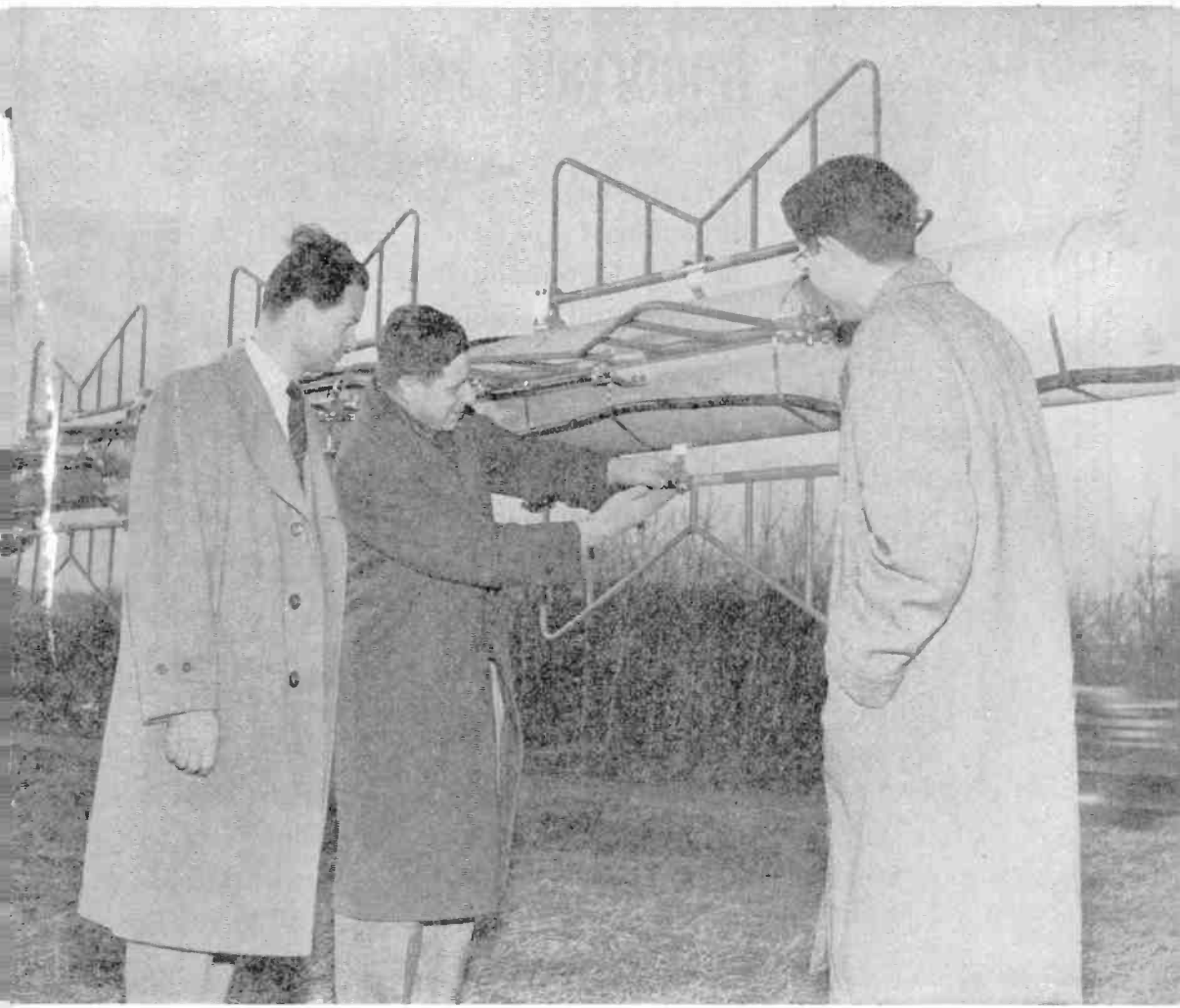
National RADIO-TV NEWS



IN THIS ISSUE

Connecting Accessories to Radio Receivers

Servicing Loudspeakers

Alumni Association News

April-May
1950

VOL. 14
No. 2

We're All Mighty Important Fellows

What is behind the attainment of most worthwhile things? For example, who really deserves the credit for training NRI's outstanding students and successful graduates?

We might mention our staff of textbook writers, constantly busy revising or writing new textbooks. Yes, they're important. They deserve part of the credit. Then there's our consultation staff ready to help you with your special problems, and our lesson graders, our student service section, and a host of others working as a team, each responsible for a part of your training.

And *YOU* are on our team, too. Though NRI training methods have guided thousands of our graduates along the way to real success, we can only furnish the study material, and make tried and proved suggestions for its use. *YOU* are the one who makes this material meaningful. Only when this technical knowledge has been absorbed from our textbooks into *YOUR* mind does it become of value to YOU and to your prospective customers. It takes the efforts of all to make a good team. Each of us is mighty important.

J. E. SMITH, *President.*

Connecting Accessories To Radio Receivers

By WILLIAM F. DUNN

NRI Consultant

William F. Dunn

AT some time or other most servicemen will be called upon to connect an extra speaker to a receiver, or perhaps to add a set of headphones or a phono pick-up. It is comparatively simply to connect these devices to a radio and if a few precautions are observed, these jobs can be performed quickly and profitably.

Adding Headphones

The circuit arrangement shown in Fig. 1 has proved to be satisfactory for the connection of headphones to a radio receiver. Terminal 1 is connected to the receiver chassis. (In the case of AC/DC receivers in which the chassis is not an electrical part of the circuit, terminal 1 should be connected to B—). Terminal 2 is connected to the plate electrode of the output tube. Rather than make these connections directly to the receiver, it would be better to mount a socket on the receiver chassis and then use a plug to connect the headphones to the receiver.

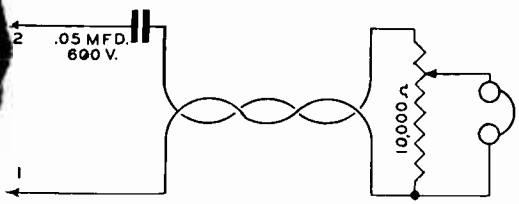


Fig. 1

With this circuit added to the receiver the loudspeaker will still operate. In some cases this may be desirable, but in many instances the owner of the receiver will wish some means provided to shut off the speaker while the headphones are in use. This can be done quite simply. The circuit shown in Fig. 1 is again used to connect the phones to the receiver. The speaker is silenced by using a single-pole, double-throw switch, to connect a resistor into the circuit in place of the speaker voice coil. The resistor should be approximately equal to the voice coil impedance of the speaker. In cases where the voice coil impedance is unknown, a 5 ohm resistor will usually be satisfactory.

The resistor must dissipate fairly large amounts of power. In small sets, a 5-watt resistor will usually be large enough, but in the larger sets, it would be better to use a resistor rated at 10-watts. The circuit used to connect the resistor into the circuit in place of the speaker voice coil is shown in Fig. 2.

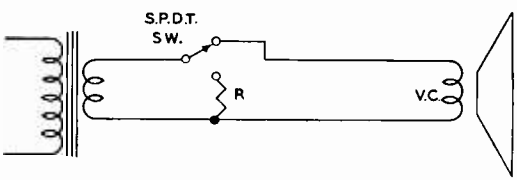


Fig. 2

Adding An Extension Loudspeaker

This is another device that the serviceman is frequently called upon to connect to a receiver.

Frequently an extension speaker will be placed in a bedroom or in the kitchen so that it will be possible to listen to the radio without actually staying close by the receiver.

It is a simple task to connect an extension speaker to a receiver. The circuit shown in Fig. 3 will work satisfactorily. With this circuit arrangement, the voice coil of the extension speaker is connected in parallel with the voice coil of the speaker in the radio. Therefore, although the circuit shows a single ended output stage, it will work just as well with a push-pull output stage.

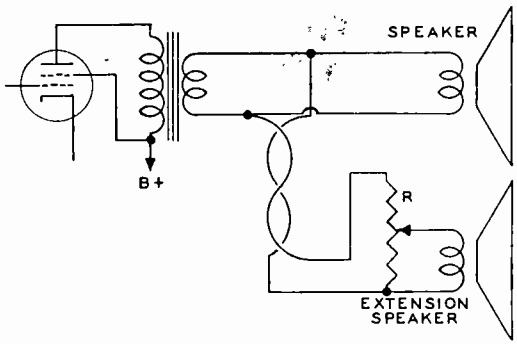


Fig. 3

The potentiometer R shown in Fig. 3 should be a 30-ohm wire wound potentiometer rated at 10-watts or more. This control must handle large amounts of power and if a smaller one is used it will burn out. The control can be mounted on the receiver chassis, but it would probably be more convenient to mount it near the extension speaker so that the volume may be conveniently adjusted.

Frequently it will be advantageous to be able to silence the speaker in the receiver when the extension speaker is being used. To be able to do this a single-pole, single-throw switch should be installed in series with the lead to the receiver speaker voice coil. It is not necessary to connect a resistor in the circuit in this case as it was when using headphones. In this circuit the extension loudspeaker provides the load across the secondary of the output transformer.

The line used to connect the extension speaker voice coil to the receiver may be ordinary twisted lamp cord. It can be soldered permanently to the secondary of the output transformer or a plug and socket may be used so that the speaker can be conveniently disconnected from the receiver. An ordinary line plug and socket may be used, but it probably would be more convenient and safer to obtain a special plug and socket. Not only will it be smaller in size, but it also eliminates the danger of accidentally plugging the speaker into some power outlet.

When connecting an external speaker to a receiver, a permanent magnet dynamic speaker should be employed. This type of speaker is far more satisfactory for this use because it is not necessary to provide D.C. power to excite the field as in the case of an electro-dynamic speaker. Of course, a power supply can be built to excite the speaker field, but this is impractical when P.M. speakers are readily available.

Adding A Microphone

Another device that the serviceman is sometimes called upon to connect to a receiver is a microphone. This frequently presents a number of difficulties. With the exception of the carbon types, the output of a microphone is so low that it is impossible to obtain sufficient volume without the use of a preamplifier. The difficulties when a preamplifier is used can only be worked out experimentally, by increasing the filtering where hum is encountered, and by shielding the input and re-arranging the layout in the case of feedback.

Carbon microphones are not widely used because of their poor quality of reproduction. The chief disadvantage is the relatively high carbon hiss that is present in all microphones of this type. However the output of this type is comparatively high. It is usually possible to feed the signal from this type directly into the audio section of the receiver without any pre-amplification.

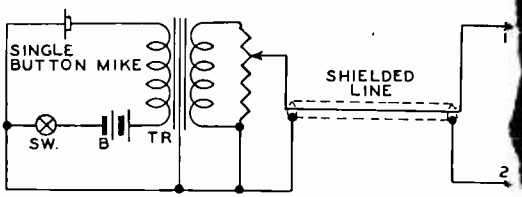


Fig. 4

Fig. 4 shows how a single-button carbon microphone can be used with a radio receiver. An OFF-ON switch SW is connected in series with the primary of the transformer TR, which is a standard single-button microphone transformer. The battery B is an ordinary 4.5 volt battery. The potentiometer, which is connected across the secondary of the microphone transformer, is a .1 megohm audio type volume control. The frame of the microphone, the frame of the transformer, one terminal of the secondary winding of the transformer and the braided metal shield of the line running to the radio receiver are all connected together to terminal 2, which is connected to the chassis of the set. (In AC/DC sets it is

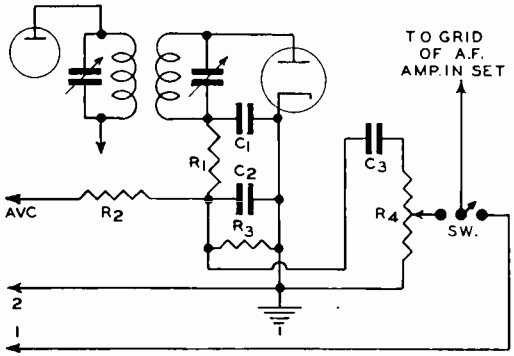


Fig. 5

not practical to connect a microphone to the receiver. Not only is it likely that hum will be encountered, but also there would be a dangerous shock hazard present at all times.)

A shielded line is necessary in connecting the output to the receiver in order to eliminate hum and feed-back, inasmuch as the secondary voltage of the microphone is rather low and the secondary circuit, being of high impedance, is susceptible to noise and hum pick-up. The shielded line may be coaxial cable that is currently being used in many TV antenna installations. It is also possible to obtain a covered type of shielded line that is somewhat more flexible. The line should not be any longer than necessary, and in no case should it be more than 100 feet long.

The actual connections depend upon the type of detector circuit employed in the receiver. Fig. 5 shows a typical diode detector circuit. A switch has been added so that the detected radio signal across the volume control may be connected to the audio amplifier or so that the signal from the microphone may be fed to the first audio tube. The terminal marked 1 in this diagram should be connected to the terminal marked 1 in Fig. 4. The ground connection marked 2 will actually be made by connecting the shield used on the line to the receiver chassis.

While it would be possible to solder the connections directly to the receiver chassis and to the terminal of the switch, it would be far more convenient to mount a jack on the receiver chassis and a plug on the line from the microphone circuit. The microphone can then be conveniently disconnected from the receiver when it is not in use. The connections from the jack to the switch should be made by a shielded line and the shield should be properly grounded to the receiver chassis.

With this circuit set for microphone operation there would be a certain amount of signal from the radio fed into the first audio stage due to the internal switch capacity. It may be possible to tune the set to a quiet spot on the band and use the circuit as shown. However, it would be better to provide a means of "killing" the signal from the receiver. This can be done by inserting another switch in the circuit. The switch may be in either the cathode circuit or the screen circuit of the I.F. Stage. It would be connected so that when the radio-microphone switch is in the radio position the circuit is closed applying screen voltage to the I.F. tube or completing the cathode circuit, depending on which circuit the switch is installed. When the radio-microphones switch is in the microphone position the other switch will be open, effectively "killing" the receiver.

Fig. 6 shows a typical detector circuit in which a duplex-diode, triode tube is employed. A double-pole, double-throw switch is used. One section of the switch is used to connect the microphone output to the receiver, whereas the other section of

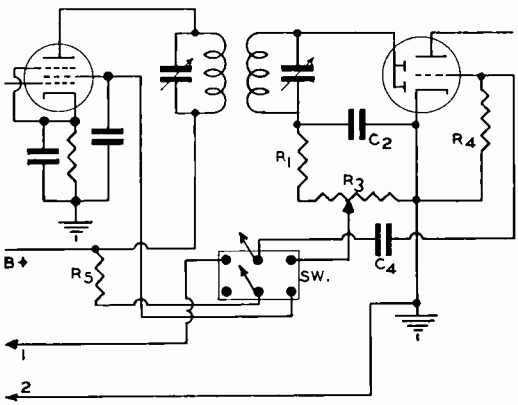


Fig. 6

the switch is used to remove the screen voltage from the I.F. stage when the microphone is in use.

As in the case of the preceding circuit, rather than connect the microphone directly to the switch a suitable plug and jack should be employed.

The connections for a double-button carbon microphone are shown in Fig. 7. Note that the two buttons of the microphone are connected to the two outside terminals of the primary winding of the double-button microphone transformer TR. The switch, the 4.5 volt battery, the .1 megohm potentiometer R and the shielded line are connected as shown. The case of the microphone transformer, the positive terminal of the battery and the shielded side of the line are all connected together.

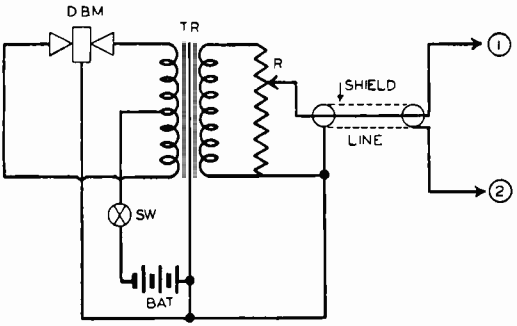


Fig. 7

The double-button microphone should be connected to the receiver using the circuits shown in Fig. 5 and 6 for the single-button carbon microphone. The only difference in the connections of these two types of microphones is in the actual connections to the microphone itself.

With the preceding circuits a separate volume control is used to control the volume from the microphone. In many cases it may be desirable to connect the microphone to the receiver so that the receiver volume control can be used to control both the volume of the receiver and the microphone volume. In this case the potentiometer R may be omitted from the circuits shown in Figs. 4 and 7 and the output taken directly across the secondary of the microphone transformer. The microphone should then be connected to the diode circuit as shown in Fig. 8. Notice that once again a double-pole, double-throw switch is employed, and one section of the switch is used to remove the screen voltage from the I.F. stage.

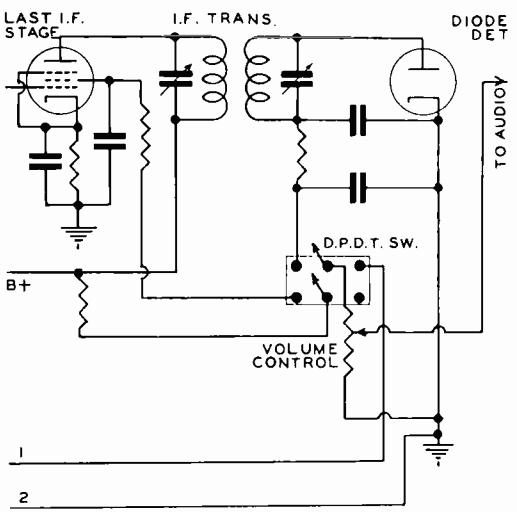


Fig. 8

Fig. 9 shows the connections to a duplex-diode, triode stage. In some circuits of this type the lower end of the volume control is brought back to a resistor located in the negative side of the power supply. Bias for the triode section of the tube is obtained in this manner. Fig. 10 shows this type of circuit and how the microphone may be connected. Notice that the shield is connected directly to the lower side of the volume control rather than to the chassis. When this circuit is used, the shield must be insulated from the chassis or it will short out the bias on the triode.

The shield can be connected to ground even in this type of circuit by using a large by-pass condenser across the resistor R_3. A 50 mfd. electrolytic condenser rated at about 10 volts should be suitable for this purpose. The positive side of the condenser should connect to the chassis and the negative side to the junction of R_3 and R_4. This arrangement makes it possible to connect the shield directly to the chassis as previously and avoids the problem of insulating it from the chassis.

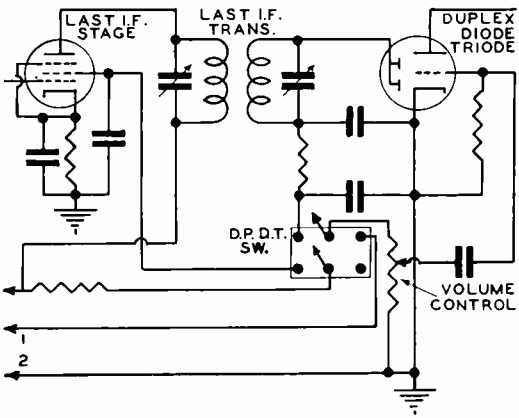


Fig. 9

The various other types of microphones such as crystal, dynamic, etc. may be connected to a receiver but since the output is comparatively low, it is necessary to use some pre-amplification in order to obtain sufficient output. Frequently in constructing a pre-amplifier, numerous difficulties will be encountered in the layout of the amplifier.

These difficulties must be worked out experimentally. The circuit shown in Fig. 11 uses a sharp cut-off pentode as a pre-amplifier. Any of the tubes of this type such as a 57, 77, 6C6, 6J7,

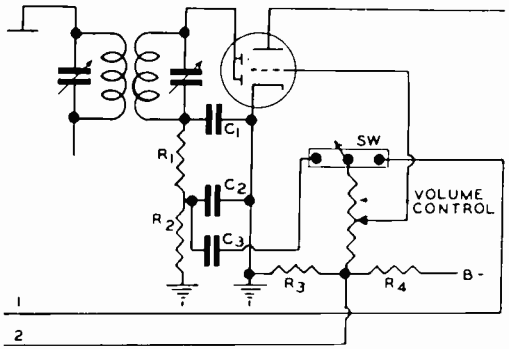


Fig. 10

6SJ7, or their equivalent, may be employed, but because it is possible to obtain more complete shielding with the metal tube types, the 6J7 or 6SJ7 tube is recommended.

The signal from the pre-amplifier appears across the output terminals in Fig. 11. A shielded line must be used to avoid hum pickup and feed-back. The output of the pre-amplifier will be connected using the circuits shown previously for the carbon microphones. The circuits shown in Fig. 8 and 9 are recommended. With this type of circuit it is possible to set the volume control on the pre-amplifier so that the same volume may be obtained when using either the radio or the microphone. Increasing the volume of the radio will increase the microphone volume an equal amount.

Connecting A Phono Pickup

Probably there is no other device that the service-

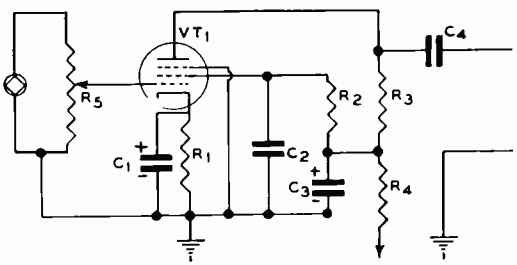


Fig. 11. VT_1—6SJ7, 57, 6C6, or equivalent. R_1—500 ohms R_4—10,000 ohms C_2—.1mfd./600v. R_2—.5 meg. R_5—.5 meg. C_3—20mfd./450v. R_3—.1 meg. C_1—10mfd./25v. C_4—.02mfd./600v.

man will be called upon to connect to a receiver more frequently than a phono pickup. When radios were first made with phonograph attachments the phonograph pickup was usually of the magnetic type. However, at the present time the

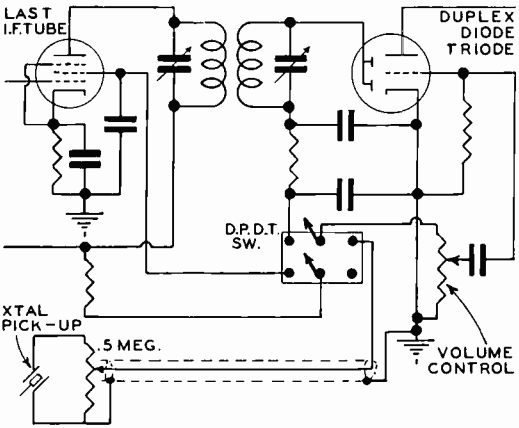


Fig. 12

crystal pickup is almost universally used. This type of pickup is comparatively inexpensive and it has reasonably good quality combined with a fairly high level output.

To connect a crystal pickup to a receiver a shielded line should be connected to the pickup. When soldering the line to the pickup, the line should be soldered in place as quickly as possible. A crystal pickup is very easily damaged by heat and if the soldering iron is left on the terminals of the pickup for any length of time while soldering the leads in place the pickup will probably be damaged.

The circuits shown in Figs. 8, 9 and 10 may be used to connect the crystal pickup to a receiver. As in the case of the microphone, a double-pole double-throw switch is used so that the screen voltage may be removed from the last I.F. stage to prevent signals from the radio getting through while the phono is being operated. A signal-pole, double-throw switch could be used if there is no objection to tuning the receiver to a quiet spot on the band when the phono is to be used. However, removing the screen voltage is preferable.

Fig. 12 shows a crystal pickup with a separate volume control placed across the crystal circuit. Both the volume control across the crystal and the one in the receiver may be used to control the volume in this circuit. The detector circuit shown employs a typical duplex-diode, triode type of tube. A double-pole, double-throw switch is shown. When the switch is in the phono position, the screen voltage is removed from the I.F. tube and the output from the crystal pickup is fed across the volume control.

Recently there has been a number of new types of pickups on the market. Probably the most widely used is the General Electric variable re-

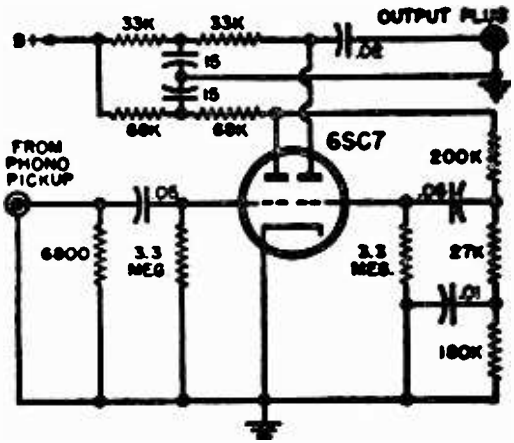


Fig. 13

luctance pickup. With this particular pickup it is necessary to use a pre-amplifier. Fig. 13 shows a typical pre-amplifier that may be used with this pickup. The current requirements of this pre-amplifier are modest and power to operate it can usually be obtained from the receiver. The output from the pre-amplifier may be connected to the receiver using one of the circuits already shown.

The two-speed and three-speed record players now on the market do not present any special problem. The pickup used is normally a crystal pickup and it should be connected to the receiver using the same circuits already shown for crystal pickups.

In many of the older receivers a C-bias type of detector or a plate detector was employed. In these older sets the volume control was either in the antenna circuit or sometimes it would be used to vary the bias voltage or the screen voltage applied to the RF tubes. In order to connect a phonograph to a receiver of this type it would be necessary in most cases to modify the detector circuit. This is not practical, because of difficulties that may be encountered. In modifying the detector circuit hum or oscillation may be introduced. The only practical way of connecting a phono pickup to these older sets is by means of a phono oscillator.

A typical phono oscillator circuit is shown in Fig. 14. In using this type of instrument to play records through a receiver the radio should be tuned to a quiet spot on the band. The phono oscillator should then be adjusted to this frequency. An easy way to do this is to tune the receiver to a quiet spot on the low frequency end of the dial and then put a record on the phonograph, and with both the receiver and the phono pickup operating, adjust the phono oscillator frequency until the record can be heard in the receiver.

The phono oscillator shown in Fig. 14 is AC-DC operated. If it is built up on a metal chassis and the chassis is used as B— it must be kept away from grounded objects such as radiators, etc. Also, care must be taken not to touch the chassis while the body is grounded either by touching a radiator, a water pipe or by standing on a concrete floor.

As a safety precaution, it probably would be a good idea to use a piece of bus wire insulated from the metal chassis as B— and return all of the ground connections to this bus.

In the discussion on connecting microphones to the receiver, the inadvisability of connecting a microphone to an A.C.-D.C. receiver was brought out. Since the shield and the microphone case must be connected to B—, touching the microphone would be the same as touching one side of the power line.

In the case of connecting a phono pickup to an A.C.-D.C. receiver the hazard is not so great. It is possible to insulate the shielded lead and the pickup itself so that they do not make contact with the arm of the player. However, this is not necessary. The record player may simply be placed in a spot where the possibility of touching a grounded object and the tone arm at the same time is eliminated. Therefore, though connecting a phono pickup to this type of set is not as ideal as connecting one to an A.C. operated receiver that uses a power transformer, it can be done with comparative safety. The circuits used to connect the phono pickup in this type of receiver are exactly the same as those previously described. However, in sets where the chassis is not an electrical part of the circuit all "chassis" connections must be made to B—. In most receivers the set side of the on-off switch connects directly to B—. This point may be used for making the "chassis" connections shown.

FM Tuners

With all of the FM stations now on the air, many persons owning older receivers that are not capable of picking up these FM stations will purchase FM tuners to connect to these receivers. The output from the FM tuner is an audio signal exactly the same as the output signal from a crystal pickup. As you might expect, the output from the FM tuner can then be fed into the receiver in exactly the same way as you would feed the output from a crystal pickup into the set. Where no instructions are supplied with the tuner, follow the circuits shown in Figs. 8, 9 and 10.

Some FM tuners have a switching arrangement built right into them. The switch operates the

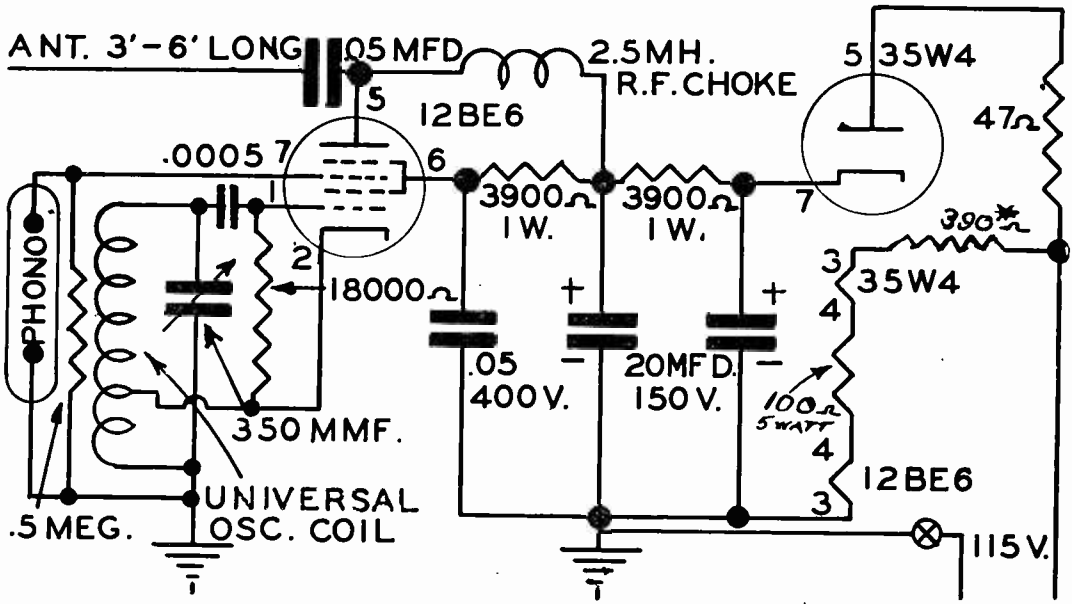


Fig. 14. * 390 ohm standard line cord resistor is connected in series with tube filaments and 100 ohm voltage dropping resistor.

instant the tuner is turned on. With this type of tuner the signal from the receiver is fed through the FM tuner. When the tuner is turned off the AM signal passes through the switch and on back to the volume control in the receiver.

When the FM tuner is turned on, the signal path from the radio receiver is open. The FM signal is picked up and detected by the FM tuner and it is fed through the switching arrangement into the receiver audio system. Usually complete instructions will be given by the manufacturer of this type of tuner and of course these instructions should be followed exactly.

Adding Tone Controls

There are many different types of tone controls found in commercially manufactured receivers. However, in most cases it would be impractical to try to add an elaborate tone control circuit.

Fig. 15 shows a simple tone control that can be added to a receiver. This tone control consists of a .05 MFD condenser and a .1 meg. potentiometer. The tone control works by by-passing the high frequency signals and thereby giving an apparent increase in the bass response.

Mechanical Details

As it was previously pointed out, it is possible to connect a microphone or a phono pickup to a receiver simply by soldering the leads from the microphone or pickup directly to the set. However, this is a rather cumbersome arrangement. If it is necessary to remove the receiver chassis for repairs, it is rather awkward to have a number of things permanently connected to the set.

It is much better to use a suitable plug and jack arrangement. The jack shown in Fig. 16 is recommended both for connecting a phono pickup and a microphone to a receiver. It is referred to simply as a phono plug and jack and it can be purchased from any wholesaler.

To mount the jack, simply drill a hole in the rear of the receiver chassis. A hole approximately ⅜ inches in diameter is required. Since many drills are not capable of handling such a large bit, it may be desirable to drill a ¼ inch hole and then bring the hole up to the required size with a

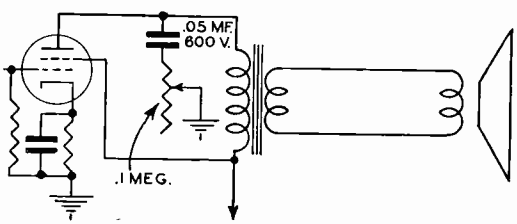


Fig. 15

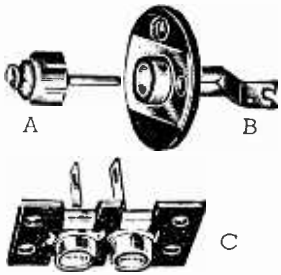


Fig. 16. (A) Single prong shielded phono plug. (B) Single phono jack—mounts directly on receiver chassis. (C) Double phono jack.

reamer or with a rat-tail file. In sets where the shielded line must be insulated from the chassis, be sure to make the hole large enough so that the metal part of the jack will not short to the chassis.

The devices discussed in this article are the ones the serviceman will most frequently be called upon to connect to a receiver. The circuits shown will not cover every situation that may be encountered, but they will be helpful in most cases. By slightly re-arranging circuits in some instances or by applying the ideas brought out in this article it should be possible to handle most situations.

— — — n r i — — — —

Tiny Radio

A simple vest-pocket radio, smaller than the average cigarette case, looks like it is becoming a big dollar earner for Britain. This little eight-ounce, four-tube set is made by a firm which has specialized in hearing aids, and which is now negotiating for an initial order of 10,000 sets for distribution in the United States.

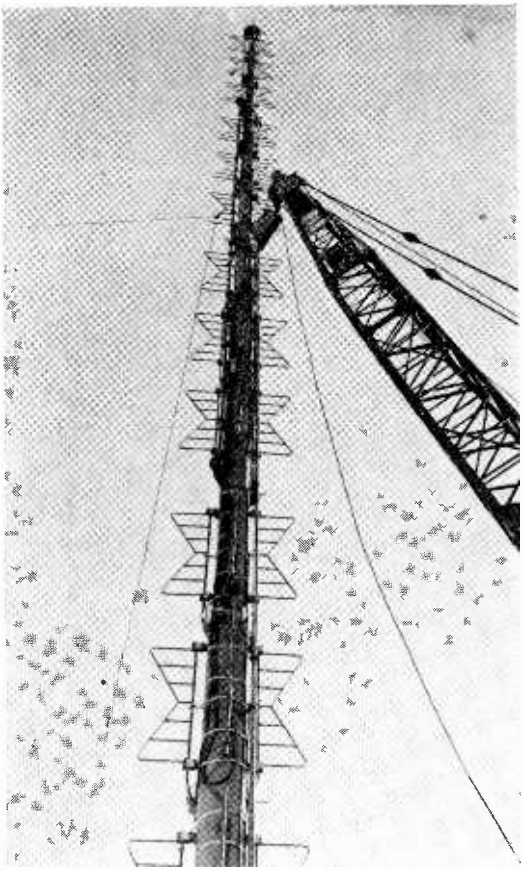
— — — — n r i — — — —

Our Cover Photo

Engineers are shown discussing elements for the world's largest 12-bay television antenna. This antenna is being built for station WHAS-TV, Louisville, Kentucky. In the cover photograph, left to right, are Orrin Towner, chief engineer of WHAS; M. E. Hiehle, General Electric's engineering section; and H. W. Granberry, General Electric television sales.

An additional photograph on this page shows a mobile crane engaged in the process of erecting this giant television antenna for testing operations at Amboy airport, near Syracuse, N. Y.

The manufacturing of this huge television transmitting antenna required approximately four months. The high-gain antenna has a total weight of four tons. Final tests required 350,000 square feet of area to make necessary electrical measurements. Final tests included checking for required electrical impedance, testing of de-icing equipment, and pressurizing of the co-axial transmission lines so that engineers could check for leaks in the co-axial line system. Tests were also made to measure power distribution.



The new antenna was recently shipped to Louisville, Kentucky, where it will be hoisted atop a 526-foot tower. Television picture and sound signals will radiate from forty-eight bat-wing-shaped antenna elements spaced in groups of four, approximately every six feet along the antenna mast.

Other General Electric equipment supplied to station WHAS-TV includes a 5-kw high channel transmitter, two film channels, two 16-mm. projectors, and miscellaneous studio equipment.

Destination Moon

SCIENTISTS and physicists whether they admit it or not, are working swiftly toward a day when they will send a space ship to the Moon. They are eager to do this because they know that any nation controlling the Moon will in turn control Earth. This is because Earth gravity is six times stronger than the Moon's, and a military base on Moon would easily defeat any Earth-bound fortress.

But, these scientists are doomed to come off second best in their race!

Not long ago, deep in the Mojave Desert, a hundred miles northeast from Los Angeles, all traffic stopped along a state highway. Ahead was a military barrier, and further a great crowd milled around parked vans and trucks.

Far in the distance, the discerning eye spotted a slim silver Rocket rising 150 feet into the air, its pointed nose gleaming in the desert sunlight.

Night fell and passed. Just before dawn, at 3:40 A.M., to be exact, a terrific roar screamed through the quiet desert air. Upward through the darkness rose American Industry's hopeful answer to others who also turned jealous eyes toward the Moon. The huge slim "space-ship" rapidly gathered speed and 3 minutes and 50 seconds later passed the altitude of 700 miles. Traveling at a speed of 7 miles per second it burst forth from restraining forces of gravity and was in "space."

Forty-six hours later it landed hazardously but safely within the crater Harpalus, high in the northern latitudes of the Moon's surface, and the first human being to set foot on the Moon climbed down the side of the great space-ship "Luna," and claimed it in the name of the United States for the welfare of all mankind.

The man who beat the scientists? Mr. George Pal. And in Technicolor, too! George Pal, Hollywood producer, and father of the famous Puppetoons, who just last year began producing live-action movies, has startled even Hollywood, let alone scientists, astronomers, and the general public.

Closely following known scientific facts and guarding against any intimation of a Buck Rogers fairy-tale, Producer Pal will offer to the public a "documentary view into the near future" in August of this year.

Filmed behind locked doors and on lonesome stretches of desert far from prying eyes, Mr. Pal was amazed when he received requests from leading physicists and astronomers for permission to visit his sets.

The requests granted, he was well repaid for his meticulous efforts to produce an authentic, believable film story when he learned he had earned their approval of his efforts. He knew the subject matter was sufficiently thrilling to need no "Hollywood" glamour to win the public's approval, but to win even condonement from scientists was more than he had hoped.

"DESTINATION MOON," as a story, takes the

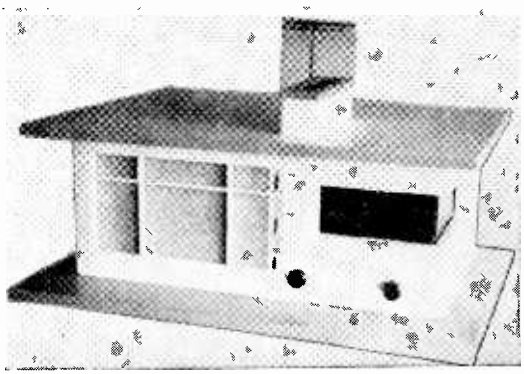
first four space travelers through many wonderous adventures. In space beyond the pull of gravity there is no "up," no "down" and everything is weightless. Within the ship the men float about and at lunch time, they need no table. Their food floats!

During the trip they venture out onto the surface of the space-ship. There is no atmosphere, so they are not blown off, and they have magnetic boots. But one of the scientists in the story does "fall" off. He kneels down to inspect the jets, and disconnects his magnets. As he grabs to regain his footing, he floats off in space, alone. His rescue from drifting through the universe forever is one of the highlights of "DESTINATION MOON."

The travelers spend four days on the Moon itself, exploring its desolate wastes, and true to life, as scientists today assure us, they find no living thing, just waste. No moon maidens, even. And still in believable fashion they return safely to Earth.

Apparently, even scientists can't keep ahead of Hollywood, but if you ask the next one you talk to about a real trip to the moon, you'll probably hear him say that it will take a little time, and a lot of money, but in the near future there will be a real-life project called: DESTINATION MOON.

———*n r i*———



Unusual Cabinet for NRI Receiver

"After seeing the picture in NATIONAL RADIO NEWS with the 7RK receiver dressed up, I got busy with my unit and produced the results shown. The cabinet is built of ⅝ inch plywood, plastic, and ⅛ inch walnut speaker baffle. It has excellent tone qualities. Enjoying it immensely."

ROGER D. RAYMO, Atlanta, Ga.

SPECIAL TV SERVICE TO SHOW NEW FILMS

300 to Get Zenith Outlet On Trial Basis at $1 a Movie

PHONEVISION, a revolutionary television step to bring current Hollywood movies into the home, was approved by the FCC on a limited scale in Chicago.

Comdr. E. F. McDonald, president of Zenith Radio Corp., developer of the system, said permission has been granted to service 300 subscribers at $1 a picture.

Selection will be made in a manner that will obtain a cross-section of television users.

The pictures will be transmitted over telephone lines. A contract was signed with the Illinois Bell Telephone Co. Commander McDonald said, and negotiations with Hollywood studios have been started.

Phonevision subscribers will be given a gadget that "decodes" the picture over Channel 2. All other television users will see only a blur. There is no interruption of phone service during showing of the film.

Subscribers will be told in advance what picture is scheduled for the particular night. A call to the telephone operator will send an impulse over the phone wire that will remove the distortion from the TV picture.

McDonald said phonevision is the Zenith answer to the growing dilemma that finds advertisers unable to sponsor expensive performances such as good movies, major athletic events and "better entertainment."

"I would predict," he said, "that if there should ever be another prize fight on the scale of the Dempsey-Tunney fight, the take over Phonevision would be 10,000 times that at the gate.

"This is the answer for the problem of the sponsors of the various events and the television public."

McDonald declared the FCC will closely observe the tests, scheduled to be held over a 90-day period, to see if Phonevision is "economically feasible."

No starting time has been set. "We have a lot of work to do yet," he said.

How to Get Along With Others

DR. JAMES F. BENDER, DIRECTOR

The National Institute for Human Relations

I wonder whether we stop often enough to count the blessings that flow from laughter?

1. Laughter crowds tension out of our lives—brings worry to a halt—gives the personality a chance to stretch.

2. Laughter brings refreshment—courage to try again—adds joy to our work and play.

3. Laughter builds strength—aids digestion—develops the lungs—frees the vocal cords for kind and gracious tones.

4. Laughter feeds our sense of humor—turns away barbed words and unkind thoughts —puts our personal problems in proper perspective.

5. Laughter quickens the mind—feeds on wit—grows strong on the sense of the ridiculous.

6. Laughter mellows the soul—renews faith in our fellows—makes a philosopher out of a man or woman.

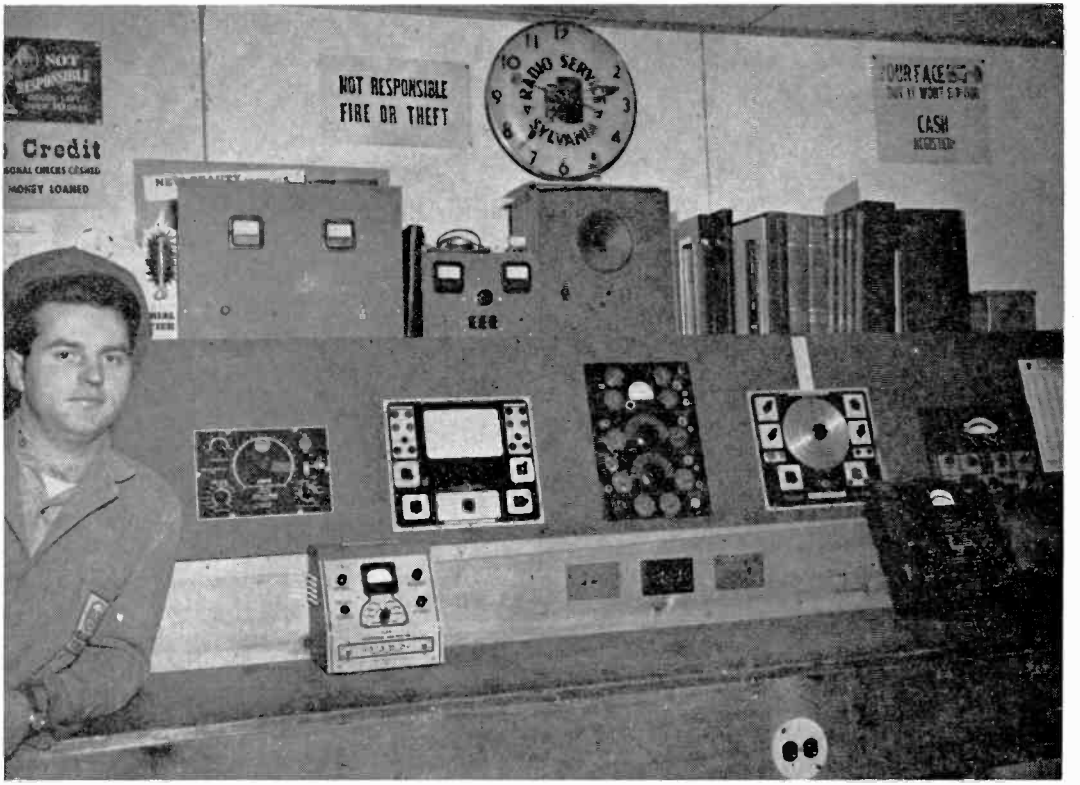
7. Laughter is contagious—spreads contentment—helps the heart-sick to take new hope —makes friends and converts enemies.

8. Laughter is always "with" rather than "at"—it costs nothing yet brings handsome dividends.

9. Laughter lightens the daily load—greases life's axles—helps us to run up hill.

10. Laughter is the mark of the positive spirit—the warm and understanding heart—the badge of the person who gets along well with others.

Its close relatives are the friendly smile, the infectious chuckle, the hilarious guffaw. It can be musical, raucous, loud or soft, high or low. It should come quick and be sincere. As such it is a good deed in a naughty world.



PLANNING AHEAD MEANS SUCCESSFUL BUSINESS

Dear Mr. Smith:

When I began the NRI course in the year 1942, I knew very little about the actual operation of radio parts and circuits. I had however built several one and two tube radios. I was in high school at this time and from the money I made from radio, working in a shop with an interior floor space of a little over eight feet, I paid for the NRI course and paid my expenses in school. Though my family was poor I was more than able to keep up with the Joneses.

At the age of 17 I went into the Navy as an aviation radio man. I was discharged August 3, 1946 and took a job at one of the mines to build up some capital which I used to back up a loan. On April 1, 1947, I opened the doors of my new shop, which I had built in the business district of town. I might say that I was heavily in debt. The building is 16 x 24 feet, and it is only frame, but it was a place to work and sell radios.

I have been servicing all makes and models of radios in the past three years and have the authorized service and sales of Motorola and Emerson radios. I also sell electrical appliances and could service them but, I have found it pays to specialize in one field so I stick to radio. I now have nearly all of the debt paid off on the shop and on January 1, when I took inventory, the net worth of the business was over $5,000, and I have a bank account of several hundred which is more than can be said for the average working man today.

Radio has done this for me and without NRI I would not know radio as I do today. I might go on record as saying, that it is not necessary to have a lot of education as I know several men who make a good living in the service side of radio, who do not even have an eighth grade diploma. I have completed several courses in various subjects by correspondence and it is the easiest way for me to learn.

If you take a correspondence course, choose it wisely. If you plan to study radio, plan to study NRI.

Leslie H. Harry
Pinehurst, Idaho

Servicing Loudspeakers

By GEORGE J. ROHRICH

NRI Laboratory Instructor

George J. Rohrich

IN your business of servicing radio and television receivers you are sure to encounter a problem which involves distortion of sound given out by the loudspeaker. Your knowledge of the facts, gained from experience and supplemented by instructions in your lessons, will quickly let you isolate the trouble in most cases.

However, there will be some early symptoms which may leave you in doubt whether the actual source of trouble could exist within the amplifier or within the loudspeaker system. Under this condition you can sometimes speed up your work on your receiver by substituting temporarily a portion or all of its loudspeaker system with a unit known to be in good condition.

This article gives you the essential information for working out your own assembly of a simple yet flexible loudspeaker replacement system which readily lets you use its parts either individually or collectively.

From a study of Figures 1 and 2 you see that its arrangement is made flexible because seven pin jacks are connected at vital points of the partially yet essentially connected circuit. When you insert some flexible wires into these pin jacks and connect their free ends (to which alligator clips are attached) at the required terminals of your receiver, a substitution of the desired unit is quickly effected.

Parts List

The following parts are needed:

1 Six-inch PM Speaker, Jensen Type P6-T, or equivalent.
1 Universal Matching Output Transformer, with center tapped primary and five or six taps in secondary winding.
2 Six position selector switches.
2 Pointer type knobs for switches.
1 10-Henry, 100-m.a. filter choke.
1 5000-ohm, 50-watt, adjustable resistor with five movable contacts.
1 Metal utility box, six inches deep, with removable cover size 8″ x 10″.
7 Pin jacks.
5 Flexible wires, each with a pin connector and alligator clip at its respective ends.
1 Piece of grille cloth, approx. 6″ x 6″.

These parts may be bought from any one of your favorite dealers in your locality or may be procured by mail from firms specializing in such services. Such standard parts are not available from the National Radio Institute and you must, therefore, procure them elsewhere.

Figure 3 shows where the speaker, switches and jacks may be located on the panel. You will also need additional holes in the panel for mounting the speaker but these are omitted purposely in Figure 3 because their location would vary for individual types of speakers. You can add these holes as required. Likewise, mounting holes are not shown for the 10-Henry choke, the output transformer or for the adjustable resistor because the spacing of holes is not uniform for these parts. In our own case we found that the speaker frame had two holes (where an output transformer is customarily attached) but these holes were most satisfactory for mounting our choke, so we switched from the customary practice, and mounted the choke on the speaker frame. Then the output transformer was mounted on the inside of the panel, using two

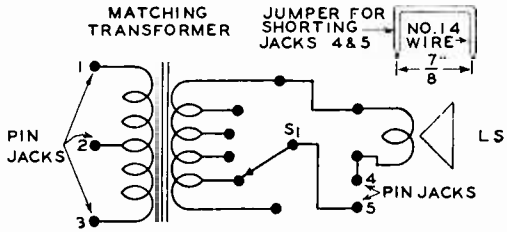


Fig. 1.

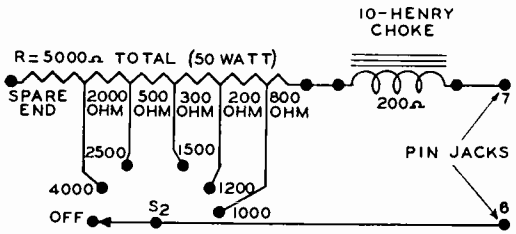


Fig. 2.

holes, drilled at convenient locations slightly above the pin jack holes 3 and 6.

Our adjustable resistor was also mounted on the speaker frame. Two long pieces of threaded rod were used for mounting it. This let the resistor extend beyond the speaker magnet and its adjustable sliders, therefore, could be easily moved to select whatever resistance we desired later, in event that our pre-determined selection proved inadequate. However, only on one occasion was it necessary to move the last slider along the spare end of the resistance, to take care of a special field-coil substitution which had a total resistance of 5,000 ohms.

Look at Figure 2 for a moment. Because the minimum resistance of most field coils has a value of 1,000 ohms, we adjusted our first slider so the total resistance between it and jack No. 7 equals this amount. Our choke has a resistance of 200 ohms. Therefore, an additional amount of 800 ohms was selected from R. This was done with an ohmmeter.

The second slider is adjusted so the total resistance between it and jack No. 7 amounts to 1,200 ohms. Then the next sliders are adjusted to permit respective selections of 1,500, 2,500 and 4,000 ohms. If the receivers in your locality are known to have other values than these for their field coils, then you should preferably adjust them to such known values which will accommodate them during substitution at a later time.

Facts Worth Remembering About Impedance Matching

"Impedance matching" is often stressed by many engineers. You will endeavor to do likewise whenever practical. However, don't get the mistaken idea that you must match impedances exactly. This precaution is *not* necessary to get *acceptable* performance.

Engineers tell you quite often that it is necessary to know the *impedance* of a loudspeaker in order to couple it *properly* to an amplifier or line. Notice that *properly* is emphasized. This is desirable. However, "properly" implies that *any other* mismatch produces intolerable results. This is not entirely true.

The fact is, that in practice it is often permissible to introduce a considerable mismatch, without critical ears perceiving the results of that mismatch. More often a mismatch causes a drop in volume without distortion. This is particularly true if the *load impedance* has a *higher* value than the source. So if you must select a mismatch (because the exact match is not practical) then see to it that the load has a higher impedance than the source. You will no doubt find from experience while using the equipment shown in Fig. 1, that triode tube circuits can tolerate a mismatch of several hundred per cent while pentode circuits are more critical, with a mismatch above twenty or thirty per cent of specified values given by tube manufacturers becoming objectionable. Any drop in volume due to mismatch can be usually regained from a higher setting of your variable volume control.

Using the Test Speaker Alone

Refer to Figure 1. When you want to use the test speaker alone, you first remove the jumper from jacks No. 4 and No. 5. Insert the jumper in jacks No. 1 and No. 2, instead. Insert one test lead in jack No. 4. Insert another test lead in jack No. 5. Connect the free ends of these test leads to your receiver's output transformer (secondary) connections.

One voice coil lead of the speaker in the receiver should be disconnected temporarily. This lets you hear the sound from the test speaker alone.

You will discover that switch S_1 can be left in any position as long as the jumper remains inserted in jacks No. 1 and No. 2. This is because the transformer is short circuited; although short-circuited across one pair of terminals, this condition is "reflected" across each pair of terminals. Consequently, the position of the switch is not important unless the jumper is removed; then you would have to select the particular position of S_1 where only the speaker is in the external circuit.

Comparisons can be made readily between the performance of the test speaker and the per-

formance of the original speaker in the receiver. If sounds from the test speaker are satisfactory, but are distorted from the original speaker, you can conclude at once that trouble exists there. Take the necessary steps to replace or repair it.

Using the Test Speaker With Matching Transformer

Refer to Figure 1. The first step is to remove any test leads previously inserted in jacks No. 4 and No. 5. Also remove the jumper previously inserted in jacks No. 1 and 2. Insert the jumper, instead, into jacks No. 4 and 5. Rotate the selector switch preferably to a central position at the beginning of your tests; otherwise, you may have chosen that particular end position where the speaker is not in the circuit. Insert one test lead in jack No. 1. Insert another test lead either in jack No. 2 or No. 3, depending on your requirements for your load being low or high impedance, respectively; if requirements are unknown make a trial with this test lead first inserted in jack No. 2, followed by a later trial in jack No. 3.

Connect the free ends of the test leads to your receiver's output transformer (primary) connections.

One primary lead of the transformer in the receiver should be disconnected temporarily. This lets you hear the sound from the test speaker alone.

Rotate the selector switch S_1 until the clearest reproduction is heard from the test speaker.

The transformer in the test speaker unit also can be used for substitution in a push-pull stage. For this purpose you will use three test leads inserted respectively in jacks No. 1, No. 2 and No. 3.

Using the Field Replacement Unit

The field replacement unit in Figure 2 is only needed when the original field coil in the receiver is defective and you wish to quickly substitute a similar counterpart.

Under these conditions you insert a pair of test leads into jacks No. 6 and No. 7. Then connect the remaining free ends of the test leads to the required terminals where the original field coil was connected. Switch S_2 should be turned to the position which selects the equivalent total resistance of the original field.

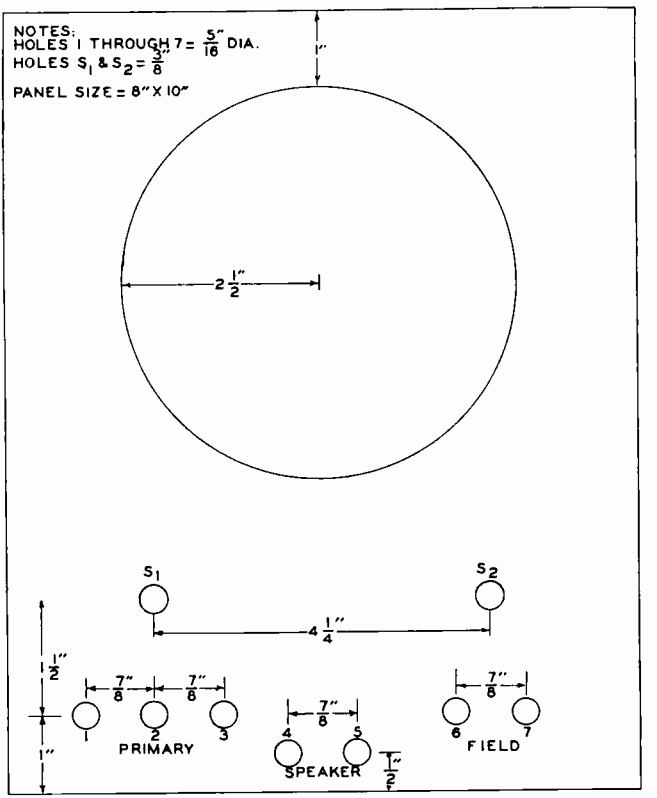


Fig. 3.

Making Your Decision Whether To Replace or Repair A Bad Speaker

A loudspeaker system is one of the larger items in the average radio receiver. Many of its defects can be repaired. However, a satisfactory repair often costs more than the expenditure for a new speaker system and its installation. No doubt you have heard the expression: "Just as good as new but twice as expensive." Be on the lookout for such a possibility and don't hesitate to make a replacement when warranted. If the cost of repair equals the cost of replacement, I would always recommend you to choose the latter. It may be gratifying always to your pride in knowing that you made a nice repair but if you estimate or know the job requires a lengthy or time-consuming procedure, then you will be wiser to decide immediately that a quicker, better looking and better performing job will result from a complete replacement.

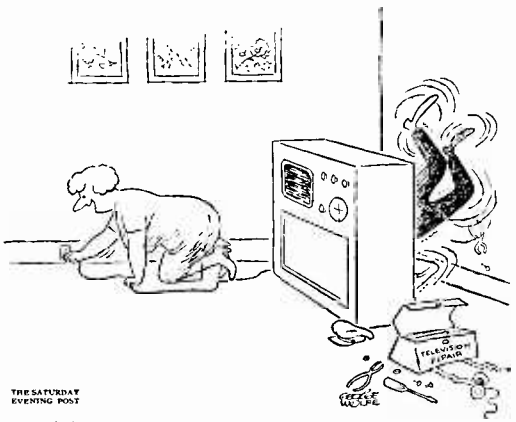
The above covers those cases where replacements are readily available at reasonable prices. On the other hand you or your customer may decide

a particular speaker should be repaired instead of replaced, disregarding its probable appearance but agreeing that its performance shall be acceptable. Under this consideration you will be wise to know some of the "kinks" or special methods which can be used in making unusual repairs.

Making Unusual Speaker Repairs

There are some types of repairs given up as seemingly hopeless. Necessity may warrant your tackling an unusual repair, one ordinarily not recommended.

I have in mind a complaint of distortion, finally traced to a voice coil rubbing against its pole piece. The normal procedure is to replace the



"No wonder it wouldn't work—it wasn't plugged in!"

Reprinted by special permission of The Saturday Evening Post. Copyright 1949, by the Curtis Publishing Company.

entire cone or the entire speaker. Yet I have seen an expert simply bend the rim on the outside speaker frame with the help of only a pair of pliers so a permanent cure was effected in a matter of a few seconds. Here is a case where the expert used "a simple twist of the wrist and a touch of the know-how."

The expert gave me a clue which I pass on to you. He said his first attempts were not very successful—in fact he ruined or gave up further attempts on many jobs. But replacements for rubbing voice coils became less as each added attempt gave him a larger percentage of success. I found another clue to his success. He wasn't afraid to try an unusual repair; he tried so many times that he is now more often successful than unsuccessful.

I, too, was intrigued by his success. So I tried my luck when a similar case confronted me. I was about ready to give up after making a few trial *permanent* bends in the frame. This, I later discovered, was *not* to be done. Just grab the frame at its outer edge with your pliers, then spring it slightly to locate where a permanent bend could be made. I usually find now two or three places where a permanent bend could be placed and one of these places permits a greater leeway for making a larger kink there in the frame. Here is where the permanent twist belongs.

Dropping several drops of heavy oil into the space between voice coil and magnet is another unorthodox method which in many cases effectively clears up disortion from a rubbing voice coil. Use it as a last resort, however, after all other attempts for recentering the cone have failed.

In most recent speakers you will find a dust cover or button glued over the voice coil. Remove it with a radio service solvent. Then inject the oil and replace the dust cover.

The quality of the heavy oil should be of the best kind. It should be of the free moving variety which will not thicken or become gummy in cold weather. Grease, castor oil and vaseline should be avoided. A choice may be made from clean automobile lubricating oil. No. 30 or No. 40, or thick medicinal mineral oil.

The amount of oil used may vary from two or three drops to approximately half of a teaspoonful. Use no more than necessary. Avoid using excessive quantities which cause dripping. The right amount will stay where you put it with little or no creeping, unless you have chosen a thin oil.

Although quite permanent in its performance, this type of repair is recommended for tentative purposes only, especially useful to tide over a customer during a lengthy period while awaiting special replacement parts or arrival of a new receiver placed on back order.

Another type of repair to a speaker which is frowned upon, is repairing a tear in its paper cone. I disagree heartily with anyone who puts a tear together with "scotch tape" because this popularly handy tape is effective on a vibrating cone only during dry weather. During humid weather the "scotch tape repair" fails completely. The edges of the tape absorb moisture and curl, finally working loose entirely.

It is the temporary condition with which I find fault for using scotch tape. However, I do recommend a permanent method for repairing a tear in a speaker cone by using a waterproof cement. "Speaker cement" is waterprof and normally is used only on the rim of the cone. However, if a bit of fluffy absorbent cotton is worked in flat over a torn slit, along with this waterproof "speaker cement," then you get an effective permanent repair. Its appearance may not be as neat as when using scotch tape but it is one that will stand up under all conditions to which a new cone can be subjected.

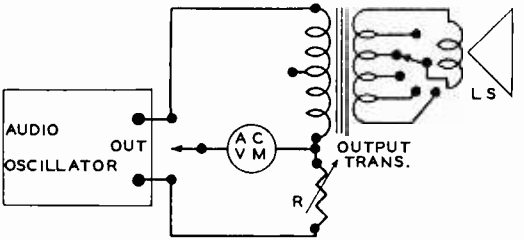


Fig. 4.

Both sides of the tear in the cone should be treated for best results. Try this method when you find it difficult or impossible to get a replacement cone for the speaker in an old set owned by a sentimental customer.

The above recommended use of speaker cement with fluffy absorbent cotton will also let you repair a relatively large hole in the speaker cone. Numerous tears can be treated as effectively as a single rip or hole. I know this from experience on one special job which required treatment at seven places on its surface, where the longest single tear was at least four inches long.

Helpful Information for NRI Graduates Owning NRI Professional Instruments Model 45 and Model 88 or Their Equivalents

Matching transformer impedance values can be determined by comparison with an equal amount of resistance connected in series. A circuit like that shown in Figure 4 is used for this purpose. NRI graduates or students who own the Model 45 Multimeter and the Model 88 signal generator, or their equivalents, have the essential requirements for Figure 4. The variable resistor R should be capable of being readily adjusted to varying values over wide ranges, falling between 2,000 ohms and 25,000 ohms. Several 1000 ohm fixed resistors which can be added in series with a single 2,000 ohm variable will make it easier to get closer readings than while attempting to use a single 25,000 ohm variable resistor. However, the single unit will serve quite well if you don't mind abrupt changes during measurements on settings for lower impedance than 10,000 ohms. (Tests are made using 400 cycles.)

Use the arrangement shown in Figure 4 to first find how much resistance is equivalent to the transformer impedance. As you know the transformer serves as an impedance changer, depending on how much load is connected and also depending on the turns-ratio of the transformer. However, all this is quickly summed up and determined in Figure 4 when you adjust the variable resistor R unit until the amount of measured A.C. voltage across R equals the measured A.C. voltage across the transformer primary. You will read the resistor's voltage when you fasten the left wire of the meter to the lower output terminal on the oscillator. You will read the transformer's primary voltage when you fasten the left wire of the meter to the upper output terminal on the oscillator. (as shown in Figure 4) It is not essential to know which voltage you are reading. Neither is it essential to use any specified amount of voltage—simply shift the left lead of the voltmeter, repeatedly up and down, over and over again, *until the two voltage readings are alike,* which is accomplished while varying R.

After you have made the required adjustments of R, then you can measure its resistance value with an ohmmeter. Its resistance value equals the impedance value of the transformer. Therefore, one purpose has been achieved by finding out how much impedance exists for any one or more choices of taps on the output transformer. Now you can comply with a tube manufacturer's specifications and choose that load which is nearest the one he specifies in his table of tube characteristics.

There is another method which is quicker for accomplishing the same purpose of matching the transformer and its load to a specified value. Again you will use the arrangement shown in Figure 4 but this time you will preset R to the specified value and then make their voltages equal, simply by selecting the proper tap on the transformer. Procure a tube manufacturer's list of tube characteristics and see how many ohms are specified (for the stated output power) to serve for its tube load. Let us say this specified load is 7600 ohms. (Suitable for a 6K6 tube working at 250 volts plate voltage when the grid bias is 18 volts). Set R in Figure 5 to 7600 ohms with the help of your ohmmeter. Then switch your Model 45 to take AC voltmeter readings across R and compare them with voltmeter readings across the transformer. If the values of voltage are unequal, you have a mismatch. Therefore, select another tap on the output transformer and repeat your voltage comparisons until they are equal or nearly so. Seldom may you find an exact match, as explained earlier. Therefore, select that particular tap on the output transformer which gives the nearest to equal voltage readings, provided further that the voltage reading across the transformer, finally observed, is *higher* than the voltage reading across the (7600-ohm) resistor. If you will recheck for the actual impedance you will find that it complies with requirements that any mismatch shall be *higher* than specified.

Seldom is it essential to know the impedance of the speaker itself. The previously described procedures let you achieve proper matching without any necessity for knowing what is the speaker impedance value.

However, if you should find some particular problem requires knowledge of the approximate

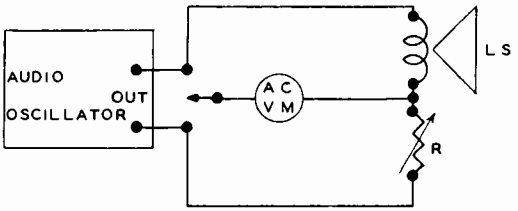


Fig. 5.

speaker voice coil impedance, then you can use a practical bit of information which covers impedance values ranging between 3 ohms and 16 ohms. First measure the D.C. resistance of the voice coil with an ohmmeter and then multiplying by 1.5. For example, a measurement of D.C. resistance of 2 ohms is multiplied by 1.5, giving 3 ohms for its approximate impedance. Likewise, a resistance value of 10 ohms is multiplied by 1.5 and you get 15 ohms for its approximate empedance.

Where you require knowledge of a more accurate impedance value, you can resort to the circuit shown in Figure 5. You will recognize its similarity with Figure 4 but it is essential in Figure 5 that the output of the oscillator (or its equivalent in an amplifier stage) should have a low impedance, capable of delivering a readable voltage on the lowest scale of the A.C. voltmeter.

In other words, the usual audio signal generator has a high impedance output and its output voltage drops to zero when a low impedance load is connected for an attempted measurement. Therefore, don't try to connect your speaker directly to the high impedance output of the NRI Model 88 Signal Generator.

If you do wish to use your Model 88 Signal Generator, then feed its audio output into the grid circuit of an audio amplifier having a matching transformer with a low impedance output. (This signal may be fed into the control grid of the 1st A.F. amplifier in an ordinary receiver and the circuit in Fig. 5 connected across the low impedance secondary winding of the receiver's output transformer.) Your modified circuit of Figure 5 is then ready for using the same procedures outlined earlier. Remember that R must be capable of ready adjustment to values which usually fall between 3 ohms and 16 ohms.

———*n r i*———

Sorry, Wrong Answer!

Student: "Why didn't I make a hundred on my history test, teacher?"
Teacher: "You remember the question, 'Why did the pioneers go into the wilderness?'—Well, 'To neck' was the wrong answer."

TV Installations FOR Apartment-Houses

MANY landlords will not permit tenants to install individual TV antennas on the roofs of their apartment houses. In cases of this sort, the TV set owner must generally use a window or an indoor antenna unless he has a set having a built-in antenna.

The effectiveness of such antennas, including built-in ones, depends on the location. In many places they work well, in others they are satisfactory only if boosters are used with them. Very often, however, a TV receiver will fail to give satisfactory performance unless it is connected to a suitable outside antenna.

Usually an apartment-house owner who will not permit each tenant to erect an outdoor antenna will allow one master antenna to be put up. For that matter, it may not be desirable for every tenant to put up his own antenna even if he is permitted to do so, because each antenna will have a certain effect on any other antenna near it. For this reason, antennas cannot be placed too close together; if they are, the result is that none of them works well. This fact creates a problem when there are a great many television sets in one apartment house, because it is impossible to erect enough antennas on the roof to take care of all of them without having the antennas so close together that all of them will be affected.

There is, therefore, a demand in apartment-house installations for a master antenna system that will furnish a signal for several receivers. In small apartment houses, systems like those shown in Figs. 1 and 2 may be suitable. A more elaborate system must generally be used for a large apartment house, however.

Several systems have been devised to answer the problem of apartment house installations. One of these is the Jerrold "Mul-TV Antenna System," which we shall describe briefly.

The simplest form of the Jerrold system is shown in block diagram form in Fig. 3. As you can see, it consists of a series of distribution boxes coupled to each other and to the antenna by 72-ohm coaxial transmission line. (For convenience in reference, we shall call this the distribution line.) A 72-ohm terminating resistor is connected across the end of the line.

Two kinds of distribution boxes, called ADO-1

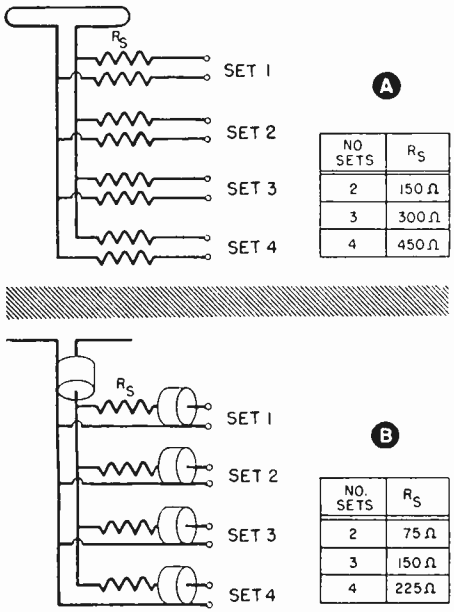


FIG. 1. Methods of connecting several sets to the same transmission line. The resistive networks permit the lines to be terminated in their characteristic impedances, thus eliminating line reflections.

and ADO-2 by the manufacturer, are used in this system. The ADO-1 is used to couple one 72-ohm set to the line, the ADO-2 to couple two 300-ohm sets to it. Either kind of box can be used anywhere in the system, so 72-ohm and 300-ohm receivers can be connected to the line in any proportion.

Each distribution box contains a cathode-follower amplifier and its power supply. The input of each box is connected across the distribution line; since this input consists of the grid circuit of the cathode follower and therefore has a high impedance, it attenuates the signal in the distribution line only slightly. For this reason, a great many boxes can be connected to the line without attenuating the signal too much.

The output of each box is taken from the cathode circuit of the cathode follower. Therefore, the only connection between the input and the output is through the internal capacities of the tube, which are low. For this reason, there is practically no backward transmission (from output to input) of signals through the distribution boxes. This means that any signal feeding back from the local oscillator of a set that is connected to the output of a distribution box will be very severely attenuated before it is applied to the distribution line of the system. The distribution boxes thus act as decoupling devices to prevent the receivers connected to them from interfering with each other.

The manufacturer of this system offers several

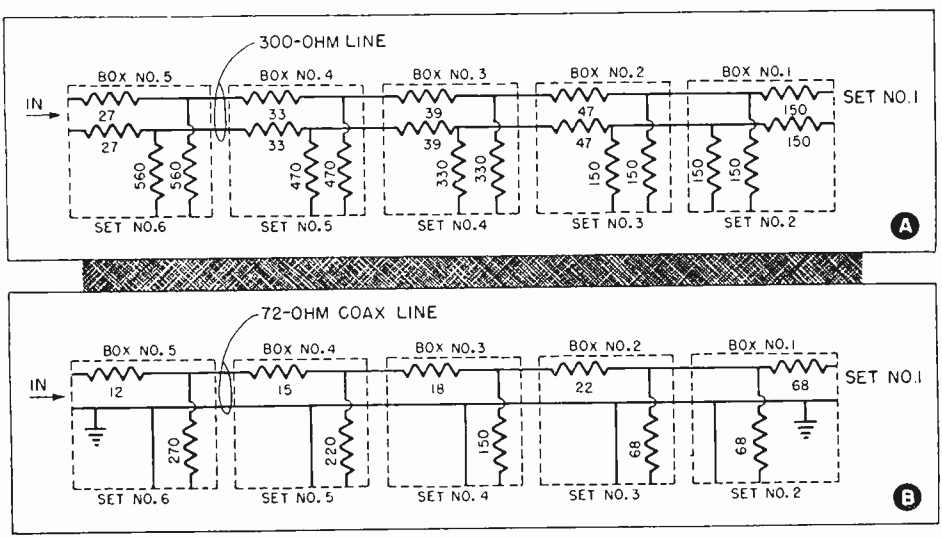
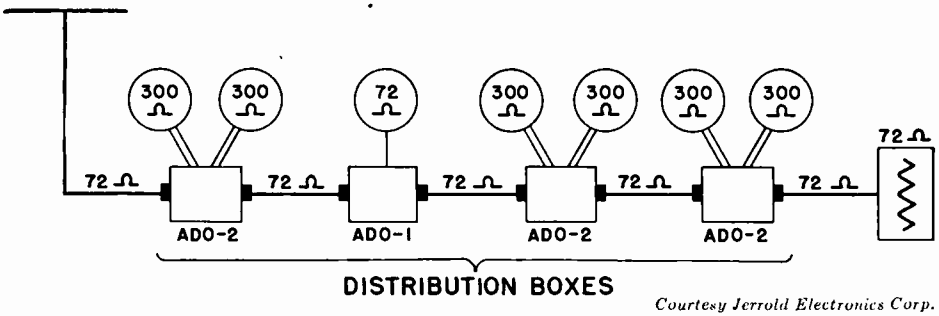


FIG. 2. These matching networks can be used to permit as many as 6 sets to be connected to the same line.



Courtesy Jerrold Electronics Corp.

FIG. 3. A block diagram of the Jerrold Mul-TV antenna system intended for use in apartment installations. Either 72-ohm or 300-ohm receivers can be connected to this system. One or two sets can be connected to an ADO-2 box.

accessories that can be used to adapt it to meet various needs. For example, there is a matching transformer that permits the 72-ohm distribution line of the system to be matched to a 300-ohm line if it is necessary to use the latter with the antenna selected.

Another accessory device is a channel amplifier that is intended for use in low-signal areas or in installations in which the run of the coaxial distribution line is so long that the signal is attenuated too much. This amplifier contains four plug-in amplifier strips, each of which is a 6-tube r.f. amplifier that is designed to handle a particular channel. There is an individual gain control for each strip, an arrangement that permits the outputs of all the strips to be adjusted to the same level. These individual outputs are applied to a mixing network from which they are fed to the main distribution line of the system.

Each amplifier strip of this device has its own input. If an individual antenna is used for each station that is to be picked up, the transmission line from each antenna can be connected to the appropriate amplifier input. If a single antenna is to be used for all stations, however, an antenna matching network offered by the manufacturer must be used. This network consists of six tuned circuits connected in parallel across an input terminal that is connected to the transmission line from the antenna. Each circuit can be tuned over a range of 20 mc., and their basic frequencies are staggered so that their combined range covers all the TV and f.m. frequencies. When this network is used, the antenna transmission line is connected to its input, and the proper outputs are connected to the individual inputs of the channel amplifier. The unused outputs of the network can then be used to trap interference if desired.

Another network offered by the manufacturer is the reverse of the one just described. It is intended to be used to couple the transmission lines from as many as six individual antennas to the single coaxial distribution line of the system. It is used only with unamplified systems, of course.

Finally, the manufacturer offers noise filters for each TV channel. These are intended for use only with amplified systems. Each is installed just ahead of the amplifier for the channel for which it is designed.

The choice of the antenna to be used with this master system depends upon the location. If several stations lying in different directions are to be picked up, it is usually best to use an individual antenna for each, aiming it for best pick-up and minimum ghosting. If all the local stations can be picked up well with one antenna, however, there is no need to use a separate antenna for each.

In an apartment-house installation, the use of an antenna system of this sort is very desirable. Not only does it furnish each tenant an adequate signal for his set on each channel, but also it practically eliminates interference between receivers. Its cost is fairly high but not excessively so, particularly if it is installed while the house is being built, since it is simple at that time to run the necessary distribution cable from one apartment to the next.

Television Jobs in Richmond and Norfolk, Va.

The Wards Co., 705 W. Broad St., Richmond 20, Va., is interested in finding several *well-trained* Television servicemen for their stores in Richmond and in Norfolk. Any students or graduates who can qualify and who are interested should write to the above mentioned firm.

Method of Enclosing Lesson Labels Is Changed To Improve Our Service To Students

NRI students who are sending in lessons regularly are familiar with the *Lesson Labels* they fill in and enclose, one with each set of lesson answers they send us. We in turn use the filled-in lesson labels to send the next new lesson text which is due.

Up to now, we have enclosed one blank label inside the back cover of each new lesson text mailed out.

In an effort to speed up our service and handling, we are starting to enclose several labels in some lesson books, and we are not enclosing any labels in some of the others. Therefore, when you get several labels at a time with some of your books, please save the extra labels as you receive them. Send us just ONE FILLED-IN LABEL WITH EACH SET OF LESSON ANSWERS.

Also, as fast as we can print a new supply, these labels will come to you *without any gumming* on the back. The gummed labels have been giving some trouble, particularly in humid weather or if the student happens to live in a place where the atmosphere is damp. The label often would stick to the pages of the book. Even though we tried using wax paper inserts, we still got a lot of complaints.

We are going to do the gumming here at the Institute as the last step, just before the label is affixed to the lesson envelope. These changes are being made in line with NRI's established policy of always trying to improve its service to students.

Joseph S. Cunningham, Student Service Department.

———*n r i*———

Job Opportunity—Radio and Appliance Servicing

NRI Graduate Ellis Rice, Owner of Rice's Radio and Electric Service, 609 East Main Street, Glasgow, Kentucky, writes that his business has expanded to one of the largest in his part of the state, and that the business continues to grow steadily.

He is in need of one, or possibly two, mechanically inclined NRI graduates. He says he believes he has a fine opportunity for a good man who needs practical experience. His washing machine, electric and gasoline motor repair business all fit in well with Radio repair work.

If any qualified students or graduates are interested in this opportunity, we suggest that they write a good letter of application to Mr. Rice.

NEW TUBE TEST DATA AVAILABLE FOR NRI PROFESSIONAL TUBE TESTERS

Read Carefully Before Ordering

Students and Graduates of NRI who have purchased either a Model 66, 67 or 68 NRI Professional Tube Tester will be interested to know there is now available a new up-to-date tube chart for these models. The cost is $1.00 with order. No C.O.D.'s, please. New tubes have been introduced during the past few years, perhaps the most important type being the new 9 pin miniature tubes which are found frequently in FM and Television receivers. These are tubes such as the type 12AT7, type 6T8, type 12AX7, etc.

Below is an order blank which you may clip out and use in ordering an instruction booklet for your NRI Tube Tester. Be sure to clearly state the model number of your Tube Tester. If you do not wish to remove the order blank from your copy of this magazine, you may include the required information in a brief letter. However, to speed up the handling of your order, please do not include any questions concerning other problems.

ORDER BLANK for New Tube Test Data Books for NRI Tube Testers

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

Enclosed is $1.00*. Please send, postpaid:

☐ A new, up-to-date tube chart for the Model 66 NRI Professional Tube Tester.

☐ A new(up-to-date tube chart for the Model 67 NRI Professional Tube Tester. (Also used with present Model 68.)

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

Address .....

City..... State.....

The Model number of my Tube Tester is

Model.....

***If you live in the District of Columbia, please enclose an additional 2c for D.C. sales tax. (Total $1.02.)**

Alumnus Chester H. Hefner, who is an Assistant Building Inspector, has some sound criticism of our article "Installing Three-Way Switches"

As an alumnus of NRI, I receive and read all copies of NATIONAL RADIO NEWS with much pleasure. However being now Assistant Building Inspector of San Mateo County, California I feel it necessary that I write you in regard to an article titled "Installing Three-Way Switches" in February-March-1950 issue. Any criticisms herewith are given in a spirit of cooperation and I hope they will be received in the same light.

First—as a local Inspector (electrical), and as a member of the International Association of Electrical Inspectors, I am quite concerned in having all wiring inspected no matter where it may be installed.

Second—I feel that possibly you wandered a little afield with this article which pertains to Electrical wiring rather than to Radio and TV.

Third—I feel concerned for the Alumnus or student who may proceed exactly as outlined in your article and have trouble due to having done so.

Why? That is a good question and deserves an answer.

First—Your article does not advise that the first thing necessary to do wiring in many localities is a permit. This must be obtained from the local inspector before any wiring is started.

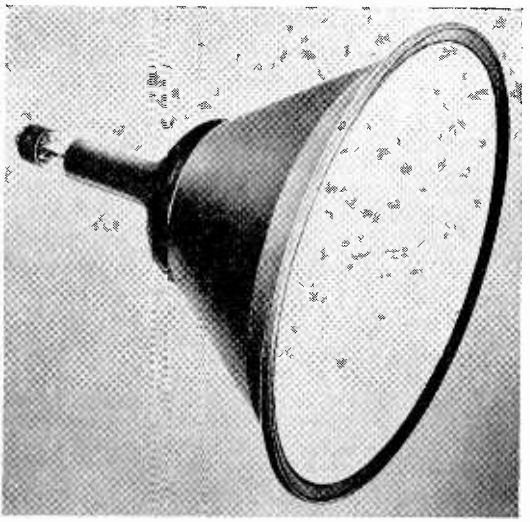
Second—As stated in this article. "The method described is in accordance with the National Electrical Wiring Code." This code specifically states that the requirements are a minimum and that it is not to be used as a standard.

Third—Many localities have amending and supplementary ordinances. For instance in this county armored cable (BX) may be used only by special permission of the Electrical Inspector.

Also if this student or alumnus happens to live in an apartment or the job happens to be in a store or shop conduit is required.

I personally would prefer that the articles be confined to subjects related to Radio and TV as I think this article is a little out of that field. Hoping that this may do some good I remain,

CHESTER H. HEFNER.
Redwood City,
California.



16" TV Picture Tube Is 20% Shorter

A 16 inch metal TV viewing tube, five inches shorter than the 16AP4, has been announced by Sylvania Electric Products, Inc., 500 Fifth Avenue, New York 18, New York.

The tube, type 16GP4, is also ¼" shorter than the standard 10" types. Deflection angle is 70 degrees, or approximately 15 degrees greater than prior types of the same screen diameter. The tube is supplied with a neutral gray face plate to improve picture contracts, particularly in the presence of high ambient light levels.

Enormity of U.S. Budget Staggers the Imagination

Piled In Dollar Bills It Would Rise 15 Million Feet

By

BOB CONSIDINE

(Noted Author and Columnist)

DO you have the faintest idea how much is $42,500,000,000?

You're going to have to raise part of it, to fill the president's budget for the next fiscal year and enable him to pay the costs of running the most complex organization in history—the U. S. Government.

If you're anything like me, Mac, you can't think very clearly when confronted by figures more than four digits. You plod along wondering when you're going to get an extra buck to stash away or play around with, and when the boys in Washington tap you over the skull with the word "billion" it no longer hurts.

We've become so punchy with big figures that it might be helpful today to re-explain the lost enormity of the word "billion."

Let's use the birth of Christ, 1950 years ago, as a kind of key to a better understanding of some of the figures that are rolling off our collective backs today.

A billion is an everyday term at the moment, but do you realize that scarcely more than one billion minutes have ticked off the sun-dials and watches of the world since the birth of Christ?

Only 17 million hours have gone by since the event at Bethlehem, and we think of $17 millions today as something that might be a gift to a minor (very minor) country—for irrigation, or some such.

Now, for some mathematical reflections on the money involved in the president's request for cabbage enough to operate us for one year. Remember, one year!

If you were born when Christ was and had broken the habit of sleeping and had the cash, and were immune to death, you would have had to spend $42 a minute, night and day, for 1950 years to equal what we're going to spend in the next year.

That would mean you'd spend $2,500 an hour; a lot of mink coats over the years.

Or about $60,000 each 24-hour day . . . right down through the years of the Apostles, the Crusades, the Dark Ages, the Age of Exploration, the deliberate formation of the United States, the Birth of the Industrial Age, the Civil War, the two World Wars—and up to this minute.

That would mean you'd have had to spend around $22,000,000 a year, every year, for nineteen and a half centuries, in order to come up to what we'll spend in one fiscal year of peace!

For what we're going to spend next fiscal year, we could have arranged for the Louisiana purchase and then repurchased it from Napoleon 3,000 additional times at the same $15,000,000 rate. But for the original $15,000,000 we got nearly a million square miles of the richest land on earth, carved eventually into more than two dozen of our 48 states.

We could have bought and rebought Alaska 6,000 times.

A man at the treasury department told me that it takes 233 new $1 bills to stack up an inch. That's $2,796 to the foot.

In other (and appalling) words, if you changed the president's budget into dollar bills, and stacked them it would create a titanic tower reaching 15,200,000 feet into the air! The uppermost limit man has reached in going into the air, is about 60,000 feet. He needs oxygen tanks after 15,000.

If you laid the same 42½ billion dollars end to end (the dollar bill is 6.14 inches long) they would stretch out more than a quarter of a trillion inches long. That would make 16 stacks of bills reaching between the earth and the moon, or 160 belts of dollar bills around the world!

Anyway, let's stop saying, "it's later than you think." How about changing to "it's more than you think." And, to top all of these heady statistics, and to give me a chance to sit down for a moment, did you read that little sentence that was buried down in the stories about the budget? It said that $42½ wouldn't be enough, really.

We'll go an additional five billion in the red—regardless.

Ideas for A Home Work Bench

Dear Mr. Smith:

"Since graduating from your school I have been doing part time service work and also helping a local serviceman during rush seasons. In doing part time service work in my home, I needed a compact arrangement for my equipment. I decided a roll-top desk would be just the thing I needed and was lucky enough to find a large one at an auction sale. After removing the pigeonholes, I constructed a panel into which all my instruments could be placed.

"As you can see from the picture, the lower section of the panel is vertical. The upper section is sloped to match the sloping panels of the NRI instruments. From left to right in the lower section of the panel is the main line switch and above it an instrument fuse. These control all power in the bench.

"Next is the output of the isolation transformer, which is mounted behind the panel. I constructed this transformer, using the core of an old radio power transformer. The secondary is tapped in 5 volt steps from 90 volts to 135 volts. The taps are connected to a selector switch and the outlet is connected to a voltmeter so that the output voltage can be checked at all times. The on-off switch is connected to the primary of the transformer.

"Next is the ground terminal and the antenna terminal. On the right are two phone jacks marked plus and minus. Through a selector switch various values of capacitors are connected to these jacks for capacitor substitution. On the right side of the desk a double a.c. outlet is mounted, into which the soldering iron is plugged. On the front of the desk two double a.c. outlets are mounted.

"The top of the desk is covered with linoleum. The drawers give me plenty of storage space. When I am not using the desk, I can close the roll top to keep my instruments from getting dusty and also to keep the children's hands off of them. I have found that this arrangement has been very satisfactory. I can do all the work and get at replacement parts without getting up from my chair.

"I hope my ideas will be of some help to any one who has the same problem that I had—a small, neat, and efficient workbench. Later on I'm going to build and mount a six volt d.c. supply in the panel above the RC Tester, which will enable me to work on car radios.

"During the past year I have averaged nearly $10 per week in part time Radio servicing. Although the pay I receive in my regular work as a laboratory technician in an experimental laboratory is higher than average, the extra money which I receive in part time service work comes in handy especially when a man has five children to provide for."

H. K. Gressel,
Columbus, Indiana

N.R.I. ALUMNI NEWS

"PROPERTY is the fruit of labor; property is desirable; it is a positive good in the world; that some should be rich shows that others may become rich, and hence is just encouragement to industry and enterprise. Let not him who is houseless pull down the house of another, but let him work diligently and build one for himself, thus by example assuring that his own shall be safe from violence when built."

—ABRAHAM LINCOLN,
March 21, 1864

Chapter Chatter

The past months have seen much interesting and beneficial activity on the part of the NRI local Alumni Chapters. Most of the chapters have increased their membership considerably, and all of the chapters stand ready to welcome NRI men as visitors or prospective members. Contact the secretary of your nearest chapter if you wish to enjoy this fellowship.

Mr. Kraft, Mr. Seganti and Mr. Morris were appointed to act on our newly created "Educational Committee." This Committee was partly inspired by the well planned program announcements which we have received from New York Chapter. We hope to instigate something similar to this in Phila-Camden Chapter. Harvey Morris continues his interesting and beneficial discussions on television trouble shooting. Due to his great experience in this field, he is of inestimable service to our chapter.

A meeting of the Auditing Committee of Phila-Camden Chapter, held at the home of Secretary Honnen. Left to right, front row: J. McCaffery, R. Honnen, and M. Segal. Back row: J. Rooney, C. Hill, C. Fehn, and J. Cohen.

Phila-Camden Chapter

Election results for Phila-Camden Chapter are as follows: Chairman, Clifford Hill; Vice-Chairman, Norman Kraft; Recording Secretary, Robert Honnen; Financial Secretary, Joseph Rooney; Treasurer, Charles Fehn; Librarian, Julius Cohen; and Sergeant at Arms, Fred Mascavis. The chairmanship in our chapter is in very good hands, and our chairman is assisted by an extremely able and enthusiastic staff of officers. We know that they will guide us through the current year in a very successful way.

Television has been our main discussion; this subject seeming to arouse the greatest interest among our members, old and new.

Our chapter received four new members recently, as follows: Jerry Toscano, Raymond Stout, Mac Kessluk and John Balk.

Meeting nights are the second and fourth Monday of each month, 4510 Frankford Avenue, in Philadelphia.

ROBERT L. HONNEN, Secretary,
132 S. 58th Street,
Philadelphia 39, Penna.

Chicago Chapter

Our new quarters in the upper tower space of the American Furniture Mart building are proving very satisfactory. We now have facilities in our laboratory for cooking hot dogs and preparing coffee. This greatly facilitates our serving refreshments.

Our Treasurer, Mr. Clark Adamson, a very active member of our chapter, recently gave a lecture on "Getting Started with Television." All of our members enjoyed his lecture, and we have

Floyd Buehler (Standing) delivering a lecture at a meeting of Detroit Chapter. Clarence McMaster, Chairman of Detroit Chapter, is seated at the head table.

other equally good lectures planned for future meetings. We hope to include service information on hearing aids in one of our next meetings.

An unusually instructive talk was recently delivered by Mr. Saffro, on the subject of Meters. He discussed the various types, their merits and general usefulness. Blackboard illustrations emphasized points of particular interest, and a Round Table discussion followed.

Our members are giving their full support to our new cash fund, created to finance the purchase of radio and television test equipment, experimental kits and parts necessary for our laboratory work. We are making plans to purchase additional equipment to increase the interest of our laboratory sessions.

Attendance is good. However, we do hope that more NRI men in our locality will be able to join us. Regular meetings are held once a month, on the second Wednesday of the month, in Room 1745, Merchandise Mart, 666 North Lake Shore Drive. Enter the building through the West door.

CHARLES C. MEADE, Secretary,
666 N. Lake Shore Drive, Rm. 227,
Chicago 11, Illinois.

Detroit Chapter

As a diversion from the routine of regular meetings, Detroit Chapter held a stag party on February 24. Arrangements were made by Chairman Clarence McMaster to hold the party in Amherstburg, Ont., Canada where McMaster lives.

Because of the rather large attendance the party was held at the spacious home of Mr. and Mrs. Merrifield, the parents of Mrs. McMaster. Detroit Chapter will ever be grateful to these good people for their hospitality. Food and refreshments were served in abundance, the entertainment was delightful. Mr. Merrifield went to great lengths to see that the boys had a good time. Gracious Mrs. McMaster and her equally charming mother were extremely attentive to every want of every one present. To these good people and to Chairman McMaster our thanks for an evening that will live long in the memory of all who attended.

Brief talks were made by the chairman, Secretary Stephens, and also by L. L. Menne, who came from Washington to be with us.

The trip to Amherstburg was made by automobiles in a caravan that assembled at a given point on the Canadian side of the tunnel. It had snowed very hard but Mr. McMaster used his influence, the snow plow had cleared the roads, and except for a bit of discomfort owing to zero temperature the long trip to Amherstburg was without mishap. However the boys will not soon forget the walk to Clarence McMaster's home to see his house and radio lay-out. McMaster said he lived "right next door." So we bundled up in overcoats and rubbers to brave the elements. "Right next door" proved to be a good quarter of a mile in the face of a strong, unsympathetic wind. There was much good-natured ribbing of McMaster who made light of the wailings of the less hardy. The visit to McMaster's cozy home was very interesting. Then out again into the wintry blasts to return to the warmth and glow of the Merrifield home and the party. A swell affair. Thanks also to Harry Stephens, Earl Oliver, Floyd Buehler, Harold Chase, Bob Mains, Larry Upham and so many others who did so much to add to the festivities. We want more of these parties.

Great interest has been shown by our members in chapter meetings. One of our older members, Bernard Hiller, donated two large boxes full of Radio books. We sold these books to chapter members at an auction, with Stephen Grajek

acting as the auctioneer. Proceeds from the sale of the books were very gratifying.

Earl Oliver continues to conduct our very popular service forum. Members are invited to bring exceptionally difficult repair jobs with them to chapter meetings where they will receive the assistance of the more experienced members.

Some excellent technical films have been presented at our meetings. The films are obtained through the arrangements of our Floyd Buehler.

Robert Mains delivered a very good talk on television servicing. Our chapter is discussing the advisability of purchasing a television receiver kit for experimental purposes. We plan to purchase the kit soon.

Bernard Hiller also donated a post-card size rotary duplicator to our chapter, and we have recently acquired a new addressing machine. This equipment will greatly lessen the work of our Secretary, and will enable more attractive announcements covering chapter activities.

Our meetings are held at 21 Henry Street, at Woodward, on the second and fourth Fridays of each month.

HARRY R. STEPHENS, Secretary,
5910 Grayton, Detroit 24, Mich.

New York Chapter

As this material is written, a very successful winter season of chapter activities is coming to an end. We are planning additional activities for the coming months which will be of great benefit to all.

A series of lectures on the Cathode Ray Oscilloscope have been delivered by our member-lecturer James J. Newbeck. The first lecture was entitled "The Cathode Ray Tube." This lecture took up the construction and beam formation in the Cathode Ray Tube.

Mr. Newbeck's next lecture was on "Saw-tooth Generators for Beam Deflectors." This included information on Gas filled triodes, Multi-Vibrators, and blocking oscillators.

Another lecture in this series was on "synchronization." Newbeck discussed the obtaining of one or more types of wave forms. A lecture, yet to come in the series, is entitled "Servicing With the Oscilloscope."

Our speakers are greatly encouraged by the support which our members give them through their regular attendance.

We meet on the first and third Thursday of each month, at St. Marks Community Center,

12 St. Mark's Place, between Second and Third Avenues, in New York City. Time—8:30 P.M.

LOUIS J. KUNERT, Secretary,
539 Seaford Avenue,
Massapequa, New York.

Baltimore Chapter

We have held our annual installation of officers for the coming year. Several new members have been admitted to our chapter, including Frank Wilson, John Maskol, and Michael Betley.

Worthwhile contributions have been made by several of our members in the form of lectures and discussions. H. J. Rathbun delivered a lecture on "Installation of Selenium Rectifiers." At another meeting, Mr. Rathbun conducted a television quiz asking the chapter members various questions on TV.

Thomas Clark recently held a question and answer forum on Radio and Television. This talk was very interesting.

Ernest Gosnell contributed a very informative lecture on "Power Supplies and Servicing by Voltage Measurements."

We meet weekly, each Tuesday night, except the first Tuesday in the month, at 745 West Baltimore Street, in Red Man's Hall.

THOMAS KELLY, Secretary,
1414 Mt. Royal Avenue,
Baltimore 17, Maryland.

n r i

Directory of NRI Alumni Association Officers

President—Harvey W. Morris, 6216 Charles St., Philadelphia, Penn.
Vice President—F. Earl Oliver, 3999 Bedford, Detroit, Mich.
Vice President—Alexander M. Remer, 517 W. 161st St., New York 32, N. Y.
Vice President—Oliver B. Hill, 610 E. Verdugo Ave., Burbank, Calif.
Vice President—Claude W. Longstreet, 533 Rahway Ave., Westfield, N. J.
Executive Secretary—Louis L. Menne, National Radio Institute, 16th and You Sts., N. W., Washington 9, D. C.

Here And There Among Alumni Members

A recent visitor at NRI was graduate Donald M. Hughes, of Defiance, Ohio. Graduate Hughes has been employed for the past few years with the Magnavox Corporation, Fort Wayne, Indiana. He was visiting Washington on company business, and dropped in at NRI to chat with Chief Instructor Dowie.

———*n r i*———

Frank J. Lhotsky of Cicero, Illinois, is approaching his 69th birthday, but is as active as ever in his full-time radio shop. Mr. Lhotsky graduated in 1935. He has been doing nicely in Radio ever since.

———*n r i*———

Joaquim Almeida of Pawtucket, Rhode Island, a recent NRI graduate under the GI Bill, sends us a photo of his workbench. It's a peach! Nicely arranged and contains several NRI testing instruments. Mr. Almeida is very proud of his shop and has good reason to be.

———*n r i*———

Graduate Clyde J. Burdette, Chief Engineer of WORD/WOXY-FM, Spartanburg, South Carolina, has long coveted a radio amatuer license. He writes that at last he has obtained his amateur license, call W4PDM.

———*n r i*———

Ashley S. Arrowood, Jr. of Knoxville, Tennessee has good and bad news. He passed the examination for a second-class Radio-telephone license, and is going to Atlanta, Georgia to try for a first-class license. A job as an instructor in a Radio school in Tennessee is awaiting him as soon as he gets his first-class license. On the unhappy side is the news that his house burned down—a complete loss. Well, the sun just cannot shine every day in any life.

———*n r i*———

NRI Graduate Jack Murphy, of Leaksville, North Carolina, stopped in to visit us here at NRI. He was on his way home after recently being discharged from the United States Air Force. Murphy has been a Radio mechanic for the past eighteen months, and hopes to continue his Radio activities in civilian life. We wish him the best of luck.

———*n r i*———

Quentin B. Dowdy is transmitter engineer at Station WTPR in Paris, Tennessee. He gives NRI full credit for his success in Radio. Never had any other training. Incidentally, Mr. Dowdy is soon to take the examination for an amateur license.

———*n r i*———

We are delighted to hear that Graduate Leon Aboud, of Jacksonville, Florida, has obtained his amateur license. He also has a part-time radio shop in his "back room." Clears $15 to $20 a week. Graduate Aboud wrote to inquire about NRI's new Radio and Television Communication course.

Alumunus H. Leslie Garrison is now serving as an engineer and technician at Station TGNA, in Guatemala City, Central America. This station will soon become the voice of the Central American Mission. Garrison holds an Amateur License and a General Certificate in Radio Proficiency granted by the Canadian Government.

———*n r i*———

Alumnus George Ott, Jr., of Meadville, Penna., whose photo appeared on the cover of the last issue of NR News, asked us to mention his interest in meeting other NRI students or graduates. Says he will be pleased to give technical assistance and a discount on parts to NRI men.

———*n r i*———

The word from Karl W. Bierdemann, Jr., of Tucson, Arizona, is that: "The radio business is pretty good right now. People are having their radios repaired in preference to buying some of the newer sets now on the market. My business is very small, but it is growing all the time."

———*n r i*———

From Dayton, Ohio comes word that Aldin Trickler is doing nicely in Radio and TV repairing. It is nice to get this good report.

———*n r i*———

William R. Channer of Kelso, Washington reports he has a nice set-up in a growing sales and service business in his home town.

———*n r i*———

Rene D. Fontaine is employed as a Television technician by the Lynn Television Service of Lynn, Massachusetts. Is doing very well.

———*n r i*———

George Olexa, Jr., of Perth Amboy, New Jersey, is operating his own Radio and Television store. In the past two years he has serviced RCA, DuMont, Admiral, Emerson, Crosley, Fada, Teletone, Transvision, Philco, G.E., Motorola and Arvin television receivers. We think this is quite a lot of experience.

———*n r i*———

George R. Bailey, of Cambridge, Massachusetts, tells us he thinks Radio is the greatest hobby. He has repaired hundreds of them, and is very proud of the fact that many of his friends will not allow any one else to work on their Radio receivers.

———*n r i*———

By the way, this page is for the big NRI Alumni Association family, now numbering close to 10,000. If you have anything for this page please shoot it along. Address it to the editor.

———*n r i*———

Edward B. Arnell of Richmond Hill, New York, is operating a spare time Radio and Television servicing business. He is getting ready for the time he will retire from his regular job. Building up his stock—and good will.

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

For:

Mr. Francis H. Fingado 25236 4
611 17th St.
Denver 2, Colo.

POSTMASTER: If addressee has removed, notify sender on FORM 3547 postage for which is guaranteed.

National RADIO-TV NEWS

Vol. 14 April-May, 1950 No. 2

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
J. B. STRAUGHN, TECHNICAL EDITOR

Index

Printed in U.S.A.