SUCCESSFUL *Servicing*

APRIL 1953

I-F Trap Circuits in TV Receivers

by Sid Deutsch

Television receiver trap circuits are one of the few items that may be radically different from one manufacturer to the next. Some receivers have as many as six trap circuits, while others have only one. This may explain why the serviceman often neglects the trap circuits of a faulty receiver. Improperly aligned or missing trap circuits can give rise to important difficulties.

The Need for Traps

Trap circuits are placed in the intermediate-frequency and video sections of the receiver, and are named from the fact that they are used to "trap" certain undesired signals. To illustrate the need for trap circuits, let us assume that the receiver is being used in a locality where the signals of channels 2, 3, and 4 are present. (In general, this can occur midway between two large cities, such as between New York and Philadelphia.) Let us further assume that the receiver is tuned to channel 3, and that the new 44-mc i-f range is employed. The local-oscillator frequency will then be 107 mc. The local oscillator will hetrodyne with the picture and the sound carriers of channels 2, 3, and 4 to give the intermediate frequencies shown in Fig. 1. Notice that the local oscillator causes the frequencies to invert, so that channel 4 appears a a lower intermediate frequency than channel 3.

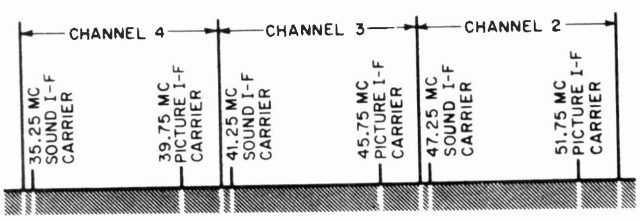

Fig. 1. Intermediate frequencies that may be present when receiving channel 3 in the 44 mc i-f range.

The i-f response curve of a receiver is relatively wide. In the absence of trap circuits, certain of the frequencies of Fig. 1 will reach the second detector and give rise to spurious effects. The response curves of Fig. 2 have been drawn to illustrate these effects. The dotted curve is the response curve of a receiver without i-f trap circuits, while the solid curve is the correct overall i-f response curve of a receiver. In the example chosen, improper trapping will result in the following effects.

1. The adjacent picture i-f carrier, 39.75 mc, will introduce the channel-4 picture at the same time that channel 3 is being received. The interfering picture will usually appear dimly in the background, but out of synchronization with the desired picture.

2. The 47.25-mc adjacent sound i-f carrier, if allowed to reach the second detector, will place horizontal sound bars of the channel-2 sound upon the channel-3 picture. Even more serious, however, is the fact that this signal will hetrodyne with the 45-75-mc picture i-f carrier to produce a 1.5-mc beat signal. This will appear as an annoying vertical-line interference in the picture.

3. The associated sound i-f carrier, 41.25 mc, is the most important signal to be acted upon by trap circuits. Excessive amplitude of this signal at the second detector will result in horizontal sound bar interference in the picture. It is also possible for the 41.25-mc sound i-f carrier to hetrodyne with the 45.75-mc picture i-f carrier. This will result in a 4.5-mc signal that can appear as interference in the television picture.

In non-intercarrier receivers, it is desirable to trap out as much of the associated sound i-f carrier as possible. In intercarrier receivers, on the other hand, the amplitude of this carrier at the second detector should be approximately at the 3 percent level, as shown in Fig. 2. The 4-5-mc signal mentioned in the previous paragraph is used, in intercarrier receivers, as the sound intermediate frequency. If the 41.25-mc amplitude in Fig. 2 is much

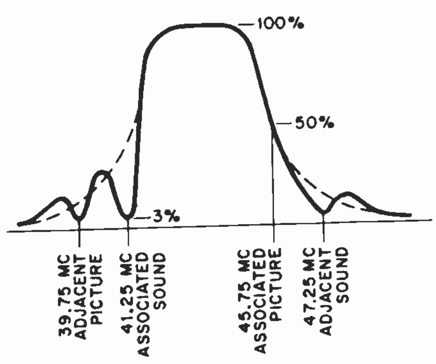

Fig. 2. The 44 mc i-f response curve of a TV receiver. Dotted curve - without traps. Solid curve - with a complete set of traps.

below 3 percent, the sound output of an intercarrier receiver will be unnecessarily reduced. If the amplitude is much above 3 percent, the sound output may contain the annoying 60-cycle buzz that often plagues intercarrier receivers. (The 60-cycle buzz is the way a picture signal "sounds" in a loudspeaker. It seems peculiar, therefore, that excessive 41.25-mc sound i-f carrier amplitude can result in a buzz. When two signals hetrodyne together, however, the amplitude of the beat signal is controlled by the amplitude of the weaker of the two original signals. Thus, a weak 41.25-mc sound i-f carrier hetrodyning with a strong 45.75-mc picture i-f carrier will result in a clean 4.5-mc sound i-f signal.

The 35.25-mc and 51.75-mc signals of Fig. 1 are relatively weak in a properly aligned receiver, and will not cause interference effects.

In general, as shown in Fig. 2, each of the undesired i-f carriers should have an amplitude of 3 percent or less, while the desired picture i-f carrier of 45.75-mc should have an amplitude of 50 percent.

Almost all receivers employ associated sound traps. Some receivers have an additional 4.5-mc trap in the video section to eliminate the 41-25-mc—45.75-mc beat note. All intercarrier receivers use such a 4.5-mc trap for the purpose of developing the sound i-f signal. Some receivers have adjacent picture and sound traps in addition to associated sound traps.

Types of Trap Circuits

Figure 3 illustrates the four main types of trap circuit. All of these traps have one thing in common—very high Q's. The trap coils, for example, consist of a few turns of relatively heavy wire, since a low-Q trap circuit

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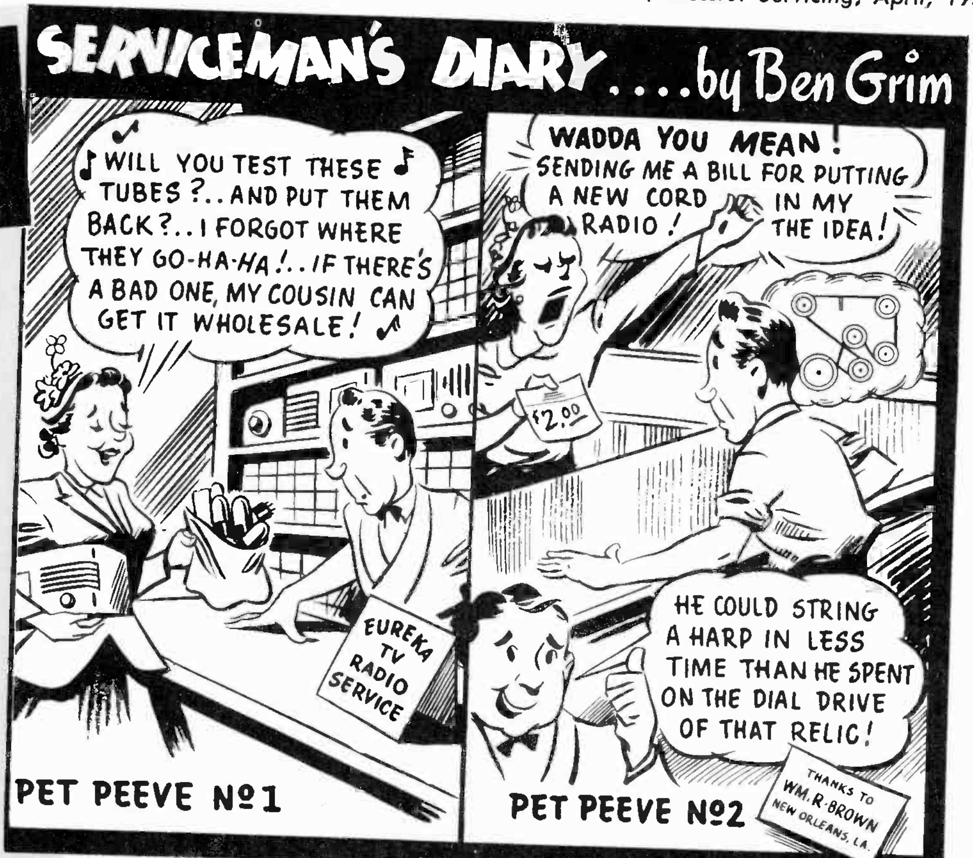

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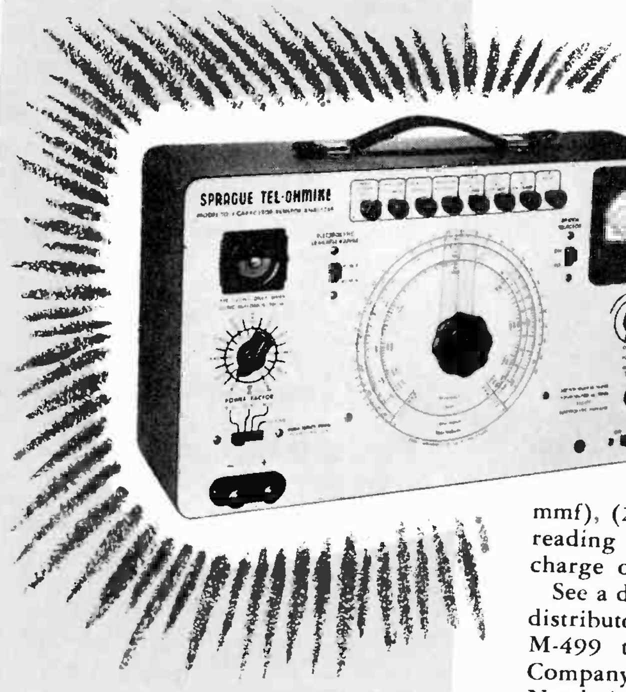

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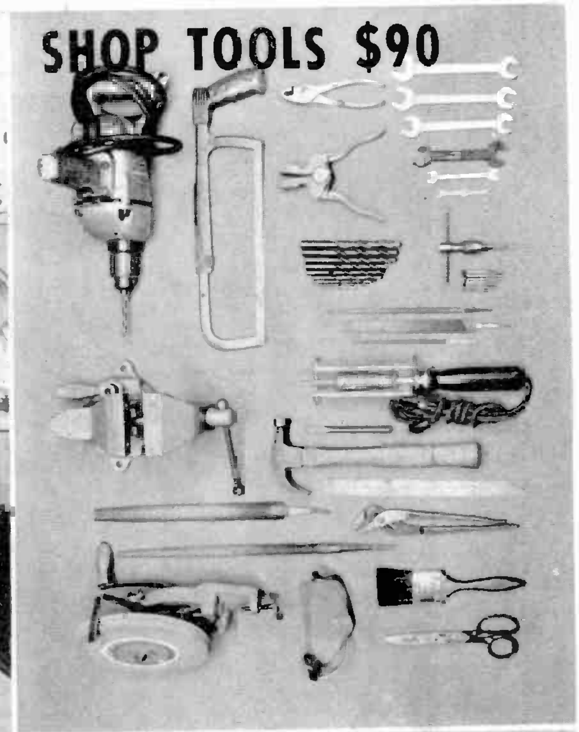

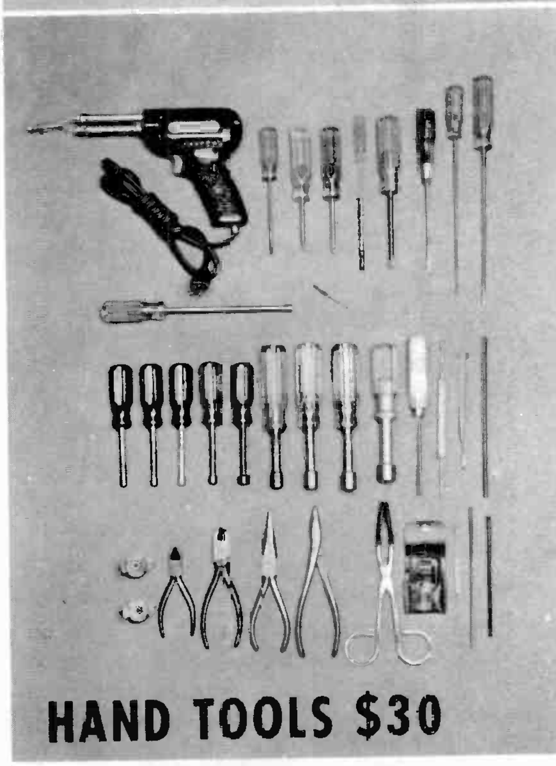

Setting Up for TV Service

Because of the opening of new market areas and an awakening realization in old ones of the values of store-operated service, many dealers are asking: What does it take, in dollars and equipment, to set up for TV service? Herewith, from several experts, the answers.

by Ted Weber

The following article and its illustrations are reprinted through the courtesy of ELECTRICAL MERCHADISING and the McGraw-Hill Publishing Co., Inc. who acknowledge the cooperation of experts from Emerson Radio & Phonograph Corp., Allen D. DuMont Laboratories, Inc., and RCA Service Co. in providing data for this article.

Reckoned in dollars and cents, setting up a television service operation is an expensive undertaking.

But figured in terms of customer good will, a good service operation is a profitable investment.

There's no paradox here — it does take money to equip a service department to handle TV. But, once equipped, a well-managed service operation can hold old friends and make new ones.

Not every dealer wants to handle his own TV servicing. Some may find it more economical or more efficient to let a distributor or an independent service agency handle the work. Many others, however, will feel that it will pay them to set up their own service shop. Taving made that decision, the retailer is faced with a number of other questions—boiled down they ask the how, what and where of setting up a TV service department.

For the answers, Electrical Merchandising asked a group of TV set makers for their recommendations. On this, and the following pages, their suggestions for shop layouts, test equipment, hand tools, installation tools and materials and parts inventories are summarized for the dealer interested in handling his own service.

Planning the Shop

Space limitations may prevent the dealer from choosing the "ideal" location or dimensions for a service shop. But good planning can turn a less than ideal space into an

If possible, service benches should be placed end to end and flush against the wall to facilitate supervision. Storage area for incoming and outgoing work should be as near to the benches as possible; if it is any great distance away some sort of wheeled "dolly" should be provided for moving chassis from the storage area to the benches.

If a one-man shop is planned, test equipment can be permanently fixed in a panel. However, in shops employing more than a single technician, flexibility must be considered and the solution would appear to be a shelf (12 to 24 inches high) mounted at the rear of the bench. An adequate number of AC outlets should be provided along the length of the shelf. Test equipment can then be moved from place to place on the shelf.

Generally speaking, the bench surface should be large enough to allow one receiver to be set aside for a heat run while the technician is working on a second set. The bench should be at least six feet long, four feet deep and be from 36 to 38 inches high. Placement of drawers, AC outlets and the selection of a bench top are largely matters of personal preference. Generally, a single drawer will be sufficient for the storage of hand tools; too many drawers will lead service men to regard them as a last resting place for parts and junk. There are arguments for and against metal top benches. One firm suggested the use of either copper or tempered masonite bench tops, terming the decision a matter of personal preference. But a second manufacturer's service manager said that the use of a metal top "is not recommended."

Sufficient AC outlets must be provided not only for the shelf holding test equipment but for the service bench itself. One service

(Continued on page 25)

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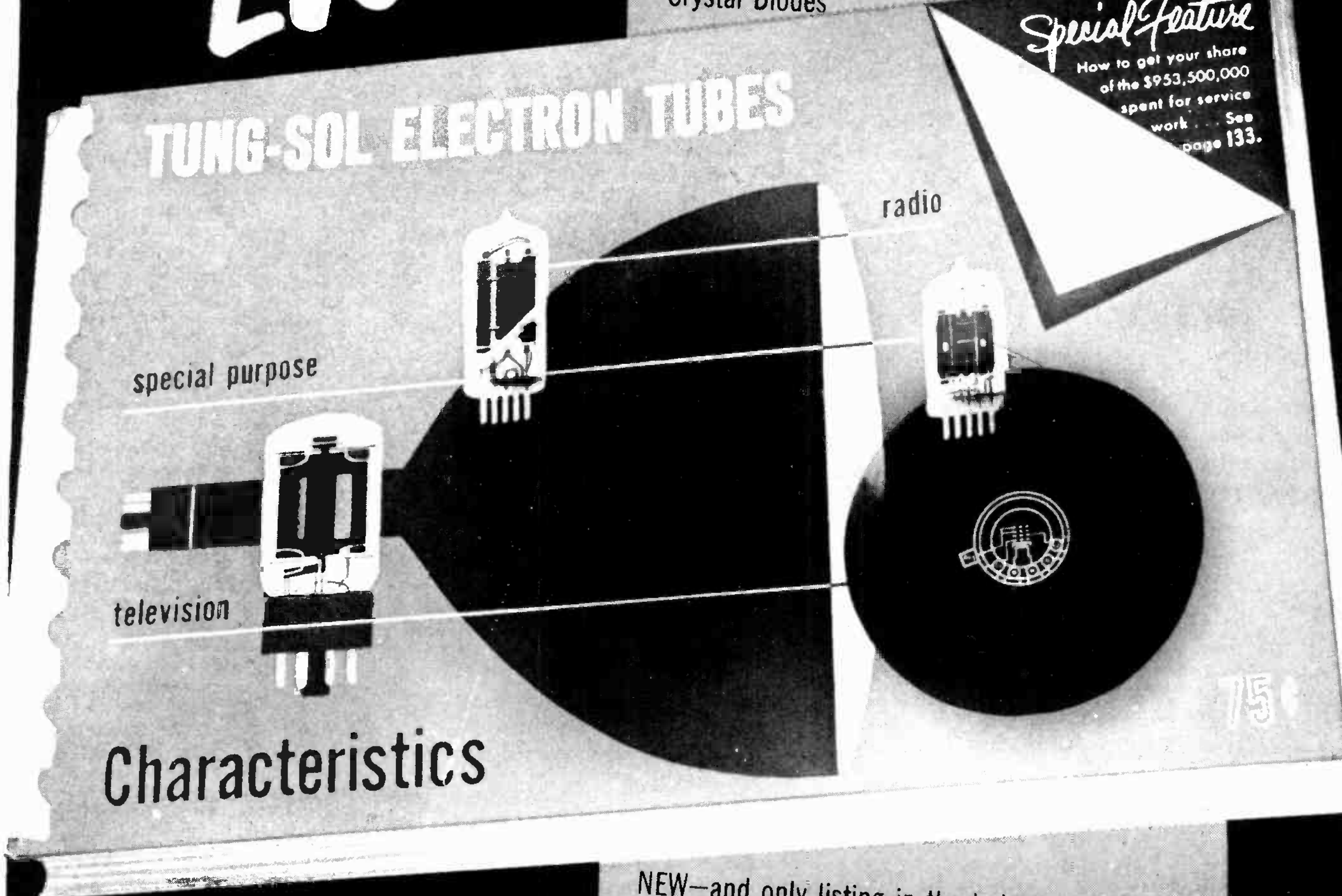

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The Itinerant TV Service Technician

A Detroit TV Service Association publication has commented on our editorial on the itinerant service technician which appeared in the January, 1953 issue of SUCCESSFUL SERVICING. The contention is that we have changed our minds concerning the disadvantages of doing service work in the home; that is, we expressed contrary opinions some time ago and now seem to be in favor of it.

The fact of the matter is that we spoke about what seems to be the trend, and fairly definite at that. Moreover it is not unusual to change one's opinion with changing times. Trends do appear and while all individuals and concerns having an interest in it may not agree, only time tells which is proven right or wrong.

There is no question about the advantages of doing service work in the shop and the disadvantages of working in the home. But the public has learned that service work can be done in the home. Perhaps it has been mainly tube changing in the past, but in the eyes of the public it has been service—and they like the idea of not having the chassis removed from the home. Admittedly they accepted the idea of chassis pulling and removal to the service shop, but by and large they were unhappy about it and prefer service in the home. Add to this the fact that more than just a random few service facilities in different parts of the country are making an effort to render service in the home, and others are talking about it more and more, and there you have your trend. The likelihood of it growing is very great, if for no other reason that the public likes it.

The statement was made that a complete repair cannot be made in the home. Isn't it determined by the type of fault present in the receiver and what is involved in the repair? We agree that a good job should be done, that certain tests should be made on a receiver, but it is not inconceivable that many complete repairs and tests can be made in the home. It all depends on the nature of the trouble; the availability of the proper types of test equipment for diagnosis in the home, the availability of parts—the competency of the service technician and his sales ability, etc. These are problems but their solutions are not impossible.

The cardinal item is the public reaction to a servicing approach which has been set by TV servicing facilities. In the past it has been tube changing by many; but others have changed yokes, focus coils, variable resistance controls, tuner coil strips, electrolytic capacitors, peaking coils, fixed capacitors, width and linearity coils and numerous small inductor type components in the home. Defects associated with these components are not necessarily complicated—although they may be so, if the fault found is multiple. In that event the chassis is removed to the service shop. Major repairs like overall alignment, power transformer and horizontal output trans-former changes are shop jobs. It is interesting to note that one receiver manufacturer has unitized chassis for sectional replacement in the home; another has introduced horizontal-output transformers with phone tip connectors.

There are no laws which dictate that service work must be done in the home, but isn't it somewhat unwise to shut one's eyes to a trend? Picture if you will the possibilities of having a removable bottom to every table model cabinet . . . access to the bottom of the chassis without pulling it!—One manufacturer already has a screen at the bottom of the table model cabinet. Now it is there for ventilation purposes, but if it were made removable, consider the convenience for home servicing.

Manufacturrs are adding tests points available at the top of the chassis as a convenience for trouble diagnosis. Naturally it is a convenience in shop servicing, but it also aids in the evaluation of the type of fault possibly present in the receiver when diagnosis is carried on in the home.

One of the points raised against home service is that the family watches the repair operations and becomes a time keeper. Another contention is that if a schematic is used, the receiver owner suspects incompetency. A third is the matter of bickering over price. All of the conditions described happen, but the question is are they valid reasons for not performing home service—or should the visiting technician also be a salesman who will educate the public to undertand each of the points being raised? Perhaps the final result will be understanding from only 90 percent of the television receiver owners, *but* it is a step in the right direction. The public does not know—and some do not want to learn—but by and large, the majority can be sold. It all depends on the approach . . . It may be a long drawn out affair, but it is the problem of the servicing industry and all those who cater to it, to try to find the answer for better public relations and more profitable operation.

Maybe it will take years for the home servicing trend to develop . . . Maybe it will grow for a year or so, and then change because of some other situation. Maybe the arrival of color television (in about two years) may nullify the trend; then again maybe the reverse will happen—receiver manufacturers may so design their equipments that substantial amount of service can be done in the home. We're not fortune tellers—but neither do we fail to note the appeal which home TV service has to the public. Nor can we shut our eyes to the fact that more than just a few service facilities operating in different parts of the nation are doing more than just tube changing TV service in the home.

When we examine public reaction, we must be objective. Consider the expansion of department stores. Traffic problems make it difficult for suburbanites to come into town—so, many large stores open branches in the suburbs. This is a trend which is developing around all large cities. All stores don't comply, but many do—the idea being to meet the desires of the public—who in the final analysis foots the bills.

Ask any design engineer active in the electronic field about printed circuits . . . It's a trend, and little by little it is growing. Can tube manufacturers ward off the semi-conductor (transistor) trend? Of course not! How will the transistor and printed circuits affect other component manufacturers in time? The impact is a relatively long time off, but the trend is there.

The point is raised that adequate numbers of competent personnel may not be available for good home service . . . Perhaps this is true and it may limit the extent of the activity . . . Perhaps the shortage may be so great as to actually prevent the realization of the trend . . . But does this mean that we should not see the trend? . . . As we said before, all organizations may not welcome a change of this kind. It is their privelege to try to ward it off, but how is it possible to ward off something if we don't see it looming in the distance?

We repeat that if the trend takes hold, it will be necessary for competitive organizations to follow suit. Isn't this normal in competitive activities which render a service? The prices need not be the same but the modus operandi for satisfying the public's wishes cannot differ too greatly.

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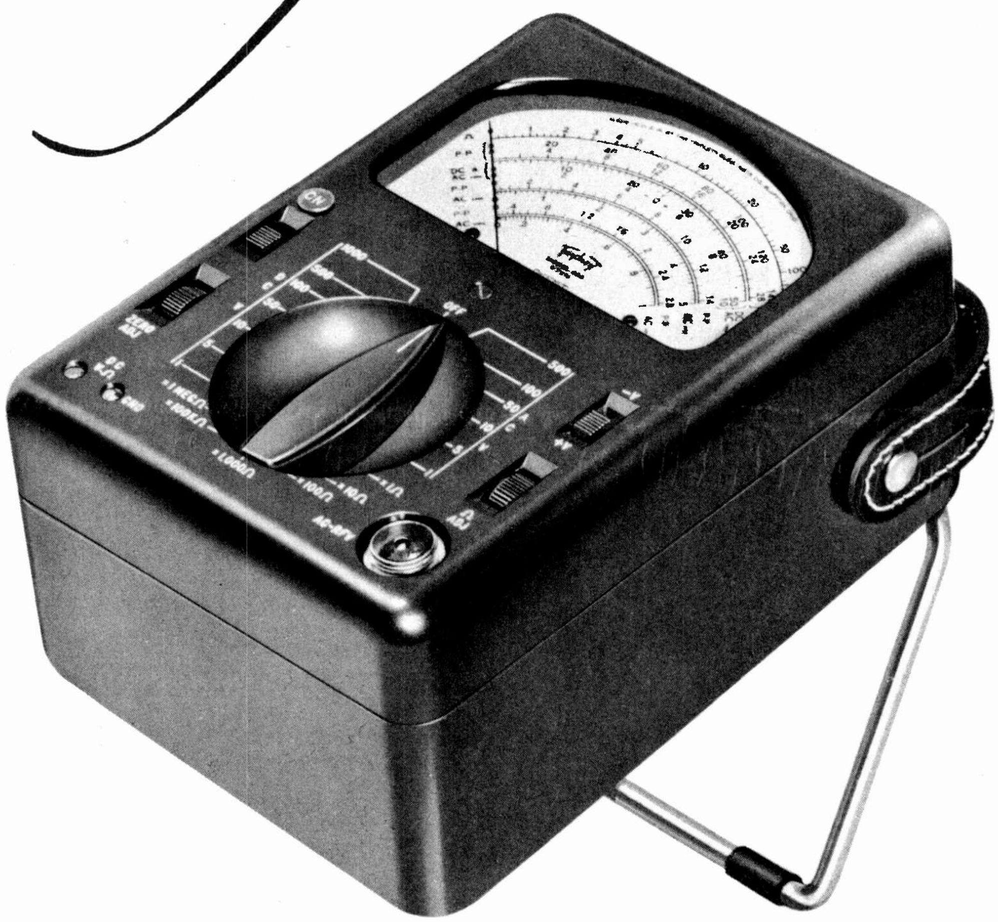

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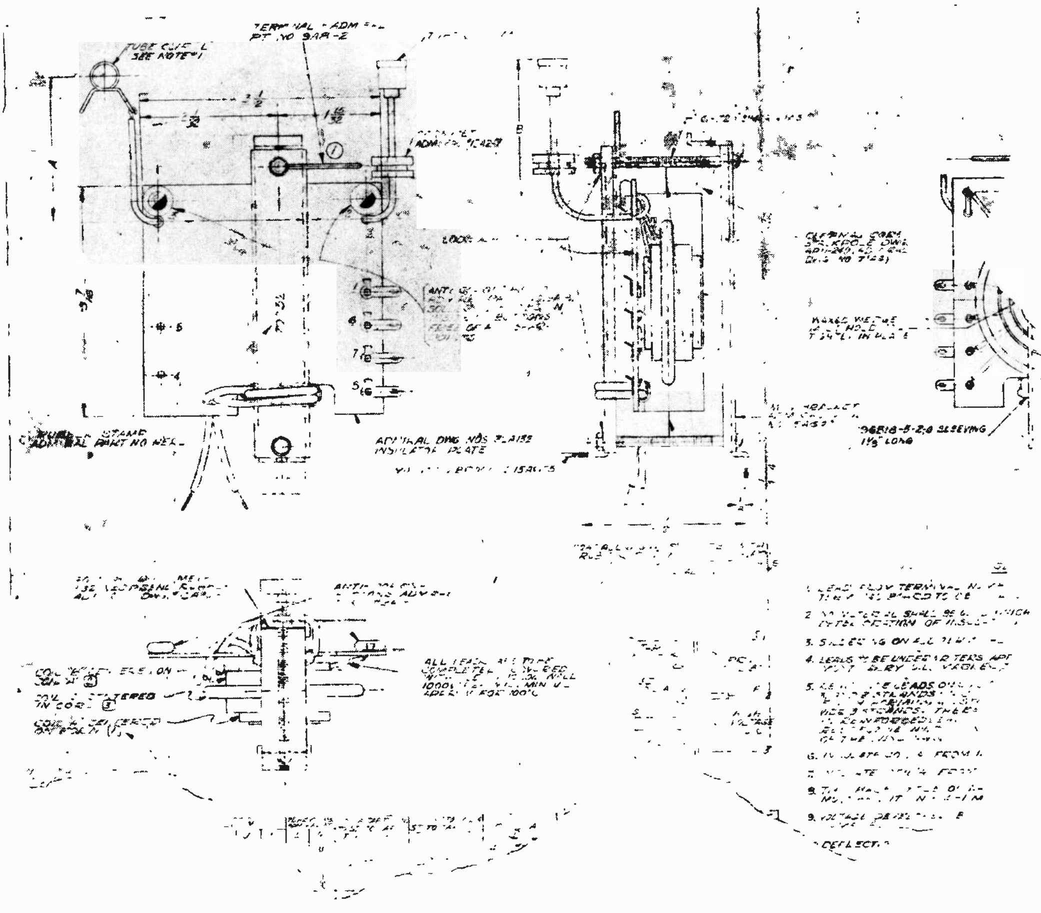


Fig. 1. Sample of the set manufacturer's blueprint used for reference, describing all electrical mechanical and physical details of the original parts.

Some Questions & Answers About Rider's Dependable Replacement Parts Listings

We have received numerous letters asking questions concerning the Replacement Parts Listings which appeared for the first time in Rider's TV Manual 10 and in the Tek-Files beginning with pack 57. We feel that these questions can best be answered by listing the query and explaining the answer.

Q—Why are there vacant spaces in the parts manufacturers' columns?

A—The vacant spaces under the various parts manufacturers' listings indicate that, at the time of preparation of the list for inclusion in the Rider Manual or Tek-File, the parts manufacturer did not have a replacement which, upon analysis, was considered suitable as a replacement for the original part used by the set manufacturer.

Q—It it important to adhere to the tolerance specifications given in the tolerance column in the fixed capacitor listing?

A—The answer is yes. The tolerance listed in the tolerance column relates to the original capacitor used in the receiver. Numerous circuits in TV receivers are critical. Unless it was necessary, the receiver manufacturer would not pay a premium price to the parts supplier for capacitors which are closer to the nominal value than the industry standard of plus or minus 20%. It is always best servicing practice to use replacements which conform with stated tolerance ratings, also those which are expressed in terms of micro micro farads. It is conceivable that under certain conditions a capacitor rated at a higher tolerance may function satisfactorily in a circuit, wherein a more rigid tolerance is specified, but this does not indicate that it will happen in many cases. On occasion a 20% capacitor may display a capacitance which is within 1% of the normal rating. This is just a fortunate circumstance. Unless the set manufacturer's engineers felt that they needed a 5 or 10% capacitor, they would not so specify on the blueprint and pay the extra money for the higher accuracy.

Q—How is the suitability of a replacement part decided?

A—The replacement parts listed are selected by *comparing* the electrical, physical and test specifications on those parts with the corresponding specifications of the original parts used in the receiver. If the specifications for the suggested replacement match the specifications for the original parts, the replacement is listed. The receiver manufacturers furnish us with blueprints of the various components which we embrace in the Replacement Part Program. An example of one of the blue prints is shown here. It is for a horizontal output transformer. Although the Rider Dependable Replacement Parts Program is only about eight months old, we already on hand, for reference purposes, blueprints covering m o r e than 20,000 components such as transformers, capacitors, variable resistor controls and speakers, used in television receivers. Many are received each day. Using blueprints of the original components is the most reliable means of determining the constants of the parts used in all of the production runs of television receivers produced by manufacturers.

Q—How do you take care of the different kinds of speakers which are used in the different models?

A—The information we receive from receiver manufacturers indicates to us the variety of speakers which are used in the table models, consoles, and consolette Models of television receivers. The new replacemnt parts listing which will accompany Rider's TV Manual 11, and shown herein, will in many instances, disclose from 3 to 10 different versions of loud speakers which are used for the chassis listed. Competitive parts listing services that are incomplete frequenly show just one speaker as being applicable for perhaps 10 to 20, or more, receiver models.

Q—Are the parts listed as replacements in Rider listings subject to much fabrication?

A—No. The need for extensive fabrication is one of the reasons for disqualifying a suggested replacement part. The blueprints covering original components received from the receiver manufacturers, stipulate the mechanical requirements. Only such replacement parts as fit within these mechanical limitations, with minor variations, are listed. This means that when a service technician purchases one of the parts shown in our listing, fabrication or alteration by him is unnecessary, or at least is kept to the absolute minimum.

Q—What does "compliance with test specifications mean?"

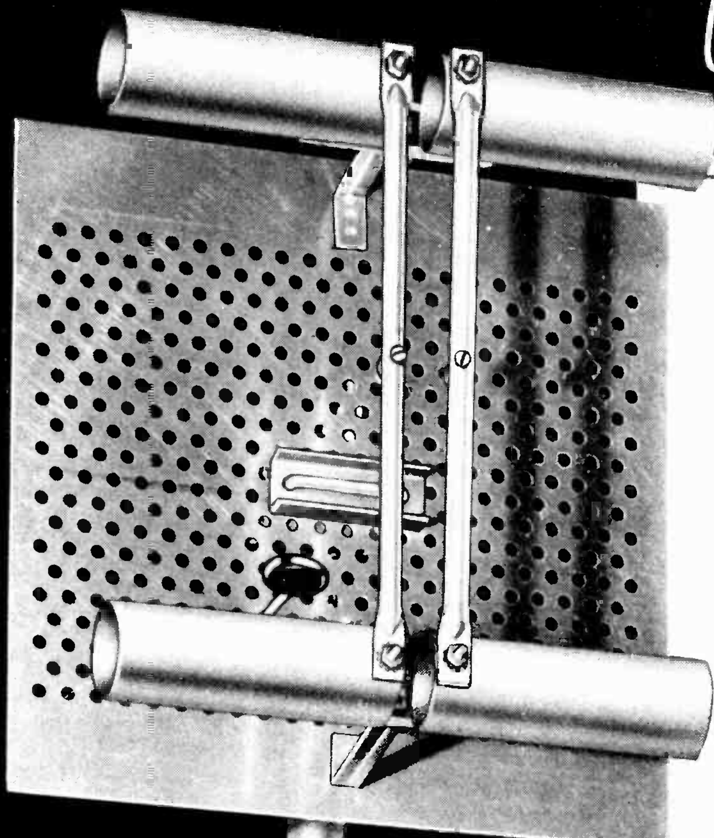
A—One of the requirements set by us for listing a replacement part, is that its test specifications conform with those which cover the original part in the receiver. In other words, if the set manufacturer stipulates that the original part must withstand the application of 2,500 volts rms between the winding and the coil of a transformer, the replacement part must do likewise in order that it be considered acceptable for listing. This is a safeguard for the service technician and is one of the many reasons why the Rider listings are the most dependable.

Q—Do you ever check parts in receivers?

A—Yes, many times. This is why we consider the matter of tolerance on inductive and capacitive components to be such a serious matter. Time and again we establish that as little as 10% difference in the inductance of a horizontal deflection winding from that of the original part can be very troublesome; that as little as 10% difference in the turns-ratio of a vertical output transformer from the rating of the original part can cause substantial non-linearity and correction would

(Continued on page 32)

why guess?



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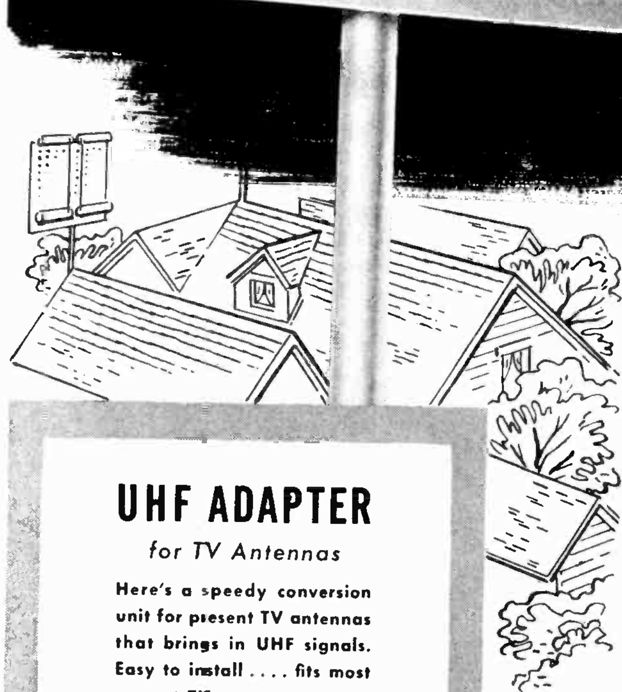

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A Note on TV in England

Observations made by one of our servicemen-authors who has been trying his hand at TV Servicing in a shop in England while "vacationing" abroad.

by John D. Burke

Our author - John D. Burke

One of my biggest problems since starting to work in a London TV repair shop two months ago, has been in reading the diagrams provided for our use.

First of all — there is a considerable difference just in terminology, between the two countries — even though we both speak the "same" language.

Here are some of the translations:

American	British
B Plus	High Tension (H.T.)
Power Line	Extra High Tension (E.H.T.)
High Voltage	
Tube	Valve (except for a CRT—which is a "tube")
Antenna	Aerial
Ground	Earth
Shielding	Screening
Chassis	(Sometimes called "the deck")
Globar Resistor	Brimistor Resistor
Vertical	Frame
Horizontal	Line
Micromicrofarad	Pica Farad
Yoke	Scan Coils
Broadcast Band	Medium Wave
Mixer	Frequency Changer
By-Pass	Decoupling
Socket	Valve Holder
Plate	Anode
Phonograph	Gramophone
Damper	Efficiency Diode
B Plus Plus	Boosted H.T.
Sweep Circuits	Time Bases
"Open"	O/C
Short	S/C
Unsoldered Connection	Dry Joint
Filter Capacitor	Smoothing Capacitor
Input Capacitor	Reservoir Capacitor
VTVM	Valve Voltmeter

May I hasten to add the fact that there are many more words which are the same in both countries — we can read one another's technical literature. For example, such words as *focus, definition, radio frequency, alignment, synchronization* — mean the same.

It was just the fact that these strange words had to be understood by me, quickly, and while I was struggling with other problems of a foreign country's TV system.

The shop in which I work employs four bench mechanics — called "service engineers". We have a rather good supply of service information. Good, that is, in that it covers most of the sets we are likely to see; and good in comparison with the service information a smaller shop might have been able to acquire. This word "acquire" is used advisedly. For, service information in not offered to the whole trade. Some manufacturers will only supply such information to those dealers who are franchised to sell and service their brand of sets.

Other manufacturers have released diagrams for publication — but there are limitations. A book has just been published giving a great deal of information about quite a few sets. But the price is very high. Also, the diagrams are so small I cannot read them without a magnifying glass!

There are two magazines with restricted circulation which publish one TV and one radio schematic each month. One of these magazines goes only to full-time profesisonal repairman. The other *only* to dealers. The information they give is very welcome, and I have been working with such forms of technical guidance for two months.

However, I find a number of great shortcomings in practically all British radio and TV service sheets:

Size — generally much smaller print than can be read comfortably.

Values of resistors and capacitors — not given on the diagrams. Sometimes they are, but usually one has to hunt up the parts lists, with a great loss of time, and much annoyance.

Tubes not designated by type — that is, the diagram only bears V1, V2, V3, etc. Again, time is spent looking for the list of tubes (valves).

Pin numbers not given — a few English diagrams do show the pin connections but most do not. Sometimes they will have a basing chart printed near the schematic. Other times, one must hunt for it.

Chassis layout charts also have the same defect — they show you where V6 is, but they do not say what type of tube it is, nor what function it has in the set.

Voltage readings are not given on the schematic. Usually this is given on a separate chart.

Ohms readings on coils are also given separately, if given at all.

Of course, my criticisms of English schematics are prompted mostly by my having worked with those used by our trade in the U.S. My shopmates are accustomed to using what they have, and manage to get along quite well in spite of the handicap.

In time I will be able to do the same. But I hope for an improvement. Perhaps it will come as Britain gets more flooded with TV sets. They now have about 2,000,000 in use.

It must be added, in their favor, that the sets are quite good, and compare favorably with American sets.

There are many varieties of chassis — with some 20 to 30 manufacturers — less than in the States, but quite enough to satisfy my wish to always have new and interesting problems to solve each day.

I brought along with me some technical literature, including some copies of Rider's Tek-Files. Looking through several as I write this, let me assure you that the English TV repairman quite often has only about 10% of the information furnished to him that you are getting.

English shops do not promise quick-as-a-wink service. And most repair jobs go into the shop. The average job in my shop takes two to three days from pick-up 'til delivery.

Also the sets are simpler, and the problems of 405 line television, and one-channel television, are much less. However, that will provide material for other articles.

ATTENTION AUTHORS:

We are soliciting articles concerning radio, television, and allied electronic maintenance. All aspects are of interest. Articles of 1,000 to 2,000 words are desired. Preference is given to subject matter which reflects practical work rather than theory. The presentation should be direct, to the point, and amply illustrated. Finished art work will be prepared by us from the roughs submitted. Photographs are welcome. The rate of payment is on a word basis — and, needless to say, good writing rates good pay!

Submit all articles and inquiries to Editor, *Successful Servicing*.

I-F Trap Circuits in TV Receivers

(Continued from page 1)

is useless. Trap circuit capacitors must be of a low-loss type in order to obtain high Q's. For convenience, we will assume that each of the diagrams of Fig. 3 represents an associated sound traps, although trap circuits do not depend upon the frequency to which the trap is tuned.

The coil of an inductively-coupled trap, as in Fig. 3(A), is placed near the i-f interstage coil with which it is to work. If a 41.25-mc associated sound signal is present in the i-f interstage coil, it will induce a signal in the trap circuit. This will result in a relatively large circulating current in the trap because of its high Q. The circulating current produces a magnetic field that acts to oppose the 41.25-mc signal in the i-f interstage coil, thereby considerably reducing the strength of the associated sound signal. (The amplitude of this signal cannot be reduced to zero, of course, because then there will be no magnetic field in the trap circuit).

A second type of circuit, the capacitively-coupled trap, is shown in Fig. 3(B). Although the operation of this circuit is different than that of the inductively-coupled trap, the end result is the same. At 41.25 mc, for example, coupling capacitor C_C in combination with L and C, will produce a low-impedance series-resonant path to ground. This will "short-circuit" the 41.25-mc signal that is present in the i-f interstage coil. The capacitively-coupled trap also produces a peak to the left of 41.25 mc, but in this case it is caused by a high-impedance parallel-resonant condition between the i-f interstage coil and the trap circuit.

The effectiveness of the capacitively-coupled trap is partly determined by the size of the C_C. If this capacitor is too large, the trapping action will remove some of the picture signals, while an undersized coupling capacitor will result in insufficient trapping action. A typical value for C_C is 1.5 $\mu\mu f$.

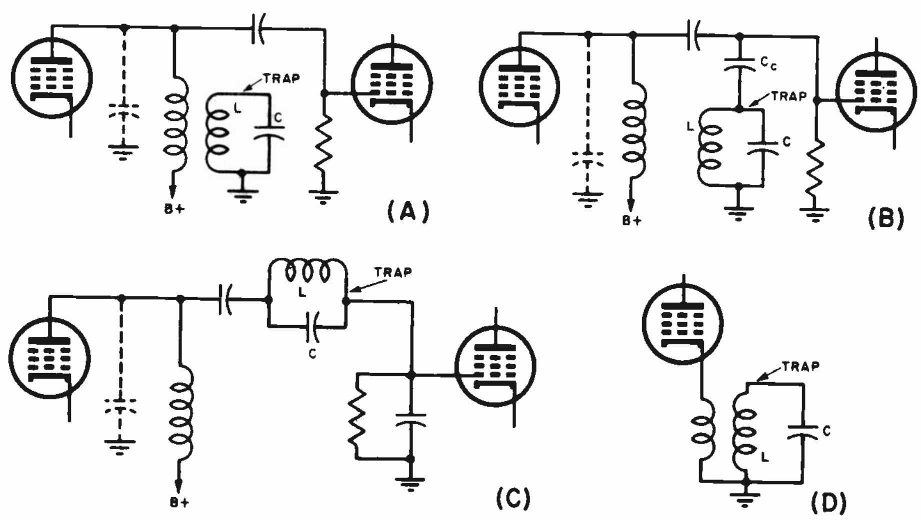


Fig. 3. Various trap circuits. (A) Inductively-coupled trap. (B) Capacitively-coupled trap. (C) Series-coupled trap. (D) Cathode trap.

As the solid line of Fig. 2 shows, the 41.25-mc trap produces a response-curve peak slightly to the left of 41.25-mc. If a 40.5-mc signal is present in the i-f interstage coil, for example, it will also produce some circulating current in the trap circuit. The magnetic field that is produced in this case, however, will aid the 40.5-mc signal because of phase differences between the 40.5-mc and 41.25-mc operation. Fortunately, there is little likelihood of a signal at 40.5 mc, and the peak at this point should cause no trouble. Similar peaks may be created to the left of 39.75 mc and to the right of 47.25 mc.

If the inductively-coupled trap coil is too near the i-f interstage coil, the trapping effect becomes broadened out until some of the picture signals are trapped out in addition to 41.25 mc. If the trap coil is too far from the i-f interstage coil it will have insufficient effect.

The series-coupled trap of Fig. 3(C) acts by introducing a high-impedance parallel-resonant circuit in series with the signal path. This trap is also characterized by a peak to the left of 41.25 mc. The action of the trap is controlled by the size of C. When C is too small, the picture frequencies will be affected. When C is too large, the size of L becomes correspondingly small and it becomes difficult to build a high-Q trap coil. C is generally over 100$\mu\mu f$ in value.

The fourth circuit, the cathode trap, is shown in Fig. 3(D). The action of this trap is based upon the reduced gain that results when an impedance is introduced into the cathode circuit of a tube. At 41.25 mc the trap coil reflects a high impedance into the cathode circuit, while at other frequencies it has very little effect. The cathode coil by itself is a small inductance, and does not

(Continued on page 18)

Replacement Parts in TV Receivers

(Part 1-Capacitors con'td)

by John F. Rider

This is the sixth in a series of articles on "Replacement Parts in TV Receivers." "Transformers" will be discussed next month.

Maximum Operating Temperature

We have already referred to the item of operating temperature. In a sense, the maximum operating temperature is a constant for a capacitor although it might, perhaps, be better viewed as a rating. By and large the general run of capacitors intended for use in television receivers are designd for operation at either maximum temperatures of 65°C or 85°C. In either case, whatever are supposed to be the other constants of the unit are assumed to be true only if the capacitor is used within the maximum operating temperature rating.

An attempt towards standardizing maximum operating temperature ratings of paper dielectric capacitors used in TV receivers at 85°C is under way. However, 65°C capacitors are still commonplace. Operating a capacitor above its maximum operating temperature rating generally results in a reduction in the insulation resistance of the capacitor and in an increase in the power factor, that is, in the electrical losses in the unit.

Receiver manufacturers have displayed during the past few years, a trend towards the use of 85°C capacitors in place of the 65°C capacitors which they used in the past. Unfortunately, the specific capacitor used in a receiver does not bear a label which indicates its maximum operating temperature rating. Hence, when replacement is the issue it is a matter of either replacing with a component which is similar to that used in the receiver, which may be a 65°C unit or buying a 85°C and using it. In this respect, reference to the catalogues made by the capacitor manufacturers will disclose the maximum operating temperature ratings of their components. It is pretty much standard today that molded capacitors are 85°C rated. As a matter of fact, the replacements shown in the Rider Dependable Replacement Parts Lists for tubular capacitors are the molded variety even when the original part was a paper tubular. Summarizing the entire matter, the use of molded case paper dielectric tubulars with the various synthetic impregnants as replacements for tubular capacitors used in TV receivers will satisfy the maximum operating temperature ratings set by the receiver manufacturers with very rare exceptions.

Insulation Resistance

The insulation resistance is a rating associated with paper dielectric tubulars, mica dielectric and ceramic dielectric fixed capacitors. It expresses the d-c resistance of the capacitor at rated temperatures. It is an important item when capacitors are used as blocking devices to prevent the application of d-c voltage present at one point, at another point. The blocking capacitor, also known as the coupling capacitor in many amplifier circuits is the example of such an application.

The usual way in which the insulation resistance of paper dielectric capacitors is mentioned, is megohms times microfarads. On the average, the insulation resistance of paper dielectric tubular capacitors at the temperatures from 20 to 25°C runs around 2,000 megohms per microfarad for values above .1 mfd. On occasion the rating is 1,000 megohms per microfarad. This means that if the capacitance is .5 microfarad the insulation resistance may vary from 500 to perhaps 1,000 megohms. If the capacitance is less than .1 mfd the insulation resistance usually is specified at a fixed amount, as for example, 5,000 megohms for the unit. As to the change in insulation resistance with temperature, it may decrease to as low as 1/70th of its base value at 20°C, when the temperature rises 40 to 50°C.

In the case of ceramic and mica capacitors which are generally available in the lower values, the insulation resistance is generally expressed as a fixed quantity as for example 5,000 megohms, or more or less. The receiver manufacturers generally specify the insulation resistance when they order capacitors and their requirements extend from 5,000 to 7,500 megohms. Replacement units of this kind of capacitor generally display similar values of insulation resistance.

The lower the insulation resistance of a capacitor, the greater is the possible leakage of the d-c voltage applied to the plate of a tube, through the capacitor, to the grid of the next tube, assuming that the capacitor is the d-c blocking device between these two tube electrodes. On the face of it, it may seem as though 1,000 megohms insulation resistance is a tremendously high ohmic value, yet receiver manufacturers frequently require that paper, ceramic and mica capacitors in certain capacitance ranges display insulation resistance of from 6,000 megohms to 7,500 megohms minimum, when measured at 100 volts dc at from 20 to 25°C. For example, if the insulation resistance is 1,000 megohms and the voltage is 250 volts, a current of .25 microampere will flow through the capacitor. If this amount of current is allowed to flow through, a 10 megohm grid leak and a 2½ volt drop will develop across the resistor and by virtue of the polarity, can very materially and adversly affect the existing grid bias. This accounts for the requirement of 5,000 to 10,000 megohms insulation resistance for capacitors less than .1 mf used in this manner. Frequently, in order to maintain the high insulation resistance present between the terminals of mica capacitors for example, they are waxed dipped.

Although we have not mentioned this point earlier, it is always advisable before wiring in a replacement capacitor to check its capacitance and its insulation resistance. On more than one occasion, we found that this brief test saved a great deal of time, because in some cases the capacitor was wrongly labeled and in other cases its insulation resistance had for some unknown reason, fallen from far below its normal value. This does not happen too frequently, but the few moments necessary to make these tests will be worthwhile in the long run.

Relative to insulation resistance it is well to take note of another very important consideration, namely the voltage at which the capacitor is tested. The ordinary ohmmeter test is not satisfactory because the voltage applied is too low. Whenever possible, the insulation resistance test should be made with at least 100 volt dc applied, preferably several hundred volts.

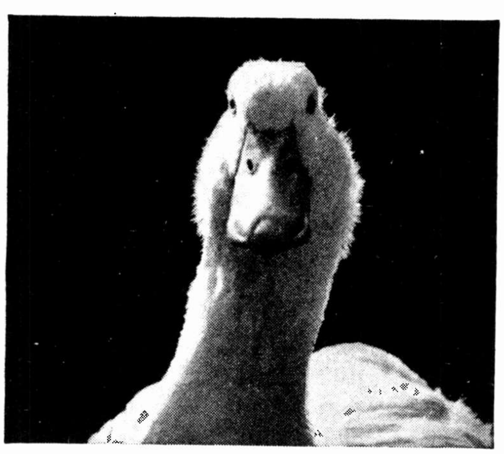
Quite frequently the insulation test made with an ordinary ohmmeter shows a tremendously high resistance, but when the applied voltage is increased from 100 volts dc to perhaps 300 volts dc, the insulation resistance falls to a value which indicates excessive leakage through the capacitor and its unsuitability for use in the circuit.

Power Factor

Power factor is a constant for all capacitors. It is an expression which denotes the

(*Continued on page* 28)

Laughs in the Life of a TV Serviceman



"That sounds serious—do I need a new tuner?"

"NO MA'M, it isn't serious, your turner's OK—and you're lucky you own a Raytheon TV receiver. They're well engineered and an easy set to service. Their tuner is one of the best on the market."

Raytheon's VU-matic® tuner is one of the few tuners you can service 100% while it is in the chassis. All tuner parts and circuits are easy to get at for test, repair or alignment. This eliminates the necessity for complete tuner replacement and new turner alignment.

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HINT FOR FINDING TV CHANNEL FREQUENCIES

The following hint, which appeared originally in "The Relay" (published by the Fred C. Harrison Co., Elmira, N. Y.) is based on an idea submitted by John Mulligan.

1. To find the frequencies corresponding to any uhf channel (channels 14 to 83) proceed as follows. Multiply the channel number by 6, then add 389 mc. This will give the center frequency of the channel. The frequency of the picture carrier is 1.75 mc below the center frequency, and the frequency of the sound carrier is 2.75 mc above the center frequency.

2. To find the frequencies corresponding to a channel in the high vhf band (channels 7 to 13) proceed as follows: Multiply the channel number by 6, then add 135 mc. This will give the center frequency of the channel. The picture-carrier frequency is 1.75 mc below the center frequency, and the sound-carrier frequency is 2.75 mc above the center frequency.

3. To find the frequencies corresponding to a channel in the low vhf band (channels 2 to 6) proceed as follows: Multiply the channel number by 6, then add 49 mc for channels 5 or 6 or add 45 mc for channels 2, 3, or 4. This will give the center frequency of the channel. The picture-carrier frequency is 1.75 mc below and the sound-carrier frequency is 2.75 mc above the center frequency.

As an example, assume you are interested in knowing the frequencies coresponding to uhf channel 44. The center frequency is 44 times 6 plus 389 mc, or 653 mc. The picture-carrier frequency is 1.75 mc lower, or 651.25 mc while the sound-carrier frequency is 2.75 mc higher, or 655.75 mc.

As a second example, assume you are interested in knowing the frequencies of vhf channel 11. The center frequency is 11 times 6 plus 135 mc, or 201 mc. The picture-carrier frequency (1.75 mc lower) is 199.25 mc, while the sound-carrier frequency (2.75 mc higher) is 203.75 mc.

Maintenance and Repair

(*Continued from page* 15)

be glad to pay the extra charge when he sees the improvement made on performance.

In conclusion, we might say that you only get out of the radio-TV service business what you put into it. If you put your full time into doing the best possible work on your customer's sets, using all of the helps available, you will be more than repaid in the increased service business, especially in the repeat business that high-quality work will always bring in.

TV SUPPLEMENTARY SHEET NO. 2

MODEL & CHASSIS	PART #	CATALOG #	FUNCTION	DESCRIPTION	LIST PRICE
ARVIN					
6175TM 6179TM	E22464-20	RTV-259	Vert. Lin./ Height	3000/2.5 Meg. 2W-W.W./carbon Conc. Dual	$3.10
	E22464-27	RTV-352	Contrast Vol./Sw.	1500/250 Ω Conc. Dual carbon--SPST	$3.70
	E22464-34	AG-49-S KSS-3	Bright.	100K Ω carbon	$1.25
CHASSIS TE-331 TE-331-2	E22464-36	AG-83-S KSS-3	Vert. Hold	1.5 Meg. Ω carbon	$1.25
	E22464-38	AG-[illegible] KSS-3	Hor. Hold	25K Ω carbon	$1.25
BELMONT-RAYTHEON					
C-1729A C-1731A M-1726A M-172[illegible]A	A10A-18[illegible]	RTV-218	Contrast/ Vol./Sw.	5000/1Meg. Tap 100K Ω Conc. Dual carbon DPST	$4.50
	A10B-17275	AG-49-S KSS-3	Vert. Hold	100K Ω carbon	$1.25
	A10B-17764	AG-44-S KSS-3	Bright.	50K Ω carbon	$1.25
	A10B-19218	AG-19-S FKS-1/4	Vert. Lin.	5000 Ω carbon	$1.25
	A10B-19220	AG-61-S FKS-1/4	Height	750K Ω carbon	$1.25
	A10B-19542	AG-63-Z KSS-3	Tone	1 Meg. Ω carbon	$1.25
BENDIX					
0AK3 21K3 21KD 21T3 21X3	CH262022-4	AG-42-S FS-3	Hor. Hold	30K Ω carbon	$1.25
	CH262024-15	AG-27-S FKS-1/4	Noise Inverter	10K Ω carbon	$1.25
	RV4C10 CH262025-4 CH262025-14	AG-83-S FKS-1/4	Vert. Hold	2 Meg. Ω carbon	$1.25
	RV4C07 CH262025-7	AG-85-S FKS-1/4	Height	3 Meg. Ω carbon	$1.25
	RV4C07 CH262025-7 CH262025-12	AG-85-S FKS-1/4	Focus	3 Meg. Ω carbon	$1.25
	RV4C11 CH262025-10 CH262025-13	AG-58-S FKS-1/4	Vert. Lin.	600K Ω carbon	$1.25
	CH262041-2	AT-90 FS-3/SWA	Vol./Sw.	500K Ω carbon--SPST	$1.25
	LH262045-1	RTV-373	Bright./ Contrast	100K/1200 Ω Conc. Dual carbon	$3.10
CROSLEY					
DU-20CDM, CHB, CHM, COB, COM,	B-148952	AG-83-S RS-2	Vert. Hold	1.5 Meg. Ω carbon	$1.25
	B-148953	AG-44-S RS-2	Hor. Hold	50K Ω carbon	$1.25
DU-21CDM1, CDN, CHM, COB, COL, COLB, COM	B-148966	AG-43-S RS-2	Bright.	40K Ω carbon	$1.25
	B-149893	A10-1500 KSS-3	Focus	1500 Ω 4W-W.W.	$1.85
	B-151634	AG-15-S RS-2	Vert. Lin.	3000 Ω carbon	$1.25
CHASSIS 357 357-1	B-152129	AG-83-S RS-2	Height	1.5 Meg. Ω carbon	$1.25
	C-151111	RTV-327	Contrast/ Vol./Sw.	1500/1Meg. Tap 250K Ω Conc. Dual carbon SPST	$4.30

MODEL & CHASSIS	PART #	CATALOG #	FUNCTION	DESCRIPTION	LIST PRICE
	W-148861	Order From MFR.	AGC	1000 Ω 1W-W.W.	
EMERSON					
711B 712B 720B	390156	AG-61-S KSS-5	Vert. Hold	1 Meg. Ω carbon	$1.25
	390181	AG-52-S KSS-5	Bright.	200K Ω carbon	$1.25
	390183	AG-44-S KSS-5	Hor. Hold	50K Ω carbon	$1.25
	390196	AG-83-S FKS-1/4	Height	2 Meg. Ω carbon	$1.25
CHASSIS 120164B	390196	AG-83-S FKS-1/4	Focus	2 Meg. Ω carbon	$1.25
	390197	A43-5000 FKS-1/4	Vert. Lin.	5000 Ω 2W-W.W.	$1.25
	390201	RTV-296	Contrast Vol./Sw.	1500/1 Meg. Conc. Dual carbon--SPST	$3.70
	390202	AG-83-S FKS-1/4/SWB	Fringe Compensator	2 Meg. Ω carbon--SPST	$1.25 .60
FADA					
7C42 7C52	* D220076G20	A43-5000 FKS-1/4	Vert. Lin.	5000 Ω 2W-W.W.	$1.25
	52.24	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	52.64	RTV-109	Contrast/ Vol./Sw.	750 Tap 500/500K Ω 2W-W.W./carbon Conc. Dual--SPST	$4.50
	52.66	RTV-110	Vert./ Hor. Hold	1 Meg./50K Ω Conc. Dual carbon	$3.10
	52.69	AG-44-S FS-3	Bright.	50K Ω carbon	$1.25
	52.74	AG-84-S FKS-1/4	Focus	2.5 Meg. Ω carbon	$1.25
	* Some Models Use Part # 52.68				
7T32, 77T32, 721	52.24	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	* 52.24	AG-84-S FKS-1/4	Focus	2.5 Meg. Ω carbon	$1.25
	52.64	RTV-109	Contrast Vol./Sw.	750 Tap 500/500K Ω 2W-W.W./carbon Conc. Dual--SPST	$4.50
	52.66	RTV-110	Vert/ Hor. Hold	1 Meg/50K Ω Conc. Dual carbon	$3.10
	52.68	A43-5000 FKS-1/4	Vert. Lin.	5000 Ω 2W-W.W.	$1.25
	52.69	AG-44-S FS-3	Bright.	50K Ω carbon	$1.25
	* Some Models Use Alternate Part # 52.74				
20C22 20T12 24T10	52.24	AG-84-S FKS-1/4	Height	2.5 Meg. Ω carbon	$1.25
	52.64	RTV-109	Contrast/ Vol./Sw.	750 Tap 500/500K Ω 2W-W.W./carbon Conc. Dual--SPST	$4.50
	52.66	RTV-110	Vert./Hor. Hold	1 Meg./50K Ω Conc. Dual carbon	$3.10
	52.68	A43-5000 FKS-1/4	Vert. Lin.	5000 Ω 2W-W.W.	$1.25
	52.69	AG-44-S FS-3	Bright.	50K Ω carbon	$1.25

Form No. 751836010-5M-11/52

Mismatched TV Components

Numerous comments concerning the effects of improperly matched TV components have appeared in SUCCESSFUL SERVICING in the past. These have led to numerous telephone calls from service technicians asking that we publish information concerning the effects of such conditions. These articles will appear in this magazine beginning with the May, 1953 issue.

The Editor

CORRECTION TO:

Rider's Dependable Replacement Parts Listing published in TV Volume 10.

SWEEP TRANSFORMERS

Set Mfr.	Set Mfr's Original Part No.
Gamble-Skogmo	51X156

Correction: Transpose A-8141 from Ram column to Stancor column.

RCA	74114

Correction: Change Part No. 74114 to 74144 in Part No. column.

I-F Trap Circuits etc.

(*Continued from page* 10)

cause much degeneration. A transformer arrangement is used to obtain a high-Q trap circuit. The coupling between primary and secondary determines the effectiveness of the trap.

The cathode trap generally does not produce a peak to the left of 41.25 mc. However, the trap loses its effectiveness if the transconductance of the associated tube is low. This tube should operate, therefore, with a constant bias. If agc bias is applied to the tube, the trap will become useless when strong station signals are being received.

Any of the four arangements shown in Fig. 3 may be used to trap out a 4.5-mc signal in the video section of the receiver.

Tuning of Traps

In non-intercarrier receivers, the sound i-f signal is removed from one of the 41.25-mc traps, while in intercarrier receivers the sound signal is obtained from a 4.5-mc trap. The question arises, when tuning these traps, as to whether to tune for maximum sound output or minimum picture-signal output. The answer is that i-f traps should always be adjusted for minimum second-detector output, so as to obtain the solid-line response curve of Fig. 2. Similarly, 4.5-mc traps should be adjusted for minimum 4-5-mc signal at the cathode-ray tube. A properly designed receiver will have sufficient sound output when the traps are adjusted in this manner, and it is more important to optimize the picure presentation. Receiver schematics usually specify the frequency at which each trap is intended to operate. In most cases, the trap circuits are slug tuned.

Conclusion and Summary

From the foregoing discussion, one may conclude that many television receiver faults may be traced to improperly aligned traps, or to traps that have been omitted in the design of the receiver. In all cases, improperly aligned traps may trap out picture signals rather than the signals they were intended for. This may be checked by examining the overall i-f and video response curves of the receiver. Summarizing, we may note that:

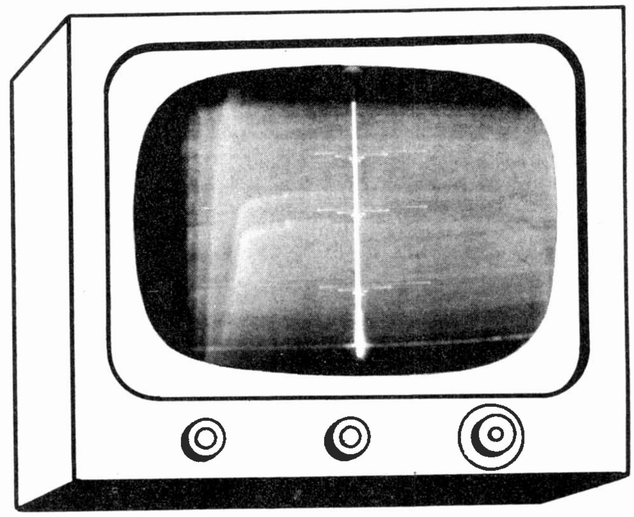
1. Improperly aligned or missing associated sound traps may result in sound-bar and 4.5-mc interference in the picture, and buzz in intercarrier receivers;

2. An improperly aligned or missing adjacent sound trap may result in sound-bar and 1.5-mc interference in the picture;

3. An improperly aligned or missing adjacent picture trap may result in adjacent-picture interference in the desired picture;

4. An improperly aligned or missing 4.5-mc trap may results in 4.5-mc interference in the picture, and weak sound in intercarrier receivers.

Are You a TV Troubleshooting EXPERT?



What caused the abnormal picture tube pattern in this TV receiver?

These are the waveforms that resulted when the above TV receiver was tested with an oscilloscope. Do you know the trouble?

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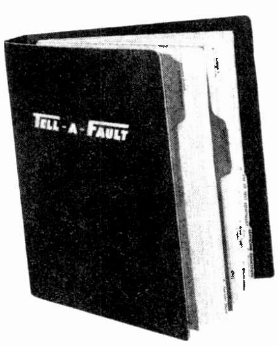

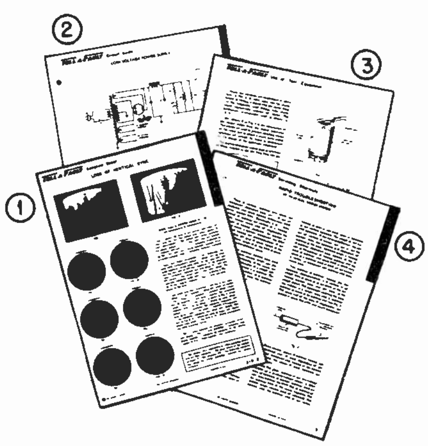

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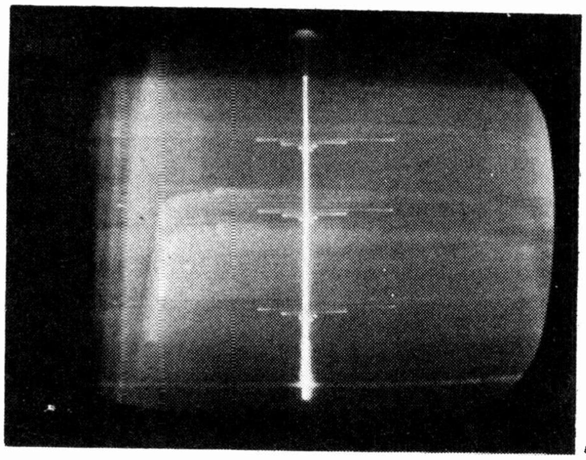

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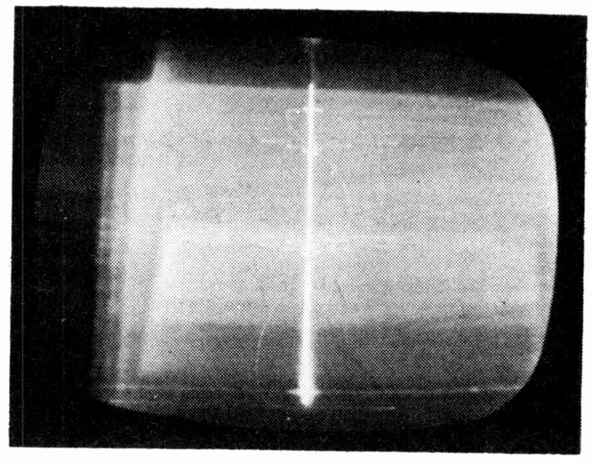
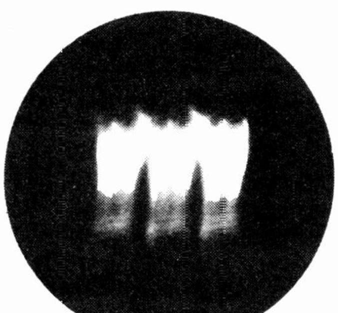


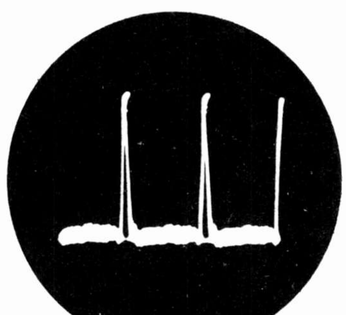
2

(NOTE: Refer to CIRCUIT GUIDE IV-9(A) for identification of components.)

The unstable picture-tube pattern evident while the receiver was defective is shown, as photographed at different instants, in Figs. 1 and 2. The raster was shrunken in size and jumped erratically over the face of the picture tube at a rapid but visible rate, giving the appearance of a flickering raster. Neither vertical nor horizontal sync could be restored by adjustment of the hold controls. The bright vertical line, marked by intermittent horizontal streaks, was conspicuous at all times. While audio-output level was normal, a steady oscillation of undetermined frequency accompanied the sound.

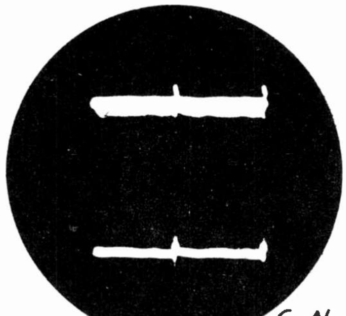


3-A

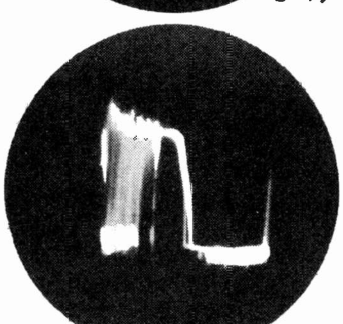


4-N

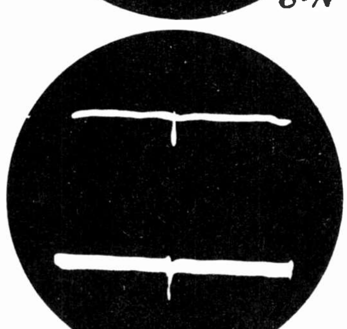
5-A



6-N



7-A



8-N

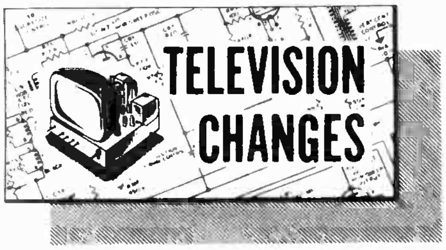
Since symptoms of faulty operation appeared to involve both vertical and horizontal synchronization and the high-voltage section, which depends on the horizontal-sweep circuit, operation of the common sync strip was checked. The sync separator and clipper (*V1* and *V2*) appeared to be operating normally. However, at the grid of the sync splitter (*V3*), the unstable, distorted waveform of Fig. 3 was obtained, with an isolating probe, at H/3. Normally, the well-defined steady pulse of Fig. 4 is present. A similar condition existed at the vertical-scanning frequency.

Output from this stage was then investigated. Waveforms at the plate were badly distorted in shape. For example, at V/2 through the low-capacitance probe, the pattern of Fig. 5 was noted. This stage, when functioning properly, produces a plate waveform like that shown in Fig. 6 at the frequency mentioned.

The cathode-output waveform (obtained at the junction of *R9* with *R10*) was similar to but out of phase with the plate output, as expected (see Fig. 7). However, it was much lower in amplitude. Cathode and plate output waveforms are normally of the same amplitude. The normal output waveforms of Figs. 6 and 8, for example, are similar in shape, opposite in polarity, and of the same P-P height. The positive d-c voltage at the junction of *R9* and *R10*, however, was considerably larger than the normal low value.

A check of the output side of capacitor *C6*, feeding from the cathode, revealed the expected display, already shown in Fig. 7; but the d-c voltage, normally negative, was identical to the positive reading found at the previously mentioned junction of *R9* and *R10*. In addition, resistance readings on either side of capacitor *C6* were the same.

Normal operation of this receiver was restored by replacing a defective component in the cathode-output circuit of the phase splitter, V3. Coupling capacitor C6 was found to be shorted.



The Rider Manual pages and TEK-FILE pack which include the original data and shematics to which the following production changes apply, appear in the index on page 29 of this issue.

GAMBLE-SKOGMO (CORONADO)
MODELS 05TV1-43-9014A, 15RA2-43-9105A
CHASSIS 16AY210

Circuit Changes, Audio

A 6T8 tube (triode-triple diode) replaces the audio amp. 6AV6 (V12) and the audio det. 6AL5 (V21), performing the same functions as these two tubes.

In the audio strip assembly, 72 (Part No. B-13M-19257, the ratio detector coil) is replaced by Part No. B-13M-17273.

NOTE: Chassis stamped with RMA date code number 124031 or higher incorporate these changes.

•

MAGNAVOX
CHASSIS CT-275, 276, 277, 278, 279, 280, 281, 282

R-F Unit

These chassis use either r-f unit 700349 or 700354.

SYLVANIA
MODEL 1110X
CHASSIS 1-329

Sound I-F Limiter (Circuit Change)

1. Dual ceramic capacitor C-103 and C-104 (.004μf, 450v), connected to pins 6 and 7 of the Sound I-F Limiter (V-9, 6AU6), is removed from the circuit.
2. Resistor R-105 (330 ohms, ½w), connected to pin 7 of V-9, is removed from the circuit.
3. The cathode of V-9 (pin 7) is connected directly to ground.
4. New capacitor C-103 (.005μf, 500v, ceramic, Service Part 166-500D) is added to the circuit as screen grid bypass for V-9 (pin No. 6 to ground).

NOTE: Chassis coded C02 and later incorporate this change.

•

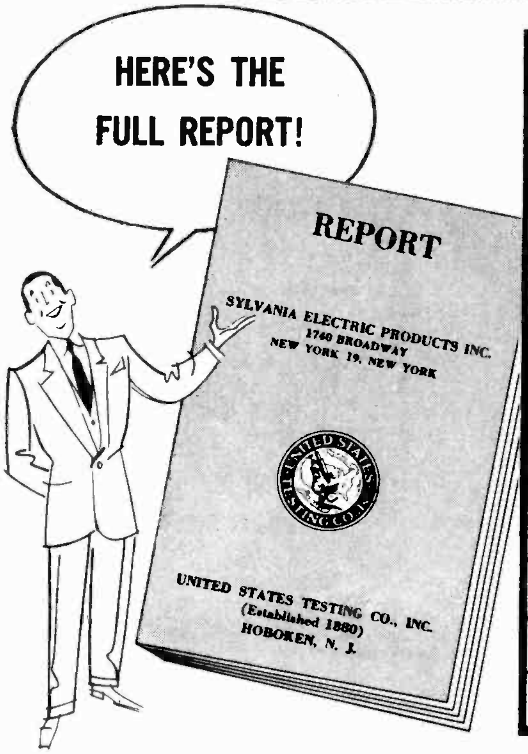
SYLVANIA
MODELS 71M, 72M, 73B, 73M
CHASSIS 1-366(C08), 1-441(C02)

Sound I-F Limiter (Circuit Change)

1. Resistor R-105 (330 ohms) and capacitor C-103 (.004μf) are removed from the cathode (pin 7) of the Sound I-F Limiter (V-10, 6AU6).
2. The cathode is conneoted directly to ground.
3. Capacitor C-103 (pin 6 of V-10, 6AU6) is changed from .004μf, 500v to .005μf, 500v (Service Part 166-5000D).

NOTE: Chassis 1-366 coded C09 and chassis 1-441 coded C03 incorporate this change.

SUPERIOR PERFORMANCE OF SYLVANIA PICTURE TUBES NOW PROVED BEYOND ALL DOUBT

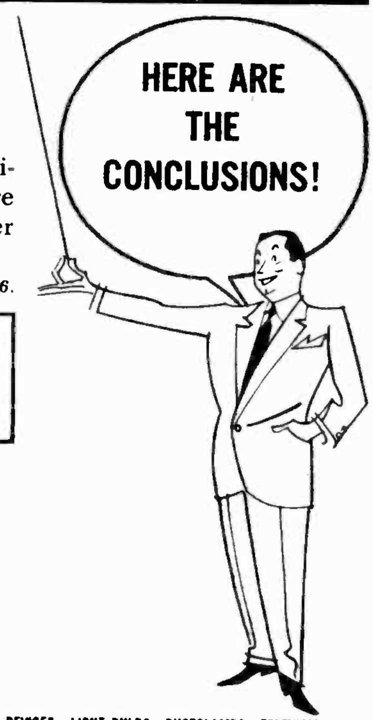


LIFE TEST MAGNETIC TUBES
United States Testing Company
Hoboken, N. J.

Test No. E-5526
Date 10-11-52
Engineer A.S.M.

Mfr.	Tubes Tested	Tubes Failed	Point Quality
A	8	3	76
B	8	4	79
C	8	6	62
D	8	4	74
E	8	4	67
F	8	5	42
G	8	4	52
H	8	5	30
SYLVANIA	8	0	93

Exhaustive tests by United States Testing Company prove Sylvania Picture Tubes out-last, out-perform all others tested!



● Hour after hour for over 1,400 consecutive hours, Sylvania Picture tubes were tested side by side with tubes of 8 other manufacturers. The chart at right tells the remarkable performance record. Note that only Sylvania Picture tubes showed no failures. Here's the conclusion of the U. S. Testing Company Report: "On the basis of an ultimate Life Test Evaluation of the eight tubes of each brand tested, it can be concluded that the averaged overall qualities measured on the Sylvania Tubes were superior to the averages of the other brands tested."*

**United States Testing Company, Inc., Test No. E-5526.*

We'll be glad to send you full details of this report. Send your request to Sylvania Electric Products Inc., Department 3R-1804, 1740 Broadway, New York 19, N. Y.

SYLVANIA

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT LAMPS, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

What Is The Fastest Way To Trouble-Shoot A TV Set?

This material originally appeared in A.G. RADIO NEWS, published by the AG Radio Parts Co.

Every service technician has his own little private system of trouble shooting because it is developed from day to day experiences in dealing with an endless variety of problems.

In beginning to trouble shoot a chassis brought into the shop, some prefer to check prominent B voltage points first; others choose to test suspected groups of tubes first; some rely on observation of the end result of both picture and sound for the prime indication of a defect and still others turn directly to signal tracing or signal injection methods.

Each of these approaches has it own definite advantages and because of this, furnishes grounds for argument, which incidentally, is not the concern of this review.

Regardless of the system of trouble shooting which you may employ, it may be wise to stop and analyze it occasionally to find if you are competitive in today's modern service market.

How does your system of trouble shooting measure up to the following questions?

(1) Is it fast enough to be competitive even when severe problems are encountered?

(2) Is it a sure-fire direct approach to the source of a defect right down to the very component at fault?

(3) Does it furnish positive proof of correction enabling you to gain control over the cause of trouble so you can repeat bad or good operation at will?

When the going gets tough and extraordinary demands are placed on any particular system, it may soon be found to be limited to the extent where tests methods of another system must be reverted to in order to reach a conclusion. On may suppose then, that a combination of the above listed systems might be best, but this hardly seems practical.

From another aspect, trouble shooting practice can be relegated to two broader classifications:

(a) The "case history" or "experience" method and

(b) progressive testing.

Many technicians depend on their experience with one set to guide them in repairing another one like it. When an unfamiliar problem arises, someone else's experience is sought, either through conversation or by resorting to technical files.

The popularity of direct solutions to characteristic problems is responsible for the introduction of many technical data sheets hints and kinks, and other printed helps. Therein other peoples' experience are described so the technician can avoid the costly process of working them out for himself. The limitation to this "case history" method, however, lies in the extensive filing job necessary to organize sufficient data and to constantly amend it for all makes of sets. Filing could conceivably take more time than trouble shooting!

Where specialization on a single line of receivers alone is practiced, the "case history" method with its repeatedly used short-cut experiences, becomes highly practical. This is a point in favor of having exclusively franchised dealers or large specializing contractors.

Progressive testing should appeal more to the independent technician who services all makes of receivers. His pet system of trouble shooting, plus schematics, voltage charts, and other pertinent basic information will enable him to rush through most problems.

When his routine practice is completed, the employment of his extended knowledge of various systems of trouble shooting, quickly leads to conclusive results.

This "general practitioner", therefore, must rely more on his ability to think of a test that will solve his unusual problems than to rely solely on finding a case history that will match any problem which he may encounter.

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Setting Up for TV Service

(*Continued from page* 3)

manager specified seven outlets served through a circuit braker and isolation transformer. A switch pilot light should also be incorporated.

Two sets of antenna leads should be available at the bench. Provisions for the mounting of a test CRT should also be provided.

As far as storage space is concerned, the shop should have adequate space to heat run repaired chassis for at least four hours, preferably in their cabinets.

Generally speaking, lighting should be such that the service man does not cast shadows on his work. Recommendations as to fluorescent and incandescent lamps vary. If the former is used, it must be properly installed to minimize interference. Overhead lighting should be supplemented by gooseneck or floating-arm lights.

There is some tendency to locate service shops in basements or other poorly ventilated spots. In any shop, efficiency can be stepped up by giving some attention to good ventilation. Actual sound-proofing of the shop is usually impractical but a little attention to layout and some inexpensive soundproofing measures are often sufficient. In addition, the shop noise level can often be reduced by care on the part of service personnel.

A regard for efficiency alone will dictate the minimums as regards shop layout, lighting and ventilation. Dividends in the form of better employee morale and a better impression on the public can be realized by going one step further in providing a neat, well-laid out shop. An operation of this type can be well publicized, rather than being relegated to obscurity.

Test Equipment

Many of the service managers contributing advice to Electrical Merchandising in preparing this article emphasized that purchase of inferior test equipment was no economy.

Said one, summarizing the problem: "A big headache to manufacturers is the type of equipment offered by test suppliers, since there is a good chance that test equipment will not perform as advertised. We have spent considerable time in analyzing test equipment offered to the trade and have found some of it almost worthless. . . . . Generally speaking, a serviceman gets what he pays for. . . . Much of the equipment offered to the serviceman two years ago is not acceptable for use on TV receivers today because of the increased sensitivity built into sets since that time."

What test equipment does the dealer need for his service shop? Four manufacturers provided answers, varying in detail.

A spokesman for Admiral Corp. suggested that the minimum would include an oscilloscope, a vacuum tube voltmeter with high voltage test leads and RF probe, a sweep generator and calibrator.

CHART I—TEST EQUIPMENT (Du Mont Recommendations)

The Minimum

1. Oscillograph with horizontal probe (from $150 to $330).
2. Vacuum tube voltmeter ($55 to $125).
3. Sweep generator ($220 to $550).
4. Peak to peak scope calibrator ($40).
5. Isolation transformer ($25).

Useful Additions

Tube tester with CRT test adaptor ($100 to $165). Capacitor checker ($70). Cross hatch generator ($175). Field strength meter ($85). High frequency and high voltage probes for VTTM.

How Much Equipment

Each bench should have an oscillograph and VTTM.

A de luxe shop would have one sweep generator setup for every two benches and a Scope P-P Calibrator for every bench. At a minimum, however, one of each of these pieces of equipment would be adequate.

What To Look For In Buying This Equipment

1. Oscillograph
   Sensitivity—minimum 30 mv/in. R.M.S.
   Vertical amplifier response—Flat from a few cycles per second to a minimum of 100KC (at 10% point).
   Shielding—CRT, and input terminals must be fully shielded.
   Screen Size—Preferably 5".
2. Vacuum tube voltmeter
   Input impedence—At least 10 megohms.
   Voltage ranges—Minimum low range—3v. Minimum high range—600v.
   Polarity switching—Should incorporate provisions for switching between positive and negative voltage.
   Zero center scale—Should provide one for simplified FM alignment.
3. Sweep generator
   Flatness—Output should be flat within .2db.
   Shielding—Unit must be fully shielded to minimize extraneous pickup.
   Sensitivity—Should have at least a maximum 0.1v output.
   Sweep width—Minimum 10mc.
   Center Freq.—Minimum 4mc to 216 mc.
4. Marker
   Sensitivity—At least a maximum 0.1v output.
   Accuracy—Within ± 0.5%.
   Modulation—Should provide frequency for internal modulation of cw marker.
   Horizontal check—Incorporates horizontal oscillator for accuracy tests.
5. Scope P — P Calibrator
   Range—Preferably .01v to 100v in direct readings.
   Physically—Should be mounted on scope to provide instantaneous p — p measurement by simply turning a knob on the calibrator.

In describing the test equipment needed by a servicing dealer, DuMont and Emerson experts went into considerable detail, not only as to the equipment but also as to the features and performance characteristics which should be found in such equipment. For these opinions, see Charts I and II.

RCA, whose subsidiary, RCA Service Co., is the largest servicing organization in the field, suggested these guides for purchasing test equipment. (The large shop shown in the table employs from 16 to 20 technicians, the small has only three or four.)

Item	*Large Shop*	*Small Shop*
Audio amplifiers	1	1
Antenna rotor kits	8	2
Dual turntable racks	1	1
High voltage test probe	1	1
Oscilloscope	1	1
Circuit tester	27	5
Sweep generator	1	1
Crystal calibrator	1	1
Signal generator	1	1
Monitor TV set	1	1
RF unit test jig	1	1
Junior Voltohmyst	2	1
Sound power phone (hand)	7	2
Sound power phone (chest)	7	2
Telescopic survey truck	1	1
Tube tester	1	0
Survey receiver	1	0
Record player	3	3
Capacitor analyzer	1	0
16" test jig	2	1
17" test jig	2	1
21" test jig	2	1

Tools: Hand, Shop, and Installation

Chart III gives a good idea of the variety of tools required for servicing a set and for installation work. Generally speaking one set of hand tools is required for each bench. A single set of shop tools, however, should be sufficient for the entire shop.

Installation Supplies

A crew handling installations must carry a wide variety of supplies; these can be broken down roughly into antennas (and masts) and mounting accessories. An ample supply of accessories should be maintained on the truck at all times. The antennas and masts can be drawn from stock each morning to cover that day's jobs. Each truck should carry about 1,000 feet of antenna lead-in wire.

In determining his stock levels on installation supplies, the dealer must take into consideration the number of trucks being used and the number of installations handled on an average day. Generally speaking, a two-

CHART II —TEST EQUIPMENT (Emerson Recommendations)

The Equipment

1. Oscilloscope (from $175 to $300).
2. Vacuum Tube Voltmeter ($50 to $65).
3. Sweep and marker generators ($175 to $500).
4. AM-FM Signal Generator ($75 to $200).
5. Tube Tester ($150).

How Much Equipment

1. Usually only one alignment set (scope, sweep and marker generators) is necessary for the entire shop.
2. Each man should have a VTTM and oscilloscope.

What To Look For In Buying This Equipment

1. Oscilloscope
   An oscilloscope should have at least .05 volts per inch vertical deflection sensitivity and have a good frequency response to at least 150KC. Be certain that the input resistance is in the order of 35 mmf. or less and at least 1 meg ohm, and that it has provision for at least a 20KC sweep sync rate. Be certain that the scanning line has enough intensity and can be focused on high intensity settings. A good sync is also desirable.
   A more elaborate scope has provisions for peak to peak voltage readings, frequency response to over 300KC and a very bright and well focused scanning beam. The vertical sensitivity is usually in the order of .01 volts per inch deflection with high horizontal gain for expanding wave pattern. This type of scope sells for about $300.
   The above two pieces of equipment are required for service work. The following equipment is needed for alignment work which sometimes is the cause of many service headaches.
2. Vacuum tube voltmetee
   a) Make sure it has a high D.C. input impedance about 11 megohms for minimum loading of circuits.
   b) Low voltage scale of at least 5v.
   c) Zero center scale for alignment of Discr. is good but not necessary.
   d) Should also read A.C. volts and ohms. (x 1 meg).
   A more elaborate V.T.V.M. should also have a high input impedance on A.C. and be relatively flat for a wide range of audio frequencies, so that it can be used as an output meter and test probe. The cost for such a V.T.V.M. is about $65.
3. Sweep and marker generators
   a) Sweep 20 and 40 mc I.F. ranges. Plus F.M.
   b) Sweep entire T.V. R.F. spectrum.
   c) Linearity of sweep to be constant with output setting. (Voltage output should not change with frequency over sweep range).
   d) At least .1 volt output.
   e) Marker should be accurate to at least 1% preferably crystal controlled and relatively free of drift after warm up.
   f) Marker should have at least .1 volts output.
   g) Each unit should be free of Harmonic output (well shielded) especially the sweep generator.
   h) Provision for calibrating dial, especially for marker.
   There is more of a variation in price for the above items than practically any other. Better units have separate markers and sweeps and operate strictly on fundamentals. Cheaper units usually do not contain R.F. markers, so that the stations must be used to align the local oscillator. Such equipment cannot be used too well for the alignment or repair of tuners. Cheaper units which do a fair job cost about $175 while better units cost anywhere upwards of $500 for sweep and marker.
   In any event, the most important factors are sufficient output and good linearity, especially with a change in attenuator setting (output voltage).
4. AM-FM Signal Generator
   a) Cover frequencies of from about 100KC to 120 mc.
   b) Sufficient output at least .1 volt.
   c) Good stability after warm up and at least 3% accuracy.
   d) Amplitude modulated by about 400 cycles at approximately 30% modulation.
   Cheaper units operate mainly on harmonics, have low output, poor stability and tracking accuracy, about $50.
   Better units operate on fundamentals, have approximately 1% accuracy, have provisions for varying percent modulation and frequency of modulation, and also can frequency modulate the R.F. carrier. These units are approximately $200.
5. Tube Tester
   A tube tester is necessary for counter use, (testing customers tubes). It should be of the dynamic mutual conductance type and take all different type tubes including miniatures. It should have provisions for testing shorts and noise with an internal replaceable tube chart roll.

(*Continued on page* 26)

Setting Up for TV Service

(*Continued from page 25*)

CHART III—TOOLS . . . Hand, Shop and Installation

A. HAND TOOLS

Suggested by Du Mont

Screw driver set (regular and Phillips head)	$ 3.00
Set of spintights	5.00
Long nose pliers	2.00
Diagonal cutters	2.00
Set, alignment and adjustment tools	4.00
Soldering gun	12.00
Tube puller	.75
Pin straighteners (7 and 9 pin base)	.75
Hex and spline wrench set	1.25

Suggestions by Admiral

- Screw driver set (1/8" to 1/4" blade)
- Set, spin type wrenches, 3/32" to 3/8"
- Diagonal pliers
- Long nose pliers
- Soldering gun/iron
- Alignment wrenches

Suggestions by RCA Service Co.

- Diagonal pliers 6"
- Slip joint pliers—6"
- Screw driver, cap tip 8"
- Screw drivers, set of 4
- Ratchet—1/4"
- Socket set 11 pieces
- Soldering gun
- Needle-nose pliers—6"
- Crescent wrench—6"
- Phillips screw driver 1/4"
- Allen wrenches
- Mirror, 4 x 5 inches

Suggestions by Emerson

200 watt soldering gun	$13.00
Long nose pliers	2.25
Diagonal cutters	2.25
Set, spintights	4.25
Screw drivers (2)	1.00
Phillips head screw drivers (2)	1.50
Kit, alignment tools	1.00

B. SHOP TOOLS

Du Mont

Vise	$15.00
200 watt soldering iron	6.50
1/2" electric hand drill and set of drills	40.00
Wire stripper	4.00
Adjustable hack saw	1.75
Center punch	.75
Tool steel reamers	2.00
Set of files	4.00
Hammer	1.50
Set, open-end wrenches	3.00
Mirrors, stand	5.00
Electric grinder	15.00

Admiral

- Electric drill
- Vise
- Socket punches
- Drill set—1/16" to at least 1/4"

Emerson

- Use 200 watt soldering iron instead of gun
- Each technician is furnished more expensive set of alignment tools than specified under hand tools
- Shop tools such as vise, electric drill, etc.

RCA Service Co. (shop and installation tools)

- Extension cord, 100 feet
- Soldering iron
- Hammer, double face, 3 lbs.
- Wood lever, 12"
- Files (2), 8" med.
- Keyhole saw; hack saw
- Screw driver, 6" blade
- Screw driver, Phillips
- Pliers, side cut, 7"
- Cold chisel, 1/2"; wood chisel, 1/2"
- Center punch, 3/8" dia.
- Ratchet wrench box type (1/2 x 9/16")
- Ratchet wrench box type (3/8" x 7/16")
- Flashlight, right angle
- Channel lock pliers
- Tri-plug
- Bit brace
- Claw hammer, 16 oz.
- Screw driver std. tip, 3" blade
- Cab. tip and screw
- Diagonal pliers, 7"
- Pliers, needle-nose, 7"
- Paint brush, 1"; putty knife
- End wrench, 8"
- Steel tape, 6 ft.
- Pliers, slip joint

C. INSTALLATION TOOLS

Du Mont

- Adjustable 50 ft ladders
- Pipe wrenches
- Rope (100 ft)
- Extension cord (200 feet with multiple outlets)
- Set masonry drills
- Hammer heavy construction type
- Set chisels
- Pair of phones—sound powered
- Heavy duty electric drill
- COST: About $120 per truck

Emerson

Hack saw	$1.25
Pipe wrench	5.00
Vice grip wrench	1.00
Set, box wrenches	3.00
Assorted size star drills	1.00
Medium size hammer	2.50
Large screw driver	.70
Lacquer (for corrosion proofing)	

man crew should be able to handle four installations per day.

For some idea of what's required in the way of supplies for installations, see Chart IV.

CHART IV—INSTALLATION SUPPLIES

- Antennas, Masts and Mast extensions, Mast connectors
- 300 ohm antenna wire
- Coaxial cable (72 or 75 ohm. Should be used only for special applications: electrically noisy areas, damp salty areas where 300 ohm line would deteriorate rapidly).
- Gonset low loss open wire line (to be used only in extreme fringe areas where minimum line loss is necessary).
- Lightning arrestor, aluminum ground wire, ground clamps and ground rods
- Mounts: chimney, wall, adjustable wall (for clearing obstructions) and base mounts
- Guy Wire (6 strand steel wire), turnbuckles and guy rings
- Anchor bolts for mounting brackets to masonry
- Lead plugs for securing stand-offs to masonry
- Stand offs for: twin lead in wire, coaxial antenna wire
- Single and double mast stand-offs for securing antenna wire to mast
- Insulated tacks, black friction tape
- Spring-wing toggle bolts for mounting brackets against hollow wall
- Rotors and boosters

Parts

A good service operation is no stronger than its weakest link—and the most elaborate service set-up will be rendered ineffective if the dealer fails to stock an adequate supply of parts and tubes.

What constitutes an adequate stock of these items is a question which is best determined with reference to past experience. Some general rules can be set up as a preliminary guide. They may have to be adjusted or supplemented when a dealer has put them into effect and determined whether they suit the conditions he is meeting.

One manufacturer tells his dealers: maintain two replacement parts unless you find that you need more. Have at least 10 tubes of each type on hand and for the more popular types, keep 50 on hand.

RCA Service Co. carries a two-month supply of parts available within 30 days and keeps an additional month's supply on order.

Maintenance of a parts inventory system is strongly recommended, both as a control measure and as a means of determining satisfactory inventory levels. These records can be maintained in a variety of forms. Dealers should remember that the more information required by the system, the more valuable it will be to management. The following items, listed in order of their importance, could be included:

1. Record of purchases by description, purchase order number and date and quantity ordered.
2. Record of receipts by quantity and date.
3. Cost of item to dealer and list price.
4. Usage and balance on hand.
5. Minimum and maximum stock quantities.
6. Location of items.

According to Harold Schulman, manager of the Du Mont teleset service control department, the information provided in items (1) and (2) above automatically provide the dealer with:

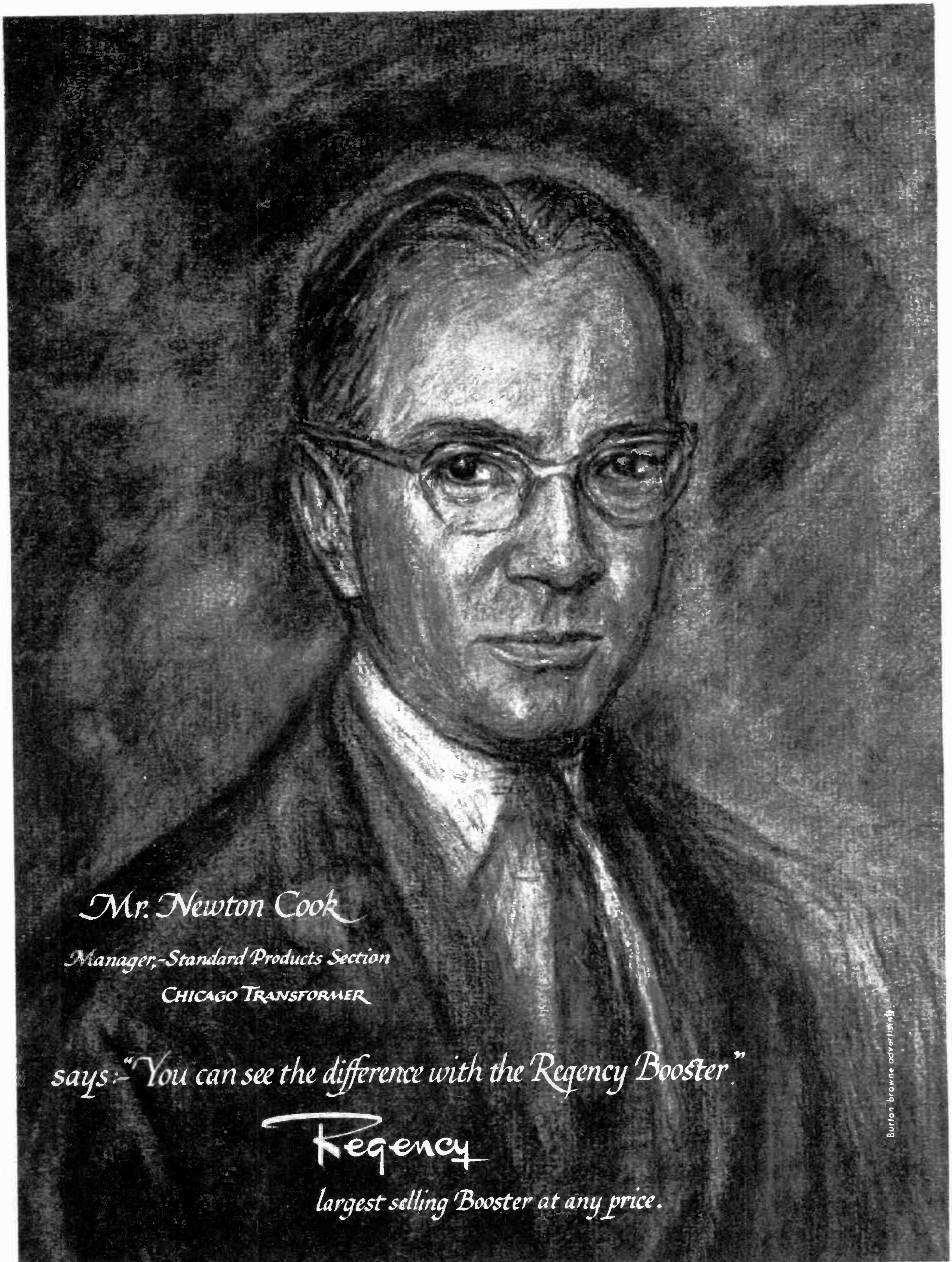
a. The approximate rate of usage. Quantity to be purchased can then be judged according to the frequency and quantities of past orders.

b. A safeguard against reordering parts already on order—a major cause of overstocking.

c. A steady reference file for giving approximate dates of delivery and timing of purchases.

This system has one drawback, Schulman warns: it provides no usage report. The dan-

(*Continued on page 31*)


Mr. Newton Cook
Manager,-Standard Products Section
CHICAGO TRANSFORMER
says:-"You can see the difference with the Regency Booster."
Regency
largest selling Booster at any price.
Burton browne advertising

REPLACEMENT PARTS, Etc.

(*Continued from page* 13)

magnitude of electrical losses. It is expressed in terms of percentage. The range of power factor for paper dielectric tubulars at base temperatures of 20 to 25°C is from perhaps .25 to 1%. As a general rule, power factor increases with both decrease and increase in operating temperature relative to the rated base temperature, so that an increase of from 3 to perhaps 5% for a temperature rise of 40—60°C is not unusual. Generally, the power factor increases very rapidly when a capacitor is used at temperatures beyond its rated operating temperature.

In the case of mica capacitors and ceramic capacitors, the power factor figures are substantially lower than for the paper dielectric type of unit. Assuming these types of capacitors are being used within their rated operating temperatures, the power factor of mica capacitors generally is substantially below 0.2%, especially the silver mica variety. Ceramics are in the same category, generally even better, frequently displaying power factor values as low as .02%, if not less.

The general order of paper dielectric tubular, mica dielectric and ceramic dielectric offered for replacement are within the general ratings set by the receiver manufacturers for the original components used in their receivers.

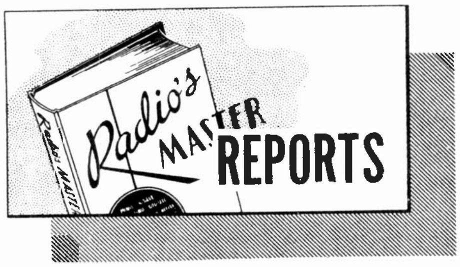
Summary

We realize that all possible items relating to capacitors have not been treated in this series. As it is, and even with these omissions the articles have extended over six issues of SUCCESSFUL SERVICING. We have much more to go in covering the other components used in television receivers.

The facts given herein, when supplemented with information contained in the capacitor manufacturers' catalogues, and when complemented with the information given in the Rider Replacement Part Listings, should be of material aid in the problem of understanding TV receiver capacitor components and replacements.

The statements made in these series of articles represent highlights of the factors which are important relative to this component. We say this to fend off possible misconceptions which may result from the occasional hap-hazard selection and use of a replacement capacitor in a television receiver without noting any undesirable effects. This may lead one to believe that the important points raised here are simply efforts to fill space. This is not so. Many service technicians have been greatly confused by the peculiar behavior of receivers after a capacitor replacement which, to all intents and purposes, should have worked properly because the capacitor was electrically perfect.

We might emphasize to the servicing industry that, as time passes, closer and closer attention will have to be paid to capacitance tolerance and temperature coefficients and that when a service technician takes in a stock of fixed capacitors he will require 10% units as well as 20% units, and in some few instances even 5% units. Fortunately this is not a problem, because an examination of the Rider Replacement Part Listings found in Rider Manuals, discloses the fact that some specific values of capacitors more than others, are of the 10% capacitance tolerance rating. Incidentally, this might be of interest also to the capacitor manufacturers who sell to the parts jobbers, and to the parts jobbers who in turn sell to the servicing industry.



A monthly summary of product developments and price changes supplied by RADIO'S MASTER, the Industry's Official Buying Guide, available through local parts distributors.

COMMENT: Over-all product activity continues to be heavy, with more manufacturers reporting changes for this period. As noted last month, tube, antenna and sound manufacturers continue their dominance of the "change activity" scene, while the steady increase in tube prices noted over the last three months has slackened off slightly.

New Items

AMERICAN MICROPHONE — Added Model RCS, crystal microphone with slide switch at $8.10 dealer net.

AMERICAN PHENOLIC — Added new bo-ty and reflector antenna package No. 114-065 at $4.65 dealer net, containing No. 114-053, bo-ty and No. 114-560, bo-ty reflector, with stacking bar included.

CLEVELAND ELECTRONICS — Added Model 88, UHF TV antenna at $5.97 dealer net.

CORNELL-DUBILIER — Added auto radio replacement vibrators; Model 6326 at $2.76 dealer net . . . Model 6330 at $2.76 dealer net . . . Model 6370 at $2.52 dealer net and Model 5370 at $2.52 dealer net, which supercedes Model 5520-4.

CREST LABS. — Added a number of Universal Variable Inductance Kits. Also added a new series of receiver replacement output transformers.

FRETCO — Added Bo-Ti UHF antennas; Model Bo-Ti at $2.70 dealer net . . . Model Bo-Ti reflector at $4.35 dealer net and Model Bo-Ti corner reflector at $8.97 dealer net.

GENERAL ELECTRIC — Added GL-6130, a hydrogen thyroton especially designed for pulsing applications which require a tube that will give dependable operation at high altitudes under stringent operating conditions at $18.00 dealer net and TV picture tube 21ZP4A at $38.50 dealer net.

HARVEY-WELLS ELECTRONICS — Added Bandmaster VFO at $47.50 dealer net.

HYTRON — Added point-contact transistors No. PT-2A at $17.40 dealer net and No. PT-2S at $17.40 dealer net. Also added receiving tubes 12X4 at $1.55 list . . . 12AQ5 at $2.00 list . . . 12V6GT at $2.00 list and germanium diode 1N133 at $1.20 dealer net.

ILLINOIS RESEARCH LABS. — Added Silencer, gallon size at $24.00 dealer net and Sta-Clear, quart size at $4.50 dealer net.

MALLORY & CO., P. R. — Added new 12 volt replacement vibrator, Model G-874 at $3.30 dealer net. Also added Model 6SAC4, battery charger with selenium rectifier at $10.00 dealer net . . . Model 12SAC5, battery charger with selenium rectifier at $24.00 dealer net . . . Model R-670, output cable at $1.30 dealer net and Model 675, output cable at $1.49 dealer net.

MARKEL ELECTRIC PRODUCTS — Added No. A-7180 at $9.98 dealer net and No. A-7181 at $9.98 dealer net, both sapphire tipped Pfan-Tone Cartridges. (These models replace metal tipped Pfan-Tone cartridges No. A-7157 and No. A-7158.)

NATIONAL ELECTRONICS — Added full-wave rectifier, Model NL-606 at $16.63 dealer net and ignitron, Model NL-1005 at $80.50 dealer net.

PERMOFLUX — Added outdoor theater speakers Model 4C-DI at $2.73 dealer net and Model 52C-DI at $2.91 dealer net.

PREMAX PRODUCTS — Aluminum ground wire No. AW-810 at $1.62 dealer net . . . No. AW-825 at $3.60 dealer net and No. AW-850 at $7.20 dealer net have been added to their line.

QUAM-NICHOLS — Added Model QF-3, focalizer unit at $3.57 dealer net and Model IT-4, ion trap at $.60 dealer net.

RCA — Added No. 76323, sapphire at $.90 dealer net. Also added Volume VII to their Service Data series at $5.00 dealer net.

RADIO RECEPTOR CO. — Added a number of new germanium diodes.

REEVES SOUNDCRAFT — Added a number of new tape recording accessories.

RIDER, JOHN F. — Added No. 143-2, TV Manufacturers' Receiver Trouble Cures, Volume 2 at $1.80 dealer net . . . No. 145, TV Sweep Alignment Techniques at $2.10 dealer net and No. 2011, Rider Television Manual, Volume 11 at $24.00 dealer net (available in April).

SCALA RADIO — Introduced Model BZ-4, voltage doubler probe at $10.75 dealer net.

SCOTT INC., HERMAN — Added Model 214-AB at $196.75 dealer net and Model 214-X8 at $29.95 dealer net, both remote control amplifiers and Model 120-AB, equalizer pre-amplifier at $79.25 dealer net.

SPRAGUE PRODUCTS — Added a number of twist-lok electrolytic capacitors.

STANCOR — Added new ultra-miniature transistor transformers; No. UM-110, interstage at $7.35 dealer net . . . No. UM-111, output or matching at $9.00 dealer net . . . No. UM-112, high imp. mic. input at $8.25 dealer net . . . No. UM-113, interstage at $6.60 dealer net and No. UM-114, output or matching at $9.00 dealer net.

SYLVANIA — Added 21" TV picture tubes; 21-WP4 at $39.00 dealer net . . . 21XP4 at $40.50 dealer net . . . 21YP4 at $41.50 dealer net and 21ZP4 at $40.00 dealer net. Also radio receiving tube 6CS6 at $1.90 list.

TRIPLETT ELECTRICAL CO. — Added Model 420, volume unit meter at $16.50 dealer net and Model 420 (illuminated) at $18.00 dealer net.

TURNER CO. — Added Model 9R, microphone at $14.10 dealer net . . . Model SR9R, microphone at $16.80 dealer net and Model C-4, stand at $3.45 dealer net.

WHARFEDALE SPEAKERS — Added Model HS/CR/3, 3 way crossover network at $31.00 net.

Discontinued Items

ASTATIC CORP. — Discontinued Models AT-1B, BT-1 and BT-2 all TV and FM radio boosters.

ELECTRONIC MEASUREMENT — Discontinued Model 300, vacuum tube volt-ohm-capacity meter and Model 300P, same meter with portable case and cover.

GENERAL ELECTRIC — Discontinued Model RPX-051, triple play variable reluctance cartridge . . . Model RPX-042, single variable reluctance cartridge and Model SPX-001, phono preamplifier.

INTERNATIONAL RESISTANCE — Discontinued replacement control QJ-375.

RAYTHEON — Discontinued TV picture tubes 3KP4 and 12LP4.

SIMPSON MFG. CO. — Discontinued a number of items including driver pre-amplifiers; Models DR-5, DR-5M, DR-5MP and DR-5P.

SYLVANIA — Discontinued radio receiving tubes 1S6 . . . 1W5 and IX2.

TRIPLETT ELECTRICAL CO. — Discontinued Model 466, electrodynamometer.

VIBRALOC — Discontinued their "W" series containing sloping wall type baffle . . . grill plate and reducers.

WIRT PRODUCTS — Model S-924, auto radio iginition suppressor, snap-on plug type, discontinued.

Price Decreases

CLEVELAND ELECTRONICS — Decreased price on Model T-WA, lightning arrester to $.90 dealer net.

CONTINENTAL CARBON — Model NF-½, metal film resistor, decreased to $.48 dealer net.

CORNELL-DUBILIER — Decreased price on a number of auto generator capacitors.

DUMONT LABS. — Decreased price on teletron tube 16K/RP4 to $28.00 dealer net.

GENERAL ELECTRIC — Decreased price on industrial and transmitting type tubes GL-5670 to $5.25 dealer net and GL-5844 to $2.25 dealer net. Also decreased TV picture tube 21ZP4A to $38.50 dealer net.

GONSET — Decreased price on rocket antennas; Model 1511 to $18.27 dealer net and Model 1510 to $8.55 dealer net.

RCA — Decreased price on batteries; No. VS216 to $2.30 dealer net and VS236 to $.21 dealer net.

SYLVANIA — Sub-miniature tube 5719 decreased to $9.80 dealer net.

Price Increases

ALPHA WIRE — Increased prices on numbers 286, 289, 292, 295 and 296, tinned copper bus-bar wire.

GENERAL ELECTRIC — Increased price on TV picture tube 17CP4 to $26.15 dealer net. Also increased price on Model RKP-009, replacement parts kit for triple play cartridges (less stylus assemblies) to $.19 dealer net.

GONSET — Model 3026, 2 meter transmitter receiver increased to $199.50 dealer net. Also increased price on Model 1508, rocket antenna to $5.67 dealer net and Model 1512, rocket antenna to $5.07 dealer net.

HYTRON — Increased price on radio receiving tubes 12A4 to $2.40 list . . . 12B4 to $2.40 list . . . 6BY5G to $2.90 list and germanium diode 1N51 to $.54 dealer net.

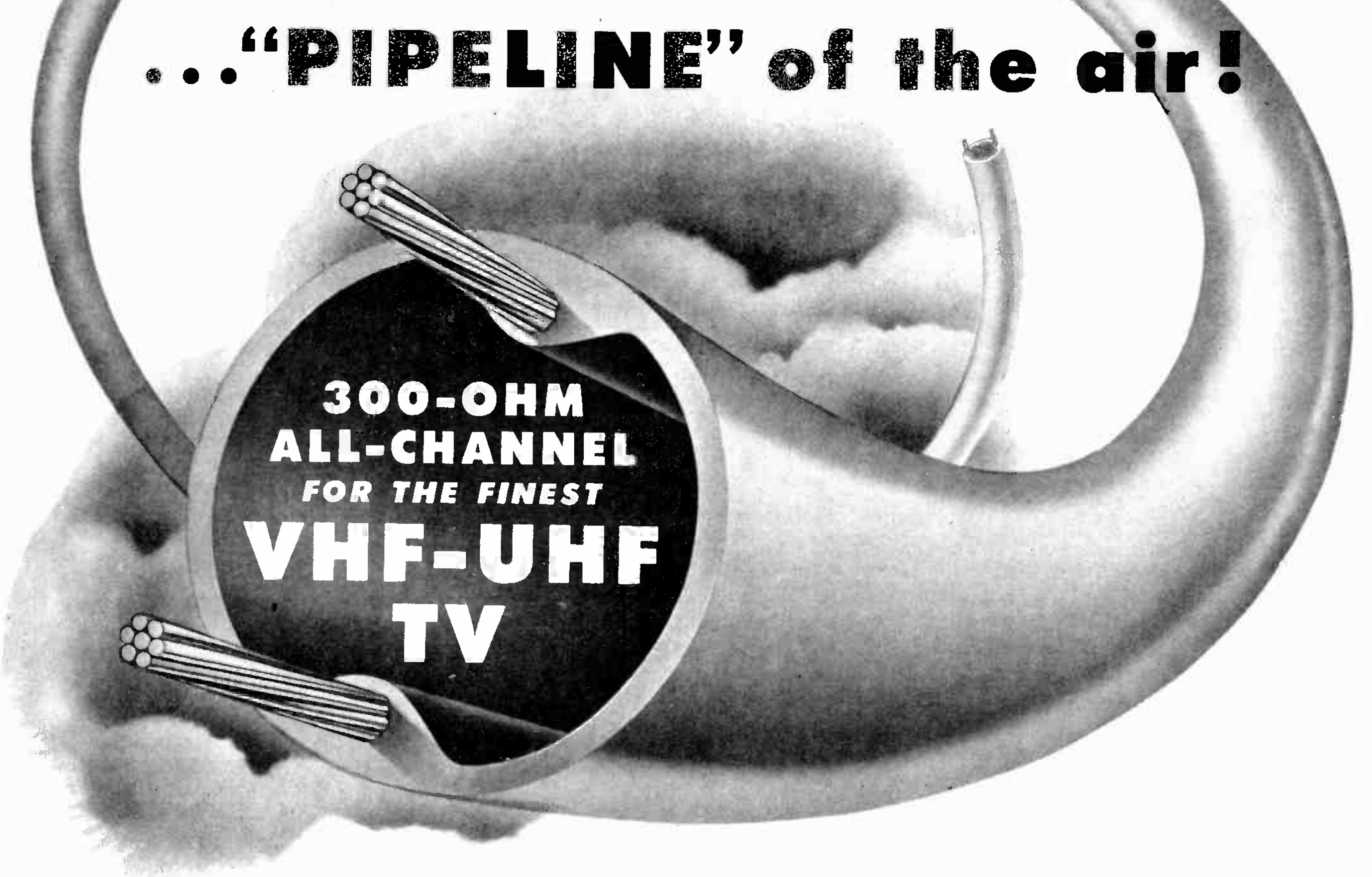
Correction

GONSET — Only the 1521 model radarray has been discontinued—not the complete series as was published in error.

INDEX OF CHANGES

Model No.	Manual Page From	To	Tek-File Pack
Gamble-Skogmo 05TV1-43-9014A, 15RA2-43-9105A, Ch. 16AY210	6-1	6-16	3
Magnavox Ch. CT-275, -276, -277, -278, -279, -280, -281, -282	7-14	7-28	30 30
Sylvania 1110X, Ch. 1-329	8-64	8-82	13
Sylvania 71M, 72M, 73B, 73M, Ch. 1-366(C08), 1-441(C02)	8-140	8-153	13

Presenting *Federal's* TV-1185
..."PIPELINE" of the air!



with the all-weather "silver" pigmentation that lets you
INSTALL IT and FORGET IT!

FEDERAL'S TV-1185—newest sensation of the top-quality twin-leads — is virtually a *"pipeline"* for better-than-ever TV reception ... VHF or UHF!

Insulated with the revolutionary Federal-developed "silver" polyethylene, TV-1185 is amazingly *tough* and *efficient.* It repels sunlight...fights heat... resists moisture and salt spray and other destructive deposits. Dirt and dust *tumble* off its fine, smooth, tubular surface!

TV-1185 keeps the energy field inside the weather-proof "silver" polyethylene sheath ... providing *low loss ... more constant impedance* ... a better TV picture regardless of area or length of lead!

There's nothing finer for VHF or UHF than Federal's "pipeline" twin-lead ... *because nothing but the finest has gone into its design and production!*

For complete details see your Federal distributor or write to Dept. D-5101.

OUTSTANDING FEATURES OF FEDERAL'S TV-1185

- Exceptionally low loss
- Holds impedance values
- Copperweld conductors—7/#28
- Leads in Weatherometer tests
- Flexible in low temperatures
- Rejects ultra-violet rays at higher temperature levels
- Top performer in any area
- Attenuation- db/100 ft.

10 mc— 0.50	400 mc— 2.6
50 " — 0.95	500 " — 3.0
100 " — 1.11	1000 " — 4.6
200 " — 1.7	

- SO EASY TO INSTALL:

Expose required length of wire by stripping off polyethylene. To tight-seal, heat end of tube with match or other flame and crimp together with pliers. Sealing assures quality performance under all atmospheric conditions.

Federal
Telephone and Radio Corporation

FEDERAL TELEPHONE & RADIO · FTR · AN IT&T ASSOCIATE

SELENIUM-INTELIN DIVISION, 100 KINGSLAND ROAD, CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P.Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

Setting Up For TV Service

(*Continued from page 26*)

ger of running out of an item before it can be ordered can be minimized by keeping a "want book". Anyone drawing parts should be required to note in this book if the stock of that particular item is low. This, of course, poses a problem of what is "low stock". Although it is possible to rely on the judgment of the parts clerk, a more desirable solution is to establish a minimum quantity. This can be posted on the bin or drawer where the part is stored. On small parts, the minimum quantity can be placed in a sealed envelope; when it becomes necessary to open the envelope, parts should be reordered.

What Does it Cost

Determining what maintenance of a good service shop and an adequate parts inventory will cost a dealer in dollars and cents investment is difficult to determine. Most servicemen feel that the dollars and cents figure is relatively unimportant when measured in terms of the return the dealer can expect from his service operation.

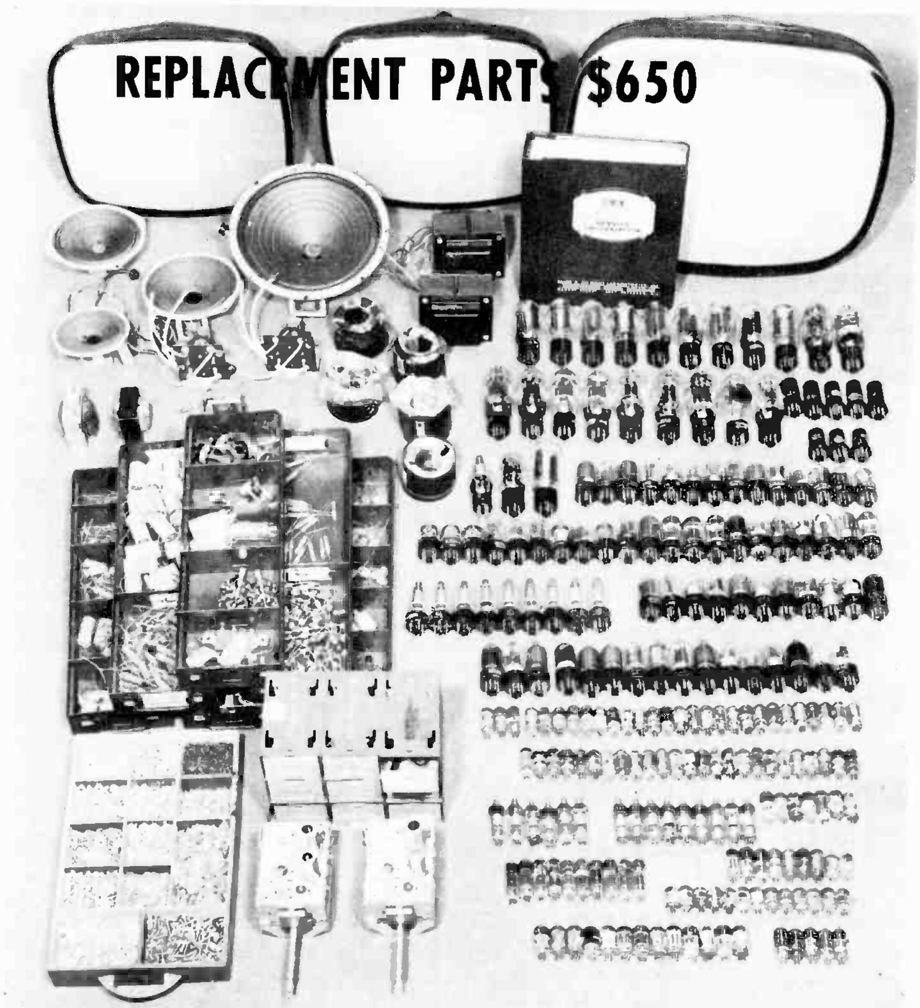
In addition, the investment varies with the dealer's location, the size of his shop and the volume of business he handles. Even with all these variables, one must consider also that dealers in the same area with the same business volume may differ in the amount of money they invest. One may feel that the "minimum" investment in equipment and parts is the wisest decision; the second may decide to spend considerably more in setting up his shop.

Du Mont's Schulman estimates the cost of a service shop in these terms (truck not included):

a. deluxe operation — about $2500 (including $1000 in parts)
b. average operation — about $1500 (including $600 parts)
c. minimum operation — about $1000 (including $300 in parts).

Harold Bernstein, service manager for Emerson, uses a different basis in coming up with his estimate. For a one man operation, he says, equipment, tubes, fixtures and basic parts would require about $2500. For each additional man add about $125 more for extra tools, meters, tubes and so forth.

No matter whose estimate you accept, establishing a service shop is an expensive move in terms of dollars and cents alone. A decision as to whether the investment will pay off—both tangibly in the form of dollar income from service work and intangibly in the form of a good service reputation which builds additional set sales for the dealers—is one that must be made with reference to the dealer's own circumstances.



Some Questions and Answers, etc.

(*Continued from page 7*)

require substantial differences in the constants of the vertical output tube, or that the use of a 20% capacitance tolerance capacitor where a 5% unit is required results in instability and unsatisfactory receiver performance. We do not feel that a service technician should make changes in circuit constants in order to compensate for a replacement part that is not within the required tolerance ratings of the original component. Because we adhere to this philosophy in the listing of replacement parts, the service technician can have the greatest faith in the replacement parts which are shown in Rider Lists. It explains why our listings of suitable replacement parts show fewer parts than other listings.

Q—If you exercise care when selecting replacement parts for listing, why do you have to publish change notices?

A—For several reasons. Regardless of the extreme care which is used in checking, typographical errors in parts number listings occur. Remember that we are listing thousands upon thousands of numbers, and transpositions are possible. We try to keep the errors to the absolute minimum, but they occur.

A second reason is the changes which are made in receivers at the manufacturing point. If one part was a replacement and a change was made calling for a new replacement part, it is foolish to continue reprinting the original replacement part number—the new one with the changed part is the correct one.

We publish additions to the list because some of the replacement data arrives too late for inclusion in the printed list, and because the parts manufacturers we work with are adding new replacement parts to their line.

Q—Your replacement parts lists show only the set manufacturers' parts numbers, but not the receiver chassis in which they are used. Why?

A—This was so only in the Rider TV 10 Manual listing. In the new replacement parts listings for TV 11, which will be cumulative for TV 10 and TV 11, the parts numbers are related to the chassis in which they are used. A section of the replacement parts list for Emerson is shown herein as an example of our new listing format.

Q—Why don't you have replacement parts listing for Rider's TV 9 and earlier manuals?

A—Because we started the replacement part listing program with TV 10. However, we now are in the process of preparing data on TV 9 and earlier Rider TV Manual contents. The task of preparing the data is prodigious; we must prepare information specification sheets for the parts manufacturers, and before we do this it is necessary to correlate the contents of the receivers made during all the production runs. It will take time to do this, but it will be done. Such replacement parts guides will be available to service technicians sometime in the near future.

Fig. 2. Below: Type of spec. sheet on which the part's manufacturer lists his replacement suggestion.

This is your file copy.

JOHN F. RIDER PUBLISHER, INC.
480 CANAL ST., N. Y. 13, N. Y.

This information prepared by
JOHN F. RIDER LABS INC
480 CANAL ST., N. Y. 13, N. Y.
for

Information requested below is required within 10 working days from date shown

DATE
RECEIVER Sylvania MFR. Same
MODEL NO.
CHASSIS NO. 1-502-3
SERIAL NO.
CIRCUIT SYMBOL NO.
PART FUNCTION
REC. MFR. PART NO. 141-0022
DWG # 55-77358

POWER TRANSFORMERS

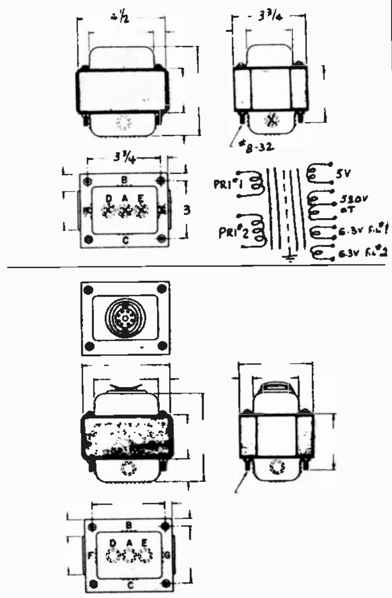
Windings	Lead Position	Lead Color	Minimum Lead Length	DC Resistance	Volts / Amps / Cps
Primary #1	B	BLK. / BLK-RD	7½ / 7¾		117V* 60~
PRIMARY #2	B	WHITE / BLK-YEL	5½ / 6½		117V* 60~
Secondary #1 CT	B	RD / RD-YEL	7⅞ / 3¼		@ 315 ma DC 260V-0-260V
Secondary #2 CT	B	YEL	6		5V 6A
Secondary #3	B FIL #1	GRN / ORANGE	5⅜ / 5⅜		6.3V 6.3A
Secondary #4	B FIL #2	BRWN / BLUE	6⅝ / 5⅝		6.3V 6.3A
Secondary #6					

Insulation Test Between FIL #1 and GROUND 2500 Volts RMS
Between and Volts Temp. Rise 55 C MAX.
Between and Volts
Ripple Input To Filter Volts Peak-to-Peak Ripple Output From Filter Volts Peak-to-Peak
Potting Compound Clearance Faraday Shield Yes No
Remarks: For 117V operation, Connect PRI #1 + #2 in parallel; for 234V in Series

SUGGESTED REPLACEMENTS

Manufacturer	Number	Remarks	Signature

JOHN F. RIDER PUBLISHER, INC., 480 Canal Street, N. Y. 13, N. Y.



VARIABLE RESISTANCE CONTROLS

NOTE: For single controls the identification may appear under the Cat. No. or Stock No. columns. If a special shaft number is shown for a single control, it appears under Inner Shaft column.

RECEIVER MANUFACTURER: EMERSON — MODELS & CHASSIS; REPLACEMENTS

COMPONENT TYPE and PART NUMBER	120153-B	120153-D	120160-B	120162-A	120163-D	120164-B	120166-D	120168-D	120171-B	CLAROSTAT Cat. No.	CLAROSTAT Inner Shaft	CLAROSTAT Switch No.	IRC Stock No.	IRC Kit. No.	IRC Panel Elem.	IRC Rear Elem.	IRC Outer Shaft	IRC Inner Shaft	IRC Switch No.	MALLORY Stock No.	MALLORY Kit. No.	MALLORY Panel Elem.	MALLORY Rear Elem.	MALLORY Outer Shaft	MALLORY Inner Shaft	MALLORY Switch No.
390142	X	X	X	X						AG-83-S	FKS-1/4		Q11-139							SU56						
390143	X	X	X	X						A43-5000	FKS-1/4		W-5000							R5000L						
390156					X	X		X		AG-61-S	KSS-5		Q11-137							U-54					DS-36	
390163	X	X	X	X						AG-61-S	KSS-3		Q11-137							U-54						
390164	X	X	X	X						AG-44-S	KSS-3		Q11-123							U-35						
390181					X	X		X		AG-52-S	KSS-5		Q11-129							U-43					DS-36	
390183					X	X		X		AG-44-S	KSS-3		Q11-123							U-35					DS-36	
390184	X	X		X						RTV-296			QJ-313	K-2	B17-110	B13-137	P1-224	R1-308	76-1			UF152R	UR16A			US-26
390187			X							RTV-362			QJ-237	K-2	B17-110	B13-137X	P1-224	R1-308	76-1			UF152L	UR16T25			
390191	X	X	X	X						AG-52-S	RS-2		Q11-129							U-43						
390196					X	X	X	X	X	AG-83-S	FKS-1/4		Q11-139							SU56						
390197					X	X	X	X	X	A43-5000	FKS-1/4		W-5000							SU14						
390201					X	X		X		RTV-296			QJ-313	K-2	B17-110	B13-137	P1-224	R1-308	76-1			UF152L	UR16A			US-26
390202				X	X	X	X	X	X	AG-83-S	FKS-1/4	SWB	Q11-139						76-1	U-56						US-26
390207							X		X	RTV-378			QJ-410	K-2	B17-109	B13-137	P2-116	R1-202	76-1			UF152L	UR16A			US-26
390208							X		X	AG-52-S	KSS-3		Q11-129							U-43						
390209							X		X	AG-44-S	KSS-3		Q11-123							U-35						
390211							X		X	AG-61-S	KSS-3		Q11-137							U-54						
390219							X	X	X	AG-52-S	FKS-1/4		Q11-129							U-43						

Fig. 3. A greatly reduced example of how variable resistors are shown in Rider's Replacement Parts Listings.

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