

RADIO and TELEVISION *maintenance*

**CALIBRATING THE
TV OSCILLOSCOPE**

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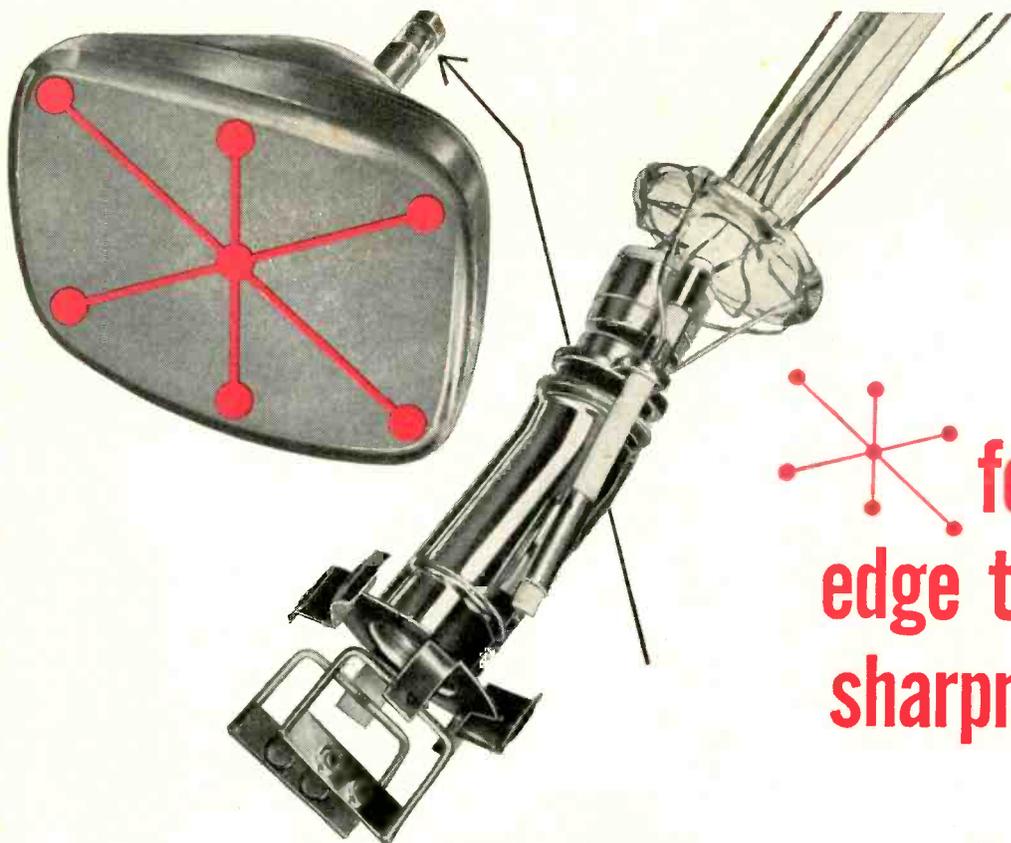
**AN ANALYSIS OF HEATER
AND FILAMENT CIRCUITS**

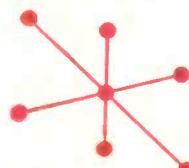
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custom television businessSee Page 10

OCTOBER 1950




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TV SET MAKERS BALK AT FCC COLOR STAND

Reaction of television set manufacturers to the FCC's tentative acceptance of the CBS color TV system was an almost universal refusal to accept the commission's recommendation of "bracket standards," which would permit reception of CBS color broadcasts in black and white, on new black and white receivers. The strongest comment was from RCA, which called the FCC findings "scientifically incorrect," and said the company would continue to work on its own color system. The stand taken by the set makers puts the FCC in the position of having to go ahead with its intention, announced early in September, of fully authorizing the CBS system.

OTHER COLOR SYSTEMS ARE TOO COMPLEX—COY

Wayne Coy, chairman of the FCC, clarified the group's position on the color issue by telling the National Electronics Conference that all seven commission members were agreed that the RCA and CTI designs were too complex for home use, and that they did not produce true colors. He said the commission was satisfied that "the defects were fundamental" and that the mechanical disk of the CBS system would probably be replaced eventually by direct-view tubes. This might well eliminate one of the chief objections to the device: the limitation on picture tube size imposed by the use of a rotating disk in front of the screen.

CAN'T DEPRIVE 40 MILLION OF COLOR

The non-compatibility of color receivers built for the CBS system is a major point of contention by manufacturers. FCC members, according to Chairman Coy, "agreed that it would be desirable to have a compatible color system if that were possible . . . (but) no successful compatible color system has been demonstrated." He declared, however, that existing sets could be adapted for reception of CBS color at a "reasonable price," and that it would not be fair to "deprive 40,000,000 families of the opportunity to have color simply because the owners of 7,000,000 or 8,000,000 sets might have to spend some money in adapting their present receivers."

NOT ENOUGH TIME FOR BRACKET STANDARDS

Although the question of CBS compatibility would be solved by the adoption of bracket standards for new sets, manufacturers said it would take much longer for them to engineer the modifications than the time allowed by the FCC. The commission stated that extra time to develop other systems would be allowed only if the manufacturers agreed to begin producing sets capable of receiving CBS color TV in black and white by the middle of November. Even the companies that were willing to abide by the decision, such as Emerson, Hallicrafters, General Electric and DuMont, said it would be impossible for them to begin production in less than several months at least.

EXTEND COAX AND MICROWAVE LINKS

More and more communities were promised network TV as coaxial cables were extended. One line was built to Atlanta, Ga., while AT & T announced that it had finished a chain of relays from New York to Chicago, and would soon complete connections to Omaha. Construction is underway to span the nation with relays and cables.

TV NETWORKS FIGHTING FOR CABLE ALLOCATION

Network broadcasters are still arguing with AT & T as to how the inter-city connections should be allotted. Of the four major networks, NBC and CBS were reported to be claiming that time allocations should be made on the basis of advertising time sold to sponsors, while ABC and DuMont were trying to get an equal four-way split of the use of the facilities. AT & T proposed a division of the time which did not satisfy any of the networks.

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QUESTION

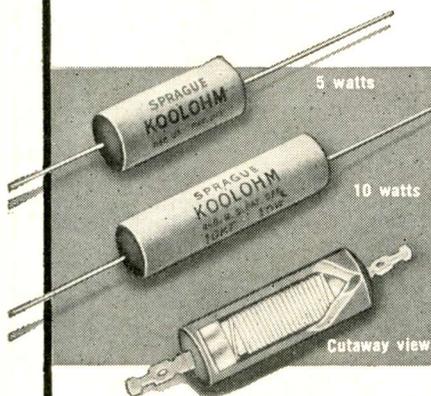
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ANSWER

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SERVICE HINT

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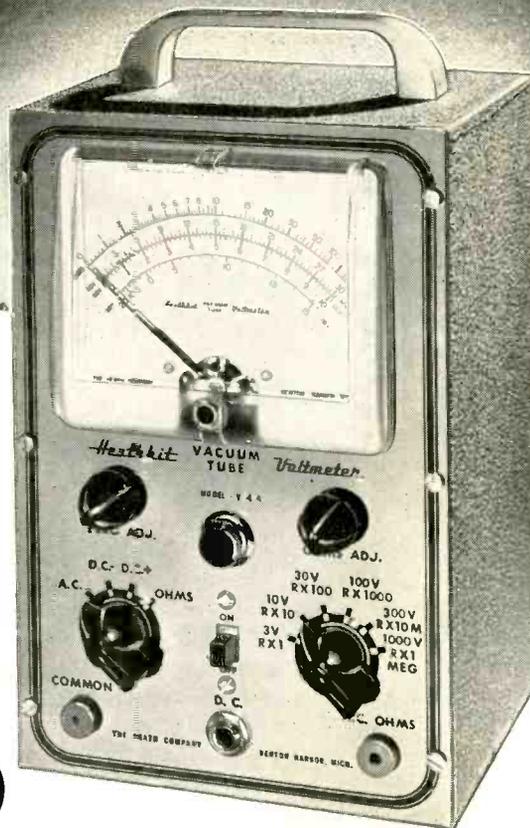
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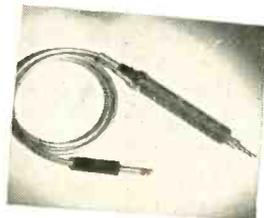
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CALIBRATING THE TELEVISION OSCILLOSCOPE

By RUFUS P. TURNER

IN past years, few radio service technicians made any attempt whatever to use the oscilloscope in trouble shooting. Most repairmen thought its usefulness was dubious. Television servicing, however, has brought the oscilloscope to the front as an *essential* instrument. Wide-band oscilloscopes suitable for reproduction of television waveforms now are available to the serviceman at prices he can afford to pay.

Both qualitative and quantitative information may be obtained from oscilloscope patterns. By qualitative information, we mean that the shape of a wave may be ascertained (that is, whether it is a rectangular pulse, square wave, differentiated pulse, sine wave, or some other type, and whether it is distorted). By quantitative information, we have in mind the actual peak voltage of the wave or portions of it being studied. Both types of information, of course, are important to the trouble shooter. Not only is it necessary to know that the signal in a given stage has the proper wave shape, but we must determine also its peak or peak-to-peak amplitude in order to ascertain operating conditions in the stage. The bandwidth of the vertical amplifier of the TV oscilloscope is sufficient to insure faithful reproduction of the wave shapes encountered in TV receiver stages. The TV oscilloscope thus is a voltmeter capable of handling a wider variety of complex waves than any ordinary meter.

In order that accurate quantitative measurements may be made, the oscilloscope screen must be calibrated, and its calibration should be checked occasion-

ally as a routine matter to compensate for aging of tubes and components within the instrument. Only when a complete screen calibration has been made can the technician give an intelligent answer to the questions "what is the voltage value of the observed signal?" and "how much amplification or loss results from a given circuit adjustment?"

Ratings Not Accurate

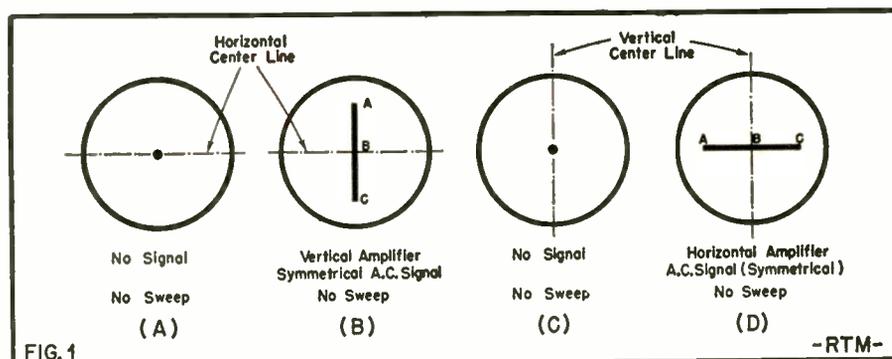
At this point, the reader is apt to inquire why the sensitivity given by the scope manufacturer is not sufficient. The answer is that such figures depend upon several variable factors, such as voltage amplification within the instrument, uniformity of tubes, and uniformity of circuit components in manufacture. A certain amount of variation between instruments of the same type, therefore, can be reasonably expected. Individual calibrations cannot be made at the factory on each instrument without raising the sales price in proportion. Moreover, the voltage sensitivity figures given usually apply to one operating

condition, that is, with the oscilloscope gain controls wide open, a condition seldom attained in actual practice.

Voltage and Deflection

When no signal is applied to the vertical amplifier input terminals of the scope, and the internal sweep oscillator is switched off, a single spot appears at the center of the screen. This condition is illustrated by (A) and (C) in Fig. 1.

Now, consider a symmetrical AC signal applied to the vertical input terminals. A symmetrical signal is one in which the positive and negative peaks have equal amplitudes. During the positive half-cycle, the spot will be deflected from its position of rest B (see Fig. 1-B) upward to point A and back to B. It then will be deflected downward to point C and back to B during the negative half-cycle. The result is the vertical straight-line trace ABC made by the moving spot. Since both the positive and negative half-cycles are of equal amplitude in this case, the movement of the spot from B to A is equal to its movement from B to C. Note carefully



Trace on scope screen with signal at vertical terminals, no sweep, as shown at (B) is used for calibration of instrument. Trace (D) shows signal on horizontal input terminals only.

that the distance BA corresponds to the *peak* value of the positive half-cycle of signal voltage, and BC to the *peak* value of the negative half-cycle. The rms values, indicated by ordinary voltmeters, would lie somewhere between B and A and between B and C, the actual positions depending upon the signal waveform. (If the signal were a sine wave, the rms voltage value would lie 0.707 of the distance from B to A or from

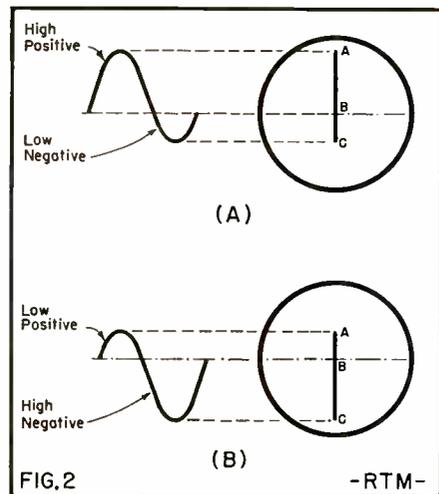


FIG. 2
-RTM-
Traces on scope screen when non-symmetrical voltage is applied to vertical terminals. These traces are not useful for the calibration described in the text, but can be calculated as voltage after calibration is made.

B to C. For a complex waveform, the rms value would be at some other point between B and A and between B and C.) The *peak-to-peak* voltage value is measured from A to C.

A similar condition results when a symmetrical signal is applied only to the horizontal input terminals of the oscilloscope. See Figures 1(C) and 1(D). In this case, the spot is deflected rapidly to the right and left of its position of rest at the center of the screen. The result is a horizontal straight-line trace, as shown in Figure 1(D). Here, the peak voltage, rms voltage, and peak-to-peak voltage are measured in the same manner just described for the vertical line trace.

Asymmetrical Deflection

An asymmetrical signal might be one in which the positive half-cycle is higher than the negative, or conversely the negative half-cycle might be of greater amplitude than the positive. These conditions are shown in Fig. 2. The effect of the high positive amplitude is to deflect the spot farther from B to A than it is deflected from B to C by the negative half-cycle. Positive peak voltage amplitude BA, as measured

along the line trace, accordingly is larger than the negative peak voltage amplitude measured from B to C. The corresponding rms voltages will be in the same ratio.

In making the oscilloscope calibration, we will use line patterns similar to Fig. 1(B). The line will be adjusted to various lengths by varying the calibration voltage, and the voltage value will be read by means of an AC voltmeter. The scope sweep is not used, since the highest point of a line is easier to see than the peak of a waveform.

Calibration Procedure

When the vertical amplifier of the oscilloscope is operated at its full gain, only a few millivolts are required to deflect the spot each inch on the screen. This fact undoubtedly will bring up the question of the need of an expensive AC millivoltmeter for making the screen calibration. The millivoltmeter is *not* required, since a good 0-10 AC voltmeter may be used in conjunction with a potentiometer circuit to obtain known millivoltage output. Fig. 3 shows the circuit.

A continuously variable 0 to 10-volt AC source is procured. This source may be a 10-volt filament transformer with a volume control-type potentiometer across its secondary or a Variac in its primary to adjust the output voltage. The transformer may be operated from the power line. For higher-frequency calibration, the input voltage must be supplied by an oscillator which will supply a signal voltage at the desired frequency.

The value of the adjustable input signal voltage is read directly on the scale of the AC voltmeter. For 60-cycle operation, this instrument can be a calibrated voltmeter of any AC type. For higher-frequency measurements, the in-

strument must be a freshly-calibrated AC vacuum tube voltmeter, in order that frequency errors may be eliminated.

Voltage Divider

The voltage-dividing potentiometer consists of resistor R_1 , R_2 , or R_3 switched in series (by means of selector switch S) with the 10-ohm output resistor, R_4 . All four of these resistors must be accurate wirewound or carbon units. The 90- and 990-ohm units can be made up from appropriate values connected in series to total the odd values. The signal voltage applied to the oscilloscope is developed by voltage drop across the 10-ohm resistor. Through the potentiometer action, this voltage will be equal to 1/1000 of the 0-10 v. applied when switch S is in its R_3 position, 1/100 of 0-10 v. when S is in its R_2 position, and 1/10 of 0-10 v. when S is in its R_1 position. This means that 0-10 millivolts will be applied to the scope when switch S is in its lower position, 0-100 mv when S is in its center position, and 0-1000 mv (0-1 volt) when S is in its upper position. These millivolt values accordingly may be read from the scale of the 0-10 AC voltmeter; directly for 0-10 mv, and by mentally adding 1 cipher for the 0-100 mv range and 2 ciphers for the 0-1000 mv range. The voltage values read, however, will be rms, so the meter readings must be multiplied by 1.414 to obtain peak values to which the deflections of the spot correspond.

The calibration procedure thus will consist of adjusting the input voltage to obtain a desired deflection on the oscilloscope screen, then reading the corresponding millivolts by means of the AC voltmeter and the selector switch setting, and finally multiplying this value by 1.414 to obtain the peak voltage value.

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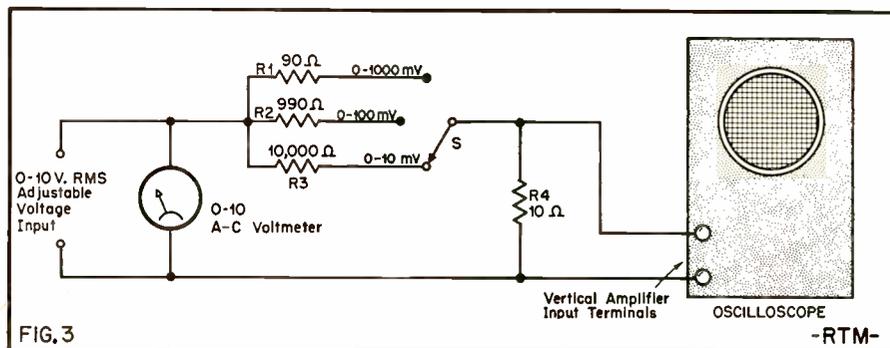
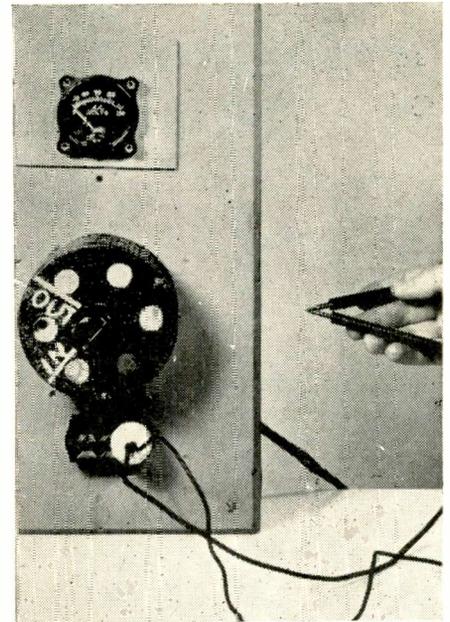
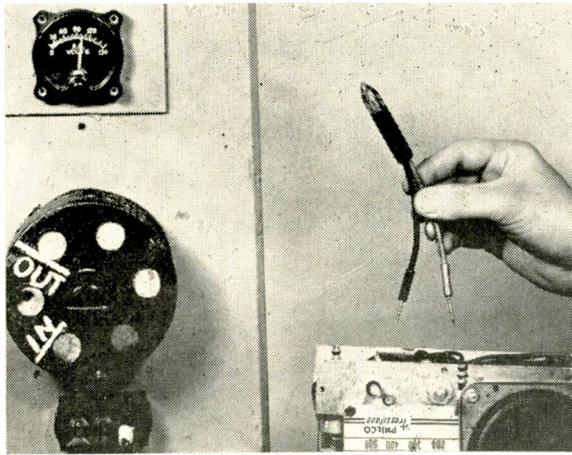


FIG. 3
-RTM-
Circuit for generation of calibrating voltages. Continuously variable AC source, at left, may be 10 volt transformer, audio generator, or signal generator. Calibration should be made at widely different frequencies, for accurate measurement of voltages at the varied frequencies.

Built-in rheostat, with meter and outlet receptacle used to test an AC-DC radio, right. Inexpensive and simple to build, the device provides many uses on the service bench. "In" and "out" positions of the resistance are marked on guard cage.



A BUILT-IN RHEOSTAT

For the Service Bench

By HARRY F. LEEPER

A GADGET for your workbench that's just as useful as it is simple is a heavy-duty rheostat mounted on a panel, and connected to a multiple outlet receptacle and an AC voltmeter in parallel.

The rheostat shown, an Ohmite model rated at 150 ohms and one ampere, has a perforated cage around it, so it was mounted on the front of the panel. An alternate arrangement might be to use a similar one without the cage, attaching it to the back of the bench or test panel, with the shaft extending through to the front.

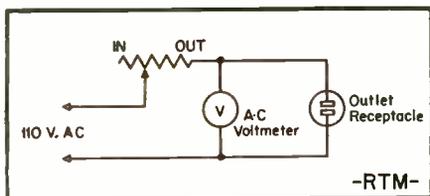
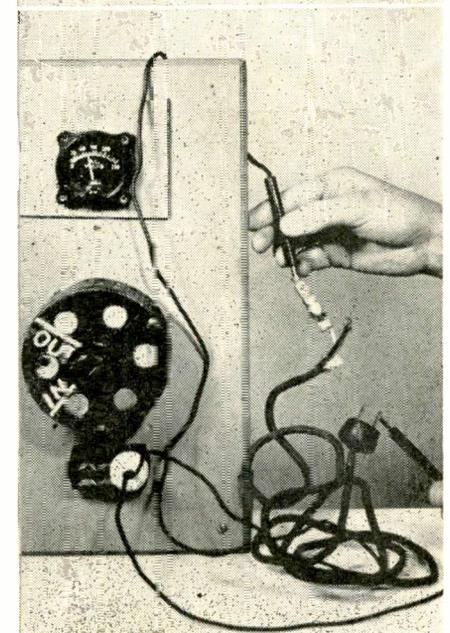
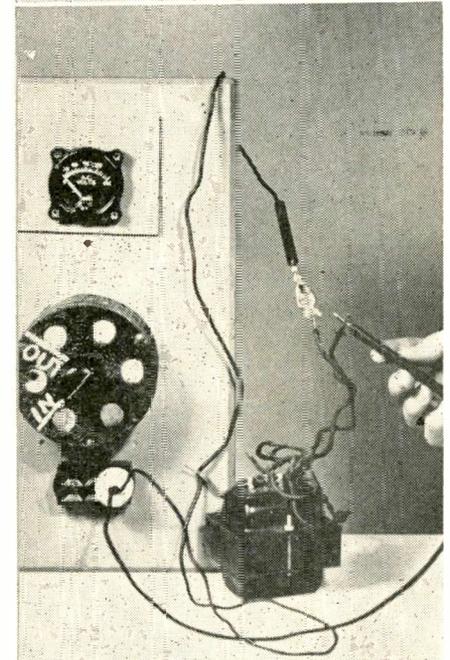
With the rheostat in the "out" position, as marked on the device, the unit is energized, the meter shows the full line voltage, and the receptacle can be used when an extra source of line power is needed.

The entire resistance of the unit can

be used across the line for short periods of time without damage, with test leads plugged into the outlet socket and shorted together. This setup is useful for checking the filament windings of a power transformer, or for similar applications, such as making sure that a resistance line cord is not open.

For work on radios, the operating voltage can be dropped considerably below normal, as it can when it is desirable to keep a soldering iron in readiness for work without letting it heat up at the full line voltage. When a tube filament in an AC-DC receiver is suspected, the line voltage can be cut to about 100, and the set left in operation until the circuit opens. The bad tube is then easily located with a neon tester.

Care must be taken not to short test leads without first turning the rheostat to the full "in" position.



Schematic diagram of the setup. A triple-outlet receptacle was used for flexibility in the device built by the author.

Entire resistance across power line (top, right) registers "no voltage" with test prods shorted together. Filament winding of power transformer in parallel with voltmeter, center, acts in the same way to show no reading on scale, indicating that there is no break in the winding. With resistance line cord across test leads, bottom, load on the circuit is divided between the cord and the rheostat. Rheostat must be turned all the way to the "in" position for these checks.

Servicemen Can Gain Individuality and Profits by Developing a Business in

CUSTOM-BUILT TELEVISION

By H. SUESHOLTZ

Transvision, Inc.

CUSTOM building of television receivers is at the present time a business of much larger proportion than is generally recognized. Tucked away in a corner of the overall TV picture, the custom built television business is gradually coming into its own.

In comparison with total TV production figures, it may be considered a small business, but once you stop to measure the large dollar volume that is done by the custom builders of television an amazing total would result. A yearly estimate gives a figure somewhere between one hundred million and two hundred million dollars. There is a

definite reason for such a volume as well as a good reason for continuous expansion of the business.

TV No Longer a Novelty

In the early stages, television itself was accepted as a novelty. It was felt that vast improvements in reception would be made, that receivers would become obsolete very quickly and that it would never occupy a very important phase of American life. There was some truth to this. Changes did occur quite rapidly in circuits and picture size. But even from the beginning, the quality of reception was better than any layman had dreamed would be possible. Picture quality in general did not improve as time went on. This was due to the fact that a good deal of engineering work had been accomplished before any of the products went into production so that changes in picture quality after the initial stages were comparatively small.

In about a year or two, the public became conscious of the fact that television had been commercially perfected and that, far from being a novelty, it was assuming one of the most important positions in the home.

The entertainment life of the family became circled about the television receiver. As recognition of the fact, the public became more and more conscious of the appearance of the set in their



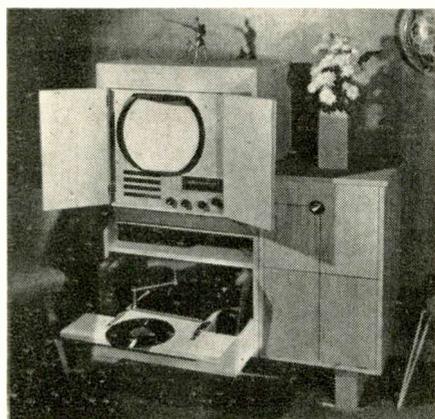
To blend with furnishings already in the house, custom television set buyers often specify period cabinets, such as this Early American type. Much wider range of styles is possible with custom sets than with commercial designs.

living rooms and with the need for obtaining a better product.

Advantages of Custom Sets

Custom building television sets to suit the particular need of a customer had many advantageous points toward filling this demand for a better product. It has many advantages for the custom builder, too.

First of all, if the customer was satisfied, he had a tendency to praise his supplier to the sky. He did his best to recommend the technician to friends and relatives.



Extra features, such as three-speed phonograph, are usually included in custom-built TV sets. High-fidelity audio equipment is also possible in these units.



Modern design of this receiver is keyed to up-to-date decoration of the buyer's home. Fine woods, careful cabinet work, unusual design give the customer individuality which he can find only in a custom-built unit. Cabinet is tailored to what the individual buyer wants.

Second, in custom building the customer had no way of comparing the sets as each set differed somewhat from any other set, so that the builder had a certain individuality.

Third, custom builders could obtain a higher mark-up because it is well recognized that any change in a product is worth additional consideration.

In order to do a custom business, the technician must recognize some very definite requirements. He must supply his customer with a quality product which will give a better picture than the commercial sets on the market. He must not cut corners to such an extent that he impairs quality.

Choice of Cabinets

His cabinet work or his selection of cabinets must be such that the customer has a choice of appearance and finish. Substitute woods such as gum or cherry are commercially used by manufacturers but should not be used in custom cabinets.

Replacement parts in the event of breakdowns which are bound to occur must be readily available. This cannot be stressed too greatly. A dissatisfied buyer of a custom built set can do more harm than a satisfied customer can do good. One of the greatest sources of customer dissatisfaction is the maker's inability to properly service a product

because of inaccessibility of parts.

The custom builder must also have good access to phonographs, radios, wire recorders, etc., because owners of custom built sets usually prefer some type of combination.

Tube Conversion Business

A large source of custom business, and one which can be treated as a completely separate subject, is the conversion of older model television receivers into large size screens. In converting, the technician often has the opportunity to combine the old set with new cabinets and phonographs into a custom combination.

In selling custom television receivers, it is important to use good customer psychology. Pricing the product too low tends to make the customer feel that he is not getting high quality. At the same time, it is not good salesmanship to hurt the customer with an unusually high price.

The best approach is to get the customer interested in the simplest device which will satisfy his need and then indicate to him that he can add this or that item to the product to build different types of combinations. The customer then realizes that a custom built piece is not out of line with commercial prices and for that reason the final price is high due to the fact that it has *features the commercial products never have.*

Perhaps the biggest reason for failure to build a business in this field is due to trying to build too quickly with too little capital. Experience has indicated that individuals working from their own homes have a better chance to build up a business than men with inadequate capital trying to build a business too rapidly with high overhead, such as high rent and advertising.

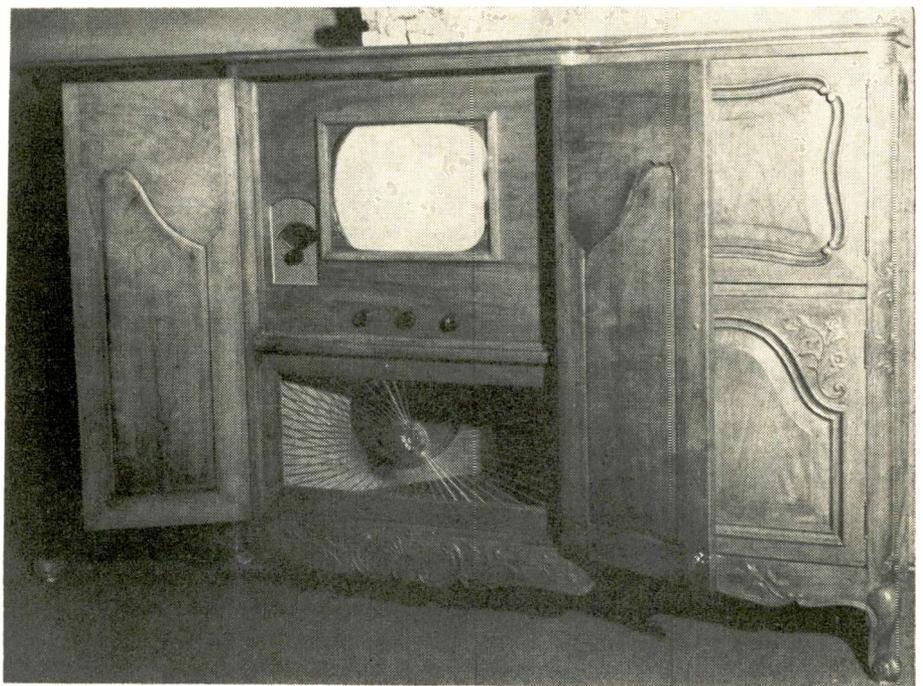
Source of Supply

Another phase in building a custom business is to get an adequate source of supply for quality merchandise. This is true in normal times and especially true in light of today's difficult supply problems. He is much better off dealing with one source who can supply him with replacement parts, wired chassis, picture tubes, choice of eight or ten different cabinets, antennas, and other components.

Building up a strong relationship with a single supplier can often be the biggest factor in helping the custom builder make a success of his business.

Business of the Future

Custom building of television receivers is a business of the future for those who want to rise above the constant struggle of competing with thousands of other similar individuals with no possible means of survival except to work harder.



When expense is less important to the buyer than getting an outstanding console, an elaborate set like this, with high fidelity sound system, dual speakers, AM-FM radio, phono, and record storage space, can be suited to his order. Period cabinet design, hand carving, and fine finish, provide a piece of high-quality furniture in addition to the receiver.

THE BUSINESS OF TELEVISION SERVICE

By CHARLES GOLEPAUL
Aerovox Corporation

Ed. Note: The following article was taken from an address by Mr. Golenpaul before the second annual meeting and exhibition of the Philadelphia Service Men's Association last month. It is presented here almost in its entirety because of its unusual value and interest to independent servicemen.

TO BEGIN with, let's consider just what it means to be a serviceman worthy of the name. Let's look at the serviceman from the standpoint of Mr. TV Set Owner or Mr. Radio Set Owner. The set around which so much of the family life rotates today, suddenly goes bad. No programs! The particular feature which the household looks forward to on this given day or evening, is suddenly absent. Something has to be done about that set—and done fast.

The owner's first thought, usually, is to call up the dealer who sold the set . . . he should fix it . . . it's his moral responsibility! Unfortunately, however, it's not always that simple. Too many dealers lose all interest in the radio or TV set the moment it goes out of the store. It's no longer the dealer's job; it's now the job of the serviceman, regardless whether he works for or with the dealer, or entirely on his own. The dealer simply sold the set; the set in due course simply wore out in part or in whole; the fixing of that set is now up to the serviceman who's in business for precisely that sort of thing.



CHARLES GOLEPAUL

Technician a "Doctor"

The set owner calls in the serviceman, just as he would a doctor. The serviceman comes into the home as one who can diagnose the ailment and work the cure. At this moment the serviceman is more important and more convincing and more respected than all the set manufacturers and engineers and designers, regardless of the millions of dollars spent for set advertising. Just imagine being that important.

Yet a great many servicemen don't take themselves that seriously. They come to the customer's home in *old and dirty clothes*. To complete the bad impression, they don't bother with manners or grammar in their conversation. Would you let a doctor cut you open after such an exhibition of brain power? Of course not!

Now understand that a serviceman

with a third-rate speaking voice may know his circuits and constants and characteristics from soup to nuts. He may be the greatest radio-television technician for miles around. But, as with the medical doctor, this business of diagnosing and curing ailments is largely a matter of psychology. The patient, in this case Mr. Set Owner, must be reassured that the serviceman knows all the answers. And the first impression—based on personal appearance and speech and general attitude—is often the *lasting impression*.

Again I say, you're the doctor. You're the king pin when you go into the home to fix that radio or television set. So live up to that high standing if you want to be somebody in this big and ever-growing service business! Remember that the owner is just plain sick. His set has gone flooey. The household is without its entertainment diet. And then you come in as the doctor who can restore the set to order once again.

Quick Diagnosis Important

Nothing is more vital in successful—and that means profitable—servicing, than quick and positive diagnosis. You know how it works with the medical doctor: he comes in, looks grave, takes the pulse, listens to the heart, puts the thermometer into the patient's mouth, looks grave some more, and then pronounces those rare words of wisdom. It's been said that a doctor is a man who prescribes drugs of which he knows little, for a body of which he knows even less. But at least he makes

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A Thorough Knowledge of Filament and Heater Circuits May Help You Solve Some Tough Problems

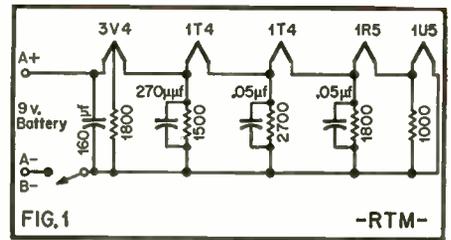


FIG.1
A typical battery filament circuit. Resistors maintain current and voltage at correct value for filaments by bypassing screen and plate currents.

HEATER AND FILAMENT HOOKUPS

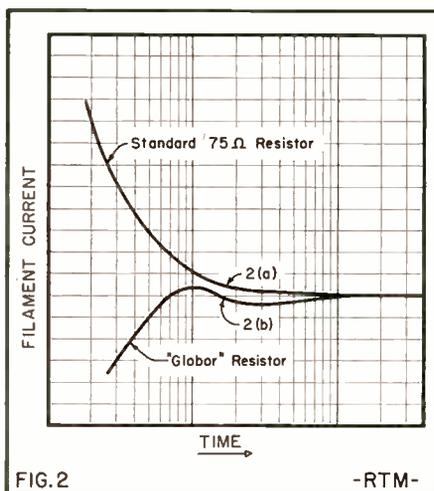


FIG.2
Graph showing how "Globar" resistors reduce initial surge through filaments. Resistors have high resistance when cold, lower resistance when hot.

By DAVID T. ARMSTRONG

IF you were to take the cathode of a radio tube and place a rod inside it, insulated from the cathode, and could heat the rod with a blowtorch, the radio tube would work remarkably well—better in fact than the ordinary radio tube works in any circuit, even with pure DC.

It is the manner in which the heat is supplied to the filament to boil the electrons off the cathode which causes so much trouble. With this in mind we describe here a variety of methods of heating filaments and the relative advantages and disadvantages of the methods indicated.

So little attention has been paid to filament heating that many technicians are unaware of the many varieties of filament circuits, one or more of which

may help solve some particularly vexing service or design problem.

Series Circuit

An AC series circuit is the most unsatisfactory method of heating filaments because it causes the greatest amount of hum and is most susceptible to electrical interference originating on the power line. It is used mainly because of its economy. Whenever the series arrangement is used with AC it is advisable to arrange the filament connections in the circuit so that those tubes most sensitive to hum are nearest the ground end of the circuit.

The reason for this arrangement is that it reduces the AC voltage measured from heater to cathode; the lower this voltage, the less hum. The rectifier is always the farthest tube from ground in any series string in the small AC-DC sets.

Battery Tubes

When the filaments of battery type tubes are connected in series, the total current is the sum of the filament sup-

ply and the plate-screen currents returning to B- through the filaments. Consequently, it is desirable to add shunt resistors to bypass some of this current and to maintain the filament voltage at the rated value. See Fig. 1 for a diagram showing the resistors suggested in a typical battery filament circuit. The filament string uses 8.4 volts at 50 mils, and the resistors maintain the current and voltage at this value by bypassing the screen and plate currents passing through the filament.

Globar Resistors

Another objection to filament series heating is that tube life is materially shortened by the initial surge of current through the circuit, when the power is first turned on. A resistor recommended for use with any series circuit is the special "Globar" resistor which has a high value when cold and a low value when hot. The ratio of cold resistance to hot resistance in a typical circuit using one of these units might be about 900 ohms to 75 ohms. The result of using this resistance in series with the

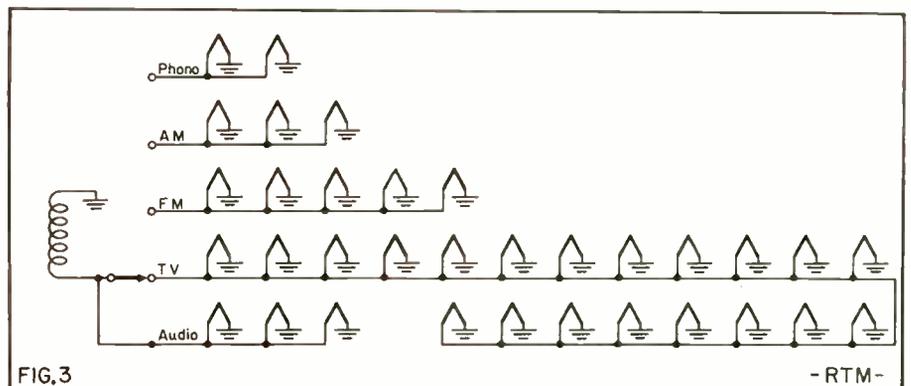


FIG.3
Selector-switch circuit for filaments of an AM-FM-TV-Phono console. Only audio section is kept in the circuit at all times. Other sections are cold when not in use, so that no plate current is drawn, tube life is lengthened.

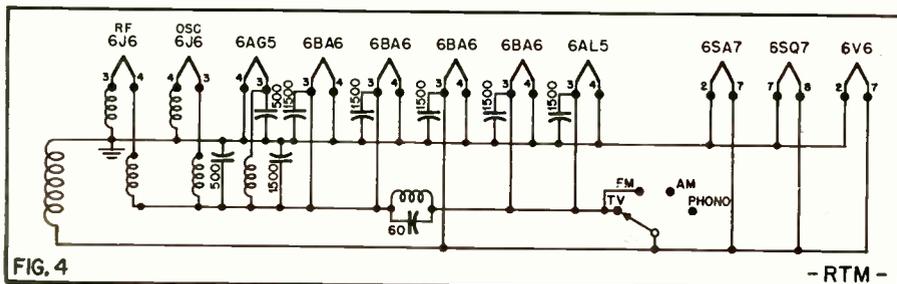


FIG. 4
Filament circuit used in Andrea VJ12 receiver. Note wide use of chokes and capacitors.

heaters is to eliminate the starting surge. The graph, Fig. 2, compares a standard 75 ohm resistor with the Globar resistor.

A parallel circuit with AC is the most commonly used and best known method of filament heating. Therefore, only some of the more unusual aspects of this type of filament supply will be discussed here. The filaments may be supplied either from the two legs of the line, or from the 6.3 winding of a filament transformer. The number of tubes to be supplied from a 6.3 volt winding is limited only by the ampere rating of the transformer secondary. Tubes drawing various currents may be connected to the same transformer winding in parallel provided they are all 6.3 volt tubes. Some tubes, like the 12AU7 and 12AX7, may be connected either with 12.6 volts at 150 mils or 6.3 volts at 300 mils.

Switch Selection

When there are a large number of tubes in a circuit it is highly undesirable to have all standing by when you are using only a few tubes. Many fine consoles today have AM, FM, Phono, and TV. With phono you use the minimum number of tubes, and with TV you use nearly all the tubes. Therefore it is practical to use some such circuit as that shown in Fig. 3 for switching on tubes desired. When the filament is not heated the tube is not functioning and no plate current will be drawn. Tube life will be materially lengthened. Note that the audio section is in the circuit at all times since it is required regardless of which filament circuit is connected at a given moment.

Figure 4 shows a rather unusual filament circuit, notable for its use of a great many filament filter chokes and bypass capacitors. This is used in the Andrea VJ12 receiver and is the most thorough filtering circuit for filaments with which I am familiar.

Shunt Transformer Circuit

It is also possible to combine both

AC and DC filament supplies from one basic source, as shown in Fig. 5. This is known as the "shunt transformer filament heating circuit." The tubes are connected so that the amount of current required by the two sides are approximately equal. The 1500 mmf ceramic capacitors are used to prevent RF strays from being introduced through the AC line.

The unusual factor about this filament supply is that it provides DC for the oscillator to improve reception and to reduce hum modulation on the high frequency channels. The two selenium rectifiers are connected across the 6.3-0-6.3 winding in a full wave rectifier circuit.

Utilizes Peak Voltage

At first it may not be clear how you get 6.3 volts out of a 6.3 input. The design shown here utilizes the peak voltage of the 6.3 volts AC, which is actually about 8.8 volts. The 1 ohm resistor acts to reduce the peak charging current into the 2000 mfd ripple smoothing filter capacitor to safe limits, which in conjunction with the 1 ohm resistor does the filtering. The RF choke and the 5000 mmf ceramic capacitor are included in the circuit to prevent undesired coupling of the oscillator to other tubes in the receiver.

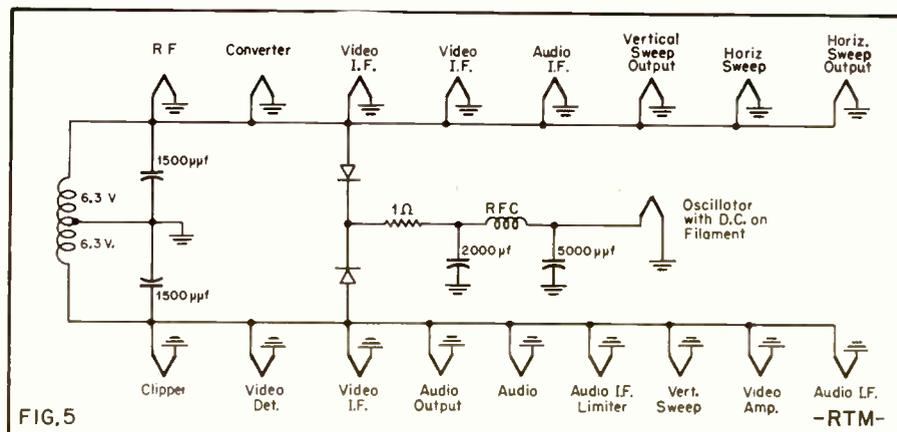


FIG. 5
Circuit using both AC and DC on filaments, the "shunt transformer filament heating circuit." Ceramic capacitors of 1500 mmf prevent RF strays from coming in through AC line.

A low pass filter, as shown in Fig. 4, designed to pass 120 cycle AC and to cut off higher frequencies, particularly RF and IF, is sometimes included in the filament circuit. The chokes typically used are wound on a 1/4 inch mandrel. They are approximately 15 to 25 turns of heavy wire, which is used so they will be self-supporting.

The inductance of the choke, which is in series with the hot leg of the filament supply, is not critical. The idea is simply to get as much inductance as possible in the available space, at the same time keeping distributed capacity to a minimum. A good practical value is 20 turns of #22 enamel wire on a 1/4 inch form.

The r-f and oscillator stages are most critical and their heaters must be carefully isolated from other circuits.

Filament Hum

While AC is just as good as DC for filament heating, some AC is likely to be picked up by the grid and appear as hum in the output. AC hum is most undesirable in an oscillator stage and in high gain audio amplifiers.

With the heater cathode tube types, the source of AC for the filament does not introduce hum by direct connection, since the heater is insulated from the cathode. Here the chief problem is the magnetic field set up by the heater current. Occasionally there is leakage between the heater and cathode. This leakage permits a small AC voltage to appear on the grid. You can measure the heater cathode leakage with an ohmmeter. The only cure for this condition is to replace the tube with a new one. The better the tube design, of course, the less hum. Grounding one

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Fix on the Facts

by Frye

Here's How to Get Rid of Oscillation Troubles and Other Causes of Squealing

NO ONE likes a squealer, and this statement goes doubled in spades when the "squealer" is a radio receiver. Even the most inexperienced serviceman, however, has encountered at least one of these exasperating sets that simply cannot be aligned properly without having the receiver break into oscillation. Neither TRF nor superheterodyne circuits are immune to this malady, and the "radio doctor" must be prepared to diagnose and cure the trouble with certainty and dispatch.

It is a matter of basic importance to approach the problem with the proper mental attitude. The oscillation can usually be stopped by detuning some of the tuned circuits sufficiently, but that certainly is not the way to correct the difficulty. The oscillation, in that case, will have been cured at the expense of selectivity and sensitivity; moreover, the only way the serviceman can justify such a makeshift procedure is to assume that the receiver was deliberately misaligned at the factory.

This, in all probability, is just so much wishful thinking. If you will take it for granted that the receiver was in exact alignment without any trace of



JOHN T. FRYE

oscillation when it left the production line and believe that it can be restored to that condition again, you will be approaching the problem with a healthy, constructive outlook that will help in repairing the trouble instead of wasting time in thinking up excuses for not doing so.

Oscillation from Feedback

As you all know, oscillation is caused by a sufficient and properly phased portion of the output of a circuit being fed back into the input. To prevent this feeding back, input and output circuits are carefully shielded from each other; and the RF currents are grounded, usually through bypass condensers, at various strategic points of the circuit. When you are baying on the trail of an elusive oscillation, keep looking for a place where the shielding is imperfect or where the grounding of the RF currents is not complete.

Shielding is at least partly a mechanical affair and can usually be tested by manipulation of the various tube shields, IF and RF shield cans, etc. If moving one of these items causes the oscillation to come and go, you are getting warm, and the repair is simply a matter of seeing that there is a good electrical connection at all times between the part you are moving and the chassis.

Tube shields that slip over mounts held in place by the same rivets that fasten the tube socket to the chassis are particularly bad offenders. Wrestling the tube in and out of the socket loosens the rivets just enough so that the electrical bond between the shield-mount and the chassis is impaired. Sometimes, when the chassis is cold, the bonding is good enough to prevent oscillation; but as the set warms up and the rivets expand a few millionths of an inch, the

oscillation begins. Soldering the shield-holder to the chassis takes care of this.

Metal Tubes Not Foolproof

But even shieldless metal tubes must be looked at with suspicion. The metal shell in such cases is the shield, and it is connected to the chassis through a tube pin and a grounded socket lug. A poor connection between the shell and the pin, the pin and the lug, or the lug and the ground can all result in oscillation. Moving the grounded socket lug will quickly reveal whether the trouble is there. Temporarily grounding the metal tube shell directly to the chassis will spotlight any open circuit between the shell and the grounding pin. Repairing or replacing the socket will solve the first trouble; replacing the tube is the best way of handling the latter.

We do not meet up with many TRF receivers these days, and that probably accounts for the fact that a few of the newer servicemen overlook a very common cause of oscillation in these sets: poor connection between the rotor of the tuning condenser and the frame. This connection is made by one or more wiping contacts, and dirt or corrosion in these contacts will cause the grounding of the rotor to be faulty and intermittent. The receiver, in such cases, will oscillate erratically; often the oscillation can be started or stopped simply by moving the dial a bit. Cleaning the wipers and the surfaces upon which they rest with carbon tetrachloride and very fine emery cloth will banish this condition.

Open Bypass Condensers

Probably open bypass condensers account for more oscillation trouble than any other single cause. Fortunately, de-

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Products
for the
Trade

Some of the interesting new items being made available currently in the Radio and TV service field are presented in this column. For further information, write to: Products Editor, RADIO AND TELEVISION MAINTENANCE, P. O. Box 867, Atlantic City, N. J.

NEW MARKER GENERATOR

A new television marker generator, Type 501, designed for use with TV sweep signal generators, has been announced by Sylvania.

Crystal controlled signals are provided by a separate self-contained crystal oscillator which may be operated at any frequency fixed by a plug-in crystal. It provides check-points at fundamental frequencies ranging from 2 to 20 Mc and has useful harmonics up to at least the sixth. The crystal oscillator may be operated at the same time as the variable oscillator to provide two simultaneous markers on an oscilloscope screen.

Two pips may be used to set video and IF circuits and traps, or the variable marker may be brought into coincidence with the crystal marker to check dial reading with crystal frequency or crystal frequency harmonic.

The tuned oscillator in the generator



provides frequencies ranging from 15 to 240 Mc in four bands: 15-30 Mc; 30-60 Mc; 60-120 Mc, and 120-240 Mc. With an appropriate crystal inserted in the panel socket, oscillator will operate at any frequency between 2 to 20 Mc, and will provide useful harmonic output up to the sixth for all band calibration.

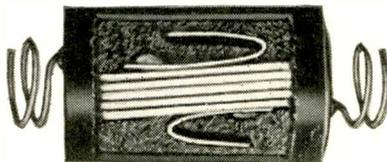
Individual attenuators for each oscil-

lator feed-through input for a sweep signal and an edge-lighted, slide-rule type dial add convenience of operation. The single switching control provides standby operation on continuously variable and crystal controlled signals separately and simultaneously. A 4.5 Mc crystal, type 229, providing the accuracy required in servicing receivers with inter-carrier sound circuits, is available on special request.

— RTM —

SELENIUM RECTIFIER

Something new in rectifiers is claimed in the "Plastisel" selenium units recently put into production by the Precision Rectifier Corp. Resembling paper condensers in appearance, the new rectifiers



can be installed without drilling mounting holes.

Completely sealed, yet able to run fairly cool up to their rated capacities, according to the manufacturer, the units are available in 40, 65, and 100 ma. models, while production of larger types up to 500 ma. is expected shortly.

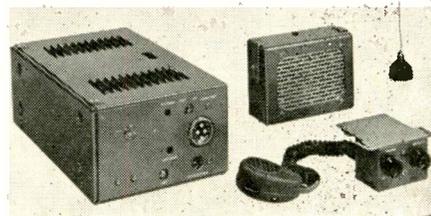
— RTM —

MOBILE UNIT

A newly engineered and designed addition to the RCA "Carfone" line was announced recently. The mobile two-way equipment, for adjacent channel operation in the 152-174 Mc band, is labeled Type CMV-1B. It includes separate speaker and control units, to allow greater versatility in mounting locations. The transmitter-receiver unit is of the "sandwich case" construction which per-

mits mounting in either vertical or horizontal positions. It requires no space for mounting brackets or sliding drawers, the announcement said.

Retaining the 31-circuit selectivity of former models of RCA mobile equip-



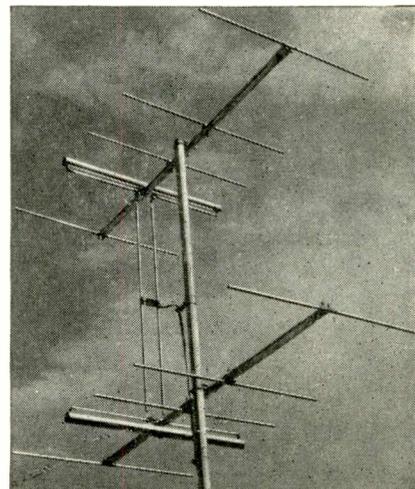
ment, the new device develops greater power output over its entire operating band. Designed to exceed all RMA and FCC requirements, the unit has a low susceptibility to intermodulation interference, it was reported. It will operate on any 6.3 volt auto battery with a battery drain of 8.4 amperes in standby use, and 20.6 amperes during transmission. Power output is 15 watts in the 152-162 Mc band, and 13 watts in the 162-174 Mc band. The equipment weighs less than thirty pounds. The transmitter-receiver unit is metal shielded, 5½" x 9" x 16" in size.

— RTM —

5-ELEMENT YAGI

A new five-element, high-gain Yagi antenna, reported to give 11 Db gain in field measurements, is in production at the Technical Appliance Corporation.

Available for either high or low



bands, the assembly includes three directors, antenna element, and reflector. Both models are of all aluminum construction, and both are available in single or stacked assemblies.

The high-band model comes pre-assembled and snaps into position without bolts or screws.

PA AMPLIFIER

The first of a series of new PA amplifiers, the "Green Gem" line, has been released by Rauland-Borg Corp. The initial unit, the Rauland Model 1916, rated 16 watts at five per cent or less harmonic distortion, measured at 100, 400, and 5000 cycles, provides a peak output of 20 watts.

Two microphone inputs, both convertible for use with a low impedance



and one phono input are provided, as is a tone control.

Frequency response is plus or minus one Db, 40 to 20,000 cps. Output impedances of 4, 8, 16, 250, 333, and 500 ohms may be used. Gain ranges between 85 Db for phono and 130 Db for high-impedance microphone. Voltages required for rated output are .0015 at the high-impedance input, .0001 at the low impedance input, and .1 for phono.

— RTM —

PICTURE CENTERING DEVICE

The "BeamaJuster," a new device for centering TV pictures, which is reported to cut the time necessary for the job to three seconds, has been announced by Perfection Electric Co.

The attachment, which fits any size



picture tube, consists of a pair of rotating aluminum plates, one of which holds a permanent magnet. It is installed by snapping it on the back cover of the picture tube yoke. It will fit any standard yoke, the announcement said. The

picture is centered by rotating the outer plate. Fine adjustments are made by moving the plate up or down or to one side.

The adjuster, according to the manufacturers, can be used in place of electrical centering devices, eliminating a horizontal control, a vertical control, and several condensers.

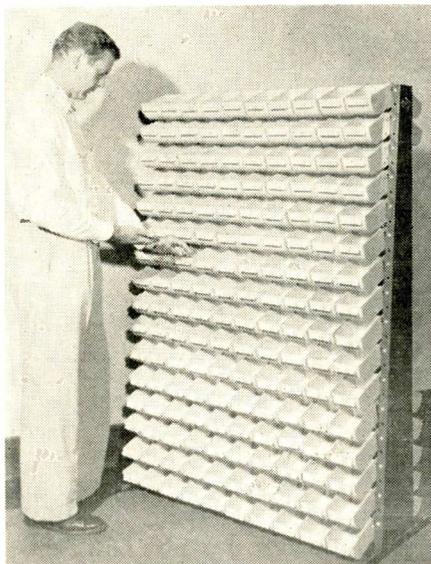
— RTM —

SMALL PARTS BINS

Two new bins designed to speed service operations have been announced.

One bin is a wall unit with 100 compartments. All are tilted forward to meet the eye and are built with rounded bottoms to make parts easier to pick out. Each compartment carries a bin tag holder for labels of part number, price, and specification.

All compartments of both units lift from the rack for stock rotation and cleaning. Shelves at the top and bottom



of the wall unit provide extra space for storage of packaged stocks.

The wall unit is 56 inches high, 44 inches wide, and 12 inches thick at the base.

The other bin is an island unit with compartments on both sides of the stand. It provides 320 separate compartments in a unit 65 inches high, 44 inches wide, and 20 inches thick at the base.

Both bins are built of 18 and 20 gauge steel and are painted in buff and maroon.

— RTM —

VARIABLE SPEED PHONO

An adjustment of turntable speed from 25 percent below normal to 10 percent above normal is possible on all three (33 1/3, 45, and 78 rpm) stand-

ard phono speeds with the 1951 models of the "Califone" transcription players. The portable phonographs, which will

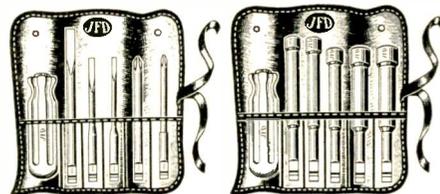


play recordings and transcriptions up to 16 inches in diameter, feature "Vari-pole" electrical speed control, according to a recent statement from the Califone company. The players, the announcement claimed, are light in weight, have good tonal quality and have "unusual reproduction capacity."

— RTM —

SCREW AND NUT DRIVERS

Two new tool kits, one of screw drivers and the other of hex nut setters, are being put out by JFD. Built so that any one of five shanks in each kit fits into one unbreakable, non-inflammable plastic handle, the tools come in six-section leatherette cases. In the screwdriver kit,



there are three straight and two Phillips bits, while in the nutdriver kit, the wrenches fit 1/4, 5/16, 11/32, 7/16 and 3/8-inch hexagonal nuts or screw heads. Sockets are heat-treated for hardness, and screwdriver bits are tempered, ground, polished, and cadmium plated.

— RTM —

TV AUDIO AMPLIFIER

A new audio amplifier designed specially to improve fidelity of sound reproduction on television sets, can be used either with the receiver's speaker or with a higher quality speaker. The manufacturer claims a 75 percent improvement in fidelity when the new device is used with the set's own speaker, and a frequency range of 100-13,000 cps with a quality speaker.

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NEWSLETTER

→ from page 3

SERVICE TECHNICIANS IN GREATER DEMAND

No matter how the questions of the day are decided, it has been evident that the shortage of radio and TV servicemen is getting more acute. Sales of TV receivers kept soaring to new heights in spite of the lack of a definite decision on color, and in spite of the fact that there is no promise of a lift on the new-station freeze. Sales of receiving tubes by members of RTMA hit a peak of more than 227,000,000 for the first eight months of the year, although less than 200,000,000 tubes were sold during the entire year of 1949. The biggest use for the tubes, of course, is in new TV sets, all of which require installation and servicing. One prediction has it that 100,000 TV technicians will be required within the next four or five years.

LARGE WAR CONTRACTS SEEN IN ELECTRONICS

Conflicting reports on what percentage of electronics manufacturers' production will go into government orders, continue to pile up. A month or two ago, a maximum of 25 percent of the total production was seen for war contracts. A more recent report, however, indicates that government orders will be tripled. Even though the Korean War may not last much longer, unofficial estimates place defense production in the electronics industry during the next 15 months at about \$1,500,000,000. Total production in the field during 1949 was about \$2,000,000,000 at the manufacturers' level.

SERVICE ADS BETTER, COMPLAINTS HIGHER

"Considerable improvement" in the advertising of TV service was noted recently by the Better Business Bureau of New York, which has been conducting a campaign to clean up malpractices in the city, in not only advertising and sale of sets, but in service contract work. Complaints to the bureau against TV service kept increasing, however, with more than 1000 complaints registered during August, as compared with slightly more than 100 in August 1949, it was reported.

HEATER AND FILAMENT HOOKUPS

→ from page 14

side of the heater, as is common with 6.3 volt tubes supplied from a transformer, usually reduces hum to an acceptable value.

Use of DC

Supplying DC for filaments may make use of a transformer rectifier-filter system similar in many respects to the DC system for supplying plate voltages. The chief difference is that more current is required and the filter system has a modified design because the output voltage is lower, except in those instances where 110 volts series strings are used. This has the effect of decreasing the value of the choke to a few millihenries and increasing the value of the capacitor to a few thousand microfarads, which in no instance should be less than 2000 mfd.

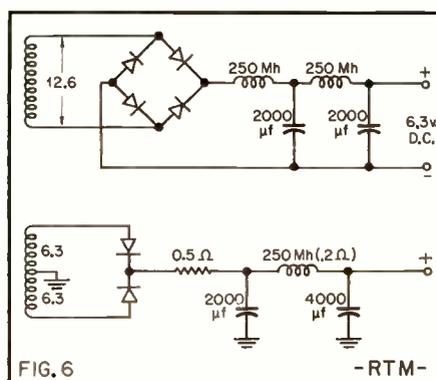
Rectifier tubes could be used but they are undesirable in this use for several

reasons.

Consequently, selenium rectifiers have become very popular for this use. They may be connected in a full wave circuit, using two of them or in a full wave bridge circuit, using four of them with very little voltage drop across the rectifier. The low voltage drop across the selenium rectifier makes possible the

use of a transformer with a 12.6 volt winding for the input to the rectifier. This is fortunate because power transformers are readily available with two 6.3-0-6.3 windings. When the 12.6 winding is used with a full wave bridge rectifier, as shown in Fig. 6, it is important to choose a choke with a proper ohmic resistance so that there is a voltage drop in the filter circuit to the desired 6.3 DC output.

The output in DC depends upon the current carrying capacity of the transformer secondary winding and the ampere rating of the selenium stack—both of which are determined by the number of tubes to be supplied with DC. Two chokes are shown with two condensers because the filtering effect is so much better. Choke input is used because the regulation of the voltage in this circuit is more stable. Whenever the output of a selenium rectifier system feeds into a capacitor it is important to include a peak current limiting resistor in series with the input capacitor.

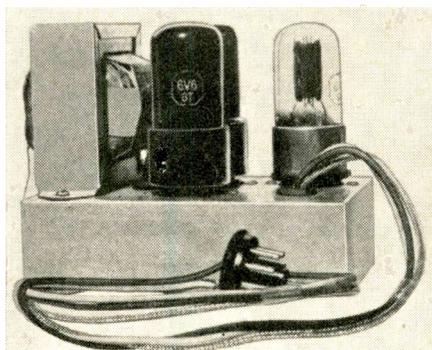


Hookups using 12.6 volt winding for full-wave bridge and full-wave circuits. Chokes are important to provide smooth DC, while peak current limiting resistor should always be used when output of selenium rectifier feeds directly into capacitor.

PRODUCTS FOR THE TRADE

→ from page 17

Plugging into most single-ended amplifiers, the unit's tube lineup includes two 6K6 or 6V6 in push-pull and a 6J5

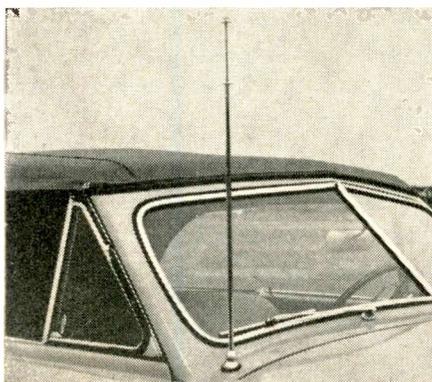


driver. Harmonic distortion is reportedly less than 3 percent. Power output is six to eight watts. The amplifier draws 45 ma. or current. Chassis size is three by five inches.

— RTM —

LIGHTED ANTENNA

An auto radio antenna enclosed in Lucite, the "Tenna-Beam," is now on sale. Put out by the Insuline Corporation, the entire lower section glows with light from a 6 volt bulb in the antenna base casting. The aerial has an extended



length of four feet and is made of chrome-plated brass tubing. The universal mounting fixture and a four foot length of shielded lead are included with the device. The bulb, the makers report, does not produce any broadcast interference.

— RTM —

MULTIPLE ANTENNA SYSTEM

A new antenna distribution system for TV store demonstration needs, apartment house and other multiple

installations has been produced by the Technical Appliance Corp.

The system, the company said recently, will cover the proposed color television channels, as it now does TV channels 2 through 13, plus the FM band. Separate plug-in amplifier strips are used in conjunction with individual high gain antennas, a power amplifier and mixer chassis, and isolation boxes



each feeding one or two receivers. The total number of sets which can be attached in the system may be as high as 100 or more.

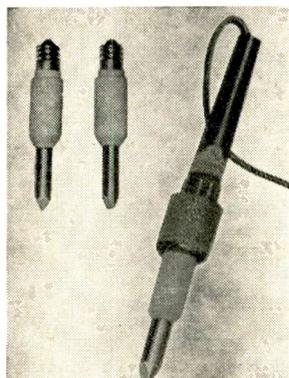
Alternative arrangements include attaching up to eight sets directly to the amplifier without the isolation boxes, and, in good-signal areas, using the isolation boxes without the amplifier. Company spokesmen report that the isolation boxes do not load the common transmission line.

— RTM —

SOLDER PENCIL TIPS

Two increased wattage soldering tips, "Hi-Heat Tips," have been put on the market by Ungar Electric Tool Co., makers of soldering "pencils."

The new tips are made of a new material which is pre-tinned, a process the



manufacturers say eliminates loss of time in cleaning and dressing. They are reported to perform "on a par with 100 to 150 watt soldering irons." Available in chisel and pyramid shapes, the tips are interchangeable with the five standard 20-watt tips previously included in the Ungar line.

PORTABLE PHONOGRAPH

All three speeds of phonograph records can be played on a new portable model recently introduced by Newcomb Audio Products Co. The player includes a 5 watt amplifier with inverse feedback, a 6" x 9" Alnico V speaker



covered by a metal grille, and a crystal pickup.

The pickup arm and turntable unit, the manufacturer claims, are so constructed that the case may be "severely shaken" without making the needle jump from the groove. The player is for AC use only.

— RTM —

ROTATOR ACCESSORIES

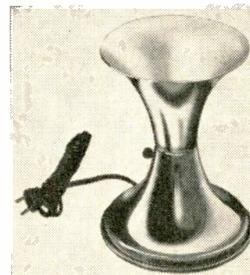
Some accessories recently added to the Radiart "Tele-Rotor" line of TV antenna rotators include a set of three rigid brace rods designed to stabilize the section of the mast above the rotator itself by means of a floating collar. Three similar rods may be attached to a stationary collar on the mast below the rotator. The assemblies are available separately or in a complete set.

— RTM —

TV LAMP

The "Tele-Lite," a lamp designed to guard against eyestrain while viewing television, has been announced by James H. Smith and Sons Corp.

Made of etched aluminum, the lamp



provides a glow of indirect light, and may be placed on top of the TV set.

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THE BUSINESS OF TELEVISION SERVICE

→ from page 12

the patient believe that everything is now under control. That's the important lesson you technicians can learn from the M.D.

Give the set owner some idea of what may be wrong with that radio or television set, within the limitations of observation or preliminary checkup in the home. Impress him with the fact that today's sets are really complicated, and that a thorough diagnosis with proper test equipment may show up weak tubes or defective components, when the set is brought to your shop.

Of course, you need proper test equipment. There was a time when a serviceman was in business when he had a pair of pliers and a screwdriver. Today, particularly in TV service, you've got to have the very best test equipment if you want quick and thorough diagnoses.

Use of Surplus Parts Risky

Now what follows the diagnosis? Repairing the defect, of course. And that usually means new parts or replacements.

Even at this late date when many servicemen have been badly burnt—I means businesswise—by using salvage or surplus components, there are still too many chances being taken with grab-bag parts. You know what I mean. There's always the temptation of buying surplus resistors at a fraction of the usual prices, or bargain-priced electrolytic capacitors of unknown vintage, or loud-speakers at give-away costs.

But it's much wiser to use reputable components—those carrying the names of recognized manufacturers—packed in original cartons—coded to indicate recent production runs. You just can't afford to take a chance on uncertain components which are apt to fail in short order and compel you to call back to make good—or to score a black eye with your customers. Sloppy material, quite as much as sloppy workmanship, can be an easy way to commit business suicide.

Figuring the Cost

Given good material and good workmanship, the next step is to know your costs. It's been preached over and over by credit experts that the majority of business failures are traceable to ignorance of the cost of doing business.

"I'm making money," says the un-businesslike serviceman. "I made \$75 last week." But did he really make any money? Has he figured in his rent, his telephone, his gas and electricity, his car or truck, his equipment, which is wearing out or at least obsolescing all the while, his investment charges, his bad accounts, his slack seasons, and a dozen other factors?

Too many servicemen operate by the week. It's \$75 take-home this week, \$50 next week, \$90 the following week, and so on. But then it may be \$25 and \$40 and \$18 for several weeks of poor business. Besides, the rent, electric and 'phone bills do not come very week, but pile up each month. If you intend to remain in business, build up your income, and develop a good business property—you must eliminate hand-to-mouth handling of money.

My advice to you is to put yourself on a salary basis, even if you're the boss. Pay yourself a fixed salary based on what the business averages by the month, or better still by the quarter. See that the salary is available after you've accounted for those other items of business cost. Live on that weekly salary. Then, at the end of every quarter or half-year or year, see how much money is left. There is *your profit*. And it's profit you're in business for, not just a salary!

Don't be afraid to charge, but don't rob your customers! You're entitled to be paid for your time. You're entitled to charge for your car or truck. You're entitled to a generous margin over the direct labor and material involved in any service job.

You want \$75 per week regular salary. All right. Your work week is probably 50 hours—remember, you've got to work longer hours when you're working for yourself. That means a direct labor cost of \$1.50 per hour. Triple that at least—that's \$4.50 per hour, or say \$5.00 for even numbers. That factor will cover your business overhead while assuring you of the \$75.00 per week salary.

When it comes to material, *charge list prices*. Just because you get a 40 percent discount on most components and material is no reason for you to bill your customer at your cost. A trade discount is not to be given away. It's part of your profit. If the set owner asks you what a resistor or capacitor or control or tube will cost him give

the list price every time. You need that trade discount as part of your profit.

Make an extra charge for transportation. Put it on a mileage basis. Make it clear to customers and prospects that you charge for your time from the moment you leave your shop until you return, for transportation, for actual labor expended, and again for material.

Service Contract Dangers

The customer is generally willing to pay for a job well done. He's got to—the set must be repaired quickly, properly, and dependably.

But *don't rob your customer!* I can't emphasize this point too much.

With the advent of television, the serviceman has come into his own in a bigger way than ever. For now he installs as well as services the receiver. More than that, he insures that set against breakdowns for a definite period of time.

There has been a veritable avalanche of TV service contract fees pouring into the hands of independent servicemen, large service organizations and dealers. Instead of laying aside a certain percentage of the funds collected for future claims on TV service calls and replacements, some contractors, organizations and dealers have gone to town on that pile of money, with the result that they cannot take care of their contract obligations when the sets do break down. Several large organizations have gone broke. There are nasty tales of some organizations robbing Peter to pay Paul—stripping TV sets of tubes and parts in order to repair other sets—of returning inferior sets to policyholders—of actually losing sets.

Efficiency Brings Profits

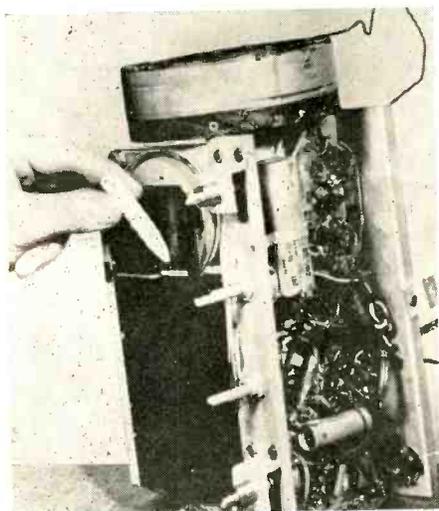
Again, charge fair prices for labor and material, but don't rob your customers! Explain the basis for your charges. Nobody expects you to work for nothing except the born chiseler—and you don't need him as your customer.

To keep your charges fair and square, be efficient. Make every hour count during the working day. Organize your jobs so as to minimize waste motion. Plan your calls so as to reduce travel mileage and time. Use the most efficient test equipment to arrive at the correct diagnosis promptly and dependably. Carry a reasonable stock of essential parts and materials so that you won't lose time chasing down to the

jobber's for every job you handle. Use dependable parts and materials that won't let you down. Remember, *labor* is your greatest item of cost. Time is money.

— RTM —

CHALK AIDS ALIGNMENT



WHEN servicing a radio built with a glass dial plate, with calibrations, attached to the inside of the cabinet instead of to the radio chassis, set the pointer to a particular frequency before removing the chassis from the cabinet for alignment. Mark the metal backing plate behind the indicator with chalk. The needle can then be returned to its original position for checking.

H. LEEPER.

— RTM —

Develops New Twin-Lead Dielectric

LITTLE FALLS, N. J.—A new dielectric material for use in twin-lead antenna feed lines, to bolster diminishing supplies of polyethylene, has been developed by the Jersey Specialty Company here, it was just announced by Peter J. Hagedoorn, president of the firm.

The new compound, containing elements of various plastics, has a Db rating of 3.9, as compared with the low-loss 1.6 rating of polyethylene, the announcement said. It is hoped that further experimental work will produce an even better material.

The plastic is between 75 and 100 times as plentiful as polyethylene, Hagedoorn said, and is considerably cheaper. Copper for the conductors still presents a serious problem of supply, however, and manufacturers are searching for a substitute for copper also.

PRODUCTS FOR THE TRADE

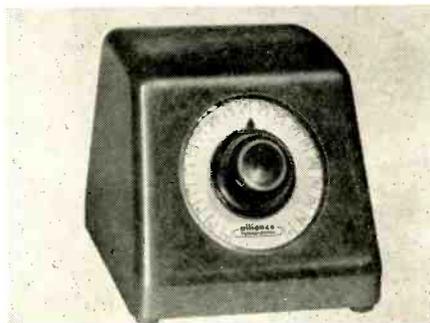
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The bulb is fully shielded from the picture screen, the manufacturer says, and a wide base reduces the danger of tipping. It is designed to use 15 or 25 watt bulbs in small or light-colored rooms, and 40 or 60 watt bulbs in large or dark-colored rooms.

— RTM —

AUTOMATIC ROTATOR

An automatic antenna rotator, a new item in the "Tenna-Rotor" line, will be ready for delivery next month, according to Alliance Manufacturing Co., the



makers. Said by the manufacturer to be the only rotator requiring no special installation for antenna direction orientation, the device permits the viewer to set the dial indicator to any desired point. The antenna then rotates to that point and stops.

The indicator dial may be marked for new channels at any time, the maker points out. A moving light on the dial shows the final antenna position.

— RTM —

SOLDERING TIPS



Three new tip types for the "Cal 88" single pole soldering gun, all made of

→ to following page

the maintenance mill

by Ghysels



"It's the only trace I can get on these expensive sets."

FIX ON THE FACTS

→ from page 15

fective condensers of this sort are usually easy to locate, especially if the oscillation is continuous. Bridging each bypass condenser with a good .1 microfarad condenser while the set is oscillating will usually bring an abrupt halt to the oscillation when the test condenser is placed across a bypass that is not doing the job it should by grounding the RF. The screen, cathode, plate-return, and AVC bypasses of the IF and RF stages are also likely to cause trouble and should always be carefully checked.

In many sets, though, a poor filter condenser will prove to be the villain of the piece. This is due to the fact that the manufacturer depends upon the bypassing action of the output filter condenser to ground the various plate returns. As this condenser begins to deteriorate, even before any increase in hum is noticed, the impedance to RF and IF currents increases and allows these currents, that should be grounded, to wander about through the set and cause oscillation. That is why it is a good idea to try your bridging condenser across the output electrolytic, too. If this cures the oscillation, replace the filter condenser instead of merely soldering the paper condenser across it, because the filter unit is on its way out and will soon allow the hum to increase.

Improper Alignment

But all of these causes of squealing radios are more or less fundamental and are comparatively easy to locate. The sets that really give you gray hair are the ones that have no loose shields, no open bypasses, no bad filter condensers, no dirty tuning condenser wipers—and yet they whistle like a banshee whenever you get close to having the IF transformers in alignment.

The first thing to do with such a set is to make sure you are aligning it properly. Do not take it for granted that the correct IF is 456 Kc. Some of them aren't. Look in a service manual and be sure. Then be certain that you are really setting the IF trimmers to the frequency being put out by the signal generator. Most servicemen align receivers with the oscillator "alive," and it is quite easy in such a case to be confused by the beats between the signal generator and the oscillator. Moving the tuning dial should have little effect

on the strength of the modulated IF signal heard in the speaker if the set is really being aligned to the IF frequency indicated by the signal generator. If moving the dial makes the signal disappear, you can be sure you are trying to align the receiver to a beat signal.

Try changing the IF and RF tubes. Quite often a tube will check all right in a conventional tube checker and still cause violent oscillation in a set. Gas, and misalignment of the grids inside the tube are two possible causes of oscillation not readily detectable in an ordinary tube tester. Before knocking yourself out hunting the trouble in other places, it is always a good idea to try substituting tubes.

IF Transformer Troubles

Another cause of oscillation that is more common than many servicemen realize lies inside the IF transformers. The coupling between the primary and secondary of these coils is quite critical (in fact, the optimum coupling is usually called "critical coupling") and any increase in this coupling can result in a set that simply cannot be brought into alignment without oscillating.

Wax Softened

As you know, the two windings are in the form of pies mounted on a dowel rod. The whole assembly is dipped in wax that tends to hold the windings in place. Often, however, the wax is softened by heat from the tubes—especially when the output and rectifier tubes are mounted quite close to the IF transformer shield can—and then the top winding will slip down close to the bottom winding, greatly increasing the coupling, and the receiver will start to oscillate. Replacing the transformer is the only practical repair.

Finally, always check to make sure the plate leads are dressed away from the grid leads. Do not forget that some of the bypass condensers are located up inside the IF transformer cans.

If you will carefully check on all of these points, you should be able to take the oscillation out of any receiver; but never give up until you can peak each IF winding right up to the top without causing the slightest tendency toward oscillation. Never let a set out of your shop that is just on the edge of oscillation, for if you do, the chances are a dozen to one that it will soon be back, squealing on your lack of thoroughness!

PRODUCTS FOR THE TRADE

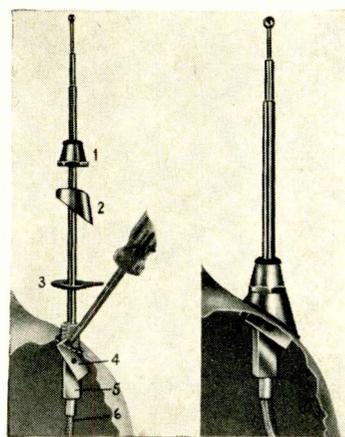
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silver, are in production. The two extra tips, interchangeable with the standard silver chisel tip with which the gun is equipped, are the "pencil point" and the "four-prong" tips. The four-prong tip is designed for prying wires out of inaccessible positions. All points are changeable with finger pressure only; no pliers are required for the operation, the company reported.

— R T M —

AUTO RADIO ANTENNA

The "Quick-Mount," an all brass and chromium auto radio antenna, is designed for simple installation. It is mounted on the cowl or fender of a car by one man. No special tools are neces-



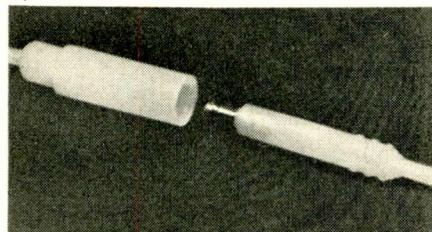
sary to do the job, and all work is done from the top, so that there is no need to get under the car.

Guaranteed rustproof, the antenna is 60 inches long when extended to its full length. Leads are 48 inches long.

— R T M —

HIGH-VOLTAGE CONNECTOR

Designed to give protection to the user and to provide a protective seal around contact against dust and moisture and to provide a protective seal with leads and body molded of polyethylene, has been put into production by Alden Products Co.



A protective sleeve on the female can be handled safely when hot, and won't arc even if dropped to ground. Because of the stubby pin on the male stud, contact is made with female in last $\frac{1}{4}$ " after sleeve and stud are sealed, so as to give protection from contact with live surface.

What's your problem?



This department of RADIO AND TELEVISION MAINTENANCE is devoted to helping to solve the difficult service problems of our readers. Tough ones of general interest will be printed, and readers will send in answers. The best solutions will be printed in later issues. If only one answer to a problem appears here, its originator will receive \$5.00 in cash. If two or more different ways of beating the poser are of nearly equal merit in the opinion of RTM editors, the second best will be worth \$3.00 to the man who submits it, and the third best will bring home \$2.00. Send your question or solution to: Problem Editor, RADIO AND TELEVISION MAINTENANCE, P. O. Box 867, Atlantic City, N. J.

TV WHISTLE

In last month's issue of RTM, Reader W. L. Vandal, Long Beach, Cal., described the troubles he was having with a television set that radiated an audible signal at the horizontal scanning frequency, about 15 Kc. He said he couldn't hear it, but his customer could, and it irritated the set owner. He tried several methods of reducing the noise, but couldn't satisfy the customer.

Reader James Sherwood gets \$5 for the following answer to Mr. Vandal's problem:

GENTLEMEN:

In reply to the letter about the 15 Kc whistle from the GE television set, I'd like to suggest that Mr. Vandal work on the horizontal output transformer.

Tightening the laminations on this transformer will eliminate the whistle, or at least reduce it greatly, I have found.

When they are loose, the laminations vibrate at the high frequency and produce an ear-piercing sound. Many people are unable to hear this because of the limited range of their ears.

If tightening the laminations doesn't reduce the whistle, then the transformer should be replaced.

—JAMES SHERWOOD
AURORA, ILLINOIS

CONVERSION DIFFICULTY

GENTLEMEN:

On one of my television service calls, for a Crosley Model 408, the owner changed over from the original 10BP4 used in the set, to a 16AP4 round metal picture tube.

Later, he asked me to replace the 16AP4 with a 16KP4A, a rectangular black-faced tube.

I tried everything I could think of to make the raster fit the screen of the new tube, but ran into trouble. I increased the horizontal scanning distance by removing a resistor in the pin 10 circuit. But on the vertical scanning, using a thin wafer focus coil and a 70-degree horizontal-vertical deflection coil, together with the proper ion trap for the 16KP4A, the only picture I can get falls short of filling the screen. It goes all the way to the sides of the frame, but it is about two inches too low at the top, and about an inch too high at the bottom. A test pattern shows up as an elliptical shape. There just doesn't seem to be anything I can do to extend the vertical scanning distance.

Can another reader help me with this puzzler?

—JOHN G. STRONG,
LOS ANGELES, CAL.

WEAK BC RECEPTION

GENTLEMEN:

On a Philco Transitone, and several other AC-DC sets of similar design I have worked on, stations come in very weak, or not at all, on the low end of the dial, between 550 and about 800 Kc.

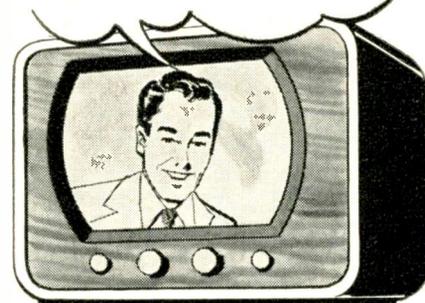
On the Transitone that's giving me trouble just now, I've peaked the IF and adjusted the RF condenser, but the lower-frequency stations are still weak unless you hold your hand near the antenna loop.

Thanks for any remedies for this you can suggest.

—ELBERT ROBBINS,
QUEEN CITY, MO.

Eliminate Noise!

(VISUAL AND AUDIBLE)



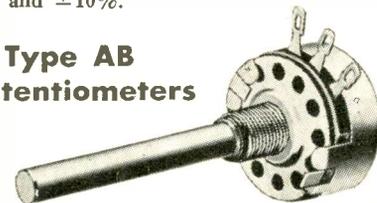
Use **OHMITE**
REPLACEMENTS



Little Devil
Composition Resistors

Molded plastic construction completely seals and insulates these tiny, rugged units. They have an extremely low noise level. Resistance and wattage clearly marked on each unit. Available in 1/2, 1, and 2-watt sizes, in all RMA resistance values. Tolerances: ±5% and ±10%.

Type AB
Potentiometers



It's quiet! This Type AB Potentiometer has a resistance unit that's solid molded. As a result, the noise level often becomes less with use. Has a 2-watt rating with a good margin of safety. Is unaffected by extremes of heat, cold, or moisture. Available with either 2" round shaft, or short, locking screwdriver shaft.

New Ohm's Law
Calculator

Solves Ohm's Law, parallel resistance problems. Also has slide rule scales.



25c

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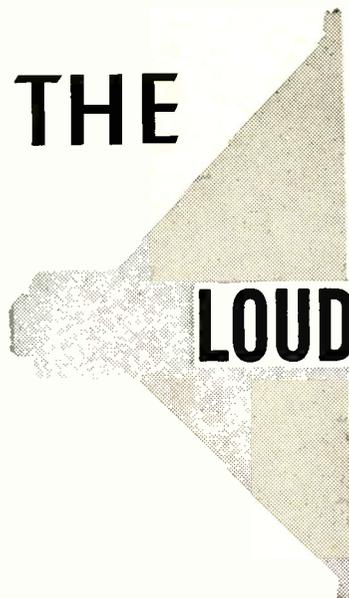
Be Right with

OHMITE

Reg. U. S. Pat. Off.

RHEOSTATS • RESISTORS • TAP SWITCHES

THE



LOUDSPEAKER

WHAT will it mean to the radio parts business if the Federal Trade Commission upholds a decision to prevent several spark plug makers from selling to automobile manufacturers at a discount?

It could mean the end of parts distribution as we know it today. It could mean that radio and television servicemen will have to pay higher prices for components and replacements. It might very easily mean a general price rise in the cost of new sets. For that matter it could mean that radio manufacturers would start shipping receivers from the factory with vital parts missing, so that the tube, for example, would have to be put in by the retailer before he put them up for sale.

It isn't immediately obvious what anything so far fetched as an FTC case involving spark plug manufacturers, has to do with the radio business. Actually there

is a close parallel between the automobile business, where manufacturers buy components from many different suppliers, and the electronics field, where much the same setup exists.

And if the recommended decision is held to by the government, it would set a concrete precedent for revamping the entire radio and TV parts distribution industry. As stated to the FTC by a trial examiner, the order provides that several manufacturers of spark plugs sell to auto makers at the same price they charge wholesalers, whose business is in the replacement field. They can give the car manufacturers discounts only when they can prove that the only differentials are those which make "allowance for differences in cost of manufacture, sale or delivery resulting from the differing methods or quantities" in which they are sold. Final decision on the case will come early next year.

If the spark plug companies are ordered to make the price to wholesalers the same as the price to makers of automobiles, it will be logical for the commission also to order electronic component manufacturers to set flat prices, no matter who the customers are.

In that case, it might be more profitable for the big set manufacturers to make all their own parts. If not, they would probably have to raise their prices to pass on to the consumer the higher rates charged to them by the component makers. It is very unlikely that wholesale prices in the parts field would simply be cut to the level of manufacturer prices.

With higher consumer prices, the radio and television business, booming now, would certainly be affected. The producers of component parts, might find it advantageous to sell direct to customers previously supplied by jobbers.

All the changes that might occur in the electronics industry, and other industries, such as the automobile business, if the examiner's recommendation is followed, will not be known until some time after the final decision is made. Thorough revisions of the systems now used in production and distribution of all products involving maintenance, particularly radios and TV sets, are certain. Directly and indirectly, nearly all electronics technicians would be affected. Just what the net result will be to the business of the independent serviceman, cannot now be ascertained.

—M. de A.

Coming in November!

Special TV ANTENNA and INSTALLATION ISSUE of RADIO AND TELEVISION MAINTENANCE

The November issue of RADIO AND TELEVISION MAINTENANCE will be the first in a series of special numbers, each giving a complete editorial treatment to some particular phase of radio and TV service. Carefully planned to cover TV antennas and installation from all angles, next month's special issue will contain articles

on types of antennas and their characteristics, fringe area reception and how to improve it, training of installation men, techniques helpful in special installations, and other material designed to present a full, all-round picture of this branch of television service.

**WATCH FOR THE NOVEMBER ISSUE OF
RADIO AND TELEVISION MAINTENANCE**

CALIBRATING THE TV OSCILLOSCOPE

→ from page 8

Step-By-Step Procedure

The following detailed procedure should be followed in the order of steps given:

1. Set up the calibration circuit shown in Fig. 3, but do not connect to the oscilloscope at this time.

2. Connect the oscilloscope to the power line and switch-on.

3. Set the VERTICAL GAIN control to its maximum position.

4. Set the HORIZONTAL GAIN control to zero.

5. Switch off the INTERNAL SWEEP.

6. Set the SYNCHRONIZATION SWITCH to its "internal" position.

7. Set the vertical and horizontal BEAM CENTERING controls to bring the cathode ray spot to the exact center point of the screen.

8. Adjust the INTENSITY and FOCUS controls for a sharp, well-defined spot without halo or fuzz.

9. In the calibration circuit (Fig. 3), set switch S to its 10-millivolt position, and reduce the input voltage to zero.

10. Connect the calibration circuit output terminals to the vertical amplifier input terminals of the oscilloscope.

11. Increase the input voltage slowly until the spot is deflected through the distance of one horizontal screen line above and below the center point. This deflection traces a vertical line from the first horizontal line above center to the first line below center. Note the voltmeter reading, convert this reading to millivolts by referring to the setting of switch S, and multiply the number of millivolts by 1.414 to obtain the peak value. Record this value on the calibration chart. This final value indicates that the first vertical division of deflection both above and below the horizontal center line correspond to so many peak millivolts.

12. Increase the input voltage carefully to deflect the spot to the second horizontal line above and below the center line on the screen. Read this voltage, convert it into peak millivolts, and record it on the calibration chart.

13. Repeat the foregoing steps, adjusting the deflection of the spot to each succeeding horizontal line until the entire screen has been checked, line by line. At some point, it will be discovered that the full 10 volts input will not deflect the spot beyond a certain

point on the screen. When this occurs, the limit of the range selected by switch S has been reached. Throw the switch to its next (100-millivolt) setting and proceed.

14. After the entire screen has been calibrated with the VERTICAL GAIN control at its maximum setting, reduce the gain control setting 1 division lower than maximum and repeat Steps 11 to 13. Then, reduce the gain control setting one more division and repeat Steps 11 to 13. Continue reducing the gain control setting one division at a time until separate voltage calibrations have been obtained for each screen division of the oscilloscope at each setting of the vertical gain control.

15. The vertical deflection of the oscilloscope is of chief calibration interest, since it is along the vertical axis that signal peak voltage values will be measured in trouble shooting and circuit adjustment. However, if desired, the horizontal axis may be calibrated in a similar manner: A. Connect the calibration circuit to the HORIZONTAL amplifier input terminals of the oscilloscope. B. Advance the HORIZONTAL GAIN control to maximum. C. Reduce the VERTICAL GAIN control setting to zero. D. Repeat Steps 11 to 14, remembering that this time the deflections will be along the horizontal center line to the right and left of the vertical center line of the screen.

This calibration procedure assumes use of a 50- or 60-cycle input signal voltage. For accuracy, the entire volt-

age calibration procedure should be repeated at several other frequencies within the guaranteed operating range of the oscilloscope. Suggested frequencies are 1000 and 10,000 cycles, and 100, 1000, and 2000 Kc.

Use With RF Generators

Since some audio signal generators, but only rare RF generators or test oscillators, give the 10 volts output required in the calibration circuit of Fig. 3, modification of the circuit is required in order to use the 1-volt signal available from these generators. The necessary circuit alterations are simple: short-circuit resistor R₁, change R₂ to 90 ohms, and change R₃ to 990 ohms. Resistor R₄ remains 10 ohms. The voltmeter must be changed to a vacuum-tube type capable of operating on both AC and RF.

The input signal voltage now must be varied between zero and 1 volt rms, as indicated by the vtvm, by means of the output control of the oscillator. The millivolt ranges selected by switch S remain the same as indicated in Fig. 3.

In order to minimize losses and re-

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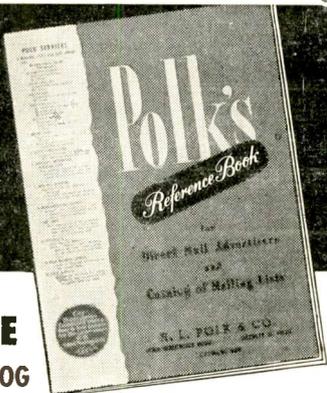
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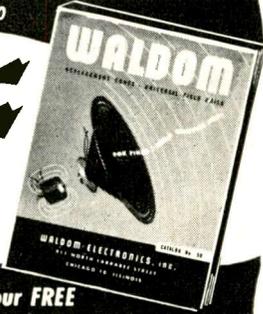
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CALIBRATING THE TV OSCILLOSCOPE

→ from preceding page

duce errors due to stray capacitances when making higher-frequency voltage calibrations, all leads in the calibration circuit and those between this circuit, the signal generator, and the oscilloscope must be kept as short as practicable. It may further become necessary to shield the short leads to and from the calibration circuit and also to shield separately each resistor (R_1 , R_2 , R_3 , and R_4) and the selector switch S. All four resistors must be of the non-inductive type when measurements are made between 100 Kc and 2 Mc.

If the oscilloscope is provided with a high-impedance pickup probe, the entire calibration must be made at all frequencies both with and without the probe. This is necessary since the voltage values obtained without the probe will be higher than those obtained with it, due to probe attenuation.

Advantages of Calibration

We realize that this procedure constitutes a painstaking job, requiring appreciable time and effort. The question is apt to arise naturally in the mind of the reader as to the value of it all. But it's easily worth the trouble.

Remember that the TV oscilloscope, as used in trouble shooting and circuit adjustment, basically is a wide-range voltmeter of considerable versatility. Its value as a voltmeter is at a maximum only when the operator knows with some precision the values of peak voltage indicated by the instrument. Seeing to it that the waveform of a signal is exactly, or nearly, of the correct shape is only part of the job. Furthermore, as the oscilloscope leads are transferred from point to point through the TV circuit, higher signal voltages are encountered and the oscilloscope gain control must be turned down in order to keep the signal from expanding off the screen. At such reduced gain settings, the screen sensitivity, as stated by the instrument manufacturer, departs considerably from the stated values and can be known only from data obtained by means of an individual calibration.

Calibration Checking

How often must calibration be made? The answer is, only occasionally under normal circumstances. Long-term observations indicate that if a complete calibration is made when the instrument

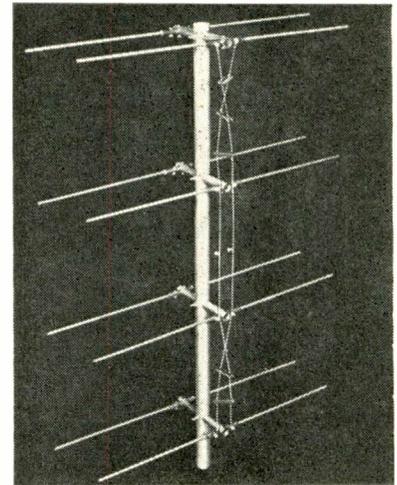
is new, it will hold quite well to the test values throughout several thousand test hours or until tubes are replaced or repairs made. An occasional spot check, say once every three months, will serve to disclose any serious departures from the original calibration.

When the amplifier or cathode ray tubes are replaced, a spot check must be made at once. If the check values vary more than about 5% from the original calibration values at several points within the frequency range of the scope, the entire calibration process must be repeated.

Keep the calibration data in the form of a chart or series of graphs, attached preferably to the oscilloscope itself. The increase in the tool value of your television oscilloscope as a result of an individual calibration, will be sufficient to repay all your efforts.

— RTM —

UHF ANTENNA



One of the antennas being used for experimental UHF reception from NBC Station KC2XAK, Stratford, Conn., is this four-bay stacked array, developed by Vee-D-X. A clear picture is said to come through on this aerial at a distance of 48 miles from the station—a fringe area. The station operates on the 529-535 Mc channel. This model is available only on special order for experimental work.

— RTM —

GE MAKES SCOPE CHANGES

Several changes have been made in the GE model ST-2A five-inch scope, it was reported recently. A provision for direct connection to the deflection plates through binding posts and switches at the rear of the instrument has been incorporated, and other modifications have also been made. The changes will facilitate modulation measurement in the laboratory and broadcast fields, the report said.

trade LITERATURE



TRANSMISSION LINE BOOK

TRANSMISSION Lines and Networks," a new textbook by Walter C. Johnson of the Princeton University Electrical Engineering Department, contains more than 350 pages of text, examples, and pictures illustrating many phases of wave distribution, impedance matching and filters, and other subjects associated with line transmission.

Directed primarily at engineers and engineering students, the book gives exact mathematical formulas and equations for most of the cases it discusses, showing derivation, calculation, and use of the mathematics of the subject.

The first section of the volume covers transmission lines generally, from a discussion of traveling waves through measurements of impedance and matching to special problems of telegraph and power lines. The second part, dealing with four-terminal networks, covers elementary network analysis, characteristics of the networks, and such topics as filters of various kinds, image and iterative operation, insertion loss, and other branches of the field.

Exhaustive in its treatment of the subject, the book includes full data, from basic material to high-level theoretical explanations. It is published by McGraw-Hill Book Co., New York. Price is \$5.00.

— RTM —

NEW EDITION TUBE MANUAL

A NEW edition of the RCA Receiving Tube Manual, said to be the most comprehensive and authoritative reference book on electron tubes in the industry, has been announced.

The new Manual, RC-16, which incorporates many new features reflecting new developments in electronics, has been revised, expanded, and brought up to date. Containing over 300 pages, it is 25 per cent larger than the RC-15 edition which it supersedes.

The same coverage of technical data contained in previous editions, from elementary theory to descriptions of latest tube applications, has been continued

and enlarged in the new RC-16. In addition, the book now has a new "lie-flat" binding for ease of use. Detailed technical information is provided on more than 460 RCA receiving tubes and kinescopes, including many discontinued types. The section on tube and circuit theory has been expanded and includes formulas and examples for calculation of power output, load resistance, and distortion for several classes of amplifier service as well as cathode follower



design information. Television coverage includes kinescope installation data and handling information.

For quick reference, the new manual contains a classification chart which groups types having similar characteristics and the same filament or heater voltages and shows miniature types and their GT equivalents. The circuit section has been expanded and contains many new amplifier and receiver circuit designs. A complete section on resistance-coupled amplifiers is provided.

— RTM —

OSCILLOSCOPE BOOK

"ENCYCLOPEDIA on Cathode-Ray Oscilloscopes and Their Uses," a new book published by John F. Rider, is now ready.

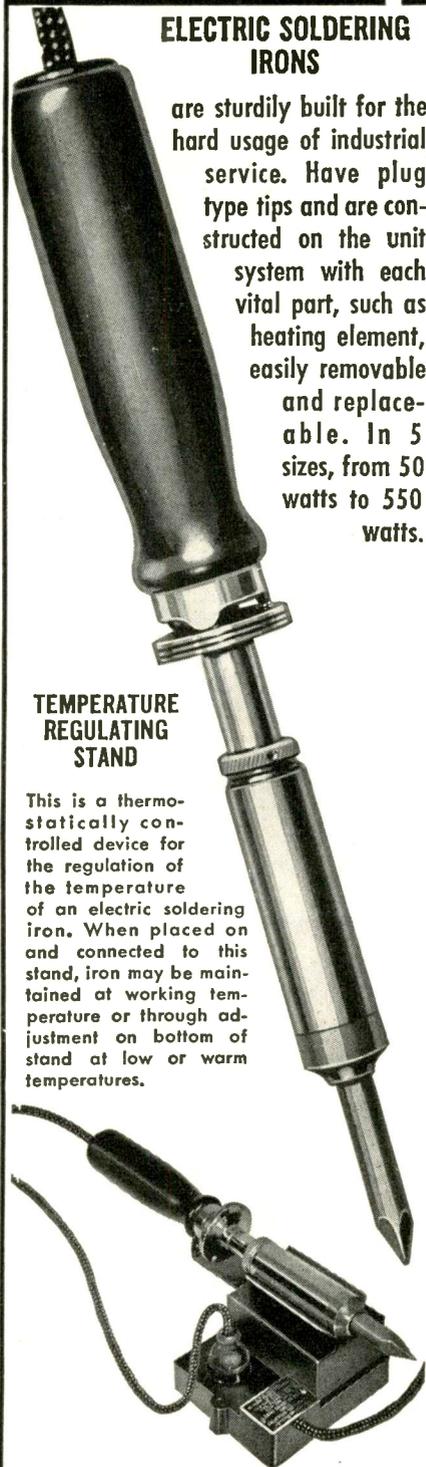
The text, co-authored by John F. Rider and Seymour D. Uslan, who collaborated on "FM Transmission and Reception" and "Understanding Vectors and Phase in Radio," is a real encyclopedia. Most of the cathode-ray oscilloscopes manufactured during the past ten years are thoroughly discussed. Roughly, the book is divided into four

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Equally as useful is the material on four-terminal networks, pointing up the application of the theory to attenuators, impedance-matching networks, and filters. Covers such recent advances as present-day transmission line charts and their use for both lossy and lossless lines . . . and microwave lines, including measurements and impedance matching.

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TRADE LITERATURE

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categories: theory and operation of the cathode-ray tube and oscilloscopes; an applications section which deals with measurements, alignment, and other uses; commercial oscilloscopes and related equipment; and a comprehensive compilation of 1600 complex waveform patterns, listing the harmonics, the exact phase and the amplitude of each waveform. Three appendixes, the characteristics of cathode-ray tubes, RTMA cathode-ray bases, and photography, round out the contents of the book.

The book contains 22 chapters with approximately 3,000 illustrations and 992 pages. Completely indexed and bound in cloth, it is priced at \$9.00.

— RTM —

SOLDERING GUN CATALOG

NEW soldering information for TV and radio technicians, electricians, auto mechanics and industrial laboratory workers, is contained in a soldering gun catalog recently issued by Weller Electric Corp. Illustrated, the new catalog covers the complete line of Weller guns and features a new light-duty model with dual spotlights. These twin pre-focused spotlights entirely eliminate shadows in the working area. A free copy may be secured by writing Weller Electric Corp., Easton, Pa.

— RTM —

CAPACITOR BOOKLET

MANY kinds of condensers, from dry electrolytics through molded paper and oil paper to the new "Metalite" self-healing, sub-miniature, metallized paper capacitors, are described in a new catalog just released by the Astron Corporation.

A listing of standard RF filters of aircraft and heavy-duty applications is also included. Copies of the catalog are available by writing to the manufacturer of the condensers, at 255 Grant Avenue, East Newark, N. J.

— RTM —

ACOUSTICAL EQUIPMENT

A CATALOG of acoustical and electro-acoustical apparatus manufactured by the Audak Company during 1950 is now available.

Covering the "Polyphase" models, as well as tuned-ribbon and heavy-duty pickups, the catalog also includes material on Audak phono cutting heads.

For a copy of the leaflet, write to the Audak Company, 500 Fifth Avenue, New York 18, N. Y.

RIDER TV VOLUME 5

THE fifth volume in the Television Manual series of John F. Rider, publisher, will be available at Rider distributors this month, it was just announced.

Factory-authorized data from 74 manufacturers is included in the new edition to the series, covering the period March-July, 1950. Material on 250 chassis and 614 models of TV receivers is given, as is a cumulative index of the preceding four volumes.

Page size is 12 by 15 inches. Cost of the volume is \$21.00.

— RTM —

TV ANTENNA BOOK

JOHN F. RIDER, Publisher, announces a new antenna book, "TV and Other Receiving Antennas" (Theory and Practice), by Arnold B. Bailey, which will soon appear.

The book gives a review of definitions of terminology used in antenna practice, an analysis of the television signal, conditions that determine signal levels at the receiver, and the problems of propagation as they relate to operations up to 1000 Mc.

It then goes on to antenna theory and the practical applications pertaining to it.

— RTM —

PARTS LISTS

THE 1951 catalog of electronic parts, complete equipment, and kits at Radio Shack Corporation, Boston, has just been published. It contains 172 pages, divided into sections on test and service instruments, public address and high fidelity music systems, amateur radio equipment, tubes, transformers, connectors, wire and cable, condensers, resistors, batteries, and books on electronics.

Copies are free on request from the company, 167 Washington St., Boston 8, Mass.

— RTM —

TV EQUIPMENT CATALOG

A CATALOG of television equipment for laboratory, manufacturer and broadcast use has just been issued by Polarad Electronics Corporation.

Fourteen pages of pictures and description give full information on the company's television cameras, synchronizing generators, monitors, TV amplifiers and power supplies designed for broadcast use.

Copies of the catalog may be obtained from the company, at 100 Metropolitan Ave., Brooklyn 11, N. Y.

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The RCA Service Company, Inc., a Radio Corporation of America subsidiary, needs qualified electronics technicians for U. S. and overseas assignments. Candidates must be of good character and qualified in the installation or maintenance of RADAR or COMMUNICATIONS equipment or TELEVISION receivers. No age limits, but must have at least three years of practical experience.

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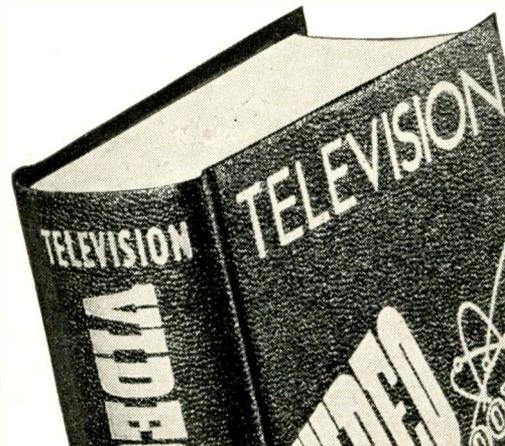
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High Permeability Affords Wide Use for New Magnetic Ceramic

WEST ORANGE, N. J.—With a ten-fold increase in permeability over previous powdered-iron cores, a new magnetic ceramic holds promise of revolutionizing TV-radio engineering, production and costs. In TV transformers and deflection yokes, its more efficient transfer of electromagnetic energy can serve to slash size and cost of TV receivers.

Already in use in place of the usual radio loop in several current radio sets, this ceramic not only simplifies design and production details but notably improves reception by way of greater signal-to-noise ratio, particularly background noise due to inductive interference or man-made static.

Croloy, as the new substance is called, has been under development for about ten years. It was worked out by Henry L. Crowley of this city.

—RTM—

STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) of

RADIO AND TELEVISION MAINTENANCE, published monthly at Atlantic City, New Jersey, for October, 1950.

1. The names and addresses of the publisher, editor, and business manager are: publisher, International Publishing Corporation, Atlantic City, N. J.; editor, Robert Letwin, Atlantic City, N. J.; business manager, Paul Lightman, Atlantic City, N. J.

2. The owner is International Publishing Corporation. Stock holders owning or holding one percent or more of total amount of stock in that corporation are: Paul Lightman, 27 N. Frothingham Ave., Atlantic City, N. J.; Paul Roberts, Gramercy Court Apartments, Atlantic City, N. J.; Philip Harrison, 10 S. Fredericksburg Ave., Atlantic City, N. J.

3. The known bondholders, mortgagees, and other security holders owning or holding one percent or more of total amount of bonds, mortgages, or other securities are: none.

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

PAUL LIGHTMAN

(Signature of business manager)

Sworn to and subscribed before me this 6th day of October, 1950.

(Seal)

RUDOLPH FIORAVANTI

Notary public of New Jersey

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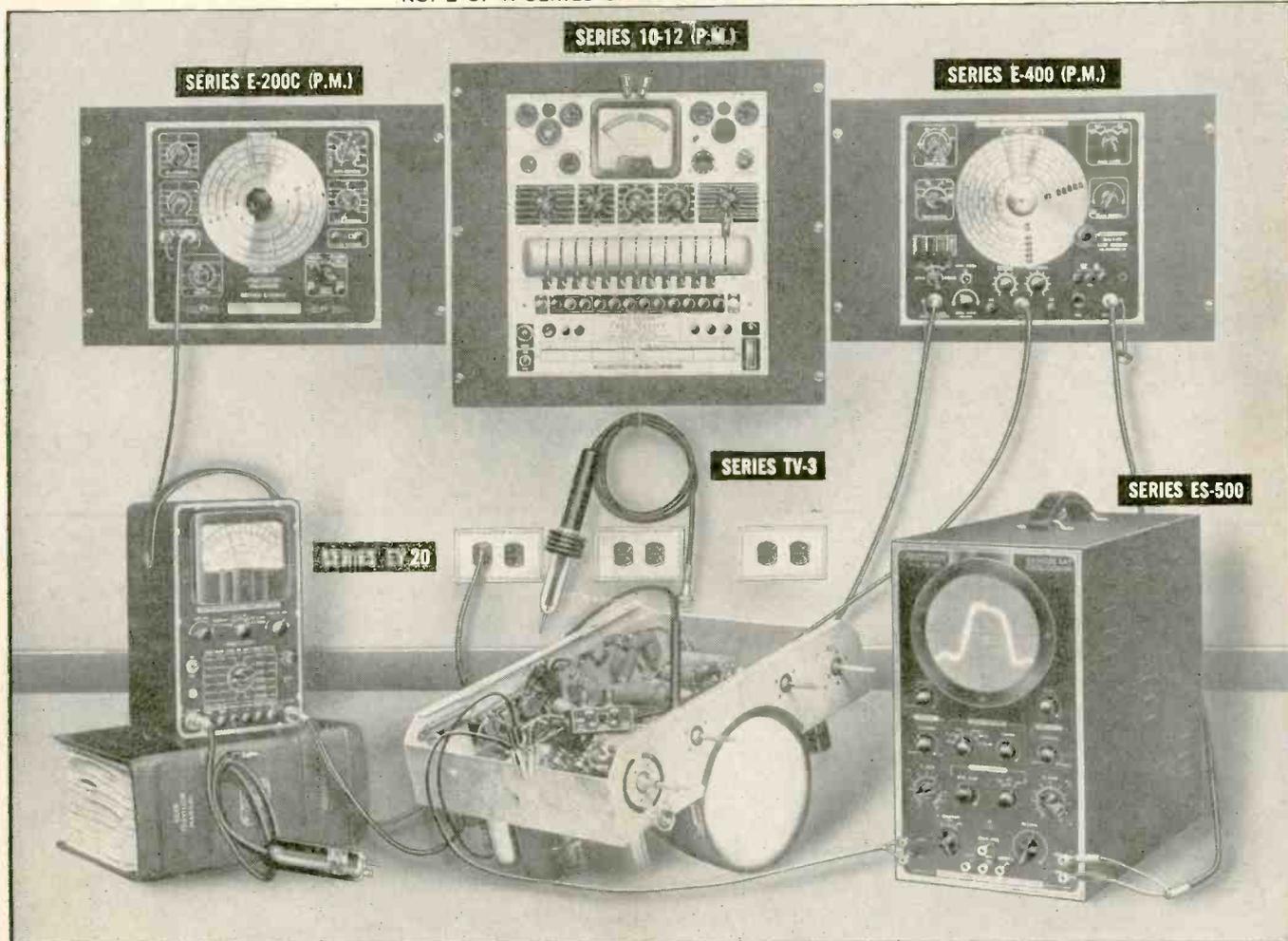
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