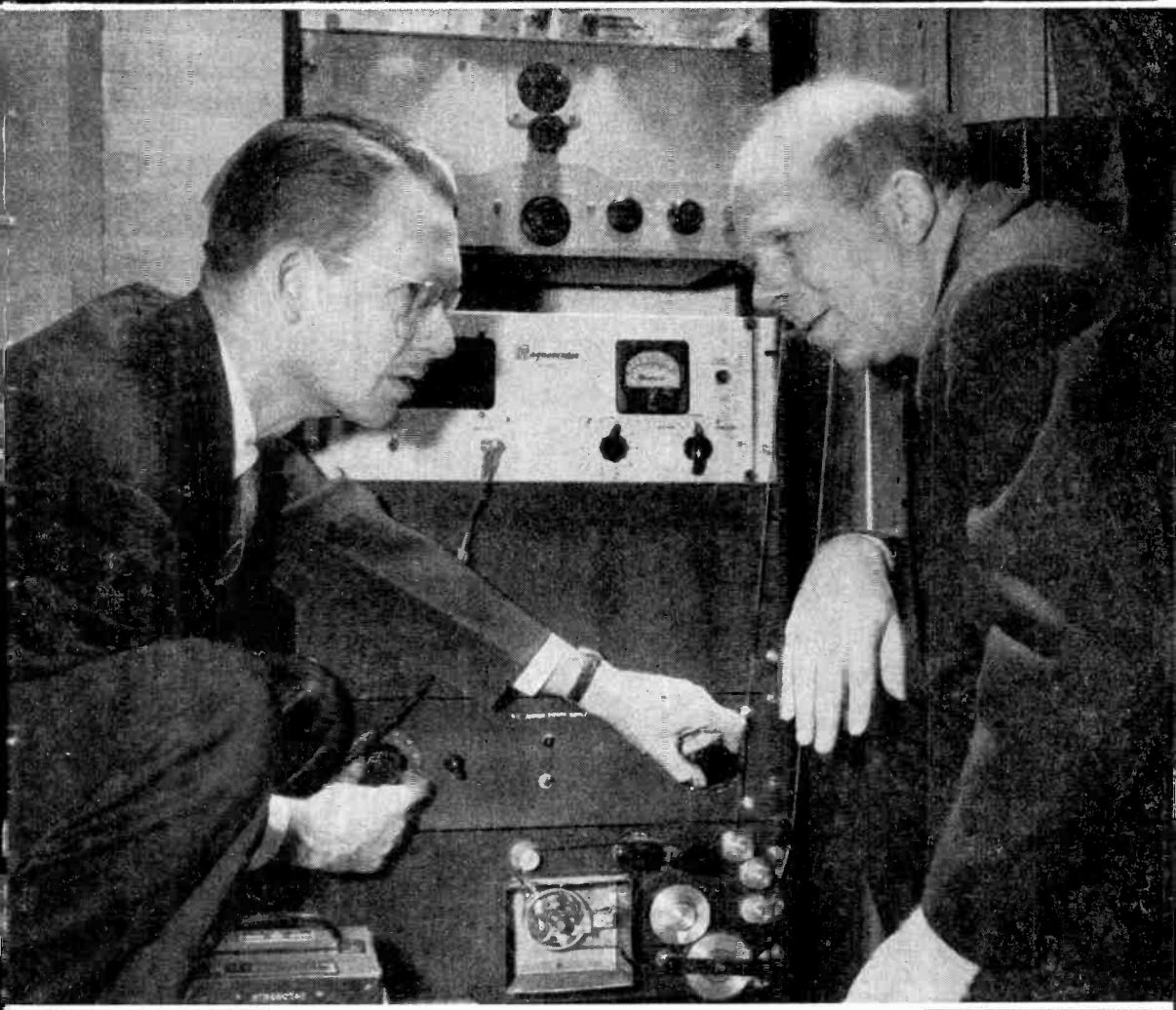
National RADIO-TV NEWS



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Alumni Association News

June-July
1953

VOL. 15
No. 9

Come Up Swinging

When you are discouraged, tired, and troubled—when everything seems to go dead wrong—when you feel like chucking aside the whole thing and taking a long rest, that's the time to tighten your belt and dig in harder than ever. Remember always, a quitter never wins.

When you are down and feel like taking the ten count, come up swinging and fight one more round.

You are never whipped until you, yourself quit.

There will always be some obstacles to overcome. Everything worth-while in life has a price. The price of success is overcoming hardships, discouragement, solving problems. The test is whether you have the determination to whip these circumstances, or whether you are going to let them whip you.

If I can say anything to my students that will help them overcome the natural tendency to take the easiest road, to help them show strength when strength is needed, I feel I am contributing as much to their success as I am with the material in their lessons and kits. The best Radio and Television course in the world can do nothing for a man unless he will study, study, study, and will beat back all negative influences that hinder him from reaching his goal.

J. E. SMITH, President

Round-up of UHF Antenna Developments

UHF Reflection Problem, Height Cancellation, Vibration and Deposit Troubles. UHF Antenna Directivity. VHF Antennas for UHF. UHF Antenna Types. Report on UHF Reception. Lighting Arrestors.

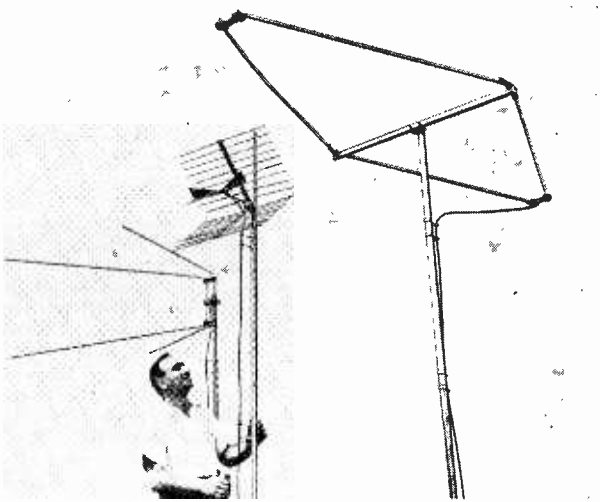

Fig. 1. JFD UHF antennas. Left to right: Broad-Band Stacked V, Corner Reflector, Rhombic.

THE differences between VHF (old-band) problems and those associated with UHF are mainly of degree, Brach Mfg. Corp. engineers point out. For instance, the UHF signal tends to travel in straight lines just like the VHF signal—but much more so; there is practically no ground wave at all and your antenna must be able to "see" the transmitter. Multipath reflections from buildings and other objects will still give you "ghosts"—but they will be much sharper ghosts, and much more annoying. Losses of all kinds are much higher—those due to long lines, poor connections, incorrect impedance terminations. Absorption of the signal by trees, building walls, and people is much higher. In VHF a small object between the receiving antenna and transmitter will not destroy the signal; in UHF there must be as little as possible intervening. This makes indoor antennas a big problem, not only because the signal must sometimes go through a wall, but because it may fluctuate when people move around in the room.

Reflection Problem

The problem of reflected signal pickup is going to be more serious at UHF than at VHF, according to the La Pointe-Plascomold Corp. Due to the short distance between the crests of two successive signal waves in space (see Fig. 2) there will be a greater number of additions and cancellations of signal at any given point. "Standing waves in space" may be present, when a good deal of reflected signal exists. Under such circumstances, sharp nulls will be close to high signal points, and the positioning of the UHF

antenna will have to be very carefully made.

The UHF antenna installer will want to know when a large amount of reflections is present in the total incoming signal, since he will have to be extra careful about the antenna's orientation at such times. An easy way for a two-man team to check for the presence of space reflections, or "standing waves in space," is to move the antenna horizontally in line with the signal wave-front. If the total signal contains a considerable amount of reflections, sharp null and high signal points will cause corresponding changes in the contrast and snow content of the received picture. When the incoming signal is largely or completely free from reflections, moving the antenna horizontally in a straight line will have much less or no effect on picture contrast.

Reflections will be visible as ghosts if they arrive at the receiver an appleciable distance behind

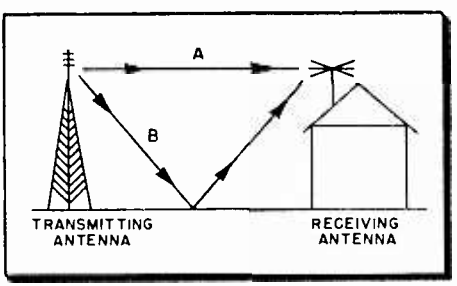

Fig. 2. The phase difference between the direct signal A, and the ground reflected signal B, produces a cancellation effect which varies with the height of the antenna.

the direct signal. Very small displacements will cause picture detail to be degraded. Reflections that produce displacements too small to be apparent to the eye can still cause the UHF signal to be attenuated. This last characteristic will be more of a problem at UHF than at VHF.

Height Cancellation

Cancellation and addition of signal in the vertical plane is another undesired characteristic of UHF reception. The phenomenon is known as height cancellation. It is the result of the sharper angles of bending in the atmosphere and the greater possibilities of a change in the polarization of the original horizontal wave. The combination of in-phase and out-of-phase signal components cause horizontal layers differing in signal strength to be superimposed over one another in vertical column form. In areas of weak signal level, it becomes very important to probe vertically (as well as horizontally) for the point of optimum reception. Even in areas of high signal

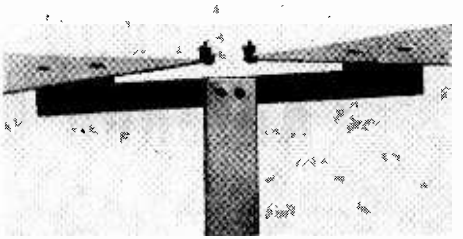

Fig. 3. Photo showing free space terminals of Channel Master antenna.

level, vertical and horizontal probing is often desirable.

UHF Antenna Directivity

High-gain antennas will possibly be used even in areas where the signal strength is strong. The reason does not lie in their better signal pickup —lower-gain antennas would provide sufficient energy in such localities—but in their superior directivity.

Why is directivity so essential? Well, horizontal directivity, or reception in a relatively narrow horizontal angle, is beneficial because unwanted signals (such as reflections) arriving outside the angle are discriminated against. Vertical directivity, or the sensitivity of the antenna to signals originating above or below, is also important. An antenna with good vertical directivity will minimize pickup of reflections from the earth to other objections, making the vertical placement of the antenna less critical. Pickup of reflections from airplanes will also be reduced, minimizing picture flutter when planes aver overhead. For these reasons, then, frequent use of high-gain antennas in urban areas may be expected.

Vibration and Deposit Problems

The UHF antenna installer will face two major problems, Channel Master Corp. engineers point out. One of these is vibration. Due to the characteristics of UHF waves, a ½-inch antenna vibration on UHF will have the same effect on the picture that a 5-inch antenna vibration would have on VHF. Highly rigid antennas therefore become a must on UHF. Antennas designed solely for VHF, when used to bring in UHF signals as well, may cause the picture to flicker and flutter due to their lack of requisite rigidity, even though their signal pickup is adequate.

The accumulation of dirt, moisture, soot or ice deposits at the antenna terminals is an even more serious problem. Deposits like these tend to gradually impair picture quality, and may eventually cause the incoming signal to be entirely shorted out. It is the opinion of the Channel

Master people that the feed points on UHF antennas of standard design are certain to be a source of severe and continuing trouble to the set-owner and dealer, necessitating frequent callbacks. To eliminate the problem, Channel Master has developed an antenna whose terminals are isolated in free space (Fig. 3).

VHF Antennas for UHF

The question of whether VHF antennas will effectively receive UHF signals will no doubt arise in the serviceman's mind. Don't expect too much of the VHF antenna in such employment. Aside from the vibration and deposit problems previously discussed, the gain of the VHF antenna for UHF signals will be low. Its directivity is generally poor, in the horizontal as well as vertical direction. The bandwidth will probably be adequate, although gain will not be uniform over the UHF band, dropping off to a certain extent

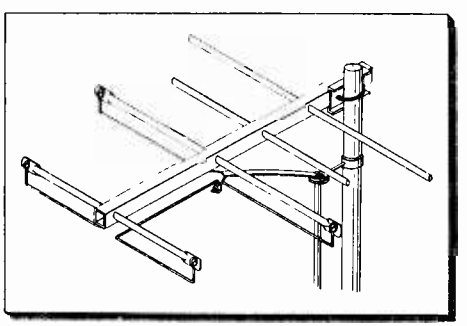

Fig. 4. Telrex "Duplex" yagi for UHF.

at the high end. The chief trouble with the antenna designed for VHF is that its response pattern shifts with frequency. For this reason, different antenna orientations may be necessary when switching from one UHF channel to another widely separated from it. A rotary-type VHF antenna will suffer less from this defect than stationary units.

UHF Antenna Types

Antenna types that are currently being used for UHF include: bow-tie, fan dipole, stacked V, corner array, rhombic, conical, double conical, stacked dipole and reflector, and yagi (see Figs. 1, 4). These units were specifically designed for UHF reception.

Ward has a novel VHF-UHF antenna called the U-Vee (see Fig. 5). The unit is basically a double-V type. The elements of the V can be assembled to make one of three different angles. In the first position, optimum VHF reception will occur. The second position is for VHF and UHF. Position number 3 is for UHF only, and therefore gives optimum gain for signals in this range.

The Brach Mfg. Corp. recommends a bow-tie antenna for primary signal areas (locations within a few miles of the transmitter) where signal strength is strong and reflections are no problem; a corner reflector is suggested for fringe areas, and primary areas in which reflection or interference is a problem. A dual-V is recommended for primary areas in which both UHF and VHF reception are desired.

The corner array or corner reflector is considered in competent quarters as one of the best of the UHF antennas commercially available. It has excellent gain, relatively small compact size, exceptional directivity, and when correctly designed will cover the entire UHF band.

Speaking of corner reflectors, Marty Bettan of RMS tells the story of the Texan who was using one on the roof of his building. A high wind came up, and the antenna began teetering dangerously over the edge of the roof. The Texan didn't want to go meandering around a roof at such a time, since the winds in Texas are, like everything else in this state, apt to be big. On the other hand, he didn't want the antenna to fall on anyone's head, for humanitarian as well as economic reasons (lawsuits are sometimes costly).

What to do? The solution was, perhaps a typically Texan one. The fellow got out his rifle and shot the antenna down (he had probably misplaced his lasso). It took quite a few shots, but he did it. When the bullet-riddled mass finally toppled into the street, there were so many holes in it that it could probably be used only for standard broadcast reception, in areas one mile from the transmitter.

Report on UHF Reception

Marty has some interesting things to report re his experiences with UHF reception in Bridgeport, Connecticut and Seattle, Washington. Sometimes, he says, the Bridgeport transmission was picked up fine in New York---but not in Bridgeport. A simple wire served as a suitable antenna in some cases; in others, a parabolic antenna (a type capable of providing the highest gain) would not produce satisfactory reception. 8 to 10 miles from the transmitting station, a high-gain antenna might be needed.

In Seattle, Washington, signals which were horizontally polarized at the transmitter became vertically polarized after bouncing off a mountain. Antennas often required tilting, as a result, to obtain optimum reception. Some antennas, oddly enough, picked up just about zero signal when beamed directly broadside to the transmitter. A wise policy, it developed, was to orient the antenna for optimum reception without regard to its position with respect to the transmit-

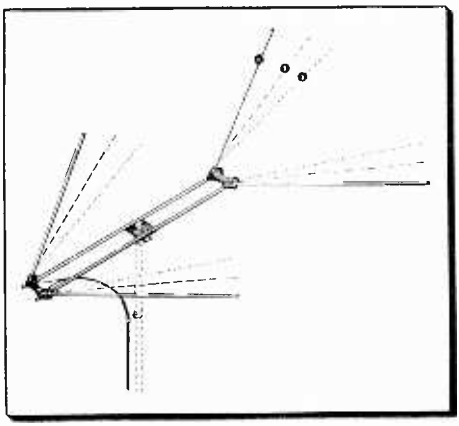

Fig. 5. Ward's U-Vee Antenna. Dotted lines show the different positions into which the elements can be assembled.

ter. When a good (maybe we should say ill) wind was blowing, a UHF antenna might swing from a high signal area into a low signal one, due to the close proximity of such different signal levels in space. Considerable disturbances in reception resulted.

Locating Dead Spots

The RCA Service Co. used an interesting method in Portland of finding the locations where UHF receiver installations were feasible. The picture on a TV receiver installed in a truck was watched while the truck was driven slowly along streets bordering "dead" areas. A 10-foot high antenna was used on the set. Much of the time, the antenna was shadowed by trees and houses. If a good picture was seen, however, when the truck was moving in the clear spaces between houses, the assumption was made that an antenna on any roof along that street would give a good signal. If no picture could be seen anywhere along the block, the whole block was considered a "dead" section. All the larger "poor reception" spots in Station KPTV's close-in area were roughly charted in this way.

Interference on UHF

Sylvania's Al White points out that UHF reception should be less susceptible to ignition and diathermy interference (entering through the front-end) than VHF. The reason for this, as we see it, is that the higher the radio frequency-band tuned to, the weaker the harmonics of the interfering signals become.

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The New NRI TV Picture Tube Adapter Proves Very Popular

In the previous issue of NATIONAL RADIO-TV NEWS we announced that an order had been placed for a quantity of TV Picture Tube Adapters that can be used on all models of NRI Professional Tube Testers from Model 66 through Model 70. Price $4.98, postage prepaid by us.

We were surprised at the number of orders we received. Our initial quantity was totally inadequate to meet the demand. We were temporarily sold out.

We have placed another order with the manufacturer for delivery as soon as possible. If you contemplate buying one of these adapters we urge you to send your order early. We will fill it as promptly as possible, but please understand there may be a slight delay. Use coupon on right.

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J. B. Straughn

Short Cuts in Servicing AC-DC Receivers

By J. B. STRAUGHN

NRI Assistant Director of Instruction

THIS article deals with the usual symptoms encountered in servicing AC-DC receivers. Everyday, we answer many consultation letters in which one or more of these symptoms are present. Here, we will not only give the usual causes of the troubles but will show just how to check for the part or parts causing the defect.

Keep this article for reference if you are a beginner, as it may make some difficult job easy.

Figure 1 shows the diagram of the Emerson Model EC, a typical AC-DC set, which we shall use in describing the troubles found in such receivers. The circuits in this receiver are standard and are found with little variation in all AC-DC superheterodyne sets.

While almost anything can happen to a receiver, the following symptoms are those most frequently encountered and we will confine our discussion to them.

Frequent Complaints in AC-DC Receivers

1. Pilot lamp burns out repeatedly as soon as set is turned on, set dead.
2. Pilot lamp burns out repeatedly as soon as set warms up.
3. No light in tube filaments.
4. Light in tube filaments goes off and on intermittently.
5. One or more tube filaments do not light.
6. Hum.
7. Distortion.
8. Distortion only at high volume control settings.
9. One station received over entire dial.

Pilot Lamp Burns Out Repeatedly as Soon as Set is Turned On, Set Dead

When the pilot lamp burns out as soon as the receiver is turned on, we know that excess current is flowing through the lamp. You should of course make certain that the right lamp is being used. Now look at the circuit in Figure 1. Note that the lamp is connected across the tap of the 35Z5 filament. A portion of the filament current flows through the lamp and also a portion of the rectifier plate current. The fact that the lamp burns out as soon as it is plugged in means that the plate current of the rectifier cannot be the cause since it takes a little time for the rectifier cathode to heat up and start emitting electrons.

In practically all cases you will find that the trouble is due to an open in the tapped portion of the rectifier filament. (This is between pins 2 and 3 in a type 35Z5 tube.) When this occurs, all of the current drawn by the other tube filaments flows through the pilot lamp and since the current is excessive for the pilot lamp alone, the latter burns out.

Strangely enough, the tube may have tested okay in a tube tester. This sometimes happens since the filament supply in the tube tester may be connected across the tube filament without regard to the tap. (On NRI tube testers, checking for filament continuity will disclose this trouble.)

The easiest way to check the tube is to remove it from the receiver and check between the pins with an ohmmeter. A tube chart will show you that the filament pins on the 35Z5 are 2 and 7 and that the tap is No. 3. You must establish con-

tinuity not only between pins 2 and 3 but also between pins 2 and 7. If you do not obtain continuity, the tube is defective and should be replaced.

Very often these taps burn out for no apparent reason. But, before a new tube is tried, you should check the filter condensers to see if they are shorted. If they are not, it's safe to install a new tube and pilot lamp. Then turn the set on. The pilot lamp will first glow brightly and then grow dim. Then, as the cathode of the rectifier heats up, more current will flow through the lamp and it will increase in brightness. If it appears that the lamp is going to burn out, turn the set off at once since excess current is being drawn from the rectifier. Later we will show what portions of the circuit outside of the filter condensers should be checked for such a current drain.

One interesting fact you should know is that when you tune from one station to another the pilot lamp will flicker. Also if the volume is turned up high the lamp may flicker in time with changes in the speech or music. This is a natural condition and is due to the fact that the current drain on the rectifier changes. The output tube does not operate strictly as a class A amplifier and will undergo average plate current variations when an unusually strong signal drives its grid. This in turn causes the flickering of the pilot lamp.

Incidentally, if you ever encounter a dead receiver and yet note that the pilot lamp flickers when you tune to a point where a station should be received (the volume control is turned all the way up), you can be pretty certain that the trouble is due to an open speaker voice coil. This is because the signal must appear at the plate of the output tube in order to cause the variations in the pilot light intensity.

Pilot Light Burns Out Repeatedly as Soon as Set Warms Up

From what has been said above you know that the pilot lamp burning out repeatedly is due to some receiver defect which results in excess current being drawn from the rectifier. Usually the output tube is the culprit, since it is capable of drawing considerable current. However you should first check the filter condensers by disconnecting their leads and measuring their leakage resistance with an ohmmeter. You should obtain a resistance reading of 100,000 ohms or more. If you get this much leakage resistance on an electrolytic it is not sufficiently leaky to draw excess current from the rectifier.

If the trouble is not due to the electrolytics, then test the output tube to see if cathode-to-heater leakage exists. In such a case the bias resistor R_3 will effectively be partially shorted and excess current can flow through the output tube. Generally however, this symptom will be caused by something other than cathode-to-heater leakage. Gas in the tube or incorrect grid bias due to leakage in coupling condenser C_{17} are more to be suspected. You can check for this condition very easily with a DC voltmeter. Connect the positive probe of your voltmeter to the grid end of resistor R_8 and the negative lead to the other end of R_8. In this case your negative voltmeter probe may be connected to the chassis. If this end of R_8 did not go to the chassis, you would make the connection directly to R_8. Now turn the set on. Ordinarily no DC voltage should appear across R_8. You can switch your voltmeter to the lowest range that does not cause the meter to go off scale. If no reading is obtained there is nothing wrong with the tube or coupling condenser. However, if you do obtain a reading you should disconnect condenser C_{17}. If the reading across R_8 now drops to zero you know that C_{17} was leaky and that it should be replaced. On the other hand, if the reading is still present, you know that the 50L6 is gassy and that it should be replaced.

If you notice some drop in reading with C_{17} disconnected but there is still a reading you have a case of leakage in the coupling condenser *and* gas in the tube. This is quite common since a leaky coupling condenser will frequently cause a tube to become gassy. In such a case you will replace both C_{17} and the output tube.

No Light in Tube Filaments

If when you turn the set on, none of the tube filaments including the pilot lamp light up, this means that there is an open somewhere in the filament string. All of the tube filaments are in series and an open anywhere in the circuit will prevent all of the tube filaments from lighting.

Since customers frequently yank on the line cord to disconnect the power plug from the wall outlet, a break sometimes occurs at this point. If you wish, you can check this first. Do so by disconnecting the receiver from the wall outlet and with your ohmmeter check for continuity between one of the prongs on the power cord and the set side of the on-off switch, which is the chassis in the set illustrated in Figure 1. You should measure zero resistance. Then, check with your ohmmeter from the other prong on the power cord to pin 2 of the 35Z5. The cord should connect directly to this point. Again you should measure zero resistance. If you do not, then the trouble is in the cord, probably near the plug. A new plug or an entire new cord and plug should be installed.

If you cannot get a low resistance reading from one of the prongs on the power cord to the chassis, then the on-off switch may be open. Check this by connecting your ohmmeter directly across the terminals of the switch. With the switch turned on, you should have zero resistance

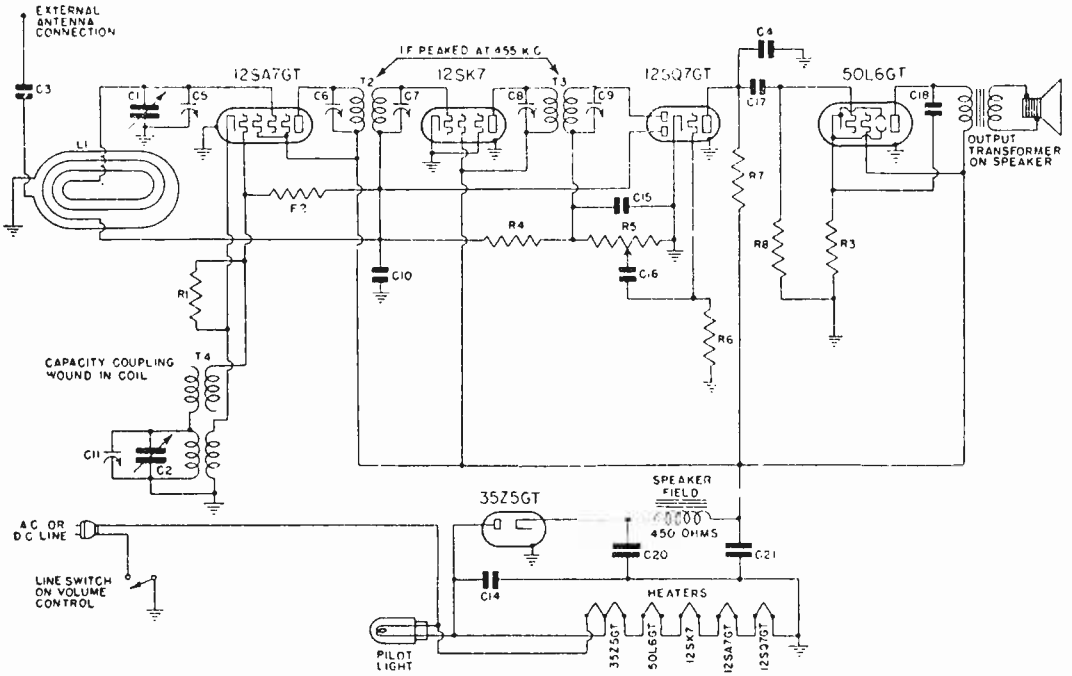


Fig. 1. A typical AC-DC Receiver, the Emerson Model EC.

and with the switch turned off, your reading should be infinity. If you do not get zero resistance a new switch will be required. Frequently in such cases it's just as well to replace the volume control on which the switch is mounted, as the original control is probably somewhat noisy.

If there is nothing wrong with the switch or line cord, the difficulty is pretty certain to be due to an open tube filament. You can, if you wish, remove all of the tubes and check them in a tube tester or you can take them out one at a time, check their filaments with an ohmmeter and re-insert them.

Also you can check for the open with an AC voltmeter. This is done by plugging the set into the line, turning the receiver on and using your AC voltmeter to check across the filament terminals of each tube. When doing this the meter should be set to measure the line voltage. Across those tubes which have good filaments you will not measure any voltage but when you come to the tube with the open filament you will measure the full line voltage across it. After the tube has been replaced you will then find normal filament voltage across each tube.

Light in Tube Filaments Goes Off and On Intermittently

When this action occurs, the receiver will probably be dead, since the filaments will not stay hot long enough to transfer their heat to the cathodes.

The trouble is invariably due to a thermal defect in one of the tube filaments. When the filament is cooled, it contracts and the ends at the break touch each other. When current flows through the filament it expands and opens at the defective point. When the filament opens, all of the tube filaments go out since the series circuit is interrupted. Usually you cannot check on such a defect in a tube tester since the steady application of voltage to the filament in the tube tester will result in enough heat being generated to cause emission from the cathode. In a few instances however, the emission of the tube as indicated on the tester will drop when the filament opens up.

The easiest way to check for this is with an AC voltmeter. Set the meter to read the full line voltage and connect it across the filament prongs of each tube, one at a time. Leave it on a tube until the filaments go out. If the meter reading drops to zero the tube under test does not have an open filament. However, if you suddenly read full line voltage on the meter, the tube under test has an open filament. Replacement of the tube will correct the condition.

One or More Tube Filaments Do Not Light

In an AC receiver using a power transformer you would immediately suspect that any tube filaments which do not light are burned out. However, in an AC-DC set you know that an open filament will interrupt the circuit and none of the tubes will light. Hence the trouble is not due to an open tube. Of course, if one or more tube filaments are shorted in some way, this would account for the trouble. An examination of the wiring will not show a short. The trouble is due to a cathode-to-heater short. Suppose, for example, a short occurred between the filament and cathode of the 12SK7. Note that the cathode is grounded and looking at the diagram you would see that this would short the filaments of the 12SA7 and 12SQ7 tubes. A check in a tube tester will show cathode to heater leakage and replacement of the tube will correct the condition. There is a possibility that the 12SK7 might not light if the cathode is shorted to the side of the filament which goes to the 50L6 type tube. Then the filaments of the 12SK7, 12SA7 and 12SQ7 tubes would all be shorted. In any event, where a condition of this short is encountered, a glance at the schematic will show the probable offender and that particular tube should be checked.

Hum

In an AC-DC receiver, hum is very often due to defective electrolytic filter condensers. A high power factor in the condenser is usually the cause of the trouble. You may disconnect the condensers and check them in an RC tester if you wish but the easiest check may be made by shunting the condensers with others of about the same size known to be in good condition. If the hum clears up when you do this, the condenser under test is defective and should be replaced.

Be careful, however, about connecting a discharged condenser from the cathode of the rectifier to B—. If the line voltage is at its positive peak when this is done there may be such a rush of current through the rectifier to charge the condenser that the rectifier tube will be damaged. You can avoid this by first connecting the condenser across the output filter condenser. (This is C_{21} in the diagram.) The condenser will then be charged up and may be connected across C_{20} without danger of shorting the rectifier output.

Sometimes a shunting test of this sort will not disclose the cause of the trouble, particularly if leakage exists between the input and output filter condensers. In such a case the speaker field will be partially shorted and a loud hum will be heard. If shunting the condensers does not clear up the trouble, you should actually disconnect both electrolytics from the circuit and temporarily try others. If this clears up the difficulty, it is very likely that there was leakage between sections.

Frequently, when two electrolytics are in a common case, a strap will be around the cardboard container and this strap will be mounted on the chassis. If you will work the condenser so that the portion of the case originally under the strap may be viewed, you will find green corroded spots on the case. This shows that there is leakage through the case and, although the condenser may check okay, hum will be heard—probably due to leakage between the sections through the case and strap.

Another frequent cause of hum is cathode-to-heater leakage in the tubes. If cathode-to-heater leakage exists in the 50L6 type tubes, the AC voltage across the 12SK7, 12SA7 and 12SQ7 tubes —about 36 volts—will appear across cathode bias resistor R_3. This is in the control grid circuit and a terrific hum will result.

A check of the tube in a tube tester will disclose leakage. The 12SQ7 is also a frequent offender and should be checked.

Hum may also occur due to an open control grid circuit. This makes the tube very susceptible to small hum voltages which may be induced in the lead or may occur due to capacity coupling.

An open in the volume control will cause trouble in this sort because small hum voltages will be applied through C_{16} across R_6. A check of the volume control with an ohmmeter will disclose this trouble. An open in C_{16} will of course cause a dead receiver, and may increase the hum level. R_6 and R_8 should be checked. An ohmmeter will suffice to check these resistors. You should, of course, let the set cool off for otherwise the application of voltage by the ohmmeter to the grids of the tubes may result in a reading through the tubes, if the cathodes are still hot enough to emit electrons. If you get a much lower reading than normal, reverse your ohmmeter probe connections. If the reading is then normal you know that the previous reading was due to the application of a positive voltage to the grids and to conduction through the tubes.

Distortion

Most distortion in AC-DC receivers occurs in the output stage and is due either to gas in the output tube or to leakage in coupling condenser C_{17}. These may be checked with the voltmeter across resistor R_8 as previously described. You should also be on the lookout for leakage in plate bypass condenser C_{18} of the 50L6. Leakage here would place an excessively high positive voltage on the cathode of the tube and would tend to cut off the plate current. Since the tube would no longer work over a linear portion of its E_g-I_p curve, distortion would result.

Defective electrolytic filter condensers are also a likely cause of distortion and you should par-

ticularly check output filter condenser C_{21}. This may be done by shunting the condenser with another of about the same size known to be in good condition.

Open control grid return circuits will cause distortion and they should be checked with an ohmmeter. Particular attention should be paid to the loop. The leads to the loop will very often break and a garbled type of response will result.

Distortion Only at High Volume Control Settings

Of course, distortion will take place in almost any set if over-loading due to excess volume occurs. In this case we mean that overloading occurs with normal volume when the volume control is turned up. Invariably the trouble is due to leakage in coupling condenser C_{16}. You see, considerable dc voltage is developed across volume control R_5 in the process of detection, making its ungrounded end negative. As the volume control setting is increased, the slider is moved toward the most negative end of resistor R_5. If leakage exists in C_{16}, this will place an increasingly negative bias on the grid of the 12SQ7, and this will drive the tube off the straight portion of its characteristic curve.

When distortion occurs you will frequently find trouble in both C_{16} and C_{17}. Both of these audio coupling condensers should be checked when distortion is the complaint.

One Station Received Over the Entire Dial

This invariably means that the oscillator is not working. Frequently the condition has been aggravated by the customer tampering with the i-f trimmer condensers. Very often he has loosened these trimmers until the i-f amplifier is actually tuned up in the broadcast band. If the set has been tampered with, the first thing to do is to realign the i-f amplifier with a signal generator if one is available. If there is no signal generator available, tighten the i-f trimmers and then back them off about ⅛ of a turn. Next intermittently short the preselector tuning condenser with a screwdriver. This will cause a clicking sound to be heard in the speaker. While making the short, adjust the i-f trimmers one at a time for maximum noise in the speaker. When you have done this, the i-f will be aligned at approximately the right frequentcy.

The next thing to do is to check to make certain that the oscillator is not functioning. This may be done by connecting a DC voltmeter, preferably a vacuum voltmeter, across oscillator grid resistor R_1. If the oscillator is working you will measure DC voltage across this resistor on the order of 5 to 15 volts. If no voltage is measured across the resistor the oscillator is not functioning. This may be due to cathode to heater leakage in the 12SA7. Such a short would prevent signal current from flowing through the oscillator coil primary and consequently no signal would be induced into the tank circuit. Replacement of the tube will clear up this difficulty.

You should also check the windings on the oscillator coil and make certain that the oscillator section of the tuning condenser gang is not shorted.

If all of these points test all right, the only thing left is the oscillator coil itself and in such a case you are safe in assuming that it is defective.

Whenever possible, a duplicate oscillator coil should be installed. Very often however, when a receiver has been out in the field for several years, duplicate replacement coils are not available. In such a case a universal oscillator coil may be purchased and installed in the receiver. Complete instructions come with such coils for their proper connections.

Note, however, the two open end windings immediately above the feedback and tank coils in the diagram. These serve to give capacity coupling between the oscillator grid and tank coil. You cannot purchase a universal coil with such a built-in capacity. However, if you connect a 100 mmfd. condenser from the oscillator grid to the ungrounded side of the tank coil satisfactory results will be obtained.

This completes our discussion of trouble shooting in ac-dc receivers. There are other complaints which will be encountered but the most common have been covered in this article. If you will be on the lookout for these troubles, you will save much time in your service work.

———*n r i*———

NRI's Price for Radio Diagrams Increased

Owing to rising costs we have had to increase the price of radio diagrams from 25¢ to 50¢ a set. New diagram order forms showing the new 50¢ radio diagram price are available. These are printed on white paper to distinguish them from the old 25¢ order forms which were printed on orange paper and should no longer be used.

Listen to This! Here's a Flashlight That Allows You Free Use of Both Hands

EVER change a tire at night—and find the beam of your flashlight would go about everywhere *except* where you needed it? And how about driving a nail in a dark corner? Really takes some juggling to get the light where you want it.

Well—here's a flashlight that will throw its beam exactly where you want it—and leaves **BOTH** your hands free.

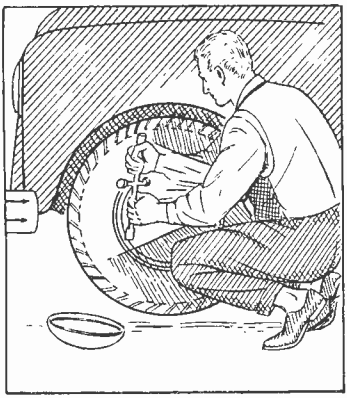
This is how it works: "The Chestlite" is equipped with easy-to-put-on straps that go around your neck and down to your belt. You then move the light to any position from your chin to your belt—and it stays put, until you want to move it again. You adjust the "Chestlite" so the beam goes wherever you need it, while you use *both* hands to make an adjustment on your car, repair a leaky pipe in the basement, bait your hook while fishing at night—easily do many things that are so awkward, inconvenient or downright impossible with the ordinary hand flashlight.

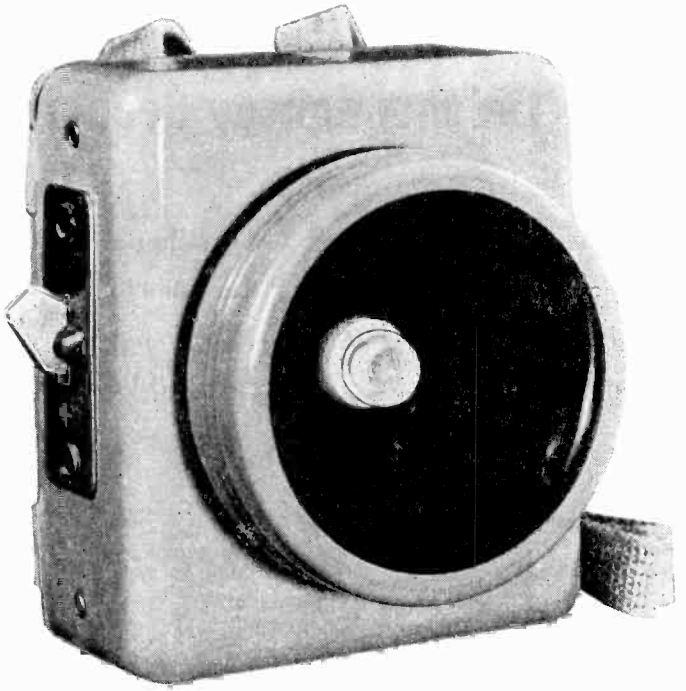
First of all, of course, the "Chestlite" appealed to us as being a very handy item for Radio-TV servicemen. Then we tested and used it, we became impressed with many, many ways in which almost any man would find it useful—invaluable.

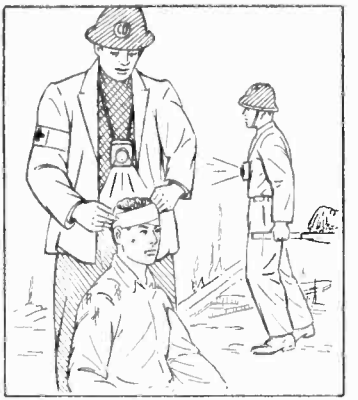
This is a focusing light. The intensity of the beam can be controlled by turning the 2¼ inch lens ring. The sturdy telegraph switch is another special feature. Trouble in most flashlights is caused by bad switches. The "Chestlite" switch is practically trouble-proof and should last for years.

"Chestlite" operates on two standard flashlight batteries. The bulb is a standard #14 screw-type flashlight bulb. Batteries can be replaced easily, within a few seconds.

This light is used by several branches of the U. S. Maritime Commission, and the Civil Defense Administration. It is also used by ship operators, commercial airlines, industrial plants, fishermen, hunters, and many others who need a light that permits free use of both hands. More than a million have been sold!



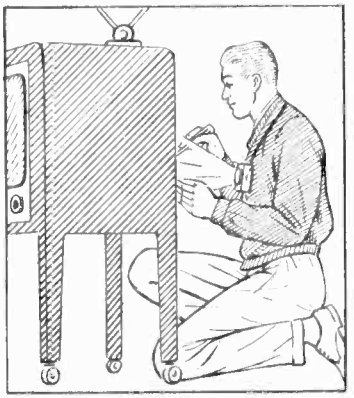




"CHESTLITE" (Trade mark reg.; U. S. Patent No. 2320193). More than 1,000,000 sold to Outdoorsmen, Air Raid Wardens, Airlines, Ship Operators, U. S. Government, and hundreds of others needing a light and at the same time the FREE USE of BOTH HANDS.

It is a sturdy, well-made job, rich gray in color with webbing straps to match. Metal parts have been treated to resist corrosion. With batteries, it weighs 15 ounces.

In addition to ordering a "Chestlite" for yourself, you might want an extra one as a present for a friend.



This is such an unusual piece of equipment, it makes a gift that is different, yet more practical.

The price — only $2.75 including batteries and bulb, sent to you by *prepaid* parcel post. Please use the order form at right.

CHESTLITE ORDER FORM

Supply Division
National Radio Institute
16th and U Sts., N.W.
Washington 9, D. C.

Please send me, parcel post prepaid:

Quantity _____ Chestlite(s) at $2.75 each Amount _____

Name ..... **Student No.** .....

Address .....

City ..... **Zone** .... **State** .....

*If you live in Washington, D.C., add 2% for D.C. Sales Tax

Here's Proof That NRI Training Leads to Financial Independence, Security

Sales and Service For a Store, Plus Own Customers, Keep Him Busy

"It was a great day when I started two years ago with NRI. I can't believe that the time passed so quickly and I know so much more now. Through NRI I not only learned Radio and TV, but I also learned how to act and talk to people and really how to live.

"I do work for a store on sales and service calls. Between my own customers and the work of this store, it really keeps me going. I am really doing good—plenty of work. The deeper I go into it, the bigger it gets. Believe me I thank NRI for what they have done for me."

WILLIAM PAWLESHYN
610 Paden St.
Union, N. Y.

———*n r i*———

Most Important Day in His Life Was When He Enrolled With NRI

"It is my pleasure to inform you that due to my training with NRI I am now employed as transmitter engineer-studio operator here at radio station KPAT.

"It was the most important day in my life when I enrolled in radio and television training with you.

"Many thanks to NRI and its staff."

ELMER FREWALDT
117 S. Lincoln Ave.
Madison, S. Dak.

———*n r i*———

NRI Training Pays Off—Gives Additional Security

"My training with NRI has paid off in the compliments which I almost invariably receive when I return a set to its owner. It seems that when I repair a set for one person, I generally get the future work from a whole family. This is how effective NRI training has been for me.

"Though I do not feel I should discard my present very satisfactory position, my future is more secure because of my NRI training. By continuing Electronic work, both for pleasure and profit, I maintain a kind of insurance against any of the things that could happen in my present full-time work. The credit for this is all due to NRI."

NORMAN E. NOLTE
2840 Ferncliff Ave.
Dayton, Ohio

Found NRI Training Easy as ABC's, Although Education Was Limited

"I take pleasure in thanking you for the course in Radio and Television. With only a sixth grade education it was easy as ABC's. I went to work for Crane Co. as an apprentice electrician and in less than three months I was promoted to electrician.

"Am at present an electrician at Tenn. Prod. & Chem. Corp., Chattanooga, Tenn. Am also doing spare time Radio work. You made this possible. So once again I thank you very, very much."

WOODROW HOWARD
4804 Oakland Ave.
Chattanooga, Tenn.

— — nri — — —

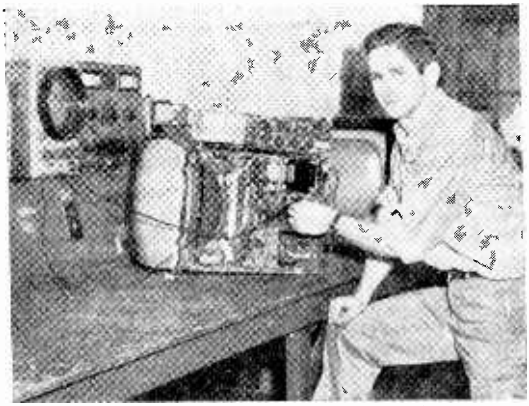
Has Own Television And Radio Shop. All the Work He Can Handle

"I started to repair Radios six months after enrolling with NRI. Income from this work was about $12 to $15 a week. NRI experimental units taught me the different stages in Radio and how to check each one separately. After I repaired a few Radios, people started bringing me Radios to repair.

"Now I have my own Television and Radio shop. I have all the work I can handle and at times I have more than I can do. Ever since I started servicing, I have never done any advertising. All my jobs come from satisfied customers telling other people."

ADAM KRAMLIK, JR.
Main Street
Sumneytown, Penna.

— — — nri — — —



Employed Full Time As Radio-TV Technician

"I received my diploma in Radio Servicing November 27, 1950 and am now employed by Charles Radio & Television Sales and Service, Louisa, Kentucky. Am doing fine.

"I wish to thank the NRI staff for their wonderful cooperation during my study and especially thank Mr. Smith for his self-confidence building philosophy that appears on the back of each lesson."

GENE BLACKBURN
RFD 1
Louisa, Kentucky

As space permits, from time to time, we plan to devote a page or two in NR-TV News to short success stories such as above. They are taken from testimonial letters we have on file. Photographs and letters of this kind are always greatly appreciated by us. We feel we should pass them on to our readers for the inspiration to be gained from a reading of them.

Introducing the New NRI Professional VOLT-OHM-MILLIAMMETER 20,000 OHMS PER VOLT

Completely Portable. No External Power Necessary

A QUALITY INSTRUMENT AT A LOW PRICE

The Model 46 NRI Professional Volt-Ohm Milliammeter has been designed to fill the need for an inexpensive, fully portable, quality test unit. Since it does not need to be plugged into a power outlet, the Model 46 can be operated anywhere.

In spite of its low price, this is an instrument with the high sensitivity of 20,000 ohms-per-volt on all dc volts ranges. Five dc current ranges also have been included in addition to the ac volts and ohms ranges.

We are proud to be able to offer a Volt-Ohm Milliammeter of this quality to our NRI students and graduates at this low price. We are able to do so because this tester is purchased direct from the manufacturer on a large quantity contract and is produced under carefully supervised but mass production conditions. We have eliminated all middle-man profits and our selling costs are low. Because of these economies we are able to make this professional instrument a real buy. Quality components are used throughout. Factory calibrated, tested and inspected. It was engineered with the needs of NRI students and graduates especially in mind.

Makes These Measurements

1. DC Volts—Five ranges covering 0—1200 volts, provide for all basic dc measurements in Radio and Television. High sensitivity of 20,000 ohms-per-volt permits dc voltage measurements in avc circuits, discriminator and ratio detector circuits, and other high resistance circuits found in AM, FM, and TV receivers. With the High Voltage TV Multiplier Probe (available at extra charge), the dc range is extended to 30,000 volts.

2. AC Volts—Five ranges covering 0-1200 volts at 1000 ohms-per-volt meet all conventional ac voltmeter requirements.

3. Ohms—Up to 60 megohms in three overlapping ranges. More than adequate. Tests condensers for leakage or opens.

4. Microamperes—For adjusting limiter stages in FM circuits and for other sensitive applications.

5. Milliamperes—Four ranges, up to 1200 ma. (1.2 amperes), measure plate and screen current in any receiver tube. 1200 ma. range, handy for measuring total current from television low-voltage supply.

6. Output Measurements—Sufficient sensitivity for avc or agc measurements. DC blocking condenser and special output jack for measuring audio signal at plate of output tube.

7. Decibels—Five ranges, from —12 to +63 db.; measurements taken across 600 ohm load with 1 milliwatt zero-reference level.

EIGHTEEN SEPARATE RANGES

• Volts D.C. (At 20,000 ohms per volt)	• Volts A.C. (At 1,000 ohms per volt)	• Output
0-3	0-3	0-3
0-12	0-12	0-12
0-60	0-60	0-60
0-300	0-300	0-300
0-1200	0-1200	0-1200

• Micro-amperes D.C.	• Milli-amperes D.C.	• Decibels (With 600 ohm load)	
0-120	0-1.2	—12	+11
	0-12	0	+23
	0-120	+14	+37
	0-1200	+28	+51
		+40	+63

• Ohms

0-6,000 (40 ohms center scale)
0-600,000 (4K ohms center scale)
0-60 Megohms (0.4 Megohms center scale)

Specifications

- **Panel:** Handsomely etched, heavy gauge aluminum; black anodized field with contrasting white aluminum characters: resistant to wear.
- **Case:** Black, durable molded bakelite, with perspiration-proof plastic handle; over-all size: 7⅛" x 5½" x 3".
- **Meter:** 50 micro-ampere, double-jeweled D'Arsonval construction, ±2%. Large 4⅝" x 4⅛" two-color meter scale—easy to read.
- **High-Quality Components:** ±1%, wire-wound, film-type, and/or metallized resistors used throughout.
- **Actual** Weight: 3½ pounds.
- **Shipping Weight:** 5 pounds.
- **Includes:** Operating instructions and schematic diagram, red and black test leads, detachable alligator clips, and ohmmeter batteries (three 1½ volt and one 45 volt).
- **Warranty:** Standard 90 day RTMA warranty.

Sent express collect. Please use order blank below. (Personal checks should be certified to avoid delay of 10 to 15 days in shipment waiting for checks to clear.)

• • •

Optional Accessories

High Voltage TV Multiplier Probe available at Extra Charge. Extends dc volts range to 30,000 volts for SAFE high-voltage TV measurements. Molded polystyrene head, heavy-duty bakelite handle with two-inch high-voltage barrier. Ceramic, helical film-type cartridge multiplier resistor. Over-all length 12½ inches. Instructions included. Price, $8.00.

Custom Designed Leather Instrument Case available at Extra Charge. Genuine top-grain heavy Cowhide. Includes a tool and test lead compartment. Water-proof lined suede interior. Adjustable hand or shoulder strap. Positive snap-lock. Richly finished in dark brown. An optional accessory. Price, $9.50.

USE THIS BLANK TO ORDER YOUR V-O-MA

National Radio Institute
16th and You Streets, N.W.
Washington 9, D. C.

46

I enclose $..... (certified check, money order or bank draft) for which send me, by Railway Express, charges collect, the items I have indicated in the box on the right.

	Price	Write price here and add this column
One NRI Professional Volt-Ohm Milliammeter, Model 46, including test leads, alligator clips and instruction manual.	$33.50	
One High Voltage TV Multiplier Probe	8.00	
One Leather Instrument Carrying Case	9.50	
(If you live in Washington, D. C., add 2% D. C. Sales Tax)		
Total amount enclosed		

Name .....Student No. .....

Address .....

City .....Zone ....State .....

Express Office .....
(Please print name and address)

OPPORTUNITY UNLIMITED*

By
Charles Golenpaul
Vice-President, Distributor Sales, Aerovox Corporation

Reprinted from "SERVICE" magazine, through courtesy of Bryan Davis Publishing Co., Inc., N. Y., N. Y.

OPPORTUNITY, said a very wise man, is a favorable occasion for grasping a disappointment. In similar vein, another noted that: Opportunity always looks bigger going than coming. Yes, opportunities lie on every hand, and so do a lot of people. If opportunity is seized when it comes, it will not have to be chased when it goes. The person who doesn't grasp opportunity when it knocks, usually winds up by knocking opportunity. The difference between opportunity and the knocker, is that opportunity knocks but once.

There's a lot of horse sense in those definitions. However, the quotation that is truly a gem is the following one:

An optimist is a person who meets the wolf at the door, and appears the next day in a fur coat.

Charles Golenpaul

Every Service Man has an outstanding opportunity, for he is indispensable. For the radio-TV manufacturer depends on every Service Man. Once the set leaves the factory, the dealer depends on the Service Man to install the set and show the folks how to run it, the set-owner counts on the Service Man to keep his pride-and-joy perking, and the engineers pay close attention to the Service Man's bouquets and brickbats in designing next year's models.

The finest TV set ever built can be no better than the local servicing available. Once that set has left the factory, passed through distributor and retailer, and reaches the home, it is entirely at the mercy of Mr. Service Man, whether the work is done in the manufacturer's own service setup, or for a dealer, or for himself. The Service Man is truly indispensable.

Now any indispensable man, whether the title be phoney or genuine, is subject to a lot of attention. On the one hand he may be looked up to and respected and properly compensated for his indispensable contribution to American home life. But more likely he is the target for much suspicion, downright hard feelings, and begrudgingly granted remuneration.

From time to time those writers and editors using sensationalism as a means of building up their readership, run articles or series of articles on radio-TV racketeers. One of the foremost popular magazines has on several occasions taken a round-house wallop at radio-TV Service Men as a group, as well as at auto mechanics. A leading New York newspaper has run a series on TV service contracts and how the public has been cheated out of millions of dollars of maintenance. Several metropolitan areas have seriously considered licensing radio-TV Service Men and organizations so as to stop the TV service contract swindle; and with due cause, to be sure, since several large TV service organizations, not to mention many small ones, have welched on their insurance commitments and even gone broke.

However, we all know that the vast majority of radio-TV Service Men and service organizations are on the level. There are a number of individuals and outfits in TV areas throughout the country that consider service contracts as sacred stewardships. Many of them put the collected monies in escrow, only to be drawn upon as contract periods expire, or when replacements or repairs are made. Frankly, most Service Men never saw the kind of money that poured in on

**From a talk delivered before the Philadelphia Radio Service Men's Association.*

them when the earlier TV sets were being installed. Many of them went on a financial binge, using up the monies as fast as they came in, without thought of the replacements and repairs that might be coming up during the contract period. And mind you, just one good windstorm could and did wipe out many of those improvident Service Men and organizations. It is good to report that the service-policy racketeers have largely disappeared.

Now it stood to reason that the high cost of TV service contracts and the low performance of the contractors would bring about a severe reaction. And sure enough, we have of late witnessed that flood of fix-it-yourself books which are enjoying a colossal sale. Large advertisements are running in metropolitan newspapers, proclaiming how simple it is to fix a TV set and thus bypass the modern version of Jesse James who would hold you up even in your own living-room. At almost any gathering of Service Men these days, conversation soon gets around to the fix-it-yourself threat to legitimate servicing.

To be sure, the ads sound mighty convincing so far as the average housewife is concerned; particularly the free advice given as the come-on. The trouble-spotter guide indicates what to do if the screen picture is wobbly or blurred or broken up or rolling or what-have-you. It's all so easy. This symptom means that simple adjustment; at worst, a new tube which the set owner can buy for a buck or two, and for which you, the modern Jesse James, would charge a ten spot.

Service Men know far too much about the intricacies of TV sets to fall for that kind of threat. We all know that the average TV set has some 1,600 components; that there are over 2,000 soldered connections; that any one of 24 to 32 tubes can require replacement after testing; that realignment of circuits calls for elaborate test equipment. How's the usual handyman going to track down the more involved troubles? How is he going to safeguard himself against the hazards of live wires and components, and charged capacitors? How's the ever-critical housewife going to react to her husband actually going to work on that precious TV set on which there are further installments to be met?

No, there is no need to worry too much about Service Men being put out of business by these first aid books and charts. For decades past, there have been books and articles on how to repair your automobile, and yet auto repairmen are doing more business today than ever before; likewise, with all the books and articles on how to do your own plumbing or wiring, roofing or siding, masonry work or painting. The building trades are still doing pretty well by themselves, even at today's high prices. Again, the home medical books haven't done the doctors out of their practices; rather, I believe, the books have served to send still more patients to the doctors. These fix-it-yourself TV books may well do the same thing, as Mr. Handyman gets into difficulties with his TV set.

As though the fix-it-yourself angle weren't enough, there is the current plague of $1.00 Service Calls. Here and there, there have appeared advertisements offering to call at any home for a fee of $1.00 to $3.00 to cover labor, with parts extra. Such low prices are startling enough during the day, but when such proffered service extends into the night, it becomes a miracle.

Many serious Service Men have become quite upset by such competition. They know that one cannot make a service call for much under $5.00, plus extra for transportation if at any considerable distance. It should be obvious to TV set owners that, in these days of 25¢ per pack cigarettes, lipsticks at $1.00, magazines at 35¢ to 50¢ per copy, butter at 79¢ per pound, the 5¢ carfare at 10¢ to 15¢, that $1.00 service call, and even a $3.00 deal, just can't be on the level. Folks simply invite highway robbery when they fall for that stuff!

Whatever Service Men may be losing by way of new or latter-day TV service contracts, one can more than make up through the number of TV sets in daily use, many of which will be requiring more and more servicing from here on, as they grow old. Of the 16-million TV sets already installed, at least one-third of that number are three years old. Many of those aging sets are of the 10" size. That spells opportunity.

No matter how well designed and built and used, a three-year-old TV set is a good prospect for service. Even if some components are not wearing out as yet, there are weak tubes. The picture tube, after two or three-thousand hours of operation, begins to lose a lot of its brilliancy. A new picture tube can give the aging set a terrific lift. The alignment of a set usually does shift over the years; therefore, the realignment of circuits can mean a lot better performance. It seems that there is real opportunity here if Service Men will only do a bit of selling; selling new tubes and selling a complete tune-up job.

When it comes to those 10" TV sets, it does not take too much selling to up the owners to larger tube sizes. If the Service Man works for a dealer or has a sales deal with a dealer, then the thing to do is to sell a new set. Where a Service Man is positively a Service Man and nothing else, then the opportunity is in the form of TV set conversions and custom-built installations.

Today, more than ever, there is a real opportunity in extra-curricular activities for the Service Man.

What does one mean by extra-curricular activi-

ties? Simply, the cultivation of brand new fields. Supposing you've already done all you could, which is doubtful, to take care of aging sets, to service and even install new and more efficient antennas, to step up old 10" and 12" sizes to large rectangulars, to revamp existing sets for fine cabinet jobs or for built-in wall installations; nevertheless, there are still new fields to be cultivated.

Until recently the trade worked the immediate and easier market, which means primary service areas of existing TV stations. Beyond, in the fringe areas or even in the poor localities where signals were weak, most did little or nothing because there was too much lush business to be grabbed. But now, with primary areas pretty much worked, we can find time and effort to look into the fringe areas and the poor-reception localities.

Actually, the poor-reception localities offer the biggest TV opportunity today, at least until such time as many more TV stations open up more primary service areas. Recently, a group of individuals and organizations specializing in community antennas met for a pow-wow. They reported over 80 community antenna systems already in use, serving perhaps 15,000 TV sets. Some have paid off 80% to 100% of investment the first year. A substantial installation fee is charged; generally $125 to $175, followed by a monthly subscriber fee of $3 to $5. As a result of this community antenna enterprise, those folks at considerable distance from TV stations, or down in deep valleys, have been permitted to join the TV audience of the nation.

Similar to the community antenna system is the apartment antenna deal, whereby one or more master antennas with suitable distribution lines can serve all the TV sets in the building. Many apartment house owners have found such an installation indispensable in reconciling local fire and other ordinances covering the clearance of roofs and walls, with the TV-mindedness of today's tenants. Here again, it's a job for the big-league Service Man or organization, rather than for the electrical contractor unless the wiring is of the concealed category calling for electricians. Now is the time to get the dope on community antenna and apartment antenna systems, and to see whether or not you can fit into those profitable pictures.

Another tremendous field is that of utilizing existing TV station signals and reception localities to the best advantage. Look around your territory and see how many ancient antennas are still in use. It doesn't require much salesmanship to sell an up-to-date, new efficient antenna to enthusiastic TV fans. Also the accessories such as rotators, boosters and especially the antenna-located boosters can mean vastly improved reception in areas heretofore considered poor.

Then what about the opportunity opening up with the early advent of uhf? It's not a bit too early to be looking into converters that can be connected on to existing sets, to uhf antennas, to special tuning strips or other means of adapting the present TV sets to uhf.

Then, in the far background, there is color. While color TV may not be a commercial reality for another few years, yet nevertheless it must be included in our business calculations. Complicated as color TV will be, it will spell a lot more business for the Service Man who can master it. It's later than you think, gentlemen, in getting ready for color TV.

While TV gets most of our attention, one should not overlook what goes in FM and phono progress. It would seem that those 16-million TV sets had soaked up most of the people'e home entertainment funds, and yet the hi-fi fad is at an unbelievable peak. And there's big money here. The music lover thinks nothing of spending from $500 to $1,000 for a beginning in hi-fi equipment. Only the best disc records are bought. Lately the tape recorders are gaining. All kinds of amplifiers, loudspeakers and tone chambers are tried out as ears become more and more critical; likewise, FM tuners and amplifiers, phono turntables and pickups. Every time one of those topflight music lovers can be exposed to even a slight gain in fidelity, another sale is in the making.

Here is an unlimited field for the ambitious Service Man willing to make a critical study of audio equipment. You will find that the installation of these costly setups, whether it be in a fancy custom-built cabinet or as a built-in job, spells many extra dollars for the chap who raises his sights and aims high.

Still bothered by those $1.00 service calls? Or the fix-it-yourself threat? Or by the racketeers who may give our profession a temporary black eye?

Come, come, fellows, there are bigger jobs waiting for you than bargain-hunting set owners. Know your TV stuff. Establish a reputation for handling service jobs promptly, thoroughly, and reasonably but not cheaply. Stand behind your work. Give sound advice when asked about the relative merits of different sets, particularly if you are strictly without retail affiliations.

And then, with your service business thus sewn up, look for new targets, raise your sights, and go after the extra dollars which are there to be plucked. Exploit uhf reception, apartment-house antenna systems, community TV networks, TV conversion and custom-built jobs, and so on.

By all means look into the hi-fi vogue, for here

(Page twenty-three, please)

B. van Sutphin

How to Select a Replacement Stock of Radio and TV Tubes

By

B. VAN SUTPHIN

NRI Consultant

ONE of the major problems facing a beginning service man is TUBES. Because of their relative expense, tubes are an important part of a service man's total stock. They must be purchased wisely to avoid having a large stock of tubes that simply sit on the shelf and gather dust.

The operator of a service business wants tubes that are used frequently to keep from tying up a great deal of money in "dead stock."

Television Tubes

Choosing a list of the most used TV tubes is relatively easy. Television receivers have been in existence only a few years, and the tube types used in the original sets are pretty much the same types that are used in modern sets. Also, most TV manufacturers have settled on certain tube types that have been found ideal for a particular purpose. Consequently, you will find certain tube types used in many receivers.

The list shown in Table I contains thirty-four tubes. At present wholesale prices, the cost of this entire group of tubes is about $35. Of course, the list does not include every tube used in every television set. But, TV service men with whom the author has talked agree that this basic tube stock covers about 90% of the receivers in use at the present time.

There are certain additional tubes that a TV service man should consider necessary if he plans to do a great deal of TV work. Examples are the 6CD6, 6CL6, 6W6, 12BY7, and 6AB4. Also, you will occasionally find a TV receiver using a 5Y3 rectifier because of the 5U4 shortage a few years ago.

TABLE I

MOST NEEDED TV TUBES

		Approximate Wholesale Price	Total
2	6AU6	$1.01	$2.02
2	6AG5	1.26	2.52
2	6CB6	1.17	2.34
1	6V6	1.40	1.40
2	6AL5	1.01	2.02
2	12AU7	1.34	2.68
2	6SN7	1.23	2.46
2	1B3	1.43	2.86
2	1X2A	1.48	2.96
2	6W4	1.03	2.06
1	12BH7	1.34	1.34
1	6AQ5	1.12	1.12
1	6T8	1.62	1.62
1	6BQ6	1.90	1.90
1	6BG6	2.68	2.68
1	6S4	.95	.95
1	6AQ5	1.12	1.12
1	6K6	.89	.89
1	12AT7	1.62	1.62
1	6BQ7	1.70	1.70
1	6AC7	1.62	1.62
1	6C4	.95	.95
1	6AV5	1.48	1.48
2	5U4	.84	1.68
			$33.99

In the modern UHF receivers, a 6AF4 is frequently used as a UHF oscillator. If your area is served by UHF stations only, it would be well to keep one or two of those tubes in stock.

To maintain your stock of TV tubes, tear the top from the box when you sell the tube, and put the top in a special box reserved for this purpose. Then, order your tubes by referring to the box tops. Also, keep a list of the other tube types that you need most frequently, and then order those as it becomes necessary. If you find that you frequently need some tube type that is not in your original stock, be sure to order that tube the next time you visit the wholesaler.

Radio Tubes

Choosing a satisfactory list of radio tubes is considerably more difficult. Radio receivers have been built since about 1922. In some areas, receivers of that vintage are still in use.

The number of old sets still in use makes it difficult to give a list of radio tubes that will suit every purpose. Consequently, a list of radio tubes must be a qualified list. No one list would fit every locality, or every type of set that the service man is likely to encounter in day-to-day service work.

The list shown in Table II attempts to cover only those tubes used in sets built since World War II. Notice that the list of radio tubes is divided into three parts: Consoles and auto sets, ac-dc sets, and three-way portables.

The list of tubes for consoles and auto sets does not cover the somewhat older sets that many families keep and still use. The tubes most frequently used in those sets are the 6A8, 6K8, 6K7, 6Q7, 6J5, 6K6, 6H6 and 5Y3. Most of the receivers using tubes older than this have been "junked" long ago, and consequently it is not economically wise for the service man to stock tubes for those older sets. The total wholesale cost of the tubes in the "auto-console" part of the list is about $25.

The list of tubes for ac-dc sets is quite complete. Except for the ac-dc receivers using loctal tubes, this one list will handle almost all of the common five-tube sets. If you are called upon to service receivers that use loctal tubes of the ac-dc series, you should, of course, stock those tubes. However, the list will handle most of the ac-dc tube problems that you will encounter. The total cost for the tubes in that portion of the list is about $25.

The list given for three-way portables also covers modern battery sets. However, it does not cover the older battery sets using tubes like the 1A7,

TABLE II

MOST USED RADIO TUBES

		Approximate Wholesale Price	Total
Consoles and Auto:			
1	0Z4	$.92	$.92
1	6X5	1.54	1.54
1	6X4	.87	.87
2	5Y3	.75	1.50
2	6BA6	1.06	2.12
2	6SK7	.92	1.84
1	6AU6	1.01	1.01
2	6V6	1.87	3.74
2	6AQ5	1.12	2.24
2	6SQ7	.89	1.78
2	6AT6	.87	1.74
1	6BA7	1.40	1.40
2	6BE6	1.06	2.12
1	6SB7Y	1.43	1.43
			$24.35
AC-DC sets:			
2	35Z5	.70	1.40
2	35W4	.73	1.46
2	12BA6	1.06	2.12
2	12SK7	.98	1.96
1	12AV6	1.01	1.01
2	50B5	1.12	2.24
1	50C5	1.12	1.12
2	50L6	.95	1.90
1	25L6	.95	.95
2	12SQ7	.84	1.68
2	12AT6	.87	1.74
1	12AV6	.87	.87
1	12BA7	1.40	1.40
2	12BE6	1.06	2.12
2	12SA7	.98	1.96
			$23.93
3-way portables:			
1	117Z3	.87	.87
1	65-ma selenium	.79	.79
1	1LN5	1.48	1.48
1	1U4	1.17	1.17
1	1T4	1.17	1.17
1	3S4	1.12	1.12
1	3Q4	1.26	1.26
1	3V4	1.12	1.12
1	1LB4	1.48	1.48
1	1LA4	1.48	1.48
1	1S5	1.06	1.06
1	1U4	1.17	1.17
1	1R5	1.17	1.17
1	1LA6	1.48	1.48
			$16.72

the 1N5, the 1H5, and the 1A5. If you are called upon to service very many of those sets, you should keep a stock of the tubes you find used most frequently.

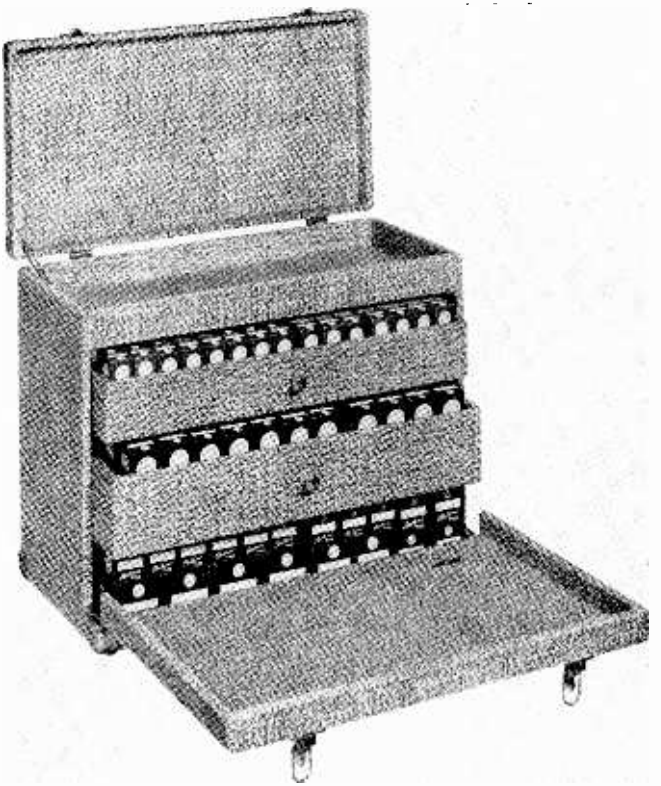
Notice that a 65 ma. selenium rectifier is included in the list of tubes for three-way portables. Even though the selenium rectifier is not a tube, it is important that the service man keep one in stock. Defective selenium rectifiers are a frequent cause for improper operation of three-way portables.

Of course, it is not necessary for the beginner to purchase all of these tubes at once. In fact, the beginning service man should purchase tubes (and other parts) only as they are needed. However, when your profits warrant the purchase of a tube stock, these lists will prove helpful.

As your service business grows, tubes should be added to the basic stock. By checking the receipts you get from the wholesaler you can determine which tubes you are using most frequently and increase your stock of those types. Also, the receipts will tell you which tubes should be added to the basic stock. Keep a list of the new tubes that are added to the stock and draw up a new, more complete list from time to time.

Most servicemen find it handy to keep a special notebook (such as a stenographic shorthand pad) for inventory purposes. Lists of the tubes, and the parts, in stock should be kept. Of course, the lists should be revised as stock increases.

When tubes are sold on service calls the box top should be saved. In this way you will be reminded to replace the tube and keep your tube stock complete. Nothing compares with the annoyance of needing a certain tube on a service call, and not having it available.



A "Tube Caddy" is a very handy means of carrying a good stock of tubes right with you on service calls. Shown here is a typical Deluxe Tube Caddy, model TC-3, which is manufactured by the Argos Products Co., of Genoa, Ill. For information as to price and how this Caddy may be obtained, send a postcard to the Supply Division, National Radio Institute, 16th & U, N. W., Washington 9, D. C.

OPPORTUNITY UNLIMITED

(*Continued from page* 20)

is a lush market where nickels and dimes are not even thought of.

Finally, it is wise to look into the business end of your service business, for first, last and always it is a business if you wish to make money out of it. Far too many Service Men are too interested in the technical aspects of their work to give any thought and effort to such essential matters as advertising for future clientele, establishing charges based on known costs, maintaining a bookkeeping system which indicates whether they are coming or going, collecting sour accounts, drawing a weekly or monthly salary first and then counting anything beyond as true profit.

Technical Ramblings

By B. VAN SUTPHIN
NRI Consultant

Question: What is Bias?

BIAS is the fixed DC voltage applied between the control grid and the cathode of a radio tube to set the operating point of the tube. It is sometimes called "C" bias.

Fig. 1 shows the Eg-Ip characteristic of a typical tube. If no bias were applied to the tube, the input signal would cause the grid-cathode voltage to vary on either side of the zero bias point of the curve (point A). That type of operation is undesirable for two reasons: 1, very little amplification is obtained; 2, severe distortion results.

If the tube is to be operated class A so that the output voltage is an exact replica of the input voltage, sufficient bias must be applied to the tube to allow the input voltage to vary the instantaneous grid-cathode voltage about point B on the curve. Notice that the curve is relatively steep and straight in that area. This means that considerable amplification is obtained, and that no distortion will occur.

This shows that the bias voltage sets the operating point of the tube so that maximum amplification with minimum distortion is obtained.

How is Bias Obtained?

There are three chief methods of obtaining bias voltage: 1, from a C bias battery which has its negative lead connected to the grid return for the tube and the positive lead connected to the cathode — or a separate bias power supply (chiefly for transmitters) may be used; 2, cathode bias, which uses a resistor in series with the cathode of the tube so that the cathode becomes positive with respect to the grid return. This is the same as making the grid return negative with respect to the cathode; 3, conduction current bias, using a large value of resistance between the grid of the tube and B—. Electrons striking the grid of the tube will force electrons out of the grid circuit through the resistor. This current flow through the resistance produces a biasing voltage across the resistor. These three biasing methods are shown in Fig. 2.

In older receivers, bias cells were frequently used. The bias cell furnishes a potential difference between the cathode and the grid, and thereby adjusts the operating characteristic of the tube. These bias cells did not cause a current flow, and consequently they had very long lives. In transmitters, a separate bias pack is frequently used. The negative lead of the bias pack output is connected to the grid circuit of the tube, and the postive lead is connected to the cathode. This makes the grid negative with respect to the cathode.

In the audio output stages of a receiver cathode bias is most commonly used. The electrons flowing through the cathode resistor produce a voltage drop across it having the polarity shown in Figure 2B. This action makes the cathode positive with respect to the grid return and the effect is the same as though the grid return were made negative with respect to the cathode. The cathode bias resistor is chosen to develop its proper bias voltage when normal current is flowing through the tube.

Conduction current bias is rarely used except in low-level high-gain audio stages. Even with large values of grid resistors, very little bias voltage is developed. This limits the usefulness of conduction current bias, but in low-level, high-gain

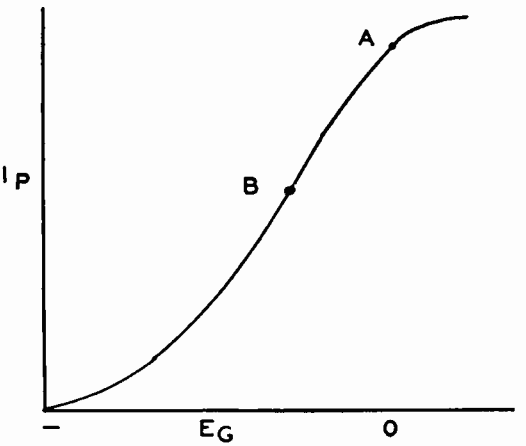


Fig. 1. The Eg-Ip characteristic of a typical tube. Point A is the zero-bias point and point B is the normal operating point.

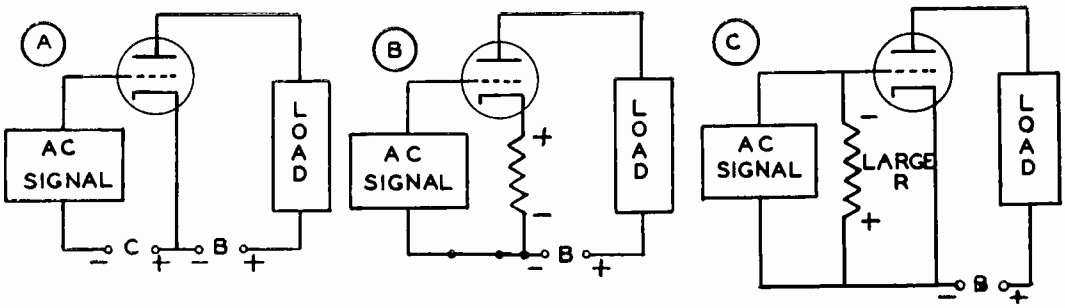


Fig. 2. The three bias methods most frequently used. Explanations are given in the text.

audio stages where very little bias is required, this system is ideal. For example, conduction current bias is normally used in the first audio amplifier stage of the "standard" AC-DC receiver. By connecting a 10 or a 15 megohm resistor between the grid of the tube and B—, sufficient bias voltage is obtained for satisfactory operation of that stage.

What Happens if the Bias Voltage is not of the Correct Value?

If the bias voltage applied to a stage is changed, the operating characteristics of that stage are changed. In audio amplifiers, this usually produces distortion. For example, if the coupling condenser between the first audio amplifier and the audio output stage shorts, a positive voltage is fed from the plate of the preceding stage to the grid of the audio output stage. This positive voltage wipes out the bias and causes distortion. In a battery biased system, a weak C battery will cause distortion by moving the operating point of the tube. In a conduction current bias system a change in the value of the grid resistor will frequently produce distortion.

In class C amplifiers used in transmitters, the bias for the tube is normally chosen so that maximum efficiency is obtained for the stage. If the bias voltage changes, the efficiency of the stage decreases. Generally, an amplifier tube will draw excessive current, and the tube will be damaged.

Most modern receivers use some form of automatic volume control. The automatic volume control circuit varies the bias that is applied to the i-f amplifier section of the receiver in accordance with the strength of the signal, thus the gain of the i-f amplifier is decreased when the signal is strong and increased when the signal is weak.

Any circuit defect that changes the bias applied to these tubes will show up as poor sensitivity, or—in some cases—oscillation.

Avc bias is generally obtained from the detector load resistor. The AC component is filtered out, and the resultant pure DC is used for bias. If a by-pass condenser on the avc line opens, some of the audio voltage will be fed to the avc line. This produces a peculiar type of fluttering that is caused by the gain of the i-f stages varying with the audio voltage instead of the average carrier signal.

Also, avc by-pass condensers will sometimes short. This destroys the avc bias and allows the tubes to run at full gain. Generally, oscillation results.

Conclusion

From this brief discussion, you can see that proper bias is important. If the bias voltage disappears, or is of an incorrect value, the equipment will not operate satisfactorily.

In your career as a technician, a thorough knowledge of what bias is, and what it does, is important.

The most important fact to keep in mind regarding bias is that the bias voltage for a tube is applied between the grid and the cathode of the tube. That statement is so important that I will repeat it: *The bias voltage for a tube must be applied between the grid and the cathode of the tube.*

In studying circuits, a clearer insight of the circuit's operation can sometimes be obtained by determining how the bias voltage for the circuit is obtained. This can be done by carefully tracing the cathode circuit and the grid circuit of the tube to determine where the bias is applied.

Also, remember that the bias voltage makes the grid of the tube negative with respect to the cathode, but it does not cause current flow. As the grid of the tube is not heated, it is impossible (under normal conditions) for the grid to emit electrons.

Our Cover Photo

The UNIVERSITY OF ILLINOIS NEWS PHOTO appearing on the cover of this issue is of Prof. Grant Fairbanks (left) and Dean W. L. Everitt with the "Time Compressor" invented at the University of Illinois. The story below is by Arthur R. Wildhagen—

URBANA-CHAMPAIGN, ILL. When the next national political campaign begins, an automatic "time compressor" for political speeches may be standard radio broadcasting equipment. Matter of fact, listeners won't miss a word when a recorded 45-minute speech has been slimmed down to fit a 30-minute broadcast spot, or an hour-and-a-quarter oration slipped into less than 60 minutes of air time.

Compressions of 10 per cent or even of 20 per cent pass unnoticed. Up to 50 per cent does not destroy understanding of speech. Music put through the machine has its tempo stepped up, but pitch and clarity of individual notes are unchanged. Precise fast effects beyond human ability now are possible.

Inventors of the "time compressor" are Prof. Grant Fairbanks, director of the Speech Research Laboratory at Illinois; Dean William L. Everitt of the College of Engineering; and Robert P. Jaeger, electronics technician.

The idea originated in Prof. Fairbanks' professional knowledge that the ear is faster than the mouth—that we can hear and understand a great deal faster than we can speak. Since the human speech organs can't be speeded up much, he found another way to fit sound to ear ability.

The problem was to produce a machine which would speed up sound automatically without making a fullback have the voice pitch of a May Queen—which is what happens if you simply record a voice and play it back faster.

After working out theoretical and mathematical principles, he made a tape recording, took out his scissors, and snipped the tape into small bits. Each covered a few hundredths of a second of the recording time. Then he threw every other one away and pasted the remaining ones back together.

The result was a little rough, but understandable even though half of the sound was in his wastebasket. The important thing was that he had not altered the sound pitch—his fullback talked twice as fast but still sounded like a fullback. That was in 1950.

Then Prof. Fairbanks and the other two inventors developed the "time compressor" to discard portions of an incoming sound signal automatically, to push the retained portions together smoothly, and to keep the pitch of the resulting signal unchanged.

The machine does these things without actually cutting the tape. Its mechanism involves a continuous loop of recording tape on which sound is temporarily stored, and a set of four pickup heads on a revolving drum around which the tape makes a right-angle turn.

The pickups are arranged like the spokes of a wheel. Only one touches the tape at a time, but just as it moves off, the next comes in contact. As far as the outgoing sound is concerned, the playback is continuous, but actually that part of the original sound which was between the "spokes" and untouched by them is left out.

Tape and drum run at different speeds, and these can be varied independently to obtain any degree of compression desired. Or, the drum can turn the other way so each pickup overlaps somewhat on sound the previous one covered. This repeats the bit of sound there and the machine becomes a "time expander." Output of the machine is recorded at a rate adjusted so that the result has the true pitch of the original.

A way to explain how the machine works is this: If from a board fence you removed every other board and then pushed the remaining boards together, you'd have a compressed fence. If a sign in big letters had been painted on that fence, you still could read the compressed sign, and it would be in the original colors. Or, you could expand the fence by separating each board and inserting a new board painted just like the one ahead of it. The expanded sign on the expanded fence would be longer, but legible and properly colored.

The machine has another possibility. Instead of compressing time it can be used to compress the tones of a voice, and then to expand them back to original understandability. This is an almost instantaneous process which may permit a telephone or radio circuit to carry many conversations where one now is carried.

This problem of "bandwidth reduction" has interested engineers for a long time. They have found various ways of making circuits do multiple duty, and now the compressor may offer another possibility of carrying more messages without building more expensive transmission facilities.

———*n r i*———

Some minds are like concrete—all mixed up and permanently set.

———*n r i*———

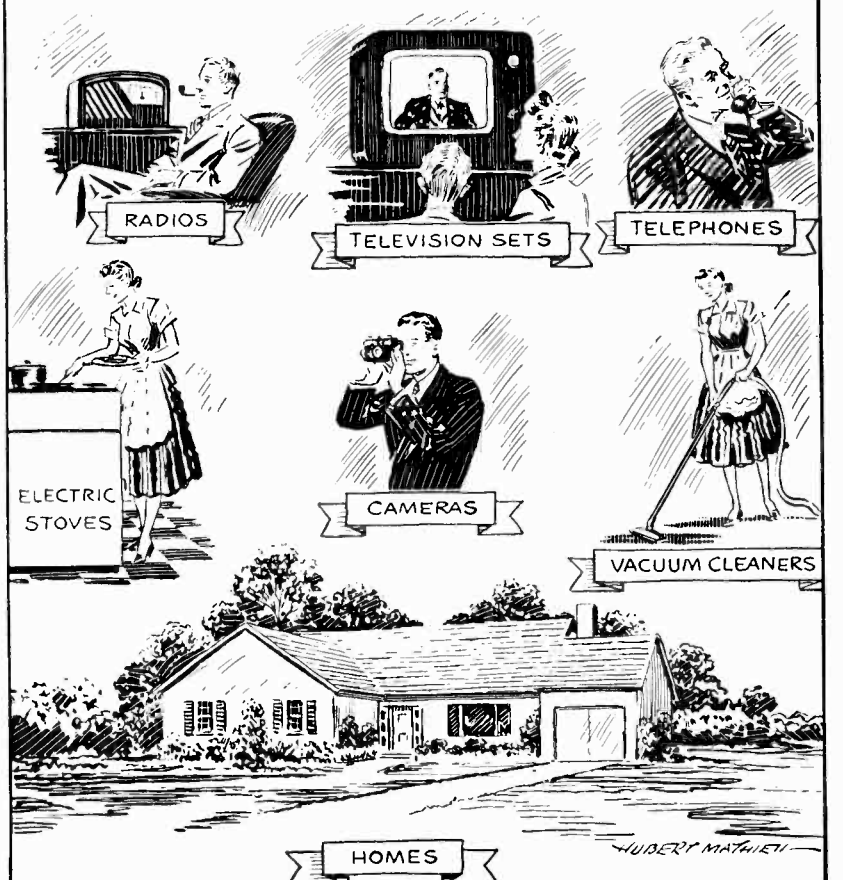
No age or time of life, no position or circumstance, has a monopoly on success. Any age is the right age to start doing.

—GERARD.

OUR DEMOCRACY — by Mat

THE MORE ABUNDANT LIFE

HERE IN AMERICA, A LUXURY SELDOM REMAINS A LUXURY FOR LONG. NOT TOO MANY YEARS AGO, THERE WEREN'T MANY AUTOMOBILES FOR THE AVERAGE INCOME FAMILIES — AND THEN ABRUPTLY THERE WERE AUTOS FOR ALMOST EVERYONE. WHAT OUTSIDERS STILL REGARD AS LUXURY ITEMS WE CONSIDER ESSENTIALS:



IN A SINGLE LIFETIME, INGENUITY AND INDUSTRIAL SKILL, BACKED BY THE SAVINGS OF THE PEOPLE, HAVE GIVEN US ALL THIS. WE HOLD IT CASUALLY, RARELY WONDERING — AN ABUNDANCE THAT GIVES OPPORTUNITY, TOO, FOR THE DEVELOPMENT OF CULTURAL AND SPIRITUAL VALUES.

N.R.I. ALUMNI NEWS

Norman Kraft ..... President
F. Earl Oliver ..... Vice Pres
Oliver B. Hill ..... Vice Pres
Harvey W. Morris ..... Vice Pres
Thomas Hull, Jr. ..... Vice Pres
Louis L. Menne ..... Executive Secretary

Chapter Chatter

New Orleans Chapter, our youngest, is now quite a baby. Chairman Louis E. Grossman has been working like a beaver to take care of all the details such as arranging for the meeting place, arranging for the speakers and contacting members. He has done a marvelous job and his enthusiasm is reflected in the fine response he is getting from members.

At the last meeting thirty-nine were present. Mr. Gene Carr, District Supervisor, General Electric, Birmingham, Alabama, spoke to the Chapter about the GE television receiver. He showed slides and, in addition, had a chassis that could simulate different faults a service man might encounter. Mr. Carr was just getting nicely warmed up to his subject when it was necessary to adjourn the meeting because of the late hour. However, Mr. Carr has promised to return at a later date to give another talk to our group.

We are very much indebted to Mr. Carr and his superior, Mr. Bill Parkinson, in Syracuse, N. Y., for this much appreciated talk.

Our Secretary, Mr. C. E. Davidson, Jr., who is in the wholesale Radio and Television business in New Orleans, has promised to have one of his men, a TV serviceman, as speaker at our next meeting. This man is to bring his own equipment and chassis and demonstrate how to align a TV receiver. This should be a very interesting meeting.

New Orleans Chapter is experiencing its growing pains but with capable officers at the helm little obstacles are overcome and the chapter is well on the road to be one of our largest. Students and graduates in the New Orleans area who are interested in attending the meetings are requested to get in touch with Chairman Louis E. Grossman, 2229 Napoleon Ave., or Secretary C. E. Davidson, Jr., Box 5318, New Orleans.

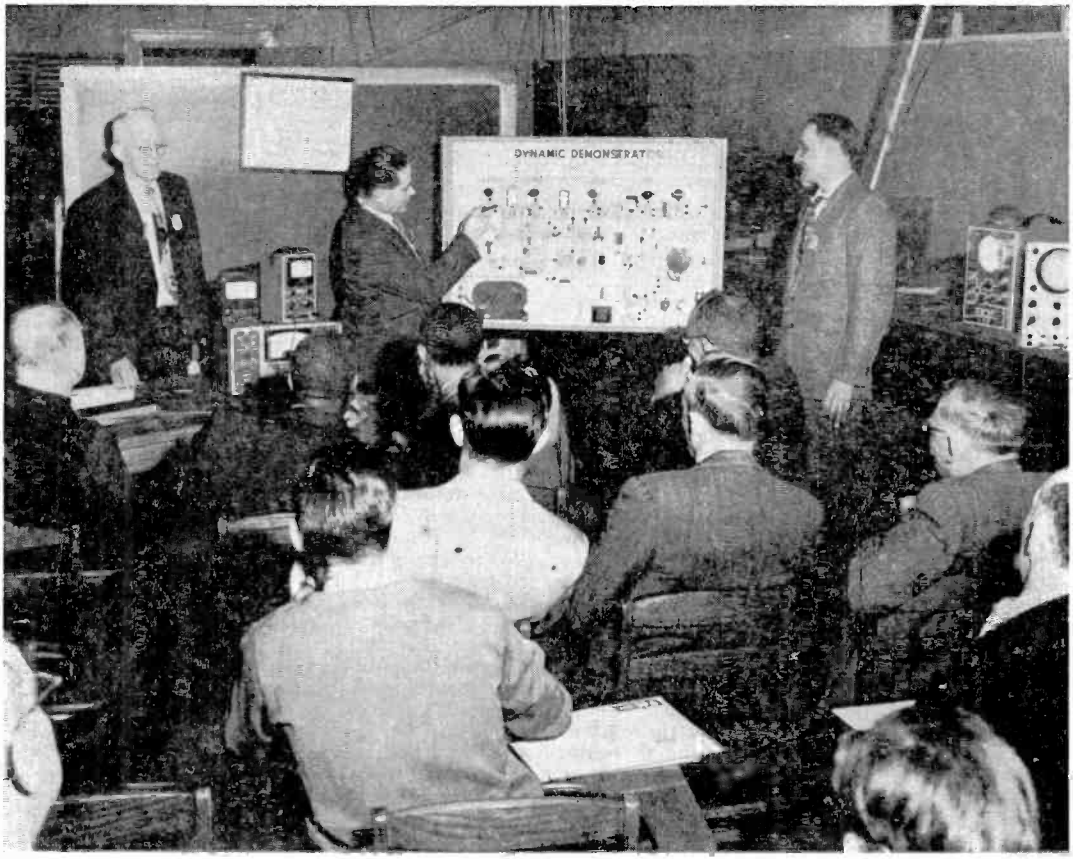
Baltimore Chapter played host to a group of members of Philadelphia-Camden Chapter who made the trip to Baltimore for the purpose of exchanging ideas. Among those from Philadelphia were our National President, Mr. Norman Kraft, past President Charles J. Fehn, former Chairman LaVerne Kulp, present Chairman Fred Seganti, and Secretary Jules Cohen. Our Executive Secretary also was present on that occasion. Short talks were made by Norman Kraft, Jules Cohen and L. L. Menne. Baltimore Chapter has promised to return the visit at an early date.

Another past President, Mr. Ernest Gosnell of Baltimore Chapter, was present. In the absence of Chairman R. F. Thompson, who was delayed, Mr. H. J. Rathbun, also a past President of the NRI Alumni Association, acted as Chairman. He conducted a regular meeting after which refreshments were served. Chairman Thompson arrived at the meeting in time to shake hands and take part in the refreshments. He and Secretary Joseph M. Nardi are doing a splendid job in Baltimore.

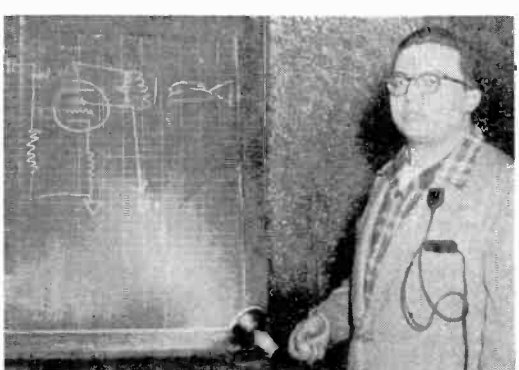
At still another meeting we were addressed by Mr. E. Shue on servicing AC-DC sets and at a third meeting Mr. H. J. Rathbun again took charge as the principal speaker.

Philadelphia-Camden Chapter, mentioned in the preceding paragraphs, gives promise of at least being the fastest growing Chapter in our organization if not the largest. Much of the credit for this is due to the very fine job of Secretary Jules Cohen who is just bubbling with enthusiasm. He reports the following new members, James F. Kravitz, Thomas Byrne, John J. Laurinitis, Walter Laforet, John S. Mento and George L. Toth.

Harvey Morris, our TV expert, is conducting a series of lectures on TV trouble-shooting, using the Philco TV set the Chapter purchased. Good



F. Earl Oliver, of Detroit Chapter, at the RCA Dynamic Demonstrator. That's Charley Mills at the left and Chairman Kenneth Kacel at the right.



Philip Spampinato (above) and Frank Manz (right) who occasionally lecture at New York Chapter. Notice the lapel microphone.

use is also made of the NRI Professional TV Scope owned by the Chapter. Harvey Morris creates all kinds of defects in the set and then shows the members how to go about locating the trouble in the fastest way using the scope as an aid. Harvey has the reputation in Philadelphia Chapter of being a real expert in locating trouble quickly and his lectures are always very well attended.

Philadelphia-Camden Chapter is drawing members from all parts of Pennsylvania and New Jersey. Anyone wishing to attend meetings as a guest is most welcome to do so. Write to Jules Cohen, 7124 Souder Street, Philadelphia, Penna., or telephone him at FI 2-8094. Meetings are held at the K of C Hall, Tulip and Tyson Streets on the second and fourth Monday of each month. Meetings start promptly at 8:15 P.M.

New York Chapter runs along like clockwork owing to the well-laid plans of its officers. In this chapter meetings are scheduled weeks in advance. Everyone knows exactly what he is to do and when he is to do it. If anything happens to interfere with these well-laid plans the speaker is expected to contact the Chairman who immediately appoints a substitute. For these reasons there are never any blank spots in the meetings at New York Chapter. In fact, New York Chapter has developed so many excellent speakers they find it difficult to find room for all of them to participate in their proceedings. This is the result of hard work on the part of Chairman Wappler, Secretary Kunert, Frank Zimmer, Thomas Hull, Jr., and Alex Remer, who serve as an executive committee.

We were very pleased to have a visit from L. L. Menne, from Washington. At this particular meeting Thomas Hull, Jr., conducted a radio clinic and William Fox gave a very interesting talk on some of his radio and TV experiences. Fox always injects a great deal of humor into his talks and yet he makes some very telling points based upon his daily problems.

Frank Manz, at one of our meetings, made a talk on Servicing High Voltage Supplies, and Philip Spampinato talked on Audio Systems in Radio and TV Receivers; at another meeting Thomas Hull, Jr., spoke on the subject of Voltage Doublers. Mr. Hull, by the way, is one of our National Vice Presidents and a real credit to our organization. He has the patience, poise and ability to get his thoughts over to the members and he is always ready to answer a question at any time during the proceedings. A good talk also was given to us by Alex Remer who chose as his subject, Using Your Head in TV Work.

Meetings are held on the first and third Thursday of each month at St. Marks Community Center. 12 St. Marks Place, opposite Cooper Union. Students are always welcome as visitors.

Chicago Chapter is also spurting. There is an improvement in attendance and the work of Chairman Mead and Secretary Ziecina is bearing fruit.

A good talk was made by Secretary Frank P. Ziecina on Television Interference. He went into the causes of interference and suggested a number of remedies.

Mr. John Hartman was elected Treasurer. Mr. Hartman has contributed some valuable reading matter to the chapter. Absence of Chairman Mead at one of our meetings was explained by the serious illness of his wife. Best wishes from all the chapter members for her speedy recovery.

Following the scheduled talks we usually conduct an open forum. These are always interesting. Members are invited to bring in their balky receivers.

We meet on the second and fourth Wednesday of each month, thirty-third floor, Tower Space. in American Furniture Mart Building, 666 Lake Shore Drive, Chicago. Use west entrance.

Detroit Chapter was led by Vice President Earl Oliver who made good use of our RCA Dynamic Demonstrator. He spoke on radio servicing problems. Mr. Oliver is always present to take over, if necessary, or lend a helping hand to anyone in the chapter who may have a problem of any kind. He has been a tremendous asset to Detroit Chapter through all these years.

The use of the RCA Dynamic Demonstrator has awakened the members to the advantages of more frequent use of the equipment owned by Detroit Chapter.

Most members are elated with our present place of meeting, which is Veterans Memorial Building, 151 West Jefferson, between Griswold and Shelby. The setup is somewhat on the order of a hotel with a nice lobby. Notices of meetings are posted on the bulletin board. The rooms are modern and very clean. Furniture is comfortable. The surroundings are everything to be desired. Several meetings have been held in these quarters and it is hoped that they may be made a permanent home of Detroit Chapter. However, some problems are still to be solved by the officers of the Chapter. The Secretary will notify members as to the place of meeting from time to time. There is need for a place which provides a workbench and storage space for our equipment, neither of which are available at the Veterans Memorial Building, and there is some doubt that this handicap may be overcome in this location. Watch for notices from your Secretary.

Here and There Among Alumni Members

Alumnus J. B. Richotte, of West Warwick, R. I., is employed by the U. S. Navy as a civilian Radio Mechanic.

n r i

Mr. Charles Fehn, 1945 President of the National Radio Institute Alumni Association, will soon take the slow walk down the middle aisle. Charley is sure he will have no trouble getting out to meetings as regularly as he has for so many years. A grand guy who has the best wishes of all his Phila-Camden Chapter friends for a long and happy marriage.

n r i

Congratulations to Thomas F. Lindsey, of Midwest City, Oklahoma, who has been promoted to Chief Engineer of Station KTOW.

n r i

Marcus H. Moses, of New York, N. Y., is now Assistant Service Manager with Sanford Electronics Corp., distributors for Webster-Chicago, and Sentinel.

n r i

Glenn B. Long, Jr., who recently completed Advanced Television Practice with NRI, is working for Westinghouse Radio and TV division in Sunbury, Penna. He is a Television Analyzer.

n r i

Congratulations to Mr. and Mrs. Wendell V. Webster of Halifax, N. S., Canada. It's a boy.

n r i

Graduate Claude E. Robinson, of El Segundo, Calif., is very happy about his position as an Electronics Mechanic with North American Aviation.

n r i

Graduate Ellis R. Grant has moved from Georgia to Van Nuys, Calif., and is enjoying his work as technician with the Pacific Mercury TV Corporation.

n r i

Michael S. Lesiak, of Taunton, Mass., now has his General Amateur's License, call letters W1WMX. He is on 80 meters CW, with the NRI Transmitter built as a part of the NRI Communications course.

n r i

Shirley Davis, of Horseheads, N. Y., has received his 2nd class Radiotelephone License and Advanced Class Amateur License. He is active in RACES (Radio Amateur Civil Emergency Service).

n r i

Graduate Edward M. Dudek, of Chicago, Ill., writes enthusiastically about his earnings. Besides an excellent full-time Radio TV job, his spare-time weekly income exceeds his previous weekly income from a factory job!

Wilson Soehlig, of Oran, Mo., recently completed a 50-watt remote controlled sound system in a new school in his community. A mighty big job to undertake in spare time. Soehlig is a wholesale Radio supply salesman.

n r i

It's good to hear that S. G. Philipowich, of Porcupine Plain, Sask., Canada, is feeling much better after his polio attack of last fall. Graduate Philipowich expects to be able to resume service work this summer.

n r i

Henry L. Mueller of Two Rivers, Wis., now has three licenses, a First-class Radiotelephone, a Novice Amateur Radio license, WN9VWS and a Technicians Class Amateur license. He is now preparing for a General Class Amateur license.

n r i

Lester L. Warriner, of Sunnyside, Washington, is with Station KREW, of Sunnyside. At present he is "working the board," or announcing and performing maintenance. Also busy wiring up sub-assemblies for a new station KLER, to go on the air soon in Lewiston, Idaho.

n r i

Alumnus Robert E. Buurley, of Hicksville, New York, is helping to pay for a new home with spare-time earnings. Well pleased with his progress.

n r i

Graduate O. B. Shuler, of Tulare, Calif., is now a Branch Manager for J. C. Arbuckle, Wholesale Radio distributor of Fresno. He's very happy in his work. Shuler graduated from NRI only two years ago. Nice going!

n r i

Parts and Service Manager is the title of F. B. Roberts, of Nashville, Tenn. He is with the Keith Simmons Co., who are distributors for RCA. Says TV's arrival really brought a repair boom with it.

n r i

Bruno Goede, of Plainview, Minn., is having fun with spare-time Radio and TV servicing. Sends a nice photo of a well-equipped shop paid for out of his earnings.

n r i

John Gaudu, Jr., of Rome, New York, has made rapid progress since graduation. He is now Manager of Cunningham's TV Service and Sales, and doing very well.

n r i

James L. Pratt, of Burlington, Vermont is working as a transmitter engineer with Station WCAX, besides working three days per week as a TV serviceman. Also has Amateur Extra License W1GAE.

n r i

Graduate Clarence E. Ellis of Red Rock, Okla., says he has a wonderful Radio and TV business out there.

NATIONAL RADIO-TV NEWS
16th & U Sts., N.W. Washington 9, D. C.

For:

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611 17th St.
Denver 2, Colo.

National RADIO-TV NEWS

Vol. 15 June-July, 1953 No. 9

Published every other month in the interest of the students and Alumni Association of the

NATIONAL RADIO INSTITUTE
Washington 9, D. C.

The Official Organ of the N R I Alumni Association. Editorial and Business Office, 16th & You Sts., N. W., Washington 9, D. C.

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Printed in U.S.A.