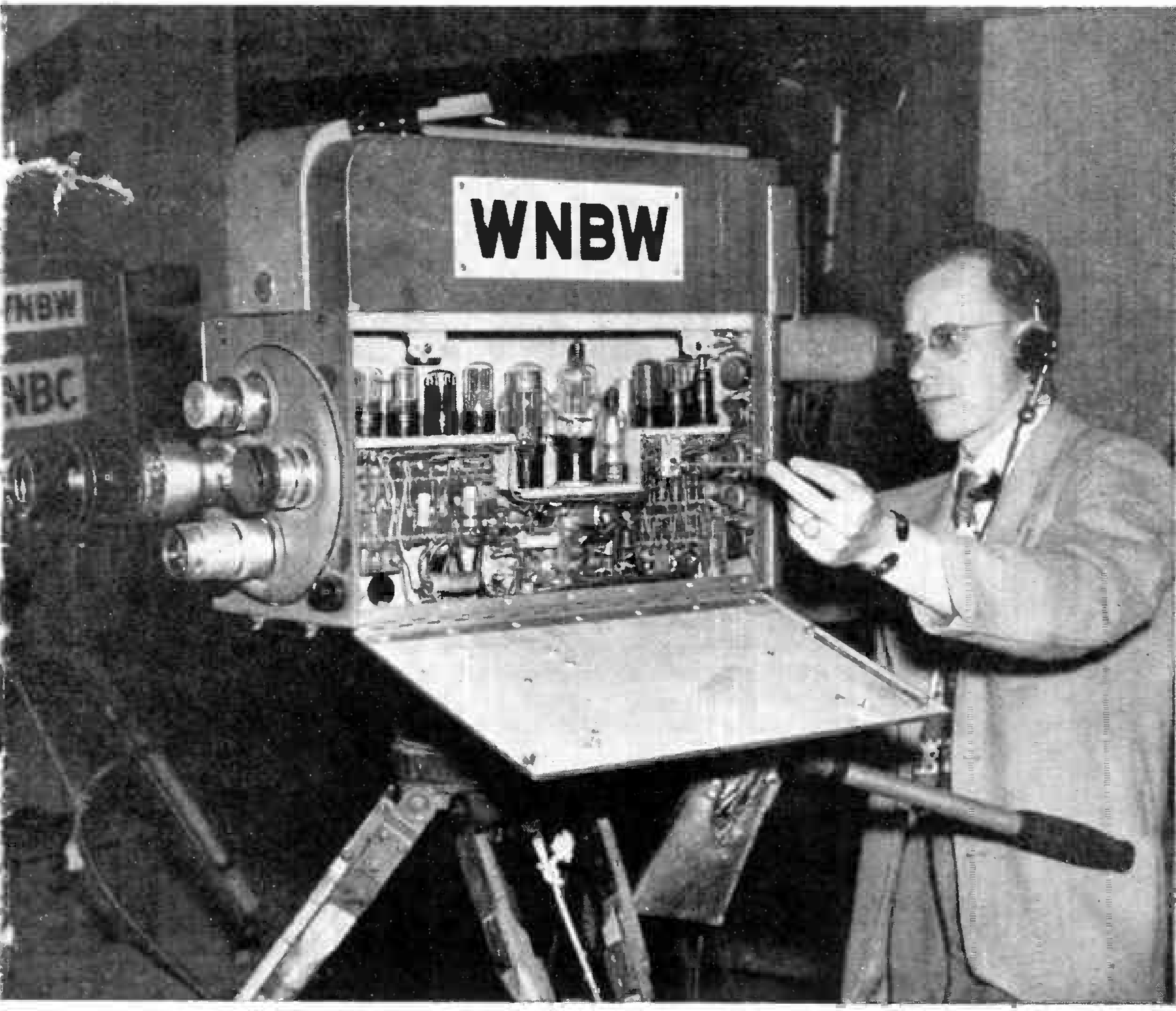
NATIONAL RADIO NEWS



IN THIS ISSUE

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The Era of Radio-Television

In this issue of NR NEWS we give our readers two splendid articles on Television. The beginner student, if he finds these articles somewhat difficult to comprehend, should retain them for future reading. As he progresses in the study of his lessons, the magic of Radio-Television will become clearer and clearer to him. Things which now seem "too deep" to him will then be understandable and he will take delight in conversing with others on the subject.

Those of us who live in urban areas such as Washington, New York, Philadelphia, Baltimore, Chicago, Pittsburgh, Dallas, San Francisco, to mention a few, know that Television is here to stay. The public has taken to it and with the gradual decrease in the cost of receivers, more and more are being purchased. At this time there are close to a million and a half television receivers in the United States. It is estimated that by 1955 there will be over ten million television receivers in use.

A television receiver is actually a big radio receiver. It is common to find twenty-four or more radio tubes in a television receiver. The picture tube, it might be said, is just a huge vacuum tube where the stream of electrons paints the picture.

I say these things to point out that the television receiver can be mastered and repaired efficiently and effectively only by a thorough knowledge of the fundamental principles of Radio and radio receiver operation.

The road to expert television repair starts through adequate training and experience in regular radio service repairs and then television repairs.

There is this important point about Television. People who have television receivers do not tolerate distortion, for the slightest visual defect is immediately obvious and the owner insists upon repairs. Defects which are put up with in a radio receiver, or which go unnoticed, quickly bring a call for a service man when they occur in a television set.

Be prepared for this new Radio-Television era by mastering your NRI Course. It's a rich opportunity for you. The addition of Television to the Radio industry brings with it new jobs, higher earning possibilities, wider opportunities to the radio man.

J. E. SMITH, *President.*

TV ANTENNA INSTALLATIONS

William F. Dunn

By WILLIAM F. DUNN

NRI Consultant

THE most commonly used antennas for Television reception are the dipole and the folded dipole. These antennas are shown in Figs. 1 and 2. The dipole has a characteristic impedance of approximately 72 ohms whereas the folded dipole is four times this impedance, 288 ohms or approximately 300 ohms.

Both antennas are bi-directional and have maximum pickup when cut to one-half wavelength at the operating frequency. Under these conditions maximum pickup is broadside to the antenna as shown in Fig. 3.

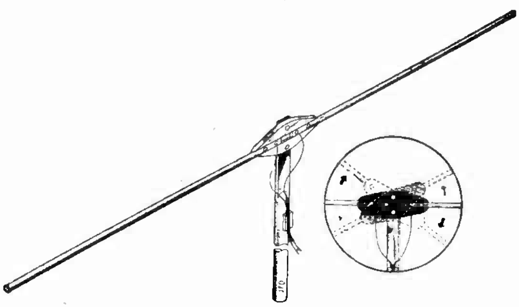
A dipole cut to a half wavelength in the center of the low TV channel will be approximately 3/2 wavelengths long on the high band. The pattern is shown in Fig. 4. Note that maximum pickup is no longer obtained broadside to the antenna, but at an angle of about 45°.

Fig. 5 shows how the change in patterns may be used advantageously in a TV installation. Suppose station A operates on channel 4 (low band) and station B on channel 7 (high band). If they are spaced approximately as shown the antenna may be positioned broadside to channel 4 for maximum pickup. In this position maximum signal pickup on a high band station would occur at approximately 45 degrees which would take care of channel 7.

If the two stations are located in approximately the same place it may be necessary to use separate antennas, one cut to ½ wavelength for each station and positioned individually.

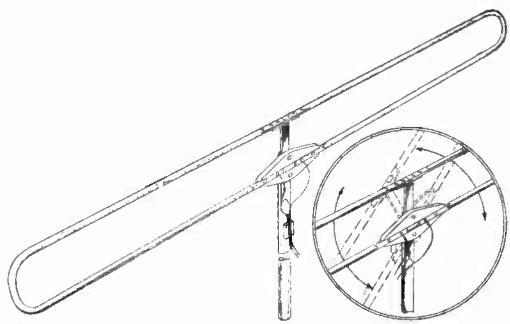
Both the dipole and the folded dipole may be used with reflectors. This will result in some gain in the antenna, but more important it will give the antenna uni-directional characteristics.

In an installation such as shown in Fig. 6, ghosts would result due to reflected signals from the



Courtesy of J.F.D. MFG. CO.

Fig. 1. Simple dipole antenna.



Courtesy of J.F.D. MFG. CO.

Fig. 2. Folded dipole antenna.

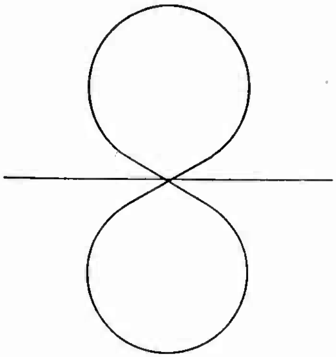


Fig. 3. Antenna pattern for half-wave dipole.

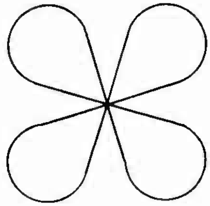


Fig. 4. Antenna pattern for $1\frac{1}{2}$ wave dipole.

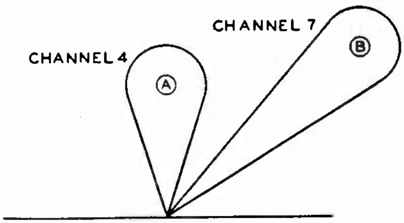


Fig. 5. Utilizing change in antenna pattern.

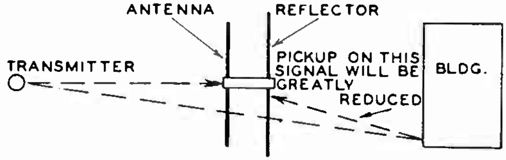


Fig. 6. Use of reflector to reduce ghosts.

building striking the antenna. By using a reflector, signal pickup from the back of the antenna will be greatly reduced, eliminating the ghosts.

In urban or suburban areas the signal strength is usually comparatively high and a dipole or folded dipole will give satisfactory signal pickup. The only problems encountered are due to ghosts, noise and various types of R.F. interference. The ghosts can usually be eliminated by using a reflector and carefully positioning the antenna. If the serviceman has the "know how" and the patience, it's possible to eliminate most of the interference and obtain pictures of good quality on all stations.

Selecting the Transmission Line

There are so many different types of transmission line on the market today that the selection of the correct type may be somewhat confusing. Actually it is simple if a few rules are remembered. (1) Select a line having the same characteristic impedance as the input of the set. This leaves only two types, the 300-ohm twin lead and the 75-ohm coax. These two types will take care of practically every set. (2) The conventional 300-ohm twin lead is not shielded and therefore noise may be picked up by this type of transmission line. In business areas use the new 300-ohm shielded twin lead. It is more expensive than the open type, but it will save time and trouble and probably the necessity of doing the installation over again using 300-ohm shielded line.

Choosing the Antenna

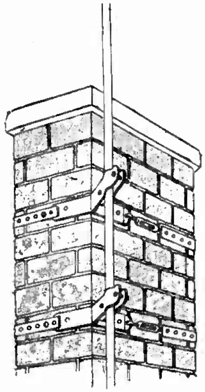
This also can be comparatively simple. Use a folded dipole on sets having a 300-ohm input and a dipole on those having a 75-ohm input. Where ghosts are likely to be encountered, a reflector will be helpful. If TV stations are operating on both high and low bands, a high band adapter should be used.

The Installation

When making the installation, it is well to remember that not only must the original results be good, but the good performance must continue. The antenna must be securely mounted, and the lead-in secured so that it will not be damaged and also to avoid the possibility of pulling or breaking loose from the antenna.

If there are a number of television antennas already erected in the neighborhood, considerable information can be gained by studying these installations. For example, if you notice that the servicemen who have made previous installations found it necessary to use a reflector the chances are that the new installation will also require a reflector. The directions that the antennas are pointing also should be helpful in determining approximately the orientation of the new antenna. Of course, the final test is to actually rotate the antenna for best results, but usually an approximate setting can be obtained by positioning the antenna in the same direction as those already installed.

Probably the first thing to do is to discuss with the set owner the location of the receiver. In most cases the owner will have a definite place picked out for the location of the new set and if the location is at all suitable it probably would be advisable to go ahead and plan the installation with the receiver in that particular position. If the location is obviously unsuitable, it might be advisable to point this out to the customer, but do not insist that the set be placed in a different location — the customer probably will never be satisfied until it is at least tried in the original position.



Courtesy Metalace Corp., New York City

Fig. 7

The next step should be to survey the location to determine the best position to mount the antenna. In doing this the receiver's location should be considered so that the transmission line can be run as direct and as conveniently as possible. Also, the availability of a suitable place to mount the antenna must be considered. If the customer is placing the set in a room in the front of the house and the roof on the front of the house is sloped, it would definitely be better to mount the antenna on a flat portion of the roof even though it might necessitate the running of a longer transmission line. Installations on sloped roofs should be avoided at all costs—they are much more difficult to make than any other type of installation and in addition there is danger of damaging the roof.

In considering the manner in which the transmission line is to be brought into the house, there are many things to be considered. Generally speaking the transmission line should be run as direct as possible and also it should be kept as far as possible away from possible interference sources. For example, a transmission line brought down the back of the house away from the street is much less likely to pick up ignition interference than one that is brought down on the street side of the house. It is well worth while to make sure that the transmission line is going to be out of the way. If it is in a place where it might be tampered with by children playing in the area this could result in a number of costly call-backs for the serviceman.

With these points in mind it is possible to go ahead and decide on the best location for the antenna and the best way to run the lead in.

Once the position of the antenna has been decided upon, the proper mounting devices can be selected. If it is necessary to drill holes in masonry they can be done by means of an electric drill or by means of a star drill. Do not try to rush this portion of the job—it's probably the most important. If the mounting devices used for the antenna mast are not securely put up, the mast will probably fall down during the first storm. This is going to result in a call-back and of course there is the possibility of serious legal difficulties if someone should be hurt by the falling antenna and mast.

Mounting the Antenna

There are many different types of mounting devices available for mounting the TV antenna on the roof. Probably the easiest ones to use are those that permit the strapping of the antenna mast to the chimney, vent pipe or some other object protruding from the roof of the house.

Chimney straps similar to those shown in Fig. 7 have proved quite satisfactory. When the antenna mast is to be mounted on the chimney, the chimney strap is superior to a mounting device that requires knocking holes in the chimney. Straps are very easy to work with and are becoming increasingly popular because it is usually possible for one man to complete an entire installation when this type of mounting is used.

In most installations in metropolitan areas where a chimney strap is used, sufficient support on the mast is obtained by the strap so it will not be necessary to use any guys on the mast. This is simply because an extremely high mast is not required in strong signal areas. Usually the mast need not be longer than from 8 to 10 feet.

In installations where the antenna mast is to be strapped to a vent pipe, straps are available that can be first mounted on the vent pipe and made reasonably tight. The antenna mast is then inserted in the straps and the straps are tightened to hold the mast in position. Of course, the straps should not be made too tight because it probably will be necessary to rotate the mast in order to obtain best signal pickup.

Using this type of mounting generally eliminates the need for a ground on the antenna mast because the vent pipe is grounded to the plumbing system in the house. However, whenever this type of mounting has been used you must be careful not to touch the dipole when the antenna is being oriented for best signal pickup. Touching the dipole and the mast at the same time may result in a shock. Although the shock may not be serious, if the vent pipe is located near the edge of the roof, there is the danger of your fall-

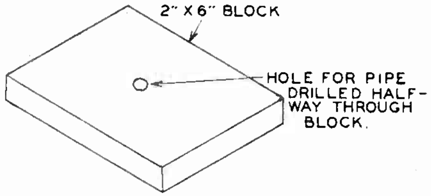
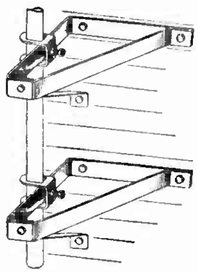


Fig. 8. Wood block for mounting antenna on a flat roof.



Courtesy Snyder Mfg. Co., Phila., Pa.

Fig. 10. Brackets for mounting antenna on any vertical part of house.

ing off the roof and being seriusly injured.

On flat roofs an antenna may be easily mounted by using a 2" x 6" x 6" board at the base of the antenna. (Fig. 8.) It might be advisable to use two pieces of lumber this size. A hole can be drilled through the first or top piece of wood large enough to accommodate the antenna mast. Then when the mast is placed in the hole and the top board secured to the lower board, the base of the mast will be held securely in position. In this type of installation it is necessary to use guy wires to support the mast.

Where installations are to be made on a flat roof, frequently the walls of the building are built up above the roof. If these walls are brick, it may be advisable to mount the antenna on the top of the brick side wall. To do this, two pieces of two by four, with a hole large enough to mount the antenna mast drilled in the top piece, (as previously described) can be used. The two pieces of two by four can be secured directly to the brick wall. This can be done by cutting holes in the brick with a star drill or an electric drill and then securing the two blocks directly on the wall.

The only difficulty with this type of mounting is that one of the guy wires cannot be anchored to the building, but will have to extend off beyond one side. There may be some nearby object—possibly another building—that this guy can be secured to. Of course, if the object to which this guy is to be secured is not on the TV set owner's property, permission must be obtained before running this guy.

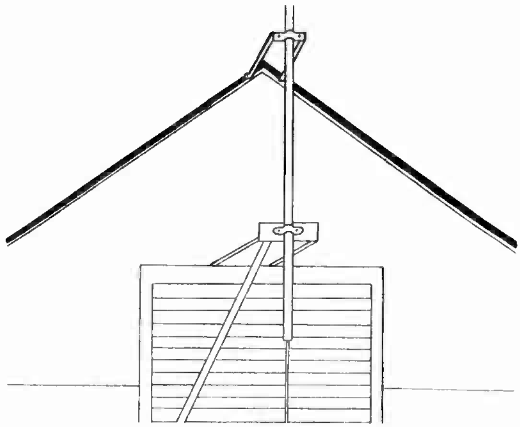


Fig. 9. One type of support used for mounting antenna at peak of gable.

Some installations must be made on buildings having a gable type of roof. It is extremely difficult to install an antenna on a sloped roof without damaging the roof. It probably would be advisable to avoid this type of installation, because it is so easy to damage the roof and there are other simpler ways of mounting the antenna.

Supports are available so that the antenna may be mounted near the peak of the gable on the side of the house as shown in Figures 9 and 10. This permits mounting the antenna on a flat surface and there's no danger of causing leaks in the roof. To mount one type of antenna, six holes must be cut in the brick—three for each strap. The straps are then to be mounted on the wall. Once the supports have been properly secured to the wall, the assembled antenna, mounted on the mast, can be placed into position. This is a rather difficult job because there is no place on the roof to stand and lower the antenna into position. Actually, the simplest way to mount the antenna is to carry the assembled unit up a ladder and insert it in place. The mounts, if they are put up properly, should be quite rugged and give additional support to the person on the ladder while the antenna and mast are being put in proper position.

It is impossible to cover all of the various installation problems considering the mechanical difficulties that might be encountered. With each installation the person making the installation should take time to plan the job and should consider each phase of the job. This should avoid getting the installation half way through and then finding out that it is not going to be suitable.

For example, it would be foolish to attempt to mount an antenna mast by drilling holes in the brick of a chimney that is in poor condition. Attempting to secure the mast to the bricks in the chimney would probably result in damaging the chimney, and even if the damage did not occur while the installation was being made, it is altogether likely that the first time there was a storm the antenna would come down. It is not advisable to attempt to knock any holes in bricks or any type of masonry that is obviously in poor condition.

When mounting antennas on wooden structures the same precautions are necessary. Do not attempt to secure the antenna mast to any wood that is rotting. The antenna must be securely mounted to a wooden building by means of screws that are large enough to obtain a good hold on the wood. If the mounts are not securely fastened and there is any play whatsoever, the masts will have a tendency to whip as the wind blows and it will not be long before it rips the mounts out of place. When mounting antenna supports on a wooden building, it is usually advisable to first drill a small hole so the screw can be easily turned in place. Do not attempt to drive the screw into place with a hammer—it must be turned in with a screwdriver in order to hold as it should. The antenna mounts or supports must not be nailed in place; they'll pull loose much too easily. However, it is usually permissible to nail a support for the lead in place since there will be little or no strain on it.

Mounting the Antenna Straps

To drill a hole in a brick wall a star drill or a masonry drill should be employed. When using a star drill the right-handed person should grasp the star drill in the left hand. It should be held in a position so that the end to be struck by the hammer can be held steady. The hand should not be placed too near this end in case you miss with the hammer. It probably would be advisable to wear gloves both to keep the hands clean and to protect them.

The star drill should be struck with the hammer firmly. Do not try to use too much force—nothing will be accomplished except the possibility of cracking the brick or missing the star drill and injuring the hand holding the drill.

Each time you strike the star drill it should be rotated slightly. The drill is to be continually rotated in a circle so that the hole will be cut neatly in the brick. If you hold the drill stationary in one position and continue to strike it, it will bind and the work will progress much slower than if it is rotated. In the end, you'll have to rotate the drill in order to obtain a round or approximately round hole.

When cutting a hole in a masonry wall by means of an electric or hand drill, a special one-half inch masonry drill bit is required. In addition, a slow speed electric drill must be used. You cannot turn a masonry type of drill at a high speed and expect the drill to stand up.

When drilling a hole in masonry, it is usually advisable to first spot the hole with a star drill. This will make it much easier to drill the hole by keeping the drill from sliding around as you start. As the drilling progresses, the drill should be taken out of the hole from time to time to remove the pulverized brick from the hole. This will enable the drill to cut cleaner and also avoid overheating due to friction produced when the material is packed in the hole.

It is comparatively easy to drill a neat hole using a drill and a masonry type of drill bit. However, a comparatively neat hole can be made with a star drill if care is taken, although this operation requires considerably more physical effort.

Once the hole has been drilled into the brick (incidentally, never drill into the mortar between the bricks) a sleeve should be inserted in the hole. This sleeve is made of lead and it should be driven into the hole with a hammer. It is easy to drive it into the hole, but as it goes in it expands and fits very snugly into the hole. Sometimes the sleeve is referred to as a lag insert.

Once these inserts have been installed in all of the holes the mounts can be secured to the brick by means of suitable lag screws. The lag screws should be tightened up until they are tight enough to securely hold the antenna mounts. It is not advisable to use a wrench having too long a handle or to apply too much force to the lag screws because it is possible to strip the threads being formed in the lag insert.

When holes in the brick work are required in order to provide a means of tacking down the transmission line, they may be drilled with a small star drill or a small masonry drill. The holes need not be very deep because there will be no force applied to the transmission line. It is usually possible to plug these holes with a wooden plug and then use either a small screw or a nail to hold the transmission line in place. In installations where it is possible, it is probably just as well to mount the transmission line support on a wooden part of the building. This will avoid drilling the additional holes in the brick work which takes considerable time.

If the installation crew will be careful not to attempt to put any holes in the mortar between the bricks and also not attempt to mount supports on any wood that is in poor condition, there should not be too much difficulty in mounting the antenna securely.

Mounting the Antenna

Once the mounts are securely in place, the next job is to mount the antenna and the antenna mast in the mounts. The exact procedure to be used will depend upon how the antenna is being mounted. The simplest thing to do would be to carry the unassembled antenna and mast to the roof individually. It can then be assembled on the roof and the lead-in connected to it. The lead-in should be secured to the mast so that the entire assembly can be picked up and then fastened to the mounting brackets.

If mounts are used so that the antenna is being mounted on the side of the house it is quite difficult to mount the antenna. It may be possible to climb up to a reasonably safe portion of the roof and assemble the antenna there and then install the assembled unit in the mounts. However, in some cases it is necessary to assemble the antenna and mast on the ground and hook up the transmission line to the antenna. Then one member of the installation crew must climb the ladder and carry the assembled unit with him. Needless to say, this is somewhat dangerous and it should be avoided whenever possible.

Once the antenna has been mounted on the roof, the transmission line should be neatly brought down the side of the house. Wherever possible it is advisable to bring the transmission line in through the basement and up through the floor in back of the television receiver. This will avoid running long lengths of line through the house.

In an installation of this type, the transmission line may be brought down the side of the house to a basement window. The casement of the basement window is then drilled and the transmission line brought through it. Just before the transmission line is brought into the house, fasten it to a lightning arrester. From this point it can be brought up through the hole drilled in the floor at the rear of the set.

In some cases, the owner may want the transmission line brought directly into the room in which the television receiver is located without going through the basement. Or, possibly the installation may be in a basementless house. In this case, the window casement should be carefully drilled and the lightning arrester mounted outside. The transmission line should be carefully tacked to the baseboard.

It is important that a certain amount of slack be left at the receiver end of the transmission line. Invariably the receiver will be moved somewhat for cleaning. If the line is connected into the receiver without sufficient slack, moving the set will result in pulling the line off the baseboard or else bending or shorting the terminals at the receiver. Most servicemen leave enough slack at the receiver end so the customer can move the set a small amount if he should desire to do so.

Once the mechanical work of installing the antenna and running the transmission line has been completed, the antenna must be oriented for a good picture on all available television stations and also any interference that has been encountered must be eliminated.

It isn't possible to cover every situation that might be encountered. However, remember that even moving the antenna a small amount in one direction or raising or lowering the antenna slightly might make the difference between a poor picture and a good picture.

If all of the television stations are located in the same direction, the antenna should be directed broad side to the stations. If both high and low band antennas are used, there should be no difficulty in obtaining a suitable signal. If a low band antenna is being used and there are stations operating both on the high and low band, some compromise setting may be necessary. However, with the strong signals usually encountered in large metropolitan areas there should be no difficulty in obtaining sufficient signal strength.

Indoor Antennas

Indoor antennas can roughly be divided into two classes. The one type is a temporary antenna that enables the customer to use his receiver while he is waiting for his permanent antenna installation. Most customers want some type of temporary arrangement made so that the set can be used as soon as it is delivered. Very often, due to unsuitable weather conditions or some other cause, it is impossible to make the permanent outdoor antenna installation at the time the receiver is delivered.

A temporary antenna can quickly be made out of a piece of 300-ohm transmission line. A piece of line approximately 64 inches long can be used. The two ends of the line should be stripped and the leads soldered together. One of the leads should be broken in the center and a piece of 300-ohm line connected at the center, as shown in Fig. 11.

When this type of antenna is made up for a temporary installation, it is usually possible to obtain satisfactory reception on at least some of the local stations. The antenna can be either laid on the floor in back of the receiver or it may be possible to conceal it by placing it beneath a rug. An even better arrangement is to place the antenna along the top of the window ledge or hang it on a curtain rod or some similar object.

With this type of antenna, considerable noise may be picked up due to the fact that the signal strength arriving at the receiver may be comparatively low. In addition, ghosts may be encountered due to the fact that the signal striking the antenna is coming from several different directions. Since the antenna is only a temporary arrangement, it is hardly worth while going to too much trouble to eliminate this interference. However, if the interference can be conveniently eliminated by rotating the antenna or placing it in a better position, it certainly would be worth while doing so.

In some buildings, particularly large apartment buildings, the owners do not allow the installation of outside antennas. In this case some form of permanent indoor installation must be made. An antenna can be made up of transmission line as previously described and in strong signal areas it is usually possible to obtain reasonably satisfactory reception on most of the local TV stations.

A number of commercial indoor antennas are available. In most cases one is as good as another. The indoor antennas that permit the adjustment of the length of the element are probably somewhat better than those having fixed element lengths. By adjusting the length of the element and rotating the antenna for best pickup on each station it is usually possible to obtain a good picture on all local stations. It is true this involves a certain amount of experimenting on the part of the customer, but when the usual program lasts from half an hour to an hour, most persons are willing to take the time to adjust the antenna in order to obtain a satisfactory picture.

With this type of antenna, the length of the element is increased to maximum or near maximum length when picking up stations on the low TV band and the length is shortened to the minimum or near minimum length when picking up the high band stations. By rotating the antenna, after the length of the element has been set, ghosts can usually be eliminated and a satisfactory picture of good quality obtained. A commercial antenna of the type described is shown in Fig. 12.

Indoor antennas of the type previously described usually will work reasonably well when located on the upper floors of an apartment building. However, frequently they fail to give satisfactory performance on the ground floor or even on the second floor. In basement apartments this type of antenna installation is in most cases practically worthless. The only solution when this type of situation is encountered is in some way to get the antenna higher. If an outside antenna is not permitted the chances are that it will be impossible to obtain satisfactory reception.

Another type of antenna that is gaining popularity is shown in Fig. 13. This antenna is mounted in the window opening. Most apartment owners who will not permit the erection of an outside antenna will permit the use of this type. In many cases the refusal to allow an outside antenna is due to the necessity of drilling holes in the brick work or in the window casement in order to mount the antenna and bring the lead-in to the receiver. With this type of antenna it is not necessary to drill any holes in the brick work and usually it is possible to use the flat type of twin line and work it in through the window opening without cutting any holes.

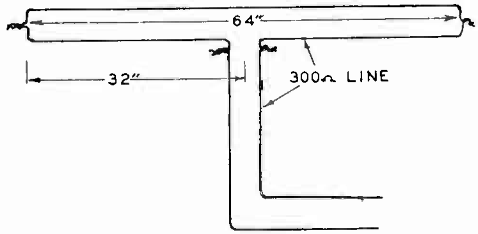


Fig. 11. Antenna made from transmission line.

Courtesy Snyder Mfg. Co., Phila., Pa.

Fig. 12. Typical indoor type TV antenna.

With this type of antenna, the mounting bracket is tightened until the unit fits tightly into the window opening. The antenna can then be adjusted so that it is flush against the wall of the building or the supporting arm can be lowered so that the antenna can be mounted about two feet away from the wall of the building. Usually there is no particular advantage in sticking the antenna out from the wall—it simply makes it more conspicuous—so in most cases the antenna is mounted as close to the wall as possible. Of course, in some installations it will be necessary to have the center of the antenna as far away from the wall as possible so that the antenna can be rotated without striking the wall of the building.

The length of the element is adjustable and the best length can be experimentally determined. Incidentally, when using this type of antenna, it is well to remember that if the positioning

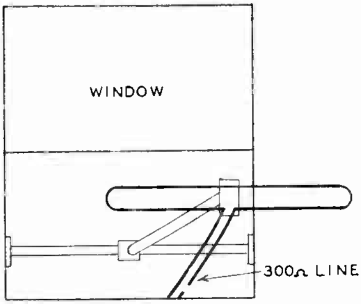


Fig. 13. Window type antenna.

of the antenna has been determined and then the length is adjusted it is advisable to try repositioning the antenna because the best position will vary with the length of the antenna.

This type of antenna is usually satisfactory in urban or suburban areas where the signal strength is reasonably high. The results obtainable from this type of antenna usually far exceed those that can be obtained from the indoor types. Usually it is possible to pick up all of the local stations without too much trouble. Even in apartments on the ground floor this type of antenna seems to be quite satisfactory.

It might be assumed that if the location of the antenna must be such that the direct line of sight between the antenna and transmitter is blocked, it will be impossible to obtain good results. This very frequenly is not the case—satisfactory reception can sometimes be obtained even though the antenna is completely blocked by the apartment building itself.

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TELEVISION BOX SCORE

Stations Operating	72
Construction Permits Granted	45
Applications Pending	341

(As of July 7, 1949)

Our Cover Photo Shows NRI Graduate at Work at Television Station WNBW NBC TV Outlet in Washington

We are proud to show NRI graduate Warren D. Deem adjusting the horizontal linearity control on one of the five image orthicon television cameras owned by TV station WNBW. Graduate Deem has been employed at WNBW as a technician since its opening premier June 27, 1947. He has been assigned to duties as a camera man, audio engineer, micro-wave engineer, and at present is working as a video engineer. He has his first class radio telephone license. Deem is one of several NRI men employed by this station.

Station WNBW is one of the most progressive TV outlets in operation today. Studios and the transmitter are located in the Wardman Park Hotel, Washington, D. C. The facilities are owned by the National Broadcasting Company.

At the time of WNBW's premiere, there were about five thousand television receivers in homes and public places in Washington. Two years later, the number of receivers installed has jumped to over fifty thousand and is increasing at a rate of between two and three thousand per month.

In its first year of operation, WNBW won the promotion award of the *Billboard Magazine,* in recognition of the activity of station personnel in advancing the station and Television as an industry. It is recalled that hundreds of Congressmen and other government officials saw Television for the first time when WNBW, although not yet broadcasting, showed the Louis-Conn heavyweight championship boxing bout on a special coaxial cable hookup with NBC in New York.

WNBW's transmitter is an RCA Model TT5A. It was the first post war television transmitter manufactured by the Radio Corporation of America. Although now operating on channel No. 4, this type transmitter can be operated on any of the twelve present television channels. The original cost of the transmitter installation was over $65,-000.

The antenna is located on top of a 350 ft. tower. Video power output of the transmitter is 5 kw., and the RCA Super Turnstile antenna boosts the effective video radiation to 20.7 kw. A total of 600 tubes are in use when the transmitter is radiating.

The editor wishes to acknowledge our indebtedness to the Press Relations Department of NBC in Washington for the fine cover photograph appearing on this issue. We are arranging for photographs of other NRI men who are members of WNBW staff. A future issue of NATIONAL RADIO NEWS will carry a more detailed story about WNBW and these NRI men.

Television Set Installation

Test patterns illustrated in this article are furnished through the courtesy of the Belmont Radio Corporation and the Radio Corporation of America.

By LOUIS E. GARNER, JR.

NRI Consultant

Louis E. Garner, Jr.

The sale of Television receivers, in dollar volume, has exceeded the sale of AM and FM receivers. More and more Television receivers are being purchased and put into use. As more TV receivers come on the market, the importance of the TV servicing and installation market will reach new highs as far as the service man is concerned.

Practically all TV receivers, even those using an "indoor" antenna, require a certain amount of "setting up" before the customer can be expected to properly operate the set. Other sets require a rather complex installation procedure.

In this, TV receivers differ considerably from conventional AM or FM sets. In many cases, conventional broadcast receivers can be sold "over the counter," perhaps without even being removed from the shipping carton. But TV sets cannot be sold in this manner—not even the small TV receivers and so-called "portables" designed to use an indoor antenna. There still must be a certain amount of adjustment or "setting up" at the shop before the receiver can be sold. In the case of larger receivers, additional adjustments may prove necessary in the customer's home.

It is extremely important that the service man make a good TV installation. The importance cannot be over-emphasized, because, in most cases, the installation of the TV receiver is the customer's first contact, as far as Television is concerned, with the service technician. The impression made on the customer at this time will go a long way toward assuring future pleasant relations and additional service work. This is of vital importance to the service man, for as TV achieves greater importance, it will represent a larger and larger portion of the servicing dollar.

In addition, the installation serves as a continuing example of the service man's skill and thoughtfulness. If a service technician does a "sloppy" job of installation, he can be pretty sure that friends and neighbors of the man owning the Television set will hear about it. In the same manner, however, if the service man does an excellent job of installation, he can also be pretty sure that word will eventually get around that "Joe Doakes' Service Shop does a good job."

Therefore, it is important that the service technician train himself to do a good job on TV installation; that he take time to do a **good job** on **every job**; and that he give as much thought to each installation as if it were his own. A good installation serves as good insurance for future business.

Generally speaking, the installation of a TV receiver consists of several major phases. The receiver is first "set up" in the shop and its operation checked. It is then transported to the customer's home, and placed in position. The antenna is installed and connected to the receiver. Final adjustments on the set are made. If trouble is encountered, such as interference, weak reception, etc., steps are taken to correct the troubles so that perfect reception is assured, insofar as is practical in a particular locality. Finally, the customer is instructed in set operation and the whole job "cleaned up."

The installation of the TV antenna is quite a job in itself—the proper antenna must be selected, the type of mounting must be suited to the building, any local laws or ordinances must be complied with, and other factors are taken into account. Because of this, the installation of the antenna is discussed elsewhere in this issue of the N.R. News (refer to the article starting on Page 3).

Therefore, we will assume that the TV antenna has already been installed as far as this article is concerned. Remember, however, that often the set is first placed into position and then the antenna installed—this is done so that the transmission line from the antenna can be brought into the house close to the receiver, assuring a short and easy connection to the set.

Setting Up the Receiver in the Shop

The first part of the installation job is to "set up" the receiver in the service shop and to check its operation. Mechanical and electrical adjustments are made at this time—the same adjustments that will later be checked in the customer's home. Often, however, readjustments may not have to be made once the set is installed in the customer's home if a good job is done at the service shop. "Setting up" the receiver in the shop requires that the picture tube be installed, if it is supplied separately; that any mechanical adjustments be made; that electrical adjustments be made; and that a check on the set operation be made—to insure that good definition is obtained, and to insure that the set is operating properly on all the local channels.

In carrying out this procedure, the service man should always refer (if possible) to the manufacturer's service and installation instructions for the receiver. These "Service Manuals" are usually available directly from the set manufacturer or from his local distributor. It is important that the instructions in the service manuals be followed for several reasons. First, the exact number and type of controls may vary somewhat from set to set—particularly where special circuits such as A.F.C. circuits, A.G.C. circuits, etc., are employed. In addition, however, the location of the adjustments may vary widely. In some sets, the adjustments may be found on the "front apron" directly behind the front panel of the cabinet. In other sets, the adjustments may be on the side of the chassis or on its top. In still other receivers, the adjustments may be found at the back of the set or on the rear apron. In many sets, the adjustments may be located at a number of points—some on top of the chassis, some at the front, and some at the rear. Thus, in order to identify and locate all the adjustments that must be made, the service technician must refer to the service manual for the set unless he is familiar with the type of receiver. Also, in order to obtain instructions on the technique of adjusting special controls, he must refer to the manufacturer's service manual.

As far as this article is concerned, we will only try to indicate the controls or adjustments that are found on practically all receivers. Special adjustments such as A.G.C. "Threshold" controls, horizontal sweep A.F.C. controls, or other special adjustments or controls will not be discussed here, since the exact technique of adjustment and the location and purpose of the control may vary widely from set to set, depending on the circuit employed, and in many sets, such special controls will not be found.

In most seven-inch TV receivers and in many of the larger receivers, the receiver will be shipped with the picture tube in place. When this is the case, the service man need only connect an antenna at his shop, plug the set in, turn it on, and then make the necessary mechanical and electrical adjustments. In other cases, however, the picture tube will be shipped separately by the manufacturer. It is then necessary for the service man to remove the picture tube from its shipping carton and to properly install it in place. The exact installation procedure employed will vary considerably from set to set, depending on the type of picture mounting employed.

Since so many different mounting schemes are employed, it is necessary for the service man to either refer to the service manual for the set or else to carefully study the mounting method employed before attempting to install the tube. Picture tubes can be dangerous if not properly handled, and hence it is important that the service man not try to force a picture tube into position or attempt to mount the picture tube improperly so that undue strain will be placed upon it.

Certain general precautions are recommended by the set manufacturers and TV picture tube manufacturers when handling the tubes. It is generally recommended that the service technician wear safety goggles and heavy, but pliable, gloves when handling the tube. The tube should be handled by the large "funnel" and the neck should be touched only for guidance. The weight should be supported on the "funnel" and one hand used to guide the neck of the tube into position when installing it. When not installed, the picture tube should be kept in the shipping carton with the cover closed. Avoid scratching the tube in any way. The tube should not be placed on a hard surface unless there is felt or other soft material under it for protection. If it is necessary to set the tube down, it is usually best to place it face downward (on a soft surface) so that there will not be too much danger of the tube rolling off the table or bench.

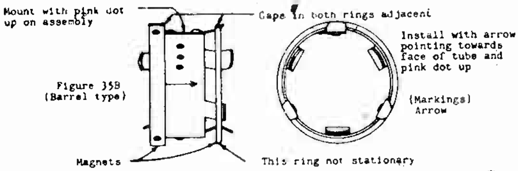
There are several reasons for taking so many precautions when handling a Television picture tube. First, the tubes (except for the "metal funnel" type) are all glass and quite large. Therefore, they should be handled with the same care given any large glass object. In addition, the cathode ray tubes are evacuated just as an ordinary receiving tube is evacuated. Since there is a vacuum inside the tube, the resulting air pressure on the outside of the tube exerts a tremendous amount of force—around fifteen pounds per square inch. When the total area of the picture tube is considered, it can be easily seen that the total force exerted on the tube may run into the hundreds or even thousands of pounds pressure. Thus, if the picture tube is cracked or broken, this heavy pressure may cause the pieces to fly together in an "implosion" (as distinguished from an explosion). The flying, sharp pieces of glass may cause considerable injury.

With tubes having an inner and outer aquadag coating, such as the 10BP4, there is a shock hazard. In tubes of this type, the capacity between the inner and outer coatings is used as the output filter condenser in the high-voltage power supply. Since glass is the dielectric and the leakage path is comparatively high in resistance, these tubes can hold a high voltage charge for a considerable length of time. Even discharging the tube by shorting between the inner and outer coatings with a piece of wire may not completely remove the charge, due to dielectric hysteresis.

It is unlikely that the charge between the inner and outer coatings can be sufficient to cause injury but the surprise of a sudden shock while handling a cathode ray tube may cause the technician to drop the tube, resulting in tube breakage and possible injury. Therefore, be aware of this danger and be careful not to touch the high voltage connection snap when handling the cathode ray tube, even if you know that the tube has been "discharged." Even tubes received from the factory in their original shipping cartons may have retained a charge left over from tests at the factory.

Mechanical Adjustments

Once the cathode ray tube has been mounted in place, certain further steps may be necessary before the power is turned on. If the tube is of the electrostatic type, the socket can simply be plugged in. If an electromagnetic tube, on the other hand, it is first necessary to attach the ion-trap magnet, which slips into position over the neck of the cathode ray tube. Then the tube socket can be plugged in and the high voltage lead snapped into position on the "funnel" of the tube. The exceptions, as far as electromagnetic tubes are concerned, are certain of the larger cathode ray tubes and tubes with



Courtesy Sparks-Withington (Sparton) Co.

Fig. 1. A popular permanent magnet type "ion trap."

a metal-backed screen. Tubes such as the 10FP4 do not require an ion-trap magnet.

The purpose of the ion-trap in the cathode ray tube is to deflect the heavy gas ions so they will not strike the fluorescent screen and burn a "spot" on the center of the screen. The ion-trap is in the tube itself and consists of either a bent electron gun or especially shaped anodes so that the beam is deflected to one side. Small ion-trap magnets are then used to re-center the electron beam. The magnetic field produced by the ion-trap magnet (external to the tube) is weak enough so that it does not deflect and re-center the heavier ions, but only the electron beam. It is necessary to properly adjust the ion-trap magnet if the electron beam is to strike the screen and if a satisfactory picture is to be reproduced.

Tubes with a metal-backed screen (such as the 10FP4) have the protection of the metal screen behind the fluorescent material. This keeps any ions striking the picture tube face from injuring the fluorescent material. Thus, an ion-trap is not needed within the tube to deflect the electrons and ion beam. Since no trap is incorporated within the tube, an external deflection magnet is not required.

Ion-trap magnets come in a wide variety of types and styles. The correct initial position will vary considerably from style to style. In most cases, the magnet assembly will consist of two magnets mounted on a small frame-work of some sort that slides over the neck of the tube. The larger magnet is usually placed at the rear and usually centered over the "two flags" that can be seen on the electron gun assembly inside the neck of the cathode ray tube. The larger magnet is placed at the rear both in the case of the more popular permanent magnet type ion-traps and the earlier electromagnetic types.

One popular type of ion-trap magnet is illustrated in Fig. 1.

Once the tube is in position, the ion-trap magnet in place (in the case of an electromagnetic tube), the socket plugged in, the high voltage lead snapped into position (on electromagnetic tubes), and the antenna connected, the set can be plugged in and tried out. Further mechanical

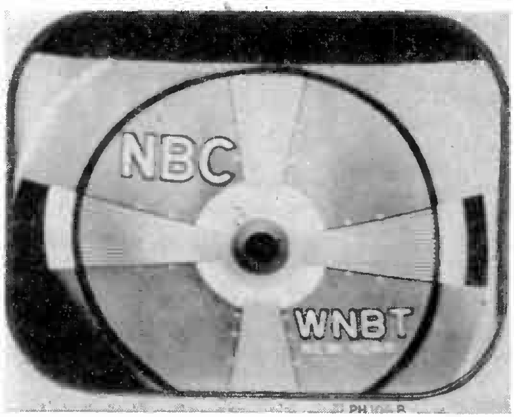


Fig. 2. Test pattern obtained with ion trap magnet and focus coil improperly adjusted.

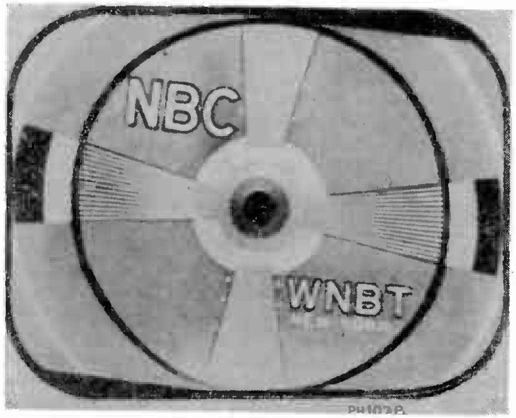


Fig. 3. Rotated pattern—due to improper tube or deflection yoke position.

adjustments are made with the power on. The exact procedure to follow depends on whether the tube used is of the electrostatic or electromagnetic type. Therefore, let us discuss each type separately.

Electromagnetic Tubes: Once the set is turned on, the brilliancy control is turned up and the ion-trap magnet adjusted by turning it slightly on the neck of the tube and sliding it back and forth until a raster appears on the face of the tube. If the two individual magnets in the magnet assembly can be moved independently, it may be necessary to readjust one magnet with respect to the other. Once the raster appears on the face of the cathode ray tube, the ion-trap magnet is adjusted further until the brightest raster is obtained. If necessary, the brilliancy control is turned backward so that the raster will not be too bright. It is important that the ion-trap magnet be adjusted quickly—otherwise, the electron beam striking the edge of one of the anodes may damage it or may burn a small hole in it. Improper positioning of the magnet may also result in circular areas of discoloration developing on the face of the tube, thus injuring the picture screen. This may happen even though the ions developed in the cathode section of the tube have been properly "trapped out." It is due to the electron beam, instead of going through the small hole in the anode of the electron gun, bombarding the edge of the hole. The heat produced vaporizes the metal of the anode, releasing gases which have a harmful effect on the tube operation. Some of the vaporized material may even be deposited on the screen of the tube, causing darkened areas. In addition to this, since the anode is damaged, it may be impossible to get a sharp focus.

Sometimes adjustment of the ion-trap magnet is not sufficient to bring the entire raster on the screen and it may also be necessary to slightly readjust the focus coil. This can be done by loosening the mounting screws and moving the focus coil by hand until the proper position is found. The screws can then be tightened.

When adjusting the focus coil position mechanically, the electrical centering controls should be turned to their mid-position. The focus coil can then be rotated about both the vertical and horizontal axis until the entire raster is visible, approximately centered and with no shadowed corners—adjustment of both the ion-trap magnet and focus coil may be necessary in this case.

Improper adjustment of the ion-trap and focus coil may result in the type of picture shown in Fig. 2.

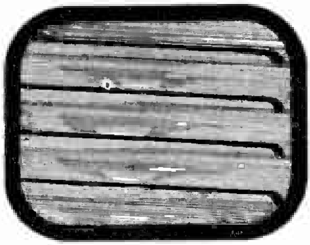
If the raster (or test pattern of the station being received) is rotated with respect to the "mask" of the television set or is not perfectly horizontal and vertical, it may be necessary to rotate the deflection yoke slightly. This can be done by loosening the screw holding the deflection coils to the yoke mounting and moving the position of the yoke slightly in either direction. In addition, when the tube is mounted, the deflection yoke should be moved forward as far as possible—that is, as close as possible to the front of the tube.

This completes the basic mechanical adjustments that are necessary. These adjustments can be made even though there is no station on the air. The adjustment of the electrical controls, to be discussed later, should preferably be made when a test pattern can be seen.

Electrostatic Sets: Usually there are no mechanical adjustments necessary on an electrostatic tube. A rotated pattern as shown in Fig. 3 simply indicates that the tube itself must be rotated in position until the raster is perfectly horizontal and vertical.

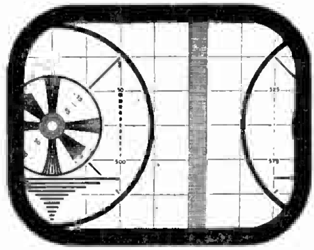
Projection Sets: In projection TV receivers there are usually a large number of mechanical adjustments that must be made. The exact procedure to follow will vary considerably from set to set and the manufacturer's instructions should be consulted. Sometimes the adjustments will be made with a test pattern on the screen, sometimes with the raster only on the screen, and sometimes with a special test pattern produced by a small lamp and screen. The adjustments usually consist of optical focusing and positioning adjustments. Separate optical focusing adjustments are usually provided for focusing the top and bottom of the screen and the left and right sides of the screen as well as an overall focus adjustment for the entire screen. These adjustments usually consist of small screws or nuts that are turned by hand until the proper position is found.

In any case, all the mechanical adjustments just discussed are first made in the service shop. Usually readjustment in the customer's home will not be necessary unless some of the adjustments shift during transportation or unless it is necessary to remove the picture tube in order to transport the set to the customer's home. If readjustment is necessary, the procedure outlined above is followed.



Horizontal Movement (fast) Left or Right

Fig. 4A



Horizontal Movement (slow) Left or Right

Fig. 4B

Electrical Adjustments

Once the mechanical adjustments have been made—the ion-trap magnet adjusted for a bright raster in the case of electromagnetic sets, the deflection yoke rotated to give a raster that is perfectly horizontal and vertical, etc.—the electrical adjustments must be made.

The electrical adjustments consist of variable resistors, coils, or condensers placed in the different circuits. By adjusting these controls, the circuit operation is changed in some manner. For example, in the case of an amplifier tube, the grid bias may be changed, which, in turn, changes the stage gain. In the case of a sweep oscillator tube, an R-C time constant may be varied, changing the frequency of operation.

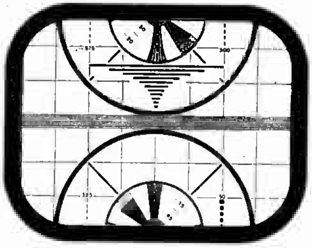
The electrical adjustments are preferably made while the set is tuned to a station, and are usually made for the best picture. The exact order of adjustment will depend, to a large extent, on the type of set. The two basic types of sets are sets using electromagnetic tubes and sets using electrostatic tubes.

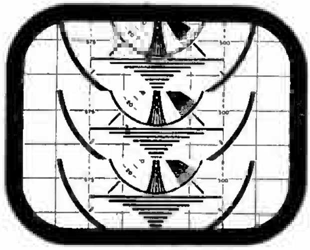
Electrostatic Sets: First, turn the *station selector* or *"main tuning"* control to select a local station that is transmitting a test pattern and that can be easily received in the locality where the set is installed. Normally, this will be done in the serviceman's shop. To make sure that a station is on the air, it is an excellent idea to have a "monitor" TV receiver available that is known to be in good operating condition. This can be used to check on the station if no pattern is received.

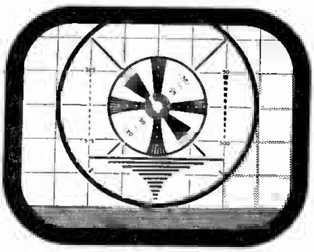
Next, with the *contrast* or *picture* control turned all the way down, turn up the *brightness* control (sometimes called *intensity* control, *brilliancy* control, or *background* control) until a raster is just visible on the screen. The *contrast* or *picture* control can then be turned to adjust for the proper shades of gray or desired light and dark contrast—this is assuming that the *hold* controls are sufficiently well aligned so that the picture more or less "snaps" in. Otherwise, it is necessary to adjust the controls governing the horizontal sweep frequency and the vertical sweep frequency until a single stationary pattern or picture is obtained.

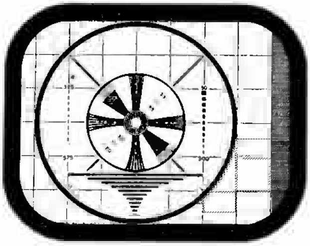
If the picture does not "snap in" it is still necessary to turn the contrast control up until a pattern of some sort appears on the screen, indicating that a station is being received. The pattern obtained when the contrast control is first turned up, before the picture is "synced" will vary considerably, depending on how far the *hold* controls are misadjusted.

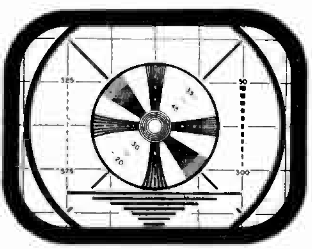
Before attempting to adjust the *hold* controls, however, turn up the *volume* control until the sound being transmitted by the station can be received—most stations, when transmitting a test pattern, will also transmit a steady audio tone. This is a sure check that the TV station is being received, even though no picture is visible on the screen. Adjust the *fine tuning control* to bring in the sound and picture. With the picture completely out of sync, a pattern somewhat as that shown in Fig. 4 may be obtained. The *horizontal hold* or *speed* control is now adjusted to stop

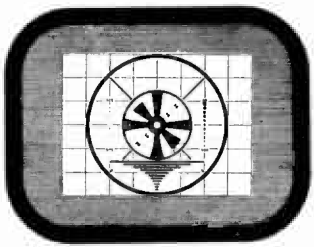

Vertical Movement (slow) Up or Down
Fig. 5A


Vertical Movement (fast) Up or Down
Fig. 5B


Off Center Vertically
Fig. 6A


Off Center Horizontally
Fig. 6B


Too Large Horizontally and Vertically
Fig. 7A


Too Small Horizontally and Vertically
Fig. 7B

horizontal tearing and movement. Once the *horizontal hold* control is properly adjusted, even though the vertical hold control is still improperly adjusted, a pattern somewhat like that shown in Figs. 5A and 5B might be obtained. The *vertical hold* control is now adjusted until the vertical or "up and down" movement is stopped.

Then, it may be necessary to readjust the *horizontal hold* control because of a slow horizontal movement as shown in Fig. 4B.

If it is found that the picture is off center either vertically or horizontally, the *vertical* and *horizontal centering* or *positioning* controls can be adjusted to bring the picture back into the center—the picture should be centered in the mask. Examples of an off-center picture are given in Figs. 6A and 6B.

Finally, a check is made on the size of the picture obtained. If the picture is too small both horizontally and vertically, it may not completely fill the mask as shown in Fig. 7B. In this case, the height control (sometimes called the *vertical size* or *vertical gain* control) is adjusted until the proper vertical size is obtained. The *width control* (sometimes called *horizontal size* or *horizontal gain* control) is adjusted until the picture fills the mask horizontally.

On the other hand, the picture may be too large so that part of the pattern is lost. This condition is illustrated in Fig. 7A, and is corrected in the same manner as for too small a picture, but the controls are turned in the opposite direction.

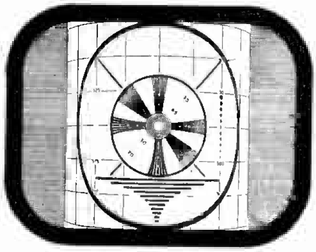
Sometimes the picture is purposely made a little too large in order to "overfill" the mask cut-out. This allows a somewhat larger picture, without losing too much of the subject material. In most cases, the television camera is centered on the important action so that the corner details are not important. By "oversizing" the pattern on the receiving tube screen, it is possible to obtain the effect of a larger picture, even though part of the total picture will be lost. If just one control is misadjusted, the picture may be distorted. Examples of this are given in Fig. 8.

In some receivers, using the entire face of the picture tube as a screen (no mask), a round picture is obtained by deliberately increasing the height and distorting the picture. In such sets, the test pattern may appear as in Fig. 8C.

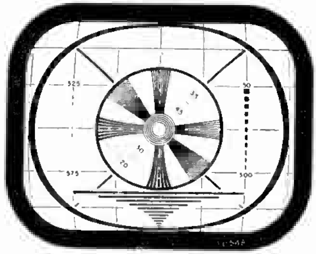
With the test pattern the correct size, and with the pattern properly in "sync," the *focus* control can be adjusted until the picture is as sharp as possible. When adjusting the *focus* control, it is a good idea to check on the adjustment of the *contrast* and *brilliancy* control. There is a certain amount of inter-action between the *contrast* and *brilliancy* and between the *brilliancy* and *focus* control in most sets.

The best method to follow when adjusting the *contrast* and *brilliancy* control is first to turn the *contrast* control all the way "down" so that no pattern is obtained. The *brilliancy* control is then turned up until a raster is just barely visible. The *contrast* control is then advanced until a clear, steady pattern is obtained with proper contrast between black, white, and various shades of gray. Such a test pattern is illustrated in Fig. 9A. If the contrast is turned too low or the brilliancy turned too high, the pattern may be too light as shown in Fig. 9B. On the other hand, if the brilliancy is turned too low or the contrast turned too high, the pattern may be too dark as shown in Fig. 9C.

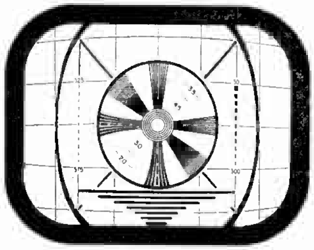
Occasionally, it may be found that the above method of adjustment of the brilliancy and contrast controls does not give the most pleasing picture—in this case, either the brilliancy or the contrast control (or both) may be readjusted in order to get the desired picture.



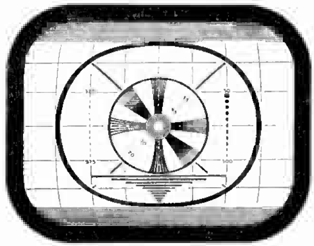
Too Small Horizontally - Correct Vertically
Fig. 8A



Too Large Horizontally - Correct Vertically
Fig. 8B



Too Large Vertically - Correct Horizontally
Fig. 8C



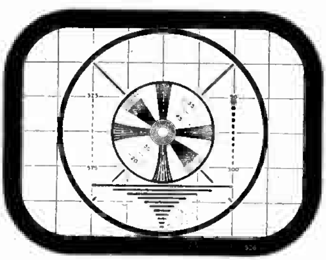
Too Small Vertically - Correct Horizontally
Fig. 8D

In addition to the general controls and adjustments previously described, some sets using electrostatic picture tubes have a "high voltage" adjustment. In most cases, this is a small tuning condenser used to adjust the output of the r.f. type high voltage power supply. This adjustment of the high voltage should be made according to the manufacturer's suggestions. It is possible to tune the r.f. supply until a peak in output voltage is obtained. Under such conditions, however, the supply may not be completely stable and the output voltage may fluctuate under varying line voltage or varying load. Therefore, the adjustment is usually made to the maximum capacity side of the peak output voltage (you can tell when peak voltage is obtained by the increase in brightness of the raster) so the supply will be more stable.

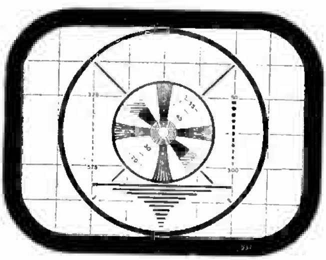
Electromagnetic Sets: Practically the same controls and adjustments that are encountered on sets using electrostatic tubes will also be found on sets using electromagnetic tubes. In addition, there will be several other controls and adjustments found on most electromagnetic sets, and the order of adjustment may be somewhat different.

Therefore, in our discussion of the order of adjustment of the various controls on a set using an electromagnetic tube, we will only discuss those operational controls in detail that differ from those found on an electrostatic set. Remember that the position of the control in the circuit or its effect on the circuit may differ considerably, even though the effect on the picture is the same. As an example, in sets employing electromagnetic deflection, the *centering* controls adjust a direct current through the deflection coils in order to fix the "resting" position of the electron beam. In sets employing electrostatic deflection tubes, on the other hand, the *centering* controls adjust a fixed d.c. voltage applied to the deflection plates. Thus, in one case, we are interested in adjusting a current and in the other case in varying a voltage.

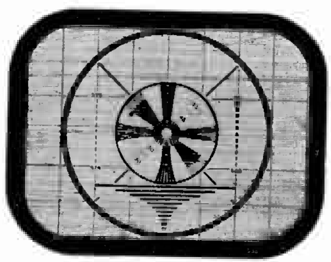
As in the case of an electrostatic set, the first move is to turn the *main tuning* or *channel selec-*



Proper Contrast
Fig. 9A



Too Light
Fig. 9B



Too Dark
Fig. 9C

tor switch to pick up a local station. The *volume* control can be turned up and then the *fine tuning* control adjusted to bring the sound and picture in together. In most cases, if the controls are far out of adjustment, the fine tuning will be adjusted simply to bring in the sound. A slight readjustment for best compromise between sound and picture may be made later.

Next, with the *contrast* control or *picture* control turned down, the *brightness* (intensity, background, or brilliancy) control is turned up until the raster is just visible. The *contrast* or *picture* control is then turned up until moving streaks on the raster indicate that the signal is being received—if the *hold* controls are properly adjusted, the picture may "snap in" and only a slight readjustment may prove necessary. Otherwise, the *horizontal* hold and *vertical* hold controls are adjusted to stop horizontal tearing and vertical movement of the picture (respectively). (Refer back to Figs. 4 and 5.)

On many electromagnetic sets, a somewhat complex automatic frequency control circuit may be employed for holding the horizontal sweep frequency at the correct value.

In sets where such circuits are employed, readjustments in these circuits may prove necessary in order to render the *horizontal hold* control effective in eliminating horizontal tearing and movement of the picture. Since a number of different a.f.c. circuits may be encountered and since the exact technique of adjustment may vary considerably from set to set, we will not try to discuss the procedure followed. Usually, however, there are at least one or two other adjustments in addition to the *horizontal hold* control which will affect the frequency of the horizontal sweep circuit.

With the picture properly "synced," the *vertical centering* or *positioning* control is adjusted until the picture is centered in the mask—refer back to the test patterns shown earlier. The *height* or *vertical size* control is adjusted until the picture fills the mask properly, or until the picture over-fills the mask if the "over-sizing" technique is used in order to get a larger picture.

Next, the *vertical linearity* control is adjusted for the best picture and in order to remove vertical distortion. This *linearity* control is seldom found on sets employing electrostatic deflection. It is found on almost all sets employing electromagnetic deflection. The purpose of the control is to insure a perfectly linear vertical sweep so that portions of the picture will not be crowded together. There is some interaction between the *vertical linearity* and the *vertical size* or *height* control and careful readjustment between these two controls as well as the centering control may prove necessary. A test pattern with poor vertical linearity is illustrated in Fig. 10.

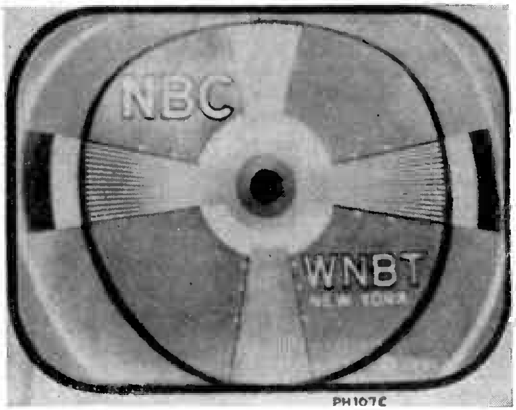


Fig. 10. Test pattern with poor vertical linearity.

Next, the *horizontal centering* control is adjusted until the picture is properly centered in the mask.

Then the *horizontal drive* control is turned as far "up" as possible without causing crowding to one side of the picture (usually the right side). You can tell when you are turning the drive control in the right direction because the brightness of the picture will increase.

The *horizontal drive* control is another control not encountered on sets using electrostatic tubes. In most sets using electromagnetic tubes, a "kick-back" type high voltage supply is used. This high voltage supply is operated by the horizontal sweep circuit. Thus, the drive on the horizontal sweep amplifier will determine the high voltage as well as the amount of horizontal sweep obtained. The *horizontal drive* control adjusts the signal applied to the horizontal sweep amplifier stage.

Next, the *width* control (sometimes called *horizontal size* or *horizontal gain* control) is adjusted until the picture fills the mask, and the *horizontal linearity* control is adjusted until the test pattern is symmetrical from left to right. The *horizontal linearity* control performs a function similar to that of the vertical linearity control, but adjusts the linearity of the picture as far as the horizontal sweep is concerned.

A certain amount of readjustment between the *horizontal linearity, horizontal drive* and *width* controls may be necessary since there is considerable interaction between these controls.

An example of the *horizontal linearity* control and *horizontal drive* control misadjusted is given in Figs. 11A and 11B.

The *focus* control is adjusted for the sharpest

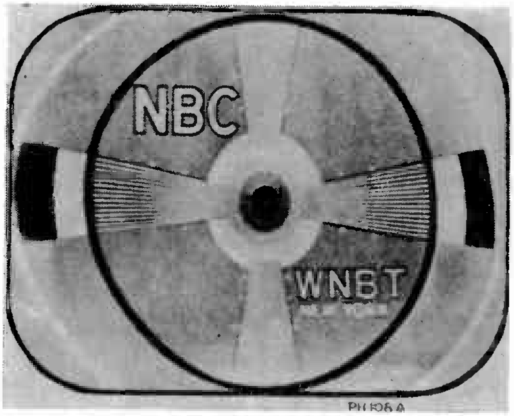


Fig. 11A. Test pattern obtained with horizontal linearity control misadjusted.

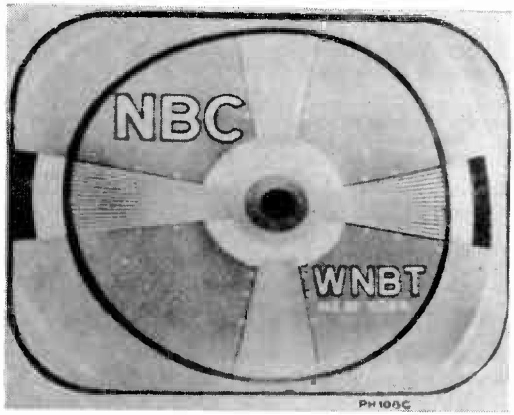


Fig. 11B. Test pattern obtained with horizontal drive control turned too high.

picture. The *focus* control may be adjusted at almost any time—the exact order of adjustment is not too critical. In fact, a good preliminary adjustment of the *focus* control may be made when no test pattern is being received—the focus control is simply adjusted for the sharpest horizontal lines in the raster.

Special Cases: In some instances, the number and type of controls may differ from those given above. The case of a set incorporating an automatic frequency control in the horizontal sweep circuit has been mentioned. In addition, there may be some type of automatic gain control (corresponding to a.v.c. in an ordinary AM set) and adjustments may prove necessary in this circuit.

Also, it may be found that more than one *hold* control is provided in addition to adjustments in the a.f.c. circuit. There may be, for example, a "coarse" and "fine" *horizontal hold* adjustment in addition to horizontal a.f.c. adjustments.

Some sets employ continuous tuning, rather than step tuning with a fine tuning knob. Where continuous tuning is used, the station should be tuned in for best sound. It is possible, by slightly mistuning the sound, to get a brighter picture on the face of the picture tube, but the brighter picture will contain less detail and is of generally poor quality.

The electrical adjustments just described are made when "setting up" the TV receiver in the service shop. These adjustments are made before the set is taken to the customer's home in order to make sure that the set is in good operating condition. Also, by "setting up" the receiver at the shop, the time necessary to properly adjust the receiver at the customer's home is reduced because most of the controls are at or near their correct setting. If any particular control gets out of adjustment for one reason or another (the customer experimenting with it, for example), then the procedures outlined above may be followed.

It is not necessary, of course, to go through the entire adjustment procedure in case one control is out of adjustment. As an example, the *hold* (both *vertical* and *horizontal*) controls may not always be found on the front panel of the receiver—often, they are placed on the rear apron, behind the front panel, or on the side apron of the set. In such cases, they are adjusted once and should hold their adjustment. If the customer, in examining his set or experimenting with it, accidentally misadjusts these controls so that the picture moves either horizontally, vertically, or both, then it is only necessary to readjust these controls.

Other controls such as the *height, width,* or *linearity* controls need not be readjusted unless they have been touched or have gotten out of adjustment in some way.

A chart listing the controls and adjustments most often encountered in TV sets and showing the approximate adjustments necessary is given in Fig. 12. Note that all of these controls may not be found on a particular TV receiver. For example, the *function* selector will be found primarily on combinations allowing the use of a phonograph, reception of AM or FM broadcast, and Television. The *brightness* control, as another example, is found on almost all TV sets but there are a few models manufactured where a special *brightness* control is not available.

The approximate order of adjustment for both electromagnetic and electrostatic sets is given in the last two columns. The asterisk refers to controls where the particular order of adjustment is not too important. The dash indicates that this

CONTROL NAME (S)	FUNCTION	HOW TO ADJUST	REMARKS	ORDER OF ADJUSTMENT	
				Electro-magnetic Sets	Electro-static Sets
Function Selector	To Choose "AM", "FM", TV, Phono.	Turn to "TV" (Combinations Only)	Operating	1	1
Channel Selector "Main Tuning"	To Select Station Tunes Front-end	Turn to Desired Station	Operating	2	2
Fine Tuning	Adjusts f of Local Oscillator	To Bring In Sound and Pix Together	Operating	4	12
Contrast Picture	Adjusts Signal Applied to CRT	(1) Adjust Until Station Is Received (2) Then, After Syncing, Adjust for Proper Shades	Operating	6	4
Brightness; Inten-sity; Brilliancy; Background	Determines Inten-sity of CRT Beam	With "Contrast" Turned Down, Adjust Until a Raster Is Just Visible	Operating	5	3
Vertical Hold Vertical Speed	Controls f of Vert. Sweep	To "Stop" Vertical Movement	Operating (See Text)	8	7
Horizontal Hold Horizontal Speed	Controls f of Hor. Sweep	To Stop Horizontal "Tearing" and Move-ment	Operating (See Text)	7	6
Vertical Center-ing; Vertical Posi-tioning	Controls Up and Down "At Rest" Position of Beam	To Center (Up and Down) Picture In The Mask	Non-Operating	9 V	8
Horizontal Cen-tering; Horizontal Positioning	Controls Sidewise "At Rest" Posi-tion of Elec. Beam	To Center (Sidewise) Picture In The Mask	Non-Operating	12 V	10
Height; Ver. Size; Ver. Gain	Controls Amount of Vert. Sweep	Until Picture Fills (Or Slightly Over-fills) Mask (Height)	Non-Operating	10 V	9
Width; Hor. Size; Hor. Gain	Controls Amount of Hor. Sweep.	Until Picture Fills (or Slightly Over-fills) Mask (Width)	Non-Operating	15 V	11
Vertical Linearity	Adjusts "Lin-earity" of Vert. Sweep	Adjust for Undistorted (Vertically) Picture	Non-Operating	11 V	—
Horizontal Line-arity	Adjusts "Lin-earity" of Hor. Sweep	Adjust for Undistorted (Horizontally) Pic-ture	Non-Operating	14 V	—
Horizontal Drive	Adjust Amplitude of Signal Applied to Hor. Sweep Amp.	Adjusted in Conjunction With Width and Horizontal Linearity Controls (Also Affects H.V.)	Non-Operating	13 V	—
Focus	Controls Sharp-ness of Electron Beam	Adjust for Sharpest Picture (Best Defini-tion)	Non-Operating	*	13
High Voltage	Tunes High Volt-age R.F. Type Supply	Adjust to Max. Cap. Side of Peak Output Voltage (Picture Brilliancy)	Non-Operating	—	*
Volume; Sound	Adjusts Sound Volume Level	Adjust for Sufficient Loudspeaker Volume	Operating	3	5

Fig. 12

particular adjustment or control is not usually found on the type of set indicated. These controls accompanied by a check mark have considerable interaction and it may be necessary to readjust the different controls after adjusting a specific one—in other words, it is necessary to adjust the *horizontal linearity, horizontal drive,* and *width controls* together for the best picture. Thus, repetitive adjustments may prove necessary.

The centering controls may not always be found—particularly on electromagnetic sets. On some electromagnetic sets, the centering is accomplished by adjusting the focus coil and the deflection yoke position.

It is also necessary to distinguish between the normal "operating" controls which are used for selecting and tuning in the different stations and the "non-operating" controls which are usually adjusted once and then left in position. The "non-operating" controls are the ones normally adjusted by the service technician when setting up the set and should not be touched by the customer. In some sets, one or more of the "non-operating" controls are available at the front panel for customer adjustment. This is particularly true as far as the *horizontal* and *vertical hold* controls are concerned. In this case, they may be considered as "operating" controls.

Remember that before any attempt should be made to adjust the fixed electrical adjustments, the mechanical adjustments, especially the ion-trap magnet in the case of sets using electromagnetic deflection, should be adjusted.

Check on Set Operation: Once the various mechanical adjustments and electrical controls are properly adjusted for good reception on a particular station, using the test pattern as a guide, a check should be made on all other local channels. Check to be sure that the definition is good. A rough check on this can be made by observing "how far down" (close to the center) the *vertical* lines in the vertical wedges of the test pattern can be distinguished. This is a direct indication of response of the band width of the set and correct alignment. If the definition obtained is not normal for the particular set, it may indicate the need for realignment. Space here does not permit a discussion of alignment techniques. Refer to the manufacturer's service manual for detailed data on aligning the TV receiver—if alignment is indicated when checking on different channels for correct definition.

Another part of the service man's job when "setting up" the set in the shop is to make sure that all local channels can be received on the particular set on which he is working.

In most sets, all TV channels can be received. Other sets, however, are designed to receive only seven or eight out of all available channels. Sometimes the service man finds it necessary to make an adjustment on the coils so that the local channels can be received—that is, to make sure the local channels are included among the seven or eight channels that can be received by the set. In some sets, this consists of a few simple "screw driver" adjustments in the front end. In other sets, however, it is necessary to actually remove small coil sections. The coil sections plug in the front end assembly. In most cases, the service technician need not worry about this because the sets come from the factory with the correct coils for the local channels in a particular locality. However, he should be aware of the fact that certain sets can receive only a limited number of channels.

Transporting the Receiver to the Home: Once the electrical and mechanical adjustments are completed, and a check on operation made so the service man is sure that the receiver operates properly, the TV set can be taken to the customer's home for final installation. There are certain general precautions that should be followed in transporting the receiver so as to avoid damage to the set.

Large TV receivers should be firmly lashed in place in the truck used for moving. Heavy blankets, such as movers use, should be placed around the set to protect its finish. When lashing the set in place, it is preferable to use a wide band "webbing" rather than a narrow rope for tying the set down. The narrow rope tends to exert pressure at one point and may crush into the wood of the cabinet, even though a blanket or padded quilt is used for protection. With wide webbing, on the other hand, the pressure is distributed over a greater area and there is less danger of marking the cabinet.

With some sets, it is necessary to remove the picture tube when transporting the set. With other sets, however, the picture tube can be left in place. If it is necessary to remove the picture tube, the tube should be transported separately in its original shipping carton.

Once the set has been taken into the customer's home, it can be placed in position. The antenna is installed and connected to the set, final adjustments are made, any trouble encountered is cleared up, and the customer is instructed in set operation.

Selecting the TV Receiver Location: In most cases, the customer will know exactly where he wants the set located, or, in the case of a previously installed antenna, the location will be determined to some extent by the antenna location. If the antenna is not yet installed, an effort should be made to locate it so that the transmission line will enter the room near the television set.

The service technician should be qualified to advise the customer on the proper location of the set, in case such advice is asked for. Such things as the viewing distance, lighting, etc., should be kept in mind when advising the customer.

Remember, however, that no effort should be made to "tell" the customer where his set should go. Let him take the initiative—after all, it is his set and his home. But, if the customer should ask for advice, remember the following important points.

1. The set should be so located that direct light does not fall upon the screen or tube face since this will tend to reduce the image brightness and contrast and may also introduce glare.

2. The TV set will probably be the "focus" of attention in the room and, therefore, the location should be chosen so that the seating arrangement allows people in the room to watch the set easily and without strain.

3. A TV receiver runs considerably hotter than does a conventional AM receiver or phonograph combination. Because of this, the TV set should not be jammed in between furniture or close to the wall. Rather, sufficient space should be allowed around it so that normal ventilation can occur. This does not mean, of course, that the set should be located several feet from the wall. One or two inches is satisfactory as long as there is space for proper air movement around the set.

4. The "optimum" viewing distance varies with the size of the TV receiver picture. The viewing distance is normally taken as 4 to 8 times the diameter of the picture tube used. Taking the number 6 as a median value, we find that the optimum viewing distance for a set employing a 10-inch tube is around 60 inches or about 5 feet. This does not mean that a good picture is not obtained when closer to the set or further from the set—this just indicates more or less the "best" viewing distance.

If the viewer sits too close to a set using a large tube, he may see the individual scanned lines. If too far, the picture may appear too small.

A room, showing possible locations of a TV receiver, is illustrated in Fig. 13. Of the four possible locations shown, locations "A" or "B" are not too good, while locations "C" and "D" are satisfactory.

Location "A" is not good because fairly strong light may come from behind the set through the windows if the set is used during the day. Location "B" is not good because the light from the windows will strike the front of the set directly and may cause strong reflections and glare. In addition, the bright light from the windows, in striking the screen directly, will reduce contrast and brilliancy.

In locations "C" and "D" the light from the windows does not hit the set face directly, nor is there a strong glare behind the set. Therefore, these locations are quite good.

Generally speaking, it is not necessary to locate the television set in total darkness, but it should not have a bright light either directly behind it or to one side or in front of it if that light hits the screen face. This general procedure is followed whether the light is natural (from win-

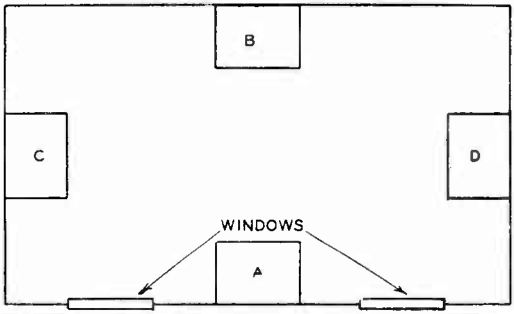


Fig. 13. Possible locations of a TV set in a room. Locations "C" and "D" are the best.

dows) or artificial (from lamps). Thus, it would be perfectly all right to set an *indirect* table model lamp on top of the TV cabinet. This would tend to light up around the set without having bright light directly on the face of the tube or behind the set. A direct table model lamp should not be placed on the TV set nor should one be placed directly in front of it.

Operational Test: Once the proper location has been chosen, the set placed in position, and connected to the antenna, the receiver can be tried out. It is tuned, in turn, to each of the local channels—preferably when a test pattern is being transmitted. The electrical and mechanical adjustments outlined previously are then checked, and it is best to make a check on these adjustments using a weaker signal. If the vertical and horizontal hold controls, for example, are properly adjusted for a weak signal, stronger signals will be easily kept in sync. On the other hand, if *hold* adjustments are made to keep a strong signal in sync, a weak signal may be lost and may not be capable of holding the picture steady.

It may not be found necessary to make any re-adjustments on the set at this time, particularly if the mechanical and electrical adjustments were carefully made at the service shop and care was taken in transporting the set to see that none of the adjustments were shifted or changed. A check should be made by the service technician, however, to be sure that all the adjustments are proper and to be sure that the local channels are easily received at the customer's locality. If all local channels cannot be received at the customer's locality, it may indicate that a more elaborate antenna installation is necessary. The service man should check on this, and make sure that the customer understands what he can expect to receive in his particular neighborhood.

The TV receiver is connected to the antenna by means of transmission line. Several varieties of transmission line are available. The more popular types are illustrated in Fig. 14. In Fig. 14A, the conventional "twin-lead" 300-ohm transmis-

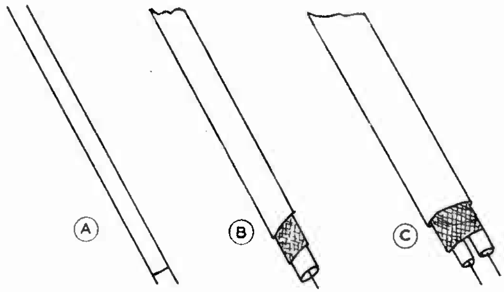


Fig. 14. Three popular types of TV transmission line.

sion line is shown. And in Fig. 14C, the new shielded 300-ohm twin conductor transmission line is shown.

The "twin-lead" transmission line shown in Fig. 14A consists of two stranded metal conductors imbedded in a flat plastic. The coaxial transmission line shown in Fig. 14B consists of a single stranded conductor imbedded in a plastic and surrounded by a metallic braided "shield" which, in turn, is surrounded by an additional plastic or rubber covering for weather protection. The construction of the twin conductor line shown in Fig. 14C is similar to that of the coaxial line but two conductors rather than one are provided. This particular transmission line has an impedance of 300 ohms and thus can be used in place of the more conventional "twin lead."

Usually, the type of transmission line used is determined by two things—the input impedance of the TV receiver and the local reception conditions. The transmission line should have an impedance equal to the input impedance of the TV set. The majority of TV sets have an input impedance of 300 ohms, with most of the remainder having an impedance of around 75 ohms. Some sets are designed to have either a 75-ohm or 300-ohm input impedance so that almost any type of transmission line may be employed.

In sets having a 300-ohm input impedance, transmission lines "A" or "C" might be employed. In the other sets, type "B" can be used.

In most cases, the service man will install first either the twin lead line shown in Fig. 14A or the coaxial line shown in Fig. 14B, depending on the input impedance of the set. The more expensive dual conductor shielded line shown in Fig. 14C will only be used if local conditions make such use necessary. Where the twin conductor shielded lead is used, the outer shield is connected to ground.

Some TV receivers should be connected to ground—others should not. Do not indiscriminately connect the chassis of the TV receiver to ground without referring to the manufacturer's service

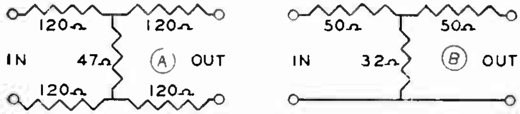


Fig. 15. Attenuator pads to reduce signal strength and prevent overloading. "A" is for 300 ohm lines. "B" is for 72 ohm lines.

manual. To do so may be dangerous—the line fuse may be "blown" or the TV receiver itself might be damaged.

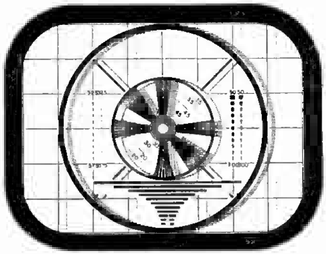
If Trouble is Encountered: Occasionally, routine installation procedure will not give good results. Some type of trouble such as weak reception, interference, etc., may be encountered. Such troubles must be compensated for or corrected if good reception is to be obtained.

One problem encountered is that of weak signals. Where a signal is exceptionally weak, it may be found that re-orienting the antenna will help to increase the signal strength, but, in many cases, this will be of little or no help. It is then necessary to get an antenna with higher gain—one that will pick up more of the signal from the weak station. In other instances, it is necessary to use a small preamplifier or "booster" amplifier connected between the transmission line from the antenna and the TV receiver. These amplifiers are available from most wholesale supply houses in quite a variety of types and forms.

Before purchasing any booster amplifier, however, get definite information from the supplier as to the actual gain provided on different channels. It has been found that some amplifiers, while providing gain on the low frequency channels, do not provide very much gain or may even cause a loss on the high frequency channels. Also, make sure that the signal-to-noise ratio is quite large in the locality where the booster is to be installed—otherwise, a good antenna is much to be preferred to the use of a booster amplifier. (A good antenna increases signal strength without appreciable increase in noise level, while a booster amplifier may amplify the noise as well as the signal, so that not too much is gained from its use.)

On the other hand, it may be that a particular locality is very close to a TV station, with the result that an extremely strong signal is received. A strong signal can cause overloading in the TV receiver, resulting in tearing of the picture, and a tendency for the picture to go almost all black with very bright highlights. If an extremely strong signal is encountered, a small attenuator "pad" may be installed. Two such attenuator pads are illustrated in Fig. 15. That shown in Fig. 15A may be used for sets with a 300-ohm input impedance. That shown in Fig. 15B may be used in sets with a 75-ohm input impedance. If one pad section does not reduce the signal strength enough, several sections may be "cascaded" or connected in series.

Another problem that may be encountered is that of multiple images or "ghosts." Such ghosts are illustrated in Fig. 16. They may be caused by mismatch of the transmission line to the TV receiver, by misalignment in the TV receiver or by multiple signals due to reflections.



Multiple Images (Ghosts)

Fig. 16

using shielded transmission line, by moving the antenna as far away from the street as possible and mounting it as high as possible. Diathermy interference may occasionally be eliminated by using similar steps.

In some cases, it may be found impossible to eliminate diathermy interference due to the close proximity of the diathermy equipment. In such instances, it may be worthwhile

As an example of multiple signals, refer to Fig. 17. There are three paths for a TV signal from the transmitter at A to the receiver at B. Two of the paths are over greater distances and exist because of reflections from fixed objects—these may be large buildings, the side of a cliff, or anything similar. Since the signals travel over different paths, they arrive at the TV receiver at slightly different times. Each signal, however, produces a complete image and thus a second, or third (or more) image may appear alongside the image caused by the primary signal. These additional images are the "ghosts."

There are a number of different types of ghosts that may be encountered. If the ghost is caused by a reflection from a moving object, it may tend to come and go and may cause a "fluttering" effect on the screen of the tube. Not much can be done to eliminate ghosts of this type since the object causing them is moving. Such trouble, however, is not likely to be cause for much complaint because it will be encountered only once in a while.

Where the ghosts are caused by reflections from fixed objects, however, they can sometimes be eliminated by carefully re-orienting the antenna and by using a more directional antenna so that the signal will be received from one path only. As an example, in Fig. 17, if a highly directional antenna were used so that the signal over the direct path were the only one received, then ghosts would no longer be a problem.

The other special installation problem that may be encountered is that of interference produced by other signals. Typical interference patterns are illustrated in Fig. 18, with the cause of the interference described.

The steps necessary to correct interference depend on the type of interference encountered. Where the interference is of the type that occurs at no particular fixed frequency, such as the ignition interference and diathermy interference, about the only thing that can be done is to try to eliminate signal pickup from the direction where the interference is obtained. As an example, ignition interference may be reduced by

to contact the people using the diathermy equipment and to see if they are willing to have the equipment shielded and to have line filters installed. If they will not agree to having the equipment worked on, in order to reduce excessive radiation, they may agree to use the equipment only at certain periods during the day when TV programs are not being received.

Interference may also be caused by other TV stations, other TV receivers, by FM stations, or by other transmitters. Where the interference is at a fixed r.f. frequency, diagonal bars or vertical bars may be produced such as illustrated in Fig. 18. Where the interference is caused by r.f. signals, these bars may slant either to the right or to the left or may be straight up and down. The number of bars may vary considerably.

If the interference is due to an FM station, the bars will not be straight as shown, but will form wavy lines as the frequency of the station shifts.

Interference of this type (from a fixed frequency transmitter) can sometimes be eliminated by using either a commercial wave-trap or by using a transmission line "stub" connected at the input of the TV receiver. This is illustrated in Fig. 19.

The open transmission line stub, when one-quarter wave length long, acts like a series resonant circuit. Thus, it tends to "short out" the signal at its resonant frequency.

To determine the length of the stub, divide 2450 by the frequency of the interfering signal

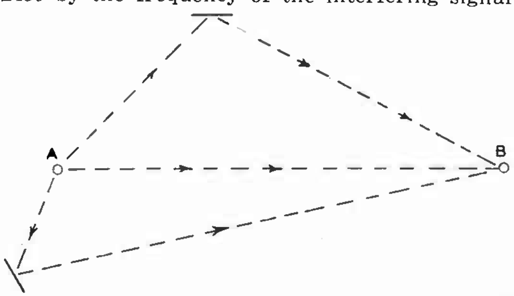
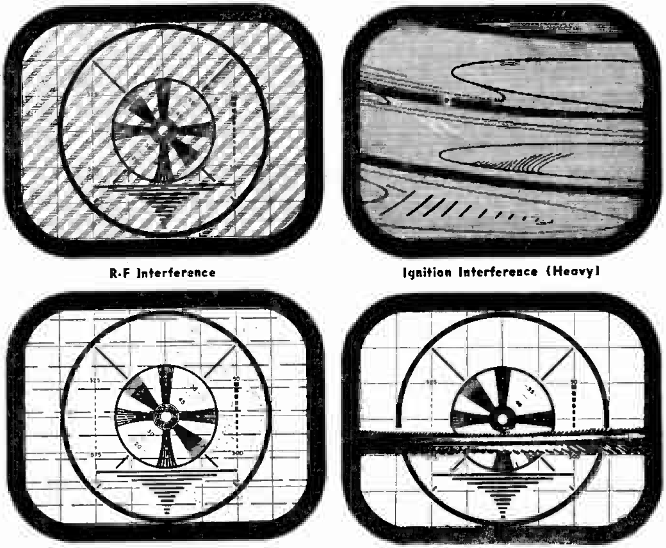


Fig. 17. How multiple signal paths may cause "ghosts."

in megacycles. This gives the approximate length in inches for a stub made of 300-ohm transmission line. Add at least 6 or 8 inches to this figure and cut the stub at the longer length. The stub is then connected to the antenna terminals of the TV receiver, the channel tuned in where the interference is encountered, and a small piece of the stub cut off. One or two inches of the stub are cut off at a time until the interference begins to decrease. Continue cautiously shortening the stub until the interference reaches a minimum. Remember, however, that the end of the transmission line is left open. Do not change the physical location of the stub after the interference has been eliminated.

A shorted transmission line stub may be used but, in this case, it is necessary to strip, tin and solder the end connections together before each trial and, in addition, the line would have to be one-half wave length long (twice as long as the open stub) to be effective.



R-F Interference

Ignition Interference (Heavy)

Ignition Interference (Light)

Diathermy Interference

Fig. 18

One trouble encountered in eliminating fixed frequency interference is identifying the frequency of the signal. This can sometimes be done by noting the nature of the interference, or the actual signal can sometimes be heard by adjusting the fine tuning control on the TV set.

Other special installation problems that may be encountered are those of installing a TV receiver in an area where only D.C. power is available. This is not too much of a problem now, however, because A.C.-D.C. TV sets are being manufactured. If the customer has purchased an A.C. operated receiver, however, then he must purchase a rotary converter or vibrator type inverter in addition in order to operate the set from a D.C. power line.

Once the set has been installed, adjusted, and any trouble encountered cleared up, the final part of the installation job can be undertaken.

Instructing the Customer and "Cleaning Up": The final part of the installation job is to instruct the customer in the operation of the set. *Leave nothing to chance.* Make sure that the customer thoroughly understands the operation of the receiver.

An effort should be made, however, to avoid technical explanations. Show the customer how the different controls affect the operation of the set rather than tell him. Have the customer demonstrate his skill in operating the TV receiver.

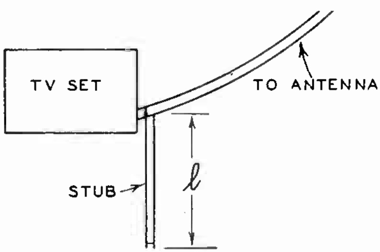


Fig. 19. A transmission line stub used to reduce interference at a fixed frequency. "L" is one-quarter wave-length long.

Care and time taken to be sure that the customer understands the operation of his TV receiver at this point may avoid future "nuisance" service calls—service calls simply because the customer has improperly adjusted the set.

If the customer does desire a technical explanation of why the different controls act as they do, keep such explanations in the layman's language and keep them as brief and simple as possible. Use analogies wherever necessary. Remember, your job is to install the TV receiver—not to give the customer a course in Television.

Once you are sure that the customer understands the operation of his TV receiver and can operate it without difficulty, "clean up" the job. Leave the customer's property in perfect condition. Remove any bits of transmission line, paper, tools, or other material.

Remember, at all times, that the installation will serve as a permanent example of the type of work you do—it may mean more future business and success, or less business and failure.

N.R.I. ALUMNI NEWS

NOMINATIONS FOR 1950

ONCE again it is time for the members of the NRI Alumni Association to select their candidates to fill offices during the coming year. We will vote for nominees for President and for four Vice Presidents.

The two men receiving the largest number of votes for the office of President, will be declared nominees. The eight men receiving the largest number of votes for Vice Presidents will be declared nominees. The names of the nominees will be published in the October-November issue of NR NEWS. That, of course, is our next issue.

Our members then will be asked to choose from among the nominees, a President and four Vice Presidents. The election will take form during the month of October. The final day for voting will be October 25. However, before we get to that we must hold our primary to select our nominees. The final day for voting in the primary is August 25, 1949. So please get your ballot in early.

It might be interesting to our members, at this point, to quote from our Constitution. The following portion of our Constitution is taken from Article VI, pertaining to the election of officers. Here it is.

1. The election of the President and the Vice President shall be by ballot.

2. The President shall be eligible for re-election only after expiration of at least one year following his existing term of office, and when not a candidate for President, may be a candidate for any other office. Other officers may be candidates to succeed themselves, or for any other, but not more than one, elective office in the Association.

3. The election of officers shall be held in October of each year, on the day designated by the Executive Secretary, but not later than the twenty-fifth of the said month.

4. The Executive Secretary shall advise Members by letter, or through the columns of the National Radio News, on or before August first of each year that names of all nominees shall be filed in his office not later than August twenty-fifth following.

5. Each Member shall be entitled to submit, in writing, one nomination for each office, and the two nominees receiving the highest number of votes shall be the nominees for the office for which nominated.

6. The Executive Secretary, before placing any name on the ballot, shall communicate with each nominee, to ascertain his acceptance of the office, if elected. If such tentative acceptance is withheld, the eligible nominee having the next highest number of votes shall be the nominee for that office.

7. The Executive Secretary, on or before October first of each year, shall furnish Members a ballot listing the names of the nominees for each office.

8. No Member shall be entitled to vote if he is in arrears in the payment of dues.

9. Ballots, properly executed and valid according to the instructions plainly printed thereon, shall be returned to the Executive Secretary on or before midnight of October twenty-fifth of each year.

10. The Executive Secretary shall designate three Election Tellers from the staff of the Institute, who shall count the ballots and certify the results, together with the return of the ballots, to the Executive Secretary.

11. In the event of a tie vote for any office, the Executive Secretary shall cast the deciding ballot.

12. The nominee receiving the greater number of votes for the office for which nominated shall be declared by the Executive Secretary to be elected to that office, and notice of such election shall be forwarded in sufficient time, prior to January one, to permit such elected officer to enter upon the duties of said office on that date.

The ballot will be found on pages 27 and 28. The polls for nomination, we repeat, will close August 25, 1949. This will allow us five days in which to count the votes and announce the nominees in the October-November issue of NR NEWS which goes to the printer on September 1. Balloting on the nominees will then take place and the successful candidates will be announced, in the December-January issue of NATIONAL RADIO NEWS, in time to take office on January 1, 1950.

A most conscientious member of long-standing, Mr. Harry Andresen of Chicago will, on January 1st, step out of the office of President. Mr. Andresen has done much for our Alumni Association, particularly in the local chapter in Chicago. He richly deserves the honors which our members have bestowed upon him.

In order that our members may have a list of candidates to choose from we are submitting some names of members located in various parts of the country. These are submitted merely to be of assistance. See below and pages 28 and 29.

We have only two recommendations. It would be nice to have our President, this year, come from the East. Harvey W. Morris, of Philadelphia who has served as Vice President for a number of years and who has done so much for the Philadelphia Chapter, is most deserving and would make an excellent President.

Another man who should soon receive recognition is Alex Remer of New York. He has been very active in New York Chapter. Always ready to extend a helping hand to a member, Mr. Remer would make a fine Vice President.

Use your own judgment, however. Vote for whom you please, just so he is a member of the NRI Alumni Association. This is your election. Please vote.

—n r i—

Nomination Suggestions

Gorden E. DeRamus, Selma, Ala.
Don Smelley, Cottondale, Ala.
H. E. Nichols, Bisbee, Ariz.
Edgar E. Joiner, El Dorado, Ark.
A. R. Waller, Keo, Ark.
Oliver B. Hill, Burbank, Calif.
Jos. E. Stocker, Los Angeles, Calif.
Herbert Garvin, Los Angeles, Calif.

(Page 28, please)

Nominations

All Alumni Association Members are requested to fill in this Ballot and return it promptly to National Headquarters. This is your opportunity to select the men you want to head your association. Turn this page—the other side is arranged for your selections.

After the ballots are returned to National Headquarters, they will be checked carefully and *the two men having the highest number of votes* for each office will be nominated as candidates for the 1950 election. The election will be conducted in the next issue of NATIONAL RADIO NEWS.

The President cannot be a candidate to succeed himself, but you may nominate him for Vice-President if you wish. You may, however, nominate all Vice-Presidents who are now serving, to succeed themselves, or select entirely new ones. It's up to you—select any men you wish as long as they are MEMBERS IN GOOD STANDING OF THE NRI ALUMNI ASSOCIATION. Be sure to give the city and state of your selections to prevent any misunderstanding.

The Executive Secretary is appointed by the Board of Trustees and is no longer an elective office. Vote only for a President and four Vice-Presidents.

Tear or cut off the ballot at the dotted line, fill it out carefully, sign it, and return it immediately to L. L. Menne, Executive Secretary, NRI Alumni Association, 16th and U Sts., N.W., Washington 9, D. C.

Let's all do our part to help the staff handling the elections, by submitting ballots early. Polls for nominations close August 25, 1949.

ALL NRI ALUMNI MEMBERS SHOULD VOTE.

Nomination Ballot

L. L. MENNE, *Executive Secretary,*
NRI Alumni Association,
16th and You Sts., N.W.,
Washington 9, D. C.

I am submitting this Nomination Ballot for my choice of candidates for the coming election. The men below are those whom I would like to see elected officers for the year 1950.

MY CHOICE FOR PRESIDENT IS

....

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

MY CHOICE FOR FOUR VICE PRESIDENTS IS

1. ....

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

2. ....

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

3. ....

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

4. ....

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

Your Signature ....

Address ....

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

Student Number ....

Nomination Suggestions

(*Continued from page* 27)

P. A. Abelt, Denver, Colo.
A. H. Wilson, Leadville, Colo.
W. R. Haberlin, Bridgeport, Conn.
David McKendrick, Devon, Conn.
Joseph Snyder, Danbury, Conn.
Jesse O. Starr, Darien, Conn.
Wm. F. Speakman, Wilmington, Del.
Jos. Certesio, So. Wilmington, Del.
Max Yacker, Washington, D. C.
Wm. G. Spathelf, Washington, D. C.
Glen G. Garrett, Bonifay, Fla.
Austin L. Hatch, Ft. Lauderdale, Fla.
Stephen J. Petruff, Miami, Fla.
W. P. Collins, Pensacola, Fla.
Odell Puckett, Rocky Face, Ga.
R. R. Wallace, Ben Hill, Ga.
Joseph Bingham, Twin Falls, Idaho.
Arvil H. King, Montpelier, Idaho.
Lloyd Immel, Chicago, Ill.
Robert Reid, Evanston, Ill.
Fred J. Haskell, Waukegan, Ill.
Jerry C. Miller, Skokie, Ill.
Louis Brodhage, Chicago, Ill.
Charles Jackowski, Chicago, Ill.
Harold Bailey, Peoria, Ill.
Lowell Long, Geneva, Ind.
Chase E. Brown, Indianapolis, Ind.
Russell Tomlinson, Marion, Ind.
H. E. McCosh, Charles City, Iowa.
E. C. Hirschler, Clarinda, Iowa.
Erney Cunningham, Olathe, Kans.
Wm. B. Martin, Kansas City, Kans.
K. M. King, Wichita, Kans.
Wm. S. Nichols, Cynthiana, Ky.
J. L. Martin, Louisville, Ky.
L. H. Ober, Alexandria, La.
Lawrence Merz, New Orleans, La.
Walter Dinsmore, Machias, Maine.
Harold Davis, Auburn, Maine.
Ralph E. Loke, Calais, Maine.
H. J. Rathbun, Baltimore, Md.
J. B. Gough, Baltimore, Md.
Samuel Robinson, Hagerstown, Md.
G. O. Spicer, Hyattsville, Md.
J. W. Layne, Somerville, Mass.
Louis Crestin, Boston, Mass.
A. Singleton, Chicopee, Mass.
Omer Lapointe, Salem, Mass.
Robert Swanbum, Duluth, Minn.
Arthur J. Haugen, Harmony, Minn.
A. R. Stewart, Staples, Minn.
F. Earl Oliver, Detroit, Mich.
Chas. H. Mills, Detroit, Mich.
Harry R. Stephens, Detroit, Mich.
Floyd Buehler, Detroit, Mich.
Al Fisher, Clarksburg, Miss.
Robert Harrison, West Point, Miss.
C. S. Burkhart, Kansas City, Mo.
A. Campbell, St. Louis, Mo.
C. W. Wichmann, Inverness, Mont.
Milburn Parker, Missoula, Mont.

(*Concluded from page 28*)

V. S. Capes, Fairmont, Nebr.
Albert C. Christensen, Sidney, Nebr.
C. D. Parker, Lovelock, Nev.
Emmitt R. Towers, Ely, Nev.
Clarence N. George, Dover, N. H.
E. Everett Darby, Woodsville, N. H.
J. A. Stegmaier, Arlington, N. J.
Delbert Delanoy, Weehawken, N. J.
Claude W. Longstreet, Westfield, N. J.
O. B. Miller, Albuquerque, N. Mex.
Solomon Ortiz, Raton, N. Mex.
Aurelius Schumacher, Buffalo, N. Y.
Alfred R. Guiles, Corinth, N. Y.
Alex Remer, New York, N. Y.
L. J. Kunert, Jamaica, L. I., N. Y.
Charles W. Dussing, Syracuse, N. Y.
Henry M. Gort, Richmond Hill, L. I., N. Y.
Irvin Gardner, Saratoga, N. C.
Max J. Silvers, Raleigh, N. C.
Arvid Bye, Spring Brook, N. Dak.
Jacob J. Knaak, Cleveland, Ohio.
H. F. Leeper, Canton, Ohio.
Chas. H. Shipman, E. Cleveland, Ohio.
Byron Kiser, Fremont, Ohio.
Pat Thompson, Oklahoma City, Okla.
Emil Domas, Dale, Oreg.
H. M. Pruner, Newport, Oreg.
Harvey Morris, Philadelphia, Pa.
Elmer E. Hartzell, Allentown, Pa.
Chas. J. Fehn, Philadelphia, Pa.
William Dyson, Pawtucket, R. I.
James F. Barton, Greer, S. C.
Joel J. Lawson, Aberdeen, S. Dak.
Chester Warren, Lead, S. Dak.
Argil Barnes, Jonesboro, Tenn.
Matthew Duckett, Memphis, Tenn.
Oscar C. Hill, Houston, Texas.
Dan Droemer, Ft. Ringgold, Tex.
N. G. Porter, Cedar City, Utah.
Clyde Kiebach, Arlington, Va.
A. P. Caldwell, Buchanan, Va.
T. E. Ellis, Richmond, Va.
Burton F. Chase, Northfield, Vt.
H. L. Larson, Seattle, Wash.
Alfred Stanley, Spokane, Wash.
G. Blomberg, Aberdeen, Wash.
Edgar Maynard, Red Jacket, W. Va.
Wm. Wiesmann, Fort Atkinson, Wisc.
J. C. Duncan, Duncan, Wyo.
Robert Kirkham, Calgary, Alta., Canada.
M. Martin, New Westminster, B. C., Canada.
E. D. Smith, Winnipeg, Man., Canada.
Ernest Earle, St. John, N. B., Canada.
W. F. Arseneualt, Dalhousie, N. B., Canada.
Donald Swan, Springhill, N. S., Canada.
G. C. Gunning, Smith's Falls, Ont., Canada.
E. Bergeron, Sherbrooke, P. Q., Canada.
Thos. Crook, Saskatoon, Sask., Canada.

Chapter Chatter

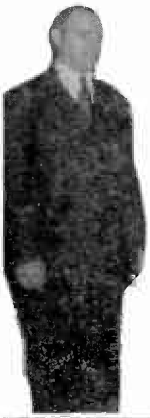
At Chicago they had sound movies on Electronics. The films were supplied by the Illinois Bell Telephone Co. and were entitled "Echoes in War and Peace" and "Microwave Radio-telephony." They were shown by member Mr. Donovan Sobottke. At another meeting, Mr. Lloyd Immel spoke on "Automatic Volume Controls" . . . A general discussion at the last meeting, pertained to equipping their laboratory with proper tools and testing instruments. It will be a place to be proud of. They expect to have it ready in September. . . . Students and graduates in the Chicago vicinity should make a note of the date of the September meeting (the 14th) and plan to attend. Expect to have Mr. L. L. Menne, Executive Secretary from headquarters, with us to help open the fall and winter season which promises so much because of the new and inviting meeting place. . . .

Phila-Camden Chapter reports attendance has been very good. . . . Television expert, Harvey Morris, is doing a great job for our members with his lectures and demonstrations on television. In addition to regular members, the service men from the Television distributor where Mr. Morris is employed, also attend the meetings so that they may learn more about television servicing. . . . This work that Harvey is giving is strictly on the practical side and our members are learning how to find and correct various troubles in a television receiver. . . . All NRI men, whether students or graduates, who live in the Philadelphia area, are welcome at meetings held on the second and fourth Monday of the month at 4510 Frankford Ave., Phila., at 8:00 P.M. You are assured a cordial reception. . . .

Baltimore reports they are getting a great deal out of their talks on television each meeting. . . . The leader in these discussions is their own expert, Mr. Clifford M. Whitt. He knows television and he also knows how to teach it to others. . . . They also do some radio repairing at each meeting. This actual work is very beneficial to the less experienced members. The sets brought in are usually the balky ones so they all get some benefit out of these practical demonstrations. . . . Had some interesting movies on Radar which were shown by Mr. Keller. They meet on the second and fourth Tuesday of each month at 8:15 P.M., Redmen's Hall, 745 W. Baltimore St., in Baltimore. Plenty of comfortable seats for all. . . .

Complete reports of Detroit and New Yory meetings were prepared but must be held over until next issue because of space limitations. . . . **Detroit** and **New York** chapters will not hold meetings in August but will resume meetings in September.

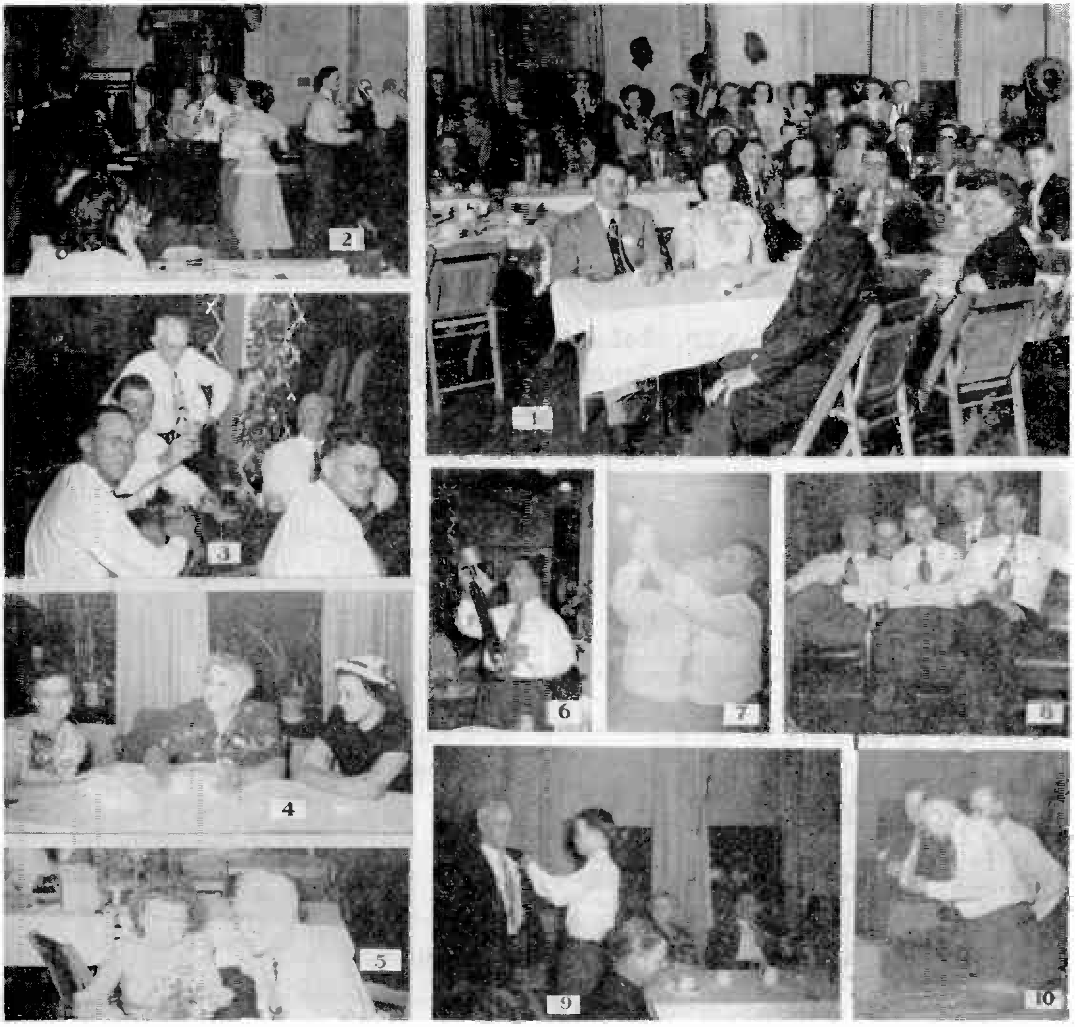
(Right) J. E. Smith, addressing a meeting of New York Chapter members of the National Radio Institute Alumni Association. A rousing reception was given the founder and president of NRI by the 105 who were present.



(Left) Bert Wappler, the dynamic Chairman of New York Chapter.

(Below) Frank Zimmer, L. L. Menne, Alex Remer, J. E. Smith, Lou Kunert, W. Fox and seated, Emil C. Ruocco, and John Krebs, all of whom took part in the program.

J. E. Smith displays a plaque, a likeness of himself, presented to him. It was made by member Otto Schwarz.



(1) Detroit Chapter members and ladies at their annual dinner party. (2) After dinner there was the usual good time. Here things get under way on the dance floor. (3) Left to right, Bob Briggs, Harold Chase, who did a marvelous job as Master of Ceremonies at the dinner table, Charley Mills, Lou Menne, and Val Guyton. (4) Mrs. Clarence McMaster, wife of the Vice Chairman; Mrs. Charles H. Mills, wife of our Vice President, and Mrs. Robert L. Mains, wife of Detroit Chapter Chairman. (5) Mr. Mills claims he was telling Mrs. Edwin A. Madill about Mr. J. E. Smith when this picture was snapped. Oh yeah! (6) Floyd Buehler, a camera fan in his odd hours, is given a tripod by members of Detroit Chapter, in appreciation of his fine work as Lecturer at meetings. (7) Man, what you will see when you haven't got a gun! (8) The hecklers, Menne, Earl Oliver, Bob Mains, Harry Stephens, and Chase. (9) Chairman Robert Mains presents Vice President Chas. H. Mills with a gift from Detroit Chapter members. Mills looks as though he expects it to explode. Actually there was a joke to it. (10) Who's-got-a-nickel! One more piece on the juke box and then we'll go home.

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L. L. MENNE, EDITOR
J. B. STRAUGHN, TECHNICAL EDITOR

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