SUCCESSFUL Servicing

JUNE 1952

Effective as of May 1, 1952, the 15-meter band was opened for use by radio amateurs. Although this is sure to make quite a few hams happy, their neighbors who own television receivers may not share their enthusiasm. The reason for this difference in reaction is that the new amateur band is uncomfortably close or, in some cases, right in the i-f pass band of a good many tv receivers. As a result, the ham who operates in this new band may find that his neighbors with television sets can tell quite easily when he goes on the air. It is more than possible that their screens will look like Fig. 1, or even Fig. 2.

Curing 15-Meter Band Interference

by Milton S. Snitzer, W2QYI

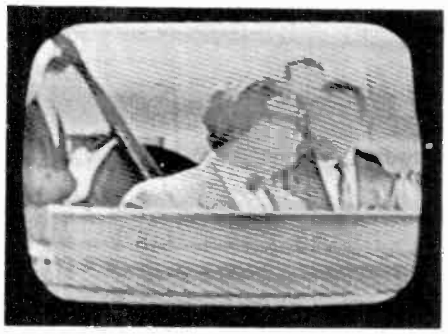
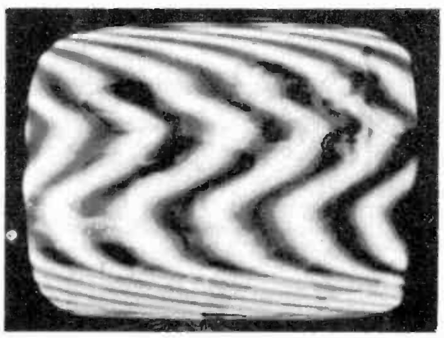


Fig. 1. Typical pattern produced by r-f beat interference.

Nature of the Interference

The 15-meter band was allocated for amateur use by the International Radio Conference in 1947; it extends from 21 to 21.45 megacycles. A good many television receivers will respond quite nicely to radiation in this frequency band, because the low-frequency end of their i-f pass band is located within it. For example, consider the receiver with a video i.f. of 25.75 mc which is operating near an amateur transmitter on 21.40 mc. The amateur signals could be picked up by the tv antenna and transmission line, ride through the r-f and mixer circuits, and then find themselves in the i-f circuits. The 21.40-mc amateur signal mixes with the 25.75-mc video i.f. and the 21.25-mc sound i.f. in the picture detector to produce 4.35-mc and 150-kc beat frequencies. These beat frequencies pass through the detector and video amplifiers onto the signal electrode of the picture tube. As a result, beat-interference patterns appear on the screen.

Fig. 2, below. Typical pattern produced by lower frequency beat interference.



Most of the interference will be produced on those receivers which are aligned so that the low end of the i-f passband or sound i.f. falls in or extends below the frequencies from 21 to 21.45 mc. It should be pointed out that even those receivers that use the newly recommended 40-mc i.f. may experience 15-meter band interference; however, since the harmonic is invariably lower in amplitude than the fundamental, the interference thus produced will usually not be as severe. If a strong second harmonic signal is being generated by the amateur transmitter, it is the ham's obligation to minimize it. However, when the second harmonic is generated by nonlinear operation of the circuits in the tv receiver, the amateur is relieved of all responsibility.

Since the 15-meter amateur band has been opened first for c-w operation, the beat interference is intermittent and follows the keying of the transmitter. Thus, every time the key is depressed at the transmitter, the beat pattern will appear; when the key is released, the interference pattern will disappear. As a result, an annoying "blinking" type of interference shows up on the picture-tube screen, along with interference in the tv sound. Later, when modulation is permitted in the 15-meter band, the beat pattern will be more or less steady, but then fluctuating sound bars may be present in the pattern.

The exact nature of the receiver interference is determined by many factors. Some of these are the frequencies involved,

(Continued on following page)

Curing 15-Meter Band Interference

(Continued from page 1)

the magnitude and type of the interfering signal, and the i-f alignment and response of the receiver. A small amount of interference may produce a beat pattern that is hardly noticeable and not objectionable. A somewhat larger amount of interference may produce the "blinking" interference mentioned above. The alternate appearance and disappearance of the interference pattern changes the average brightness of the picture observed on the tv screen. A still greater amount of interference may produce a negative picture in which all dark tones are converted to light tones and vice versa. It is obvious that this does not make for very pleasant viewing. Finally, an extremely high value of interference can wipe out the picture completely by causing loss of horizontal and vertical sync.

Use of Traps to Eliminate Interference

At this point it should be emphasized that transmission by radio amateurs within the 15-meter band represents a legally constituted operation. Little can be done at the amateur transmitter to reduce interference on tv receivers, other than reducing output power or curtailing operation. Neither of these represents a solution to the problem, because the amateur is legally authorized both by federal regulations and international agreements to use the 15-meter band. Therefore, all remedies for this type of interference must be applied at the receiver itself.

Probably the simplest method of reducing or eliminating 15-meter band inteference is to install a wavetrap at the receiver. One such circuit which the author has used successfully consists of a 7-45 $\mu\mu f$ trimmer capacitor used with an inductor constructed of 20 turns of No. 20 enameled wire closewound on a one-half inch form. This circuit is resonated to the 15-meter band at a capacitance setting of about 25 to 30 $\mu\mu f$, with the final adjustment of capacitance being made after trap is installed. If a coil of fewer turns is desired, a larger diameter winding should be used. For example, a dozen turns of wire wound to a one-inch diameter can be used.

The resonant circuit so produced may be connected to the tv receiver in a number of ways, as shown in Fig. 3. The simplest method is shown in part A of the figure. Here the coil and capacitor are connected in series, then the combination is tied between the antenna terminals of the tv receiver. At resonance, the series circuit shunts the antenna terminals with a low impedance which effectively shorts out the signal to which the circuit is tuned. The coil and capacitor may also be connected in parallel and the combination then connected in series with one side of the lead-in, as shown in part B of the figure. At resonance, the high impedance of the parallel combination blocks the signal to which the circuit is tuned.

If either of these arrangements unbalances the transmission line to such an extent that the signal-to-noise ratio is reduced or so that a degradation of picture quality occurs, the balanced arrangements shown in C and D may be more satisfactory. Here, two similar tuned circuits must be employed.

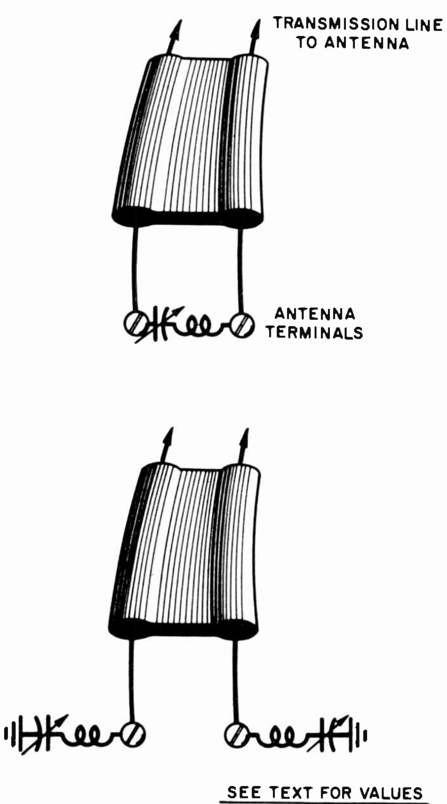


Fig. 3. Methods of connecting wavetraps.

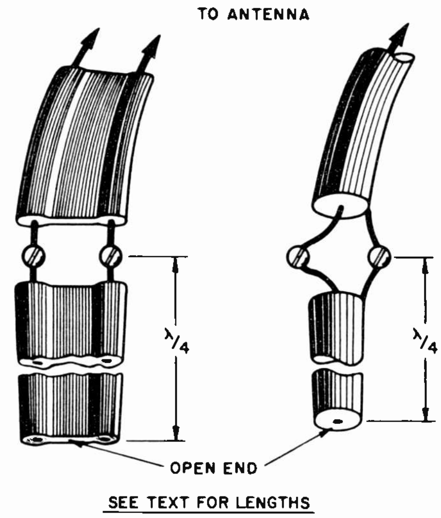


Fig. 4. Use of quarter-wave open stubs.

Although the wavetraps discussed are easier to install at the antenna terminals of the receiver, they will be somewhat more effective if they can be installed in the receiver at the point where the antenna lead-in connects to the tuner. In this way, the foot or more of lead-in between the antenna terminals and the connection to the tuner will not inject an interfering signal into the receiver.

Since 15-meter band interference can also enter the receiver through the power line and power-wiring circuits, the wavetraps may be installed at the power-line connection. To be effective for signals that may be picked up by the line cord itself, the traps should be connected at the point where the line cord enters the receiver rather than at the electrical outlet. The parallel arrangements are to be preferred here so that a breakdown in the capacitor will not produce a power-line short circuit.

The use of sections of transmission line as wavetraps should not be overlooked. Because of the relatively low frequencies involved, which would make a half-wave line inconveniently long, it is recommended that a quarter-wave open stub be used. Such a stub shunts its input terminals with a low impedance at the resonant frequency just as the series resonant circuit does. The stub is connected as shown in Fig. 4. The quarter-wave stubs should be cut to the center of the 15-meter band, which is close to 21.22 mc.

If the stub is to be made of the 2-wire ribbon line, the length is calculated as follows: the length in feet of a free-space quarter wavelength is equal to 246 divided by the frequency in megacycles, in this case

(Continued on page 29)

Improvement of fringe area reception by Proper Antenna Installation

by J. C. Spindler*

Part I

**Part I is an excerpt taken from the book "Compendium on Improving Fringe Area T.V. Performance," published by the Zenith Radio Corp., and compiled by J. C. Spindler. The article and its illustrations are reprinted through the courtesy of the publisher.*

Antenna Location and Elevation

Level Terrain. In level terrain the signal field strength increases proportionately with antenna elevation above ground. That is, doubling the antenna height doubles the signal intercepted by the antenna. For this reason adjacent roofs and towers, or other nearby high locations, should be kept in mind as ideal antenna locations. However, additional height away from the house will require additional lead-in, and since there is some signal loss in the extra lead-in, it is advisable to estimate both the extra height that can be obtained and the extra length of lead-in that will be required before deciding on such a location.

At an antenna elevation of 50 feet, the signal increase obtained from one extra foot of height, i.e., going to 51 feet, is cancelled out by 10 extra feet of 300 ohm ribbon line on channels 2-6, while only 5 extra feet of this line will nullify the improvement on channels 7-13. Table 1 below gives the approximate percentage of the signal remaining after a specified length of transmission line is inserted. That is, it denotes the ratio $\frac{\text{signal out of line.}}{\text{signal into line.}}$

Table 1 indicates that there is an ultimate limit in benefits realized from increasing antenna height because the lead-in also increases. As an example of how this table may be used, let us suppose that we have a choice of two locations. No. 1 will give us an overall elevation above ground of 30 ft. and requires 50 ft. of ribbon line to the receiver. No. 2 will give us an elevation of 70 ft., but being away from the house requires 250 ft. of lead-in. Thus No. 2 requires 200 extra feet of lead-in. The signal at the receiver obtained from location No. 2 can be compared to that obtained from location No. 1 by means of the following:

$$\frac{\text{Signal from \#2}}{\text{Signal from \#1}} = \frac{\text{Height \#2}}{\text{Height \#1}} \times \begin{array}{l}\text{Ratio from Table 1 for}\\ \text{difference in line length.}\end{array}$$

Application of this formula, and the ratios from Table 1 for 200 feet, gives the following results if 300 ohm ribbon lead is to be used:

$$\text{Ch 2-6 } \frac{\#2}{\#1} = \frac{70}{30} \times .68 = 1.6 = 160\%$$

$$\text{Ch 7-13 } \frac{\#2}{\#1} = \frac{70}{30} \times .43 = 1.0 = 100\%$$

This indicates a distinct improvement in signal to the receiver on channels 2-6, but none whatever on channels 7-13.

If open wire lead-in were to be used instead of ribbon line, then the comparison would be as follows:

$$\text{Ch 2-6 } \frac{\#2}{\#1} = \frac{70}{30} \times .90 = 2.1 = 210\%$$

$$\text{Ch 7-13 } \frac{\#2}{\#1} = \frac{70}{30} \times .78 = 1.8 = 180\%$$

This indicates a substantial improvement on channels 2-6 and also the superiority of location No. 2 on channels 7-13.

Use of Table 1 will aid in determining the best location and elevation of the antenna where the terrain is flat and variations in signal strength are comparatively small.

Hilly or Mountainous Terrain. In terrain of this type the signal amplitudes may vary rapidly and the best signals are often obtained by an antenna location which is neither the highest nor the nearest. Considerable care should be exercised, keeping in mind that extra lead-in length results in additional signal loss. A good procedure to follow is to try several of the most likely locations and then select the best. If the country is very mountainous try several elevations at each location, for in such terrain it is not necessarily true that the higher the antenna the more signal is obtained. Occasionally a lower elevation will prove superior to a higher one. Be sure to check antenna orientation each time.

Man-Made Electrical Interference

The most commonly used lead-in is the 300 ohm ribbon type, because it is both economical and reasonably efficient. If moderate man-made electrical noise (automobile ignition, electric motors, power lines, etc.) is present, it is advisable to twist this lead about once around every foot. If the electrical noise is severe, and the origin is known, it may help to choose an antenna location away from the noise source. On the other hand it may be advisable to use coaxial lead-in plus matching transformers at the antenna and receiver. If coaxial line is used, the proper balance transformers *must* also be used, as without them coaxial line may be inferior to twisted balanced ribbon line with regard to both signal transmission, efficiency and noise rejection. A third possibility, which is useful if the source of interference is directly (or nearly directly) under the antenna is to use a vertical stack of two antennas, spaced ½ wave length apart, if a single antenna has previously been used. This will increase the tv signal level and decrease the noise pickup from beneath the antenna. If the source of interference is known, it is also advisable to route the lead-in as far away

(Continued on page 6)

TABLE 1

Percentage of Signal Available after Line Loss Deduction

Ratio: $\frac{\text{Signal Out of Line}}{\text{Signal Into Line}}$

Line Length (feet)	3000 ohm ribbon or RG8/U Ch 2-6	Ch 7-13	300 ohm open wire line Ch 2-6	Ch 7-13
20	.97	.92	.99	.97
40	.92	.84	.98	.94
60	.89	.77	.97	.92
80	.85	.71	.96	.90
100	.82	.65	.95	.88
120	.79	.59	.94	.86
140	.76	.54	.93	.84
160	.73	.50	.92	.82
180	.70	.46	.91	.80
200	.68	.43	.90	.78

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VOLUME 13 NUMBER 8 JUNE, 1952

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MEMBER

Curtain Time

RTMA and the Servicing Industry

We have before us a resume of items related to the servicing industry, its relations with the public, and the responsibility of the tv receiver industry to the servicing industry and to the public. These are to be discussed at a forthcoming RTMA Service Committee meeting. We mention these facts at this time in order to advise the tv servicing industry that its comments are not going unheeded by the manufacturing industry.

It is significant to note that the RTMA Service Manager, Mr. Al Coumont, has worked up a plan of action which, if implemented by the industry, will be a great step forward. It may not answer every single problem in the minds of the nation's service technicians, but it will take care of many of them. In the meantime, let's hope that top level management in the RTMA will see their way clear to take the recommendations of its service manager and of the Service Committee.

Service Associations

The move to organize local service technician organizations is rapidly gaining momentum. We are very delighted to note interest in this direction. Perhaps it is due to the ever increasing threat of licensing, or it may be due to any one of numerous actions or reactions in the individual areas. It matters not what is responsible for it – just so long as the association comes into being, and having been born is nurtured by those who are its members.

There is every reason for the existence of service associations. Whether it is to fight against or for licensing – an association can do much more than individual voices. Whether it be to register a complaint or to deliver favorable comment – an association's voice is strong – whereas the individual's is weak. However, associations have been attempted in the past and many of them failed. They did not hurdle the obstacles, so we hasten to express words of caution. These are directed towards the membership:

1. You can't get more out of an association than you put into it. If you want your association to grow, you must attend meetings – you must think about its welfare and express yourself. You can't be too busy to attend meetings. Let the service job wait. You owe it to yourself and to your set customers to set up a local association which will make every effort to end abuses, therefore neither you nor the public suffers too much because the jobs you might complete during the servicing meeting night must be held over until the following day. Nothing is so disheartening to those members who appear at meetings and to the officers of the association as poor attendance.
2. Don't expect your officers to carry the entire burden. They need your help. Few, if any new service associations are rich enough to afford paid secretarial help, yet the lack of it has caused many to fall apart. This is why it is recommended that dues be set at a level which will allow hiring someone to take care of mailings. This seems like biting off a big chew, but it is true, and the larger the membership, the more difficult it is for unpaid officers to sacrifice their time and income to carry on their association duties. The matter of dues is not an easy one to resolve, but it is very important because it determines to a great extent the possible growth of the association. The lower the dues the greater must be the individual desire of every member to make the association grow.
3. Don't expect the officers to run the association without making mistakes and without failing to satisfy the desires of each member. If they do something which is not to your liking, don't feel that the answer is to leave the association. Try to find a solution inside the organization; you'll never rectify a mistake by being outside looking in. If there is need for the organization then there is a need for you to stay in and do your part in making it grow.
4. If you don't agree with what the officers are doing, discuss it in open meeting; let them convince you, or you convince them, but don't assume the attitude that whatever is happening is a personal affront; or that the actions taken are aimed at you. That is the first crack in the structure; the next is absence from meetings – and soon, no more association.
5. Try to remember that it is easy to criticize, and that officers who are not being paid for their efforts and who are trying to do the best they can, are doing so only at some sacrifice to themselves – either in free time or in income. They're human and can't take too much abuse. If you feel that you must criticize, don't do so on a personal basis. Above all criticism should be constructive – you should present an alternative approach to whatever may be the action you don't like; simply saying you don't like something is not sufficient.
6. Try to see the other man's point of view. Remember that the servicing industry is composed of full-time and part-time service technicians. The part-time man requires recognition. This is a country of free enterprise. No matter what may be your present complaints about the part-time worker, you'll never give him your religion concerning operations unless he is given the opportunity of full participation in the local service technicians association.
7. Don't found the association as a means of controlling or eliminating competition. This has been attempted and has always failed. It just will not work; that is not an association's purpose.

Rome wasn't built in a day. Neither can we list all of the possible pitfalls in one issue. The thought that bothers us most is that insufficient heed may be paid to these suggestions. Not that they become important because they are expressed here, but because twenty-five or so years of direct contact with the servicing industry has demonstrated that the simplest things – obvious things, when ignored, can be productive of very bad results. So it is with some of the thoughts we have listed. . . . They warrant serious attention – especially in the formative stages of a service association. . . . But the possibility of many obstacles should not be a deterrent to the effort. The service industry needs local service associations – then statewide affiliations and finally a national group. . . . If correction is needed within the servicing industry – it should come from within. These and other benefits can be the goal of every service association.

John F. Rider

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Improvement of fringe area reception

(Continued from page 3)

from it as is practical. The list below presents the foregoing measures in their approximate order of efficinecy in minimizing electrical noise effect.

1. Stacked antennas plus coaxial line in best available location.
2. Single antenna plus coaxial line in best available location.
3. Stacked antennas with twisted 300 ohm line in best available location.
4. Single antenna with twisted ribbon line in best available location.
5. Twisted ribbon line with antenna at existing location.

In steps 4 and 5 the line is to be routed as far away from the noise source as practical. It is recommended that if the amount of noise pickup is not known that the initial installation be made as per item 5. If it is found that considerable noise interference is still present, proceed further with steps in the reverse order listed.

It is of extreme importance in selecting the antenna site and lead-in that noise interference pickup, as well as signal strength, be given consideration, as picture quality can be seriously impaired by noise, as well as by the amount of "snow". In extremely noisy locations it may be necessary to reach a compromise between conditions resulting in minimum "snow" and those giving the least noise interference pickup.

Selection of Antenna

There are many types of antennas on the market today, but it is advisable to choose one which, performancewise, has been generally accepted in the field for use in similar locations. Three general types, each made by numerous manufacturers have established themselves throughout the country for fringe area reception. These are the In-line, the Conical, and the Yagi. The In-line and Conical are broad band, being designed to receive channels 2-13. The Yagi is high gain, but narrow band and is designed for reception of signals eminating from one general direction.

Preference for the In-line or Conical varies from one locality to another. The In-line has slightly better pickup efficiency on channels 3 and 4. The Conical is superior on channels 5, 6, 12, and 13. The In-line or Conical antennas are recommended wherever it is desired to receive a number of stations located in approximately the same direction, with some stations in the low band (2-6) and others in the high band (7-13).

The Yagi is usually found in fringe areas where it is possible to receive only one or two channels, in which case a separate Yagi is used for each channel.

The discussion below lists some of the more frequently encountered conditions and recommends the antennas generally found to be most helpful in each case:

A Number of Channels Available on Both High and Low Bands. If all signals arrive from the same direction, use either the In-line or Conical, single or stacked. Except in a few instances, double stacking (4 antennas) is not recommended. The extra benefit obtained in going from a stack to a double stack is small in comparison to that obtainable from either (a) increased antenna height (except as previously mentioned) (b) use of open wire 300 ohm line or (c) a separate Yagi antenna for each of the desired channels.

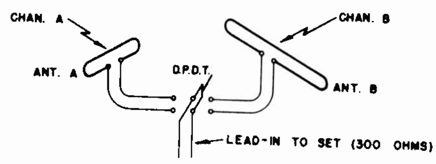

Fig. 1. Switch connection of two antennas.

If the signals arrive from different directions, it is possible to use either the In-line or Conical, single, or stacked, plus an antenna rotator. A practical, and frequently more flexible alternative, if there are only two directions involved, is to orient a first antenna (or stack) in one direction and a second antenna (or stack) in the second direction, then run a separate lead from each antenna to a switch located near the tv receiver, so that either one of the antennas may be connected to the receiver, as shown in Fig. 1.

The increased flexibility of the latter method can be illustrated by the following example: Let us assume channels 2, 4, and 5 arrive from direction A and channel 10 from B. Then the antenna for A need only contain low band elements and the antenna for B only high band elements. Furthermore, if stacking is used, it will not be necessary to compromise the stock spacing between that which is best for the low band channels and that which is best for the high band. Antenna A can utilize the stacking distance which is optimum for the low band and antenna B that which is optimum for the high band. In fact, for this particular example, it would be best to use a channel 10 Yagi (or stack of two) for antenna B.

There are many more possibilities of course, but using individual antennas for each signal direction (as shown in Fig. 2) results in greater flexibility than using one antenna plus a rotator, and frequently careful study of the situation can result in better performance at comparable cost.

Only Two Channels Available. Generally the best results are obtained by using a separate Yagi antenna for each channel, running a separate lead-in to a switch near the tv set and selecting the antenna as desired. While it is possible to make the antenna connections in such a way as to use only one lead-in, the matching stub lengths are different for each pair of channels, and unless this is done accurately, considerable signal loss can result. Use of separate lead-ins and a selector switch avoids this possibility.

However, where it is still desired to use a single lead-in from two antennas, the following procedure may be employed. Referring to Fig. 3, connect lead-ins LA and LB to each antenna and form a common junction (J) with the lead-in to the receiver. Make LA and LB long enough so that if necessary 10 feet can be cut from both and the overall length will still be sufficient to make the connection. Then, observing channel A, disconnect LB from J. If the removal of LB improves channel A, cut down LB progressively until it is of such length that its connection to the junction (J) makes

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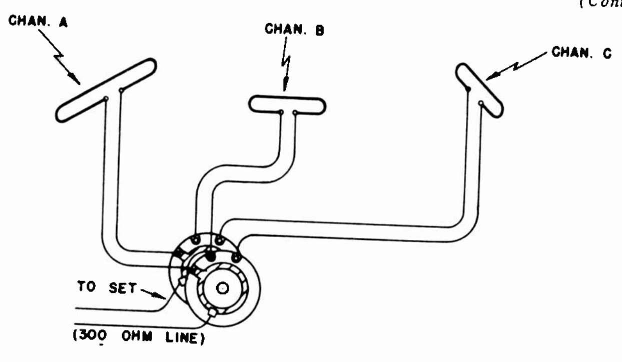

Fig. 2. Switch connection of three antennas.

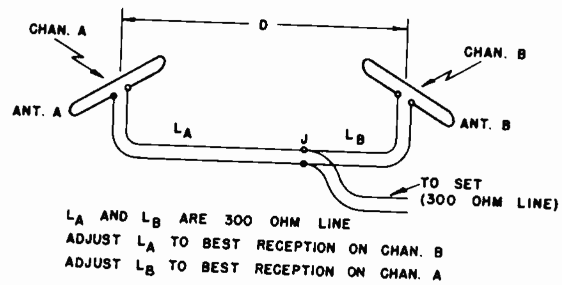

Fig. 3. Feeding two antennas to one line.

Preventive Maintenance

by John F. Rider

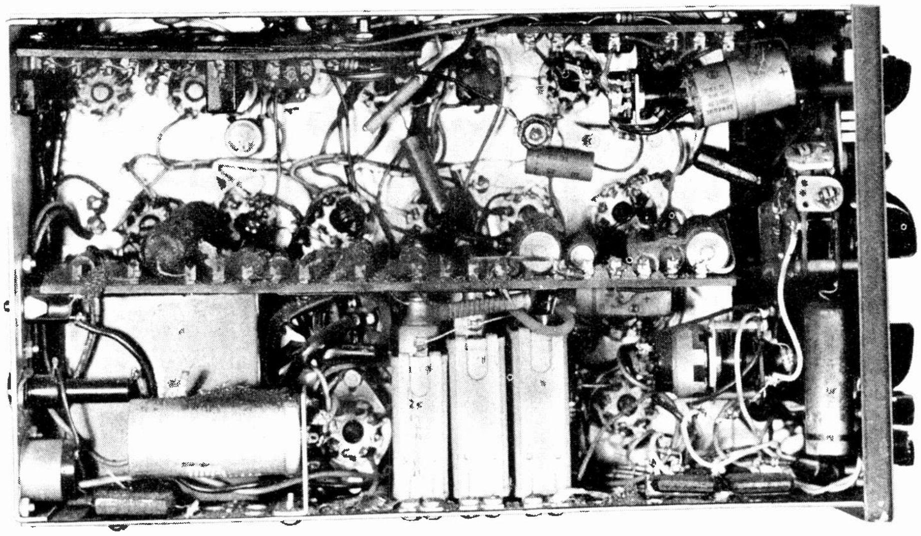

Fig. 1. If given time, dirty equipment will function poorly.

Preventive maintenance is not unknown to tv and radio service technicians who served in the Armed Forces during World War II. It was the means of keeping weapons, vehicles, electronics equipment and other devices in good working order so they would be ready for proper use and good performance when needed. This was used by all branches of the service, whether on the ground, in the air or on or below the surface of the sea.

But the application of preventive maintenance is not limited to the Armed Forces. It is practiced in civilian life too. When you take your car in for a spring check-up, for tire pressure, tightening, lubrication, new spark-plugs, points, etc., the sum and substance of the whole thing is preventive maintenance. You are preparing your car for summer use; you want to make certain that it is in proper running order. When you paint a scratch on a fender to prevent rusting – or oil the hinges of a door, tighten it on the frame and check the lock – all of this is preventive maintenance. In other words preventive maintenance is a series of operations which are periodic and are intended to keep equipment in correct working order – thus assuring longest life and, even more important, making sure that the equipment is ready to do its job when needed – and to do it well.

Every service technician who is connected with radio transmitting station operation knows the meaning of preventive maintenance. Regardless of the kind of signal being transmitted, each installation performs preventive maintenance as religiously as you wash your face. That is SOP every day, week and month – and in case you've forgotten the meaning of SOP, it is "Standard Operating Procedure." Whatever good record a broadcasting station may develop for uninterrupted service is attributable only to the preventive maintenance which is performed on a regular schedule. Neglect preventive maintenance and equipment suffers. The more expensive your equipment, the more it needs preventive maintenance if the cost of replacement is to be kept to a minimum . . . and maximum performance is to be achieved.

Service Equipment is Expensive

The test equipment and other devices used in tv and radio service shops are no longer cheap. They may have been considered relatively inexpensive in the days of radio receivers only, that is prior to 1940, but since that time costs have been rising . . . and are destined to go higher. Such being the case, it stands to reason that each service facility is interested in getting the most out of its test equipment while keeping repair and replacement at the lowest possible figure. Preventive maintenance is one way of achieving this; it is the most effective

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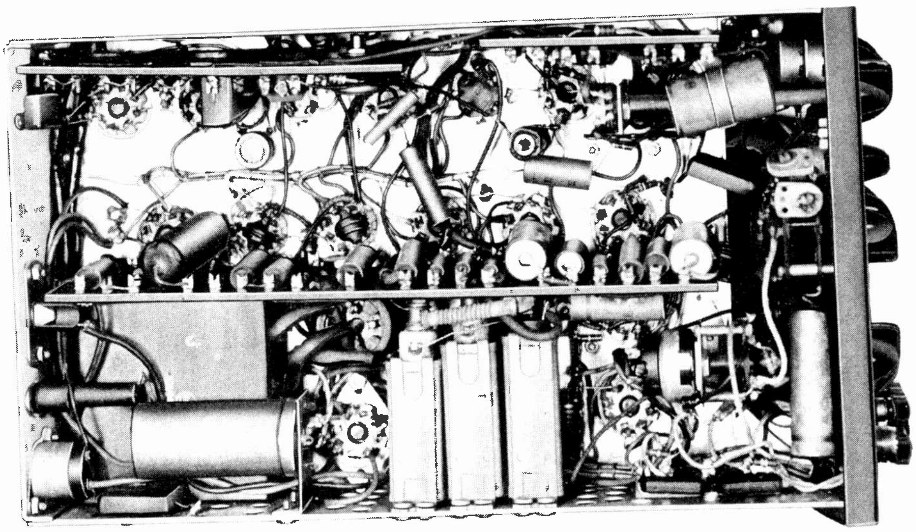

Fig. 2. Clean equipment lasts longer and operates better.

Bill Clemens says—

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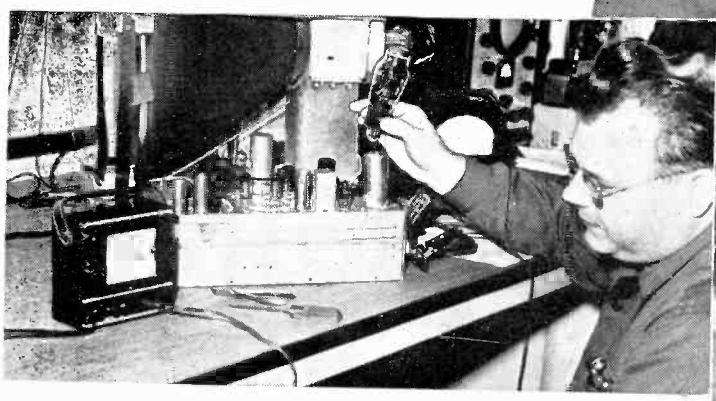
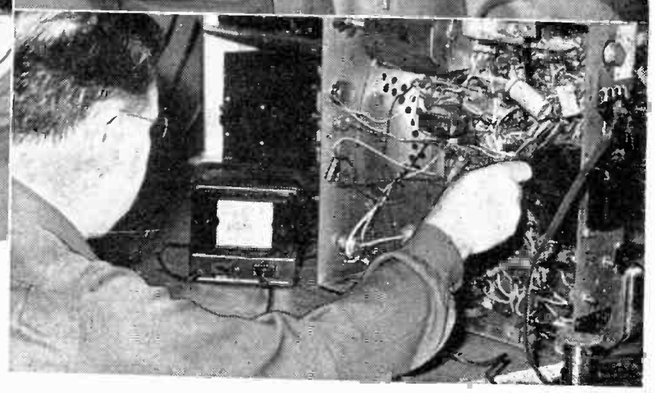
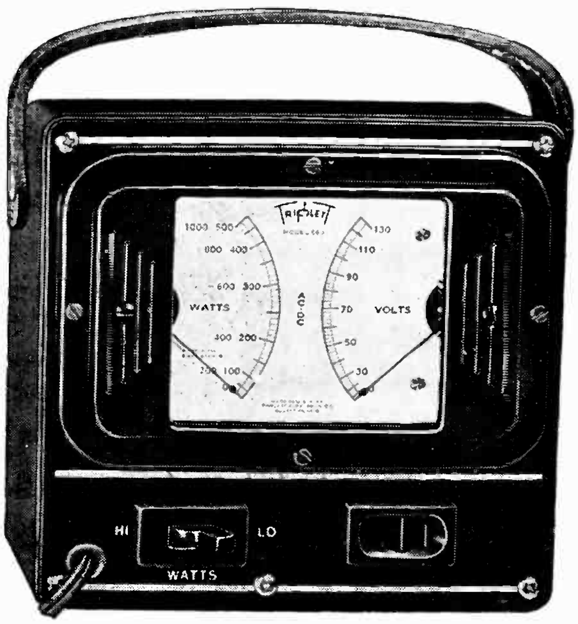
"TRIPLETT 660 saves us 50 to 100 man hours per month."



1. ISOLATING THE TROUBLE—Plug the power cord of the chassis into LOADCHEK and note the reading. With your eye on the large meter remove the rectifier tube and you can tell immediately which side of the tube the trouble is on. You have already eliminated 50% of your probing time.



2. LOCATING THE SHORT—With Loadchek you can quickly check the shorted side, part by part, without laying down tools or picking up test leads. Here, the trouble was a short in the transformer, spotted without having to warm up set. Overloads are found the same way.



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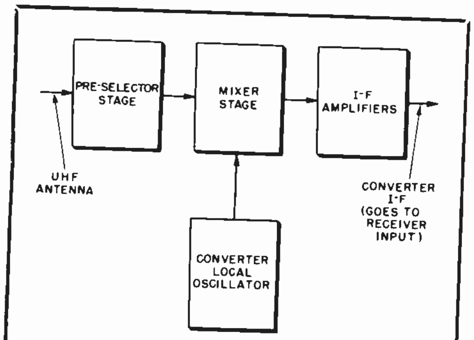


Fig. 1. Typical block diagram of uhf converter.

UHF television converters

by Allan Lytel*

NOTE: The following material was taken from the new Rider publication UHF PRACTICES & PRINCIPLES by Allan Lytel. Although only a few converters are touched on in this brief excerpt from the chapter dealing with Receivers and Converters, much additional information as well as material dealing with converters produced by other manufacturers are to be found in the book.

General Principles Involved in Conversion

When a system of broadcasting is being used by many people, as is presently the case with television broadcasting, any change in the operating frequency always brings the inevitable problem of frequency conversion. For example, frequency-modulation broadcasts could not be received on ordinary a-m broadcast receivers for several reasons. First, the radio receivers obviously could not tune in the programs since the a-m band ranges from 550 kc to 1,600 kc and the present f-m band goes from 88 mc to 108 mc. The local oscillator of the ordinary broadcast receiver would have to be modified to operate at a very high-frequency if the receiver were going to be used to pick up f-m programs. The bandwidth in a.m. is normally only 10 kc while the bandwidth in fm is almost 200 kc. In addition, the detection system in ordinary a-m broadcasting is different from the frequency-modulation detectors. These are special detectors which are responsive to variations in frequency rather than in amplitude.

As a natural consequence of these factors, converters were designed, built, and sold to many people in areas which have frequency-modulation broadcasting. These converters usually consisted of a local oscillator, mixer, several stages of intermediate-frequency amplification, a special type of detector, and an audio output jack. In some cases, converters use a stage of radio-frequency amplification for its advantages of image suppression and greater selectivity. A converter of this type was ordinarily attached to the grid of the first audio amplifier of the standard broadcast radio receiver. No part of the radio-frequency section of the radio receiver was used when the converter was attached. The radio receiver supplied only the audio amplifier and speaker section to be used with the converter.

Uhf television converters involve a situation entirely different from that which exists with the f-m converters. The amplifiers and detectors of the television receiver can be used with the converter. A television converter needs only to receive the signal and mix it with a local oscillator signal to produce an i-f output. However, this output is *not* fed to the i-f amplifier of the associated television receiver for several reasons. First, there is the mechanical difficulty in feeding a signal into the amplifier since some method of separate coupling involving an individual connection would be needed. Second, a less complicated system is required if the uhf converter has signal output which is within the tuning range of the front end of the existing television receiver. If the converter puts out a signal which is, for example, between 210 mc and 216 mc, it can be picked up by an ordinary television receiver tuned to channel 13.

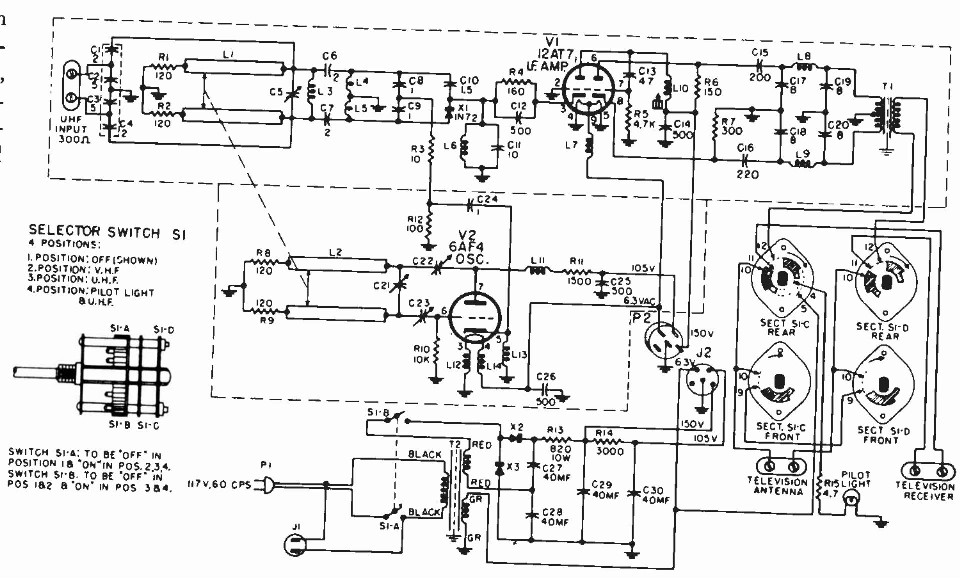
In this manner, the converter output, while it is an intermediate frequency in relation to the converter itself, represents an r-f input signal as far as the television receiver is concerned. When it is used in this manner, the converter actually changes the receiver into a double superheterodyne; that is, the uhf signal is received and mixed with the converter local oscillator to produce what is, for the converter, an intermediate frequency. This is often called the converter i.f. Experimental uhf television converters use one or two stages of i-f amplification to compensate for the loss in signal in the mixer circuit. A typical converter uses a tuned input stage feeding a tuned mixer stage, as in Fig. 1. The local oscillator also feeds into the mixer stage. The mixer may be a crystal diode because of the low inherent noise figure. The output of the converter is fed into the antenna terminals of the conventional television receiver.

Courtesy G. E.

Fig. 2. General Electric uhf converter.

Output from the converter is thus applied to the r-f amplifier of the television receiver.

(Continued on page 11)



Courtesy G. E.

Fig. 3. General Electric uhf-101 schematic diagram.

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UHF television converters

(Continued from page 9)

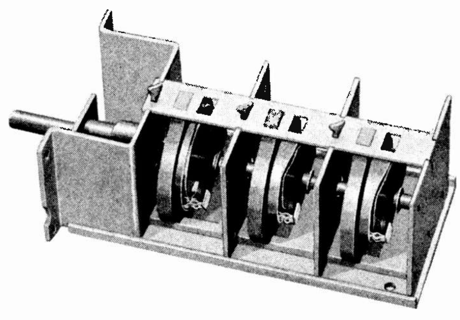
This stage feeds into the mixer where the signal frequency is mixed with the television set's local oscillator output to provide the i.f. for the receiver. This method represents maximum utilization of the existing components in the receiver itself.

Sample UHF Television Converters

Nearly all television receiver manufacturers have announced models of uhf television converters. A few of these are discussed briefly in the following paragraphs.

The General Electric Translator UHF-101. Figure 2 is the General Electric uhf television converter. As in common practice, in the vhf position of the front panel control, the standard television antenna is connected directly to the television receiver. In the uhf position, the uhf antenna is used and the converter is connected to the receiver antenna terminals. Converter output at a frequency between 79 and 85 mc is fed into the receiver which is tuned to either channel 5 or 6. Frequency adjustments are provided for the channel which is to be used.

Figure 3 is a schematic diagram of this converter. Two adjustable tuned lines are used that are ganged. One line is the tuned input for the mixer and the other is for oscillator tuning. The 6AF4 local oscillator is capacitively coupled into the crystal mixer circuit. A 12AT7 is used as a two-stage i-f amplifier whose output frequency may be adjusted. The first section of this tube uses a tuned cathode input with a grounded grid and the second stage has the signal input to the grid with the output taken between plate and cathode.



Courtesy Mallory & Co.

Fig. 4. Mallory uhf inductuner.

This unit has a self-contained selenium rectifier in a transformer-type power supply. This allows it to be used without deriving its power from the receiver.

The Mallory UHF Television Converter. The P.R. Mallory Company manufactures both a separate uhf Inductuner[1] as well as a complete converter. The tuner itself is similar in theory and operation to their model designed for vhf operation and it is available in one, two, three, or four sections. Figure 4 shows a three-unit model. The required tuning is accomplished in 270° of rotation. The preselector or tuned input elements are shaped differently from each other. These are different from the oscillator tuning element so as to provide proper tracking. Output frequencies are obtainable at approximately 40, 80, and 130 mc. The r-f tuning range is from 460 to 910 mc. A special antenna coupling input circuit is used to match the 300-ohm line.

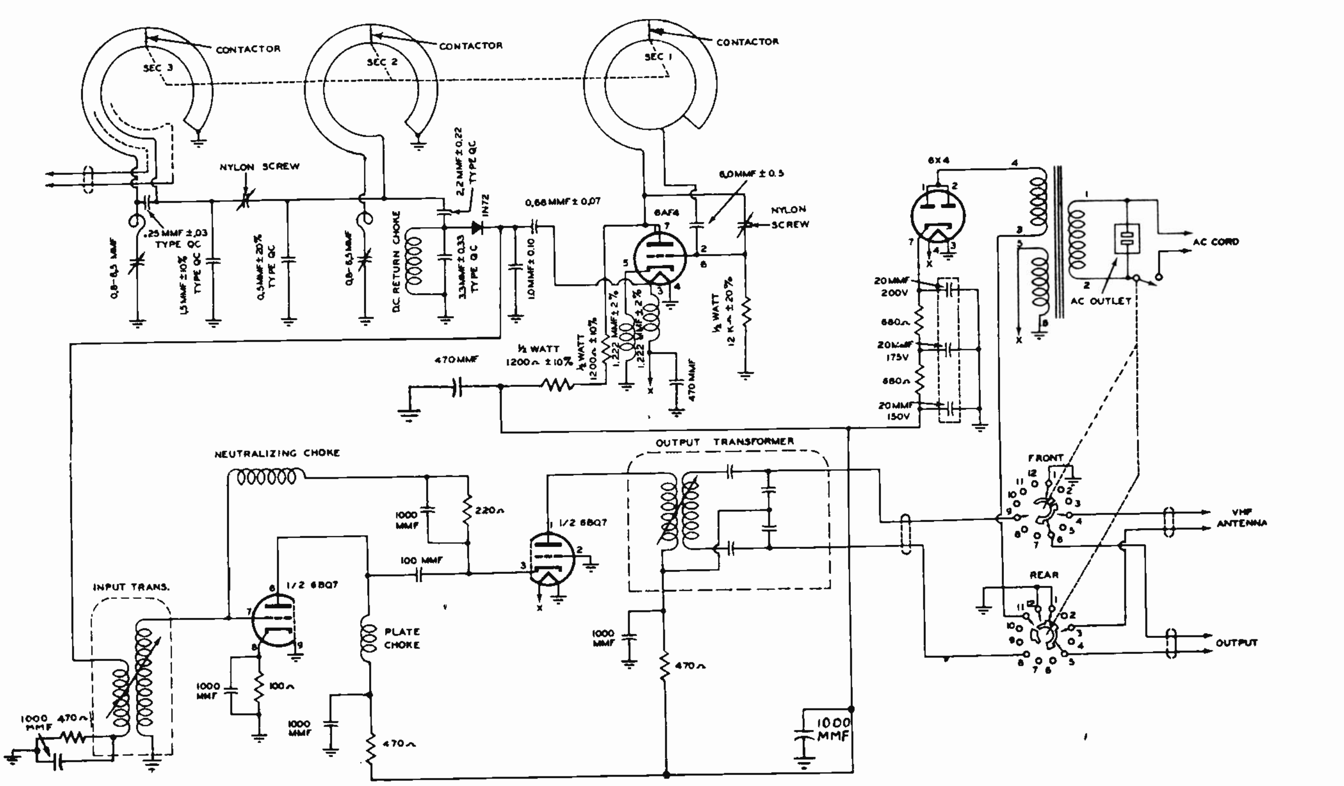
The tuning elements cover the entire uhf range with approximately 10 mc over travel at either end with an external tank capacitance of 1 μμf. The grid-to-plate capacitance of the oscillator tube, which is approximately 1.5 μμf resonates with the oscillator tuning element.

Figure 5 is a schematic diagram of the complete converter. Note the balanced input and the capacitive coupling to the preselector. This unit has a preselector tuned circuit, a crystal mixer, a local oscillator and an i-f amplifier. This amplifier uses a grounded cathode triode as input section with neutralization. This is coupled to a grounded grid triode output section. The output circuit uses a double-tuned transformer with a 12-mc bandwidth having a gain of approximately 6. Because of the conversion loss, however, the overall unit gain of the converter is approximately 1.

The Stromberg-Carlson Converter. Another example of the use of the Mallory uhf tuning is found in the Stromberg-Carlson converter shown in Fig. 6. The cabinet is 8 by 4 by 6 inches. The circuit for this unit closely resembles that shown in Fig. 5 except

(Continued on page 32)

[1] Reg. U. S. Pat. Off.



Courtesy Mallory & Co.

Fig. 5. Mallory uhf converter schematic diagram.

Preventive Maintenance

(Continued from page 7)

means of prolonging the life of equipment and keeping it in the best operating condition at the same time.

Preventive Maintenance of Electronic Equipment

Specifically what is preventive maintenance on electronic equipment? Let us say right at the outset that it is simple to perform and is not time consuming. From this point on, it is keeping the equipment clean – seeing to it that everything is always in proper operating condition – and doing these things *regularly*. And by regularly we mean according to a preset schedule.

Preventive maintenance of electronic equipment can be divided into three groups of operations. The first of these includes everything that can be done from the outside of the equipment. This means keeping the front panel clean and free from dust and dirt. It means keeping control and tuning knobs functioning properly, replacing broken meter and dial windows, and seeing to it that terminals are clean and free from corrosion and are tight so that proper connections can be made to them. Connecting cables should be clean and not oil soaked, and should not have frayed or torn insulation. Alligator clips attached to these cables should be clean and capable of making good contact, so that they do not introduce noise into the circuits they interconnect and can allow the transfer of the full signal with minimum loss. The same goes for bayonet contacts, plugs and phone tips.

The screws holding panels to the cabinet should be tight, ground contacts should be tight and free from corrosion, and covers should be on tight. Voltage, frequency and other dial markings should be clean and easily readable. All in all it means keeping the appearance of the equipment nice and clean and presentable.

If anything on the panel is broken it should be replaced; if scratches exist on the panel they should be painted over to prevent rusting and subsequent damage.

The preventive maintenance performed on the outside of the equipment should be set on a regular schedule. Believe it or not, making it daily is not too frequent. Once the operation has been started, keeping it clean is only a matter of a few minutes work each day, of course if you want to make it twice a week that's ok too. This is worthwhile because it saves far more money and time in the long run than is spent caring for your equipment each day.

Preventive Maintenance on the Inside

What is preventive maintenance inside the equipment? Again it is simple. The tubes should be tight in their sockets. The top of the chassis should be clean and free from dirt and dust. Most equipments have louvres cut in the cabinets for ventilation; dust and dirt enter the unit through these openings. In high humidity areas, a film of moisture on the top of the chassis is quite common. Of course if the equipment housing has no such openings, the need for cleaning inside is reduced; but if the equipment is handled quite a lot and its location changed so as to suit the different operations each day, it still is necessary to make certain that tubes are tight in their sockets.

Dirt and dust don't gather only on the top of the chassis, but underneath as well. However, the complete check of the chassis is something else, as is the testing of the tubes in the device to make sure they are functioning properly. This means checking the tubes with a tube checker, or whatever other means is decided upon . . . but some sort of check should be made.

Some tv generators contain vibrating devices. These impart vibration to the tubes and other components, hence these require more attention than those which do not use such units for generating frequency modulation. These references do not reflect adversely on the design of the apparatus, but such vibrating devices warrant attention.

How frequently the inside is cleaned and the tubes checked is determined by the design of the equipment. Devices which have louvres and covers require it more often than units which are completely sealed. The former may be once a month, whereas the latter can be as infrequently as every three months or even once every six months. If the top of the chassis is cleaned once a month, then the bottom of the chassis, and everything mounted on it, should be cleaned every three or every six months. In the final analysis local conditions are the determining factors. In some towns the air is loaded with dirt, dust and soot; in others the air is much cleaner. In some locations, such as near the seashore, the air is moist and loaded with salt. This can damage equipment rapidly unless cleaning is frequent.

Set whatever preventive maintenance schedule you feel is best for your location and the kind of equipment you have – but

(Continued on page 25)

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NEW HEAVY-DUTY TV HIGH-VOLTAGE RECTIFIER CAN TAKE IT!

TV high-voltage rectifiers take a beating: Terrific variations occur in applied filament voltage . . . 0.8 to 2.4 volts! Sudden arcs in the rectifying system place destructive electromechanical stresses on the filament. And the increasingly larger TV picture tubes demand peak emission and peak inverse voltage simultaneously. The new CBS-Hytron 1AX2 was especially designed to take such rough treatment and come up smiling.

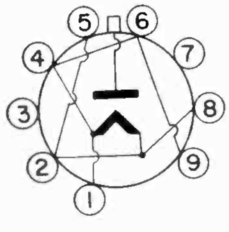
1AX2 DATA

The CBS-Hytron 1AX2 is a compact, 9-pin miniature TV pulse rectifier. Plate is brought out to top cap and filament is oxide-coated. Absolute maximum ratings are: peak inverse plate voltage, 25,000 volts; d-c load current, 1.0 ma.; and steady-state peak plate current, 11.0 ma.

Typical Operation — TV Pulse Rectifier

Filament voltage	1.4 v ± 10%
Filament current	650 ma
Positive-pulse plate voltage	20,000 v
Negative-pulse plate voltage	5,000 v
Peak inverse plate voltage	25,000 v
D-c output voltage	20,000 v
D-c load current	300 μa

BOTTOM VIEW OF SOCKET



ADVANTAGES OF NEW CBS-HYTRON 1AX2

1 Rugged, high-wattage filament of CBS-Hytron 1AX2 has adequate peak emission for the new, larger TV picture tubes. 1AX2 may be run simultaneously at both its peak inverse voltage and maximum d-c current.

2 Higher load of 1AX2 filament on transformer tends to regulate filament voltage. Eliminates need for limiting resistor. Yet lower plate-to-filament capacitance (0.7 μμf) of 1AX2 prevents loss of high voltage.

3 Insulated tension bar (patent applied for) through center of 1AX2 coiled filament limits destructive movement of filament by electromechanical stresses.

4 Filament of 1AX2 is located in base and shielded to eliminate bombardment of cool ends of filament by gas molecules.

5 An overloaded 1X2A may be replaced with its big brother, the CBS-Hytron 1AX2, by simply removing the limiting resistor. In rare cases, it may be necessary to add another turn to the secondary of the filament transformer to obtain the required 1.4 volts for the 1AX2.

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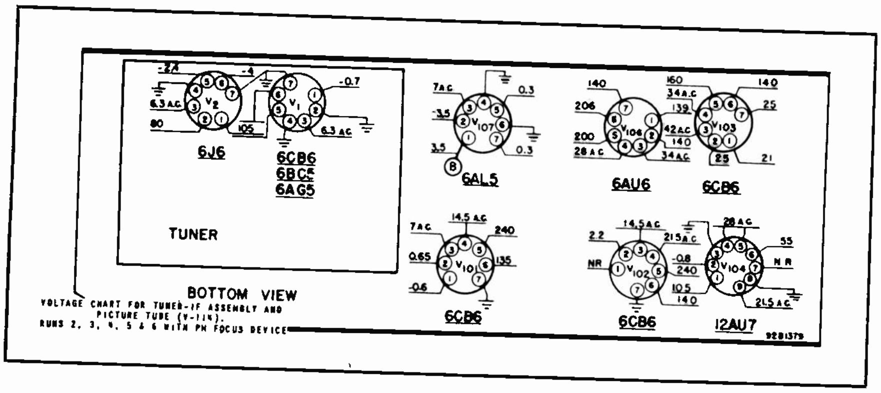

WHAT to do and HOW to do it!

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Briefly, what to do, and how to do it information . . . What it is that a surgeon learns? . . . Many things, but foremost among them is what to do and how to do it! Have you ever assembled some piece of equipment for yourself or for your youngster? What information did you follow—the simple instructions which told you what to do and how to do it. Many things which you have done, and which had no association with tv servicing were made *easy* and accomplished *successfully* only because you knew what to do, and how to do it.

Television servicing is no different. The key to easy tv servicing—and, at the same time, the open door to public good will and successful operation is knowing what to do and how to do it. And when we say this we're not thinking about theory; we are speaking about out and out practical things; we are referring to definite and specific servicing instructions. That and only that is what can make tv servicing easy.

Ever since the first radio receiver was built in 1920, and the first commercial tv receiver with a cathode-ray tube made its appearance in 1938, the place of origin of what to do and how to do it information about radio and tv servicing has been the set manufacturer's service department and his engineering department. Every set manufacturer is very much interested in having his receiver repaired properly. Having sold his product to the public, he wants it to stay sold. To help in this effort, the set producer prepares service information for use by the servicing industry. To make it most useful, he puts into it, among other facts, what to do, and how to do it—as applied to troubleshooting and repair. Following these instructions is what makes television and radio servicing easy.

And where do we come into all this?

We compile and publish this information in Rider Manuals and Tek-Files. It appears in complete, unabridged form—rich in information—rich in what to do and how to do it instructions. This is the kind of information that makes servicing easy. If a service technician has been in business one year or twenty-five, Rider information fills the bill. This is true because it is accurate, complete and dependable.

To illustrate just what we mean, here is a sample case. The receiver manufacturer is Hallicrafter, the receiver models are 805, 806, 810 and 810C and the chassis number is M800S (this appears in Rider TV Manual, Volume 8 and in Rider Tek-File Pack 6). The set manufacturer's service literature on these receivers amounts to 32 8½ x 11 inch pages. That is what we published. Now for the pertinent details.

These models were manufactured in 7 production runs. To present this data properly and to give the service technician *all* the information about the receivers, so that he can work competently on any one of the production runs which may come into his shop, individual bottom views are given for runs 1, 2 and 3 and for runs 4, 5, 6 and 7.

To make servicing easy and to show the differences between the receivers properly, the manufacturer prepared, and we reprinted, four different schematics. One of these is for run 1, another shows the receiver as produced in runs 2 and 3. Still another schematic shows the runs 4, 5, 6 and 7, but this schematic applies to the receivers using EM (electromagnetic) focus coils used in these runs. The fourth schematic applies to production runs 4, 5 and 6 for receivers which used PM (permanent magnetic) focus coils.

The variations introduced by different runs are indicated in two bottom socket views showing the operating voltages. These are illustrated in Figs. 1 and 2. Note carefully the great variations in the operating voltages at the different tube pins. Imagine having one set of voltage data, that for runs 4, 5 and 6 with the EM focus coil, and applying it to a receiver from runs 1, 2, 3, 4, 5 or 6 with a PM focus coil!

For example, compare the operating voltages used for V 101 in both cases. The tube is the same, a 6CB6. In one case the screen voltage is 135 volts; in the other it is 180 volts. The operating voltages on pins 1 and 2 differ by more than 100 percent in the two cases. Compare the operating voltages applied to tube V 103 in the video amplifier. In each case it is a 6CB6—but the operating voltages differ greatly. They differ so much that if a serviceman lacks the correct information he will draw the wrong conclusions. Without full information time would be lost in determining if the operating conditions were right or wrong, but with the *full* service data at hand, you know exactly what is right and what is wrong. There is little left to the imagination and guesswork is eliminated . . . All of this makes servicing easy . . . But you must have all the facts! You must have the set manufacturer's accurate and complete service information. . . . There is no substitute for completeness and accuracy in service information. . . . It is the foundation of easy, rapid tv servicing.

Room does not permit a full presentation to show how complete this information is. Receivers produced by other manufacturers are covered in similar detail. When you know what to do and how to do it—as stated by the receiver manufacturers and as contained in Rider Manuals and Tek-Files—servicing becomes as easy as falling off a log.

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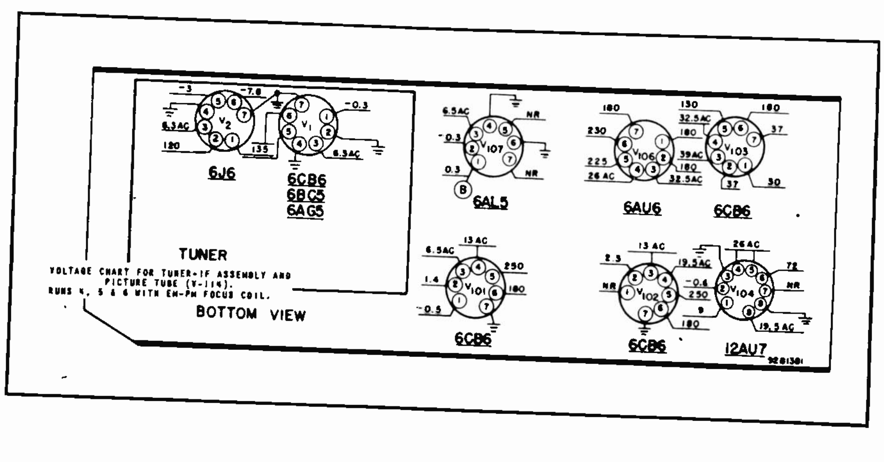

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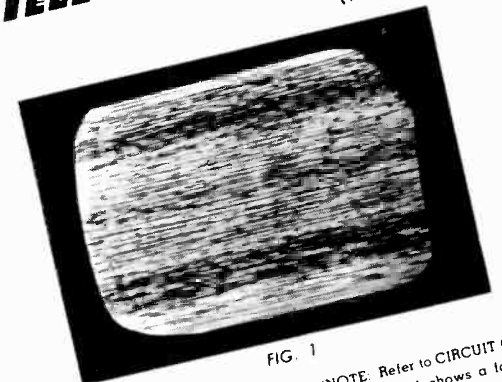

FIG. 1

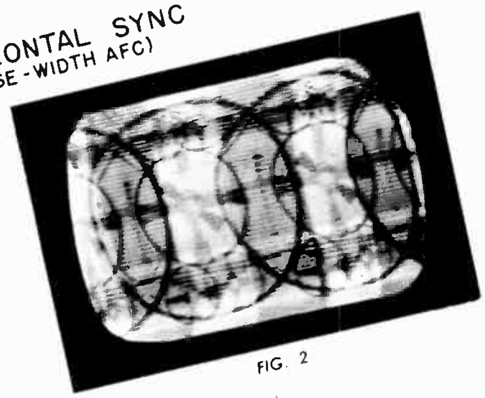

FIG. 2

(NOTE: Refer to CIRCUIT GUIDE-1 for identification of components.)

Figure 1 shows a faulty picture-tube pattern indicating loss of horizontal sync. In order to determine whether the controls and adjustments were set properly, the horizontal-lock control (C7), the horizontal-frequency control (L1), the horizontal stabilization control (L2), and the horizontal-hold control (R2) were all adjusted. Improper horizontal synchronization still existed, as shown by the multiple-image pattern in Fig. 2.

An oscilloscope was connected between the center-tap of L1 and ground through a high-impedance probe. The scope sweep was adjusted for ⅓ of the horizontal-sweep rate. The resultant waveform is shown in Fig. 3. This waveform was very jittery and was held stationary by critical adjustment of the horizontal-hold control (R2). For comparison, the normal waveform at this same point in the circuit is shown in Fig. 4. Note the low-amplitude damped oscillations that are superimposed on the fundamental frequency in this abnormal waveform, as well as the deterioration in shape. There was a slight increase in the peak-to-peak amplitude as compared with normal voltage value at the same point. The d-c voltage, as measured by VTVM, decreased by about 10% of the normal value.

ABNORMAL

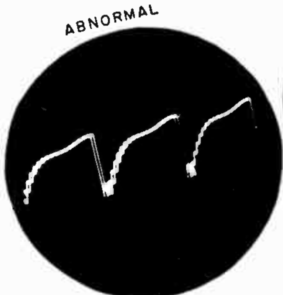

FIG. 3

NORMAL

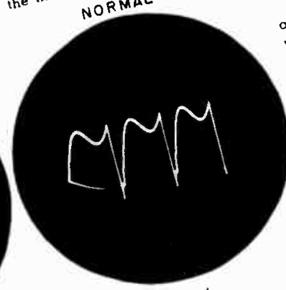

FIG. 4

The scope was then connected to the plate of the horizontal oscillator stage (V2) through a high-impedance probe, and sweep was adjusted for ½ of the horizontal-sweep rate. The resultant abnormal waveform is shown in Fig. 5. High-frequency damped oscillations appear which recur at the horizontal sweep rate. The normal waveform at the plate of the horizontal oscillator is shown in Fig. 6 for comparison. Note that high-frequency damped oscillations also occur in the normal waveform but are damped out rapidly after a few cycles. In the case of the abnormal waveform (Fig. 5), these oscillations continue for the entire interval between horizontal-oscillator pulses. The peak-to-peak amplitude of the horizontal-oscillator plate voltage, under these conditions, was over 2 times the normal value. The d-c voltage, as measured by VTVM, decreased by about 10% of the normal value.

ABNORMAL

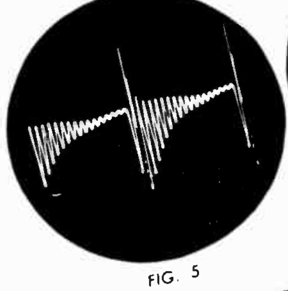

FIG. 5

NORMAL

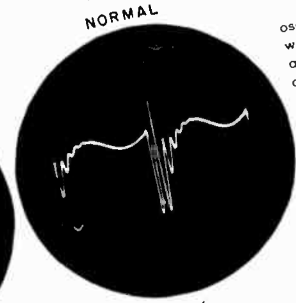

FIG. 6

The receiver fault which was responsible for the patterns and abnormal waveforms shown was an open damping resistor in the horizontal-oscillator circuit. This resistor, designated as R13, is shunted across the plate winding of the blocking-oscillator transformer. Its purpose is to provide damping for the shock-excited oscillations which occur in the blocking-oscillator circuit.

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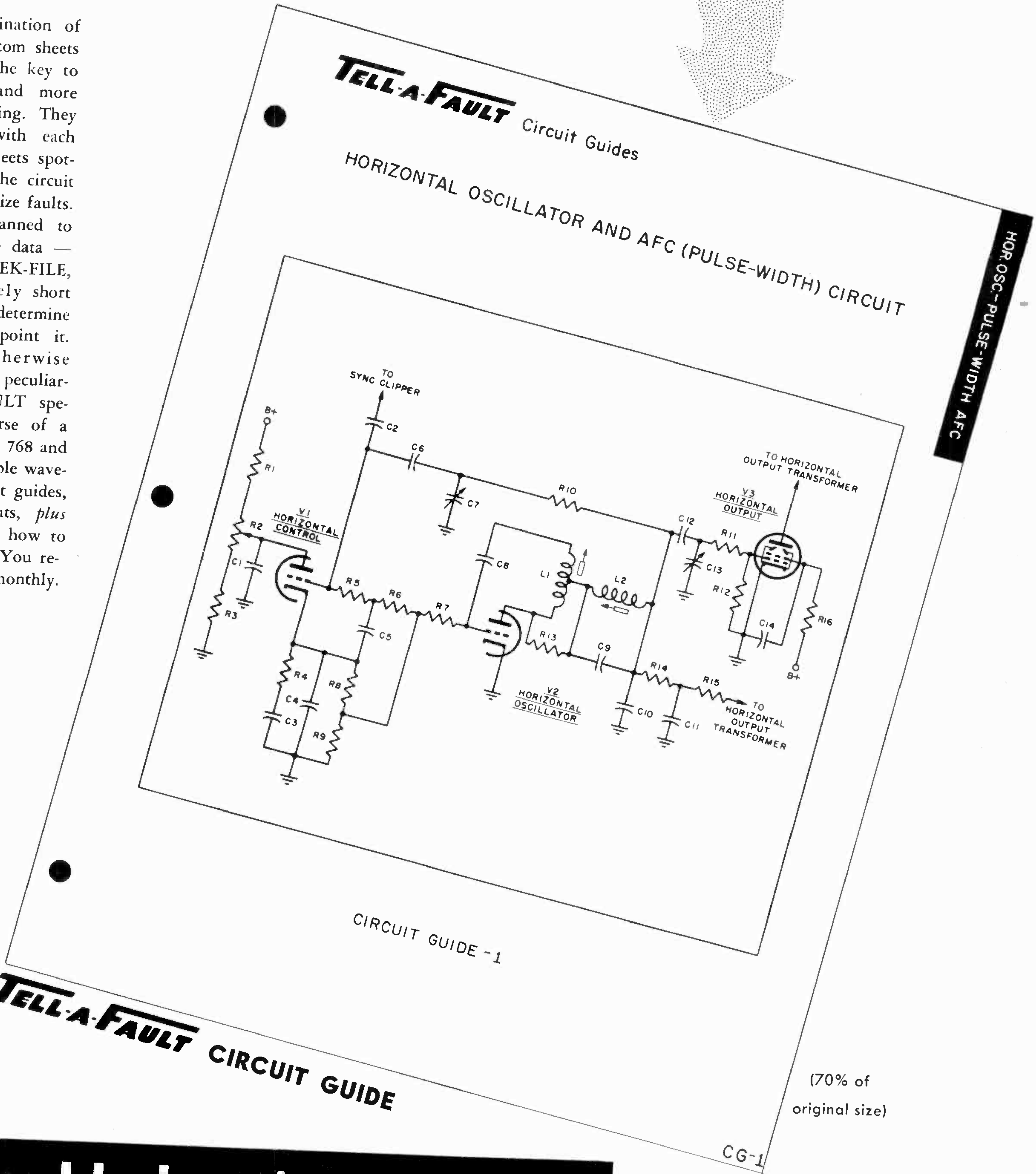

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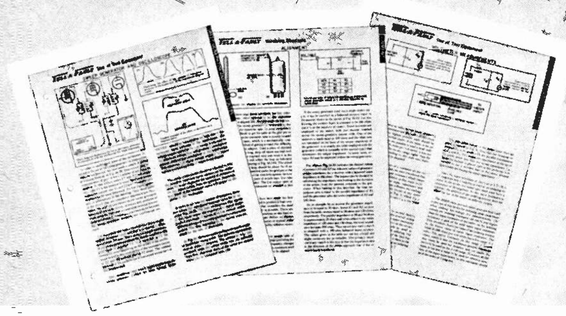

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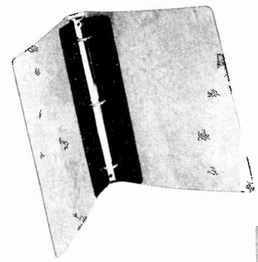

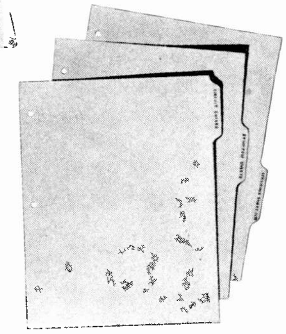

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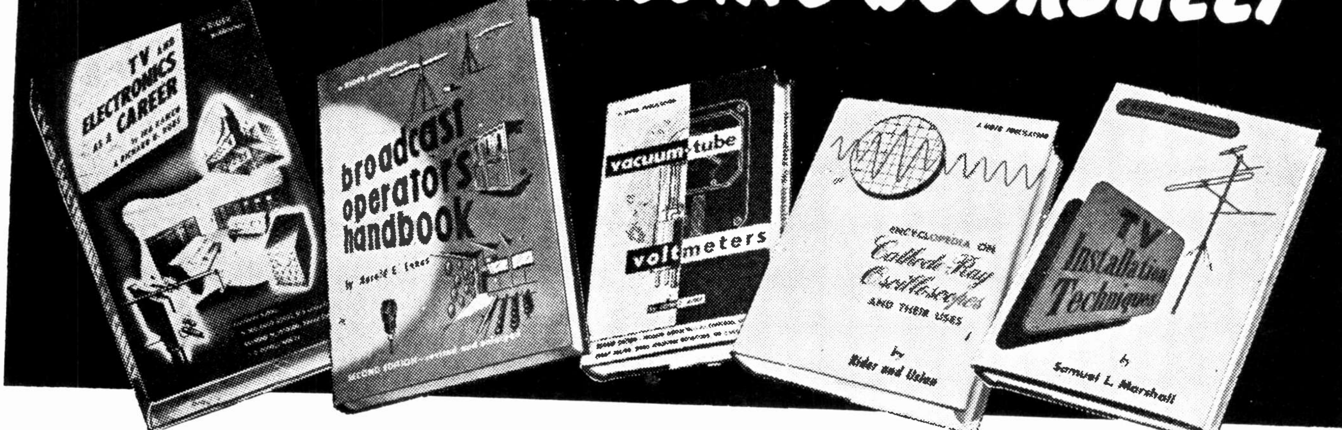

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ASSOCIATION NEWS

On May 28 some 200 Texas dealers met in Fort Worth at the *Texas Appliance and Television Dealers* Clinic. Speakers at the meeting included representatives from several large manufacturing firms and from *NARDA;* topics included "The Value of Dealer Meetings and the Value of Your Association," and "What to Expect When the Coaxial Cable Comes to Texas." It is the hope of many of the members that the clinic will become a regular affair to improve the member's knowledge of the most recent developments in their industry.

The new Charleston *NARDA* chapter is beginning to grow. A.R. Dilley of South Charleston has assumed the temporary Chairmanship, with Ralph Haynes and R.S. Baer serving with him. Harold Frankel, of Huntington, a member of the national association's Board of Directors, is acting as West Virginia's State *NARDA* Chairman.

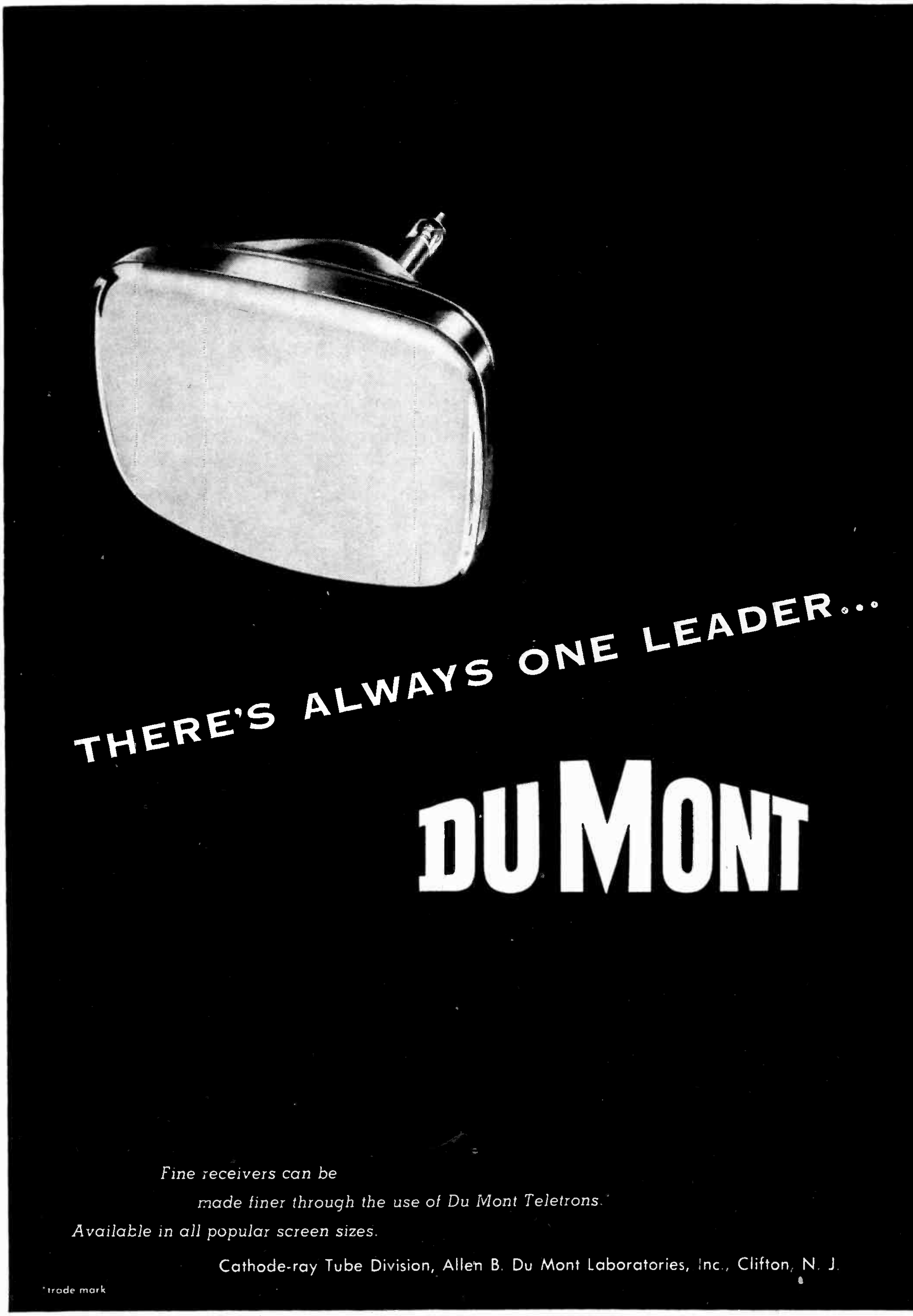
From Iowa . . . Television dealers of Waterloo met recently to form a local *NARDA* chapter and establish the association's Certified Television Installation and Service program. The local committee is developing this program to alleviate a pending city ordinance to regulate the trade . . . In Des Moines, Earl Holst, of Beaverdale Radio Sales and Service, was elected President of the newly formed Des Moines *NARDA* group. R.D. O'Callaghan is the association's State Chairman of Iowa . . . A meeting of the *Nebraska-Iowa Electrical Council* heard Mort Farr speak on credit policies for dealers, on May 20. He told the meeting that the selling advantages resulting from the government's lifting of Regulation W should be used imaginatively and with responsibility, and that dealers should not merely transfer the responsibility for their consumer credit actions from the government to their banks. Since consumer credit is a joint problem of dealers and banks, *NARDA* is establishing a special Associate Membership category for financial institutions.

Russell C. Hanson, of the Motorola Service Department, spoke on "Don't Be Afraid of UHF," at the *Elkhart, Indiana TV Council* on May 15. In discussing and demonstrating the design of UHF antennas, low-loss transmission lines and tuners, he emphasised that if servicemen are properly trained and have adequate test and installation equipment that UHF will become a quite normal part of the service industry's work. Russell also stressed the fact that the three basic needs of a good service company are equipment, well chosen parts, and up-to-date information of the tv industry. The *Elkhart TV Council* has played a large part in bringing about professional quality tv service standards in its area, without the need of municipal legislation.

TISA, Illinois affiliate of *NATESA*, is really doing something about the tv service problems in the Chicago area. Acting against the $3 service fee entry scheme by some alleged technicians who attempt to pull every set into a highly questionable "shop," and then ransom the set back to the owner with an exorbitant non-itemized bill, *TISA* has obtained hundreds of sworn statements from bilked set owners and past employees of the companies involved. Sets were set-up with very obvious, natural type defects, witnessed and sworn to by the owners and qualified experts. The sets were then submitted to suspected companies, whose "service" confirmed some of *TISA's* worse suspicions. The Chicago Better Business Bureau, States Attorneys office and some newspapers gave full cooperation. The first suspected company has been subpoenaed before the Grand Jury with other complaints pending, several companies under investigation have closed shop. The investigation is still proceeding and a permanent Grievance Committee is functioning to continue policing service operations and to expose service rackets in order to protect the legitimate service technician in the tv business.

Despite the necessity of keeping the industry on its guard against racketeers, the service industry as a whole can be proud of a recent Roper Poll which shows that the vast majority of the public considers technicians competent, prompt and polite. This nationwide public opinion pool was conducted for RCA Victor by Elmo Roper, one of the country's leading market research experts. 86 percent of all tv set owners had a high opinion of the quality of the work of service technicians, and the great majority thought them prompt, fair and reasonable in their charges. Thus it seems that the public has not judged the service industry on the unfair and misleading impressions created by a few firms. 68 percent of the people polled called service work "really good," with only 7 percent showing any dissatisfaction. Two-thirds of the people described service charges as "entirely reasonable," with only one-tenth considering the bills "too high." Less than one percent of the public considered the technician discourteous, with the rest being well satisfied. 75 percent considered the work done "in a reasonable length of time."

(Continued on page 32)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Cutting Down TV Repeat Calls

Many television technicians have been faced with the dilemma of determining why a TV receiver performs well in the service shop but is unreliable when returned to the customer's home. Here are some thoughts on the subject as determined in the field.

The antenna in the service shop may be a very good one; it is only natural that a service shop will operate with a better than average tv antenna installation . . . Is this good or bad? . . . The answer is determined by the relative effectiveness of the antennas owned by the customers served by the service facility. If the signal pickup at the service shop is very much greater than at the customer's location, it becomes a problem to judge the performance of the receiver — for that matter even the condition of the receiver. When the signal level is high the overall gain of the receiver is knocked down very substantially. Practically this means that less than required receiver gain will not be noted in the service shop unless special efforts are made to detect it.

On the other hand, less than normal receiver gain will materially affect the operation of the receiver when it is installed in the home where signal pickup is substantially below that in the service shop . . . What is the solution? The first step necessary in every service shop is the use of attenuators whereby the signal level fed into the receiver can be reduced in steps so as to determine the behavior of the receiver with varying levels of signal input. A defective condition resulting in insufficient sensitivity and which would cause unstable operation at the home would then become evident.

In addition to noting the action of the receiver with reduced signal input, it also is necessary to establish the receiver action with less than normal power line voltage. This too must be correlated with the power line voltage in the customer's home. If the line voltage in the customer's home is less than that in the service shop, the adjustments made in the shop should be accomplished at the line voltage available in the customer's home. This requires the use of a variac or other line voltage control device in every service shop and proper monitoring of the line voltage.

Speaking in generalities 117 volts may be the average line voltage, but many receiving locations are subject to less than this voltage in the evening. Under the circum-

(Continued on page 25)

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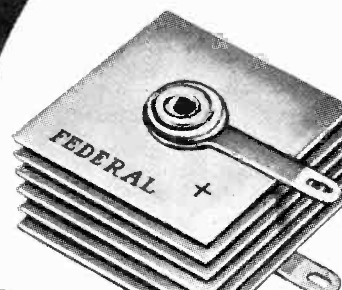

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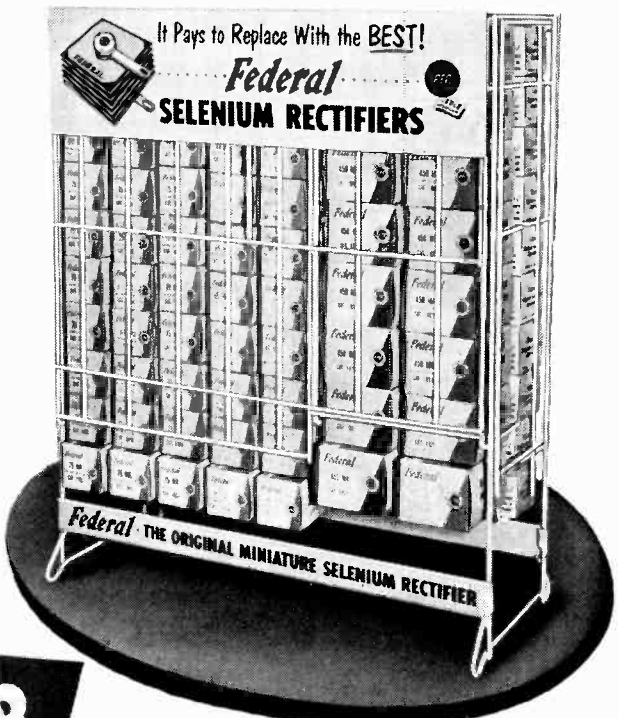

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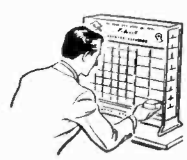

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Preventive Maintenance

(Continued from page 12)

don't fail to have a preventive maintenance schedule and to live up to it religiously.

Operational Checks

Preventive maintenance does not consist only of cleaning and tightening. It includes periodic operational tests. Check the frequency of signal generators against known signals every so often. Check the voltage readings of voltmeters against known voltages, and the resistance readings against known values. In this way you are certain that the equipment is performing properly. If discrepancies are found they should be corrected. The time spent in this way is much less costly than faulty diagnosis or completing a repair job only to discover that frequencies are wrong, voltage values incorrect, etc. In fact all of the constants of a signal being generated by a device should be checked periodically. As to frequencies, it is well to check generators at the beginning of each day to make certain that the device is on frequency. Allow time for the unit to reach a stable temperature and then make the frequency checks; it requires only a minute or so for several frequencies.

Summary

Preventive maintenance is the simplest way of keeping down repair costs and keeping up equipment operating efficiency. Individuals who have had no experience with preventive maintenance may view it as a waste of time, but those who have practiced it know that an ounce of prevention is worth a dollar of cure. If you have a lot of loose money in boxes that isn't doing anything, then you don't need preventive maintenance; but if money is not too plentiful and the cost of tv and radio test equipment is a factor in your life, then you should apply preventive maintenance to equipment in your shop.

Attention Philanthropists!

If any of you have any old vacuum tubes that might be contributed to a fixed, permanent collection, where due credit will be given to the donors, Les' Rucker, of Rucker Radio Wholesalers in Washington, D. C., would be pleased to hear from you. The collector's home address is: Leslie C. Rucker, 3139 18th Street, North, Arlington, Virginia.

Cutting Down TV Repeat Calls

(Continued from page 23)

stances it is logical to consider receiver adjustments with power line voltages of from 112 to perhaps 114 volts, especially the adjustments which determine picture dimensions.

Fall-off in output of the low-voltage rectifier tube need not be too great in order to influence the stability of receiver action. Add to this a reduction in line voltage of a few volts and an unsatisfactorily operation receiver is the result. This is especially true in areas where relatively low signal strength prevails even if it is not strictly fringe area. Testing such a receiver at more than 117 volts line voltage can give misleading results, that is create the impression than the receiver is in perfect shape whereas, actually, it is subject to correction. The use of a new low voltage rectifier tube may not be the answer. It may require a specially good tube, one which affords 5 to 10 volts more output than the average tube.

The use of signal attenuators is a very interesting item. It is not too effective if signal pickup by the antenna feed system in the receiver is permitted. The higher the signal level at the test point, the more important it is to prevent direct signal pickup by the antenna feed between the input terminals at the input to the frontn-end.

(Continued on page 32)

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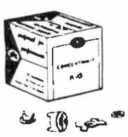

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We build these new IRC Exact Duplicates to carefully prepared specifications. Shaft lengths have not been compromised—so there's no need to improvise, to reverse connections or to alter controls in any way. Shaft ends are accurately machined for good knob fit. And electrical characteristics are carefully engineered to assure satisfactory operation. IRC Exact Duplicates are easy to install and they operate efficiently.

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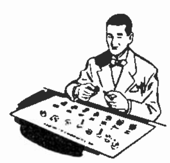

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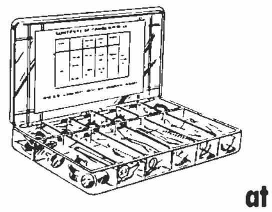

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IRC

Wherever the Circuit Says

INTERNATIONAL RESISTANCE CO.

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Improvement of fringe area reception

(Continued from page 6)

negligible difference to the reception on channel A. With LB at this optimum length, observe channel B and then remove LA from the junction (J). If removal of LA improves reception on channel B, progressively cut down LA until its connection to, or disconnection from, the junction (J) makes negligible difference in the reception of channel B. Lengths LA and LB should now be optimum and reception of channels A and B should be comparable to that obtained by alternately switching from antenna A to antenna B.

Only One Channel Available. Use a Yagi cut for the specific channel. Such an antenna is more efficient than either the In-line or Conical for single channel reception.

Three Channels Available. This is a difficult compromise and a specific recommendation is hard to make without knowing the particular channels involved, the direction or directions, from which the signals eminate and their relative strengths.

If the channels are widely separated in frequency and the signals eminate from one direction, the In-line or Conical antenna is likely to be best. If the channels are widely separated in frequency and the signals arrive from different directions, only careful study will indicate which combination of antennas is best or if a rotator array would prove superior. However, one general recommendation holds: whenever a separate antenna is used for one of the channels, careful consideration should be given to the use of a Yagi, especially on the high channels (7-13) where it is physically small, relatively cheap and very efficient. A method of switching 3 or more antennas is illustrated in Fig. 2.

Antenna Proximity

In general, *separate* antennas should be kept far enough apart to prevent serious interaction. This interaction can take the form of changing the direction of maximum pickup of the antennas and/or reducing the amount of signal obtained. Table 2 outlines recommended minimum spacing between separate antennas.

TABLE 2

Minimum spacing requirements between centers of two separate antennas

H — Horizontal separation V — Vertical separation

Ant	Chan
A	2-6
B	2-6

Lowest Chan	Spc'g in Feet H	Spc'g in Feet V
2	18	12
3	16	10
4	14	9
5	12	8

Ant	Chan
A	2-6
B	7-13

Lowest Chan	Spc'g in Feet H	Spc'g in Feet V
2	7	3
3	7	3
4	7	3
5	6	3
6	6	3

Ant	Chan
A	7-13
B	7-13

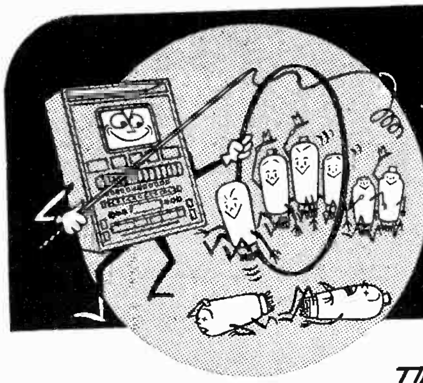
Lowest Chan	Spc'g in Feet H	Spc'g in Feet V
7	6	4
8	6	4
9	6	4
10	5	4
11	5	3
12	5	3

Minimum Separation between Centers of Two Antennas when One Antenna is Directly in Front of the other.

Operating Range—Front Antenna	Operating Range—Back Antenna	Req'd Separation in Feet
Ch 2-6	Ch 2-6	35
Ch 2-6	Ch 7-13	20
Ch 7-13	Ch 2-6	8
Ch 7-13	Ch 7-13	10

Orchids to an Ambitious Man

A KLZ (Denver) television news letter reports that a La Jara (population 912), Colorado appliance dealer announced plans of experimenting with a special "booster." He is studying the possibility of erecting a booster antenna on top of 14,363 foot Mount Blanca, receiving television signals from Albuquerque, New Mexico, 103 miles away, and then relaying the signals to a similar antenna on top of Pikes Peak, 95 miles away. That's a total of almost 200 miles; *Pike's Peak or boost.* Good luck!



THE INSTRUMENT THAT DEMANDS OVERALL PERFORMANCE FROM THE TUBE UNDER TEST!

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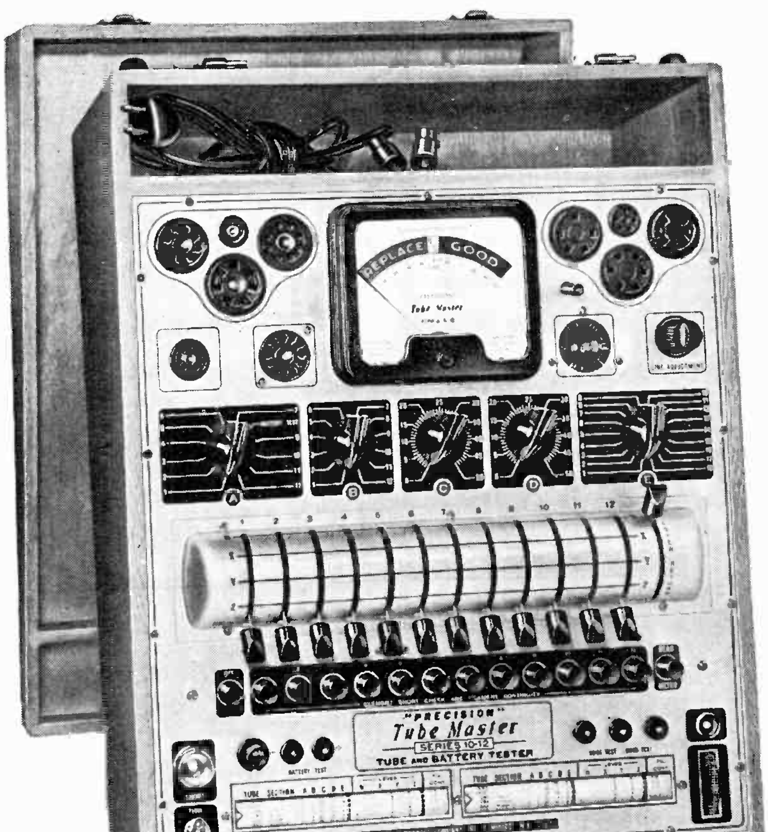
*Electronamic** Tube PERFORMANCE Tester

with 12 element free-point Master Lever Selector System



To test modern tubes for only one characteristic will not necessarily reveal ***OVERALL*** PERFORMANCE CAPABILITIES. Modern tube circuits look for more than just mutual conductance or other single factor.

It has been conclusively proven that even though a tube may work well in one circuit, it might fail to work in another—simply because different circuits demand different relative performance characteristics, such as amplification factor, plate resistance, power output, emissive capability, etc.

In the PRECISION "ELECTRONAMIC" Circuit, the tube under test is made to *perform* under appropriately phased and selected individual element potentials, encompassing a wide range of plate family characteristic curves. This COMPLETE PATH OF OPERATION is electronically integrated by the positive indicating meter circuit in the positive performance terms of *Replace-Weak-Good.*

The efficiency of this "Electronamic" test results from encompassing several fundamental tube characteristics, NOT JUST ONE. Accordingly, when a tube passes this demanding OVERALL PERFORMANCE test, it can be relied upon, to a very high degree, to work satisfactorily.

*REG. U.S. PAT. OFF. T.M. 438,006

MODEL 10-12-P (illustrated): in sloping, portable hardwood case with tool compartment and hinged removable cover. Sizes 13¾" x 17¼" x 6¾" $104.50
MODEL 10-12-C (Counter Type) $109.25
MODEL 10-12-PM (Panel Mount) $109.25

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- ★ Isolates each tube element regardless of multiple pin positions.
- ★ Dual Hi-Lo short check sensitivity for special purpose tube selection.
- ★ Simplified, High Speed, 12 element Short-Check system, uses consecutive push-button switching.
- ★ Battery Tests under dynamic load conditions.
- ★ 4½" Full Vision Meter.
- ★ Built-in Dual-Window, high speed, geared roller chart.
- ★ Free Replacement Roll Charts & supplementary tube test data service.

See the "Precision" Master "Electronamic" Tube Testers at leading Radio Equipment Distributors. Write for new, 1952 "Precision" catalog.

AM · FM · TV ·

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AM · FM · TV

Curing 15-Meter Band Interference

(Continued from page 2)

(246/21.22) 11.6 feet. This figure must be reduced to 82 percent of its value because of the reduced velocity of energy propagation along this type of line. Thus, the actual length of stub required is 82 percent of 11.6 feet, or 9.5 feet. If coaxial lead-in is used, then the stub should be made of coaxial line. In this case, the free-space quarter wavelength should be reduced to 66 percent of its value to compensate for the reduced velocity of propagation. The actual length of stub then required is 66 percent of 11.6 feet, or 7.7 feet. Quarter-wave open stubs may also be connected across the line cord to prevent power-wiring pickup of interfering signals.

Other Methods of Reducing Interference

The wave traps discussed above will reduce or eliminate 15-meter band interference which is picked up by the antenna and lead-in or by the power lines. However, some interference will undoubtedly be picked up directly by the i-f stages themselves. This condition occurs when the receiver is located quite close to the interfering transmitter. In this case, improved receiver shielding will often reduce or eliminate the interference.

Copper screening is frequently used for this purpose. The screening is tacked or stapled to the inside of the receiver cabinet and backboard. The underside of the receiver chasis should also be covered with screening, though this may alter the i-f alignment slightly and reduce the high-frequency video response. All shielding should be bonded together thoroughly at several points and connected to the receiver chassis.

Aluminum foil is occasionally used also. However, such shielding may reduce ventilation and reflect much of the heat that is produced by the receiver back to the chassis. If aluminum is employed, be sure the ventilating louvers are not obstructed.

The use of a high-pass filter at the receiver input terminals will often eliminate interference picked up by the tv antenna and transmission line; in fact some progressive manufacturers already have such filters built into their receivers. These filters attenuate all signals below 40 or 50 mc, including those in the 15-meter band, and have practically no effect on the tv channels. They can be purchased commercially or constructed by the user. One such filter, designed for use with a 300-ohm balanced line, is shown in Fig. 5. The capacitors are about 10 $\mu\mu$f and the coils constructed of 14 turns of No. 12 enameled wire with a coil diameter of one-half inch wound to a length of one and three-quarter inches.

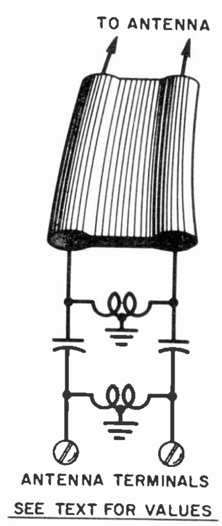
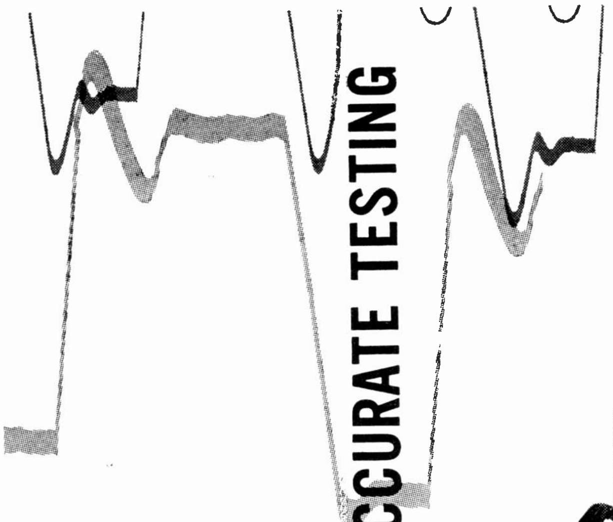


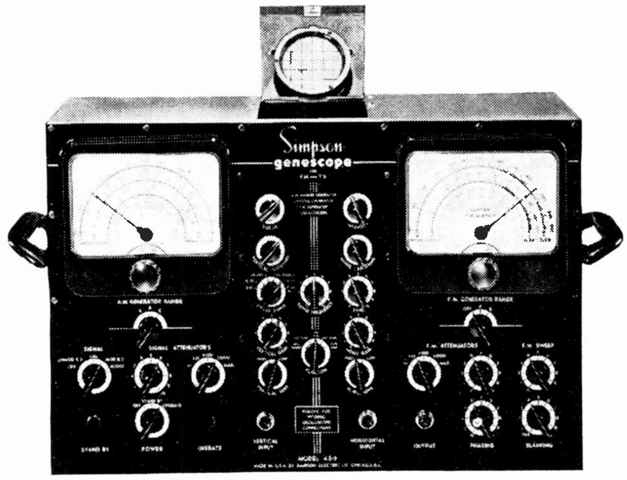
Fig. 5. Simple high-pass filter for tv receiver.

An advantage of the high-pass filter over the simple wavetrap is that the filter rejects all frequencies below 40 to 50 mc while the wave-trap rejects only the frequency to which it is tuned. Hence, it might be thought that the wavetrap would not be effective in eliminating interference from amateur stations using variable-frequency oscillators. In the case of 15-meter band interference, however, the Q's of many tuned circuits are low enough to make the use of a trap tuned to the center of the band worth trying.

Finally, probably the most effective method of reducing 15-meter band interference is to realign the receiver so that the sound i.f. or the low end of the i-f pass band is moved above the frequency of the interfering signal. For example, it has been found that raising the i-f pass-band by as little as .25 mc will noticeably reduce the effect of 15-meter band interference. This means that the sound i.f. should occur at a frequency of 21.7 mc, which is 21.45 mc (the highest frequency in the band) plus .25 mc. If the i-f pass band is raised by .50 to .75 mc or more, the interference is eliminated in almost all cases.



SIMPSON MODEL 480 GENESCOPE FOR ACCURATE TESTING



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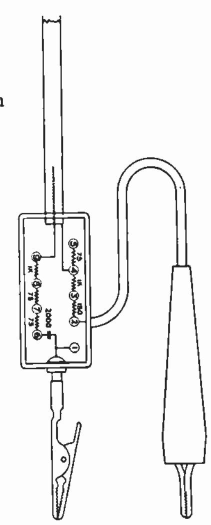
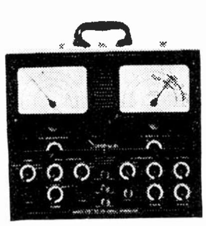
Provides all the necessary signal sources for proper alignment and servicing of FM and TV receivers • Includes the Simpson High Sensitivity Oscilloscope, complete in every detail and equipped with a high frequency crystal probe for signal tracing • Independent, continuously variable attenuators and step attenuators for both AM and FM units offer complete control of output at all times—from the high level required for front end adjustment to extremely low levels for fringe area peaking operations • Multiple shielding, generous bypassing and adequate line filtering reduces signal leakage to a negligible factor • A 0-15 megacycle sweep is provided by means of a noiseless specially designed sweep motor based on the principles of the D'Arsonval meter movement for fine control and lasting accuracy • The exclusive Simpson output cable (illustrated on the right) includes a variable termination network which is quickly adapted to provide open, 75 or 300 ohm terminations—the addition of a pad provides attenuation and isolation. The use of appropriate resistors across certain terminals will provide any other termination required. A .002 MFD blocking condensor can be added on any termination for use on circuits containing a DC component • The FM generator output voltage is constant within .2 DB per MC of sweep.
Model 480 $395.00





Also available without the oscilloscope as Simpson Model 479 TV-FM Signal Generator. Model 479 $269.00

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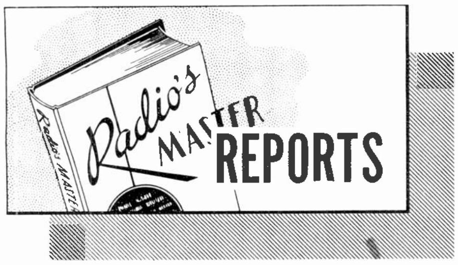


A monthly summary of product developments and price changes of radio, electronic, and television parts and equipment, supplied by United Catalog Publishers, Inc., New York City, publishers of RADIO'S MASTER.

These REPORTS will help you to buy and sell to best advantage. They will also help you to keep your inventory up to date. A complete description of most products will be found in the Official Buying Guide, RADIO'S MASTER available through local parts distributors.

New Items

DUOTONE—Added series of solid blue and solid amber Kolor-Vision screens . . . added Nos. 34 through 39, Duotone display with card of Cactus needles #18; and No. 40, Duotone display with card of "Lifetone" Osmium tipped needles.

EBY SALES—Added K-302 kit at $3.69 net and 49-13 DD, electrostatic TV socket at $.48 net.

ELECTRO-VOICE—Model 430 utility floor stand added at $10.20 net along with model 423-G desk stand. Electro-Voice advises that the restriction on the use of zinc are off and that manufacturing is now underway on their full line of stands. Also added "Baronet" folded horn corner loudspeaker enclosure for 8" speakers at $35.70 net in mahogany and $37.80 net in blonde.

G. E.—New Oscilloscope ST-2B added at $495.00 suggested user price.

JAMES VIBRAPOWR — Added new vibrator, J-74 which is, as stated, equivalent to Raytheon #B-21A-12291, mobile communications.

J F D—Added pre-assembled "Vee-Beam" single array antenna #Q800 at $4.50 net, delivering a gain of 7½ db. and Q801 stacked array "Vee-Beam" at $11.40 net, delivering a gain of over 11 db.

MALLORY—Added a number of the following items in the various categories named throughout their line: cardboard tubular dry electrolytic capacitor; bench power supply and kit; grid bias cells; midgetrol accessory part; 91 new FP series dry electrolytic capacitors; vibrator; industrial noise filters; AC motor starting capacitor; plastic tubular paper capacitors; UHF converter and kit; carbon front section controls; carbon rear section controls; single tapped midgetrols.

MARKEL ELECTRIC — Added model 74-P at $72.00 net and 75-P at $78.66 net, both Playmaster 3 speed record changer equipped with Pfan-tone standard and micro-groove high fidelity pick-ups.

MILLER MFG. CO.—Added 3 new replacement cartridges for Astatic . . . 1 for Electro-Voice . . . 1 for Magnavox . . . 3 for Shure Bros.

NATIONAL CO.—Added a number of items to their line which include: knobs, dials; transformers; dial pointers; miniature tube clamps; turret socket assemblies; condensers.

NATIONAL UNION—Added 11 radio receiving tubes.

PRESTO RECORDING—Y-5 Recorder added (for low impedance mike) at $771.00 list . . . also T-99-H, dynamic microphone at $32.50 list . . . A-15-S floor stand at $10.00 list and L-2 Transcription player at $290.00 list.

RADELCO—Added R-118, yagi low band stacking kit at $1.26 net and R-119, yagi high band stacking kit at $.45 net.

RAYTHEON—Advised of 50 new special purpose tubes and 2 radio receiving tubes.

STANDARD TRANSFORMER—Added 19 new items to their line.

SIMPSON ELECTRIC—Added 11 current transformers which are, as stated, of the inserted one turn primary type for use with switchboard and panel ammeters where external transformers are required.

TUNG-SOL ELECTRIC — Added 120 radio receiving tubes and 4 CR tubes.

WEB ELECTRONICS—Added new Web converter for 10, 11 meters, with 6J6 and OB2 tubes at $29.95 amateur net.

WHARFEDALE (British Industries) — Added 3000 cycle crossover at $13.50 net.

WRIGHT INC.—#12A flush mounting grille added for 12" speakers at $7.50 net.

XCELITE, INC.—Added #49, midget snip at $2.47 net.

Discontinued Items

BELL SOUND SYSTEMS — Withdrew #2075, portable record player.

CLEAR BEAM — Window and indoor antennas WA2 and WA100 withdrawn.

EDITORS & ENGINEERS—Withdrew "Radio-Television Question and Answers."

MILLER MFG. CO.—Withdrew diamond stylii M213 and M513 for Magnavox cartridges and PH413 (D) and PH413 (DS) for Philco cartridges.

R.C.A.—Withdrew 6 electron tubes . . . 2 radio batteries (VS007 and VS018) . . . phonograph accessory 210X1 . . . 8 television components . . . antenna and accessory #213A1 . . . 3 crystal pick-ups.

RAYTHEON — Discontinued 54 special purpose tubes and 37 radio receiving tubes.

SANGAMO ELECTRIC — Discontinued type 13 television paper tubular capacitors . . . type FM, 15 electrolytic capacitors.

SIGNAL INDICATOR — Withdrew #1005 and #1005N, pilot light assemblies.

STANDARD COIL—Withdrew B-50 booster parts (25B-001; 31C-013; 31C-026; 31C-202) and B-51 booster and parts (25B-002; 31C-500; 31C-524; 31C-537).

Price Increases

MALLORY—Increased prices on their VA series power supplies.

NATIONAL UNION—Increased price of 263 radio receiving tubes.

RAYTHEON—231 radio receiving tubes and 17 special purpose tubes increased.

SYLVANIA—Increased price of Strobotron SA-309 to $2.95 net.

TUNG-SOL ELECTRIC—Increased 167 radio receiving tubes in price.

WEB ELECTRONICS—Web converter for 6, 10 and 11 meters with 6J6 and OB2 tubes increased to $39.95 amateur net.

WILCOX GAY—Increased price on #2A10, 2 speed tape recorder to $159.95 retail price.

Price Decreases

DUMONT—Decreased prices on 12 Teletron tubes.

G. E.—10 TV picture tubes decreased in price.

NATIONAL UNION—Decreased price of 27 radio receiving tubes.

R. C. A.—Decreased prices on six 17" kinescopes and two 21" kinescopes . . . also electron tubes 5946 and 6161.

RAYTHEON—22 radio receiving tubes and 83 special purpose tubes decreased in price.

SARKES-TARZIAN — 16 TV picture tubes decreased.

SUPREME INC.—Decreased prices of DC Micro-ammeters models 2100, 2400, 3100, 3400, 4100, in ranges 0-50, 0-100, 0-200, 0-500 . . . also model 3100 and 3400 DC Voltmeters ranges 0-1, 0-3, 0-5, 0-10, 0-25, 0-50 to $9.25.

SYLVANIA—Reduced prices on 29 TV picture tubes . . . 9 silicon crystal diodes . . . 7 germanium crystal diodes . . . 2 TR and ATR tubes (1B35 and 1B63A) . . . 2 klystrons (SD 1103 and SD 1104).

TECHNICAL APPLIANCE CORP. — #873-3, change-over switch (2 or 3 circuit) reduced to $1.80 net.

THOMAS ELECTRONICS—Decreased prices on 20 cathode-ray tubes.

TUNG-SOL ELECTRIC—Reduced prices on 10 radio receiving tubes and 6 cathode-ray tubes.

VAN CLEEF BROS.—Decreased prices on 60 yard rolls of Dutch Brand masking tape available in "bulk case packing."

Association News

(Continued from page 22)

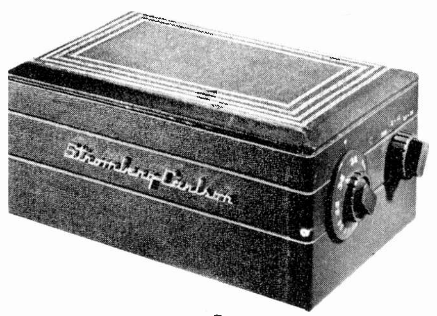
When announcing the results of this poll, E.C. Cahill, President of the RCA Service Company, pointed out that few people realize the size and scope of the service industry, which has installed and kept in good repair over 16,000,000 tv sets and which owns test equipment, tools, etc. worth over $200,000,000. Mr. Cahill probably expressed what should be the serviceman's attitude toward the results of the poll when he said, "While we are proud of the industry's record of competence and integrity, as shown by the survey, neither we nor the service associations will be content until the small percentage of undesirable practices is completely eliminated."

UHF television converters

(Continued from page 11)

cept that a selenium rectifier is used rather than a vacuum tube.

The function switch has three positions: In one, both the converter and the television receiver are turned off. In the vhf position, the television receiver is turned on with the vhf antenna going directly to the receiver through the converter switch. In this position, although the converter is not in use, its heaters have power applied to them in order to minimize the drift time when the converter is actually turned on. In the uhf position, both units are turned on and the input to the converter may be a separate outdoor uhf antenna, the built-in cabinet antenna, or the vhf antenna.



Courtesy Stromberg-Carlson

Fig. 6. Stromberg Carlson uhf converter.

By means of a selector switch on the converter chassis, the i-f amplifier has its frequency shifted by 6 mc. In this manner, either channel 5 or 6 of the television receiver may be used. Since the preselector tuned circuit has a bandwidth of 12 mc, this does not interfere with tracking.

Sarkes Tarzian UHF Converter. The Sarkes Tarzian organization has several answers to the problem of allowing coverage of the uhf band and still permitting the operation of the television receiver on all twelve present vhf channels. Their new 15-position vhf tuner has, in addition to the 12 vhf channels, three new positions. Between channels 6 and 7 there is an input position for a 130 mc signal, and ahead of the channel 2 position there are two additional positions for uhf reception.

The uhf converter made by this company tunes over the entire band with an output going into either channel 2 or 3 of the vhf tuner. A single channel device is also available, which is pretuned for one uhf channel. This unit can be connected to the vhf tuner in any of the three uhf positions mentioned above.

Cutting Down TV Repeat Calls

(Continued from page 25)

This may mean a shielded room, but it is not unreasonable that such a need exist, especially with modern day television receivers with sensitivities ranging from 10 to perhaps 20 microvolts. Tv receiver servicing is much more critical than radio receiver servicing. It need not be complicated, but it does demand the application of common sense engineering practices — none of which are beyond the capabilities of the modern-day tv technician.

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