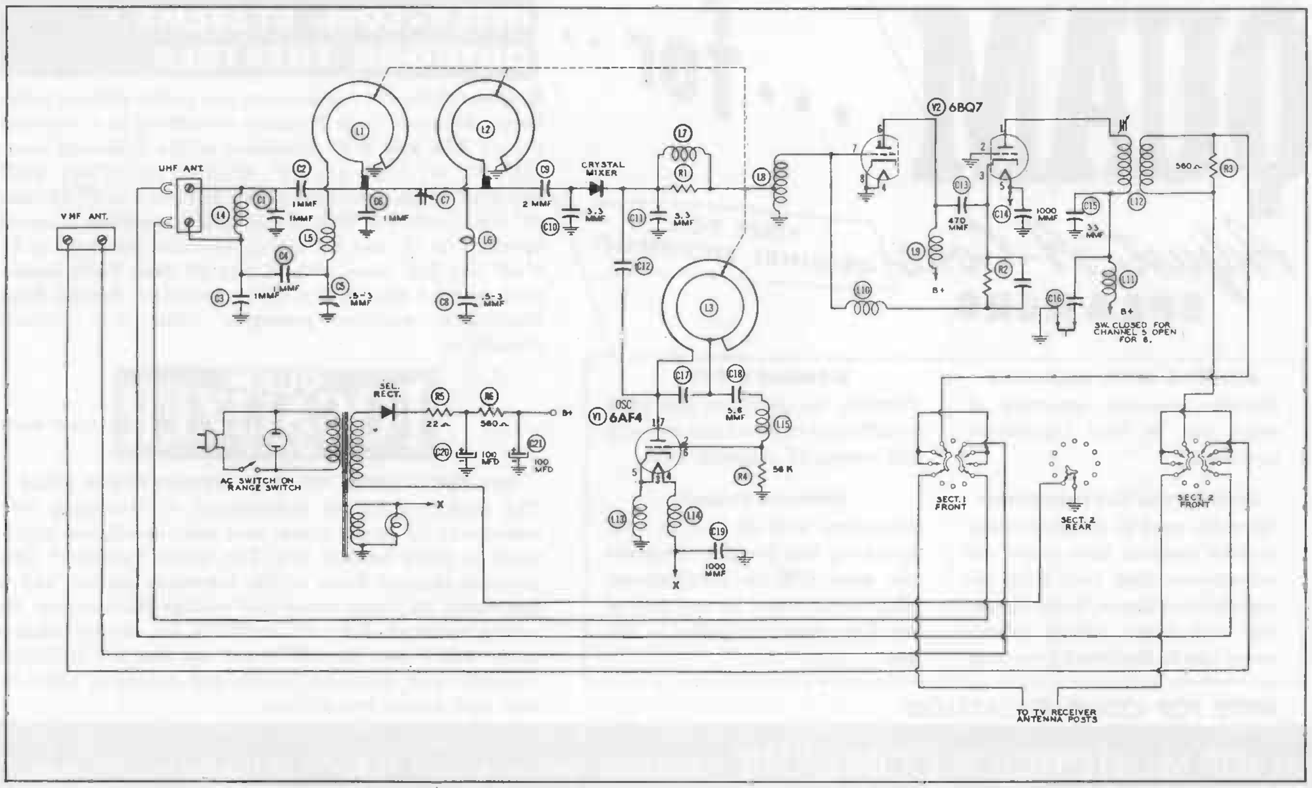

Figure 15. Schematic of Stromberg Carlson UHF Converter.

quency ends of the antenna and mixer tuned lines and grounding of the rotor contacts in the antenna section eliminate spurious suckouts within the band.

A crystal mixer type 1N72 is capacitively coupled to the mixer tuned circuit. The oscillator injection voltage is also fed to the crystal mixer.

The local oscillator is a type 6AF4 designed especially for UHF duty. A fixed series trimmer capacitor effectively establishes the low frequency end of the tuning range, while the total range and high frequency limit is controlled by a series inductance consisting of the plate and grid leads. Adjustment of this inductance is performed by varying the spacing between the two leads. Dissimilar chokes are employed in the cathode and ungrounded heater leads while resistors are used in the plate and grid return circuits. Grid-plate socket capacity is minimized through the use of a special UHF low capacity socket, thus preventing bypassing of the tuned circuit.

It is said that warm-up drift which depends somewhat upon individual tubes is nearly complete after about one minute of operation. Using the lowest possible plate voltage consistent with reliable performance also aids in minimizing warm-up drift. Shielding of the oscillator and tuned circuit, plus the low oscillator plate voltage reduces oscillator radiation.

The conversion loss of the crystal mixer is compensated for by the use of a low noise cascode-coupled amplifier. The cascode amplifier circuit employing a type 6BQ7 consists of a cathode-grounded, grid-driven, neutralized triode section followed by a grounded grid triode amplifier stage. Full 12 megacycle bandwidth is provided by the cascode amplifier input and interstage circuits. In the output triode however the plate circuit is designed for 6 megacycle bandwidth.

Shifting of the 6 megacycle bandwidth IF signal to fall on either channel 5 or channel 6 is accomplished by a slide switch. Actuating this switch connects a small capacitor from the B+ end of the output plate coil to ground. Setting this switch for the desired channel is made at the time of installation and should not require further attention.

Balanced output of the converter eliminates the pickup of interference in the lead from the converter to the television receiver.

The use of a self-contained power supply adds to the utility of the converter. The power supply consists of a selenium rectifier connected in a half-wave rectifier circuit, a surge limiter resistor and an RC filter network. A filament winding supplies 6.3 volts to the pilot light and tubes.

The low side of the power transformer secondary winding is connected to a wafer on the range switch. Thus with the range switch in VHF position the filaments in the converter receive power while the B+ is disconnected. Switching to UHF position connects the B+ circuit making UHF reception available immediately without a time lag to allow for tube warmup.

We wish to acknowledge the cooperation of the Stromberg-Carlson Company in supplying us with technical data which was used in this presentation.

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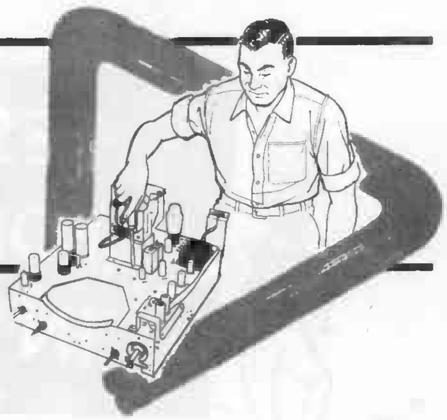

by GLEN E. SLUTZ

Alignment Tools and Gadgets

Here are a few simple aids which make alignment work a little easier. Some of these aids can be purchased ready-made and others can be very easily constructed from available material.

The local oscillator is always a problem in IF alignment procedures, since it is usually best to have it inoperative. In the case of a separate oscillator tube, this can be accomplished simply by removing the tube. Many present day sets however, employ a double triode tube as mixer and oscillator together, the type 6J6 being a very common tube for this purpose. Figure 1 shows a 6J6 that has had pin No. 1 removed; this pin is the plate connection to the triode section which is most frequently used as the oscillator. Its removal stops the oscillator without interfering with the normal operation of the mixer. When using this tube, care must be taken to align the remaining pins with their corresponding socket openings, because with a pin missing, a miniature tube can be inserted incorrectly. Still another way to interrupt the oscillator without actually removing a pin and thus permanently damaging a tube is to paint the pin with a little nail polish which will act as an insulator. However, when the tube is to be used very often in different sets, the nail polish will wear away quickly and have to be replaced, so it is advisable for service work to remove the pin entirely.

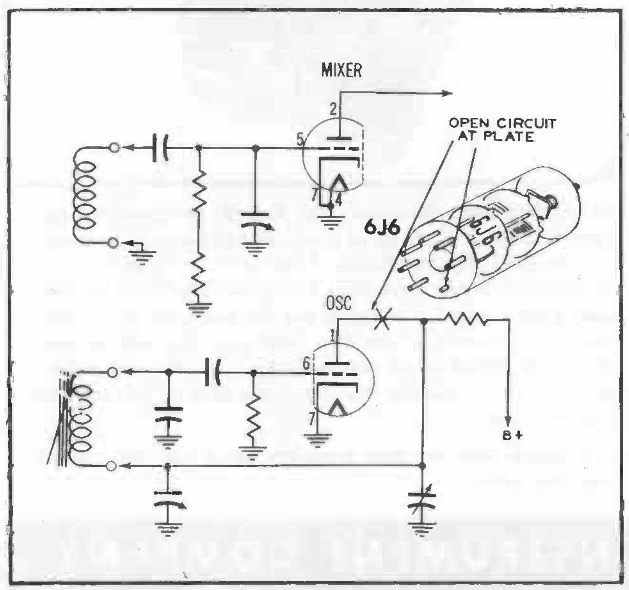

Figure 1. Dummy Converter.

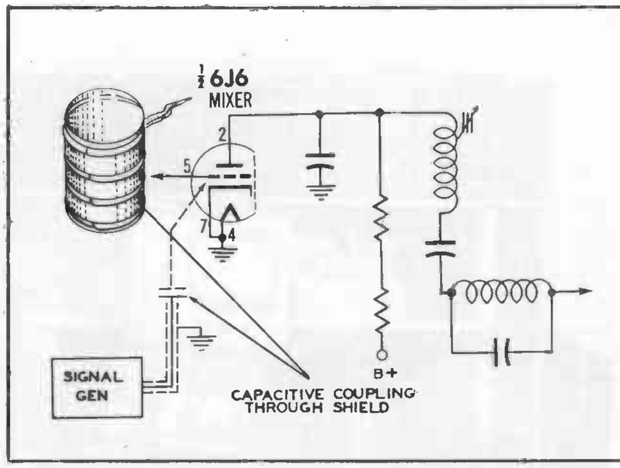

Figure 2. Ungrounded Shield for Dummy Converter.

Another handy article, for use with the dummy converter tube described above, is a metal shield for the tube which will not contact the chassis and to which a signal generator lead can be easily connected. The shield will take on the qualities of a capacitor and act to couple any signal placed upon it to the electrodes within the tube. Such a shield is shown in Figure 2. The shield should be one which will fit snugly in place about the tube so there is no problem of it sliding down and making contact with the chassis.

The pictured shield was made from a standard shield of ribbed, over-lapping construction commonly found in many receivers. It was shortened to approximately 15/16 inch in length by snipping the excess off the bottom of the shield. Then a small length of stranded, bared wire was doubled over, twisted, and soldered to the shield near its top. This wire served as a connecting post for the signal generator clip lead. The use of this shield simplifies the capacitive coupling of a signal directly into the mixer without the introduction of loading problems which might affect the frequency response of the mixer plate circuit.

A third item, shown in Figure 3, is useful in some alignment procedures where a dummy antenna is called for. This dummy antenna usually consists of a capacitor placed in series with the signal generator lead and the test point in the receiver under investigation. It serves to isolate the generator from any DC voltages which might be present at the test point. Its value is not particularly critical; a mica or a ceramic of some value between 0.001 and 0.01

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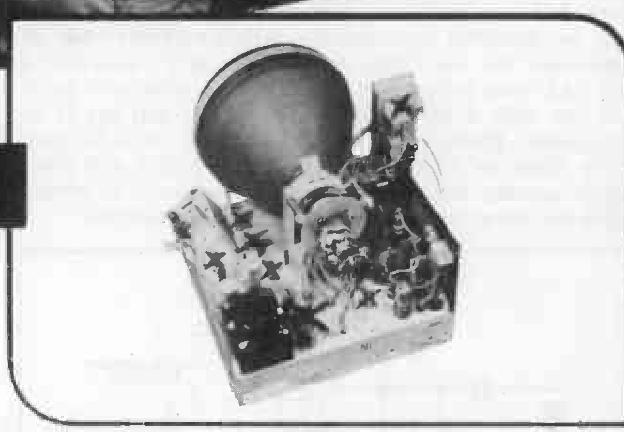

"Due to the highly efficient circuits of today's TV receivers, their Vacuum tubes are constantly pressed to their upper limits. In order to produce a sharp clear picture these circuits must function perfectly at all times.

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We have continued to stand on the accuracy of our Hickok 533 and 534A shop testers for any tube test, so we decided to invest in another Hickok to build our income with increased "house-call" business. We chose the Hickok 605 tube tester because of its multimeter. For $12.70 more than the standard Hickok we got a built-in multimeter with a vacuum tube rectifier which is better than any other V.O.M. we could buy separately; even up to $50.00 as it will also measure capacitance. The complete Hickok 605 cost $167.70. With it we replaced 235 tubes in the first week of part time use. The profit on these tubes alone covered the cost of the 605 and gave us an additional small income on top of it. Our new, fast and accurate service has added many customers by way of recommendation, as well as a healthy increase in our shop service on more complete jobs.

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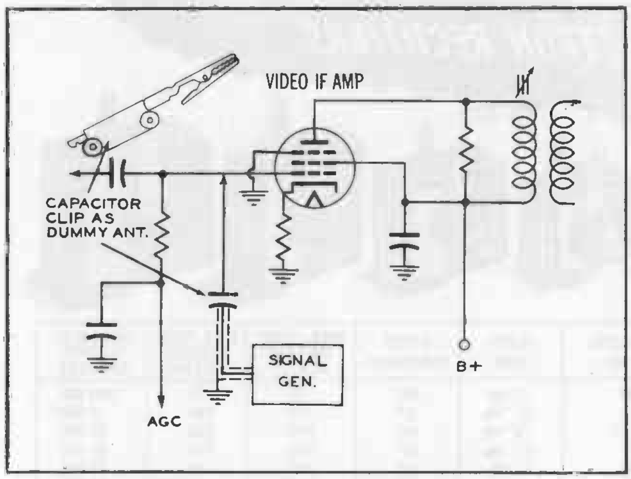

Figure 3. Dummy Antenna.

mfd. is suitable. An alligator clip is soldered to one side of the capacitor as shown. In use, the alligator clip connects to the test point and the signal generator lead connects to the other side of the capacitor.

The gadget shown in Figure 4 is simply a mica capacitor with alligator clips on its two terminals. Its value can be anywhere between 500 and 5000 mmfd. When the capacitor is connected across the input to the oscilloscope, the marker pips used with response patterns show up much more clearly and sharply. That is because a marker pip is produced by the beat between the marker frequency and the varying frequency of the sweep generator. The point of special interest to the viewer is where the sweep frequency is equal to or very close to the marker frequency. The beat then will be a null or at least a very low frequency. The beat becomes progressively higher in frequency the further away the sweep is from the marker. These higher beat frequencies are of no interest and may be shunted from the oscilloscope by the mica capacitor while the null and lower beat frequencies remain visible as a sharp pip on the screen.

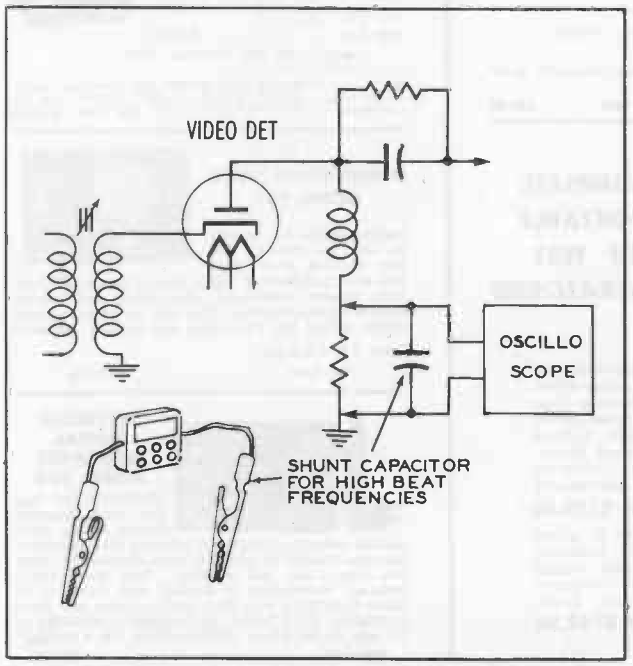

Figure 4. Capacitor for Sharpening Marker Pips.

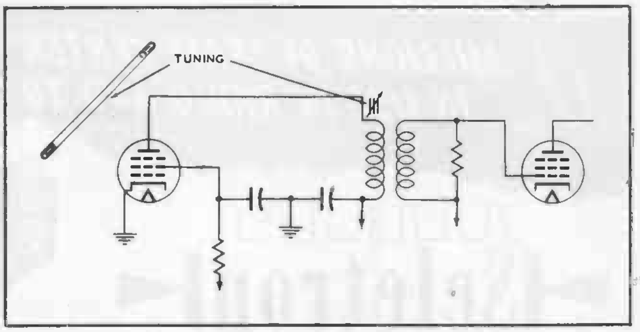

Figure 5. Tuning Wand for Touch-up Adjustments.

A tuning wand, shown in Figure 5, is useful when touching up alignment adjustments to obtain a desired shape in the response pattern. The wand consists of a molded plastic rod with a small brass tip on one end and a powdered iron tip on the other. The insertion of the iron tip into the core space of an IF transformer has the same effect as turning the adjustment slug clockwise into the transformer; it increases the inductance of the tuned circuit, thereby decreasing the resonant frequency of the transformer. The opposite effect is produced when the brass end of the wand is moved into the transformer. The inductance decreases and the resonant frequency goes higher. This is equivalent to actually turning the adjustment slug out of the transformer. The wand provides the serviceman with a means of determining which adjustment will shape the pattern correctly, and he can do this without disturbing the existing alignment of the receiver.

In addition to these articles there are, of course, the standard alignment tools with which most servicemen are familiar. These consist principally of a wide variety of insulated screwdrivers. The serviceman would be wise to have on hand a representative selection of these screwdrivers.

Vertical Deflection Troubles or No?

Some trouble-makers are hard to locate in a television receiver, as we all well know. The indication in one particular set was that the vertical deflection section was not operating properly. Soon after the set was turned on, broad, white, horizontal bars flashed intermittently over the picture. What appeared to be a vertical fold-over at the bottom half of the picture showed at intervals. The vertical sweep circuits were checked thoroughly. Nothing seemed to be wrong there. Still the picture gave every indication of trouble in the vertical sweep somewhere; in fact, the picture appeared to partially collapse at times. The trouble was finally located in a video IF amplifier as shown in Figure 6. The 6AG5 had a heater-to-cathode short. The 60 cycle hum voltage was impressed between cathode and ground and modulated the tube. If the cathode of the tube had been grounded, the effect of the heater-to-cathode short would have been much less pronounced and might not have bothered the vertical sweep section. But the trap and the cathode resistor provided a load for the hum voltage, causing a greatly amplified hum output to the picture tube and to the sync circuits.

♦ ♦ Please turn to page 64 ♦ ♦

Audio-Facts

by Robert B. Dunham

Figure 1. Top View of Completed Units.

The Williamson Amplifier has become one of the most popular and well-known audio amplifier circuits since its introduction by D. T. N. Williamson in the April and May 1947 issues of Wireless World. The complete commercially built amplifier is available as well as kits and basic components especially designed by major manufacturers for this circuit. Since it is so popular, it no doubt would be worth while to become familiar with its adjustment and operation, as most of us will encounter it sooner or later in installation, repair, construction, or just plain or fancy discussion.

The circuit is basically simple (Figure 2) using triode connected beam power output tubes, an output transformer built to rigid specifications, negative feed-back, push-pull "driver" stage with the first voltage amplifier stage direct-coupled to the "cathodyne" or "kangaroo" phase inverter.

The original circuit used British type KT66 beam power output tubes. Various type tubes have been used to replace the KT66's with, in some cases, a resulting loss in power and increase in distortion, just how much or how little depending upon the type used. The 807 seems to be the most popular with the 1614, 5881, and various other types also employed.

One of the first and best known adaptations of the circuit is the "Musician's Amplifier" as constructed and described by David Sarser and Melvin C. Sprinkle in the November, 1949 issue of Audio Engineering. Their amplifier uses 807 output tubes and American made transformers.

The Radio Craftsman C500 Ultra-Fidelity Audio Amplifier (Figure 3) is an excellent example of a commercially available high quality amplifier based on the Williamson Circuit. Two British made type KT66 tubes are used in the output stage with two

♦ ♦ Please turn to page 71 ♦ ♦

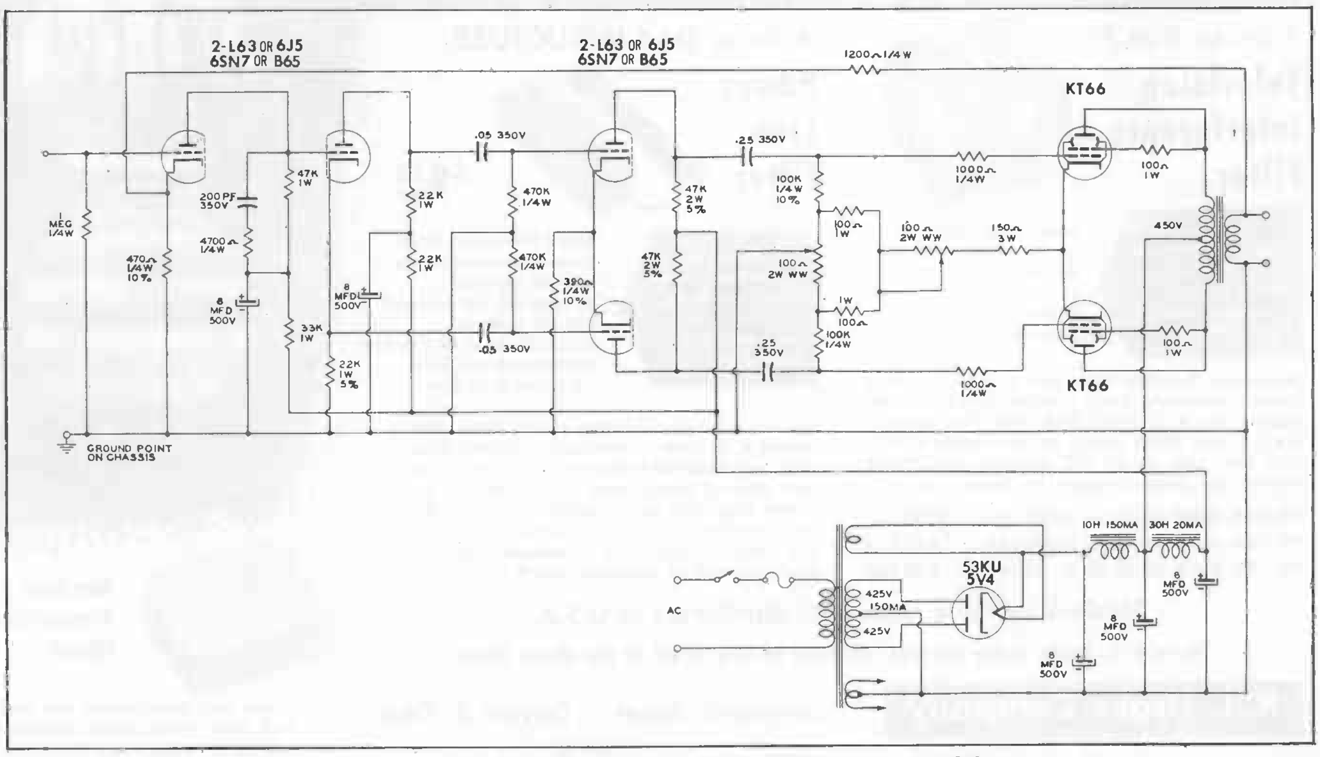

Figure 2. Schematic Diagram of Basic Williamson Amplifier.

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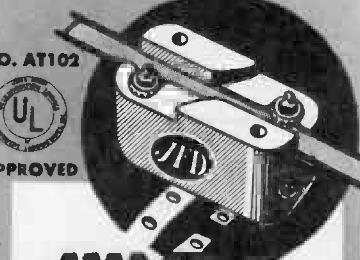

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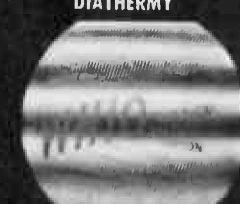

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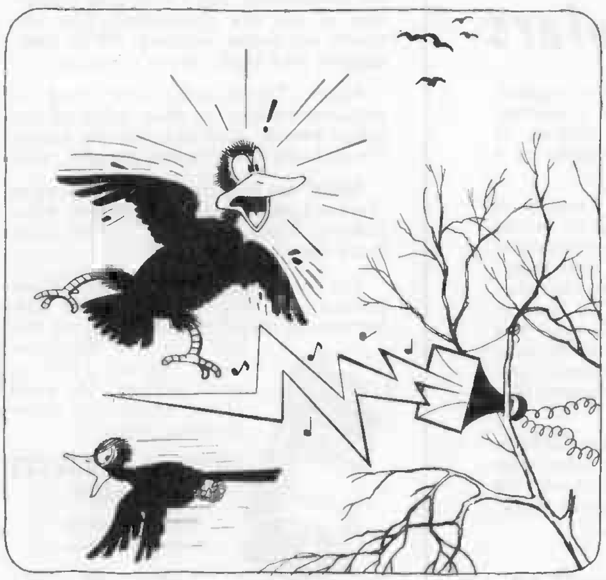
See page 24, Nov-Dec PF Index for additional information on Drake filters.

John Markus
Editor-in-Chief, McGraw-Hill Radio Servicing Library

Dollar and Sense Servicing

JABBERS. When you see a factory photo showing a lady holding her soldering iron the way a serviceman holds it, chances are 100 to 1 the shot was posed to look pretty. Soon as the photographer gets out of her hair, the gal will grab her iron like a potato masher and jab down at the joints the way she was trained by modern methods engineers. It's nothing for these girls to solder half a dozen complete joints and hook in a few wires to boot in less than a minute on a moving-belt assembly line.

BELLS. Emerson's three-way portable assembly line is both a revelation and a nightmare to an engineer seeing it for the first time. Every twenty seconds a loud bell clangs and the head girl starts a new empty chassis down the line. At the sound of the bell, each girl on the line is theoretically supposed to pass her set on to the next, though there is a spare chassis or two between operators to take care of contingencies. This is probably the shortest time cycle in the business, yet each girl does her assigned number of joints efficiently and happily, unmindful of the clangs. How many men could stand the gaff of working on some 1,400 different sets a day?



BURBLES. A public-address system fed by an audio oscillator that is rapidly varied between about 9,000 and 11,000 cps is highly effective in discouraging flocks of starlings from roosting on buildings or on trees where they are a nuisance, according to Audubon Society of Detroit. Strategically located speakers and a substantial power output level keep the birds on the wing. For more information on this ultrasonic scarecrow, see the item on page 52 of November Radio-Electronics.

ILLEGAL. Though it's quite all right to cut your own records or make tape recordings off the air, selling them is another matter. In a recent decision, the New York Supreme Court ruled against a record dealer who cut master plates of every Saturday afternoon Metropolitan Opera broadcast, stamped out a lot of records and sold them cheap. The Opera Association didn't like this because the records were poor and made the music sound bad. Columbia Records didn't like it either, because they had contracted for exclusive record rights.

THOUGHT. The man who trusts men will make fewer mistakes than he who distrusts them. - Cavour

PRISON TV. In the Houston jailhouse, police are testing an industrial TV setup which allows them to watch on a desk television receiver the prisoners in their cells. Since there's a mike alongside each camera, no prisoner can even swat a fly without being seen or heard.

UNDERSEA TV. Identifying sunken ships is TV's newest job. In searching for the sunken submarine Affray, lost during a practice dive, and using underwater sounding equipment, the British Navy located many ocean-bottom wrecks. At each site, a portable water-tight TV camera having remote controls and powerful floodlights was lowered over the wreck. Several weeks of searching brought success, as viewers on board the rescue ship read the name "Affray" on wreckage 250 feet below them.

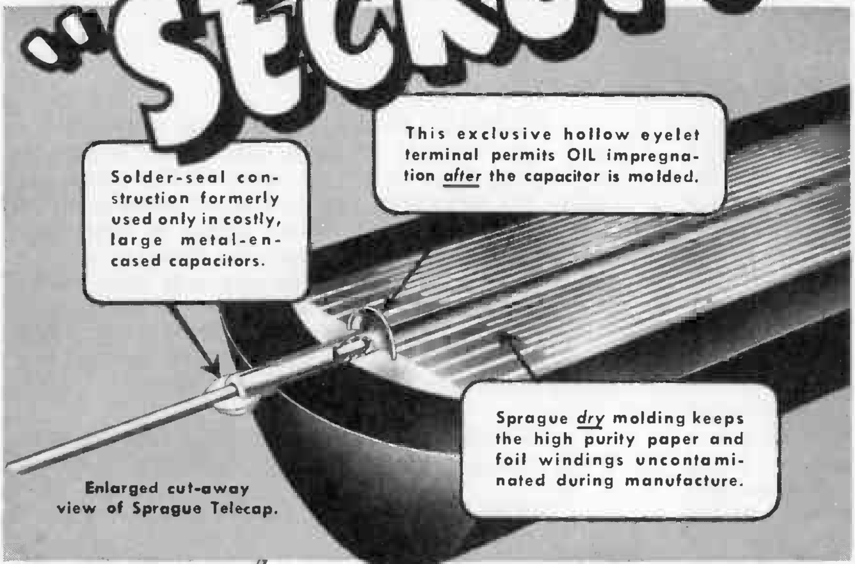
FORECAST. For 1952, not over 4 million more TV sets, according to NPA Electronics Division director E. T. Morris, Jr. For 1951, actual production was about 5 million, and for 1950 about 7.4 million.

UNFREEZE. Legal machinery for granting TV station permits is now expected to start grinding sometime in February 1952. First to get go-aheads will be small communities where there is relatively no competition for available VHF channels. In major markets like Portland, Denver and El Paso, decisions are a long way off because competition for available channels will mean long-drawn-out hearings. Alert service organizations with experience, trained personnel and business know-how are now planning establishment of branches in communities that'll soon be getting their first TV.

LICENSING. New York city council passed TV service licensing bill November 13th, setting fees ranging from $5 to $25 per year for technicians, service dealers and contractors. Commission of 8 members will administer bill and regulate licensing qualifications. Date for initiating license examinations for technicians is November 1952, according

♦ ♦ Please turn to page 65 ♦ ♦

HERE'S THE "SECRET!"



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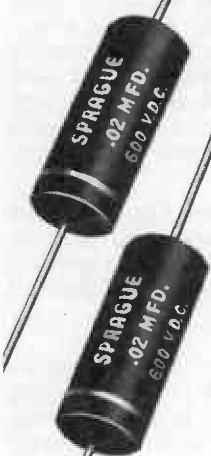

Actual, on-the-job performance *proves* the superiority of Sprague "Black Beauties" beyond question. To find the secret that explains just why they're so much better, however, you've got to see inside of a Telecap itself.

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To find the PHOTOFACT Folder you need, first look for the name of the receiver (listed alphabetically below), and then find the required model number. Opposite the model, you will find the number of the PHOTOFACT Set in which the required Folder appears, and the number of that Folder. The PHOTOFACT Set number is shown in bold-face type; the Folder number is in the regular light-face type.

IMPORTANT—1. The letter "A" following a Set number in the Index listing, indicates a "Preliminary Data Folder." These Folders are designed to provide you *immediately* with preliminary basic data on TV receivers pending their complete coverage in the standard, uniform PHOTOFACT Folder Set presentation.

2. Models marked by an asterisk (*) have not yet been covered in a standard Folder. However, regular PHOTOFACT Subscribers may obtain Schematic, Alignment Data or other required information on these models without charge. (When requesting such data, mention the name of the Parts Distributor who supplies you with your PHOTOFACT Folder Sets.)

3. Production Change Bulletins contain data supplementary to certain models covered in previously issued PHOTOFACT Folders, and are listed in this Index immediately following the listing of the original coverage of the model or chassis. These Bulletins should be filed with the Folders covering the models to which the changes apply.

IMPORTANT PHOTOFACT INFORMATION

We want you to receive maximum benefits through your use of this Index and of PHOTOFACT Folders. To keep you fully informed about PHOTOFACT, we have prepared the table of informative subjects listed below. Be sure to read each item carefully.

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IMPORTANT

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IMPORTANT

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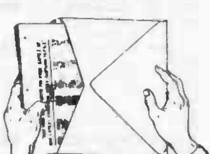
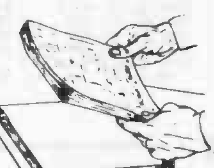
The preferred 30-Second method for filing PHOTOFACT Folders

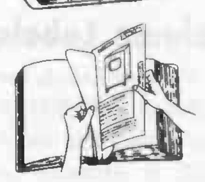
Your PHOTOFACT Folder Sets come to you in convenient envelopes. When you remove a Set from its envelope, you will find the Folders already arranged in proper filing order, and preceded by an Index Separator. This Separator lists each receiver covered in the Set, and has an index tab showing the Set number. To file, here's all you do:



1. Remove the Index Separator and the Folders from the envelope. The Folders and manila TV Jackets are already arranged in proper numerical filing order except the TV folders, which are placed last in the Set.



2. Open your binder and place the entire contents, taken from the envelope, behind the preceding Set of folders, laying aside the TV folders.



3. Now, insert the TV folders in their respective manila jackets and your filing is complete.

To locate the folder you want, refer to instructions on the first page of this index listing.

ALWAYS REFER TO THE PHOTOFACT INDEX

IMPORTANT

How to obtain PHOTOFACT Volume Labels

A certificate redeemable for a complete set of Volume Labels for PHOTOFACT *Volumes 1 through 10*, is included in PHOTOFACT *Set No. 62.* A certificate redeemable for a complete set of Volume Labels for *Volumes 11 through 20*, is included in PHOTOFACT *Set No. 102.*

Simply mail these certificates to Howard W. Sams & Co., Inc., for your free Sets of Labels.

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How to obtain Service Data on Pre-War Models

Photo copies of schematics covering pre-war (prior to 1946) receivers can be obtained by regular PHOTOFACT subscribers at 50¢ each (our cost). Additional data can be supplied at a nominal cost per page. When requesting pre-war data, please mention the name of the Parts Distributor who supplies you with your PHOTOFACT Folder Sets.

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(CM-1) indicates service data *also* available in Howard W. Sams 1947 Record Changer Manual. (CM-2) indicates service data available in Howard W. Sams 1948 Record Changer Manual. (CM-3) indicates service data available in Howard W. Sams 1949, 1950 Record Changer Manual.

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ADDITIONAL PHOTOFACT BENEFITS

From time to time, PHOTOFACT Folder Sets include valuable "bonus" aids, as well as useful data of a special nature. The following materials are extra benefits incorporated in the PHOTOFACT Folder Sets indicated, at no additional cost.

	Set No.
1—RMA Production Source Code (July 1, 1946)	5
2—RMA Production Source Code (Jan. 1, 1949)	70
3—RMA Production Source Code (Revisions as of July 1, 1949)	92
4—TRADE DIRECTORY— Parts Manufacturers	12
5—National Electrical Code on Antennas	88
6—Record Changer Cross Reference by Manufacturer and Model	118
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8—Ion Trap Alignment	62
9—"Let's Look at the Sync Pulses"	64
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11—Certificate entitling subscriber to PHOTOFACT Volume Labels for Vols. 1-10	62
12—Certificate entitling subscriber to PHOTOFACT Volume Labels for Vols. 11-20	102
13—Certificate entitling subscriber to 100 Door Knob Hangers	80
14—Photofact Television Course appearing serially in	38-51, 54
15—CR Tube Dimension Chart	112
16—CR (Electromagnetic) Tube Characteristics Chart	112
17—CR Tube Interchangeability Chart	112
18—NPA maintenance and repair information	130
19—Proposed Television channel allocation	132

"QUICKER SERVICING" (Continued from page 39)

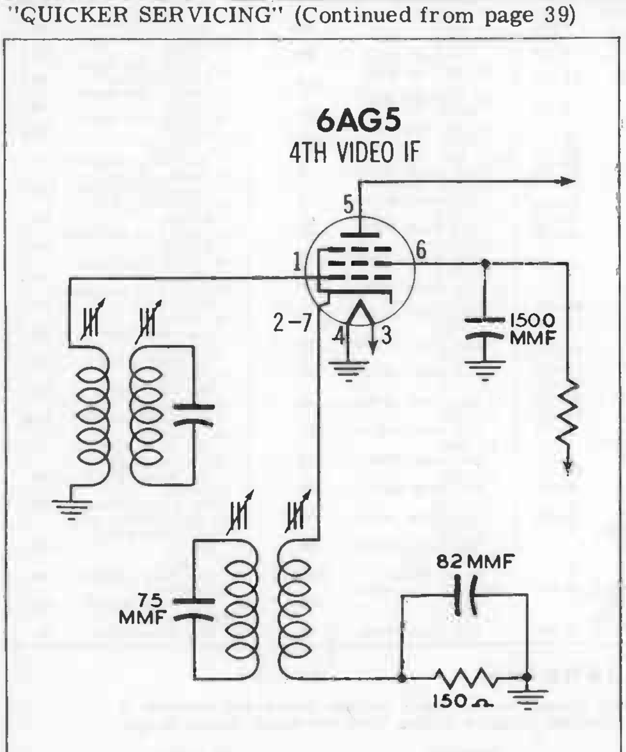


Figure 6. Video IF Amplifier.

On another occasion, a set was on the bench and a defective bypass capacitor had been replaced in the tuner. The set was turned on and worked perfectly until a slight adjustment of the horizontal frequency control was made, at which time the set suddenly lost vertical synchronization and would not "lock-in" despite adjustment of the vertical hold control. It was then discovered that this occurred only at one particular setting of the horizontal frequency slug. An oscilloscope was connected to the output of the vertical integrator network. With the horizontal frequency control turned away from the above-mentioned setting and the vertical hold properly set, the picture "locked-in" normally and an oscilloscope pattern as shown in Figure 7-A was obtained. In order to see clearly the vertical sync pulses, the picture was thrown out of vertical synchronization by means of the vertical hold control. Then the pattern shown in Figure 7-B was on the oscilloscope screen. When the horizontal frequency adjustment was turned to the particular setting under investigation, the sync pulse was found to disappear (Figure 7-C). Obviously this was the reason for the loss of vertical synchronization.

The question now was, what caused this apparent cancellation of the vertical sync pulse? Some spurious feedback from the vertical sweep output was first suspected. With the brightness control turned to a minimum, the vertical oscillator and vertical output tubes were removed and the waveform at the integrator output showed only the sync pulse. However, it disappeared again with adjustment of the horizontal frequency slug, so that was not the answer. Next the capacitive coupling between the horizontal AFC circuit and the sync clipper was opened. This move stopped the cancellation of the vertical sync pulse but, of course, left the horizontal sweep without

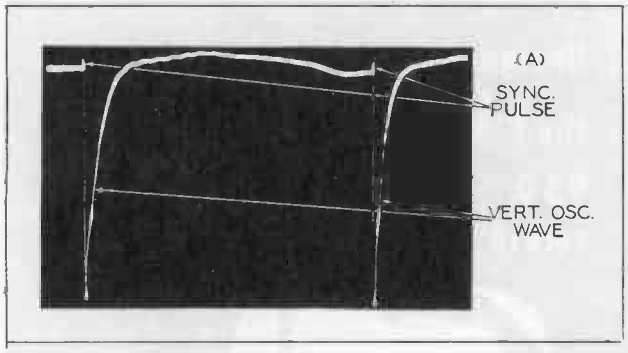


Figure 7A. Waveform at Output of Vertical Integrator Network - Picture "Locked-in."

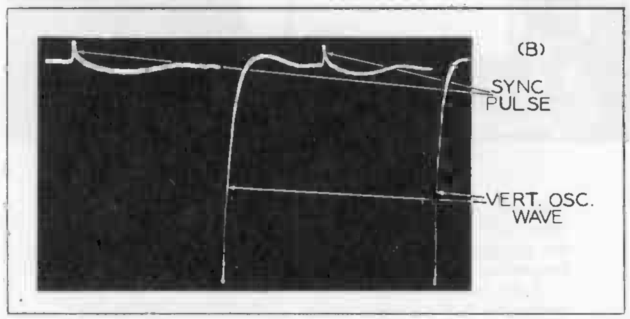


Figure 7B. Waveform at Output of Vertical Integrator Network - Picture not "Locked-in."

sync control. Much time was spent checking the components and voltages in the horizontal AFC circuit without success.

Finally the vertical sync pulse was traced back through the sync amplifiers and video amplifiers to the output of the video detector by means of the oscilloscope. It was found that the sync pulse was being destroyed by feedback occurring in the set before the video detector. The energy fed back was at horizontal sweep frequency and was adding to the composite video signal in such a way that the broad vertical sync pulses were "masked" by sharp, short-duration pulses of greater amplitude. The high voltage cage which had been removed from the set was replaced; this did not correct the trouble. The problem was solved only when the cover to the tuner, which had been removed for servicing, was put back. The feedback had been taking place between the metal picture tube surface and the unshielded tuner. The moral of the tale: replace tuner covers before testing TV receivers.

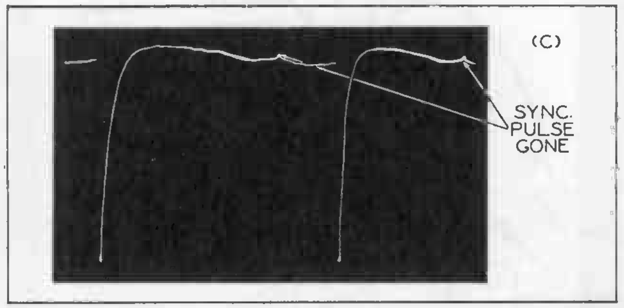


Figure 7C. Waveform at Output of Vertical Integrator Network - Picture not "Locked-in" Due to Loss of Sync Pulse.

"DOLLAR and SENSE" (Continued from page 43)

to present planning. New York State is considering same type of bill, which would then apply to all communities in state. Los Angeles is expected to adopt much the same licensing bill as New York city.

TAPED TV. First step in realization of magnetic tape recording for entire TV programs is demonstration, by Bing Crosby Enterprises, of picture played back from standard quarter-inch wide magnetic tape running at 100 inches per second. Definition was only 1/2 mc, as contrasted to 4 mc for standard TV picture, hence images were blurred and crude. Crosby engineers hope in 6 months to get pictures up to acceptable quality, using tape approximately one inch wide. Goal is to surpass kinescope recordings on movie film. Advantage of magnetic tape is that it can be erased and re-used.

CLOTHESPIN. Neatest new-product idea seen in a long time is Industrial Television's twin-lead connector clip for attaching twin-lead instantly to standard screw-type antenna terminals of TV receiver being serviced or demonstrated. They've put a metal jaw on each side of an ordinary spring-type wood clothespin and soldered one lead of the line to each jaw.

PRUNING. Annual routine for one fringe-area TV installation is pruning out new growth at top of tree on which antenna is mounted. Tree was topped at about 60-foot level and mast attached to trunk. Large spikes driven into trunk facilitate climbing to small wood platform built at top. Twin-lead is run through air diagonally down to house, but rotator line is supported by steel cable to minimize flapping in wind.

IN MEMORIAM. Alertness to take advantage of a news story resulted in the highly effective penny-postcard promotion shown below, which speaks for itself.

DEATHS

COLOR T V.—in United States.

Died suddenly, October 20th, of natural causes. Premature birth—incompatability — overprice. Beloved infant of Columbia Broadcast System. Survived solely by Black and White television who will carry on for your pleasure for ever. Memorial services daily 9:00 a.m. to 6:00 p.m., and Fridays until 9:00 p.m., to be held at the Commonwealth Appliance Co.

To you who awaited the birth of Color may we extend our sympathy, and invite you to buy one of the wonderful bargains we have in proven T.V. made by famous manufacturers. Trade that 10 or 12 inch T.V. NOW.

Relatives and friends invited.

Commonwealth APPLIANCE COMPANY
136 HARVARD AVE., ALLSTON 34, MASS. STadium 2-7930

BUZZ SAW. Cutting deflection yoke supports out of 2 x 6's for conversion jobs is the way one service shop cuts costs and speeds changeover to bigger picture tubes. Circular saw is used to cut required length and split it down middle. Power band saw is then used to cut semi-circle out of each half for yoke, so that yoke is held tightly when 2 x 6 is bolted together again around it. Bolt is easily loosened to adjust yoke. A few wood screws through chassis from bottom hold 2 x 6 upright. Focus coil is removed from set and p-m focus used instead.

EIDOPHOR. Use of an electric arc as the source of light for projection color television, a

long-sought goal, was successfully demonstrated in Zurich, Switzerland. For this Eidophor-CBS system, sponsored by 20th Century-Fox, GE is scheduled to make at least part of the equipment. There is no limit to amount of light that can be beamed through the system, hence pictures can be made to fill any existing theater screen with any length of throw. First U. S. demonstration is scheduled in New York, year-end. Pictures so far shown are wide-band, and would lose some definition when reduced to U. S. network standards.

TVI. Amateur radio operators having harmonic-free stations are urged to stay on the air all through best TV viewing hours, to stimulate viewer complaints in the hope that manufacturers and servicemen will fix sets having inadequate selectivity, in article by W5MA and W5IT in June 1951 QST. Describing the Dallas plan for TVI, article tells how amateurs there organized to investigate why their transmitters interferred with reception of channel 5 programs from Fort Worth 35 miles away. Tests showed that fundamental signals of legally operating amateur stations were getting into certain makes of receivers up to half a mile away. FCC engineers, investigating viewer complaints, likewise found that poor selectivity in TV set front-end was the basic cause of trouble in most cases. Properly installed high-pass filters on receivers usually eliminated all traces of interference, but not all TV owners were willing to buy such filters. FCC engineering division chief George Turner has encouraged other amateurs to form similar troubleshooting groups when confronted with such fringe-area TVI.

TRANSMITTERLESS TV. Latest trick for bringing TV into towns stranded by freeze is tapping the newly completed transcontinental microwave link to get closed-circuit signals for distribution over coax lines to restaurants, hotels and even homes. Technique was used in Denver by Eugene O'Fallon, operator of TV station applicant KFEL. In meantime, community antenna service is expanding. One Poplar Bluff, Missouri, organization seeks FCC permission to use microwave network for bringing signals to cable distribution systems of TV-stranded towns way out beyond fringe areas.

WAR. In military electronic gear, tubes cause 80 percent of the failures in the field, and paper condensers another 15 percent.

WORLD AVERAGES. In the United States, the average serviceman has to work 2 hours and 10 minutes to pay an average home telephone bill, according to figures in the October 1951 Bell Laboratories Record. In Stockholm the corresponding figure is 3.33 hours; London 4.5 hours; Zurich 5 hours; Amsterdam 7 hours; Paris 11.5 hours; Santiago 15 hours.

MOVIES. Latest Sears Roebuck catalog shows a 16-mm sound projector with built-in oscillator. Description says: "Plays sound through your own radio with no connecting wires! Tune radio on a silent zone and there's your sound." Here's more business for servicemen.

"WAVEFORM ANALYSIS" (Continued from page 19)

because of its low equivalent plate resistance. At the same time it presents a very low input capacitance and a high impedance to the circuit under investigation. This makes the loading effects negligible. Compare Figure 8A and 8B, partial photographs of a test pattern on the picture tube of a receiver. Figure 8A was taken with the oscilloscope test lead connected directly to the picture tube grid in the receiver; the cathode follower attachment was used when Figure 8B was taken. The difference in detail in the two pictures is quite apparent, showing that the capacity of the scope lead can cause considerable loss at high frequencies.

It follows, therefore, that in order for the cathode follower attachment to be effective, it should be located close to the test point in the receiver. In that way the connection between the test point and the cathode follower input terminal can be made short with a minimum lead loss. The cathode follower pictured in Figure 9 was constructed so that it may be clipped directly to the chassis of the receiver under test as shown. The voltages necessary for its operation can be obtained from the receiver circuit in nearly every case. There are two leads, terminating in alligator clips, which connect to a source of 6.3 AC volts for the heater of the 6C4 tube. In the case of a receiver with series filaments, an external source must be used; in most receivers, however, there is a 6.3 volt filament line which will furnish this voltage. Another clip lead goes to a source of B+ voltage in the receiver. This voltage must be taken from points where no signal voltages are present, for example, the supply side of a plate or screen load impedance. The B+ potential should be between 175 and 250 volts for satisfactory operation

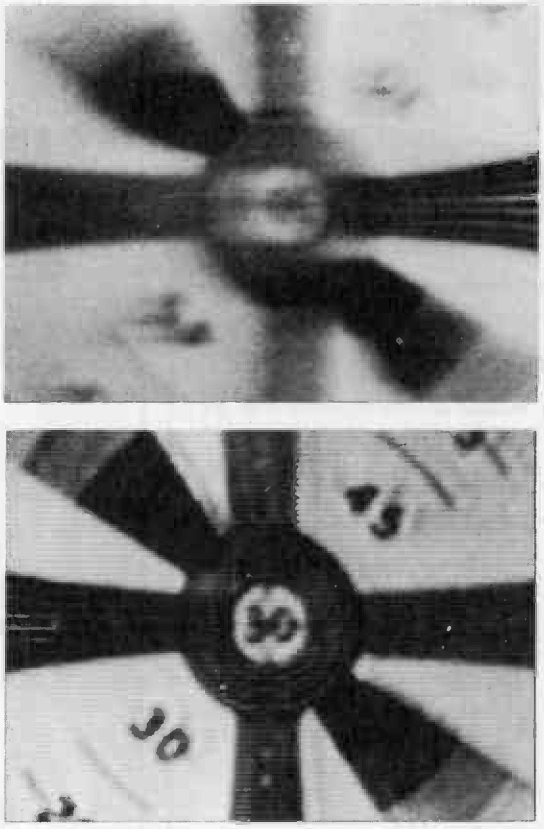


Figure 8. Partial Test Pattern Showing Effect of Cathode Follower in Reducing High Frequency Losses. (a) Oscilloscope Lead Connected Directly to Picture Tube Grid. (b) Oscilloscope Lead Connected Through Cathode Follower to Picture Tube Grid.

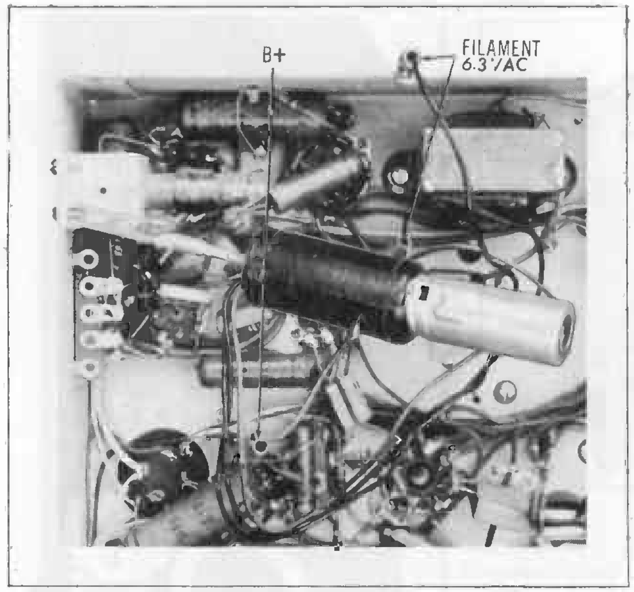


Figure 9. Cathode Follower Attachment Ready For Use.

of the cathode follower. Most all receivers have voltages within this range at easily accessible terminals. The B- return is made by means of the clip which is used to support the unit.

The complete assembly contains only a few parts and is fairly simple to construct. The schematic is shown in Figure 10 and a parts list appears at the end of this article. A second unit, mounted on a vector socket and open to view, is pictured in Figure 11. Although the physical construction of these two units is slightly different, the circuits are identical.

The cathode follower should prove very helpful, especially when connected to high impedance, frequency-determining circuits. Care must be taken, however, to insure against overload. Normally all signals of 75 volts or less peak-to-peak can be applied to the cathode follower. Voltages of greater amplitude should be applied directly to the vertical input terminals of the scope. The signal can then be attenuated with the proper controls in the scope. Normally, signals of high amplitude are not affected by the loading of the scope lead, making the use of the cathode follower unit unnecessary.

Voltage Calibrator

A typical voltage calibrator, which may be used to measure peak-to-peak voltages in waveform analysis, is pictured in Figure 11. The output of this calibrator is a 60-cycle, square-topped, symmetrical wave, accurately calibrated and fully adjustable in amplitude. The controls consist of direct-reading

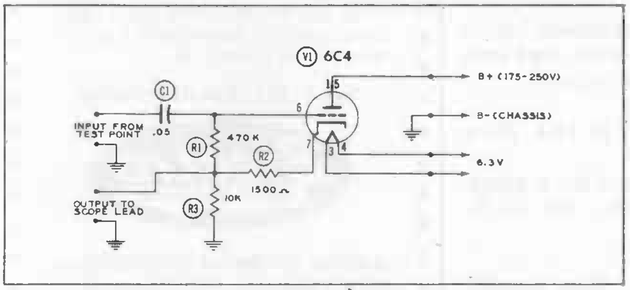


Figure 10. Schematic of Cathode Follower Attachment.

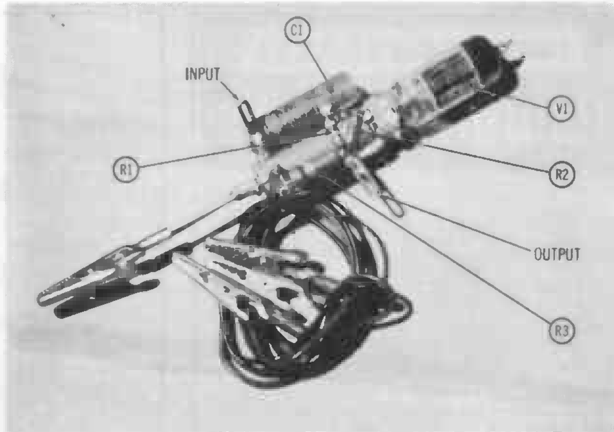


Figure 11. Cathode Follower Attachment on Vector Socket with Parts Indicated.

"volts" and "multiplier" dials, indicating peak-to-peak voltage outputs from zero to 100 volts, and an "off-direct-calibrate" switch. This switch enables the operator to connect the oscilloscope to the calibrator output and to the test signal alternately without changing connections. In the "direct" position, the signal is connected to the "signal-in" terminals. In the "calibrate" position, the calibrator's square wave is connected to the oscilloscope. Small amounts of capacitance are introduced in the signal feed-through circuit, and as a result, high frequency signals may suffer some loss. In such cases, it might be best to obtain the signal by connecting the test leads directly to the receiver test point.

As for the calibration process itself, a very convenient method is to set the scope's attenuator and gain control so that the test signal is a suitable size on the screen, then shift to the calibrator and adjust its output to equal the amplitude of the test signal. In some applications, test signals of more than 100 volts peak-to-peak are encountered. When this happens, set up the test signal on the screen at a suitable size as before; then, when viewing the calibrator's square wave, change the position of the scope attenuator switch to get a square wave of the required size. Multiply the calibrator's output voltage by whatever change was made in the scope's attenuator position. For example, if the scope's attenuator was altered from 100:1 to 10:1, multiply the calibrating voltage by a factor of 10 to get the true amplitude of the test signal.

If the oscilloscope has no attenuator switch, the oscilloscope's cross-hatched screen may be calibrated directly in volts by adjusting the scope gain control so that a 100 volt square wave occupies an

PARTS LIST FOR CATHODE FOLLOWER ATTACHMENT

Item	Description	
V1	Sylvania type 6C4 tube	
C1	.05 mfd. 600VDC	Sprague 6TM-S5 Aerovox P688-05 Cornell-Dubilier PTE6S5
R1	470,000 ohm 1/2 watt	IRC BTS .47 meg.
R2	1500 ohm 1/2 watt	IRC BTS 1500
R3	10,000 ohm 1 watt	IRC BTA 10,000

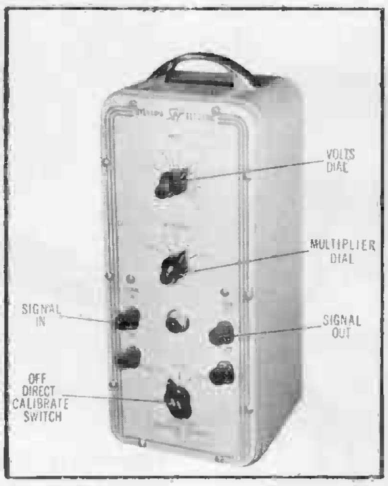


Figure 12. Typical Voltage Calibrator for Use with Oscilloscopes. (Courtesy Sylvania)

arbitrary number of divisions, thereby assigning a certain number of volts to each division.

If the cathode follower attachment is used in obtaining a certain waveform, it should be used in the calibration process also. Thus the slight loss which is a characteristic of the cathode follower will not introduce error in the calibration.

In the average television receiver there are points having pulse voltages of very high amplitude. Oscilloscope measurement should not be attempted at these points without special equipment. The plate of the horizontal output tube and the terminals of the horizontal deflection coils are examples of such points.

* * *

The photographs of the WFBM-TV test pattern which appear in the preceding article are reproduced with permission of the station management. The quality of test pattern reproductions in no way reflects upon the quality of the transmitted signal of WFBM-TV.

Girls, take heed; marriage begins when you sink in his arms, and ends with your arms in the sink.

Caller - Madame, I'm the piano tuner.
Pianiste - I didn't send for a tuner.
Caller - I know it, lady; the neighbors did.

- Pica Chatter

* * *

Figure 3. The Radio Craftsman Model C500 Amplifier.

Figure 4. Stancor Components Used in the Williamson Circuit.

American made 6SN7GTA and one 5V4G in the remaining stages. Constructed on a single chassis with no gain or tone controls the amplifier can be mounted in a convenient, sufficiently ventilated location and controlled from the associated tuner or preamplifier.

The published specifications for the Radio Craftsman Model C500 are:

Response: at 2 watts ± 0.1 Db 20-20,000 cps
and ± 2 Db 5-100,000 cps
at 12 watts ± 2 Db 10-50,000 cps

Harmonic Content: Less than 0.1% at 10 watts.

Intermodulation Content: (With 7KC and 60 cycle tone, 4:1 ratio). Less than 0.5% at 10 watts.

Hum and Noise: 90 Db down from 15 watt nominal output.

Gain: 1.5 volts (rms) required for driving to full output.

Damping Factor: 32:1.

Speaker Outputs: 8 and 16 ohms.

Wishing to construct a Williamson Amplifier for experimental and checking purposes, we obtained the following basic component parts (see Figure 4) furnished by the Standard Transformer Corporation for this circuit:

1 - A8054 Output Transformer.
1 - PC-8412 Power Transformer.
1 - C-1411 Filter Choke.
1 - WM8 Set of Two prefabricated Chassis.

With these and other components appearing in the parts list, and by following the schematic fur-

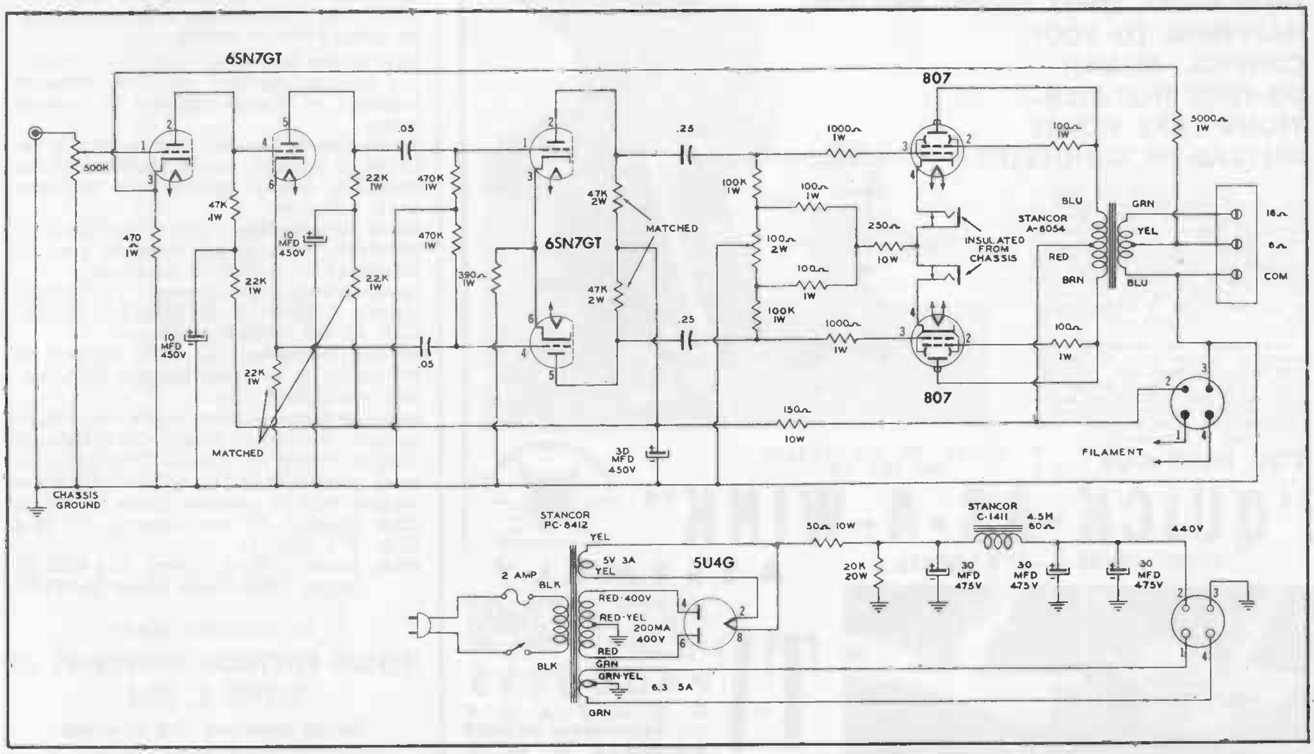
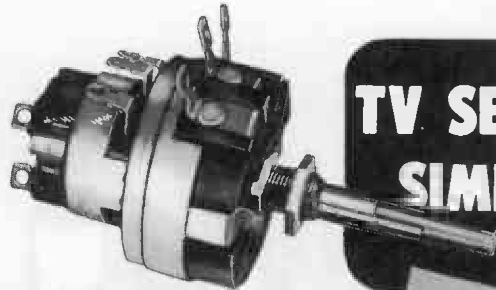


Figure 5. Schematic Diagram of the Stancor-Williamson Amplifier.



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HEY, DOC! MAYBE THAT SABOTAGING

"KREMLIN GREMLIN"*

HAS THE PARTS YOU'RE LOOKING FOR! HOW MANY TIMES BEFORE HAS THIS HAPPENED TO YOU? CONFESS, FELLA!! DO YOUR INSTALLATIONS TAKE HOURS INSTEAD OF MINUTES???

. . . if so, it's costing you quite a few dollars every time you install a T-V set. Exterminate those "Kremlin Gremlins" that are sabotaging you or your business!

The NEW, exclusive T-V Products Company line of Yagi's, straight and folded dipoles, in-a-line, and Super-V's . . . which have just been added to the regular line of Conical Antennas . . . is designed with YOU in mind.

Just remove the completely pre-assembled antenna from the carton, snap the elements open, and "QUICK-AS-A-WINK," you're all set up. No loose nuts or bolts to plague you, and no thumb-screws or wing-nuts to tighten.

REMEMBER, time is money! And, if you want to save money . . .

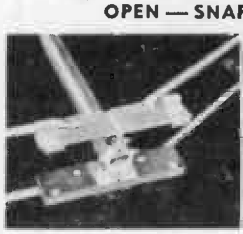
YOU NEED OUR . . .

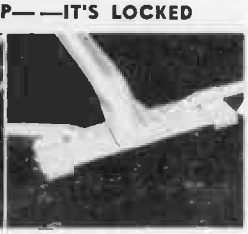
*NOTE TO JOE STALIN "SO SUE US"

IT'S THE CATS WHISKERS AND JUST AS SENSITIVE!

"QUICK-AS-A-WINK" ASSEMBLY

OPEN — SNAP— —IT'S LOCKED





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Jackson 5" Oscilloscope gives you "dual service"

This high-quality, laboratory-grade instrument provides the "dual service" of both high sensitivity and wide band width.

Vertical Amplifier—Video-type frequency compensation provides flat response within 1.5 db from 20 cycles thru 4.5 Mc, dropping smoothly to a still useful value at 6 Mc.

Sensitivity Ranges—With a band width of 20 cycles thru 100 Kc, the sensitivity ranges are .018, .18, 1.8 RMS volts-per-inch. The wide band position 20 cycles thru 4.5 Mc has sensitivity ranges of .25, 2.5, 25 RMS volts-per-inch.

Horizontal Amplifier—Push-pull with sensitivity of .55 RMS volts-per-inch.

Input Impedances—Vertical: 1.5 megohms shunted by 20 mmfd. Direct to plates, balanced 6 megohms shunted by 11 mmfd. Horizontal: 1.1 megohms.

Linear Sweep Oscillator—Saw tooth wave, 20 cycles to 50 Kc in 5 steps. 60 cycle sine wave also available, as well as provision for using external sweep.

Input Voltage Calibration—Provides a standard voltage against which to measure voltages of signal applied to vertical input.

Vertical Polarity Reversal—For reversing polarity of voltage being checked or for choosing either positive or negative sync. voltages.

Return Trace Blanking—Electronic blanking provides clear, sharp trace to prevent confusion in waveform analysis.

Synchronizing Input Control—To choose among INTERNAL, EXTERNAL, 60 CYCLE, or 120 CYCLE positions.

Intensity Modulation—60 cycle internal or provision for external voltage for intensity modulation uses.

Additional Features—Removable calibration screen—Accessory Model CR-P Demodulation Probe for Signal Tracing—All-steel, gray Ham-R-Tex cabinet. Total net weight only 26 pounds. Same height as other Jackson TV instruments: 13" H x 10¼" W x 15⅛" D.

Prices: Model CRO-2, Users' Net $197.50.
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JACKSON ELECTRICAL INSTRUMENT CO.
DAYTON 2, OHIO

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IN CANADA: THE CANADIAN MARCONI CO.

nished by Stancor (Figure 5), the amplifier as shown in Figures 1 and 6 was completed.

The circuit is not complicated, which simplifies assembly and wiring, but as is true with any high quality amplifier such as this, some requirements must be met when selecting parts and tubes. This is also true when replacing any parts or tubes in servicing this equipment. The two 22K phase inverter load resistors should be a matched pair as should the two 47K driver load resistors.

These resistors should be of high enough wattage so use will not tend to change their characteristics to too great a degree. The 6SN7GT driver tube should have matched triode sections so the drive on each 807 output tube is equal. The 807 tubes should also be a matched pair to make it possible to balance the output stage easily.

Balancing of the output stage is important and is easily accomplished by means of the 100 ohm, 2 watt potentiometer, and the closed circuit jacks in the 807 cathode circuit. Plugging a DC milliammeter into one of the jacks, by means of a standard telephone plug, and then into the other, an identical current drain for each output tube can be obtained by adjusting the 100 ohm potentiometer. A current reading of 56 ma. with no signal for each 807 was normal for the amplifier constructed here.

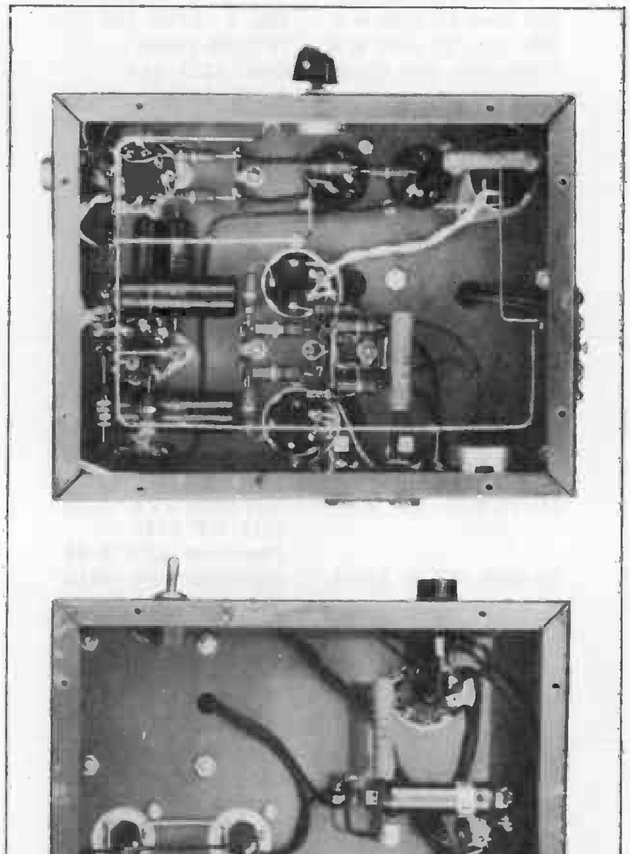

Figure 6. Bottom Chassis - Stancor-Williamson Amp.

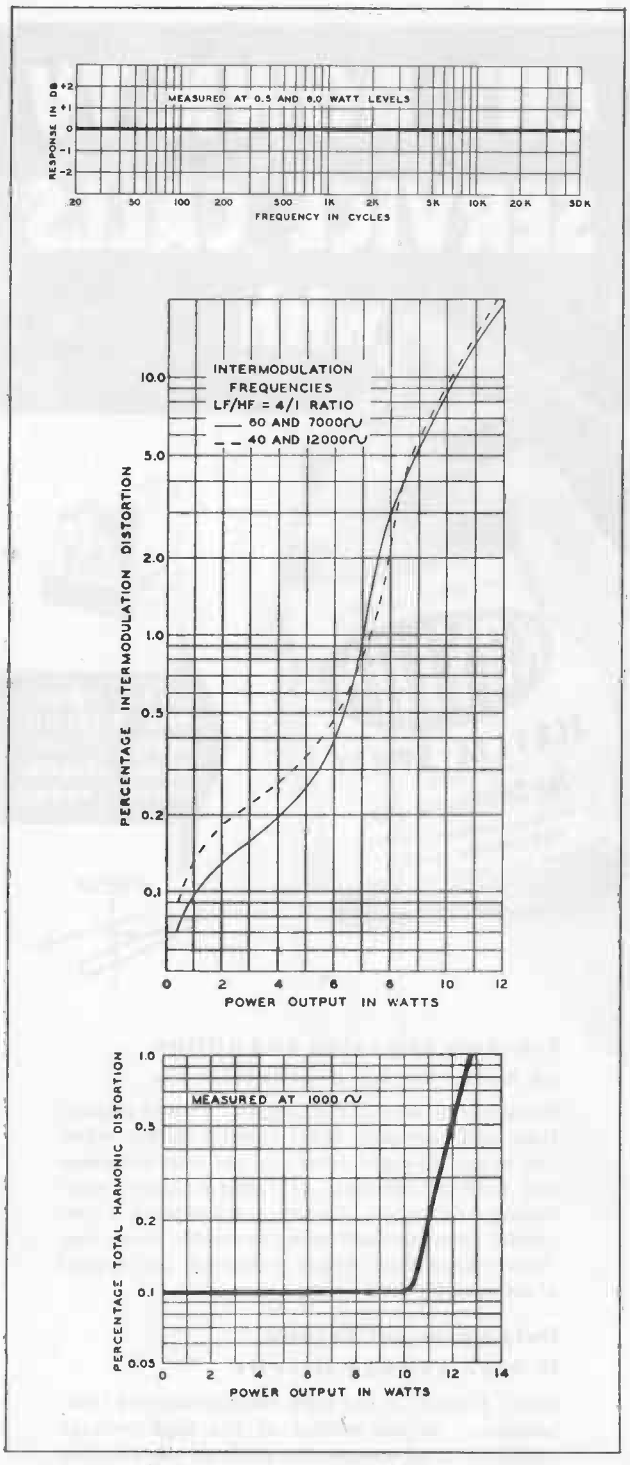

Figure 7. Frequency Response, Percentage Intermodulation, and Harmonic Distortion Curves of Stancor-Williamson Amplifier.

The data on response and distortion, published by Stancor in their bulletin 382, describing their Williamson Amplifier, is shown in Figure 7. The frequency response is excellent and does not change from the curve recorded at 8 watts output when the output is reduced to 0.5 watts. The intermodulation distortion measures only 3% at 8 watts output and the total harmonic distortion at 1000 cycles per second is very low and practically does not exist at a power output of 10 watts or less. The "listening" quality using a good sound source and speaker system is remarkable. (For Parts List - see Page 74.)

STANCOR KIT OF COMPONENTS

1 - A -8054 - Stancor Output Transformer
1 - PC -8412 - Stancor Power Transformer
1 - C -1411 - Stancor Filter Choke
1 - WM-8 - Set of 2 Stancor Prefabricated Chassis or, 2 - 7" X 9" X 2" Chassis

WILLIAMSON AMPLIFIER PARTS LIST

Tubes

2	807	Sylvania or Equivalent
2	6SN7GT	Sylvania or Equivalent
1	5U4G	Sylvania or Equivalent

Resistors

4	100 ohm 1 watt 10%	IRC BTA 100
1	390 ohm 1 watt 10%	IRC BTA 390
1	470 ohm 1 watt 10%	IRC BTA 470
2	1000 ohm 1 watt 10%	IRC BTA 1000
1	5000 ohm 1 watt 10%	IRC BTA 5000
4	22K ohm 1 watt 10%	IRC BTA 22000
1	47K ohm 1 watt 10%	IRC BTA 47000
2	47K ohm 2 watt 10%	IRC BTB 47000
2	100K ohm 1 watt 10%	IRC BTA 0.1 meg.
4	470K ohm 1 watt 10%	IRC BTA 0.47 meg.
1	50 ohm 10 watt WW	IRC 1 -3/4A 50
1	150 ohm 10 watt WW	IRC 1 -3/4A 150
1	250 ohm 10 watt WW	IRC 1 -3/4A 250
1	20K ohm 20 watt WW	IRC 2D 20000
1	500K ohm Vol. Cont.	(IRC Q13-133 (CRL B60 (Clarostat AG-60-Z (FS3
1	100 ohm 2 watt Pot.	(IRC W100 (CRL V121 (Clarostat 43-100

Capacitors

2	.05 mfd. 600 V	(Sprague 6TM-S5 (CD PTE 6S5 (Aerovox P688-05
2	.25 mfd. 600 V	(Sprague 6TM-P25 (CD GT6 P25 (Aerovox 684-25
1	10/10 mfd. 450 V Elect.	(Sprague TVL-2750 (CD UP 1145 (Aerovox AFH 2-47
4	30 mfd. 475 V Elect.	(Sprague TVL-1810 (CD UP 3050 (Aerovox AFH 1-56

Hardware

1	4 Prong Connector	Amphenol 78-PF4
1	4 Prong Connector	Amphenol 86-PM4
1	Input Connector	Amphenol 75-PC1M
1	4 Prong Plug	Amphenol 86-CP4
3	Octal Socket	Amphenol 78-S8
2	5 Prong Socket	Amphenol 78-S5
1	4 Prong Socket	Amphenol 77-M1P4
2	Closed Circuit Jacks	
2	Plate Caps 3/8"	
1	Toggle Switch, Single Pole Single Throw	
1	Fuse Extractor Post	Littlefuse 341001
1	2 amp. 3AG Fuse	Littlefuse 312002
	Output Terminal Strip, AC Line Cord, Terminal Tie Lug Strips, 4 Wire Cable, etc.	

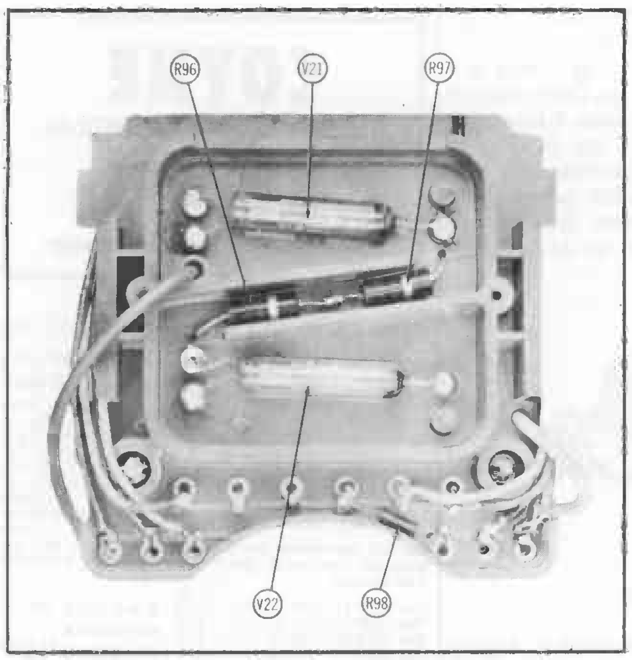

Figure 6. High Voltage Rectifier Tubes

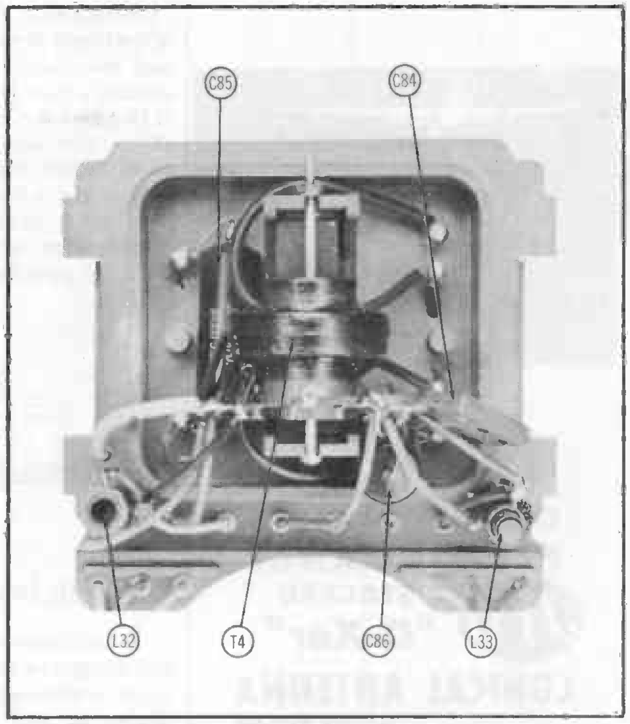

Figure 7. Horizontal Output Transformer

"DESIGN FEATURES" (Continued from page 27)

To get to the horizontal output transformer, it is necessary to remove two screws holding the deflection yoke and focus unit, and two screws holding the metal shield to the chassis. At this time the plastic form containing the transformer and associated components (see Figure 7) may be tilted out for inspection and testing. Complete removal of the plastic form may then be accomplished by unsoldering four leads extending from the assembly through the chassis, and lifting out the unit.

The Sylvania 1-260 Chassis employs a damper circuit that is connected in a manner different from that commonly employed. Looking at the schematic in Figure 8 it may be seen that the damper tube is effectively connected across the horizontal coils of the deflection yoke, but in this instance the plate of the damper is at RF ground. During retrace, therefore, a positive pulse of about 2000 volts peak to peak exists on the damper cathode, which will not let the damper conduct. At the completion of retrace the oscillatory tendency of the horizontal deflection circuit starts damper conduction which delivers a large current to the yoke, thus initiating the first half of the active trace period.

In effect this damper circuit accomplishes the same purpose as the more commonly used methods. Note that a special isolation filament transformer is required for the damper tube because of the high amplitude pulse which is applied to the damper cathode. If the filament were connected to the conventional filament supply, one side of which is grounded, arc-over would occur between cathode and filament in the damper tube.

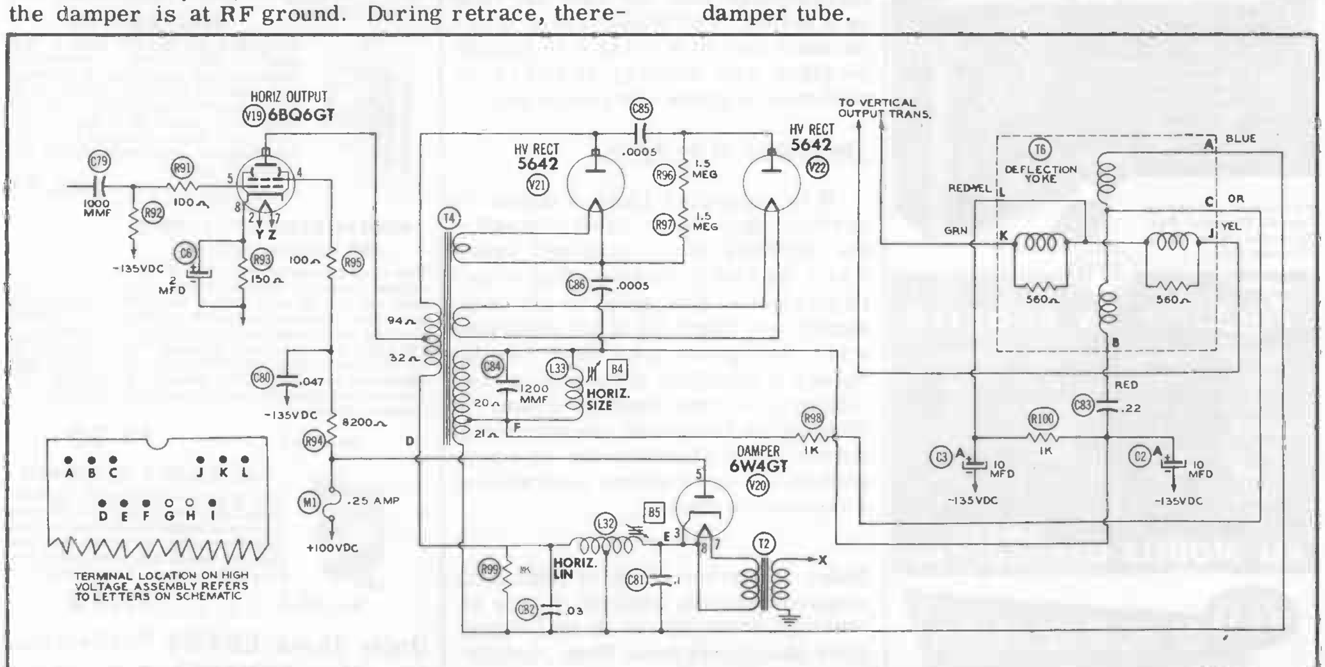

Figure 8. Schematic Diagram of Sylvania Ch. 1-260 Horizontal Deflection Circuit.

"INSURANCE PROTECTION"
(Continued from page 23)

and merchandise on a form that includes a Rate Reduction, Contribution Clause, a Coinsurance Clause or other similar clause, the dealer or shop owner should periodically examine the values of his property to keep them current with present day fluctuations so as to avoid Coinsurance penalty.

Automobile Insurance

In addition to the Bodily Injury and Property Damage insurance recited previously in this article, the dealer or service shop should also insure his own automobiles against loss arising from collision, fire or other damage or destruction of the automobile.

Crime Insurance

The dealer or service shop should carry insurance against loss arising from the infidelity of employees, forgery, loss of money or securities from inside or outside the premises, and burglary and robbery on stock of merchandise held for sale and held as a bailee. The Bailee Form of insurance can be written to include burglary and robbery on stock of merchandise held for sale and held as a bailee. The Bailee Form of insurance can be written to include burglary and robbery insofar as customer's goods are concerned.

The Choice of an Agent

It is suggested that a dealer or service shop owner avail himself of the services of a recognized insurance agency representing stock insurance companies in his community and place all of his insurance with the agency and then take the agency's complete advice in maintaining his insurance program. In dividing his insurance among several agents, he is defeating his own purpose in obtaining sound insurance at a reasonable cost.

Note: If further study of individual requirements is desired, it may be obtained from Marsh & McLennan, 1505 Merchants Bank Bldg., Indianapolis, Indiana.

"SHOP TALK" (Continued from page 5)

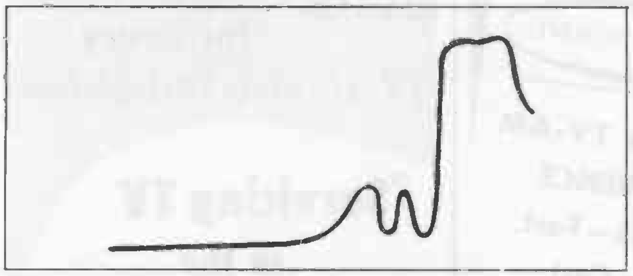

Figure 7. Improper Centering of Sweep Range. (Too low).

As the sweeping range is increased, the area that the response curve occupies on the screen becomes progressively less. See Figure 6. A curve which is too narrow is difficult to work with. 6 to 8 mc sweeping range for a 4 mc bandpass is sufficient. There is no need to go beyond this.

In some instruments, however, it is not unusual to find that a 6 to 8 mc sweeping range is obtained only when the range indicator is turned to its extreme clockwise position.

When the sweep generator is being set up, its dial should be turned to the center frequency of the band being swept over. Thus, if the bandpass from 22 to 27 mc is to be observed, the generator should be set at (or near) 24.5 mc. If the center of sweep frequency is too low, Figure 7 will result. If the center of sweep frequency is too high, Figure 8 will be obtained. Whenever both ends of a response curve are not at the base or lowest point on the observed pattern, you can be sure that the full band is not being swept over.

A common error made by many servicemen results in the pattern shown in Figure 9. Everything has been properly connected here, except that the oscilloscope is still using its saw-tooth deflection voltage to sweep the beam across the face of the screen. To obtain the proper beam motion correctly synchronized to the sweep of the frequencies across the band, the internal sweep of the scope should be turned off and 60-cycle sweep voltage obtained from the generator itself.

Sometimes the mistake is made of using a 60-cycle sinusoidal voltage developed in the scope itself

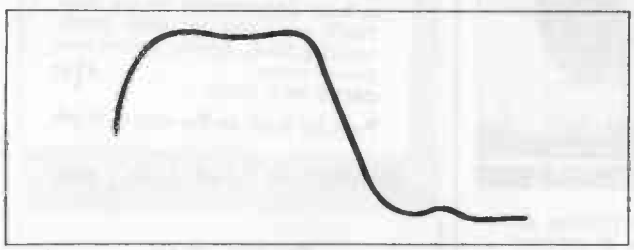

Figure 8. Wrong Centering of Sweep Range. (Too High)

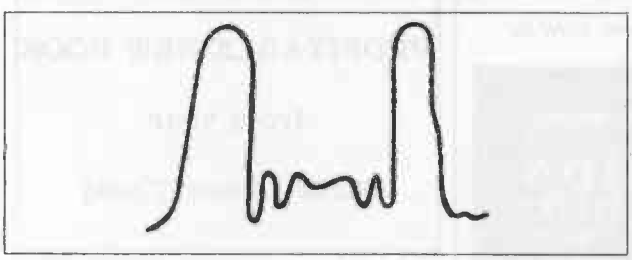

Figure 9. Curve with Incorrect Scope Deflection.

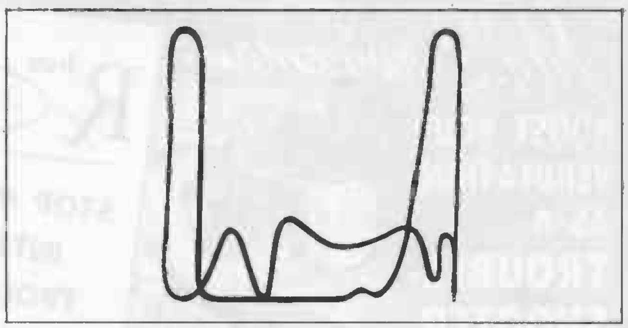

Figure 10. Curve Obtained with 60 Cycle Sinusoidal Sweep.

for the driving voltage and under these conditions the pattern shown in Figure 10 will be obtained. This can be even more confusing than the pattern of Figure 9 since not only will it give two patterns but the phase relationship of the two will vary with respect to each other.

The foregoing patterns are representative of those most frequently encountered by serviceman in their failure to obtain the proper response curve. If you study each one carefully and learn why it occurred, your chances of making the same error will be materially lessened.

The ideal video IF response curve is the one shown in Figure 1A. This curve has the proper slope on the video carrier side, has a full 4.0 mc bandwidth, and decreases to the proper level at the trap frequencies. There are a number of sets on the market from which such response curves will be obtainable. But the longer you work with television receivers, the more you come to find that there are also many sets from which you will not be able to obtain this shape curve. Thus, Motorola (to cite but one example) shows the overall response curve of Figure 11 from mixer to video second detector. Note that the bandpass here is 3.5 mc (which isn't bad at all), and the curve is quite symmetrical. Admiral, to cite another case, indicates in its service manual that the video IF response has a pronounced dip in the center of the curve. (See Figure 12.) They recommend that this dip should not extend more than 30 per cent of the overall height of the curve. Other manufacturers state that the dip should not exceed 10 per cent.

Here you have but a few of the variations that you will find among different sets when checking their IF response. For their particular circuits, under the policies of their designs, these curves are "normal" and there is little the serviceman can do to change

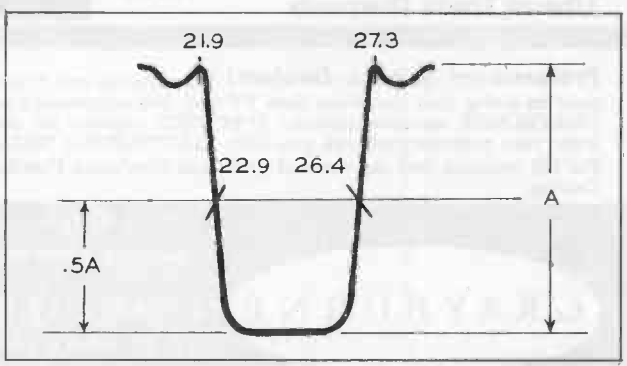

Figure 11. Overall Video IF Response for Motorola Chassis TS-172.

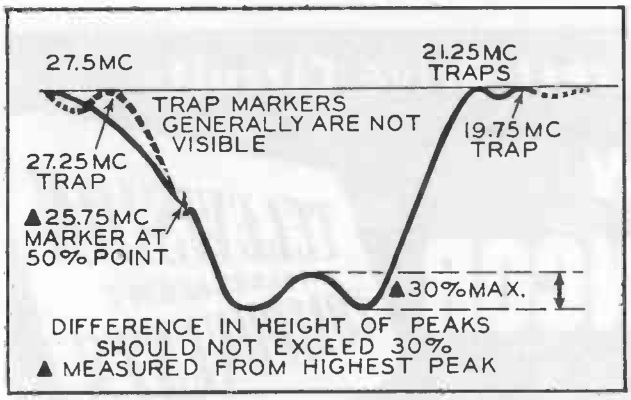

Figure 12. Overall Video IF Response for Admiral 24 D, E, F, G, and H Series TV Receivers.

them - even if he should be so inclined. Try to strike the best medium between amplification and bandwidth, emphasizing amplification in weak signal areas and bandwidth in strong signal areas.

* * *

REVIEW: An important aspect of television receiver installation is whether or not to ground the antenna structure. The review this month concerns two well written articles on this subject.

"Lightning Protection for TV Installation"

by Rufus P. Turner
Radio and Television Maintenance, December 1950
Published by
International Publishing Corporation
16 Union Street, Somerville, N. J.
Subscription Price $4.00 per Year, U. S. A.
and Possessions. $5.00 per Year in Canada

"TV Antenna Grounds"

by C. H. Jensen - Service, April 1951
Copyright 1951
Bryan Davis Publishing Co., Inc.
52 Vanderbilt Avenue, New York 17, N. Y.
Subscription Price $2.00 per Year,
U. S. A. and Canada

"To ground or not to ground, that is the question." And in the installation of television antennas, that is indeed a very important question. For whenever an outside television antenna is erected, it is frequently the highest point in the immediate vicinity. And, as such, it is an excellent target for lightning flashes, streamers from a direct hit on an adjacent object, or induced high voltage charges. The slender, pointed rods from which television antennas are constructed are especially enticing to the high potentials packed by thunderclouds.

In view of the vulnerable position of the television antenna, it is surprising to find that many installation men consider the grounding of an antenna mast or the use of a lightning arrestor where the transmission line enters the house as unnecessary and a complete waste of time and money. This negligence on the part of the installation crew places the television set, the antenna, and most important of all, the building (and its occupants) in serious jeopardy.

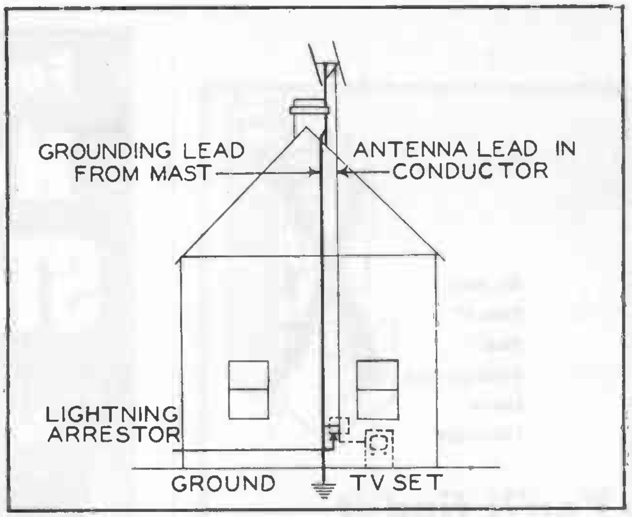

Figure 13. Approved Grounding Method.

The proper procedure for grounding a TV antenna system is illustrated in Figure 13. A grounding lead should be securely connected to the antenna metal supporting mast and then extended down on the outside of the building to the ground. For maximum safety, the lead should be of heavy insulated wire, No. 10 or larger. The lead should be kept as short and direct as possible, avoiding sharp bends or loops where the lightning might arc or jump across. Since the grounding lead might have to carry a considerable discharge current, it should be insulated from and supported away from the building throughout its length. For this, stand-off insulators are employed.

While there are a number of methods whereby the grounding lead is actually grounded, the simplest and most effective method is the use of a rod driven into the ground. To insure long effective usefulness, the rod should be of a non-ferrous, non-rusting type. A rod diameter of 1/2 inch and a length of 4 to 6 feet will, in most instances, serve to provide the proper low resistance grounding connection if driven well into the earth. When installing a ground rod, it should be driven at a point well out from the building foundation. This affords better protection because rods driven too close to the foundation will often have a high resistance. Where the rod has to be driven in the lawn several feet from the house, the following procedure (illustrated in Figure 14) should be followed.

♦ ♦ Please turn to page 82 ♦ ♦

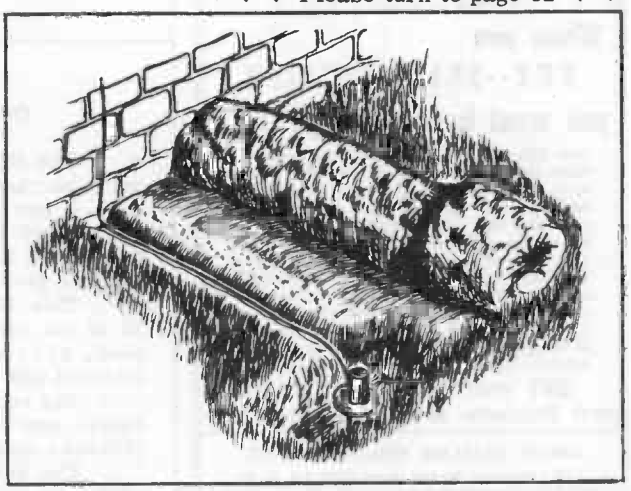

Figure 14. Procedure for Use when Driving Ground Rod in Lawn Several Feet From House.

OPS INTERPRETATION OF EXTENDED WARRANTIES

The RTMA has just issued a report on the OPS regulation concerning parts warranty by manufacturers of television receivers.

It was pointed out that some manufacturers asked to substitute a compulsory longer warranty period at additional cost than the previous 90-day period included in the selling price of the television receiver during the base period.

This, the report states, constitutes a tie-in sale in violation of Section 18 of the ceiling price regulation and similar provisions in other regulations, since the purchaser would have to buy something which was not included with the television receiver during the base period.

The report also stated that increasing the base period warranty charge and reducing the price of the television set a like amount also constitutes a violation of the ceiling price regulation.

The seller, it was noted, is not prohibited from offering something additional over that which was offered during the base period, provided full option is extended to the purchaser to either take or leave the additional item.

Mr. Serviceman!

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a sure double plus value!

the Tele-Lead

see your jobber

DUMONT *Teletrons**

*Trade-mark

CATHODE-RAY TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., CLIFTON, N. J.

'SHOP TALK" (Continued from page 79)

The sod should be cut with a sharp spade on three sides of the point where the rod is to be driven in and carefully rolled back toward the fourth side. The dirt should then be removed to a depth of approximately a foot and the rod driven into this hole as far as it will go.

To connect the grounding wire to the rod, a trench should be dug on a straight line from the point where the grounding wire reaches the ground to the rod. The wire is now connected to the rod, either by soldering or by the use of suitable clamp. The hole and the trench are then filled in and the sod rolled back into place and patted down so as to leave the lawn in its original condition.

In order to obtain an effective ground in an extremely dry, rocky, or sandy area, it may be necessary to dig a deep pit, and bury a sheet of wire screen, a metal plate or large interconnected pieces of scrap metal. The ground lead is then attached to the buried metal. In arid sections, a good ground can be constructed by running long wires in deep trenches, especially if the trenches are irrigated from time to time. Moist earth provides the best low-resistance grounding path and this should be sought out whenever possible.

In apartment buildings it is seldom practical to run grounding leads from the roof of the structure to the ground. In these instances a cold water pipe, if available, will generally provide a low-resistance grounding path. Many installation men use the plumbing vent pipe which sticks through the roof top not only for grounding, but for support as well. Whether or not this will serve for grounding depends upon the resistance of this particular path to ground. It is not uncommon to find an insulating type of sealing compound used on the pipe joints and in these instances the resistance of this path to ground may be so high as to render it useless for static discharge. Again, metal plumbing pipes are frequently connected to terra-cotta or non-metallic sewer pipes under ground, in which case the resistance to ground would also be quite high.

Probably the chief reason why grounding to the vent pipe is not the most desirable method is because this pipe not only passes through the interior of the building, but also connects to all or most of the other plumbing wires located within the building. A lightning discharge striking the antenna will thus pass down one or all pipes and if a lower resistance path is offered by water or gas pipes closely adjacent to the plumbing, the high voltage may jump or arc across to these other pipes with the possible hazard of fire or explosion.

LIGHTNING ARRESTORS. In addition to the protection afforded the antenna mast, similar protection, in the form of a lightning arrestor, should be given the lead-in line and the receiver. The most common (and the best) point to install the arrestor is at the point where the lead-in line enters the house. See Figure 13. The ground lead from the arrestor may be run directly to its own earth ground or it may be connected to the antenna mast grounding lead, whichever is most convenient.

The lightning arrestor consists of two tiny spark gaps. Each gap is connected between one conductor of the twin-lead transmission line and a good ground. A heavy static charge, such as would accumulate on the antenna during or just before a thunderstorm will jump the gaps and flow to earth. Some arrestors accomplish the same effect with static-draining resistors, others with neon lamps. A fourth variety employs a combination of spark gaps and resistors.

There are a number of lightning arrestors on the market, all designed only for the balanced or ungrounded twin-lead type of lead-in line. Most are designed so that the line is laid across the arrestor and held in place by contact screws which, when fastened down securely, force their teeth through the lead insulation to make contact with the conductors. A few types require that the line be stripped for contact to the arrestor terminals.

Coaxial transmission lines do not require special lightning arrestors as long as the precaution is taken to ground securely their outer shield. Doing this will afford adequate lightning protection and is sanctioned by the electrical code.

PF INDEX
AND TECHNICAL DIGEST

INDEX TO ADVERTISERS
January - February 1952 Issue

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this Index.

+ More or Less –

Portions of a conversation overheard during a recent visit to a local service shop should furnish quite a bit of food for thought. The conversation was evidently between an experienced television technician and a man breaking in on television service requirements.

The primary purpose was that of individual instruction, but several points covered were so applicable to efficient service operation that they are repeated here - possibly not verbatim but, at least, in essence:

"First - don't be afraid of the TV set. The television set is big; it employs a lot of tubes and associated components. Some of its circuits may be new, or, at least, unfamiliar. Just remember, however, that the basic operations of these circuits are extensions of similar circuit performance in radio applications. If you truly understand the principles of amplification, detection, and oscillation in radio work, you can certainly apply them in television service and study out the refinements as necessary.

"Second - use your radio knowledge and experience. The causes of nonoperation in television receivers very closely parallel causes of the same troubles in radio receivers. Component failure, with resultant stage or voltage failure, accounts for the same percentage of television difficulties as they did in radio applications. As in radio work, the highest percentage of nonoperation is caused by tube failure - the second spot being occupied by defective capacitors, and the third ranking assigned to either transformers or resistors.

"Make your general service procedure correspond to these facts. In other words, satisfy yourself first that the tubes are good; then check to see that voltages are normal in the stages diagnosed as possibly contributing to the nonoperation.

"Don't rush to attribute nonoperation, or failure, to circuits which you don't understand, simply on the basis that they aren't understood.

"Third - don't try to employ all the test equipment available in the modern service shop on every job that comes into the shop. In setting up test equipment for a given operation, make sure that your setup is consistent with the description of symptoms furnished you or those which you have observed. Classification here would roughly correspond to the idea of nonperformance versus degree of performance.

"You don't need to have signal generators, scopes, etc., connected to find a simple tube failure. You would need such equipment, for example, to find out why a receiver is low in sensitivity or has less than normal sound or picture operation.

"Fourth - accumulate your TV service experience. In your radio work, you gradually accumulated knowledge of common failures and their causes. Similarly, remember, or jot down if necessary, your experiences in servicing television receivers. This isn't meant in the nature of a case-history proposition - it is intended to provide logical procedure in servicing where commonly recurring troubles are indicated by similar sound or picture deficiency. It is often helpful, in this connection, to think of the equipment in block diagram form and tentatively isolate the function, or stage, most likely to create the particular difficulty."

Summing up, his advice amounts to: For efficient service operation use your head and your experience before you use your hands.

- J. R. R.

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