

National RADIO-TV NEWS



IN THIS ISSUE

Servicing the Standard Coil Tuner

How to "Haunt" Stairways

Alumni Association News

June-July
1954

VOL. 16
No. 3



Look Ahead to New Wonders

When engineers were searching for a name to give to the new medium, they coined “Television”—far seeing! We talk about the *video* and *audio* signals; in Latin *video* means “I see,” and *audio* means “I hear.” You, in making Radio-Television your career have shown “far sightedness,” but in looking ahead to new wonders don’t overlook “I see” and “I hear” in learning *basic facts!*

Remember, color TV is already here and to service the very complicated color control circuits you must know how the simpler monochrome receiver works. Don’t be so far seeing that you overlook the closer, essential things. Before you can learn the intricacies of Television you must learn Radio-Electronics if your foundation is to be secure.

We at NRI are looking ahead to a future of electronic marvels in which Radio, Television, and many other applications of the simple vacuum tube will make life even easier—and will provide more opportunities for the well-trained serviceman.

J. E. SMITH, *President.*

Servicing the Standard Coil Tuner

By WILLIAM F. DUNN

NRI Consultant



William F. Dunn

THE Standard Coil tuner, manufactured by Standard Coil Products Co., of Chicago, Ill., is the most popular turret type tuner in use at the present time. This type of tuner has been used in millions of receivers such as Admiral, Capehart, Emerson, Fada, Hoffman, Magnavox, Muntz, etc. This tuner is also found in many of the expensive custom-built TV receivers. This article is presented with the hope that it will help you gain familiarity with the tuner used in many receivers.

It is a "step" type tuner with a separate fine tuning control that allows minor adjustment of the oscillator frequency.

This tuner is designed for VHF reception, Channels 2 to 13. However, it is possible to place UHF Channel strips in the tuner and thus to "convert" it for UHF reception. The UHF strips will be discussed later.

Circuit Analysis

The Standard Coil tuner shown in Fig. 1 is the "pentode" type most frequently found in commercial receivers. Let's discuss the operation of that circuit.

The signal reaching the antenna terminals is fed to the antenna coil L101. This coil has a grounded center tap, thus permitting a balanced input for a 300-ohm transmission line between the terminals 8 and 10. Thus, if a 300-ohm transmission line is connected to the input of the set, its impedance will be properly matched and the impedance to ground will be balanced.

The center tap also permits a 75-ohm coaxial cable to be used for the input. If coaxial cable is used, the inner conductor is connected to one

of the antenna terminals and the outer conductor (shield) is grounded. This connects the 75-ohm line across one-half of the coil, which offers a quarter of the impedance of the total coil, so 75 ohms is approximately matched.

This type of input coil is used by most tuner manufacturers, although there are a few tuners designed to operate from either 300 ohms or 75 ohms but not *both*.

The signal voltage across L101 is transferred to L102 where it is applied between the control grid of the 6BC5 (or 6AG5 in some models) rf amplifier and the grounded cathode. The ground return from coil L102 is through condenser C101.

The output of the rf amplifier tube appears across the plate coil L103 and is coupled to the mixer grid coil L104.

The lower half of the 6J6 tube is the oscillator, and the upper half is the mixer. Coil L105 is the oscillator tank coil, and is coupled to L104 so that energy from the oscillator circuit is fed to the grid of the mixer. The output of the mixer is fed to the grid of the first video i-f amplifier through an rf filter consisting of L110 and C107, and the i-f coil L111. Coil L111 has an adjustable slug so that you can set this coil, acting as the first video i-f transformer, to pass both the sound and the picture carriers and their associated side bands.

When a different channel is wanted, the sets of coils enclosed in the dotted lines are changed. Coils L101 and L102 are mounted on a rotatable drum in such a way that, when the drum is turned, a different set of coils is put into place so that the coil studs engage the contacting fingers inside the tuner. Similarly, coils L103,

L104, and oscillator coil L105 are changed. Coils L102, L103, and L104 resonate to the channel for which they are designed, but they are rather broadly tuned. Most of the selectivity in a TV receiver comes from the video i-f amplifier rather than from the tuner. The tuner is primarily depended upon to reject image signals rather than signals from adjacent channels.

Of course, to produce the proper i-f frequency, the oscillator must be accurately tuned. Therefore, coil L105 is slug tuned, and the slug is adjustable. Furthermore, once it has been set for approximately the right value, the set owner can make small adjustments in the oscillator frequency by turning the "fine-tuning" control (variable condenser C122). This fine-tuning condenser consists of two fixed plates with a movable dielectric between them so that the *dielectric* is variable. It differs from the usual variable condenser in which the overlapping area of the plates, or the plate spacing is changed while the dielectric remains constant.

Certain other condensers are somewhat different from those usually found in radios. In particular, condensers C114, C115, C116, and C117 are what are known as "feed-through" condensers. In other words, the capacity is obtained where the wires pass through shield partitions by placing an insulator with a very high dielectric constant between the wire and the shield. At VHF frequencies, even the capacity between a wire and the edges of a hole in the shield is appreciable, so it is deliberately made use of and even increased by the proper choice of dielectric. If even more capacity is wanted at certain points, the dielectric is made as a tube rather than as a bead, and it is coated on the outside with a metal foil that is grounded. This increases the area of the grounded "plate" of the condenser, and thus increases the capacity.

The tubes used in tuners are specially selected and are carefully aged to assure long life. Because internal tube capacities are important at VHF frequencies, the manufacturer makes the final adjustment of each tuner with its tubes in place. If it is ever necessary to replace a tube in a tuner, you may have to try a number of them before you find one with internal capacities near that of the original tube. Occasionally, a tuner must be realigned to suit the available tubes. This should not be attempted, however, without the proper equipment. The oscillator adjustment is an exception; we will discuss that later.

Notice that in addition to the shielding, the filament circuits are filtered, so that the oscillator signal cannot radiate. If this signal did radiate, interference would be produced with other TV receivers.

Fig. 2 shows a side view of the tuner and identi-

fies some of the parts. Examine the tuning shaft. You will find two sections: an inner-shaft identified as the selector shaft, and an outer-shaft for the fine tuning. The metal plate held by screw A is one plate of the fine tuning condenser. Mounted on the chassis proper, opposite this plate, there is a deposit of metal on a ceramic insulator. The bakelite sheet on the end of the fine tuning control is so shaped that, as the fine tuning control is rotated, more and more of the bakelite comes between the two plates of the fine tuning condenser. This gradually changes the dielectric constant from that of air to that of bakelite and therefore changes the capacity. Although both the capacity and the capacity change are very small by radio-receiver standards, they are appreciable at the frequencies used for television reception.

Coil L111 is mounted at an angle because in some receivers, the picture tube is mounted over the tuner. Bending the mounting of this coil gives more clearance between the picture tube and the tuner, and it also permits adjustment of this coil from the side when it would not be possible to reach from directly above because of the picture tube. As mentioned previously, this coil is the first i-f transformer.

The RF Test Point identified in Fig. 1 and Fig. 2 is the signal generator connection point for aligning the first video i-f transformer. By connecting the signal generator output to this point, the signal is fed through the mixer section of the 6J6 tube to the transformer. The transformer can then be adjusted for maximum response at the proper frequency without detuning.

The latest Standard Coil tuners have a bottom cover plate; the earlier tuners do not have this cover. To remove the bottom cover from the tuner, insert a screwdriver under the lip of the bottom cover and gently pry off the cover.

The bakelite strips shown in Fig. 3 are the channel tuning strips. The numbers on these strips correspond to the channels for which each particular strip is designed. The letter beside the channel number identifies the particular tuner model. This is very important. This manufacturer has made many different models, and it is vital that, if any channel strips are to be replaced, the proper ones be used. Therefore, always be sure in ordering replacement strips for such a tuner that you identify the strips both by channel number *and by the code letters* marked on the original strips.

Incidentally, if you ever have to install UHF strips in such a tuner, it is important that the UHF strip have the number that identifies the local UHF channel *and the same code letter* on the original strips in the tuner. Check to make certain you have received the correct UHF strips

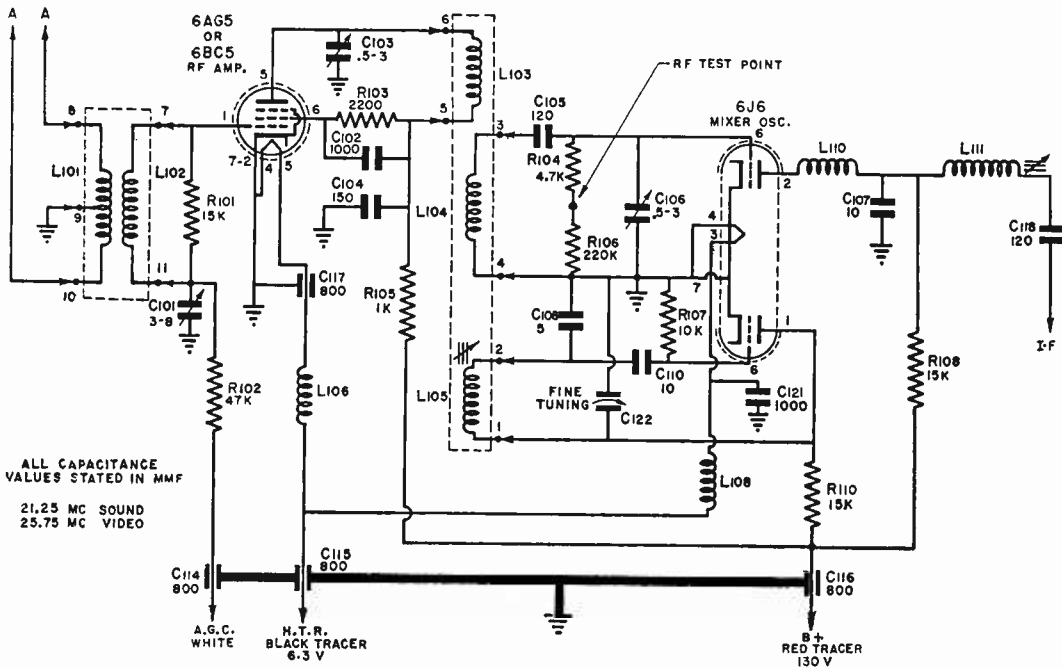


Fig. 1. Schematic of the "pentode" Standard Coil tuner.

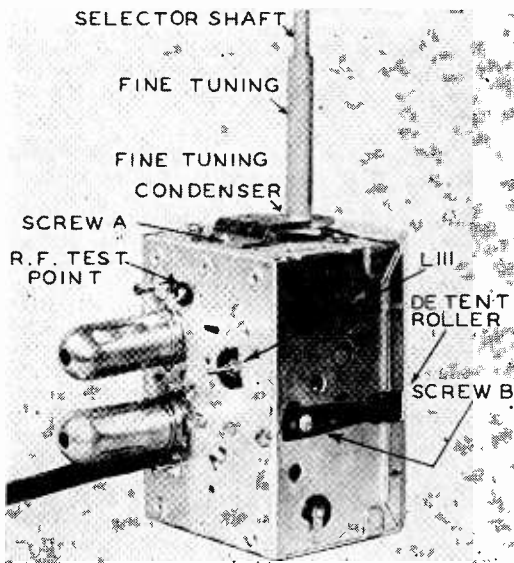


Fig. 2. Side view of the Standard Coil tuner with identification of parts.

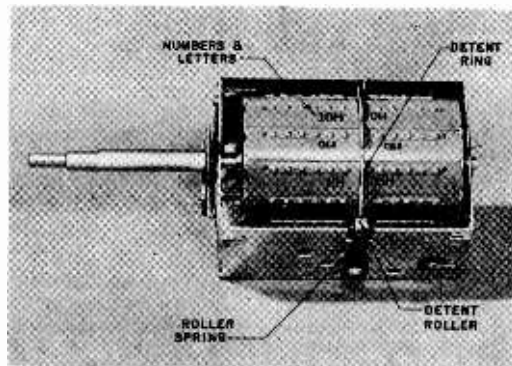


Fig. 3. Notice the channel numbers and the tuner code letters on each strip.

a set of spring "fingers" at the end of the strips. Fig. 4 shows how to pry a spring finger to remove a strip. When the finger just clears the end of the strip, lift that end of the strip upward and it will come out. Do not pry the finger back so far that the finger will not spring back into place. The finger must hold the strip when it is replaced.

before installing these UHF strips in the tuner. The individual strips are held on the drum by

When you remove a set of strips, you will notice that the oscillator and antenna-coil strips are different sizes, so it is impossible to get the

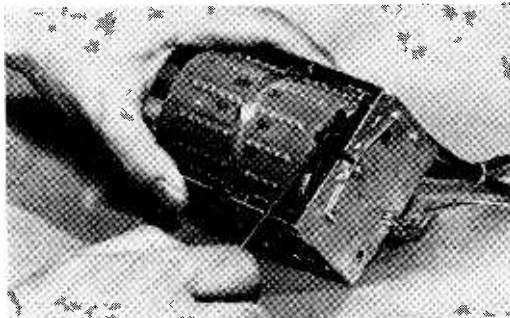


Fig. 4. How to remove channel strips.

oscillator strip in place of the antenna strip, and vice versa. However, to avoid confusion, do not take out more than one set of strips at a time, and do not rotate the drum while a set of strips is out of the tuner.

Replacing a strip is the reverse of removing it. The small projections on one end of the strip fit into slots in the detent ring. Put these projections on the strip in the slots in this ring; then, while holding the spring back with a small screwdriver, drop the strip into place.

To see what happens when the selector shaft is rotated, turn the shaft and notice the action of the detent roller on the detent ring. This roller provides indexing so that the drum carrying the strips snaps into position at a point where a set of strips is in contact with the fingers built into the fixed portion of the tuner. (The drum may be turned in either direction as it has no stop.)

UHF Reception

Many sections of the country have only VHF television stations, while other sections have both VHF and UHF stations. To avoid interference as much as possible, no section of the country has VHF channels consecutively assigned. That is, if a certain section has channel 3, it will not have channel 2 or channel 4; if a section has channel 9, it will not have channel 8 or channel 10. (Channels 4 and 5 are frequently assigned in the same locality because there is a 4 megacycle "guard band" between these two channels in the spectrum. This guard band prevents interference.)

Since no locality has more than seven VHF stations assigned, and this tuner has provisions for twelve channels, it appears that there is a waste of five channel positions in the tuner. This is true, but set manufacturers would rather pay the extra money for the unused channel strips than pick out sets and adjust them for each particular part of the country. Also, many per-

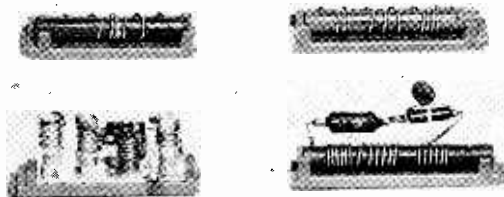


Fig. 5. A comparison of VHF strips and UHF strips. The UHF strips are at the bottom.

sons use their receiver for both local reception and fringe area reception. Consequently, in some localities you can receive stations on all of the channels between 2 and 13.

Since there are unused channel strips in the tuner, these may be removed and replaced by UHF channel strips in those localities where both VHF and UHF service exists.

If you live in the service area of UHF stations, you will frequently have to install UHF channel strips in these tuners.

The procedure described above for removing a VHF strip and re-installing it is basically the same procedure for removing a VHF strip and installing a UHF strip. The UHF strips are, however, much more complex than the VHF ones, and must be handled with great care to prevent damage. Fig. 5 shows a set of typical UHF strips below a set of typical VHF strips. As you can see, the UHF strips are much more complex.

Fig. 6 is the tuner schematic when a UHF strip is installed. The circuit operation is as follows:

Because of the extreme difficulty of amplifying frequencies between 500 and 900 megacycles, no rf stage is used on UHF. Stray capacities and the inductance of leads is now a very critical item. For these reasons, practically all UHF conversion strips have a crystal mixer-detector immediately after the input band-pass circuit. The signal from the local oscillator must be fed to this crystal. Since the crystal detector is on the antenna strip, this requires a connection between the oscillator strip and the antenna strip for UHF.

It is difficult to get the oscillator to work properly at UHF frequencies when the original layout was for VHF. Therefore, it is common practice to allow the oscillator to work at a lower (VHF) frequency, then to use a harmonic of the oscillator to produce a signal to beat with the incoming signal and thus provide the proper superheterodyne action. The harmonic is produced by rectifying the oscillator sine-wave output with a crystal diode on the oscillator

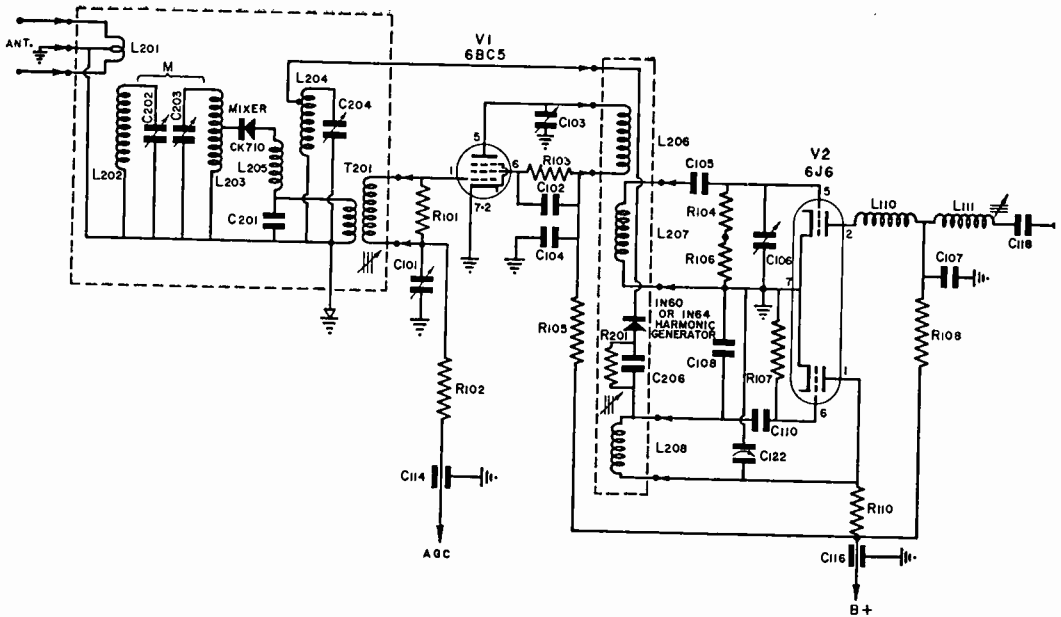


Fig. 6. Schematic of the "pentode" Standard Coil tuner with UHF strips installed.

strip. The output of a rectifier is rich in harmonics, and this output is applied to a tuned circuit L204-C204 on the antenna strip. This circuit is tuned to one of the harmonics, so it will be excited into oscillation by this harmonic. Its oscillator current will be sinusoidal at that harmonic frequency, so we are feeding practically a pure sine wave at this harmonic frequency into the mixer.

There are two possible circuit arrangements. Some tuners use a *single* superheterodyne circuit, in which the i-f frequency of the set is produced directly by the mixer. In such a case, the channel strips change the circuits of the original rf amplifier and mixer in the VHF tuner so that both are i-f amplifiers. This changes the original tuner so that it becomes a mixer-oscillator and two-stage i-f amplifier. The Standard Coil tuner uses the circuit known as a *double* superheterodyne. In this arrangement, a harmonic of the oscillator beats with the incoming UHF signal to convert it to a VHF signal, which is then applied to the rf amplifier of the tuner just as any other VHF signal would be. The rf stage amplifies this signal, and feeds it to the VHF mixer, where it is combined with the *fundamental* signal of the oscillator to produce the true i-f for the video i-f stages. Thus, the oscillator signal beats with the signal twice—once to produce a VHF signal, and again to produce the i-f signal. The VHF signal produced by the first beat does not necessarily correspond to any of the VHF television channels, so the input transformer T201 and the coils L206

and L207 must be tuned at the factory to the proper frequency.

Installing UHF Strips

If you live in a UHF service area, you will have to install UHF strips from time to time. Here is the procedure:

Remove one set of the unused VHF strips. It does not matter which set, just so you have a means of locating the UHF strips as you rotate the drum. The channel 13 position (if that channel is not received in the particular area) is generally used.

The longer (oscillator) strip must be installed first. This is the strip that is nearer the front of the tuner. There is a pin or contact that extends from this UHF strip in the direction of the antenna strip, which is used to transfer the oscillator signal to the antenna strip. This pin must be passed through the slot in the detent ring. When you insert the shorter antenna strip in the rear section of the tuner, be sure that this pin makes firm contact with the metal plate or loop provided for this purpose on the antenna strip.

It is extremely important that you do not tamper with the adjusters on UHF strips. They can be adjusted only at the factory. The one exception is the oscillator adjustment; the procedure for setting that adjustment will be explained a little later.

To Clean Contacts

A common problem with step tuners is noise produced by dirty contacts. The "ball" contacts on the channel strips may be cleaned easily but the built-in contact fingers are not so easily reached. If a complete clean-up is required, the drum must be removed. This is a simple operation if the proper procedure is followed.

You can, in most cases, remove the drum while the tuner is mounted in the chassis. The figures show the tuner out of the chassis because the exact procedure is clearer when the tuner is not mounted in a chassis. The procedure, however, is exactly the same in both cases.

Refer to Fig. 2 and locate the screw A that holds the top plate of the fine tuning condenser. Remove this screw and the top plate. You will now find it possible to slide the fine tuning shaft off the selector shaft. The brass spring on the selector shaft should now be removed. If there is a washer under this spring, it, too, should be removed.

Next, locate the screw B shown in Fig. 2 that holds the detent spring and roller. Take this screw out and remove the detent mechanism.

The drum is held in place by two wire springs, one at each end of the shaft. With a large pair of pliers, grasp the spring near the end and move it so that it clears the notch in the case. It will now come away so that you can remove the looped end of the spring from its notch. Do the same to the spring at the other end of the tuner and the drum can then be removed. (NOTE: On some of the Standard Coil tuners, the end of the spring fits in a slot in the tuner chassis. On these, it is necessary to lift the looped end of the spring off the notch before removing the other end from the chassis slot.)

Fig. 7 shows the inside view of the tuner with the drum removed, and the various component parts of the tuner that must be removed in order to free the drum.

When the drum is removed, the contact fingers are visible and can be cleaned. Clean these contacts, and the contacts on the drum, with a soft rag moistened with carbon tet. (NOTE: carbon tet can be *deadly*. If you use carbon tet in cleaning these strips, be sure that the area is well ventilated, and try not to inhale the fumes.) After you have cleaned the contacts, wipe them with a soft, dry cloth. Then wipe away the old lubricant at the points of contact between the drum shaft and the tuner chassis. Use a *small* amount of *conductive* Vaseline (one containing graphite, such as Grapholine) at each end of the shaft and on the detent ring. Ordinary grease or Vaseline should not be used be-

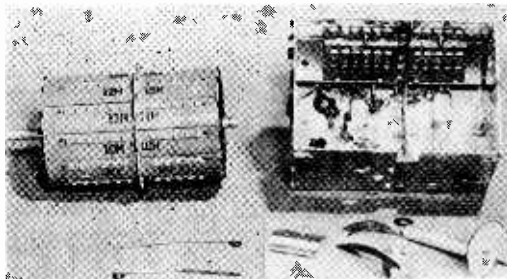


Fig. 7. Inside view of tuner with drum removed. The parts that must be removed to free the drum are also shown.

cause it is a non-conductor and insulates the metal parts of the drum from the chassis. This causes the tuner to become noisy. You can obtain a conductive lubricant from your radio parts dealer.

You are now ready to reassemble the tuner. Put the drum back in place, hook one end of the retaining spring wire over its notch, then with a heavy pair of pliers, latch the free end of the spring wire in its notch. Do the same at the other end of the drum. Next replace the detent spring and roller and tighten its screw. Be sure that the detent roller is centered in the chassis slot so it is centered over the detent ring on the drum. (Most Standard Coil tuners have an aligning projection on the tuner chassis that insures proper placement of the detent spring.)

Be very careful in reassembling the fine tuning control. Place the washer (if one is used) and the brass spring over the selector shaft first, then put on the fine tuning shaft. Finally, replace the top plate of the fine tuning condenser. When you do this, be sure that the bakelite plate on the fine tuning control is in such a position that the tip is not under the top plate. To prevent breaking the bakelite, press down on the fine tuning *shaft* to depress the brass spring as you tighten the screw holding the top plate of the fine tuning condenser. When the screw is tight, rotate the fine tuning shaft over its range to be sure its operation is normal.

Next, examine the bottom cover plate (if one is used). At the rear end, there are two bent fingers that fit into slots at the rear end of the tuner. Engage these fingers in their slots and press the cover into place until the detents on the free end of the cover snap into the holes near the fine tuning condenser.

How to Adjust the Oscillator

To adjust the oscillator slug for a particular channel you must have an alignment tool at

least six inches long made of a non-magnetic material. It must be small enough to pass through the aligning hole in the front of the tuner.

Set the channel selector to the channel you plan to adjust. Determine the physical mid-position for the fine tuning control. You can judge this position by rotating the control from one end of its range to the other and then coming back approximately half way. In certain positions of the fine tuning control, the bakelite plate will cover the hole in the front of the tuner that you must reach through, so you will have to set the fine tuning control to the center of its range so you can reach the oscillator slug.

Insert your adjusting tool through the hole, and adjust the slug for maximum sound. Turn the slug *very slowly* as its adjustment is critical. If you turn it the wrong way, the signal will decrease. You should be able to make this adjustment within about one to one and one-half turns of the oscillator slug. If you turn the slug too far in either direction, it will run off the thread and will no longer be adjustable.

If you happen to have turned it so that it is coming out of the channel strip (counter clockwise) merely turn it back in until the thread is again engaged with the spring that holds the slug.

On the other hand, if you turned it in (clockwise) you will have to remove the oscillator strip and put the slug back in position. To do this, rotate the channel selector until the strip for the channel you are trying to adjust can be reached. Remove this strip in the manner previously described.

Be careful not to disturb the position of the coils. Locate the spring (marked in Fig. 8) and move the spring out of its slot. You can now shake the slug out of the coil end. Once it comes out, push the spring back into the slot and insert the slug with its pointed end into the coil first. Turn it clockwise until the thread on the slug engages the spring.

Install the strip in the drum. Rotate the channel selector so that the proper strip is in contact with the fingers and continue your adjustment procedure. Be careful not to run the slug into the coil too far again. This same procedure can be repeated for all of the channels.

The procedure for adjusting a set of UHF strips is basically the same, but the UHF strips must be adjusted more carefully. Set the oscillator slug, and then depend upon the fine tuning control for final adjustment. It will be very difficult to adjust a UHF strip to exactly the proper frequency. So long as you can set the fine tuning control for maximum sound output, that is all that's important.

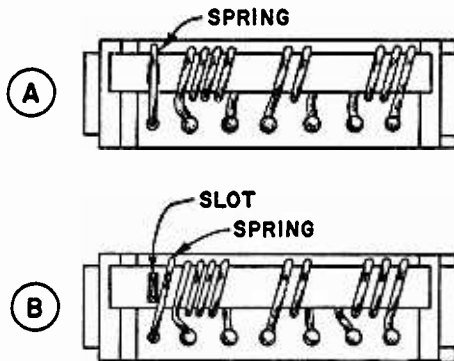


Fig. 8. How to put the oscillator slug back in place when it is run in too far.

Conclusion

The tuner used in the illustrations for this article is the model H. The physical layout of the first i-f transformer and the RF Test Point is not the same on all the models, but you should have no difficulty locating these points on any Standard Coil tuner.

This same company also makes a Cascode tuner that uses a 6BK7 (or 6BQ7) rf amplifier tube. The physical features of the Cascode model are the same, and the service procedures are identical.

At one time the company made a special model of their tuner for use in receivers with separate sound and video i-f sections. They have now discontinued this special tuner, but they sell a sound take-off transformer which, when added to any 21-mc Standard Coil tuner, converts it for use in receivers with separate i-f systems. This transformer, part number XM-752, is available from most large wholesalers. *Neither the tuners nor the coils are available from the Institute.* They must be purchased from a radio wholesaler.

— n r i —

The Fisherman's Prayer

*"Dear Lord, when Gabriel blows his blast
And I come home to rest at last,
Don't measure me for harp and wings;
Let me have instead these things:*

*Some tackle and a rod and reel,
A pair of waders, and a creel.
A gushing, frothy, glacier stream
A placid lake by which to dream,*

*An angel pal with whom to angle,
Magic lines that will not tangle,
And permission, Lord, with fingers crossed
To lie about the fish I lost."*

NRI Graduates Increase Their Incomes — Have Greater Independence



Television
Technician
with
RCA Distributor

"I am now employed by the RCA Distributor in this area as a Television Technician. Am making \$80 per week, plus any overtime.

"Training with NRI was one of the best investments I ever made. There is a world of good, useful information included. I personally have no hesitancy in recommending NRI highly to anyone who asks about it."

GLENN B. LONG, JR.
1610 Reynolds Street
Verona, Penna.



Has Good Job
In a
Television
Repair Shop

"May I take this time to tell you how much your course did for me. I have a good job in a Television repair shop, Transvideonics, in Steubenville, Ohio. Also have a small business of my own in my home.

"I really am enthusiastic about your course. In one year's time I went from the lowest paid help to the head benchman."

VERN BARR
RFD #1—Box 255A
Toronto, Ohio

— n r i —

— n r i —

Over \$2,000 Profit from Spare-time Shop in Last Twelve Months



"I have owned and operated my own part-time Radio and Television service shop for over eight years. In my experience, I have found no better training than the NRI course.

"I am personally acquainted with many servicemen. Among these men are other NRI students and graduates. We all agree that NRI training is tops.

"NRI training gave me a profit of over \$2000 in the past twelve months from my part-time service shop—really a welcome increase in my receipts."

CLIFTON W. HARTLEY
Box 74
Arcadia, Indiana



**Engineer and
Announcer with
Station WHPE**

"Thanks to the NRI course, I operated a very successful Radio repair shop for a period of one and one-half years, after which I decided I would like to work for a Radio broadcasting station. I became employed by Station WPAQ, and later by Station WBOB. I am now serving as an announcer and engineer for Station WHPE, which is paying me a larger salary.

"I think this is proof enough to convince any young man that his future can be secure if he will give only a few minutes a day of his spare time and effort to a reliable and well qualified school. I wish to thank NRI, and their staff, for all the things they have done for me."

VAN W. WORKMAN
2403 Van Buren Street
High Point, N. C.

— n r i —



**Started Spare-time Business
After Fifteen Lessons**

"When I enrolled with NRI, I knew practically nothing about Electronics. After fifteen lessons, I started repairing Radios for my friends. I bought a piece of sheet metal, painted a sign on it, and attached it to my house. My spare time Radio service business was a going concern in thirty days.

"I am now sitting at a work bench surrounded by hundreds of dollars worth of test equipment and tubes. The swell part of it is that it did not cost me a cent of my own money. The profits from my business paid for it all. The money I have made has bought many things for my family which would have been out of the question before. My future looks brighter than ever. Signing up for NRI was the smartest thing I ever did."

DONALD B. ACKERMAN
342 Quincy Street, N.E.
Minneapolis, Minn.

— n r i —

After Working Fourteen Years, Quit Job and Started Own Business



"After nearly fourteen years doing Radio and TV work in spare time, I decided to quit my regular job. I am now doing Television work full time. It was hard to break away from a steady pay check (I was making tops in my line), but my heart was always in the Radio and Television field. I am doing all right financially, building a nice business, with many happy customers. But, the big thing to me is that I love my work. I am not just punching a time clock and putting in time.

"If only fellows knew what a wonderful investment NRI really is, they would not hesitate one moment to sign up. I would not take one hundred times the price I paid for the course."

WILLIAM F. KLINE
6833 Merwin Avenue
Cincinnati, Ohio

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.

HOW TO "HAUNT" STAIRWAYS

By LEO M. CONNOR

NRI Consultant



Leo M. Connor

THE widespread popularity of recreation rooms has led to the development of many "gadgets" for "gag" purposes.

The "Stair Haunter" that is to be described in this article is one of the more complex "gag" devices and, in company with similar items, its cost is rather high. However, there are some people who will pay well for equipment of this sort. The Radio-TV service man is logically equipped to design and install such devices along with custom built radio, TV and sound systems.

This particular stunt was developed after reading an account of a "haunted house" in which people could be heard going up and down stairs with no sign of actual people at any time.

The sound of footsteps is produced by means of solenoid operated "strikers" mounted under each step. The step sequence is controlled by contacts mounted on a motor driven drum.

By properly setting up the contacts it is possible to duplicate the sound of a person going up or down stairs. It is also possible to make it seem as though the person went part way up or down the flight of steps and then returned to the starting point.

In order to get the greatest amount of surprise and mystery into the stunt, the solenoids and "strikers" should be completely concealed.

This may be difficult if the underside of the steps has been "finished off" by plastering or a similar

covering. If the covering is made of plywood or some type of sheet finish it may be possible to remove the sheet and replace it without too much damage.

The solenoids could be mounted on top of the steps and at one side. However, concealment would be difficult and it would be easy for guests to discover the source of the ghostly footsteps.

The "Stair Haunter" cannot be used on carpeted stairs because ordinary footstep sounds would be masked by the carpeting.

It is necessary to make up a large part of the striking arrangement and to build the contact arrangement. In fact, the only items which can be purchased are the motor, solenoid coils and plungers. All of the other equipment must be fabricated by the builder. For this reason each installation is "custom built."

NRI cannot furnish any of the parts used in this item. The parts used in the original model were obtained from Herbach and Raderman Inc., 1204 Arch St., Philadelphia, Penna. Requests for information on ordering these or similar items should be sent to that firm at the address given.

It should be borne in mind that it is possible to make modifications in the equipment and still obtain the desired results. The design to be described seemed best suited for the original installation and is not offered as the best for every case.

Design Considerations

The number of contacts will be determined by the number of steps in the stairs. This will also determine the number of solenoids and strikers that are needed. There were 12 steps in the original location so the contact arrangement will be described for this number of steps. Suitable changes would need to be made for fewer or more steps.

The motor is a 1 RPM unit designed to operate on 115 volts, 60 cycles a.c. However, any motor could be used provided that it was geared down so that the contact drum speed was 1 RPM.

The solenoids are designed to operate on 6 volts a.c. This low operating voltage was chosen because it is necessary to run a line to each solenoid and, when low voltage is used, ordinary two wire thermostat cord or bell wire can be used. If 115 volts a.c. solenoids were used it would have been necessary to comply with the National Electric Code and use regular house wiring equipment and practices. Regardless of the voltage used, the solenoids should have a lift rating of $\frac{1}{2}$ ounce and a stroke length of $1\frac{1}{2}$ inches.

Construction Details

The details of the "striker" are shown in Fig. 1. No dimensions are given because they are not too critical.

The bracket which holds the assembly to the step is bent from 16 gauge aluminum stock. In the original model the strips were $1\frac{1}{2}$ " wide and 7" long. The lip which fastens to the step with two wood screws is one inch long. The vertical section of the bracket is two inches long and the horizontal section is four inches long.

The angle bracket which serves as a pivot for the striker arm is made from a strip of 16 gauge aluminum $\frac{1}{2}$ " wide and 2" long. It is bent so that both legs are 1" long. Two holes are drilled in the leg that is to be bolted to the main bracket. In the original model, 6-32 x $\frac{1}{4}$ " machine screws were used so the holes should be large enough to clear these screws.

Another hole is drilled in the vertical section of the bracket. This hole is $\frac{3}{4}$ " above the base and serves as a pivot for the striker arm.

The striker arm is made from a strip of 16 gauge aluminum $\frac{1}{2}$ " wide by 6" long. The strip is placed in a vise so that all but $1\frac{1}{2}$ " is held in the jaws of the vise. A pair of heavy pliers are then clamped on the end and the strip bent or twisted 90 degrees. A hole is then drilled in the end of the longer section. This hole should be of the correct size to clear the bolt used to fasten the lever to the angle. Another hole should be drilled at the center of the short section. In the original

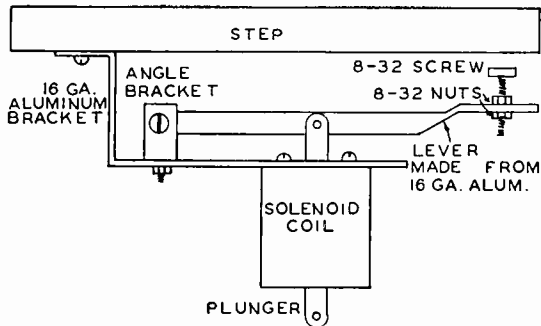


Figure 1.

model an 8-32 binder head screw was used as a "knocker." The adjustment for proper operation is made with the two nuts shown in the drawing. Lock washers were placed under each nut in order to avoid the possibility of vibration shaking them loose.

The solenoid coil should be mounted on the bracket before the lever is assembled. In the original model the solenoid plunger was $\frac{1}{2}$ " in diameter and a $\frac{9}{16}$ " hole was drilled in the bracket to clear the plunger. The coil has two mounting bushings threaded for 4-36 x $\frac{1}{4}$ " machine screws. The bracket should be drilled in the proper locations for these screws. In the original model the plunger hole was located $1\frac{1}{2}$ " from the end of the bracket and in the center of the strip.

After the coil is mounted, temporarily fasten the lever to the bracket and insert the lever into the slot in the plunger. Mark the lever by sticking a sharp pointed tool through the hole in the plunger and then take the assembly apart and drill a hole in the lever to clear the pin used to fasten the plunger to the lever.

The final assembly of the "striker" can then be completed. Be sure that the assembly moves freely and that there is no binding at the angle or the plunger.

After mounting the bracket near the center of the step, apply 6 volts a.c. to the coil terminals and adjust the nuts so that the head of the screw strikes the step.

One of the striker assemblies should be prepared for each step.

Construction Details—Contact Drum

The drum which carries the contact pins is made from a copper shield can. Actually any metal cylinder having the correct diameter could be used but copper is best because of its low resistance.

The motor, drum and contact assembly are all mounted on a piece of $\frac{3}{4}$ " plywood 12" x 18" in size. This size could be reduced but the size given allows plenty of room.

The drum diameter will be determined by the number of steps. If too small diameter is used the "steps" will be spaced so close that it will sound like the person is running. In the original model, the drum diameter was such that there was a five second interval between sounds. The original drum was $5\frac{1}{2}$ " long and $3\frac{3}{8}$ " in diameter and, since the circumference of a circle is equal to 3.1416 times the diameter, its circumference was slightly over 12 inches. The contact pins were then spaced one inch apart around the circumference which gave one step each 5 seconds because the motor speed was 1 RPM. If a faster rate is desired, the pins should be more closely spaced.

The drum used in the original model had a solid top so it was necessary to accurately locate the center of the top. After locating the center, a center punch was used to accurately mark the center.

The motor used in the original model had a one-quarter inch diameter shaft and an old flexible shaft coupling of the type used to connect condenser shafts to dial mechanisms, was revamped for use as a coupling. The rivets used to hold the assembly together were drilled out. The sections of the coupling are made up of a quarter-inch bushing with a set screw and arms which can be bolted to the drum. The easiest way to mark the holes for the bolts is to drill a hole in the center of the shield can top that will clear a piece of one-quarter inch shafting. Then fasten the bushing on the shafting and put the shafting through the hole in the top of the can. The holes for bolts to be used in securing the bushing to the can are then accurately located. These holes should be drilled. If desired, the coupling can be fastened to the drum at this time.

In order to keep wobble to a minimum, a support is used on the open end of the can. In the original model a wood block was turned to a force fit in a lathe. The center is then drilled for a piece of quarter-inch shafting. You may use either a "force fit" or the remaining half of the shaft coupling to secure the shafting to the block. The support for this shaft is a slightly oversize hole in a block of wood. This method is acceptable because of the slow shaft speed. Just make sure it does not bind. Fig. 2 shows a side view of the motor, drum and drum support.

After you have finished the drum supporting assembly you are ready to start placing the contact pins. There is a wide choice of arrangement and if you wish to make a permanent sequence the pins can be soldered at the proper points. If you wish to change the sequence of switching

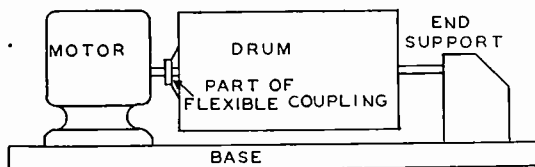


Figure 2.

the pins should be removable. This last arrangement is the most difficult to build. However, being able to change the sequence keeps the "gag" from getting old.

The holes for the pins are "staggered" around the drum circumference so as to allow proper spacing of the contact fingers. The easiest way to locate the holes is to use a sheet of paper just long enough to go around the drum and $\frac{3}{8}$ " narrower than the length of the drum. After cutting the paper to the proper size, lay it on a flat surface and draw a diagonal line between opposite corners. This line is then divided into a number of parts that are equal to the number of steps.

The paper is placed around the drum and fastened in place with "Scotch" tape. A center punch is then used to mark the hole locations on the drum. In the original model, the hole locations were marked as described and then the paper was reversed so that two diagonals were marked on the drum surface. This gives flexibility in the contact arrangement and makes it possible to vary the step action and then give a variety of effects.

The diameter of the holes will be determined by the contact system you select. Since it was desirable to change the contact arrangement, the original model used phone tip jacks set into the drum. These jacks are of the type designed for mounting on an insulated surface and when they are mounted on a metal surface, they furnish a means of contact.

The tip jacks requires holes $\frac{1}{4}$ " in diameter. They are mounted so that the nuts are on the inside of the drum. The holes in the tip jacks are the right size for a number 12 wire which is used as a contact. After the jacks are mounted, a piece of number 12 tinned wire is straightened and cut in one inch lengths. These wires are inserted in the tip jacks.

Construction Details—Contact Fingers

After finishing the drum assembly you are ready for the contact finger assembly. The number of "fingers" required is equal to the number of steps plus one. The extra finger is for the drum.

The "fingers" may be mounted on a piece of dry

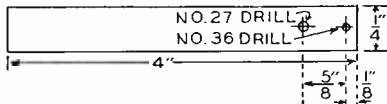


Figure 3.

wood but, if there is considerable dampness where the motor board is set up, better insulation should be used. The original control unit was to be used in a dry location so a piece of maple was used as a support. After the construction work was done, the maple block was placed in a pan of hot parafin and boiled for one-half hour. At the end of this time the block was lifted out with tongs and the surplus parafin wiped off. The block will absorb enough parafin to keep out moisture.

Figure 3 shows the finger dimensions and drilling detail. The number 36 drill hole is used as a solder lug so that the lead can be connected easily. The number 27 drill hole is used to fasten the strip to the wood block. In making the fingers, a sheet of brass stock was first marked off and drilled. The strips were then cut out with tin snips.

The strips are then mounted on the block as shown in Figure 4. The spacing between strips is $\frac{1}{8}$ inch. After all the strips have been mounted the block should be placed on the motor board and positioned so that the strips make contact with their respective pins as the drum is turned by hand. The strip on the left should be bent so that it contacts the drum. Keep in mind that minor variations can be made by bending the contacts slightly. The contact assembly may be fastened to the motor board after you have determined the correct position.

Wiring the Contacts and Coils

The schematic wiring diagram is shown in Fig. 5. Note that the drum and contacts act as switches in series with a coil and the voltage source. The wiring should be arranged so that the first contact is in series with the first step solenoid, the second contact in series with the second step solenoid, etc.

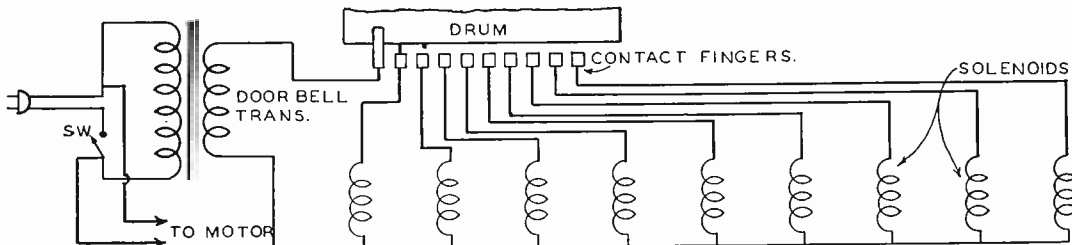


Figure 5.

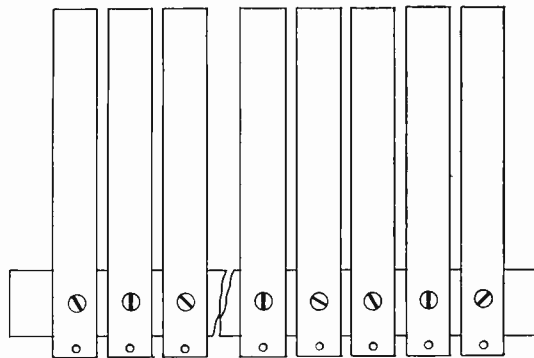


Figure 4.

There is no built-in provision for an automatic positioning of the drum. If the contacts are set up for ascending steps and the switch left on, one set of steps will be heard ascending the stairs and as soon as the cycle is completed, another "ghost" will start climbing the steps!

If the contact pins are set up so that an ascending effect is present until the "ghost" is half-way up the stairs and then the remainder of the pins set so that the solenoids are operated in reverse order, the "ghost" will go back down the steps. This is a rather baffling stunt when you sternly order the "ghost" to come back down and join the party!

If the switch is set behind a bar so that it is concealed a little practice will enable one to shut the motor off just when the last step is reached. Since there are five seconds between "steps" there is plenty of time to shut it off.

One variation of this stunt is to fasten the strikers to floor joists under the floor and so positioned that steps can be heard walking across the floor. With two doors in a room, steps can be made to come in one door and go out the other by properly setting the "strikers" under the floor. Many variations will suggest themselves for different locations.

THE "BEST TEACHER"

By HENRY FARAD

Reprinted through courtesy of Radio-Electronics, who are owners of the copyright, 1954. The editor of National Radio-TV News is grateful to Radio-Electronics for permission to print this article.

Actually, the advanced student will recognize in this article the NRI Practical Training Plan. We are pleased to present this article, however, because it tells the story in an interesting manner and we feel that it is practically impossible to say too much on the subject of how to gain experience.

HE DRIFTS into my TV repair shop two or three times a year. He's a different individual each time, but his problem is always the same. He has studied TV theory until it's running out of his ears; what he needs now is on-the-job experience to make that theory worth something in terms of dollars and cents. He is up against a problem as old as civilization—he hasn't been able to find a job because he has no experience; he can't get any experience because he can't find a job!

I can't help him directly. I'm a smallbore operator on a side street; my shop is in front of my home. You know the setup; in slack season not half enough work for one man; when things get snowed under, a few 12- or 14-hour days clear the decks. I get by, which is just fine. But hired help I can't use.

However, I can explain how I got my experience after I'd run up against the identical problem. Like many others, I learned my TV theory at home in my spare time; making a living occupied most of my daylight hours. My only teachers were books, magazines, and a study course.

Inevitably, as does every student, I reached a point where the books began to blur. I'd absorbed all the wordage I could handle for the time being. I needed actual contact with TV sets—preferably in bad order.

I could have gotten that contact in a residential TV school, but I had a family to support and no rich uncles. A job as a helper or apprentice in a TV shop was another possibility, but a shop helper's pay is too low and his progress not fast enough for any but single, unburdened individuals. I solved the problem by creating my own experience. The method is simple and relatively cheap; it can be duplicated anywhere. It can supply any student—as it supplied me—with experience at exactly the right pace; never too fast, never too slow; whenever he wants it—evenings, week-ends, any time.

My first step was to become what amounted to

a part-time dealer in TV junk. This was simple enough. I inserted a classified ad in a local paper, offering to buy old TV sets—any size, shape, or condition for cash. You don't have to be a big dealer to do this. I put a \$50 maximum on my offer, thus side-stepping big stuff; I never paid more than \$30 for any of the ten-inch clonkers I dragged home. \$30 was my top a couple of years back—a \$20 maximum would be more in line with today's situation.

Having dragged a relic home, I proceeded to restore it to working condition, which frequently took a little doing. As might be expected, there was something badly amiss with every one of my prizes. Some produced neither raster nor sound; some made with fearful planing-mill noises. Others were inhabited by gremlins or some of the many ailments common to TV sets. Sad cases every one, but you don't learn TV repairing by working with sets in good order. Assuming a receiver hasn't suffered a major burn-up (sniff well before buying), and hasn't been robbed of tubes, then the worse its condition the better for the student seeking experience.

The actual, hard-rock experience I gained in repairing those boxes was only part of the program. My next stop was to twist every non-operating control I could find, with the idea of getting everything as far out of kilter as possible. Then I restored everything to normal, sometimes repeating the process several times. The further I progressed the bolder I became; the deeper I dug into my clonkers. I introduced defects and observed the symptoms. I practiced signal-tracing and alignment, to mention just a few of my earlier experiments. Then, after I'd milked a chassis dry of information I sold it down the river, as detailed a little later.

In one corner of my over-sized garage I fought first one piece of junk back into working order and then another—and another. A v.t.v.m. with a couple of probes, a tube tester, and some early printings by Rider and Photofact made up my equipment, plus the usual hand tools.

It's no fun—not at the start. Not for the student completely on his own, with not a soul to give him a lift when he gets stuck in the mud, which is often. It's not the most efficient method in the world, either; it involves frustrated hours of doing things the wrong way, stupid mistakes, wrong approaches, errors of both omission and commission. There were times when I'd have sold out for a fraction of the inventory.

But you can say this about the method—it works! It produces real, valuable experience. Moreover, it sticks with you, as does anything acquired the hard way. Another advantage is that you have neither employer nor impatient customer breathing down your neck—a handicap which can make even an experienced mechanic sometimes black out.

I started out in my garage loaded with theory but inclined to go numb from the neck up the moment I removed the back of a defective TV set. The first time I pulled one out of a cabinet and turned it over I recall sitting there for half an hour, just gawking, with a gone feeling at the pit of my stomach, wondering why I'd ever started this. The first few times I compared a schematic with a chassis I got lost so fast it was worse than pitiful. No fun at the start.

Little by little, however, stage by stage, I acquired competence and confidence, a backlog of experience. I discovered head-on attacks don't pay off in TV repairing. Strategy is the key to the jackpot; knowing when to attack a repair job via the dynamic approach, checking a.c. components with a v.t.v.m. or scope, and knowing when to use the static approach, routinely checking socket voltages, capacitors or resistors. It means knowing when to use a tube-tester and when to rely entirely on substitution. The difference between the strategic and the head-down approach is the difference between minutes and hours in wrapping up a repair job.

The strategist is always changing pace. He hangs onto an idea or a deduction just so long, then if it fails to pan out he dumps it. This is an attitude of mind to be cultivated. Let me illustrate the disadvantages of not having this attitude, by using a hypothetical Joe Doakes. Confronted with a fairly tough case of TV trouble, Joe looks the situation over and makes a quick deduction as to the probable cause. So far so good. However, Joe's test gear promptly reports that everything is under control in the suspected area. This is where real trouble starts.

Instead of changing pace and developing a second deduction, Joe stubbornly makes another pass at the original target. When this gets him nowhere, he promptly goofs off. Two hours, three hours later you may find him still working over the same group of components. Meanwhile in the process of checking and re-checking it's quite

possible Joe's test gear has indicated the cause of the trouble. But because Joe is operating strictly under Condition Gooff, he pays no attention to what the test gear tells him. He ignores it, knot-headedly continuing his original line of attack.

After lunch or possibly the next day, he'll come to, kick himself, and proceed to repair the TV set in a normal manner. I goofed off like this more than once. Others far more competent than I have done exactly the same thing.

The calm, cool, and collected attitude is about twenty-five percent of the top-drawer technician. It increases output and accuracy, it inspires that precious gem, customer confidence. Move slowly and deliberately; it will reduce the number of chassis unnecessarily pulled, and the number of 6AU6's popped by forgetting to return the filament knob on the tester back from 12.6. In short, the less haste the more speed.

I once pulled a chassis and fought with it for an hour, trying to discover the reason for non-sound. I was knee-deep in gear and half-stangled with test leads when I noticed at long last that the record-player switch had somehow been snapped over to PHONO.

Then there was that memorable Philco on which I wasted more than half a morning trying to find out why the over-all bandwidth had decreased to about 2 megacycles. (Yes, I checked and re-checked the tubes.) The trouble, it eventually developed, grew out of the fact that a 12AU7 and a 12AV7 were planted side by side in the front end—and someone had swapped them! Later I discovered the owner had taken some of his tubes downtown for testing before calling me in, which shows to go you—never take anything for granted.

When nothing produces results within a reasonable time, start taking wild shots in the dark. I am reminded of a certain series-filament conglomeration wherein all the symptoms of an open grid circuit in the C-R tube were produced by a heater-to-cathode short in the damper! Then there was that frightful case of horizontal non-linearity which was caused by trouble in a 6SN7-GT horizontal oscillator which checked perfectly in my tester. In this case and as an added unattraction, the horizontal drive capacitor had insanelly taken over the function of a horizontal centering control!

Anyway, and as I started to say some time back, little by little, stage by stage, headache by headache, I acquired competence and confidence at my garage workbench. If I've made it sound rough, I can only say it is indeed rough—at the start.

In the end, I no longer crept timidly up to each

sour TV set, wondering whether this one would be my Waterloo as I began to probe its inards.

Oh, sure you get thrown for a loss every so often by some box tougher than you, but re-pairing the vast majority of TV sets is so simple—even for a halfway competent technician—that it sometimes seems a shame to take the money(?).

I bought a lot of clonkers, but my actual inventory at any one time was seldom more than one TV set. As soon as I milked one dry, it was promptly sold.

I'd have a really good story here if I could say these transactions showed a nice profit, but not so. I had to price those boxes low enough to insure prompt disposal, and I had to get cash. The prices I got were anything but fancy. Considering the cost of advertising, mileage, replaced tubes and components, I lost something on every deal—around \$7.50 per box.

Holding on for higher prices could have showed a profit possibly, but I wasn't necessarily trying to make money; my objective was getting experience. Keeping a constant supply of TV cadavers coming my way was the all-important item.

I started my project with a v.t.v.m. and a tube-tester; eventually I acquired a scope, sweep and marker generators, 1,000-kc crystal marker oscillator, grid-dip meter, wattmeter, capacitance-bridge, short wave receiver to monitor WWV, complete set of service manuals, and trimmings. You don't have to be a big dealer to do this. I bought my gear one item at a time. Moreover the purchases were spread out over a considerable period of time.

Slow work? Well, acquiring electronic know-how is a slow process. The TV student in a hurry is licked before he starts; never less than a year and often two years must elapse before he gains enough ground to tackle general repair work.

Also pretty well licked before he starts is the TV student who expects to draw a salary while he gets his practical experience. Students pay considerable sums to acquire theory, and without protest. However, the thought that practical experience must also have a price tag is something which seldom occurs to them. But that's what it amounts to when the inexperienced technician—sharp though he may be in theory—tries to hire out in Slowblow's TV shop.

Apprentice training works out well enough in some occupations, where other services may be rendered while the student learns. Simply observing a TV repairman at work is of little value to the novice, assuming the repairman is not doubling as instructor. Ninety-nine per cent of the effort is quite invisible, consisting of mental

processes involved in diagnosing the trouble.

If Slowblow takes him as a bona-fide apprentice or learner, the novice will be in Slowblow's way for a long time; he's only half a technician. Slowblow would be forced to make up his deficiencies. Slowblow must spend many hours teaching the novice the techniques he needs; inevitably the novice will make numerous and sometimes expensive mistakes. In short, he'll be a student drawing wages for being instructed!

The only practical way Slowblow can hire the student is on the basis of shop helper. Most of the time he will put up aerials, pull chassis, act as general man-of-all-work. Thus the student earns his wages, but acquiring experience is strictly hit-or-miss, at a woefully slow rate.

Hence, unless he's exceptionally lucky, the average Joe must buy his experience—and the only visible method is along the general route I've been outlining.

Even if the student does not plan to go into business for himself, buying this test gear is actually a necessity. Considering the strong economic position enjoyed by the experienced, competent TV service technician, the money represents a trivial investment indeed.

— n r i —

Our Cover Photo

The modern, well-stocked Radio-TV-Appliance Store shown on this issue's front cover is owned by NRI graduate Abraham L. Fulps, of Lockhart, Texas. Graduate Fulps is standing behind the counter, at his work bench. His wife, Mrs. Cleo Fulps, is demonstrating a refrigerator to Mr. Pond. Mr. Fulps writes:

"I opened my radio shop January 8, 1944; started merchandising radios in 1946 and sold my first TV set in 1948 with only KLEE-TV out of Houston, Texas, some 148 miles away.

"I try to give one-day service on Radios, TV, Refrigerators, Ranges and Laundry equipment. It's a job—but it has paid off as we have gained a little each year.

"I'm sure we could use thousands more men and women in the electronic field as the demand is bound to increase for some time.

"Thanks for what you have done for me and lots of others. I am making a living for myself and getting four children through school."

ABRAHAM L. FULPS
P. O. Box 697
Lockhart, Texas

Attention, Owners of NRI Professional Tube Testers

New Tube Test Charts and TV Picture Tube Adapter Now Available from NRI

A tube tester is no better than the tube test information which is available for it. Recognizing this very important factor, NRI tries to bring out freshly revised tube test information for all models as frequently as we can do so. For Models 66, 67 and 68, there are now available completely new charts, all information being contained in one booklet, eliminating the need for extra sheets.



NRI TV Picture Tube Adapter

These were printed in February, 1954. A new roll chart, revised in January 1954, is now available for the Model 69. A new roll chart is now being printed for the Model 70 tube tester, and will be available about July 10, 1954.

NRI can supply a Television Picture Tube Adapter which may be used with all NRI Professional Tube Testers, Models 66 through 70. (Not usable with NRI Model 1185.) This Adapter enables you to test a Television picture tube in a receiver, or in the original factory carton. The test includes a cathode emission check and a check for shorts between the various elements in the tube. Manufacturers do not claim that a Television Picture Tube Adapter is a fool-proof means of testing Television pictures tubes. There are certain comparatively infrequent troubles in picture tubes which an Adapter will not detect. It is, nevertheless, a popular and useful accessory.

In ordering either a new tube test chart for your NRI Tube Tester, or a Television Picture Tube Adapter, please use the convenient order blank included on this page. Be sure to include the proper remittance, and in *ordering tube test charts, be absolutely certain to mention the model number of your tube tester.*

How to Install New Roll Chart in Model 70 Tube Tester. (Retain these instructions if you order a new Roll Chart.) First, remove the instrument from its wood case by taking out the eight Phillips wood screws from around the edge of the front panel. The panel will now be free and can be removed from the instrument case. For better accessibility, you can remove the complete Roll Chart mechanism from the instrument. However, this is not necessary.

The Roll Chart is held securely to the wooden rollers by means of three brass spring clips.

These can easily be removed with the fingers, or by means of a pair of pliers. Note the amount of tension in the old paper Roll Chart before removing it. You will want to include the same amount of tension in the new Chart.

How to Install New Roll Chart in Model 69 Tube Tester. Remove the front panel of the instrument by taking out the screws found in the four corners of the panel. Closely observe the mechanical operation of the old Roll Chart and the tension of the paper before removing the old Roll Chart. Fasten the new Chart to the wooden rollers using scotch tape. Reassemble the instrument.

ORDER BLANK FOR OWNERS OF NRI PROFESSIONAL TUBE TESTERS

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

Enclosed is \$..... for which send me the following material, as checked:

- Paper Roll Chart for Model 70 NRI Professional Tube Tester. Available about July 10, 1954. Price \$1.25, postpaid.
- Paper Roll Chart for Model 69 NRI Professional Tube Tester. Revised January, 1954. Price \$1.25, postpaid.
- Completely revised test data, in one booklet, for Models 67 and 68 NRI Professional Tube Testers. Revised February, 1954. Price \$1, postpaid.
- Completely revised test data, in one booklet, for Model 66 NRI Professional Tube Tester. Revised in February, 1954. Price \$1, postpaid.
- Television Picture Tube Adapter. May be used with all NRI Professional Tube Testers. Models 66 through 70. Includes instructions. Price \$4.98, postpaid.

Name Student No.....

Address

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

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



The above photograph shows Mr. Macheak in the center foreground. His charming wife is standing at his left.

NRI GRADUATE GERALD J. MACHEAK, OF CEDAR FALLS, IOWA, WINS OCEAN CRUISE TO BERMUDA AND NASSAU AS LARGEST RCA TELEVISION DEALER IN HIS DISTRICT

We are delighted to devote this space to congratulating Mr. and Mrs. Gerald J. Macheak, of Cedar Falls, Iowa, for the outstanding success which they are achieving in their Radio and Television business. We had the pleasure of receiving a visit from these people some weeks ago on their return from a well-deserved vacation trip.

Mr. Macheak writes in part as follows concerning his business:

"I would like to present a short history of our business, which has been quite successful, and for which we are deeply indebted to NRI for the technical know-how and encouragement received from your school.

"After my graduation from NRI, we decided to open our own business in Cedar Falls, Iowa, which we did on October 1, 1951, with a capital of \$750. At that time, the area did not have local Television service. At first we did only service work on Radios, record players, and TV.

"In the spring of 1952, we took the RCA fran-

chise and went into retail selling. Our gross business amounted to \$65,000.

"By 1953, our business had expanded to the extent that we were looking for larger quarters. On October 1, 1953, we moved into a large building on Main street. At that time, our first primary area TV station opened in Cedar Rapids, and the selling began in earnest. We had to hire extra help, buy a delivery truck, service car, and other equipment. The following month a local TV station went on the air, and our business really picked up. We ended the year of 1953 as the largest TV dealer in our district, and grossed over \$135,000.

"As a result of our sales, we were fortunate to win an ocean cruise to Bermuda and Nassau. The vacation was badly needed, because we have never been able to find a substitute for hard work, and we had to work very hard in establishing our business."

GERALD J. MACHEAK
202 Main Street
Cedar Falls, Iowa

CONNECTING ACCESSORIES TO THE 7E RECEIVER

By JOHN G. DODGSON

NRI Consultant

STUDENTS and graduates frequently ask advice on connecting accessories to the six tube superheterodyne receiver built in their seventh experimental kit (E series).

The most common accessory—a phonograph input—is shown in Fig. 1. Only three parts are necessary:

One single pole—double throw switch.

One foot of single conductor shielded cable.

A phonograph jack (whichever type will match the phonograph plug).

The total cost of these parts is usually less than \$1.

The switch and jack can be mounted in any convenient position on the chassis. Many students have found it best to mount the switch between the tuning and volume controls on the front of the chassis and to install the phonograph jack on the loop antenna (next to the loop mounting bracket) on the back of the receiver. Care must be taken not to damage the loop by opening or shorting any turns. Either a toggle or rotary type switch can be used.

After mounting the switch and jack, follow these simple steps:

(1) Disconnect the lead at terminal 36 of the volume control and connect it to one of the outside terminals of the switch.

(2) Connect terminal 36 of the volume control

to the pole of the switch.

(3) Cut the cable to a convenient length; connect one end of the conductor center lead to the outer side of the switch and connect the other end of the conductor to the center (ungrounded terminal) of the input jack.

(4) Both ends of the shield should be grounded. Use a solder lug at the input jack if necessary.

Use as short a cable as possible to prevent stray pick-up and ground the shield of the cable as close to the cable as possible. This phonograph input can also be used as a microphone input for crystal microphones; other type microphones may need a preamplifier.

The second most common accessory is a tone control. Two circuits for tone controls are shown in Fig. 2.

The first type of tone control—the continuously variable type—is the most common since it is quite inexpensive. To connect this tone control to the receiver, it is only necessary to disconnect the .005-mfd. plate by-pass condenser C10 and connect the condenser and potentiometer as shown in the illustration. Be sure that the condenser is rated at 600 volts.

The second type tone control is more expensive but has the advantage of wider frequency control. A rotary type switch can be used and all of the condensers should be rated at 600 volts. Condenser values are as follows: C₁—.05 mfd.; C₂—.03 mfd.; C₃—.01 mfd.; C₄—.005 mfd.; and C₅—.001 mfd.

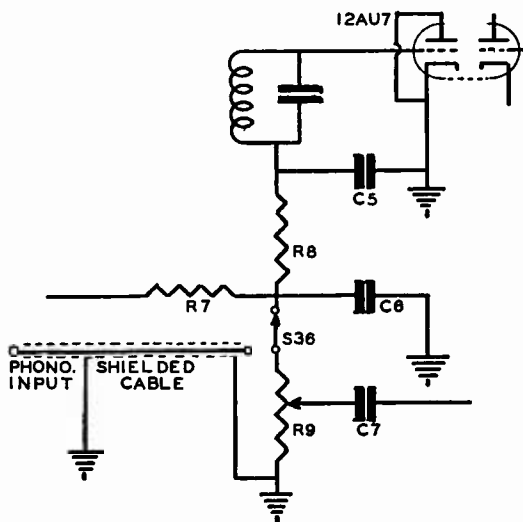


Figure 1.

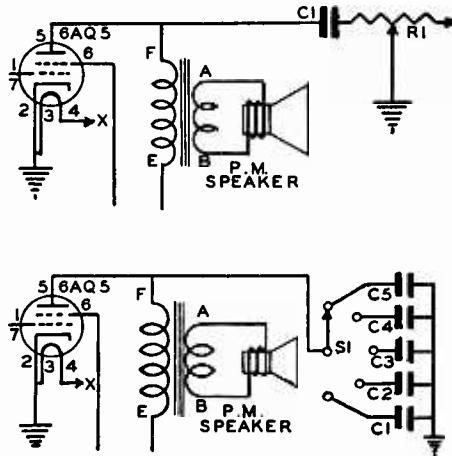


Figure 2.

Technical Ramblings

By B. VAN SUTPHIN
NRI Consultant

FILAMENT CIRCUITS IN THREE-WAY PORTABLE RECEIVERS

AFTER a lengthy session of servicing a filament circuit defect in a 3-way portable, many service men (including myself) have wondered why anyone started building this type of receiver. From my own experience, and from discussing this problem with other service men, I believe that the real source of trouble is usually an incomplete understanding of how the filament voltage is obtained in these receivers. Let's take a good look at the filament circuits commonly used in 3-way portables.

Battery Tube Filament Circuit Theory

Battery tubes do not (as a rule) have separate cathodes. That is, the tube filament is used as the cathode. This means that the tube filament is in the plate-cathode circuit of the tube. Consequently, the voltage applied to the tube filament must be dc. If an ac voltage were applied to the filament, this would cause ac variations of the plate current and produce hum in the output circuit.

It is very important that the proper voltage be applied to these filaments. The filament of a battery-type tube is a slender strand of wire supported by a spring that prevents the filament from touching any other element in the tube. Even slightly higher than normal voltage will cause the filament to fail. You have probably seen receivers with a complete set of burned out battery-type tubes.

How Filament Voltages Are Obtained in 3-Way Portable Receivers

Some 3-way portable receivers use a separate output tube for power line operation of the set. This system is seldom used in modern sets, however, and we will discuss the most popular system first. The earlier system will be discussed later.

Fig. 1 shows the type of filament circuit commonly used in modern 3-way portable receivers. Notice that the individual tube filaments are

connected in series, and then connected to the output of the dc power supply through resistor R3. Resistor R3 is the filament dropping resistor for the receiver.

The filament string shown in Fig. 1 requires 7.5 volts at 50 milliamperes. Therefore, the current flow through resistor R3 is 50 milliamperes. If 120 volts dc exists at the junction of resistors R1, R2 and R3, and 7.5 volts must exist at the junction of R3, C1c and the filament lead of the 3Q4, 112.5 volts of drop must

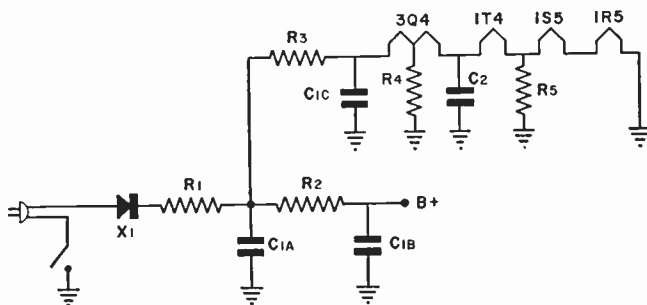


Figure 1.

exist across resistor R3. As we know the voltage drop across the resistor, and the current flow through it, we can readily compute the value of R3. In this particular case, it will be 2250 ohms.

If the filament circuit is continuous, and 50 milliamperes are flowing through R3, 7.5 volts will exist at the point mentioned previously. If one of the tube filaments is open, however, the current flow through R3 will drop to a very low value and the full voltage output of the selenium rectifier supply will exist at the junction of R3, C1c, and the 3Q4 filament. This is to be expected. The higher than normal voltage applied to condenser C1c will charge it to a higher than normal voltage and it may damage the condenser.

When you service one of these receivers that has been turned on for some time with a defective tube in place, you should always check the

electrolytic filament bypass condenser for a possible short. If the condenser is not shorted, you should discharge it before installing a new tube. Otherwise, installing a new tube in the receiver will damage the new tube, or some other tube in the filament string, because the higher than normal voltage across condenser C_{1c} will be applied to the filament string.

If the receiver has a case history of constant filament failure, check the filament dropping resistor. If it has lower than specified value, replace it. Be sure to use a resistor with the correct wattage rating.

Of course, it is not necessary to carry out this elaborate servicing procedure every time you install a new tube in a 3-way portable receiver. You should, however, try to short the electrolytic filament bypass condenser or leave the receiver turned off an hour or so before you install a new tube.

The resistors connected to the filament circuit are for shunt purposes. The 1S5 filament and the 1R5 filament would, if shunt resistors were not included, carry all of the plate currents for the 3Q4 audio output tube and the 1T4 i-f amplifier tube. To keep the current flow through these two filaments at a reasonable value, resistors are connected from certain points in the filament network to ground. These resistors are in parallel with portions of the filament circuit and they carry a part of the plate current for various tubes. For example, resistor R₄ carries a portion of the plate current for the 3Q4 audio output tube while resistor R₅ carries a portion of the plate current for both the 1T4 and the 3Q4. No shunt resistor is necessary between the 1R5 tube and the 1S5 tube because one side of the 1R5 filament is connected to B—, and the 1S5 tube in series with the 1R5 passes very little current. The condensers complete the ac plate circuits for the various tubes. Lower than normal filament voltage in a circuit like that shown in Fig. 1 generally indicates a defective rectifier or defective filter condensers. A defective current limiting resistor (R₁) can also cause this complaint.

One of the chief complaints about the older 3-way portable receivers was insufficient audio output when the set was operated from the power line and was expected to give room volume. To solve this problem, a number of manufacturers started using tubes with ac operated filaments in the audio amplifier circuit for power line operation. The "BATTERY-POWER LINE" switch changed the circuit so that ac filament voltage was applied to the "power line audio output tube" and so that the necessary changes in the other tubes' filament circuit were completed. The filament circuit for the battery type tubes when the receiver is set for POWER LINE operation is shown in Fig. 2.

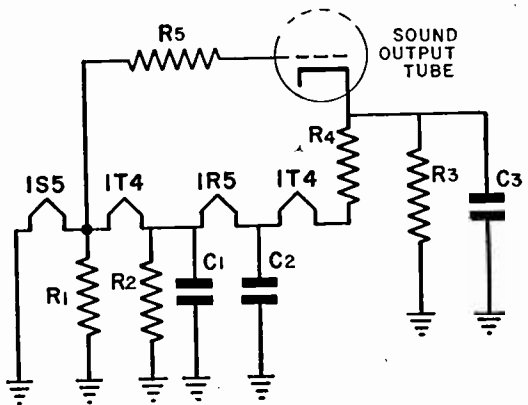


Figure 2.

Notice that the series filament string with current limiting resistor R₄ is in series with the output tube cathode circuit and in parallel with resistor R₃. The cathode current for the output tube flows through this parallel combination. By properly choosing the value of R₃, the correct current flow can be maintained through the battery tube filaments.

Particularly notice that the grid circuit of the output tube is returned to the junction of two tube filaments. Therefore, the bias applied to the audio output tube is the voltage drop across only three of the tube filaments in series. Therefore, the bias is approximately 4.5 volts. If greater bias were needed, resistor R₅ could be transferred to the B— connection, or if less bias were needed, the grid return could be transferred to some other point in the filament string. (The arrangement shown in Fig. 2 provides degeneration and better tone quality in addition to correct bias voltage.)

Though this circuit has the distinct advantage of greater audio output, it also has some disadvantages. One of the most important ones is that a weak audio output tube—even one that is slightly weak—may prevent the set from operating from the power line. Let's see why. The total cathode current for the audio output tube depends upon the cathode emission. If the cathode emission decreases, the cathode current will decrease; when this happens, the current through the tube filaments will also decrease. Even a slight decrease in the filament current of an oscillator-mixer tube (1R5 in this set) will prevent the tube from oscillating. Therefore, a weak audio amplifier tube in this type of circuit can cause oscillator failure!

Increased current flow through the tube will also affect the circuit operation. If the coupling

(Page Twenty-five, please)

SERVICING PRINTED CHASSIS

Recommended Soldering Technique for
"Etched-Metal" Radios

By JACK BAYHA

Chief Engineer, Phen-O-Tron, Inc.,
New Rochelle, N. Y.

Reprinted through courtesy of Technician Magazine and Caldwell-Clements, Inc.

THE rash of etched-metal radio sets appearing on the market, and the millions to come soon, have placed many servicemen in somewhat of a dilemma. Actually a blessing in disguise, the printed chassis seems like a Frankenstein monster to many technicians. Some of them, in fact, are even refusing to service sets of this type.

The etched-metal, or as some call it, printed-circuit radio, is actually easier to service than a conventional set, once you know the tricks of the trade, and can put them into practice. There is no great secret to successful etched-metal service work. Follow the simple methods outlined here, and you will find servicing a pleasure.

Several types of etched-metal, embossed-circuit and printed-circuit sets exist. In the true-printed-circuit receiver, the wiring is electroplated on a layer of conductive (metallized) ink, printed on a sheet of phenolic plastic material, and deposited by a printing or silk-screening process. The bond between the chassis and wiring is very delicate, and special care is therefore necessary during servicing.

The embossed circuit is made by stamping metal or metallic powder into the surface of the plastic; the bond to the base material is quite strong.

The most popular form, the etched-metal panel, is made by etching away from a solid sheet of copper, which is bonded to the plastic, those areas where wiring is not wanted, leaving solid copper wiring. Bond strength is excellent.

The following tools and accessories are needed to service any of the three receiver types just mentioned:

1. A good pair of long-nose pliers.
2. 60-40 low-temperature solder with rosin core.
3. A glue brush (app. cost, five cents) purchasable at the local hardware store.
4. A 25-watt soldering iron. A higher-wattage will not do.
5. Tinned wire, such as resistor or capacitor pigtail clippings.
6. Carbon tetrachloride.

Page Twenty-four

Solder Removal

As you probably know, etched-metal sets are assembled by either automatic or dip soldering in a matter of seconds; getting them apart, however, is not as speedily achieved, as you may well have found out. Maybe you are one of the servicemen who have turned the air blue in your

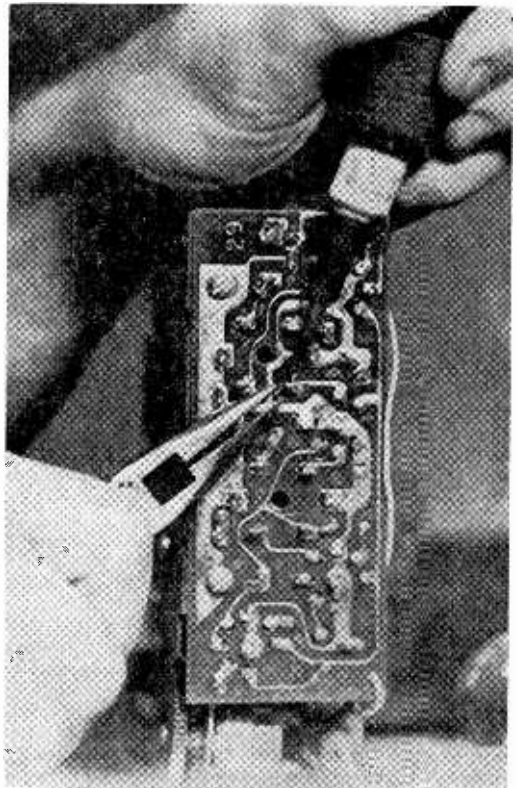


Photo of unsoldering job in progress on a late-model Admiral printed-chassis radio.

immediate area with words not meant for tender ears, as you smashed tubes and speaker, and broke chassis boards, trying to extract a particularly stubborn i-f can from the death grip in which the chassis held it. The answer to the problem lies in getting the solder away from the joint between the etched conductor and the component.

Removing the solder from a joint is readily accomplished with the glue brush and the low-wattage iron. Heat the joint cautiously; if the set manufacturer has bent the prongs of some unit in forty directions, as sometimes happens, straighten them out with your long-nose pliers. By heating the joint again and rapidly brushing it, you can brush off the still molten solder. Since the solder present in the set has a very low melting point, and a low-wattage soldering iron is being used, the conductor will not generally be lifted from the base plate during this operation.

Component Installation

After eliminating all the solder by brushing, remove the component carefully, using your iron to smooth out the solder left on the pattern. Be sure to leave the component holes open for insertion of a replacement. Clean the chassis area around the repair zone with carbon tetrachloride, before installing the replacement part.

Install the new component with care, so as to not lift the pattern; then solder it in place with the special low-temperature solder. Leave coating of rosin in place, to act as a protective layer.

Successful removal and replacement of a component without damage to the conductors is not always possible, and occasionally a conductor section will break off. Repairs are readily made in such a case by soldering a short piece of tinned wire to the damaged conductor. Resistor or condenser pigtailed are ideal for this purpose.

At all times use only a low-wattage soldering iron, always brush all joints free from solder, use only 60-40 solder, and be just a little careful—and etched-metal radio servicing will be a cinch. You will soon find the excellent accessibility, and absence of conventional wires, more than makes up for the extra care needed to service these sets.

By all means learn to service these units—you'll be getting plenty of this type of work soon, as almost every major manufacturer is currently putting such sets on the market, or will do so in the near future.

————— n r i —————

BUILD YOUR BUSINESS as you build your life. Have your big moments; but don't try to be spectacular all the time.—*James Adams*

condenser between the first audio amplifier and the power line operated audio output tube shorts or becomes leaky, the audio output tube will pass excessive current. A portion of this current flows through the battery tube filaments. Consequently, a leaky coupling condenser in this type of circuit can cause one or more of the battery tube filaments to burn out. Gas in the output tube will give the same effect.

Resistor R_1 and resistor R_2 are shunt resistors that prevent excessive current flow through some of the tube filaments. Condenser C_3 is the cathode bypass for the audio output stage; condensers C_1 and C_2 are filament circuit bypasses that complete the ac plate circuit for various tubes.

In the older receivers using this circuit, the sound output tube was usually a combination rectifier-amplifier with a 117-volt filament. The 117L7 and the 117N7 were used most frequently. In later receivers, particularly those manufactured immediately after World War II, two separate tubes were used. The receiver from which Fig. 2 was taken used a 35W4 rectifier and a 50B5 output tube.

————— n r i —————

Du Mont Discloses 19-inch Color Tube

Passaic, N. J.—Allen B. Du Mont Laboratories, Inc., has disclosed a 19-inch color picture tube which delivers a picture almost equivalent in size to a 19-inch black-and-white tube.

Du Mont officials point out that the simplicity of the tube's design and its inherent picture clarity may bring mass production of large screen color television at a reasonable price within two to three years. From the standpoint of television viewers, this apparently means that the small screen color receivers presently being offered have been rendered obsolete.

The Du Mont "Chroma-Sync Teletron" is a shadow mask type of color tube using a new Du Mont Mono-convergence three-beam electron gun. Color phosphors are applied directly to the curved face plate of the tube by a photographic process, and the electron shadow mask has a curvature similar to the face of the tube and is positioned directly behind it.

The new Mono-convergence three-beam electron gun, developed by Du Mont, is of major importance in the performance of the tube. The beam-to-beam spacing in the 19-inch "Chroma-Sync" is only 70% of that used in other color tubes. Electron beam deflection can therefore be increased to 60° and the net length of the tube reduced by almost two inches. The decreased beam-to-beam spacing involves no degradation of focus quality.

SCIENCE QUESTION BOX

By Scientists of the General Electric Company

Q: Why is the planet Mercury very cold if it is nearer the Sun than the Earth?

A: The planet Mercury turns in such a way that it always keeps the same half toward the Sun, just as the Moon does toward the Earth. The hemisphere that faces the Sun is not cold, but is very hot, about 700 degrees Fahrenheit. The opposite region, where the Sun's rays never reach, is very cold, perhaps 450 degrees below zero. Mercury has no atmosphere. If it did, currents of warm air might be carried from the light to the dark side, making the difference in temperature less extreme. Mercury is 36,000,000 miles from the Sun, compared with 93,000,000 for the Earth.

Q: How is the speed of a ship measured?

A: Originally it was measured with the log, a specially-shaped piece of wood, at the end of a long line, which was thrown overboard from the stern. At regular intervals on the line knots were tied and the number of knots payed out in a fixed time, usually 28 seconds were counted. This gave the speed in knots, equivalent to nautical miles per hour. (One nautical mile measures 6080 feet.) More modern logs measure the speed of the water going past the ship by means of a small propeller. Depending on the design of the ship, it requires some correction, so it is usually calibrated in trial runs, where the ship is actually run past fixed points on shore a known distance apart.

Q: What happens to a mixture of ice and water at exactly 32 degrees?

A: At 32 degrees F. water is in equilibrium with ice. That is, 32 degrees is both the temperature of freezing water and of melting ice. If you put a piece of ice at 32 degrees in water at the same temperature, the ice will not melt nor will the water freeze. If heat is added to the mixture (and it is well stirred to assure that it is uniformly distributed) the ice will melt, but the temperature will remain at 32 until the ice is completely gone. That is why a cold drink stays cold even on a hot day, as long as there is ice in it. On the other hand, if you cool it, or take heat away, the piece of ice will grow until all the water is frozen. Once again the temperature will remain at 32, until all the water is frozen, then the temperature of the ice will begin to drop.

Q: Is there gold in the ocean?

A: Yes, there is an enormous amount of gold in all the oceans of the world but it is so thinly

distributed that it is not economical to get at it. In a cubic mile of sea-water, which weighs about 4,700,000,000 tons, there are some 55 pounds of gold.

Q: Do the stars move?

A: Yes, but they are so far away that it takes many years before these motions are easily apparent. The stars have what are called "proper motions," which are across the sky, and cause a radical change in our constellation figures over the ages. For example, fifty thousand years from now our familiar Great Dipper will have a very different shape. Both these movements can be measured by astronomers and then the real motion of a star in space can be found.

Q: Why is it that a person often wakes up just before the alarm clock goes off?

A: Experiments have been made with students who thought they could wake up "any time they pleased." They were put in a dark room with cotton in their ears, and it was found that they could not tell the time even within two or three hours. Psychologists believe that just as we may look at our watches during the day without realizing it, at night we may also check subconsciously while we are asleep by such things as the time the milkman comes, a church clock rings or a factory whistle blows. Also, many alarm clocks have a very faint click as the gears get the mechanism ready to ring. It is well known that very often we "hear" subconsciously what we cannot hear consciously, so such a click, faint as it is, might serve to awaken a person in advance of the actual ringing of the alarm. You might try putting the clock in another room, and then seeing if you wake up before it goes off.

Q: Does an angle worm feel any pain when impaled upon a fish-hook?

A: No one knows. The angle worm has a nervous system and it does react to stimulation. However, pain is a subjective matter. An individual person has certain reactions, which are called feelings or sensations, but he can never know whether other individuals have the same feelings. It is presumed that they do, since their nervous systems are alike and they behave in the same way in response to similar stimuli. This same assumption can hardly be extended to angle worms, which have a different nervous system, and no brain, as we know it.

Q: Should television be viewed in a lighted or a darkened room?

A: Eye strain results when the retina attempts to adjust between a bright picture and a dark room surrounding it. For that reason, the proper operation of a television receiver includes the use of a soft light, so that the set is not surrounded by darkness.



N.R.I. ALUMNI NEWS

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

Chapter Chatter



Charter members of Springfield, Mass., chapter.

Springfield, Massachusetts now has a local chapter of the NRI Alumni Association. Following the inspirational leadership of Howard B. Smith, several preliminary meetings were held by a small group of Alumni members. The necessary twenty-five signatures to an application for a charter were easily obtained and on April 14 a charter was delivered to our Springfield Chapter. On that occasion, the chapter was visited by L. L. Menne and J. B. Straughn of Washington.

The Chairman for this chapter is Mr. Howard B. Smith, 53 Bangor Street. The Vice-Chairman is Raymond A. Nystrom, 36 Baltimore Avenue, the Secretary is A. L. Brosseau, 56 Gardner Street, and the Treasurer is L. Lyman Brown, 69 Pasadena Street, all of Springfield.

Mr. Howard B. Smith is a very capable administrator having had wide experience in lodge activities. Mr. Nystrom is an NRI graduate of 1922 and is a Communications Engineer. Mr. Brosseau is a successful businessman and will be a very capable Secretary. Mr. L. Lyman Brown

is an NRI graduate of 1934. He is a member of the Institute of Radio Engineers, has been in business for himself since 1923 doing service, repair, maintenance, construction, and more recently has been extremely busy as Consulting Engineer in the construction of TV stations.

The members of Springfield, Massachusetts Chapter are fortunate to have such eminently qualified men as their leaders.

Students and graduates in the Springfield area are invited to communicate with the secretary who will advise them regarding future meetings.

Flint, Michigan is another city in which a local chapter of the NRI Alumni Association was established after some organization work by Mr. George Rashead, 338 East Marengo Avenue, who has been elected Chairman, and Mr. David J. Nagel, 3135 East Mt. Morris Rd., Mt. Morris, Michigan, who has been elected Secretary.

Vice-President Earl Oliver delivered the charter to this group. Students and graduates in the



The charter being delivered in Springfield, Mass. The group are, left; A. L. Brosseau, Sec'y; L. L. Menne; J. B. Straughn; Ray A. Nystrom, Vice Chairman; Howard B. Smith, Chairman; and L. Lyman Brown, Treasurer.

Flint, Michigan area who are interested in joining this chapter are invited to get in touch with Secretary Nagel.

Philadelphia-Camden Chapter on May 24 had a real blow-out. They celebrated their twentieth anniversary of continuous operation as a local chapter of the NEI Alumni Association. They have had their ups and downs but owing to the staunch support of some of the original organizers, the chapter today is stronger than ever.

Harvey Morris has been delivering a series of talks on How to Use Service Equipment. The chapter has a complete set of Radio and Television test instruments including a sweep generator and marker, an oscilloscope, a volt-ohm-mil-ammeter, a signal generator and miscel-



Lcu Menne giving recognition to Vice President Harvey Morris for valuable services to Philadelphia chapter.

Page Twenty-eight

laneous other equipment not to overlook the RCA dynamic demonstrator.

We are shown how to use the equipment, how to hook up the meters, the proper grounding, the need for it, the proper shielded leads to use, the importance of this, and, all in all, the proper way to get the best use out of the instruments to speed up Radio and Television servicing. These talks are very interesting to our members who particularly appreciate the opportunity to manipulate the equipment and learn by actual experience.

New members are John Towber of Philadelphia and Carmen Marchese, Burlington, N. J.

Mr. Roy Sunday of the American Phenolic Corp., associated with the Bittan-Boenecke Company in Camden, gave a very interesting film demonstration and talk on antennas. He conducted a question and answer session which brought forth a lot of questions and very illuminating answers. Our sincere thanks are extended to Mr. Sunday for the time and attention he gave to our request that he address our chapter.

Secretary Jules Cohen is very pleased with the number of telephone inquiries he is receiving from students and graduates regarding meetings. Mr. Cohen is arranging for another tour through a TV station in Philadelphia. This tour is scheduled for the near future. Mr. Cohen will be glad to have telephone inquiries from anyone. Phone FI 2-8094 or write to 7124 Souder Street, Philadelphia 49.

Meetings are held on the second and fourth Monday of the month at the Knights of Columbus Hall, Tulip and Tyson Sts., Philadelphia.

Milwaukee Chapter held one meeting under the leadership of Treasurer Ernie Bettencourt who described the manufacture of printed circuits. He discussed the various stages of baking the circuits on ceramics. Mr. Bettencourt is associated with the Globe-Union Plant, which puts out the Centralab brand of printed Electronic Circuits.

Two army films were shown, each of one half hour duration. One covered the subject of tubes and the other showed the advance of radio from the crystal set to Super-Het. Our thanks to Ernie Bettencourt and Harvey Otto for procuring these films and operating the equipment to show them to our members.

The chapter is rapidly accumulating valuable material for our library.

A UHF antenna was offered as a door prize and was won by Harvey Otto. At our next meeting, the door prize will be a soldering pencil, donated to our chapter by CBS.

Chairman S. J. Petrich, who is a real leader in his Radio and Television business in Milwaukee, conducted an open forum. He was very adept at answering questions put to him by the members based on his personal experiences with servicing Radio and Television receivers.

Our Finance and Entertainment Committees meet regularly so as to have things planned well in advance before our scheduled meetings.

Meetings are held on the third Monday of each month at 2249 North Humboldt Avenue at 8:00 P.M. Information may be had by contacting Secretary Robert Krauss, 135 E. Keefe Avenue.

Baltimore Chapter, after some twelve years of meeting at 745 West Baltimore Street has found it advisable to seek new quarters. Mr. H. J. Rathbun took the initiative and has made arrangements for the chapter to meet in the lodge hall at 100 N. Paca Street, near Fayette, on the third floor. Meetings are scheduled for the second Tuesday of each month at 8:00 P.M.

Information regarding meetings may be obtained by communicating with Secretary Joseph M. Nardi, 4157 Eierman Avenue, Baltimore 6.

Pittsburgh Chapter has been reporting an attendance of 45 to 50 at each meeting. Speakers at recent meetings were B. A. Bregenzer, prominent Radio and TV authority, who spoke on color TV, J. S. Kyler, who demonstrated the use of the Scope, T. D. Schnader and H. A. Tate, who spoke on the Bar Generator.

A demonstration of Electronic components and a lecture on TV troubleshooting in sweep circuits were the principal subjects at one meeting.

The chapter meets on the first Thursday of each month, at 8:00 P.M. at 134 Market Place. The Chairman is Frank P. Skolnik, 616 Springfield Avenue, Pittsburgh, and the Secretary is Ken J. Shipley, 1009 St. Martin St., Pittsburgh.

Detroit Chapter is having a big year under the competent leadership of Chairman John B. Kehoe and Secretary Robert M. Kinney. The members are enthusiastic in their praise of the fine work being done by these and other officers of the chapter.

Recent meetings were devoted to a discussion of Radio and TV interference by a representative of the Detroit-Edison Company, a demonstration of microwave by the Michigan Bell Telephone Company, a discussion of the Detroit Police radio setup by a member of the Detroit Police Force and there was also shown a series of educational films. Our sincere thanks are expressed to Mr. Addison Wareham and Mr. Ed. Mack of the Michigan Bell Telephone Company, to Sergeant Kenneth A. Gilbert, Chief Operator

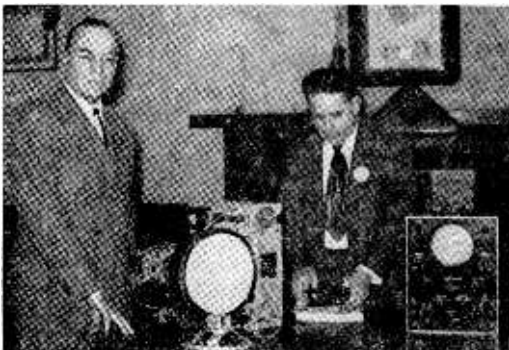


Chairman John Kehoe and Vice Chairman Tom Peterson preparing to open a meeting of Detroit chapter.

of the Detroit Police Radio System for very interesting and educational talks and demonstrations. We are arranging to have the representatives of the Michigan Bell Telephone Company return in the very near future for another demonstration and talk on Transistors.

Earl Oliver, our National Vice-President, gave an interesting talk using the RCA Dynamic Demonstrator owned by the Chapter. It might be mentioned that the chapter now has a rather complete line of Radio and Television testing instruments and plans are being made to acquire several new instruments. These will be very helpful in future demonstrations.

Meetings are held on the second and fourth Friday of each month at 8:00 P.M. at St. Andrews Society Hall, 431 East Congress in Detroit. Inquiries regarding the Detroit Chapter activities may be addressed to Mr. Robert Kinney, Secretary, 16565 Cruse, Detroit 35, who will be glad to hear from students and graduates in the



Harry R. Stephens and F. Earl Oliver demonstrating the NRI Professional TV Oscilloscope before Detroit chapter.

Detroit area interested in Detroit Chapter activities.

New Orleans Chapter members have decided to meet twice a month on the first and third Tuesday. They find the meetings so interesting that they feel once a month is not sufficient for their members to get together. For the present, meetings are being held at 2229 Napoleon Avenue in the very suitable quarters arranged for by Chairman Louis E. Grossman.

Some of the subjects discussed and on schedule for future meetings are short-cuts to servicing, TV troubleshooting, servicing an auto receiver and, of course, the usual interesting talks on servicing radio receivers.

The members have missed the able leadership of Chairman Grossman who has been a bit slow in recovering from an emergency operation. However, at last reports, Mr. Grossman was much improved and just about ready to resume his position as leader of our very fine chapter in the Crescent City.

Peter Fonte made a very interesting talk on Practical Television Servicing. He injected defects in the receiver and showed the members how to remedy them in the shortest time and most efficient manner.

The Secretary is Anthony H. Buckley, 2817 Burgundy Street, New Orleans.

New York Chapter, very proud of their position as the largest local chapter in our organization, continues to demonstrate that they properly deserve their distinction. Attendance for the past several meetings has averaged sixty-five members and guests.

Each year a number of members are presented with a gift for good attendance. The presentation is customarily made by Assistant Secretary Frank Zimmer who this year presented prizes to William Trapp, Paul Engles, Dan Scinto and Meyer Ferdinand for perfect attendance during the past year.

Members who missed only one meeting and who also were given gifts for second place are Edward Mehl, Philip Spampinato, Joseph Pagan, Charles Conradson, Frank Manz, Sylvester Conradson, Peter Laudoni, and J. A. Beavers. The prizes were donated by the chapter and consisted of practical Radio and Television tools. Much credit is given to Frank Zimmer for his interest in keeping very accurate records regarding attendance and for the splendid manner in which he conducted the ceremonies. The chapter members got a big kick out of this annual affair.

As a bit of diversion, Frank Manz entertained

Page Thirty

the members with some magic tricks. Some of us are still trying to figure out where that long rope came from.

L. L. Menne was a visitor at this meeting and paid tribute to a considerable number of individuals for the enthusiastic support they have given the chapter. The fraternal spirit of New York Chapter is very deep indeed.

Alex Remer made a short talk on troubleshooting technique. Vice-Chairman and National Vice-President Thomas Hull, Jr., gave a very enlightening talk on the Oscilloscope, which by the way is the property of our chapter. Philip Spampinato gave his usual good talk, this time on Servicing by Schematics. Alex Remer again spoke on Simplified Antenna Testing. At still another meeting Thomas Hull spoke on Keyed A.G.C.

The inspirational leader of New York Chapter is Chairman Bert Wappler, 27-10 Astoria Blvd., Long Island City, who is ably assisted by Secretary Louis J. Kunert, 539 Seaford Ave., Massapequa, L. I. Meetings are held on the first and third Thursday of each month at St. Mark's Community Center, 12 St. Marks Place, between 2nd and 3rd Avenues, New York City.

Chicago Chapter continues to meet at 8 P.M. on the second Wednesday of each month in the American Furniture Mart, 666 Lake Shore Drive (West entrance).

Mr. Chas. C. Mead, Room 228, 666 Lake Shore Drive, is Chairman. Mr. Frank Ziecina, 2928 W. 40th St., is Secretary.

— n r i —

Du Mont TV Unit to Provide Color from 16 MM Film

Passaic, N. J.—A major advance in color television broadcasting was demonstrated to the press here by the Television Transmitter Department of Allen B. Du Mont Labs., Inc. The development will open up a vast range of color programming as soon as color receivers are available at popular prices, it was pointed out.

The Du Mont development, called a "Color Multi-Scanner," allows 16 mm color film to be produced on television with quality that equals or excels that of "live" color telecasting. The equipment will make it possible for telecasters to have a wider range of color programming since many thousands of subjects already in film libraries can be available.

The "Color Multi-Scanner" can also produce "still" color pictures of quality identical with the color films, from transparent color slides, thereby making it an ideal unit for use in telecasting commercials.



Here and There Among Alumni Members

Andrew Jobbagy of Flint, Michigan, was a recent visitor at NRI. He was accompanied by his wife and son. Mr. Jobbagy is a member of our new Flint, Michigan chapter and is a real goodwill ambassador for that group.

Harry M. Andrew is now Chief Trouble Shooter and TV Service Manager for the Sears Roebuck Store in Stroudsburg, Pennsylvania.

F. C. Von Wicklen, of Mount Vernon, Ohio, has received his 1st class radiotelephone license and is now on the technical staff of Station WMVO.

James J. Walker, of West Chelmsford, Mass., reports that he now has a good position with a large New England electronics company.

Louis E. Grossman, chairman of our New Orleans Chapter is a director in the Raceland Bank and Trust Company, Raceland, Louisiana.

Charles P. Cooney, of Johnsonburg, Pennsylvania, recently supervised part of the installation of a Jerrold Master Antenna TV Distribution System. He reports over 600 subscribers and excellent reception on three channels. Says the transmission line theory in NRI Communications Course was a big help.

Herman Woolsey of Nashville, Ill., reports that he has been able to buy a home from his spare time Radio earnings.

Oscar E. Smith is now employed as an audio and video engineer at KRBC-TV in Abilene, Texas.

Congratulations to Pvt. Kjell S. Kandola, of Fort Sill, Oklahoma. He recently graduated from the Signal Corps field radio repair course with an excellent rating, and is now at Fort Sill as a repairman at the communications school. In addition, he became a U. S. citizen about two months ago and now has his general amateur ticket, call W5DQO.

Harmon P. Keddy of New Ross, Nova Scotia, Canada, has a good Radio Servicing business which keeps him happily busy but he is arranging things so he can give regularly scheduled time to preparing himself for the TV spurt when it comes to his area.

J. W. Yount, of Chaffee, Missouri, is well pleased with his position as operator at Radio Station KFVS, Cape Girardeau, Missouri. Yount has two years of servicing experience, plus one year in broadcasting. Not bad for a 19-year-old.

Miss Mariette Montreuil, of Lachine, P. Q., Canada, started working for the Lachine Radio and Supply Store before graduating from NRI. Graduate Montreuil is now in charge of Radio repairs for her concern, and is busy getting ready for television.

Conrad J. Kolodejcek, of San Antonio, Texas, has accepted a position as TV and Radio Technician with the Southern Equipment Company of San Antonio, the largest exclusive wholesale Philco Distributor in the Southwest.

Bill Delzell, of Grand Island, Nebraska, is now with Radio Station KMMJ.

Kenneth R. Shipley, of Anderson, Indiana, is employed in the machine repair section, Delco-Remy Division of General Motors Corp. Says modern machinery is more and more being controlled by electronics, and NRI training has been very helpful in advancing in this field.

Jay Merlyn Suter says he was successful in obtaining his Radiophone 2nd license after studying about 25 lessons. When he had completed 42 lessons he applied for and received his Radiophone, 1st class license. He was immediately employed by Radio Station WGTM, Wilson, North Carolina.

Roddy Rogers, of Vancouver, Washington, now has his own modern Radio and Television service shop. Has been his own boss since July, 1952.

Alvin V. Ornellas, of Wailuku, Hawaii, took an examination soon after graduating and received his Radiophone 2nd class license. He is now Radio communications Technician for the Hawaiian Telephone Co.

Stanley F. Waszkiewicz, an NRI Graduate of some fifteen years ago, has had his own business in Philadelphia for many years. He can speak with authority, since he did a \$45,000 business last year. He says, "The world of tomorrow is the world of Electronics! Industrial Electronics, TV, Public Address (our stand-by) and many other phases of Electronics are a lucrative field."

Graduate Clifford J. Noch of Parma, Ohio, is another automobile plant worker who puts in his spare time to financial advantage by servicing Radios and TV. He has acquired quite a few Radio and Television testing instruments including the NRI oscilloscope.

Robert D. Vosbury is very happy at the General Electric Air Force Plant, in Johnson City, New York. His background in electronics enabled him to obtain this fine position.

NATIONAL RADIO-TV NEWS

16th & U Sts., N.W.

Washington 9, D. C.

Sec. 34.66, P. L. & R.
U. S. POSTAGE
1½c PAID
Washington, D. C.
Permit No. 7052

Forwarding Postage Guaranteed

For:

Mr. Francis H. Fingado
611 17th St.
Denver 2, Colo.

25236-G

4

POSTMASTER—FORM 3547 REQUESTED



Vol. 16 June-July, 1954 No. 3

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.

L. L. MENNE, EDITOR
H. L. EMERSON, ASSOCIATE EDITOR
J. B. STRAUGHN, TECHNICAL EDITOR

NATIONAL RADIO-TV NEWS accepts no paid advertising. Articles referring to products of manufacturers, wholesalers, etc., are included for readers' information only, and we assume no responsibility for these companies or their products.

Index

Article	Page
Editorial	2
Servicing the Standard Coil Tuner	3
How to "Haunt" Stairways	12
The "Best Teacher"	16
Our Cover Photograph	18
Attention, Owners of NRI Professional Tube Testers	19
Connecting Accessories to the 7-E Receiver	21
Technical Ramblings	22
Servicing Printed Chassis	24
Science Question Box	26
NRI Alumni Association News	27
Here and There Among Alumni Association Members	31

Printed in U.S.A.