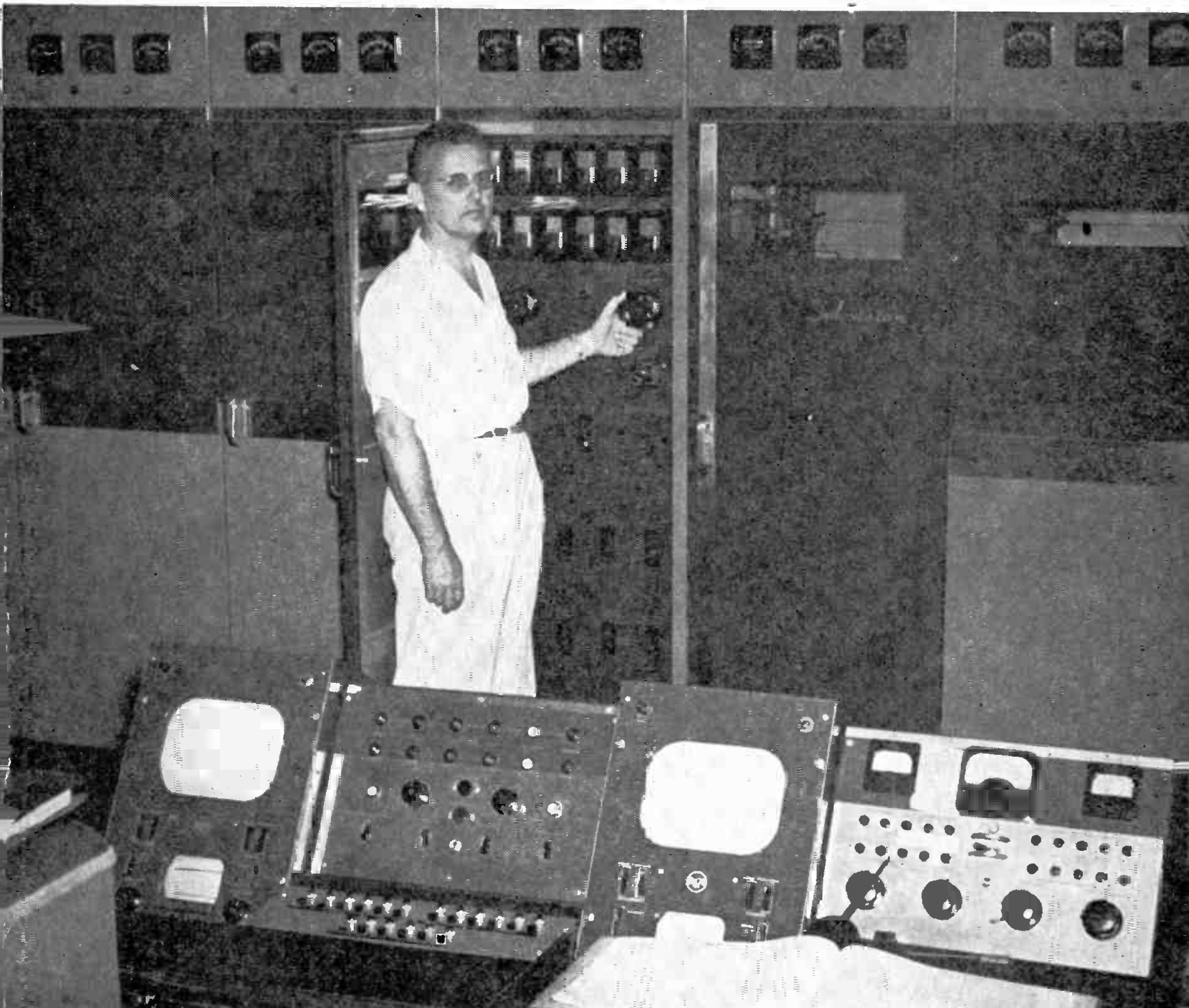
National RADIO-TV NEWS



IN THIS ISSUE

How to Build High Fidelity into Receivers

How to Become a Radio Amateur

Alumni Association News

Aug.-Sept. 1950

VOL. 14 No. 4

PERSISTENCE PAYS

You don't need to be a *genius* in order to succeed in your chosen career!

The greatest results in life are usually obtained by simple means—and by the exercise of ordinary qualities that we all have.

The common every-day life, with its cares, necessities, and duties, gives us plenty of opportunity to get experience of the best kind—and provides abundant room for self improvement.

The road of human welfare lies along the old highway of steadfast well-doing. The men who are most persistent will usually be the most successful.

"Fortune" has often been blamed for her blindness. But "fortune" is not as blind as men are. "Fortune" is usually on the side of the industrious— just as the wind and waves are on the side of the best navigator.

J. E. SMITH, *President*

Max M. Tall

"How to Build High Fidelity into a Radio Receiver"

By MAX M. TALL

NRI Consultant

THE increase in listening enjoyment resulting from the "naturalness" in high fidelity systems has led to a greater interest in the "faithful" reproduction and communication of sound. The discriminating listener is no longer satisfied with anything less than high quality reproduction.

It is common knowledge that the cost of a high quality, high fidelity receiver or amplifier is beyond the reach of the ordinary pocket-book. In fact, building your own high fidelity system can be quite expensive. However, most families own at least one fairly good receiver that can be improved immeasurably without going to great expense. The improvements outlined in this article can be governed by the amount you desire to spend. These same improvements can, of course, also be applied to an amplifier or PA system.

Your receiver or amplifier should be a basically good one. It should have at least a push-pull output stage. There's no point in attempting to build quality into a receiver or amplifier containing non-linear circuits.

In revamping a system for the electrical reproduction of sound, it is wise to consider the various ways in which the sound wave may be distorted and the result of such distortion on listening pleasure. We have always considered amplitude distortion as a major factor in judging receiver or amplifier quality. However, a measure of the intermodulation present is a more sensitive and realistic evaluation of amplifier quality. If the intermodulation term exceeds 2%, it will be detectable when listening to music. This corresponds to approximately 4% of second harmonic distortion for a single tone. Odd harmonics are even more troublesome than even harmonics and the amount of distortion permissible becomes even less with a wider frequency range. For this reason, it is better to start with a basically good receiver or amplifier.

The most important single factor in a high quality system is the frequency range. Ordinary speech has a frequency range from 100 to 10,000 cycles. Music, on the other hand, will range from 40 to 15,000 cycles. However, a frequency range of 80 to 8,000 cycles will yield excellent reproduction of all sounds except certain types of noises such as the jangling of keys. The usual AM broadcast station transmits a frequency range from 100 to 5,000 cycles; while FM will transmit 50 to 15,000 cycles. However, many home radios will not yield a flat response above 3500 cycles.

The purpose of this article is to suggest various means to improve the response of your receiver, cut down the distortion and thus increase your listening pleasure.

The fidelity of a receiver depends upon the variation of the output of the modulation frequency across the output load as a resistor for different modulation frequencies. It does not include the characteristics of the loudspeaker. The fidelity at the lower modulation frequencies is determined primarily by the audio section. On the other hand, side band trimmings in the i.f. section, and in some instances the r.f. section, will affect the fidelity at the higher frequencies.

It is advisable to favor triodes in your audio section. Triodes are usually free from inter-modulation and harmonic distortion, while pentodes and beam power tubes have small immeasurable kinks in their characteristics that contribute to "listener's fatigue." Most good quality receivers will use triodes in the audio section.

The high frequency response of an audio stage can be improved by making Req approach Xo in value.

$$R_{eq} = \frac{R_c\, r_p\, R_{g1}}{R_c\, R_{g1} + R_c\, r_p + R_{g1}\, r_p}$$

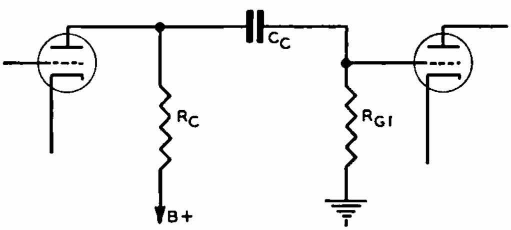


Fig. 1. Resistance-coupled amplifier.

(See Fig. 1). Where r_p=plate resistance of the tube. It can be seen that Req is equal to the effective resistance of the plate resistance, coupling resistance, and grid-leak resistance in parallel. X_o, on the other hand, is equal to $\frac{1}{6.28fC_o}$, where

C_o is the sum of the output capacitance of the last stage and the input capcitance of the next stage. This data can be found in any tube manual. The frequency f, is of course the upper limit of the frequency that we desire to transmit.

Since r_p, the plate resistance is fixed for a particular tube and R_{g1} is made as large as possible, we can only reduce R_{eq} by reducing R_c, the coupling resistor. Reducing R_c will also reduce distortion in the following tubes since the grid swing will not be as great. Keep in mind, however that reducing R_c will also reduce the gain of the stage. With a little experimentation, a happy medium can be found between high frequency response and satisfactory gain.

The low frequency response can be improved by increasing the size of the coupling condenser, C_c. However, making this condenser too large will increase the capacitance between this condenser and ground, increasing C_o and reducing the high frequency response.

Most modern receivers use pentodes in the audio section and pentodes or beam power tubes in the output stage. A good receiver will have inverse feedback to reduce distortion introduced by the "kinks" in the characteristics of these tubes. However, should you find that the receiver you plan to revamp does not have any provision for feedback, it would be advisable to install some form of inverse feedback.

You might simply leave one of the amplifier cathode resistors upbypassed—that is, remove the bypass condenser. Better yet, replace each of the cathode resistors by two—one should have a value of 100 or 200 ohms. This resistor may be left unbypassed while the other one is bypassed as usual.

Figs. 2A and B illustrate two methods of inverse feedback. A word of precaution—when taking a

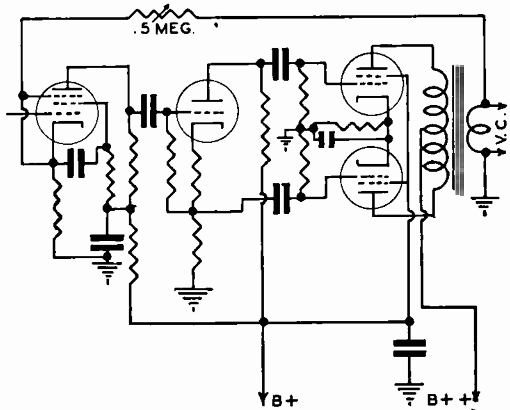


Fig. 2A. Illustration of an over-feedback loop in a three stage amplifier. A potentiometer is used to determine the proper amount of feedback and may be replaced by a fixed resistor in the final circuit.

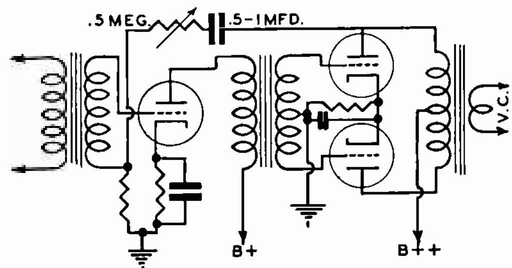


Fig. 2B. Illustration of feedback over two stages. A potentiometer again is used to determine the proper amount of feedback and may then be replaced with a fixed resistor in the final circuit.

feedback voltage from a coil or transformer, one side of the coil will yield regeneration and oscillations and the other side degeneration. Make your first connection to the coil temporary. Should you find that the amplifier howls, make your connection to the other side of the coil.

If you use a power transformer as an audio transformer, as explained later, one of the unused windings can be used to provide for feedback. However, a variable voltage divider should be connected across the coil to determine the proper amount of feedback.

You will find that most good receivers and amplifiers do have a satisfactory frequency response. The loss in response occurs in the audio output transformer and speaker itself. You will be quite surprised at the uneven response of the average audio transformer and speaker.

Thus, the first problem is to secure a good output transformer. A good transformer should have a core with a high permeability and a great number of turns on each of the coils. The coils should be mechanically arranged to keep the leakage flux at a minimum. The resistance of the windings should be small compared to the impedance in the audio frequency range.

One of the finest audio transformers manufactured is the Peerless Transformer made by Altec-Lansing. However, this one is quite expensive. Any of the good standard brands selling for about $10 or $15 will have a good frequency range.

A high voltage power transformer with the proper turns ratio will prove satisfactory for most cases and will be more reasonable in cost.

When a power transformer is used, the high voltage secondary of the transformer is used as the primary and connected to the plates of the output tubes (as in Fig. 3). The primary is then connected to the voice coil of the speaker or to the dividing network when a real high voltage transformer is used. If the proper impedance match cannot be made in this manner, the voice coil can be connected to one of the filament windings. In other words, the action of the transformer is reversed. In choosing the transformer, remember that the impedance ratio is the square of the voltage ratio. Thus, if the transformer has a voltage ratio of 10, the impedance ratio is 100.

With reasonable fidelity being obtained from the circuit, it would be a shame to destroy it with a poor speaker. In fact, in most receivers and amplifiers, the greatest loss in fidelity occurs at this source. It would be advisable to purchase the best speaker you can afford. A two-way speaker system with a "woofer" and "tweeter" may even be more desirable. The "woofer" and "tweeter" may be a coaxial speaker or two separate speakers. The "woofer," of course, is for good bass response; while the "tweeter" will bring out the brilliancy of the highs.

The use of a two-way speaker system brings in the problem of a suitable dividing network. Since it is not possible to design speakers which reproduce frequencies in one band and attenuate frequencies outside of the band, it is necessary to supply an electrical network between the final power amplifiers and the speakers to send the correct frequency band to each loudspeaker. These networks are called "dividing networks" or cross-over networks.

Cross-over networks pass their band of frequencies but do not sharply attenuate all others. Rather, they transmit the required band uniformly then gradually roll off in their response.

This leads to a certain amount of overlap between the two speakers. While it may seem desirable to have a sharp attenuation outside of the assigned frequency, the sharpness of attenuation is necessarily a compromise between cost and effectiveness.

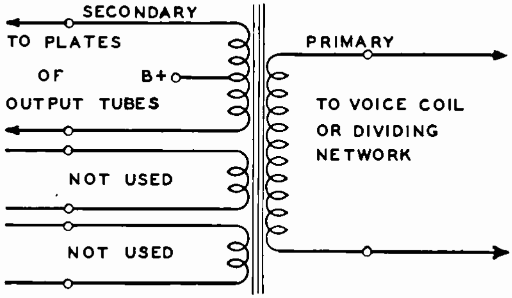


Fig. 3A. Using a very high voltage transformer as an audio output transformer.

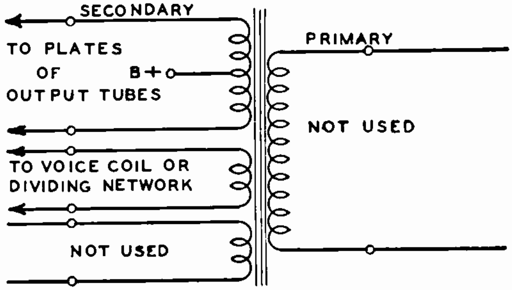


Fig. 3B. Alternate connection for a power transformer as an audio output transformer.

In fact, an analysis of a great number of speaker systems shows that a cross-over network that provides at least ten to twelve db attenuation one octave away from its cut off and not more than 18 db attenuation per octave is perfectly satisfactory.

Speakers may be purchased with dividing networks already built in. However, you may desire to construct your own two-way speaker system, especially since the cost may be reduced materially in this way.

The "tweeter" can be any one of the common garden variety of three or five inch speakers. The "woofer" on the other hand, should be at least a twelve or fifteen inch speaker.

In general, loudspeakers are unable to radiate low frequencies effectively because a loss of coupling occurs between the diaphragm and transmitting medium air. For this reason, the speaker should be adequately baffled. A major defect of commercial loudspeakers is the large amount of amplitude distortion. The use of a thick and comparatively soft cone which can be driven fully without break-up, with the resulting

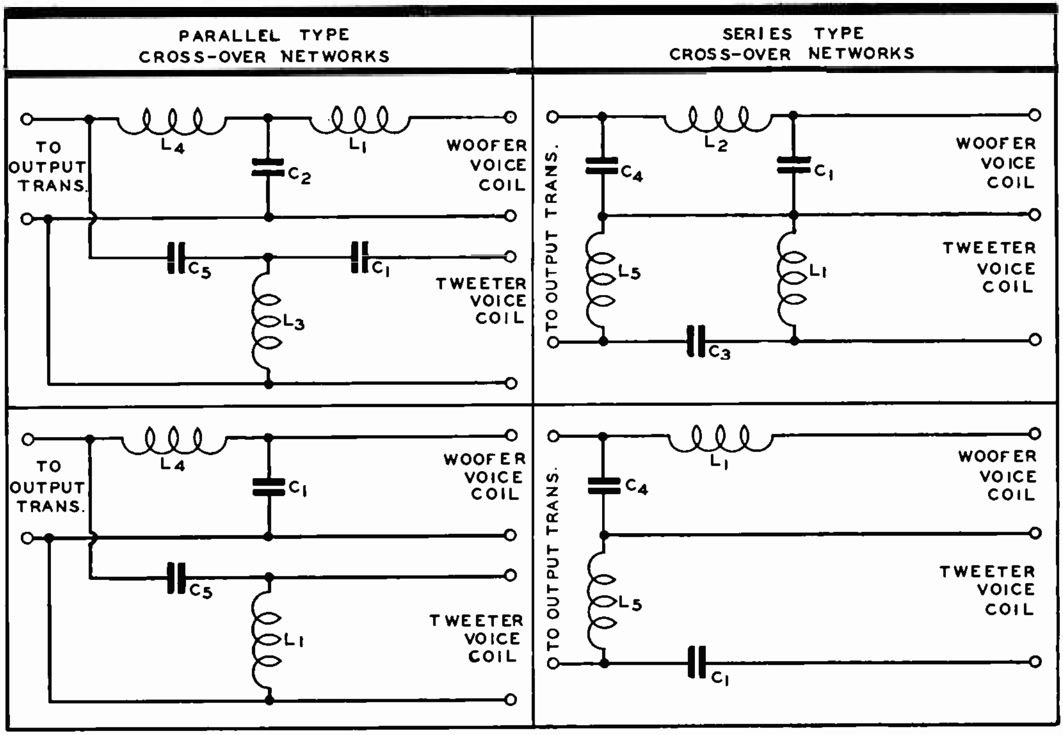


Fig. 4. Cross-over networks. Z_W—impedance of Woofer. Z_T—impedance of Tweeter.
$R_o = \sqrt{Z_W Z_T}$ m = 0.6; fc = 400 ∿; $\omega_c = 6.28 \times 400 = 2512$

$$L_1 = \frac{R_o}{\omega_c} = \frac{R_o}{2512} \text{ henries} \qquad C_1 = \frac{1}{\omega_c R_o} = \frac{1}{2512\ R_o} \text{ farads}$$

$$L_2 = \frac{2R_o}{\omega_c} = \frac{R_o}{1256} \text{ henries} \qquad C_2 = \frac{2}{\omega_c R_o} = \frac{1}{1256\ R_o} \text{ farads}$$

$$L_3 = \frac{R_o}{2\omega_c} = \frac{R_o}{5024} \text{ henries} \qquad C_3 = \frac{1}{2\omega_c R_o} = \frac{1}{5024\ R_o} \text{ farads}$$

$$L_4 = \frac{(1+m)\,R_o}{\omega_c} = \frac{R_o}{1570} \text{ henries} \qquad C_4 = \frac{1+m}{\omega_c R_o} = \frac{1}{1570\ R_o} \text{ farads}$$

$$L_5 = \frac{R_o}{(1+m)\ \omega_c} = \frac{R_o}{4019} \text{ henries} \qquad C_5 = \frac{1}{(1+m)\ \omega_c R_o} = \frac{1}{4019\ R_o} \text{ farads}$$

harmonic distortion, will yield clean reproduction at the lower frequencies.

In a two-way speaker system, the point where both speakers receive equal amounts of energy is called the "cross-over point." The frequency chosen for this critical or cross-over frequency is governed by several factors. If it is chosen too low, then large values of capacity will have to be used in the network and a large "tweeter" will have to be used. Choosing two high a frequency will cause us to encounter the characteristic dip which always seems to be present in large speakers. A good compromise will result if the cross-over frequency is between 250 and 400 cycles.

In our calculations, we will use a cross-over frequency of 400 cycles and an m equal to 0.6 which has been found best for series and parallel operation of filters.

In Fig. 4 are shown four standard types of dividing networks (two parallel and two series types). The first of each type shown is the desirable type while the second of each type shown is cheaper to construct.

In regard to the filter coils, it is advisable to give some thought to their type and effective resistance. Modulation will result when the coils are overloaded if they have iron cores. In addition, a large effective resistance will cause excessive losses in the filter bands. From a practical standpoint, large air core coils will solve the problem effectively.

For best listening results, the speaker should be mounted and baffled properly. The room acoustics of the average home cannot be changed too much. The average person can do no more than place the receiver in a corner or avoid placing it where a hard wall surface nearby will cause severe reflection. However, the unit may be made sufficiently flexible by adequate tone controls (described later on in this article). Of equal importance is the speaker enclosure or cabinet. A square, flat, symmetrical baffle should never be used since its symmetry results in cancellations of frequency. Simply mounting the speaker on an irregular baffle will eliminate this fault. When two speakers are used, do not mount them equally spaced from the edge of the baffle. They should be close together and somewhat off center. The cones will then load each other more effectively and result in better low frequency response.

Because of the large physical size required, open baffles do not operate well much below 125 cycles. For this reason, acoustic labyrinths and bass-reflex enclosures were developed. These cabinets may be purchased or constructed.

It is strange that in all discussions of high fidelity, the emphasis has been placed on extending the high frequency range and little has been said about the required balance between both the upper and lower limits.

Actually, tests have revealed that full program enjoyment is only possible with this balance. In practice, listeners whose sets yield a frequency range to 5 kc. (for AM) will use their tone control, if they have one, to cause the set to cut off somewhere between 2500 and 4000 cycles. Even musically inclined listeners who appreciate the brilliancy of the highs are found to do the same thing. The usual excuse given for this practice is that the tone is more mellow or pleasant and so on. Although claims have been made that this is due to noise and distortion at the higher frequencies, it is actually due to the unbalance in frequency range. It is for this reason that care should be taken to enclose the speaker properly to bring out the full lows the system is capable of delivering. Then, a tone control can be used for minor adjustments.

Another good argument for tone controls is due to the response of the ear. The ear responds non-linearly to tones of large amplitude. With strong sound waves, the ear produces harmonics as well as sum and difference tones. These tones

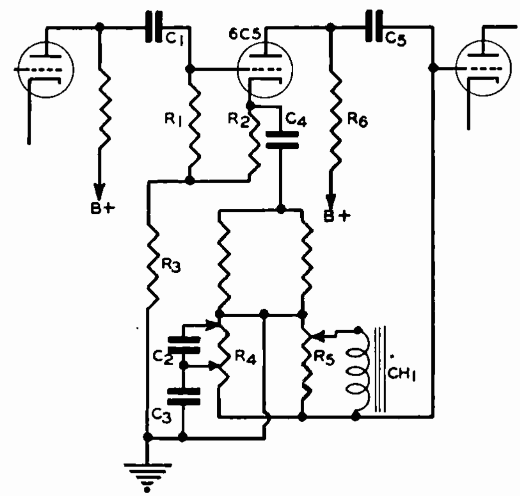


Fig. 5. Thordarson Dual Tone Control.

R_1 250 K ½ w.
R_2 1 K 1 w.
R_3 20 K 1 w.
R_4, R_5 Dual tone control, Thordarson R-1068
R_6 20 K 1 w.
C_1 .1 mfd. 400.v.
C_2 .04 mfd. 400 v.
C_3 .01 mfd. 400 v.
C_4 10 mfd. 200 v.
C_5 .1 mfd. 400 v.

which are not present in the original sound actually exist in the ear. Tones that are produced in the ear are called subjective tones.

It is this quality of the ear that makes most receivers and loudspeakers passable. The pitch of the sound does not change by removing the fundamental since the harmonics combine in the ear to produce a difference frequency that creates the fundamental in the form of a subjective tone. Thus, the ear will supply many low frequencies that the equipment itself fails to produce.

Another important result of the non-linearity of the ear is called masking. When the ear produces harmonics of lower frequencies, it is not as sensitive to the high frequencies which are then said to be masked. The intensity level at which sound is reproduced is also of peculiar importance. If the sound level coming from the loudspeaker is lower than the original sound, the lower frequencies tend to disappear, while the masking of the high frequencies is reduced. With high intensity, the highs are almost completely masked. For these reasons, it is advisable to have a tone control to vary the frequency response of the unit with different levels of loudness.

Many tone controls have been described in the literature. The Thordarson dual tone control (Thordarson Electric Manufacturing Division) described here, was developed to provide an effective tone compensating network for any sound system. The system is useful when control over a wide range of frequencies is desirable.

Operation is based upon degeneration which occurs in the cathode circuit of a triode (See Fig. 5). The plate load resistor is small compared to the cathode resistor so that a large part of the developed voltage appears in the cathode circuit. Variable frequency response is obtained by introducing inductance and capacitance into the grid and cathode circuits, which in turn determine the amount of degeneration for various frequency ranges.

The dual tone control may be installed between two resistance coupled stages of an amplifier (audio section of receiver). It may be mounted on the chassis or constructed as a separate unit.

In conclusion, it is well to emphasize that a good receiver be chosen. Many of the old type receivers having triodes in the audio section and push-pull output stage will be satisfactory. The frequency response of the set can be extended somewhat by decreasing the value of the plate coupling resistor and increasing the size of the coupling condenser in a resistance coupled amplifier. A good output transformer and speaker system will enable you to take advantage of the receiver's improved fidelity. The tone control will increase your listening pleasure immeasurably. Here's to good listening!

n r i

Rectangular Picture Tube Features Bent-Gun

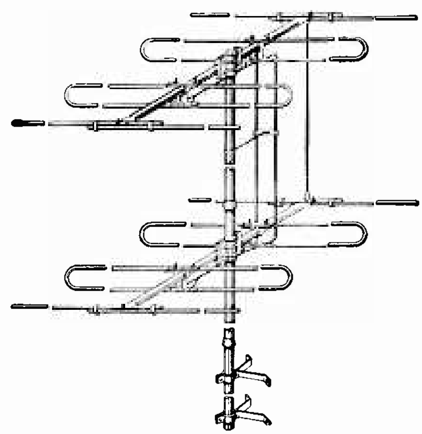
The Tube Division of Allen B. DuMont Laboratories, Clifton, N. J., recently announced a new rectangular cathode-ray TV picture tube, featuring exclusive DuMont bent-gun design.

The new Type 16TP4 uses the bent-gun design to assure a sharper spot focus, and at the same time to provide protection from ion spot blemishes. A gray filter face-plate is used for improvement of contrast in the presence of ambient light.

Designed as initial equipment, or as a conversion tube, the overall width is only 16⅛", and the overall length 18⅛", making for attractive, compact cabinet design.

n r i

New Twin-Driven Yagi Stagger-Tuned For Channels 4 and 5

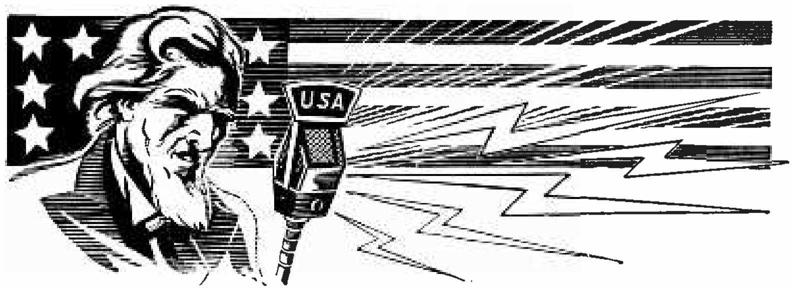


Following the design and development of the Twin-Driven Yagi antenna, Technical Appliance Corporation, Sherburne, N. Y., now announces a new Twin-Driven Yagi, Cat. 985—4½, which has performance peaks at both Channel 4 and Channel 5.

With this new design it will now be possible to achieve the gain in the antenna heretofore possible on only one channel. In fringe areas, or weak signal locations, this new antenna will bring in signals and at the same time will not require the mast height required for comparable signals by other antenna types.

This antenna is an important addition to the TACO line of fringe area antennas since many of the large metropolitan areas, such as Chicago, Cleveland, New York, Washington, Los Angeles and San Francisco, have stations operating on Channels 4 and 5.

This new antenna is constructed in the famous Jiffy-Rig method, thereby cutting installation time to a fraction of that formerly required.



THE VETERAN'S PAGE

Devoted to news items and information of special interest to veterans taking NRI courses under the GI Bill of Rights.

CUT-OFF DATE FOR START OR RESUMPTION OF TRAINING UNDER GI BILL OF RIGHTS

The big news on GI training is not really NEWS. Since 1945 the law has provided that GI training must be started within four years from date of discharge or the legal end of the war—with certain exceptions. Congress has set July 25, 1947, as the end of the war for purposes of determining educational benefits. Four years after this date will be—July 25, 1951.

Most veterans cannot start courses after July 25, 1951. In effect present VA instructions say:

a. A veteran must be *in training* July 25, 1951, if he wants to study after that date. Applications on July 25 don't count; having a certificate on July 25 for a course starting later doesn't count. He must be *in training*.

b. A veteran who interrupted a course will not be able to re-open the course *after* July 25, 1951, except for reasons satisfactory to the VA.

c. Veterans *in training* on July 25, 1951, will have until July 25, 1956 to complete their courses—if entitlement lasts and if they stay in training *continuously*.

For NRI students and graduates these regulations mean:

a. Anyone now enrolled, who wants a second course, must complete his *present* course in time to *be enrolled* for the second on or before July 25, 1951.

b. Anyone who started an NRI course and who interrupted, must be re-entered on or before July 25, 1951.

c. Anyone who completed one course, and wants a second one "sometime" must *be enrolled* for that training *on or before* July 25, 1951.

Unless Congress changes the basic bills, there will be few exceptions to the above. Anyone in service on July 25, 1947 should disregard these dates. We have special information for those few veterans discharged on July 26, 1947, or later, and will be glad to supply this special information to veterans inquiring about it.

Since the VA specifically requested us to publish this information, you should tell any of your GI friends who intend to take schooling under the GI Bill that July 25, 1951, is the last day, except for veterans discharged after July 25, 1947.

Even if you don't intend to take a second NRI course or any other training upon graduating from your present course, there are reasons why you should complete your present course as soon as possible. You not only qualify for promotions, and higher pay, but by the time the course is completed, you *may* want additional training. Up until July 25, 1951, you can take it, with VA permission.

This information in no way changes previous VA instructions on length of entitlement, reasons for changing courses or fields of training. It's just an added limitation you should keep in mind.

Our Cover Photo

NRI Graduate W. P. Searcy, Jr., appears on the front cover of our magazine. He is at the control panel of an RCA type TT-5A Television transmitter, adjusting the filament voltage on the picture section of the equipment. Graduate Searcy is employed by Television Station WDSU-TV, New Orleans, Louisiana.

The above photograph shows NRI Graduate Searcy standing in front of the micro-wave relay equipment truck, a part of the modern equipment owned by Television Station WDSU-TV, New Orleans, La.

Dear Mr. Smith:

"Having seen plenty of successful Radiotricians who secured their training through NRI, I decided to take NRI training. Now I know Radio servicing and can highly recommend the NRI training.

"I graduated from NRI in 1945, and then went into a broadcast station as an Engineer. Later I went to sea as Chief Radio Operator on board cargo and passenger ships. In 1949 I came with my present company, working first at their A.M. transmitter outlet. When a vacancy occurred, I was transferred to our TV transmitter, and am now serving as an Audio Engineer on the micro-wave unit of WDSU-TV and also serving as an Engineer at the Television transmitter.

"I hold both Radiotelephone first-class and Radiotelegraph first-class licenses, as well as a Class A Amateur license. Amateurs will find me on the 75 meter phone band, or on the 20 meter phone band, operating my own amateur radio station under the call letters of W5LV.

"I can recommend NRI training very highly for any phase of Radio."

Very truly yours,

W. P. Searcy, Jr.
1916 Fern St.
New Orleans, La.

TV TROUBLE-SHOOTING WITH NRI PROFESSIONAL EQUIPMENT

By H. L. EMERSON

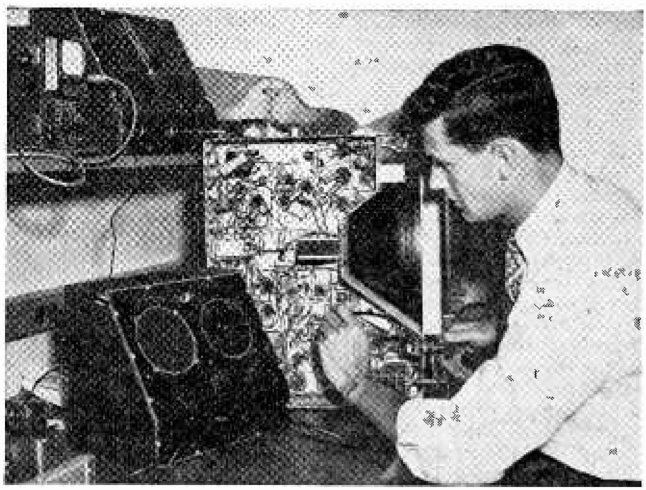
NRI Supply Division

MANY NRI students and graduates who have purchased NRI professional test equipment have probably already discovered ways to use their equipment in TV servicing. While the model 45 Volt-Ohm-Mil-Ammeter, the model 68 Tube Tester, and the model 112 Resistor-Condenser Tester are general-purpose instruments, designed for all radio and TV work, the model 34 Signal Tracer and model 88 Signal Generator were designed primarily for servicing AM and FM broadcast receivers. Nevertheless, the latter two instruments can be used to good advantage in servicing Television receivers when the proper techniques are employed.

In this article we will outline basic techniques for using the model 34 Signal Tracer and the model 88 Signal Generator in TV trouble-shooting. The use of the model 45 Volt-Ohm-Mil-Ammeter, the model 68 Tube Tester, and the RC-112 Tester in TV work is so similar to their use in conventional AM and FM broadcast receiver service work that we need not go into detail on using these instruments here. It is important to note, however, that the usefulness of the model 45 in TV work is increased considerably if this instrument is supplemented with NRI's High Voltage Television Test Probe.

The NRI Signal Tracer is a tuned-type signal tracer, and covers frequencies only slightly above 11 megacycles. This seems to limit our signal tracer in TV work because the video I.F. frequencies used in Television receivers are always higher than 11 Megacycles.

Regardless of the Television channel being received, there are always two carrier signals, with the video carrier frequency always exactly 4.5 megacycles lower than the sound carrier frequency. According to the theory of heterodyne action, a sum and a difference frequency will be created by the interaction of these two carrier frequencies. The difference frequency will always be 4.5 megacycles. If a practical means of detecting this difference frequency is devised, the 4.5 megacycle signal can be detected and amplified. If this amplified signal is fed to a loudspeaker, the sound portion of the Television program will be audible and the vertical sync pulses (occurring 60 times per second) will be audible.



The author using a Model 34 NRI Professional Signal Tracer in checking the RCA 630 TS chassis.

We shall discuss the use of a type IN34 crystal in connection with the NRI Professional Signal Tracer for detecting this 4.5 megacycle signal in a Television receiver.

Experiments in the NRI Television laboratory were carried on with a Model 34 NRI Professional Signal Tracer and an RCA type 630 TS chassis. Procedure described on the following pages will concern these two models insofar as signal tracing is concerned. Similar results should be obtained when using other Television receivers. In this article, we shall only discuss actual results,

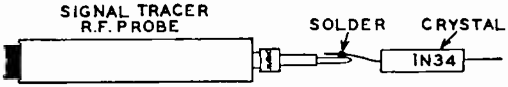


Fig. 1.

as we obtained them. The article is intended to give you interest in experimenting with your NRI test equipment in connection with Television, so that maximum benefit will be derived from your instruments. If you plan to use your signal tracer in Television Servicing, we recommend that you become familiar with results which may be expected from different types of Television receivers known to be in good condition. Do not wait to use your signal tracer until you have a defective Television receiver in your shop for servicing.

Information on using the Model 88 NRI Professional Signal Generator to isolate defective stages will also be covered. This utilizes the "signal injection" method.

Keep in mind that, unlike ordinary Radio receivers, there are dangerous high voltages present in a Television receiver which could harm you or your test equipment.

Signal Tracing in TV Receivers

The only additional equipment necessary for using your NRI Signal Tracer in Television circuits is a type IN34 Germanium diode. This is a small Germanium crystal, with characteristics like an ordinary half-wave detector. It is contained in a small tubular case and has two leads. General appearance is similar to a resistor. This item cannot be supplied by NRI, but is available through Radio wholesalers or mail-order houses at a cost of about $1. In Figure 1 we have shown how a type IN34 crystal can easily be connected to the R.F. probe of your signal tracer. Thoroughly clean the metal tip of this probe so that solder will easily adhere to the tip. Tin the probe tip with solder and, using a drop of solder, attach the crystal to the probe as shown in Figure 1. For your purposes, it will not matter which of the crystal leads is connected to the R.F. probe. The free lead of the crystal is then used as a test probe.

After you have finished using your signal tracer, unsolder the crystal. To clean the tip of your R.F. probe, merely heat the tip thoroughly with a hot soldering iron and then quickly wipe the probe with a cloth. No evidence of solder will remain.

For our purposes we have shown the receiver diagram for the RCA type 630 TS chassis. All portions of the circuit which will be discussed are included in Figure 2. Let us first consider signal tracing in the video I.F. section.

Choose a time of day when a test pattern is on the air, or when programs are actually being telecast. Choose the strongest and most reliable channel available and adjust the television receiver for normal picture. It will probably be advantageous to keep the television sound control turned very low.

Set up the signal tracer as follows: Band selector on position "D"; coarse R.F. attenuator on position 1; fine R.F. attenuator in maximum clockwise direction; input selector switch in the R.F. position; and the main tuning control in the vicinity of 4.5 megacycles. Connect the signal tracer ground lead to the TV chassis. You will have to tune the signal tracer slightly in either direction until you pick up the 4.5 megacycle "beat" frequency.

In finding test points on the Television receiver chassis, it will be necessary to have a detailed circuit diagram, and a diagram showing the tube location. Without this information it would be very impractical to attempt the location of test points.

In signal tracing in the video I.F. strip, normal procedure would be to begin at the plate of the converter tube. In Figure 2, this is V-2, either pin 1 or pin 2. Naturally a stronger signal would be available at the output of the I.F. strip. Therefore if you are not able to locate the 4.5 megacycle signal at the plate of the converter tube, move the R.F. probe of the signal tracer temporarily to pin 1 of V114-A. Tuning the signal tracer slightly should give you a strong signal from the signal tracer's loudspeaker, and should also close, or at least affect, the signal tracer's tuning eye. IF NO SIGNAL IS HEARD, TURN THE RECEIVER'S CONTRAST CONTROL ON FULL. THIS MIGHT OVERLOAD THE SET, BUT MAY BE NECESSARY WITH SOME RECEIVERS FOR SIGNAL TRACING IN THE VIDEO I.F. STAGES. You should hear both the audio signal and the characteristic buzz of the vertical sync pulses. After you have become acquainted with the type of signal to expect, move the r.f. probe back toward the plate of the converter tube, V-2. Once the signal tracer main tuning control has been peaked, it should not be necessary to readjust this control. In our laboratory, we had no difficulty in picking up a satisfactory signal at the plate of the converter tube. A strong signal from a local station was available and the receiver's contrast control was on full for most tests. If you are not as ideally located, or if the signal at the plate of the converter tube in another set is normally weaker, you may not be able to pick up the 4.5 megacycle frequency until you have moved the R.F. probe to the plate of the first video I.F. amplifier. This is something which will be determined by your own particular circumstances, and your experience will have to guide you as to what may be expected. Signal tracing at this higher frequency requires more patience than tracing in an ordinary A.M. receiver.

In signal tracing through the video I.F. strip, proceed from the plate of the converter tube, V-2, to the grid of the first video I.F. amplifier tube, V-110. This is pin 1. Then move the R.F. probe from the grid to the plate, pin 5, of this tube. Some gain should be observed. If you are interested in gain measurement, follow the instructions for this operation as given in the instruction booklet furnished with your signal tracer. The R.F. probe may be successively moved from grid to plate of the following I.F. amplifier tubes, which are V-111, V-112, and V-113 in the receiver shown in Figure 2.

The tests described above will be useful only in locating the cause of a "dead" video I.F. strip. Improper alignment or poor frequency response will not be detected with the signal tracer. This method will be especially effective in locating trouble due to a defective tube or due to an open coupling condenser. Note: As the R.F. probe is held in the vicinity of the video I.F. strip, it is normal to pick up a weak 4.5 megacycle signal through capacitive effect. A definite change in signal strength will be noted when the probe is touched to a test point.

The detected video signal can be picked up with the signal tracer at the plate of the picture second detector tube. After tracing the video I.F. frequency to the input of the video second detector, pin 1 of V114-A, proceed as follows. Change the signal tracer input selector switch to a.f., and use the a.f. probe. Placing this probe on pin 7 of V114-A should give you a characteristic buzzing sound of the sync pulses. The TV audio signal will not be present. Move the audio probe next to the input of the first video amplifier, V115. Proceed from the grid, pin 1, of this tube to the plate, pin 5. Some increase in amplification of the audible signal will be noticed, as well as an increase in tuning eye closure. You may then check the signal at the input and output of the second video amplifier, V-116. A last check for video signal may be made right in the circuit which connects to the picture tube grid.

The NRI Signal Tracer cannot be used in the sound I.F. strip because the narrow bandwidth of the sound I.F. does not permit passage of the video carrier to help form the 4.5 megacycle signal. "Signal Injection" with the Model 88 NRI Professional Signal Generator will be used in checking the sound I.F. stages. An audio signal will be present at the terminal for the movable contact on the sound volume control, and you should be able to use conventional procedure in tracing the audio signal with the signal tracer from this point through the audio system (V108 and V109) to the voice coil of the loudspeaker.

Tracing Sync Pulses

Both the horizontal and vertical sync pulses will be picked up at pin 5 and pin 2 of V114-B, the D.C. restorer tube. However, only the 60 cycle vertical sync pulses will be heard from the loudspeaker of the signal tracer. This test, and following tests for sync pulses, are made with the A.F. probe of the signal tracer, and with the input selector switch set on the A.F. position. Move the A.F. probe from pin 2 of V114-B to pin 4 of V118, the first sync amplifier.

The characteristic 60 cycle buzz should be heard on the plate, pin 8 of the first sync amplifier. This same signal should also be heard at pin 4 and pin 8 of V119. Each of these tubes should exhibit some increase in signal strength. The vertical sync pulse should be heard on pin 1 of V120A and on pin 2 of this same tube. The sync pulse should also be heard on the right hand side of condenser C149. The vertical sweep signal will be audible at pin 5 of V122, and in the plate circuit of this same tube, pin 3.

The scanning frequency in Television is 15,750 cycles per second. The audio section of the NRI Professional Signal Tracer is not designed to reproduce this high audio frequency, but the tuning eye circuit will give a suitable indication to indicate presence of the horizontal sync signal. Such an indication should be obtained across resistor R229. This test point is found by tracing from the plate of V120A through condenser C-166, and to resistor R229. If the horizontal oscillator tube, V125, is in operation, you should observe an indication of horizontal sweep on pin 5 of this tube, and at pin 3, the output of this tube. Remember that horizontal sync and sweep voltages are indicated only by closure of the tuning eye. You may trace this signal from pin 4 of V120-B to pin 5 of this same tube, and from here to pin 5 of V126. DO NOT ATTEMPT TO TRACE THE HORIZONTAL SWEEP PULSE IN THE PLATE CIRCUIT OF V-126 BECAUSE OF THE HIGH VOLTAGE PULSES WHICH ARE PRESENT IN THIS CIRCUIT. This could cause serious damage to your signal tracer.

Signal Substitution in Television Receivers Using NRI Professional Signal Generator

The Model 88 NRI Professional Signal Generator covers the I.F. frequencies of Television receivers without resorting to harmonics. It is a very convenient instrument for use in locating a dead stage, especially in the sound I.F. strip. In general, we do not suggest that you attempt any alignment in Television receivers using the Model 88 Signal Generator. To check the sound I.F. stages, set up the Model 88 Signal Generator on the sound I.F. frequency, in the case of the Model 630 TS chassis, 21.25 megacycles. Use an R.F. modulated signal. This frequency will be found on the "E" band of the signal generator.

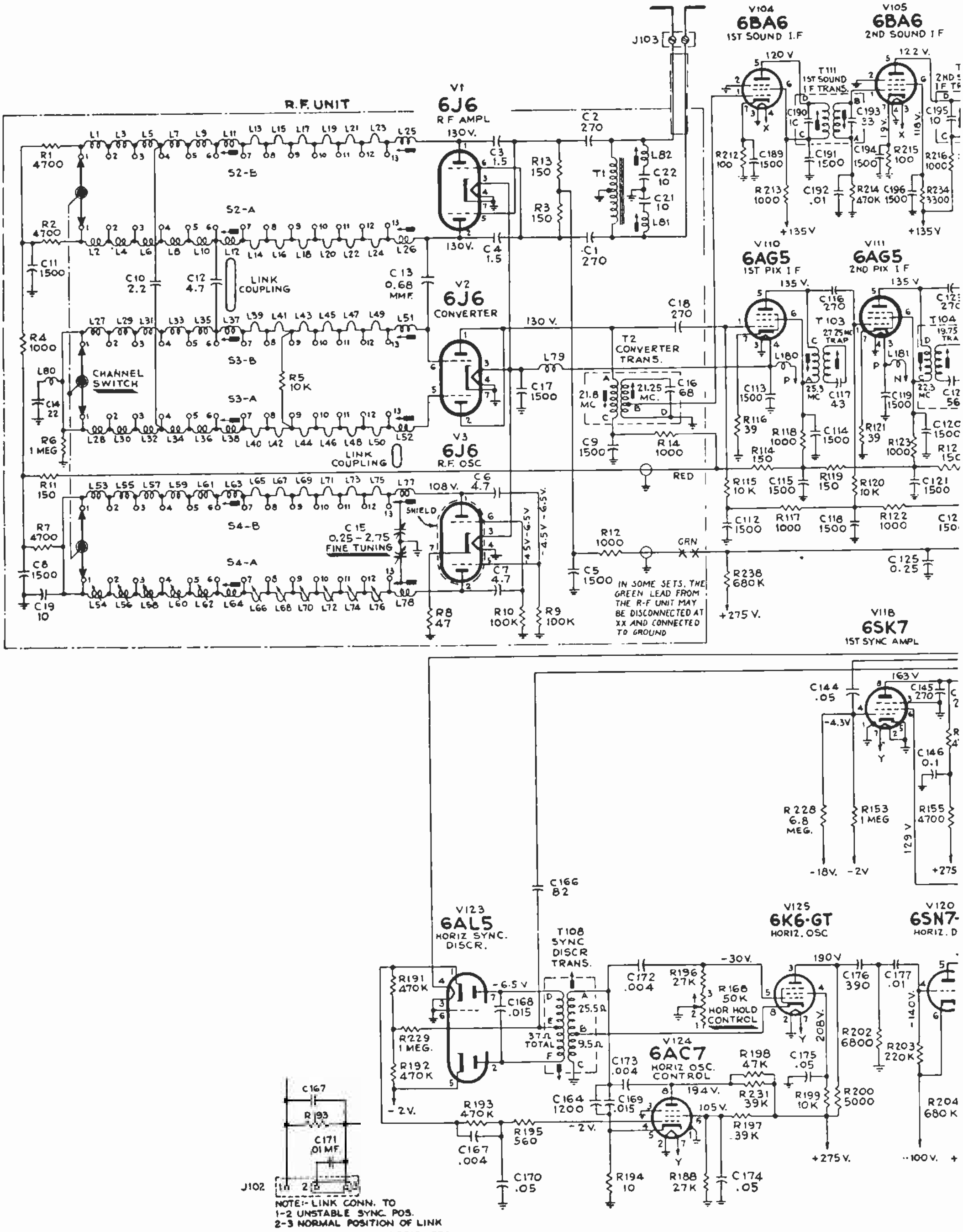
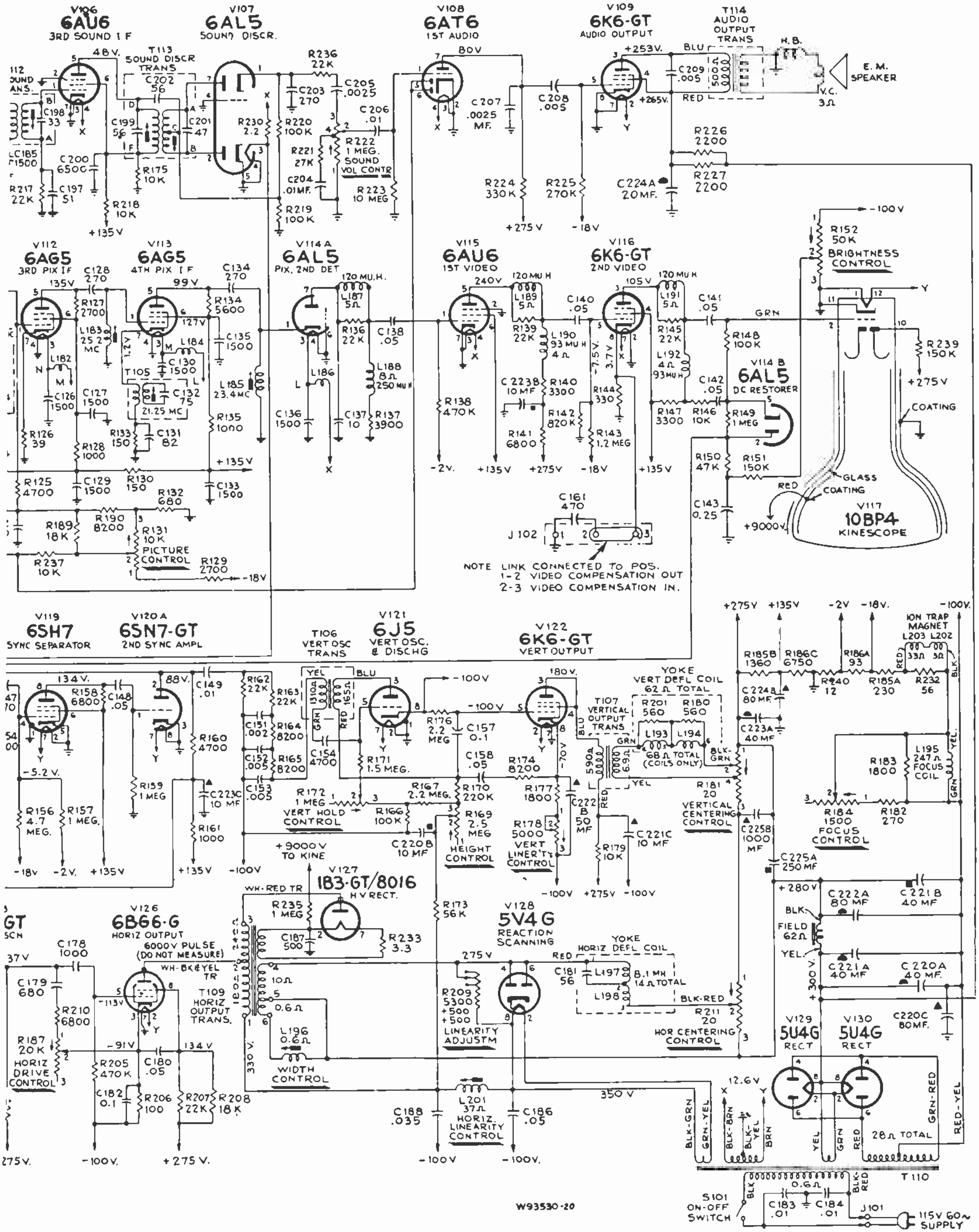


Fig. 2. The RCA type 630 TS



Schematic Diagram.

Courtesy of RCA

Although this is an amplitude modulated signal and TV sound is F.M., you will be able to hear the audio modulation in the Television receiver's loudspeaker. The sound volume control of the Television receiver should be on full, or approximately so, during this check. (An antenna should not be attached to the TV receiver when using the Model 88 Signal Generator for the following tests.)

Attach the "hot" output lead from the Model 88 Signal Generator to the plate of V106, pin 5. An audible tone, not necessarily of good quality, should be heard from the receiver's loudspeaker. Better results may be obtained if the signal generator ground lead is also connected to the receiver's chassis. Move the R.F. lead from the signal generator to the input of V106, pin 1. Next, transfer this lead to pin 5, the plate of V105. An audible signal should be heard. Proceed then to pin 1 of V105, to pin 5 of V104, and to pin 1 of V104. Any defect causing a dead sound I.F. strip will become apparent during these tests. However, little gain in output from the receiver's loudspeaker will be noticed as the "signal injection" proceeds from the output of the sound I.F. strip toward the input. This is because an A.M. signal is being fed into an F.M. system.

Notice that no Television station signal is used when testing the sound I.F. channel. The Model 88 supplies the test signal. The Model 88 Signal Generator can also be used to test the video I.F. channel of a Television receiver and then to check the video amplifier section. No Television station signal is necessary.

An audio modulated R.F. signal from the Model 88 Signal Generator is injected into the video I.F. section of the Television receiver. If the signal is passing through the video I.F. section, undergoing detection, and then passing through the video amplifier section, a pattern of horizontal bars will appear on the picture tube. Adjust receiver's Horizontal and Vertical Hold controls in order to stop this pattern. The pattern is illustrated by the drawing in Figure 3. Practice this procedure and become familiar with the pattern to be expected when a Television receiver is operating normally. Experiment in varying the output frequency from the Model 88 signal generator. Because of the wide band width in the video I.F. amplifiers you will notice that a signal generator frequency varying between approximately 22 megacycles and 25 megacycles will cause the bar pattern to appear on the Television picture tube. You can practice signal injection starting with the input to the picture second detector, pin 1 of V114A, Figure 2. Transfer the probe from the signal generator next to the plate of V113, pin 5, and proceed to inject a signal working toward the output of the converter tube, V2.

A pure audio signal from the Model 88 signal generator should also cause the bar pattern to appear on the picture tube when injected in the video amplifier circuit, beginning with pin 5 of V115 and proceeding through the video amplifier.

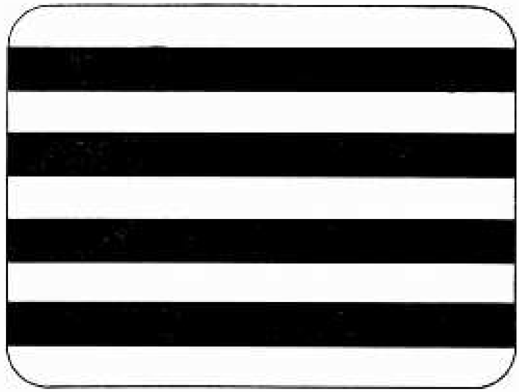


Fig. 3.

Additional Hints

The servicing procedure described above for using the NRI Signal Tracer and Signal Generator in Television work will be helpful in locating loss of signal, or weak signal, in either the sound or video strips. The above procedure as described under signal tracing will also be helpful in tracing lost sync signal, either in the vertical or horizontal sync circuits. In many instances, the above procedure will help you locate directly a defective tube or a defective coupling condenser. In other cases, the above procedures will only help you isolate the defective stage. When only a defective stage is known, you can resort to voltage measurements and continuity measurements to isolate the defective part.

It is stressed again that you should experiment with your signal tracer or signal generator on several receivers which are known to be in good operating condition. Become acquainted with the results which you can expect in different receivers. Results may vary somewhat from those obtained with the Model 630 TS, or with your local conditions insofar as signal tracing is concerned.

In connection with using the signal tracer, remember that the 4.5 megacycle signal will always appear at exactly the same point on your signal tracer's dial. This will be true regardless of the channel which you are using for a test signal, and also regardless of the receiver which you are checking. It may be well to place a light calibrating mark on the dial of your signal tracer so that you can find this exact point easily. A fine pencil mark or a light scratch with a knife on the signal tracer's scale will be helpful. Notice whether or not your signal tracer drifts even slightly in frequency as it warms up. If so, you will have to allow at least a 15 minute warm up time before beginning your signal tracing operations on a defective receiver.

We have not discussed alignment procedure for Television receivers because we do not recommend that video and sound I.F. alignment be attempted with the above instruments. Television service technicians are finding that alignment is not as frequently needed as was predicted two or three years ago. Also, we have not discussed the R.F. tuner for the type 630 TS. The isolating techniques mentioned above will tell you if the signal is passing through the tuner. Substitution testing for tubes and resistance measurements in the tuner will often help you find the source of difficulty. The alert and resourceful NRI man equipped with the Model 34 NRI Professional Signal Tracer, the Model 88 NRI Professional Signal Generator, and a good multimeter, such as the Model 45 NRI Professional Volt-Ohm-Mil-Ammeter, including High Voltage Test Probe, will be able to meet many Television service problems.

n r i

Practical

Judges of Iran now sentence persons found guilty of drunken and disorderly conduct to a spell at cleaning the city's streets and public markets. Since the system was inaugurated recently, there has been a sharp decrease in such cases.

Good Deed

How far can a good thing go? A couple of San Francisco Boy Scouts noticed a car parked in the same place for several days and decided their good deed for the day would be to report it to the police department. And who paid the resulting fine for overparking? Their scoutmaster.

Steel Champs

The United States now has steel-making facilities capable of turning out nearly a hundred million tons a year. This record capacity puts us eleven million tons ahead of the combined output of all the rest of the world.

Drive-In Church

The ultimate in "drive-in" service has been reached. The Rev. Harold S. Lucas of Monte Vista Baptist Church used a loudspeaker to broadcast his sermon at outdoor services while his congregation remained in its autos.

How To Get Along With Others

Dr. James F. Bender, Director

The National Institute for Human Relations

Conversation, you know, is the grand art of friendship. Would you like to check up on your conversation habits? Here is a quiz to help you do so. You may want to give it to yourself about twice a year. In that way you can encourage those little habits that make chatting a delightful pastime.

	Yes	*No*	*Sometimes*
1. Do I avoid monopolizing the conversation?	15	0	5
2. Do I watch the speaker all the time while he's talking?	15	0	5
3. Do I avoid over-familiarity?	15	0	5
4. Have I learned to tell my amusing stories well? ..	15	0	5
5. Am I the first to laugh at my own jokes?	0	15	5
6. Have I mastered at least one dialect to heighten the interest in my stories? ...	15	0	5
7. Am I a "one-subject" conversationalist?	0	15	5
8. Do I avoid forcing personal opinions upon others?	15	0	5
9. Do I avoid derogatory remarks about others?	15	0	5
10. Do I assume responsibility for dispersing the conversational doldrums?	15	0	5
11. Do I have the bad habit of interrupting a speaker?	0	15	5
12. Am I given to flat contradiction?	0	15	5
13. Do I like to change the subject abruptly?	0	15	5
14. Do I avoid talking too much about myself?	15	0	5
15. Do I speak clearly and slowly enough to make myself clearly understood? ..	15	0	5
16. Do I listen carefully?	15	0	5
17. Do I consciously look for ways and means to improve my conversational ability?	15	0	5
Total			

A good score is 200. But a perfect score is within reach of all of us.

Leo M. Conner

How to Become A Radio Amateur

By LEO M. CONNER

NRI Consultant

MANY radio men would like to have an amateur station. However, there is a feeling that it is too much trouble to obtain a license.

It is true that it is necessary to learn the code and be able to send and receive at the rate of 13 words per minute but, this is not at all difficult if you use the proper method.

The technical part of the examination for the license is made up of 50 questions. Some of these questions are on Radio Laws and Regulations as they relate to amateur operation and the rest of the questions are of a technical nature.

Some people have an idea that a complete amateur station costs a lot of money and some of them do cost several thousand dollars, However, it is possible to put a complete amateur station together for approximately $50 at current net prices. This price includes an a.c. operated code oscillator, a regenerative receiver with one stage of audio amplification, a power supply for these two sections, a crystal oscillator-amplifier transmitter and power supply plus a simple antenna.

The purpose of this article is to show how to learn the code and build simple equipment. All of the equipment used is standard and you should be able to purchase it at your regular wholesalers. The Institute cannot supply any of the parts and no step by step wiring instructions or pictorial diagrams are available.

Learning The Code

The first step in becoming an amateur is to learn the code. In effect this is like learning a new language and, if the proper approach is used, it can be a lot of fun.

Fig. 1 shows a chart which lists the code characters for the alphabet, numerals and punctuation marks.

As you can see, the group representing each complete character is made up of dots, dashes or a combination of dots and dashes. Right at the start think of the letters in terms of "sound" rather than in terms of dots and dashes. Otherwise you will be in for a lot of trouble when you get up to about eight words per minute.

Go about learning the code in this way: when you see a dot on the chart—call it a "dit." Say it to yourself and make it sound sharp and snappy. When you see a dash call it a "dahh"—accent it slightly and drag it out, as "dahhhh." The letter A would be pronounced "dit-dahh" or, to make it sound more like the actual code letter you will hear over the air, "di*daahh*." The accent and swing should be the same as "today," making the "to" very short and accenting "day." When speaking the other letters, remember to keep the "dits" short and the "dahhs" longer and accented.

Everytime you see the code equivalent of a letter, say it to yourself, and do not try to memorize a picture of it as printed. Practice saying strings of "dits"; it should sound like a blast from a machine gun. Then practice saying strings of "dahhs"—they should be long and smooth (three times as long as a "dit"), with as short a space

A	. —	dit-dahh
B	— . . .	dahh-dit-dit-dit
C	— . — .	dahh-dit-dahh-dit
D	— . .	dahh-dit-dit
E	.	dit
F	. . — .	dit-dit-dahh-dit
G	— — .	dahh-dahh-dit
H	. . . .	dit-dit-dit-dit
I	. .	dit-dit
J	. — — —	dit-dahh-dahh-dahh
K	— . —	dahh-dit-dahh
L	. — . .	dit-dahh-dit-dit
M	— —	dahh-dahh
N	— .	dahh-dit
O	— — —	dahh-dahh-dahh
P	. — — .	dit-dahh-dahh-dit
Q	— — . —	dahh-dahh-dit-dahh
R	. — .	dit-dahh-dit
S	. . .	dit-dit-dit
T	—	dahh
U	. . —	dit-dit-dahh
V	. . . —	dit-dit-dit-dahh
W	. — —	dit-dahh-dahh
X	— . . —	dahh-dit-dit-dahh
Y	— . — —	dahh-dit-dahh-dahh
Z	— — . .	dahh-dahh-dit-dit
1	. — — — —	dit-dahh-dahh-dahh-dahh
2	. . — — —	dit-dit-dahh-dahh-dahh
3	. . . — —	dit-dit-dit-dahh-dahh
4	. . . . —	dit-dit-dit-dit-dahh
5	. . . . .	dit-dit-dit-dit-dit
6	—	dahh-dit-dit-dit-dit
7	— — . . .	dahh-dahh-dit-dit-dit
8	— — — . .	dahh-dahh-dahh-dit-dit
9	— — — — .	dahh-dahh-dahh-dahh-dit
0	— — — — —	dahh-dahh-dahh-dahh-dahh

Period	. — . — . —
Comma	— — . . — —
Question mark	. . — — . .
Error	. . . .
Double dash ($\overline{BT}$)	— . . . —
Wait ($\overline{AS}$)	. — . . .
End of message ($\overline{AR}$)	. — . — .
Invitation to transmit	— . —
End of work ($\overline{SK}$)	. . . — . —

Fig. 1

Max Tall tunes regenerative receiver of beginner's "ham" station.

between them as your tongue can make.

Learn the dot characters first, e, i, s, h, and 5. Then make up simple words such as, is, his, sis and learn how they sound. Next take up the dash characters t, m, o and zero. Make up simple words like mot, tom, etc. and then combine the dot and dash characters you have learned to form words like hit, sit, miss, set, them, this and so on. You can also combine them to make a complete sentence such as, "50 hits no misses" or "She hit him."

Then take up the letters, a, u, v and the numerals 1, 2, 3 and 4. After you can say these without trouble make up words and phrases using the new characters and the ones you have previously learned. Next come the letters n and g and the numerals 6, 7, 8 and 9. Add these to the others you have learned to form additional words, phrases and complete sentences.

The next letters should be c, f, k, l, p, r, w and z. Follow these with b, d, j, q, x and y. This completes the alphabet and numerals. You will find it amusing and helpful to spell out newspaper headlines and short articles as you read them. When riding street cars and busses, spell out the ads in the car. This is excellent practice.

Do not use the chart for long study, learn a few letters and then lay the chart aside while you practice the sounds or, better yet, hand the chart to a friend and have them check your answers. Then have them call random letters so that you can check your progress. Don't hurry

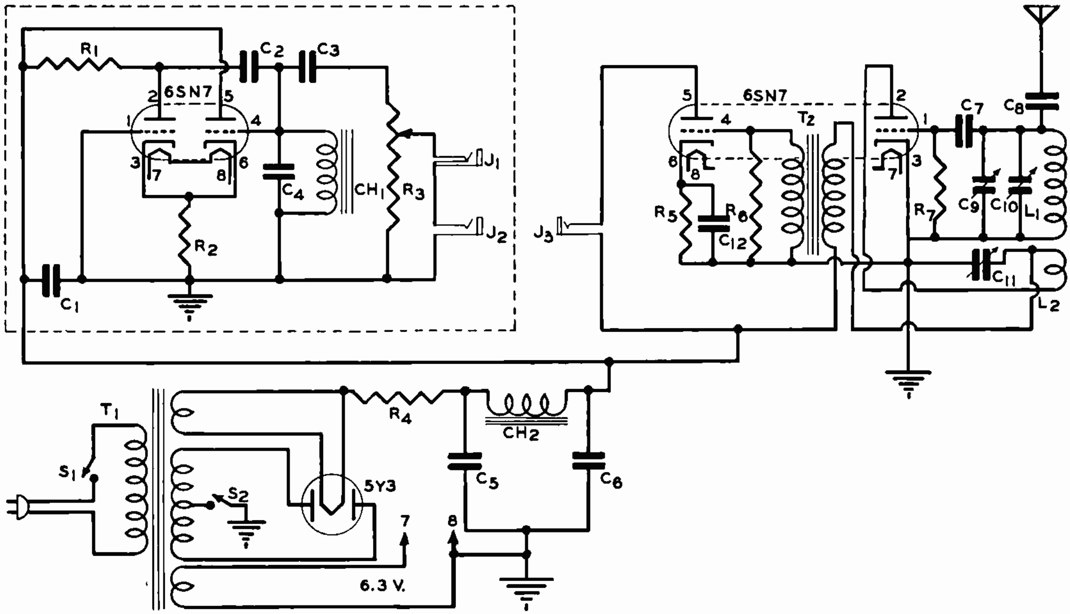


Fig. 2. This is the schematic circuit for the code practice oscillator and regenerative receiver. The parts values are:

R_1—68000—ohm, 1 watt
R_2—1500—ohm, 1 watt
R_3—500,000—ohm volume control
R_4—25000—ohm, 10 watt
R_5—1500—ohm, 1 watt
R_6—.15 meg. 1/2 watt
R_7—1.5 meg. 1/2 watt
T—275-0-275 volts at 50 Ma., 6.3 at 2.5 amp., 5V at 2 amp.
CH_1—AC-DC filter choke
CH_2—15 H. 50 Ma. choke
T_2—Audio trans. 3:1 ratio
S_1—SPST toggle switch

S_2—SPST toggle switch

J_1—closed circuit jack
J_2—open circuit jack

C_1—8 mfd—450V electrolytic cond.
C_2—.1 mfd.—400V paper cond.
C_3—.1 mfd—400V paper cond.
C_4—.005 mfd—400V paper cond.
C_5—10 mfd—450V electrolytic
C_6—10 mfd—450V electrolytic
C_7—.00025 mfd—mica condenser
C_8—gimmick—3 turns twisted tightly

C_9—15 mmfd—variable cond.
C_{10}—140 mmfd—variable cond.
C_{11}—140 mmfd—variable cond.
L_1—9 terms—1 1/2" diameter spaced 10ts. per inch (40M.)
L_2—10 turns—#28DCC spaced 1/8" from ground end of L_1
J_3—open circuit jack

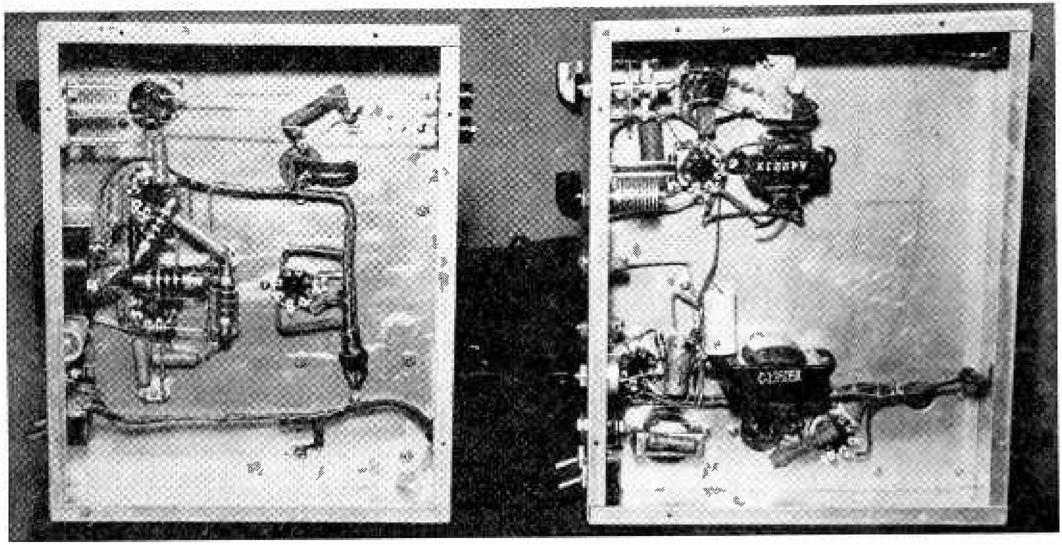
though because what you are doing is learning mental coordination, and practice with 8 or 10 letters is just as good from that standpoint as practice with all 26 letters.

A very good way to practice code is for two people to practice together and either speak or whistle the letters. Send single words using letters you have learned up to that time while the other person writes down your "message." Then let him "send" to you while you write down the material.

When you have progressed this far it is a good idea to use a code practice oscillator so that the characters are formed with a key and the sounds will resemble what you will hear "over the air."

Building The Code Practice Oscillator And Receiver

A simple a.c. operated audio oscillator, power supply and regenerative rceiver is shown schematically in Fig. 2. The audio oscillator circuit is enclosed by the dashed lines. It may seem more elaborate than necessary but the circuit is a good one and the output is great enough for



Under-chassis view shows cabling of long leads. Transmitter is shown on the left, and the receiver is on the right.

two sets of headphones or a small magnetic type speaker.

The closed circuit jack is used for the key because it is often desired to have a continuous tone for test purposes. By pulling the key plug out of the jack the tone is uninterrupted and the volume can be controlled by means of potentiometer R_3.

The frequency of oscillation is determined by the inductance of CH and the capacity of C_4. Actually there is enough distributed capacity in the average ac-dc choke to give a usable tone without the condenser. However, the condenser alters the pitch and makes a more pleasing note. Experiment with different capacity values until you get the tone which suits you best.

The code practice oscillator and receiver on the same chassis mean that you can listen to actual signals while you are practicing. The same power supply is used and all that you need do is change the type 6SN7 tube from the code practice oscillator to the receiver socket. A standby switch is provided so that the plate voltage can be removed from the receiver without turning OFF the filaments while transmitting.

The receiver uses capacity regeneration control and band spread tuning to get greater tuning ease. C_9 is the band spread tuning condenser while C_{10} is the band setting condenser. The coil is designed to cover the amateur 40 meter band which extends from 7000 Kc to 7300 Kc.

Some experiment may be necessary in order to get smooth control of the regeneration. You can tell when the set is regenerating by the fact that a hissing sound will be heard in the phones. If the set happens to be tuned to a C.W. station this code will have a whistling sound similar to the output of the code practice oscillator.

When listening to phone stations the detector must not oscillate. The speech will be garbled if the detector is oscillating. Changing the setting of the regeneration control will stop the oscillation and make the speech clear up. Set the control so that the detector is on the verge of oscillation but not oscillating. A little practice with the receiver will soon enable you to get the "hang of tuning" it for best reception.

Both sections of the complete station are assembled on matching 10″ x 12″ x 3″ aluminum chassis which allow plenty of room for all parts without crowding.

Standard socket punches were used to cut the holes for the sockets while regular high speed drills were used for all other holes on the receiver-code practice oscillator chassis.

The complete parts list is given under the diagram and the first step should be to acquire these parts. After you have all the parts on hand, remove the paper wrapping from the chassis and cover the top, front and back sides with a sheet of plain white paper. Fasten the paper to the chassis with "scotch tape." Now "lay out" all the holes for mounting the parts on this paper.

This will make it possible to correct errors without marring the chassis and protect the chassis from scratches. Mark the hole sizes alongside the location marks and then mark the location of the hole centers with a center punch. Leave the paper in place and drill the holes. The paper can then be stripped off leaving a clean unmarked chassis.

The power supply components are mounted first. Note that one side of the 6.3 volt filament winding is grounded. Also note the single pole, single throw toggle switch in series with the high voltage secondary center tap. This is the "standby" switch and is used to remove the plate voltage without turning off the filament supply.

In the bottom view of the two chassis, the receiver and code practice oscillator are on the right. The opening at the lower right is where the leads emerge from the power transformer. They are positioned so that they can be laced into a cable after the wiring is finished.

The iron core device in the lower center is the filter choke. Above the filter choke and slightly to the right is the audio transformer. To the left of the filter choke are the audio oscillator tube socket, audio choke and fixed tuning condenser, volume control and headphone and key jacks. These parts are mounted around the tube socket in order to get a compact assembly and no special wiring precautions are necessary.

The receiver is in the upper left hand corner of the right hand chassis with the 15 mmfd band-spread condenser uppermost. Directly behind the band-spread condenser is the coil socket with the main tuning condenser behind the coil socket. The tuning condenser near the center of the front panel is the regeneration control.

In the photograph of the complete station the receiver-code practice oscillator chassis is on the right. The unused socket visible on the left side of the chassis is a tube socket. When the code practice oscillator is being used the 6SN7 receiver tube can be moved from the socket next to the coil to the socket which is empty in the photograph.

Use the photographs as a guide in locating the parts on the chassis.

The Transmitter

The transmitter is of the oscillator-amplifier type, as shown in Fig. 3. This type was chosen because it is possible to get a fair amount of output using low cost components. The measured output is approximately 30 watts.

The oscillator circuit—that section between R_1 and RFC_2—is known as the Pierce circuit. It is one of the simplest crystal-oscillator circuits, since no tuning control is required. Although it is not feasible to connect an antenna to such a circuit, it works well when used to drive a following rf amplifier stage.

The screen of the 6AG7 tube serves as the plate of the oscillator circuit. Feedback is adjusted to the proper value by C_2 which is in parallel with the screen-to-cathode capacitance. R_2 is a series resistor to reduce the voltage for the screen.

The output of the oscillator is coupled to the 6AG7 output plate circuit principally through the electron stream within the tube. This is known as electron coupling. The rf output from the plate circuit appears across RFC_2. A tuned circuit could be used instead of RFC_2 with greater output from the oscillator, but this would mean an additional tuning control and would complicate the amplifier circuit. The 6L6 tube, which is used as an rf amplifier, does not require a great amount of driving voltage and the output from the oscillator with an untuned plate circuit is ample to drive the amplifier.

An rf amplifier usually has two tuned circuits—the input tank circuit connected between grid and cathode and the output circuit connected between the plate and cathode. Unless special precautions are taken the amplifier will oscillate when the input and output circuits are tuned to the same frequency. This is primarily because the two circuits are coupled together through the plate-to-grid capacitance of the tube. We do not want the amplifier to work as an oscillator; we want it to amplify the signal from the oscillator.

To avoid oscillation in the amplifier we have made the grid circuit of the amplifier non-resonant. While this will result in less than maximum power output from the oscillator we can afford to sacrifice some efficiency at this point in the interest of simplicity. Therefore, instead of the customary tuned circuit between the amplifier grid and cathode, we substitute an rf choke and a coupling condenser.

R_3 is the amplifier grid leak. The impedance of RFC_3 prevents excessive loading of the oscillator. C_{15} and L_1 make up the output tank circuit.

Parallel feed is used to the amplifier plate through RFC_5, and C_{12} is the blocking condenser which passes rf but prevents short circuiting the dc plate supply through L_1. R_4 is a series resistor that reduces the voltage for the amplifier screen grid. C_3, C_4, C_6, C_{10}, C_{11}, C_{13}, and C_{14} are all rf by-pass condensers that are used to prevent the flow of rf (fundamental and harmonics) in the power supply leads.

The cathodes of the two tubes are connected together and the key jack is connected between the common cathode connections and the negative high voltage which is connected to the chas-

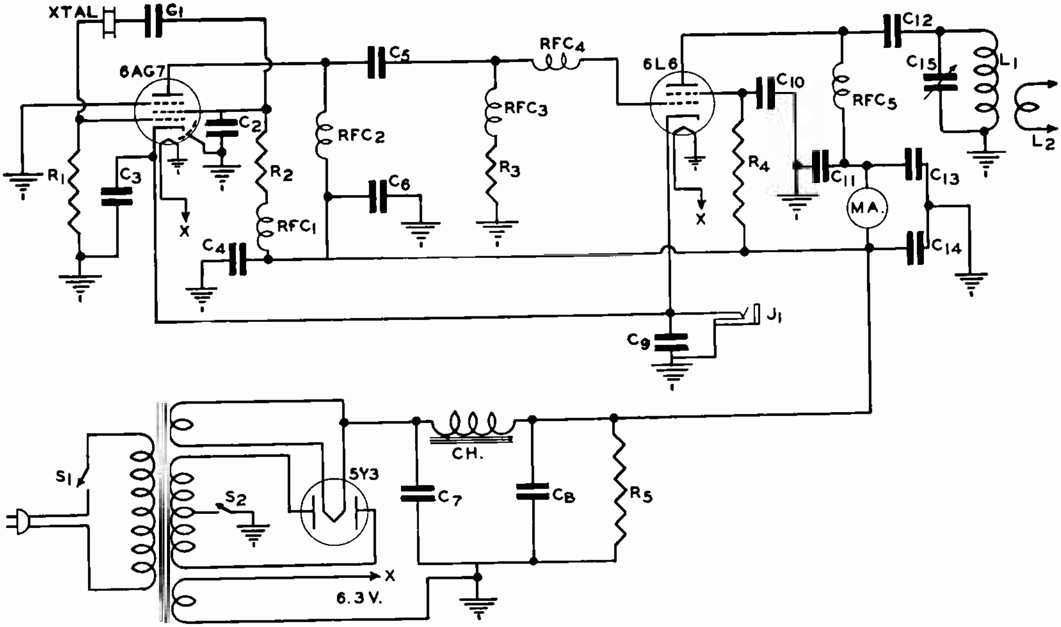


Fig. 3: Schematic diagram for transmitter. The parts values are:

R_1—15000—ohm ½ watt
R_2—39000—ohm 1 watt
R_3—22000—ohm ½ watt
R_4—10000—ohm 10 watt
R_5—50000—ohm 10 watt
RFC_1—2.5 mh. rf choke
RFC_2—100 mh. rf choke
RFC_3—2.5 mh. rf choke
RFC_4—2 mh. parasitic choke
RFC_5—2.5 mh. rf choke
MA.—150 ma. Triplett
XTAL—40 M. crystal
J_1—closed circuit jack
S_1—SPST toggle switch
S_2—SPST toggle switch
T_1—350-0-350 volts, 110 ma.
5V. at 3 amp; 6.3V at 4.5 amp.

C_1—.005 mfd paper 600V
C_2—220 mmfd mica
C_3—.005 mfd paper 600V
C_4—.005 mfd paper 600V
C_5—.0001 mfd mica
C_6—.005 mfd paper 600V
C_7—10 mfd 450V electrolytic
C_8—10 mfd 450V electrolytic
C_9—8 mfd 450V electrolytic
C_{10}—.005 mfd paper 600V
C_{11}—.005 mfd paper 600V
C_{12}—.005 mfd paper 600V
C_{13}—.005 mfd paper 600V
C_{14}—.005 mfd paper 600V
CH_1—10.5 H. 110 ma. choke
L_1—Bud 40 meter coil

L_2—link on end of L_1
C_{15}—140 mmfd variable

sis. This interrupts the flow of plate current to the tubes when the key is open. C_9 serves to reduce the clicks which may be on the transmitted signal which may cause unnecessary interference to other amateurs operating near the same frequency, as well as to nearby broadcast receivers.

One thing to keep in mind is that as we go higher in frequency, the inductance and capacity necessary to tune to resonance becomes smaller. In the regenerative receiver, for instance, the coils covering the higher frequencies are much smaller than those for the lower frequencies. If we go high enough in frequency, we come to the point where the inductance and capacitance of a short piece of wire will be resonant. In most rf amplifiers, such small unavoidable factors combine to cause oscillation at frequencies in the neighborhood of 150 Mc. This must be avoided to prevent wasting of power and to eliminate radiation of spurious frequencies. The small choke, RFC_4, which offers a high impedance to very-high frequencies, is inserted in series with the grid of the amplifier to prevent this.

The general construction of the transmitter is designed to match that of the receiver-code prac-

ANTENNA DESIGN TABLE		80 Meters	40 Meters
Horizontal Doublet	67 feet each side	Parallel	Parallel
End Fed	Feeder and Horizontal 134 feet. Horizontal to be as long as possible	Parallel	Parallel
End Fed	Feeder and Horizontal 67 feet. Horizontal as long as possible	Series	Parallel

Fig. 4.

tice chassis. Therefore, the chassis dimensions are the same and, if desired, both units may be put in the same size cabinets. The exact placement of the parts is not critical. However, the arrangement shown in the photographs is a good one and works well.

The power supply is arranged along the back of the chassis and the transmitter is laid out along the front of the chassis. The small rectangular case on top at the left front is the frequency control crystal. It is followed by the 6AG7 tube, then the 6L6 tube and the output coil. On the front panel are the standby switch, (top) and the On-Off switch (bottom), the key jack, the 150 Ma. plate current meter and the tuning condenser.

Wherever possible the transmitter wiring should be cabled. Insulated tie strips should be used to support some of the parts. However, most of the parts are supported by their leads. RF leads between the coil, condenser and output terminals are made with number 16, tinned bus bar.

The transmitter power supply will deliver 350 volts under a full load of 110 Ma. Any power supply capable of delivering up to a maximum of 350 to 375 volts under load will do. Naturally, if the voltage applied to the transmitter is lower, the power output will be reduced. The power supply for the transmitter is no different than any conventional power supply except, for the use of the switch in the centertap of the high voltage secondary. This switch makes it possible to remove the B supply voltage during periods when the receiver is in use without turning off the filaments. If this provision is omitted it would be necessary to wait for the filaments to warm up before transmitting.

Whether you elect to use the 3.5-Mc. band or the 7-Mc. band, or if you plan to divide your time between the two bands, you will encounter less interference from other amateur stations if you select crystal frequencies above the lower first 100 kc. in the band.

Antennas

A single antenna can be made to serve for both 40 and 80 meters. It may take any one of several forms. Where space is available, the preferable antenna consists primarily of a horizontal wire one-half wavelength long for 80 meters (approximately 135 feet) running in a straight line and as high as possible. An antenna of this type is connected to the transmitter through a transmission line or feeder line, which is simply a pair of parallel wires spaced 2 to 6 inches. The feed line may be attached to one end of the antenna but, wherever possible, it should be attached to the center. Where a choice in direction exists, the center-fed antenna should be run in a line at right angles to the direction in which it is most desired to work, while the end-fed antenna should be run in a direction approximately 45 degrees from the most desired path.

When a feed line is used, power from the transmitter can be more readily supplied to the antenna if the feed line is cut to certain lengths. These lengths together with other essential information are shown in Fig. 4.

The table also shows the type of tuning that should be used with the feed line. That is, whether a condenser should be connected across the output coil or in series with the coil and feed line.

Adjustment

Aside from the 6L6, a 6V6 or 6F6 may be used in the amplifier without circuit changes. The smaller tubes will not handle as much power as the 6L6, however.

The line switch should be turned on and the filaments allowed to warm up for a minute or so. A 40 meter crystal should be in the crystal socket and a 40 meter coil in the coil socket. No antenna should be connected. After the tubes have warmed up, turn the plate power on by closing the standby switch. Then turn the tuning condenser knob until the 150 Ma. meter shows minimum plate current. The amplifier is then tuned to the crystal frequency. If you are using a simple half-wave doublet antenna with a 72-ohm feed line the feeder can be connected directly to the output terminals.

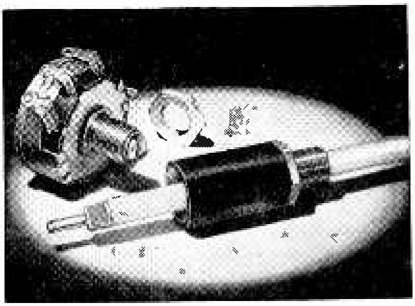
Connecting the antenna should make the minimum plate current increase and, if the antenna is matched to the plate circuit of the amplifier minimum plate current will still occur at the same setting of the tuning condenser. If it does not then some reactance is present and it will be necessary to tune the feeders.

You can listen to the output of the transmitter by using the receiver with the antenna disconnected from the receiver. The note should be clear with no trace of hum when the key is pressed.

The information given here is not supposed to be the "last word" in amateur equipment. It is intended to show how a low cost station can be assembled. Admittedly it is not a permanent station but it will give you much pleasure and enable you to get "on the air" and operate until you can form your own ideas as to the type of equipment you want for your permanent station.

If you plan to construct this transmitter, remember that you are not permitted by law to operate amateur transmitting equipment without a radio amateur's license. For information as to where and when you can take the FCC exam, write to the Federal Communications Commission, Washington 25, D. C.

n r i



Attachable High-Voltage Coupler for Replacement Controls

Assembly 59-186, with nylon shaft RN-3, for use in TV, oscilloscope, and other high-voltage circuits, is now made available in all Clarostat Pick-A-Shaft type controls, types AM and AT, states Clarostat Mfg. Co., Dover, N. H.

The high-voltage insulator sleeve screws on to the control bushing while its threaded metal-stud end takes the mounting nut. The nylon shaft slips into the control's slot, and is gently tapped, snapping firmly in place.

NEW TUBE TEST DATA AVAILABLE FOR NRI PROFESSIONAL TUBE TESTERS

Read Carefully Before Ordering

Students and Graduates of NRI who have purchased either a Model 66, 67 or 68 NRI Professional Tube Tester before Jan. 1, 1950 will be interested to know there is now available a new up-to-date tube chart for these models. Models 67 and 68 use the same tube chart. The cost is $1.00 with order. No C.O.D.'s, please. New tubes have been introduced during the past few years, perhaps the most important type being the new 9 pin miniature tubes which are found frequently in FM and Television receivers.

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

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

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

Enclosed is $1.00*. Please send, postpaid:

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

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

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

Address ....

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

The Model number of my Tube Tester is

Model...............

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

N.R.I. ALUMNI NEWS

Harvey W. Morris .... President
F. Earl Oliver .... Vice Pres.
Alexander M. Remer .... Vice Pres.
Oliver B. Hill .... Vice Pres.
Claude Longstreet .... Vice Pres.
Louis L. Menne .... Executive Secretary

NOMINATIONS FOR 1951

"Days go by, and weeks roll on. And before we know it, a year is gone."

SO reads the poem. It hardly seems possible a year has slipped by since we held our last election. Yet here we are again, according to our Constitution and By-Laws, calling for nominees to serve the NRI Alumni Association during 1951.

To most of our members who have been with us for several years the procedure is thoroughly understood. For the benefit of those who joined during the past year, however, it is necessary to explain the procedure of how we elect our officers.

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 NATIONAL RADIO-TV 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, 1950. 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.

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 NATIONAL RADIO-TV 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. In the event of a tie vote for any office, the Executive Secretary shall cast the deciding ballot.

11. The nominee receiving the greater number of votes for the office for which nominated shall be declared by the Executive Secretary to be elect-

ed 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 nominations, we repeat, will close August 25, 1950. This will allow us five days in which to count the votes and announce the nominees in the October-November issue of NR-TV 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-TV NEWS in time for them to take office on January 1, 1951.

That eminent radio and television expert in Philadelphia, so popular with our members, Harvey W. Morris, will retire as President on the last day of December. We will not, however, lose the benefit of his experience and good counsel because Harvey will continue to be active in Philadelphia-Camden Chapter as he has for many years.

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 as an aid to our members in making a choice. See below and pages 28 and 29.

It is entirely fair to suggest that Mr. H. J. Rathbun of Baltimore be given serious consideration for the office of President during 1951. Mr. Rathbun was a candidate for President last year. He has been Vice President for a number of terms. He is past Chairman of Baltimore Chapter and although he is not now in office his interest is just as keen. A man who is so thoroughly imbued with the spirit of loyalty to our Alumni members certainly is deserving of recognition. Sooner or later Mr. Rathbun will be elected President of the NRI Alumni Association. This would be an excellent time to bestow that honor upon him.

We sincerely hope that all of our Alumni members will take part in this election. We need your ballot. Please be sure to 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 1951 election. The election will be conducted in the next issue of NATIONAL RADIO-TV 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, 1950.

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 1951.

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.
Chas. Bost, Leadville, Colo.
Fritz Boehm, Bridgeport, Conn.
Geo. W. Neely, E. Woodstock, Conn.
Joseph Snyder, Danbury, Conn.
Eric Woodin, Naugatuck, 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. Pétruff, 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. Griese, Bellevue, 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. Locke, Calais, Maine.
H. J. Rathbun, Baltimore, Md.
J. B. Gough, Baltimore, Md.
Samuel Robinson, Hagerstown, Md.
G. O. Spicer, Hyattsville, Md.
Manuel Enos, Fall River, 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.
R. B. Hamblin, Pontotoc, Miss.
Robert Harrison, West Point, Miss.
C. S. Burkhart, Kansas City, Mo.
A. Campbell, St. Louis, Mo.

(Concluded from page 28)

C. W. Wichmann, Inverness, Mont.
Milburn Parker, Missoula, Mont.
V. S. Capes, Fairmont, Nebr.
Albert C. Christensen, Sidney, Nebr.
C. D. Parker, Lovelock, Nev.
Donald Harper, Beowawe, Nev.
Clarence N. George, Dover, N. H.
Mark McInnis, Enfield Center, 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, Massapequa, N. Y.
Charles W. Dussing, Syracuse, N. Y.
George Leininger, Rego Park, 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.
Robert Bond, Okla. City, Okla.
Emil Domas, Dale, Oreg.
Verl Walker, W. Jackson, Oreg.
Norman Kraft, Perkasie, Pa.
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.
Chas. Farrimond, 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.
H. V. Baxter, St. John, N. B., Canada.
W. F. Arseneualt, Dalhousie, N. B., Canada.
Donald Swan, Springhill, N. S., Canada.
J. A. Hehir, Smiths Falls, Ont., Canada.
E. Bergeron, Sherbrooke, P. Q., Canada.
Thos. Crooke, Saskatoon, Sask., Canada.

Chapter Chatter

Detroit Chapter. The first half of the 1950 season was brought to a close with our customary dinner party. We dined at Sunnyside Inn which is in Canada, about ten miles from Detroit, where the Detroit River is wide, clear and fresh. An ideal location for a warm evening. The breezes from near-by Lake St. Clair were very refreshing.

The committee on arrangements, consisting of Chairman Clarence McMaster, Alex Nikora and Larry Upham were highly complimented by those present, numbering 49. The dinner was excellent.

Floyd Buehler acted as Master of Ceremonies for the brief program. L. L. Menne spoke as did Chairman McMaster after which the entire group moved to an appropriate room to view motion pictures supplied by Bob Mains. Several reels were shown, including some sport events, recent disasters which were still vivid in our memories. Some interesting comedies were also shown to give variety. The highlight of the motion pictures, however, were those taken at our stag party of a few months ago. If our wives thought they were going to see us cutting up, they surely were disappointed because you never saw a better behaved lot of men. Bob Mains stoutly denies that he cut any part of the film except that which did not photograph well. (Good old Bob!) The film was in technicolor and was very interesting.

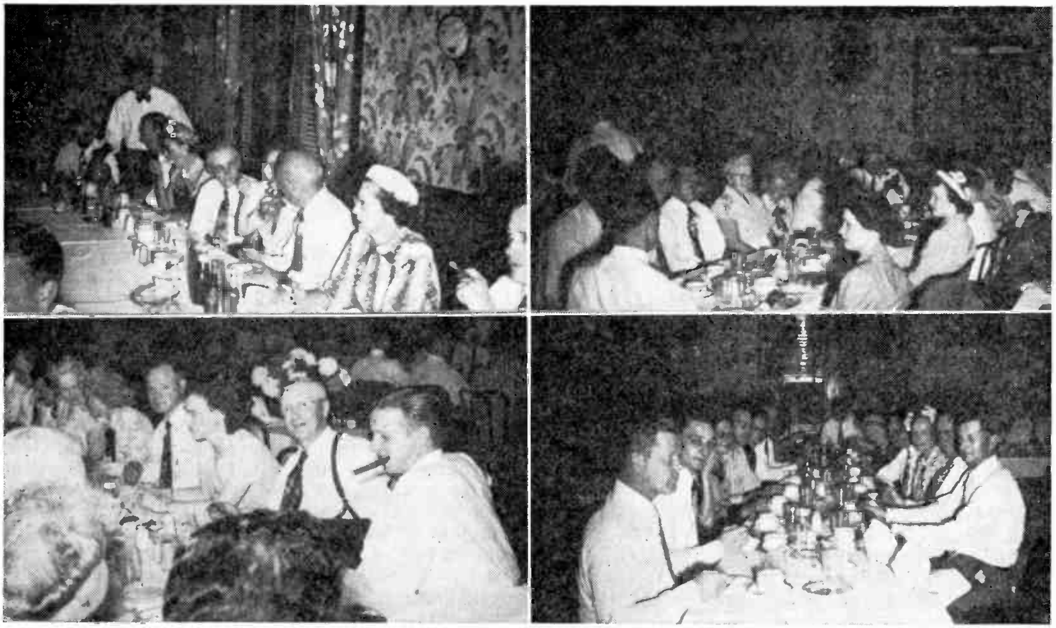
Incidentally the cameras were grinding most of the evening at this party so we may expect to see some new pictures at our next stag which is to be held in September, date to be announced by notice from Secretary Stephens.

After the motion pictures the folks broke up into smaller groups and enjoyed themselves in conversation, song and dancing. The orchestra music was exceptionally good. Chalk up another successful party for Detroit Chapter.

We are making good progress with our TV assembly sessions. Tube sockets, transformers, soldering lugs, power supply have been installed and most of the filament wiring is complete. This work is interspersed with our popular service forum which is conducted by Earl Oliver. Floyd Buehler is always present and ever ready to deliver a lecture or answer any questions the boys may care to ask. Our fall season will open with our stag party after which we will hold regular meetings again.

HARRY R. STEPHENS, *Secretary.*

Chicago Chapter. A committee consisting of Chairman Andresen, Treasurer Adamson and Secretary Mead prepared a questionnaire which was sent to all our members. The purpose was



Having a good time at the annual dinner party held by Detroit Chapter at Sunnyside Inn, La Salle, Ont., Canada, which is just across the border from Detroit.

to find out what most interested our members, whether they want to hold meetings once or twice a month, and to get suggestions for improving our meetings. The results were very satisfactory. The consensus was to continue our meetings during the summer. Therefore meetings will be held on the 9th of August, the 23rd of August, and the 13th of September. At that time we will determine whether we wish to hold meetings twice a month or once a month.

These meetings are devoted to lectures, demonstrations with Radio chassis, test equipment, schematics, etc., all in line with the wishes of our members. Chicago Chapter is on the march again. Members have made contributions for the purchase of testing equipment. This has developed into quite a fund. Some equipment has been bought which was proudly exhibited by Chairman Andresen. Mention should be made of fine talks delivered by member Brodhage on Resistance Measurements and member Adamson on Radio Servicing and Color Television. Things are moving at a lively pace in Chicago.

C. C. MEAD, *Secretary.*

New York Chapter. Chairman Bert Wappler doing a grand job for our Chapter as usual. A real live-wire and a great team worker. Attendance averaging forty-five to fifty. Good talks by our staff of lecturers including Eugene Williams who talked on an Electronic Switch, John Hull, Jr., who spoke on Transformerless Power Supplies. Both were very good talks. At another meeting Jordan W. Clayton, Jr., spoke on Aids to Servicing and again Eugene Williams spoke this time on Audio Amplifiers—traced on the oscilloscope. Jimmy Newbeck is ready for a new series of talks on servicing including one on Oscillator Troubles. The truth is our program committee is ahead of schedule with too many good speakers. Certainly nothing wrong with that. Meetings have been suspended until September 21—see you then.

L. J. KUNERT, *Secretary.*

Baltimore Chapter. Tom Clark gave us a very interesting and instructive demonstration of Servicing by Signal Tracing. At another meeting we held an interesting informal discussion on various Radio and TV subjects. C. M. Whitt was the main speaker at still another meeting. His subject was Servicing with the Oscilloscope. At another meeting he gave a demonstration of FM Alignment with the Oscilloscope. He was ably assisted by Tom Clark. On another occasion our entire group attended a lecture by Clarence Simpson, engineer with Sylvania who spoke on TV Oscillators. Plenty of interest in TV here in Baltimore. Things going satisfactorily.

THOMAS P. KELLY, *Secretary.*

Phila-Camden Chapter report will be held over until next issue. Sorry to be short of space.

Here And There Among Alumni Members

NRI Alumnus W. R. Nichols, who is Chief Engineer of the Alaska Broadcasting Co., Anchorage, Alaska, writes, "We have just added KIFW, Sitka—the 6th Station of the Alaska Broadcasting Company.

—n r i—

Graduate Frank D. Galey, of Greenbelt, Maryland, tells us that he is in charge of testing operations for the Maryland Electronic Manufacturing Company.

—n r i—

Lloyd E. Knox, of Bellingham, Washington, writes that he is interested in the short success stories appearing in this magazine. He also expresses an interest in space saving ideas for service shops.

—n r i—

Manual L. Perez, of Los Angeles, California, has a successful spare time servicing business in his home. After his regular work in a factory, he spends his time servicing auto and home radios, as well as helping several other servicemen at their shops.

—n r i—

N.A. Hilbert, of Fort Bliss, Texas, is now a Sergeant, first-class. He has been making rapid progress with his Army Radio career since graduating from NRI. His duties now are as a "line engineer" for the Fort Bliss KEPO Radio Station.

—n r i—

Canadian Graduate Michel R. Kelton, of Montreal, P.Q., Canada, is at present employed by the Canadian Broadcasting Corporation as an engineer. He is in the Department of Transmission and Development.

—n r i—

Congratulations to Graduate Fred M. Wiglusz, of Pawtucket, Rhode Island, who has passed the examination for a first-class Radio-telephone license. He recently completed NRI's new Radio and Television Communications Course.

—n r i—

Roy L. Currier, of Fair Haven, Vermont, is now servicing and installing television receivers. He says NRI training enables him to repair TV receivers without any trouble.

—n r i—

Mrs. Marjorie St. Pierre, NRI Graduate from Brooklyn, New York, has a profitable spare time Radio service business among her neighbors and friends. Both Mr. and Mrs. St. Pierre are NRI graduates, and they hope to have a full time shop before long.

—n r i—

Graduate Ralph V. Puffenbarger, of Lexington Park, Maryland, has a well established Radio and Television Sales and Service business. Because of his pressing duties with the Navy Department, Puffenbarger wants to contact another NRI man who may be interested in a partnership or in buying his business. This seems to be an excellent opportunity for a responsible person.

—n r i—

Graduate Clark F. Conaway, of Knightstown, Indiana, has enlarged his service shop four times in the past two years. This is a fine record of achievement. At present he is in a new, completely modern building. The building has been especially designed so that Clark can work easily from his wheelchair.

—n r i—

W3QGI are the new amateur call letters for Graduate Arthur G. Hinkle, of Fernwood, Pennsylvania. Hinkle sent us a fine photograph of his amateur "rig." He says he took the amateur exam last January, and was out of the FCC office in little more than one hour, thanks to NRI training.

—n r i—

Alumnus C. Thurston Higgs is Foreman of Radio Installations for a large Aircraft Corporation in Hagerstown, Maryland. Congratulations!

—n r i—

Norman Anderson, of Detroit, Michigan visited NRI recently. He has a spare time Radio Servicing business, and is now taking our new Radio and Television Communications Course.

—n r i—

We were pleased to have a talk with Graduate Robert J. Bigelow of Oneonta, New York, when he visited Washington recently. Graduate Bigelow is employed by a General Electric Research Laboratory. His hobby interest is Electronic location of metal ore.

—n r i—

Graduate Alfred J. Girard has a new position with Radio Station WHDH (50,000 watts), Boston, Massachusetts. He is a broadcast engineer. Girard also mentions that he has a '50 Ford, his own home, and enjoys his new job. He thanks NRI for starting him on this wonderful career.

—n r i—

Just released from the Navy, Graduate Robert L. Lincoln, of Anamosa, Iowa, visited NRI recently. He served in the Navy as an Electronic Technician, and is now looking around for the right opportunity in civilian life.

—n r i—

E. J. Streitenberger operates a successful spare time business in New Boston, Ohio. He says that Television is doubling his profits.

—n r i—

NRI Graduate Allen Learned has been with Television Station WSYR-TV, Syracuse, New York, for the past several months. He was transferred to this station at the time construction started, and now that the station is on the air, he is a member of the regular engineering crew.

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