NATIONAL RADIO NEWS

IN THIS ISSUE

A Yardstick for Comparing Radio Receivers

Setting Up Push-Buttons

Alumni Association News

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A Plan for Today

I WILL AWAKEN: With a smile brightening my face; with reverence for this new day in my life and the opportunities it contains.

I WILL PLAN: A program which will guide me successfully past the many temptations and distractions of a busy day and bring me one step closer to my goal of success.

I WILL WORK: With my heart always young and my eyes open so that nothing worth while shall escape me; with a cheerfulness that overcomes petty irritations and unpleasant duties; with the purpose of my work always clearly in mind.

I WILL RELAX: When tired, so as to accumulate fresh energy and live long enough to enjoy the success my work will bring.

I WILL PLAY: With the thought that today is my day, never to be lived over again once it is ended; with relaxation and pure enjoyment as the only purposes of play; putting work and worldly worries out of mind for this short portion of my day.

I WILL RETIRE: With a weariness that woos sleep; with the satisfaction that comes from a day well lived, from work well done.

I WILL SLEEP: Weary, but content; with tomorrow a vision of hope.

J. E. Smith, President.

A Yardstick for Comparing Radio Receivers

The Editor of National Radio News *is grateful to Mr. Scott, President of E. H. Scott Radio Laboratories, Inc., Chicago, Illinois for permission to present this condensed version of an outstanding article which originally appeared in Scott News.*

TODAY, with each radio manufacturer claiming his particular leading set to be the finest that can be bought, the ordinary man finds it difficult to know just what to believe. The very best way to settle the question is to make an actual comparative test, but such a test is not always convenient to make. Most decisions must be reached by reading the printed description of a receiver.

Today the purchaser of a radio receiver or radio-record player combination can make his choice from several hundred models offered by various manufacturers, and the choice is often not an easy one because the average buyer is not a radio engineer. Also, few manufacturers give technical details in their literature other than the number of tubes used and the wavelength range covered. They simply describe its performance in very general terms, and show a picture of the console.

E. H. Scott, Designer and Builder of High Quality Radio Receivers since 1924.

In most cases, an instrument is chosen largely by the design of the console, for it is difficult to tell by listening for a few minutes in a radio store just how the receiver will perform in your home.

For those who are interested in getting the most for their money and in finding the type of receiver which will give the performance they desire, the technical information which follows will be of help. Bear in mind, however, that personal preferences of an individual as to tone, cabinet design, and special features will often be as important as technical perfection. Not all persons desire or need the best possible receiver; thus, even a five-tube midget might meet the requirements of a person who does not appreciate or desire high fidelity.

Number of Tubes

In a well-designed receiver, as you will see in the analysis which follows, the more tubes which are effectively used, the better will be the performance.

Simply because a receiver has a large number of tubes, however, is no guarantee that it is a particularly efficient, highly perfected and developed instrument. There are many advanced circuits used in the better class receivers to provide much finer performance than is possible in receivers using the same number of tubes but which do not use these more advanced circuits.

We start off in the receiver with the very weak signal picked up by the antenna. This is first fed through the tubes in the r.f. amplifier. As it passes from one tube to another, its strength is built up or amplified many hundreds of times. However, there is a limit to the amount of amplification that can be secured in an r.f. amplifier, and when that limit is reached (if there is no i.f. or intermediate frequency amplifier in the receiver), the signal is passed to the detector and the audio frequency section of the receiver, so that you can hear it in the loudspeaker. The greater the total amplification, the greater is the volume.

Superheterodyne Circuit

Many years ago, all receivers used only radio frequency amplification, and because of their low sensitivity, distance reception was very poor. About 1917, during the World War, Major Armstrong invented the superheterodyne circuit. This circuit carries on where the t.r.f. or tuned radio frequency circuit leaves off, and it is this circuit which has made possible reception from weak distant stations all over the world.

For this reason, practically all modern receivers employ the superheterodyne circuit. The signal is amplified as much as possible in the r.f. stages (if present); it then passes through a section we call the frequency converter, where it is changed into a lower intermediate frequency at which it is possible to build up the strength of the signal tremendously. If only one stage of i.f. is used, you will secure a certain amount of amplification, but as you pass the signal through two, three or four stages of i.f., it increases still more in strength.

But this signal, although it has been amplified many millions of times, is still a radio frequency signal (much higher than 15,000 cycles per second), and such frequencies are inaudible to the human ear. To make this signal audible, we now pass it through the detector, which extracts the music, speech or other program material from the high-frequency wave and restores it to the original a.f. wave form. This reconstructed wave form is fed to the audio frequency amplifier, which boosts its strength still more. The loudspeaker is the final link which transforms these audible frequencies into vibrations which reach your ear as music or voice.

Signal-to-Noise Ratio

You will notice the phrase "signal-to-noise ratio" in the description of tube functions in the r.f. and i.f. sections. If the circuits used are highly developed, they will keep the strength of the signal up to a high level, while tube and circuit noises are reduced to a low level. If they are not so highly developed or if r.f. amplification is insufficient for the desired station, the internal noise will be high in comparison to the signal. As a result, the signal-to-noise ratio will be low and reception will not be very satisfactory, especially from distant stations.

Power-Handling Capacity and Harmonic Distortion

The clearness and distinctiveness with which a radio reproduces either broadcast or recorded music depends greatly upon the number of tubes which are effectively used in the audio amplifier, and this performance feature is referred to as "power-handling capacity." If only one or two tubes are used, distortion will be present at high volume. In addition, unless special circuits are used, "harmonic distortion" will occur, which makes reproduction sound raspy. Such distortion can be reduced with efficiently designed circuits to the point where it is inaudible to the human ear.

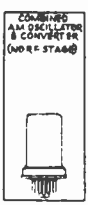
Analyzing Tube Line-Ups

To help in choosing a radio receiver or record player combination, we are listing the functions which the different tubes perform in various sections of a radio. To make it as simple as possible, we have divided the receiver into three general sections: *1.* The r.f. section, where the signal is received; *2.* The i.f. amplifier section, where the signal is built up to greater strength; *3.* The a.f. section, which amplifies the audio signal sufficiently to give the desired loudspeaker volume.

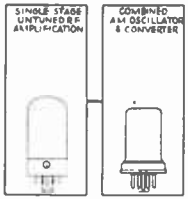
Each section begins with the minimum number of tubes which can be used in that section of the receiver, and is followed by the functions and results which may be obtained with the use of additional tubes. *Editor's Note.* The term "converter" on the diagrams corresponds to the term "mixer-first detector" used in N. R. I. textbooks and in the numbered paragraphs of this article.

The R.F. Amplifier Section

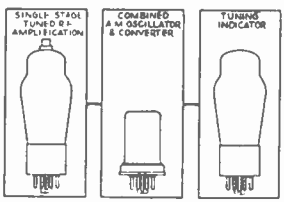
The r.f. amplifier is the first section of any superheterodyne receiver. Its purpose is to provide sufficient selectivity to prevent interference from other stations, and sufficient r.f. amplification to allow the reception of weak signals from distant stations with a minimum of receiver noise.



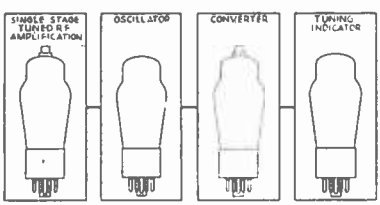
1. Combined Oscillator-Mixer-First Detector Tube (No R. F. Stage). Here is the simplest form of r.f. circuit, and is generally used in receivers having a built-in antenna. The signal-to-noise ratio is low for weak signals, and as a result, tube hiss and noise will be quite high on all except powerful nearby stations. The selectivity will be poor, making it difficult to receive certain stations without interference from undesired stations. Very unsatisfactory for use with an outdoor antenna because the stronger signal that is obtained by using an outdoor antenna will cause distortion unless the tube has adequate a.v.c. Uses one tube.



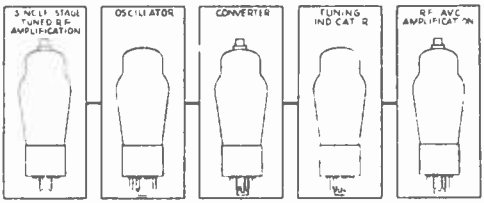
2. Combined Oscillator-Mixer-First Detector Tube (With Untuned R.F. Stage). This combination with an untuned r.f. stage has a slightly better signal-to-noise ratio, which means quieter reception with less tube hiss and noise when used with a built-in antenna. However, if used with an outdoor antenna, the apparent selectivity will be poor, and inter-station interference will sometimes be annoying. Distance reception will be fair. Uses two tubes.



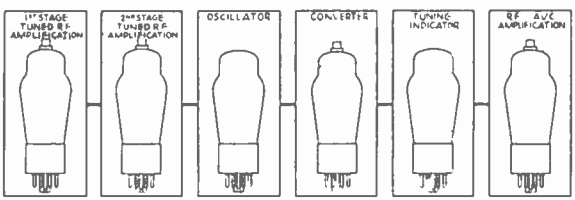
3. One Tuned R.F. Stage, With Combined Oscillator-Mixer-First Detector Tube and Tuning Indicator. This combination with a tuned r.f. stage, instead of the untuned stage, gives much quieter reception because it considerably reduces interference from stations on undesired wavelengths. At the same time, a receiver with a tuned r.f. stage provides good reception from distant stations *if it has two or more stages of i.f. amplification.* (See I.F. Section.) The tuning indicator does not contribute directly to receiver performance, but does help the listener to tune in stations accurately so as to secure the full tonal possibilities of the receiver. Uses two tubes and the tuning indicator tube.



4. One Tuned R.F. Stage, With Separate Tubes for Mixer-First Detector and for Oscillator, and With Tuning Indicator. By using a separate tube for the oscillator, dial calibration on the a.m. short-wave bands will be kept more accurate, and the sensitivity of the receiver will be much more stable. Uses three tubes (plus tuning indicator).



5. One Tuned R.F. Stage, With Separate Tubes for Oscillator, Mixer-First Detector, Tuning Indicator and A.V.C. Amplification. This combination provides a very good signal, giving quieter and clearer reception from all stations, because full sensitivity is available for weak signals and overloading is prevented on strong signals by the amplified a.v.c. action.

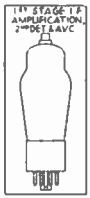


6. Two Tuned R.F. Stages, With Separate Converter Tubes for Oscillator, Mixer-First Detector, Tuning Indicator, and A.V.C. Amplification. The additional r.f. stage makes this combination the most efficient and highly developed antenna and r.f. section it is possible to incorporate in a radio receiver for entertainment purposes. It provides extremely quiet reception from all stations (when used with two or more i.f. stages) with a minimum of station interference.

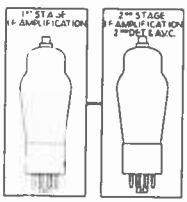
The I.F. Amplifier Section

The i.f. amplifier is the second section of a superheterodyne receiver. Its purpose is to provide a usable degree of sensitivity so that weak distant stations can be tuned in with good volume, and sufficient selectivity to prevent interference from other stations, especially those on adjacent channels.

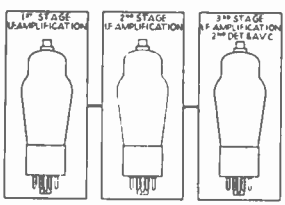
The i.f. amplifier can be made highly selective, cutting out undesirable signals as well as unimportant side-band frequencies of the radio signal being received; this is usually desirable only for reception of messages or for distance reception. For high-fidelity response, a switch should be provided which gives broad band-pass characteristics so as to pass a wide range of side frequencies.



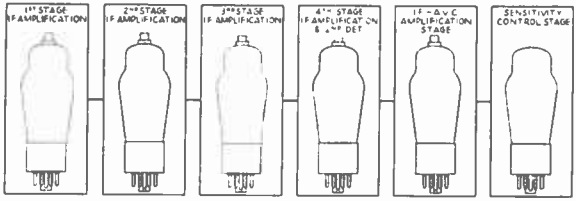
7. One Stage of I.F. Amplification, With Second Detector and A.V.C. System. This is the simplest form of i.f. amplifier that can be incorporated in a superheterodyne receiver. Station separation is poor, especially if no r.f. stage or only one r.f. stage is used. The a.v.c. (a circuit which keeps signals from fading out one second, then blasting in the next) is only fair. Uses one multi-function tube.



8. Two Stages of I.F. Amplification, With Second Detector and A.V.C. System. This combination provides better selectivity (ability to separate interfering stations) than a receiver using only one i.f. stage. The increased sensitivity will give greater distance-getting ability and better a.v.c. action than a receiver with only one i.f. stage.



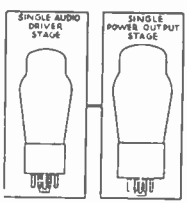
9. Three Stages of I.F. Amplification, With Second Detector and A.V.C. System. This combination gives excellent selectivity between stations on adjoining wavelengths, and makes it possible to incorporate variable selectivity efficiently in the receiver. This control makes it possible for the user to "broaden out" the receiver for high-fidelity reproduction from local stations, or "sharpen" it to provide good reception from distant stations. The high sensitivity made possible by the three-stage i.f. amplifier brings in weak distant stations, and also makes it possible to incorporate an excellent a.v.c. system in the receiver.



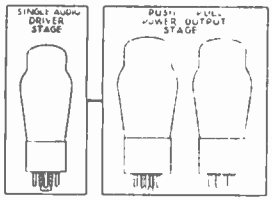
10. Four Stages of I.F. Amplification, With Second Detector, Amplified I.F. A.V.C. System and Sensitivity Control. This combination is the most efficient and advanced i.f. amplifier section which can be incorporated in a radio receiver. The wide range of selectivity available makes it possible to secure any degree of station separation, from extra-sharp for DX reception to broad response for high fidelity. The tube used for the amplified i.f. a.v.c. system, working in conjunction with the sensitivity control tube, provides a most perfect control of volume on distant stations, preventing the constant fading in and out of the signal. At the same time, the four-stage i.f. amplifier with its high, controlled gain makes it possible to bring in weak distant stations with loudspeaker volume, and provides the finest possible reception from foreign stations.

The Audio Amplifier

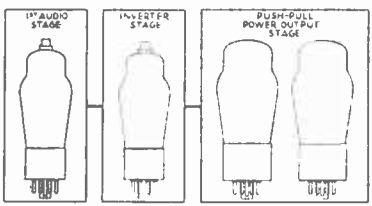
The audio amplifier is the third section of any superheterodyne receiver. Its purpose is to amplify the signal that has been detected, and build it up to sufficient volume to be heard on the loudspeaker. To provide the most faithful, as well as the most pleasing reproduction, this section of the receiver should be equipped with controls for varying both the bass and treble response, and its design must be such that no distortion is introduced.



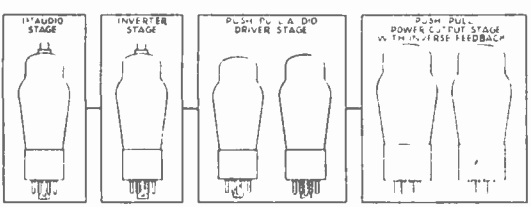
11. One Driver Stage and Single Power Output Stage. This combination is the simplest audio amplifier that can be incorporated in a radio receiver providing loudspeaker reception. The undistorted volume that can be secured is low, which means that overloading and blasting occurs if the volume control is advanced beyond low volume levels.



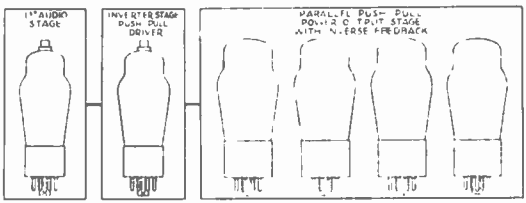
12. One Driver Stage and Push-Pull Power Output Stage. This combination with a push-pull power output stage has a higher level of undistored volume, and gives better tone quality than a single output tube.



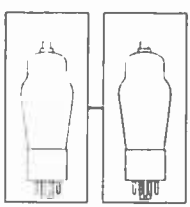
13. One Audio Stage, Inverter Stage and Push-Pull Output Stage. This combination, with a distortionless phase inverter stage, provides much cleaner reproduction at all degrees of volume, especially from fine recordings which are recorded at low level, and are therefore difficult to reproduce perfectly on any but a very good audio amplifier.



14. One Audio Stage, With Inverter Stage Feeding Push-Pull Driver Which in Turn Drives Push-Pull Power Output Stage With Inverse Feed-Back. This combination has a very low degree of harmonic distortion over a wide volume range from the softest to the loudest passage. The minimum hum level makes it possible to incorporate a circuit that reproduces all bass passages with a degree of perfection never heard on less highly developed receivers. The increased power-handling capacity gives much finer reproduction of low-level records. Separate inverter and push-pull driver tubes are used to insure sufficient output to drive the two push-pull output tubes at maximum efficiency. Inverse feed-back is incorporated to smooth out the "peaks" and "dips" which occur in the response of even the best high-fidelity speaker, thus improving the quality of reproduction.



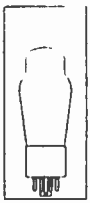
15. One Audio Stage, With Inverter Stage Feeding Parallel Push-Pull Output Stage With Inverse Feed-Back. This combination, with a parallel push-pull power output stage, provides the finest possible distortionless reproduction at all degrees of volume on either broadcast or recorded music. As four tubes are used in the output stage, a sufficient margin for maximum power output is secured with a combined inverter push-pull driver stage. You have never really heard how fine broadcast music or records can be until you have heard it through an audio system using the above combination of tubes.



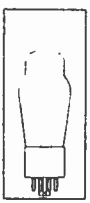
Special Features

16. Record Scratch or Surface Noise Suppressor. A special circuit which reduces scratch and surface noise heard on many records.

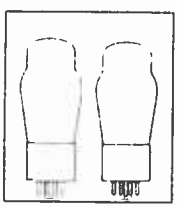
17. Automatic Noise Limiter or Noise Silencer. This is a special circuit used to eliminate ignition and similar types of electrical disturbances often encountered in tuning for weak stations on the foreign short-wave bands.



18. Voltage Regulator Tube. In some locations, there is quite a wide variation in line voltage at various times during the day. If the line voltage varies greatly, and no means are used in the receiver to keep the plate voltage on the oscillator constant at all times, reception may sometimes be unsatisfactory. A special voltage regulator tube maintains the plate voltage on the oscillator constant at all times, preventing shifts in dial calibration and noise due to line voltage changes.



19. Single Power Rectifier Tube. A single power rectifier is capable of supplying power requirements for power amplifiers up to 15 watts, but is too small for higher power amplifiers.



20. Dual Power Rectifier Tubes. Two power rectifiers are necessary to supply adequate reserve power for an audio amplifier capable of a maximum power output up to 60 watts, to insure distortionless reproduction of high volume peaks, and also to give maximum rectifier tube life.

21. Undistorted Power Output. Many manufacturers simply state that the receiver has an output of so many watts. This may mean *total* power output, or it may mean *undistorted* power output. There is a great difference between the two. *The only part of the power output really usable is the undistorted output.* In listening to many programs, "peaks" very often rise to high volume levels; if the receiver does not have sufficient power output, these "peaks" will be fuzzy and distorted. A high-quality power amplifier will provide from 15 to 40 watts of undistorted output.

22. Over-all Fidelity. Many manufacturers claim high fidelity for their receivers. The only way actual fidelity of a receiver can be shown is by means of an over-all fidelity characteristic curve. If it is claimed the receiver is a high-fidelity model, the over-all fidelity characteristic curve should show it is practically flat from 50 up to at least 7500 cycles. This is the *minimum* specification for a high-fidelity receiver. Actually, to provide true high-fidelity reception, a receiver should be capable of reproducing all frequencies from 50 up to 8500 cycles on programs received from a.m. stations, and from 30 up to 15,000 cycles or higher on the new f.m. stations.

23. High-Frequency Speakers Available to Extend the High-Fidelity Response. To reproduce every frequency from 30 to 15,000 cycles, which is the fidelity range transmitted by the new f.m. stations, it is necessary to use either one or two high-frequency speakers, for no single speaker has yet been designed which will reproduce with perfect fidelity all frequencies from 30 up to 15,000 cycles.

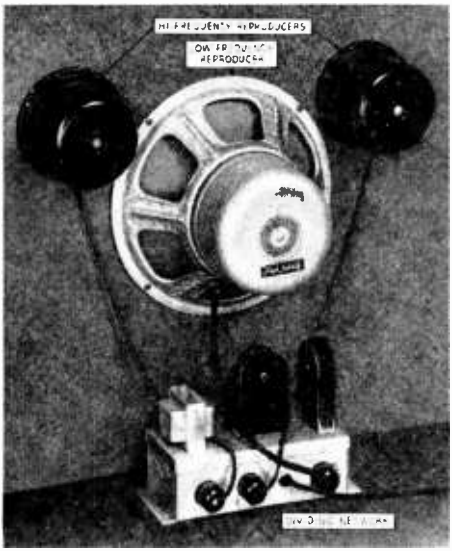
24. Variable Sensitivity. This involves a special circuit which enables the sensitivity to be varied to meet noise conditions in the location where the receiver is used. It provides *maximum* sensitivity for the reception of weak distant stations, or *minimum* sensitivity for the reception of local stations where a high degree of sensitivity is not required. It also provides quiet tuning and freedom from noise when tuning between stations.

25. Variable Selectivity. Few receivers incorporate variable selectivity, because any feature that adds an appreciable amount to the cost is usually eliminated. However, if variable selectivity is not incorporated in a receiver, the selectivity must be fixed, at time of construction, at one point. Obviously, this is a compromise between "sharp" selectivity (to enable distant stations to be received) and "broad" selectivity (to permit high-fidelity reproduction). The result is that the receiver is usually set on the "sharp" side to provide reception free from interference from stations on adjacent channels. However, such a receiver cannot bring you all programs with the maximum fidelity.

26. Variable Bass Control. Today, the great majority of receivers either have no bass control at all or provide an *apparent* bass by reducing the higher frequencies or overtones by means of a single tone control. Actually, the bass response is exactly as it was, but the effect of "cutting the highs" seems to give more bass, be-

cause the "highs" are not being reproduced as they were before. In high-quality receivers such as Scott receivers, a separate bass control is provided *to increase and decrease the bass response only, without affecting the high frequencies.* This means the listener has full control over the bass response without affecting the middle or the high-fidelity range of the receiver.

27. Variable High-Fidelity Treble Control. A treble fidelity control is provided to enable listeners to obtain the most natural reproduction of the higher overtones either from records or from broadcast programs. This control enables you to set the treble response at the exact point which provides the most enjoyable listening quality.



Special Loudspeaker System available for Scott Phantom and Philharmonic Models.

28. Weight of Loudspeaker. A light-weight loudspeaker will have a small field coil, while a heavy loudspeaker will usually have a large field coil. A large field coil is necessary, if the loudspeaker is to handle all degrees of volume without distortion. Generally speaking, the larger the cone and the heavier the loudspeaker, the finer the reproduction of bass notes.

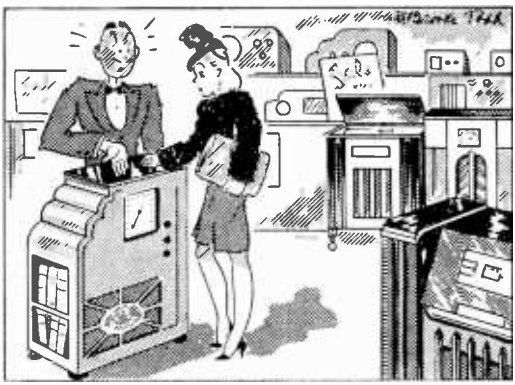
29. Total Weight of Chassis. The total weight of the chassis and amplifier can usually be taken as a reliable index of the quality built into a receiver. If the chassis and amplifier are comparatively light, then you can be assured that light-weight parts are used in the receiver.

Rinaldi's Test Bench

Alfred Rinaldi, 2190 East 2nd St., Brooklyn, N. Y., is a very observing fellow. He visited N.R.I. some months ago and showed great interest in the new test bench in our laboratory.

Rinaldi made some notes, most of them mental, then returned home with a definite plan to reproduce our test bench as nearly as possible. The photo herewith shows that he made a good job of it, if you recall the photo of N.R.I.'s test bench which was shown in the News some months ago.

We are always glad to receive photographs showing students or graduates at work with their equipment.



Idea from "Radio Today"

"I like this one. Talk me into it!"

Puzzling Radio Questions From Students

Phono Record Players

QUESTION: *I have a customer with a high fidelity phonograph combination. When the phonograph is used there is a great deal of record scratch or noise. What should I do and what causes the noise?*

ANSWER: Modern records are constructed of a hard plastic material for long record life. Due to the granular composition of the material, there will be a considerable amount of surface noise at frequencies of 3500 cycles or higher. This may not be annoying in records played at ordinary volume and records intended for dancing. However, if the owner of the receiver is a lover of good music and has some symphonic recordings in which there are soft passages, the noise is frequently annoying.

As the noise exists above 3500 cycles, the easiest method of eliminating the noise would be to reduce the high frequency response of the phonograph pick-up. The customer will undoubtedly find that when the high frequency response is lowered so that the noise level goes down, the brilliance and crispness of response will be destroyed. Thus, he must accept some sort of a compromise between acceptable music quality and the amount of noise. This depends entirely upon the taste of the customer and once he has had demonstrated to him the effects which will occur, he will generally be able to choose which response he prefers.

In some cases, the use of soft needles, either the soft steel or fiber type, will help to reduce the amount of noise. This is due to the fact that the hard plastic of the record rapidly wears off the needle point. A dull needle point cannot follow the high frequency variations in the record path and also is less sensitive to the many tiny irregularities in the composition of the record. As a result, there is a softening of the high frequency response and also somewhat less noise.

If the change in needles does not produce satisfactory results, then I would suggest reducing the high frequency response of the unit electrically. If there is a tone control for the treble notes, make use of it. However, some of these treble controls operate by raising the bass response, so that the response from the records may sound boomy when the treble control alone is used. In such a case, lower the bass response by making use of the bass control also, which normally is found on high fidelity models.

Some attempt must be made to educate the customer as to the characteristics of his unit. He may state that someone has a much cheaper combination and does not get noise. This will probably be true. The less expensive models are not high fidelity and cut off sharply above 3,000 cycles. As a result, the amount of noise is considerably less than that experienced on the high fidelity models. Were he to compare the two units side by side, however, he could readily note the tone quality difference. Thus, it is necessary to explain to the customer that he is gaining the increased tone quality at some sacrifice in the noise freedom of the unit.

It is important that records be kept clean. Dust and dirt collecting in the grooves of a record will cause noise. There are available record brushes put out by reliable record manufacturers, which can be used to dust the records. It is not at all advisable to try to use ordinary clothes brushes or other types of brushes as the record can be damaged by so doing. The turn-table on which the record rests is generally covered with a felt which collects considerable dust. It should be frequently cleaned. Old records are generally noisy; be sure to use a new record to notice improvements.

Station Interference

QUESTION: *During the last few months, I have had a number of service calls in which the complaint was station interference. A careful check and alignment of these receivers does not seem to help very much. Am I overlooking some fact? How can I satisfy my customers?*

ANSWER: I believe you are experiencing a perfectly natural type of interference. During the winter months, reception is unusually good. As a result, it is possible for stations on the same frequency as a desired station to come in.

With modern receivers, using automatic volume control systems, the sensitivity of the set will be cut down if you are listening to some powerful local station, and there will not be much interference. On the other hand, if the desired station is more than fifteen or twenty miles away, then the signal is bound to fade somewhat at times. Every time it does fade a little, the automatic volume control circuit may correct this fading by increasing the sensitivity of the receiver. As a result, you will not hear the fading in the output, but you will notice interference coming in.

Are Answered By N. R. I. Experts

The next time you have a complaint of this type, notice the interference to which the customer complains. If it seems to fade in and out, then this is definitely the type of trouble you are experiencing. Alignment will not clear up the trouble when the interfering station is on the same frequency.

You might try a different aerial. First try a short one, particularly if the desired station is a local one, then try a much longer aerial. The short aerial may reduce pick-up ability of the set to such an extent that the interfering station is not heard. On the other hand, if it still comes in, then sometimes a longer aerial will increase the amount of pick-up from the local station so much that the a.v.c. circuit can make the correction.

In the case of low powered local stations, which are generally grouped toward the high frequency end of the broadcast band, this interference may be heard all of the time. On some of the high frequency channels, there are such a number of small transmitters that interference is bound to develop. For instance, on 1310 kilocycles, there are 71 broadcast stations. None of these stations have a rating higher than 250 watts and if you live more than five or ten miles from a local station of this power, it would be indeed remarkable not to hear interference during the winter months. In this case, the interference may be steadily in the background all of the time.

The only thing you can do is to suggest to the receiver owner that he tune to some other point on the band where the interference is least noticeable. There are a few clear channels which only have one station on them, and the receiver owner may find his favorite programs come in over these stations, with less interference.

I am sure that the above information will permit you to offer a reasonable explanation to your customers, which will prevent them from being completely dissatisfied. From the foregoing, you can see that outside of changing the antenna and recommending that the owner try listening to other stations, practically nothing can be done about this type of trouble.

Filter Condenser Shock

QUESTION: *While testing a receiver, I happened to touch the filter condenser can and the set chassis at the same time and got a shock. I thought the filter condenser can was always connected to the set chassis. If so, why should I get a shock?*

ANSWER: The filter condenser can is not always connected directly to a set chassis. In many instances a bias voltage may be obtained from the power pack. In such cases the speaker field, the bias resistor, or the choke coil may be connected in the negative power supply return lead to furnish this bias. As a result, the input filter condenser will have its negative terminal (the can) connected to the center tap of the high voltage winding, and will thus be different from ground or chassis potential by the amount of voltage drop across the device in the negative return circuit. If this happens to be a speaker field, the voltage difference between this can and set chassis may be as high as 100 volts or more.

An examination of the filter condenser can and its mounting will show that a fiber insulating washer is used with the single hole mount type, or a piece of fiber paper is used with the clamp mounted type. It is easy to see the paper but sometimes you might overlook the fiber washer type of insulation. Hence, do not touch filter condensers while the set is turned on, to avoid a shock.

Burned Out R. F. Coil

QUESTION: *I have an A.C.-D.C. receiver of the T.R.F. type with the antenna coil burned out. How can I obtain a replacement for this coil?*

ANSWER: Replacement coils for A.C.-D.C. receivers can be obtained from any radio supply house. Be sure you obtain a *set* of R.F. coils however, and not just a single coil. If you obtain a single coil, its characteristics may be different from that of the original coil. As a result the two tuned circuits in the T.R.F. type A.C.-D.C. receivers would not track properly. On the other hand, if you obtain a matched set of coils, they will both be different in the same manner and will track each other.

In the few rare cases where an exact duplicate coil is absolutely necessary, send the original coil and complete data about the set to some firm which can wind a duplicate. Many mail order supply houses have such a service. In addition the Carron Manufacturing Company, 415 South Aberdeen Street, Chicago, Illinois, has such a service.

News Items from F. C. C.

This article was released to National Radio News by the Federal Communications Commission, Washington, D. C.

As the result of a conference with manufacturers of high-frequency (f.m.) broadcast equipment, the Federal Communications Commission has waived certain technical requirements to expedite operation and, incidentally, announces its 30th f.m. grant on a commercial basis—for a new station at Syracuse, New York. More than 600,000 residents within a 6800-square-mile area of that city will be served by the Central New York Broadcasting Corporation on 46,300 kilocycles.

Since high-frequency broadcast stations are rated on the basis of specified service and the actual power may vary widely for the same service area in the same location, the Commission's rules do not specify or standardize power rating. However, standardization of the maximum power rating and operating range of the transmitters would be of mutual assistance to the manufacturer and broadcaster. Since the Commission has agreed to standardize the power in connection therewith it became desirable to waive two rules —Section 3.241, relating to maximum power rating, to permit maximum power of four times the operating power between 12,500 and 25,000 watts until a 25,000-watt transmitter can be developed and placed on the market; and Section 3.245, relating to transmitter performance requirements, to permit manufacturers more time to meet the 2% limit on the combined audio frequency harmonics generated by the transmitting system.

Because proposed f.m. service in the Philadelphia and New York areas makes assignment of adjacent channels desirable, the Commission has modified the construction permit granted the WCAU Broadcasting Company, in the former city, to specify 46,900 kilocycles (instead of 46,700), and that of the Columbia Broadcasting System, Inc., New York, to specify 46,700 kilocycles (instead of 48,700). The call letters W67PH assigned to the Philadelphia station necessarily must be changed to W69PH to indicate the new frequency assignment. Call letters for the Columbia Broadcasting System station have not yet been assigned.

From The Mail Bag

A New York firm wants to know whether an additional charge may be made for broadcasting a program by means of f.m. simultaneously with the same program over standard broadcast facilities. The provisions of the Communications Act which authorize the Commission to pass on the amount of charges for communications service relate to common carriers only. A person engaged in radio broadcasting is not deemed a common carrier under this statute. Hence the Commission has no say in individual program rate charges.

A letter requests "forms" to be used in making complaint concerning alleged violations of law by a radio station. The Commission does not have or supply forms for this purpose. The person is told that he may summarize and submit to the Commission, in an affidavit executed before a notary public, any facts in his possession to support his complaint. Such affidavit should, among other things, state the type of station referred to, its call letters and location; the name of the owner and operator; the various dates and, as nearly as possible, the definite time the alleged violations were committed. This information should be accompanied by the names and post office addresses of witnesses, together with a brief summary of the facts to which they would testify.

Reply to a number of inquiries states that as of January 1 there were 831 standard broadcast stations licensed and 51 outstanding construction permits.

Foreign Language Broadcasts

A total of 199 domestic radio stations now schedule broadcasts in one or more foreign languages, and 57 additional stations, while not now broadcasting in any foreign language, have done so in the past six months. This is revealed in an analysis of responses by broadcast stations to a recent questionnaire of the Federal Communications Commission.

Thirty-one foreign languages are represented on 1,721 current weekly programs, representing nearly 1,330 hours of foreign language programs a week. Approximately three-fourths of this broadcast time is in the Italian, Polish, Spanish, Jewish and German languages, the proportions decreasing in the order listed.

The smaller stations appear to predominate in the foreign language field, 108 of the 199 stations having power not in excess of 250 watts.

However, a substantial number of the stations which devote a considerable amount of time to foreign language programs have greater power. There are 43 stations which broadcast 10 or more hours a week in one or more foreign languages. A preponderance of the stations using foreign languages are located in areas with considerable foreign-born populations, and assert that broadcasts in native tongues are popular with their listeners and their advertisers.

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NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

FARNSWORTH Models BT-20 (Chassis C-11-1), BT-22 (Chassis C-12-1)

Push Button Set Up (on BT-22 only)

When the push buttons are lifted a screw is exposed. This screw should be loosened by one or two turns by a screwdriver. Tune in the desired station manually, then firmly press the button until it hits the stop, making certain the gang setting does not change. Again lift the push button and tighten the screw. Manually detune the set, press the button just set up. If the adjustment was properly made proceed wih the remaining buttons.

EQUIPMENT AND PROCEDURE FOR ALIGNMENT

When aligning this receiver a signal generator calibrated at 455kc, 600kc, 1000kc, 1500kc, 1720kc, 6Mc, 10Mc, 16Mc, and 18.1Mc and an indicator are required. All adjustments should be made with the volume control set for maximum volume, keeping the signal generator output as low as possible, to prevent AVC action and incorrect adjustments.

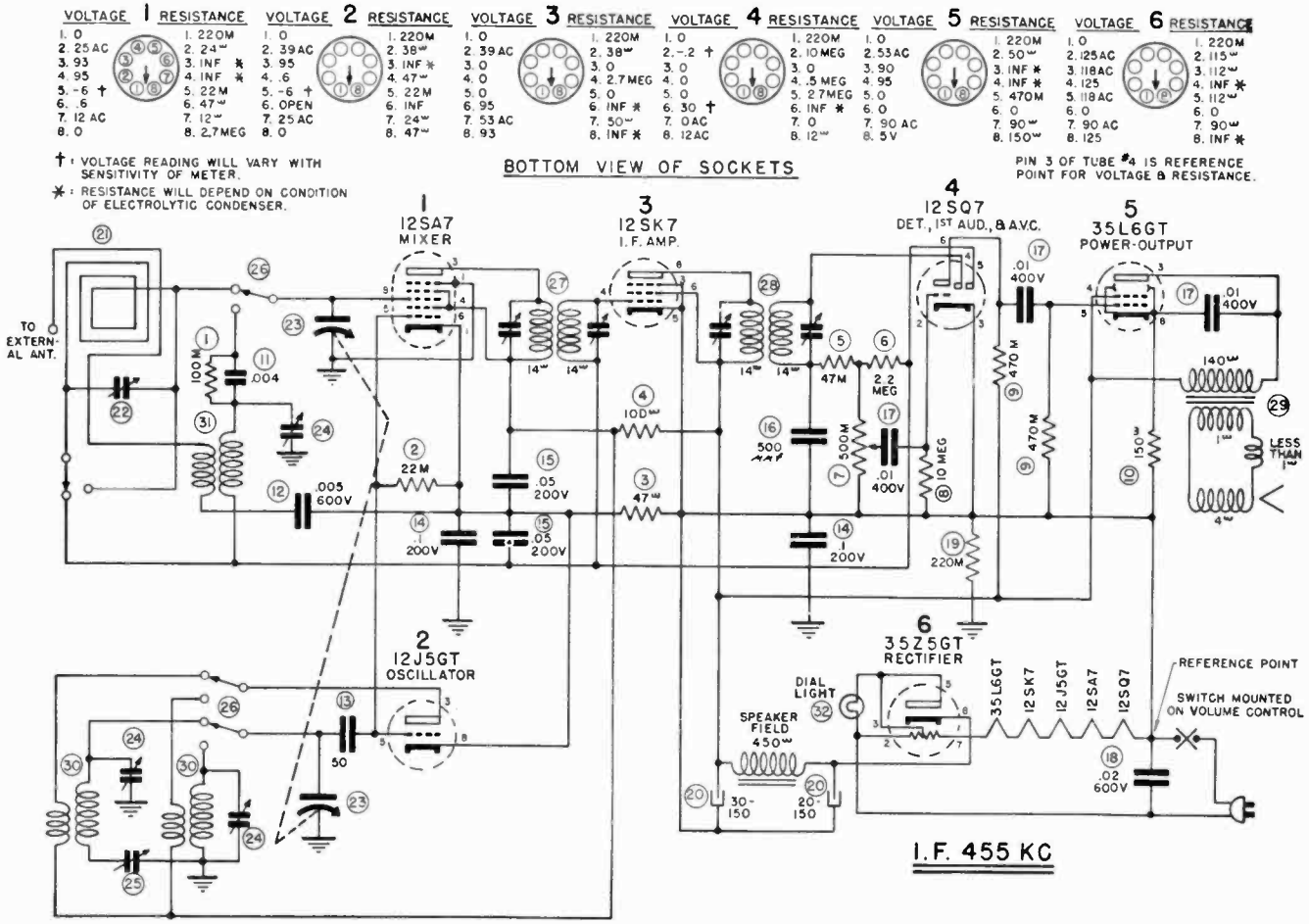
Connect the low side of the signal generator to the chassis through a .1 mfd condenser. When aligning the Short Wave Oscillator tighten the adjusting screw for maximum capacity and then loosen it until the first peak is reached. Do not use the signal heard at the lower capacity setting as in this receiver the oscillator works at a frequency lower than the one the R.F. is tuned to. If the loop is tuned to 18Mc, the oscillator is tuned to 17.545kc; that is, signal frequency minus I.F. frequency, instead of signal frequency plus I.F. frequency, or 18.455kc as is customary.

TABULATION FOR ALIGNMENT

Steps	Dummy Antenna	Set Generator at	Set Gang at	Adjust	Located	To Obtain
1	Set Volume Control For Maximum Output					
2	250 mmfd	455 Kc	Minimum	2nd I.F. Trimmers	Top of I.F. Trans.	MAXIMUM OUTPUT
3				1st I.F. Trimmers		
4		1720 Kc		B.C. Osc.* Trimmer	Nearest Front of Chassis	
5		1500 Kc	Strongest Sig. & Rock Gang	B.C. R.F. Trimmer	On Loop Antenna	
6		600 Kc		600 Kc. Pad	Top of Chassis	
7	Check	1000 Kc				
8	400 ohms	18.1 Mc	Minimum	S.W. Osc.* Trimmer	Middle of Three	
9		16 Mc	16 Mc	S.W. R.F.* Trimmer	Rear of Three	

*These Trimmers are on a strip of three at the right hand end of the chassis.

Readers who file Service Data in separate binders remove page carefully, trim on dotted line for same size as data published heretofore.



Novel Radio Items

–BY L.J. MARKUS–

Thieves who broke into a wholesale tobacco store in Indianapolis carried with them a portable radio receiver tuned to the local police station. While breaking open boxes of merchandise, a police call came over the set. "That's us! Get going," said one of the men. A few minutes later they emerged from the fire escape of the building next door, right into the hands of waiting police. What the burglars failed to realize was that in entering the building, they had unknowingly set off an American District Telegraph alarm which placed police on the trail immediately. The radio broadcast was merely a call for reenforcements.

———*n r i*———

A bolt of lightning struck one of the transmitter towers of KSAL in Salina, Kansas, melting an antenna coupling coil and burning out several meters and coils. Seeing a ball of fire traveling toward the transmitter building along the wires coming from the towers, Engineer Dick Cahill flipped the switch which disconnected the transmitter from the antennas. This "fast as lightning" action saved the transmitter from further damage.

———*n r i*———

Add to your collection of radio slang the following:

Soap opera—A dramatic serial sponsored by a soap manufacturer, usually featuring the heart affairs and troubles of women. Also called *dishwater drama.*

———*n r i*———

In a recently developed process for manufacturing metal tubes, the electrode structure is placed under a glass bell jar for evacuation of air, with the metal envelope being held above the electrode by an electromagnet which surrounds the bell jar. When evacuation is complete, the envelope is allowed to drop into position, and molten solder seals it to the metal base. The exhaust tubulation is thus eliminated. This process cuts the weight of a metal tube almost in half, speeds up manufacture, and lowers the cost of production.

———*n r i*———

A used radio tube in good condition can be expected to last just as long as a brand-new tube of the same type, according to engineers of the Bell Telephone Laboratories. The life of an individual tube may be anywhere from a few hours up to many thousands of hours, depending upon variations in construction, and only the law of chance determines when a tube will fail. No tube can last forever, but if a tube did last 100,000 hours, it would have just as good a chance of lasting another 1,000 hours as would a new tube of similar construction.

———*n r i*———

When persons taking shorthand examinations for Civil Service positions claimed that examiners in some Arizona cities spoke more clearly than those in other cities, radio stepped in and provided the same voice for all. Candidates in Phoenix, Flagstaff, Winslow, Tucson, Globe and Bisbel were seated in front of loudspeakers, and all took dictation being received by radio from a single examiner in the studios of KTAR in Phoenix.

———*n r i*———

When placed near the ringer box of a telephone, the Presto type 175-A telephone pick-up coil will pick up sufficient energy by induction to meet the input requirements of an ordinary audio amplifier which is feeding either headphones or a loudspeaker. Furthermore, if the coil is connected to a sound recorder, both sides of the telephone conversation can be recorded. (Further information on this coil can be obtained from Presto Recording Corp., 242 W. 55th St., New York, N. Y.)

———*n r i*———

An F. C. C. authorization has been granted to WHO of Des Moines, for super-power tests of a new polyphase amplitude modulated system of broadcasting which is claimed to save half of the modulated power. In this polyphase system, the regular tower transmits only the carrier frequency, and four auxiliary antennas transmit the side-bands. The station will operate with 150,000 watts of power from midnight to 6 A. M. to determine the advantages of the new technique, as soon as necessary new equipment is constructed.

———*n r i*———

A miniature radio transmitter enclosed in an 8-inch diameter rubber ball was used to trace the path of an underground stream near Bellevue, Ohio. Scientists with portable radio direction finders traced the course of this waterway for about three miles along the surface, but lost track of the ball at this point when it took an unexpected turn on its underground journey. The experiment will be repeated with a more powerful transmitter in the ball and with more direction finders stationed above ground.

L. J. MARKUS

Setting Up Push-Buttons in Radio Receivers

L. J. MARKUS
N.R.I. Technical Editor

By order of the Federal Communications Commission, March 29 has been set as the big moving day for radio. On that day, 795 of this country's broadcast stations will change their frequencies, and more than ten million radio receivers having automatic tuning will require resetting of push-buttons. This will mean a flood of profitable jobs for Radiotricians, lasting for several weeks because there just aren't enough servicemen to handle all these jobs in one day. N.R.I. students can also profit from this change, for even beginning students can reset push-buttons on the majority of sets if they master the simple general rules given in this timely article.

A RAPIDLY increasing number of the radio receivers in use are provided with automatic tuning, whereby a desired station can be tuned in accurately and almost instantly simply by pressing a push-button.

With receivers having automatic tuning, individual adjustments must be made for each station-selecting button before the push-buttons can be used. These adjustments are rarely if ever made at the factory and must therefore be made by the radio dealer or in the home of the purchaser. When receivers are purchased from mail order radio supply houses or through wholesale channels, the push-buttons must be set up by the purchaser himself or by some one whom he calls in.

The process of setting up the push-buttons for a radio receiver is relatively simple in the majority of cases, so you should be able to handle many extra-money jobs of this nature once you master the basic principles of the different automatic tuning systems covered in this article.

With some types of automatic tuning systems, the station-selecting buttons can get out of adjustment due to careless handling of the receiver, normal vibration resulting from the action of the push-button mechanism, or changes in the characteristics of tuning circuit parts due to temperature changes. The push button adjustments then require resetting.

Whenever a broadcasting station changes its operating frequency, all receivers which have a push-button set up for that station will require resetting. Many people hesitate to attempt even simple adjustments like this, so again you have an opportunity for profitable business.

Types of Automatic Tuning Systems. The various systems employed by receiver manufacturers for automatic tuning purposes can be divided into three groups, according to the operating principles employed:

1. Mechanical automatic tuning systems, in which the regular gang tuning condenser of the receiver is rotated to the correct position for a desired station by mechanical action when the station selecting button is pressed.

2. Electrical automatic tuning systems, in which pressing in of one button automatically switches into the tuning circuits of the receiver a pre-adjusted set of trimmer condensers or adjustable inductances (coils), and at the same time releases any button previously depressed.

3. Electro-mechanical tuning systems, in which a small electric motor automatically rotates the gang tuning condenser to the correct position for a desired station when a button is pressed.

Electrical systems and push-button type mechanical systems are the commonest now in use,

and are likewise the simplest to adjust. The procedures for setting up the buttons for these types will be covered in this article. Variations will undoubtedly be encountered, but your knowledge of the basic principles will alow you to figure out the correct procedure for the particular system at hand. It is almost impossible to do any serious damage even if you make mistakes at first in setting up buttons, so don't be afraid to tackle these jobs.

Telephone dial-type mechanical systems and electro-mechanical systems are somewhat more complicated, and ordinarily can be set up only by following detailed instructions provided by the manufacturer. Special adjusting tools are sometimes needed. If you have the manufacturers' instructions and the necessary tools at hand, and have a certain amount of mechanical ability and ingenuity, there is no reason why you should pass up jobs involving these more complicated systems.

General Considerations

Allow Set to Warm Up. Any receiver having automatic tuning should be allowed to operate for at least twenty minutes, so that the receiver parts will reach normal operating temperatures. If buttons are set up while the receiver is cold, stations may be appreciably off tune when circuit parts expand slightly with heat.

Study Instructions If Available. Whenever button-setting instructions are available for the receiver being adjusted, these instructions should be studied carefully unless you have had previous experience with that particular type of tuning mechanism. The general instructions given here will ordinarily be adequate, but specific instructions will often describe short-cuts which speed up the job.

Assign Stations to Buttons. Determine the number of buttons which are available for station-selecting purposes. Extra buttons are sometimes provided for turning the receiver on and off, for phonograph operation, for manual tuning, etc., and should not be included in your count.

Select a corresponding number of radio stations, giving preference to the customer's favorite local or powerful near-distant stations which can be received satisfactorily.

Determine the frequency of each selected station by referring to a radio log book or the radio program in your local newspaper, and make a list in which the stations are arranged in the order of increasing frequency (with the lowest-frequency station first on the list).

With mechanical tuning systems, the order of assigning buttons has no effect upon performance. With electrical tuning systems, however, a definite order must be followed so that the station assigned to each button will be within the frequency range of the adjustments for that button; this frequency range in kilocycles (kc.) is usually marked on the chassis near the adjustments for the button. In rare cases you may find that the only button available for a desired station will not cover the frequency of that station; in this case, you must either revise the station list so all stations will match their button ranges, or leave that one button blank and instruct the customer to use manual tuning for that station.

Make a rough sketch of the push-buttons as they appear from the front of the receiver, assign the stations in logical order to the available station-selecting buttons, and label each button accordingly on your sketch. The usual procedure is to start with the left-hand station button, assigning to it the lowest-frequency station. The sketch which you make will serve as a guide during the adjusting procedure.

Adjustments for Electrical Systems

1. Turn on the receiver, so it will warm up while you go through this preliminary step. Locate the trimmer adjustments on or above the chassis (or directly behind the push-buttons), note the frequency ranges printed on the chassis for each set of adjustments (an example of this appears in Fig. 1), then assign a station to each station selecting button in the order which makes each

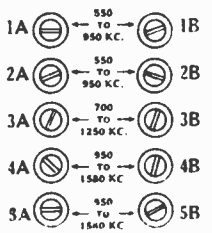


FIG. 1. Typical arrangement of adjusting screws for electrical automatic tuning systems. The left-hand (A) screws are for oscillator trimmers, and the right-hand (B) screws are for antenna trimmers. This diagram is for an auto radio receiver in which the buttons are arranged vertically; in home radios, however, the buttons are usually arranged horizontally.

station fall within the frequency limits for its button, and mark the stations on a rough sketch of the button layout as previously instructed. The trimmer adjustments will usually be accessible from the back of the cabinet; on some sets, a cover plate at the back of the set must be removed. On a few sets, the trimmer adjustments will be accessible from the front.

2. Tune in manually the first station on your list, and note the nature of the program. Now press in the button assigned to that station, and tune in the same station by adjusting the oscillator trimmer (sometimes called the tuning or station-selecting trimmer) for that button with a screwdriver (on some sets, a wrench or special tool is required for this purpose). Now adjust the other trimmer for that button (usually called the *antenna* trimmer) so as to secure maximum volume. This adjustment will be quite broad. Carefully readjust the oscillator trimmer so the station comes in clearly and with maximum volume. This completes the set-up for this button.

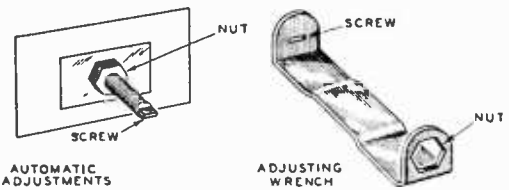


FIG. 2A. Example of coaxial adjustments sometimes used for electrical automatic tuning systems, with special adjusting wrench. On Zenith sets, the center or screw adjustment controls the oscillator, while the nut controls the antenna or input tuned circuit.

When in doubt, you can identify the oscillator trimmer by the fact that a number of stations will usually be heard when its adjusting screw is rotated. Never turn a trimmer condenser screw more than a few turns out, for this is unnecessary and the screw may fall out. Never apply force to a screw. It is not necessary to remove the receiver chassis from its cabinet during this button set-up procedure. If the station cannot at first be tuned in with the oscillator trimmer, loosen the antenna trimmer screw one or two turns, then return to the oscillator adjustment.

Restore manual tuning to make certain the same program, from the desired station, is heard equally well both on manual and automatic tuning. (Slightly greater volume will sometimes be obtained with automatic tuning, because two individual trimmers can be adjusted to resonance more accurately than can a two-gang tuning condenser.)

There is always the possibility that the trimmers are tuned to a different station which is carrying the same network program as the desired station, so it is a good idea to check your work by pressing one button after another, during the regular quarter or half-hourly interval for station announcements. When the desired station is a local, background noise will be noticeably greater when trimmers are incorrectly set to a distant station carrying the same network program.

3. Tune the receiver manually to the next station on your list, then set up the button for that station in the same manner. Repeat the entire procedure for each remaining button.

Coaxial (one inside the other) trimmer adjustments will sometimes be encountered, chiefly when the push-buttons control adjustable inductances called *permeability tuned coils*. A coaxial adjustment is illustrated in Fig. *2A*; the center screw adjustment controls the oscillator trimmer, and the outer nut adjustment controls the antenna trimmer. A typical dual permeability tuned coil is shown in Fig. *2B*; this requires only one adjustment, for it is set at the factory so that both oscillator and antenna coils will be tuned together when the screw is turned with a screwdriver. For the same change in frequency, permeability-tuned coils require many more complete turns of the adjusting screw than do trimmer condensers.

Adjustments for Mechanical Systems

Mechanical automatic tuning systems can be divided into two groups, as follows: *1.* Rocker bar mechanisms, where each button has its own locking adjustment; *2.* Cam-and-lever mechanisms, where one locking adjustment serves for all buttons.

Rocker Bar Mechanisms. A typical mechanism of this type is illustrated in Fig. *3*. A single pivoted rocker arm (flat metal piece) drives the gang tuning condenser through a gear system, so that the angle of the rocker arm determines the station which is tuned in. Each station button is on a flat metal plunger having a metal finger which can be locked in a desired angular position by means of an individual locking screw. Pressure on a button makes the rocker arm rotate to the same angle as that to which the finger on the plunger was set, thereby rotating the tuning condenser to the correct position for reception of the station assigned to that button.

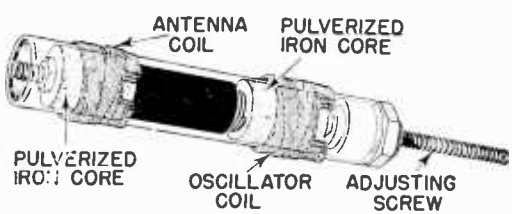
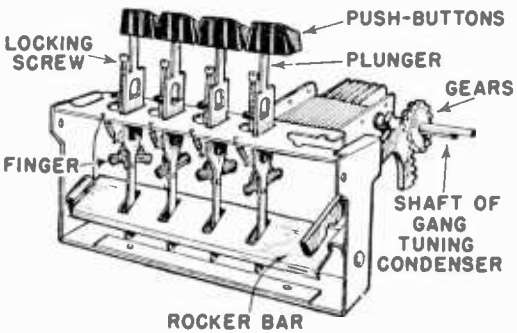


FIG. 2B. Example of dual permeability tuned coil, which requires only a single screwdriver adjustment of the center screw when setting up a push-button. Parts of the coil are cut away or shown in phantom view for clearness. Rotation of the adjusting screw makes the pulverized iron cores slide in or out of the coils, thus changing the inductance of each coil. One coil like this is provided for each station-selecting button.

The locking screws are always accessible from the front of the receiver, but are exposed in various ways depending upon the design of the mechanism. Thus, they may be exposed by removing the push-buttons, by removing the station call letter tabs from the buttons, by removing the station tabs from the push-button trim plate on the receiver panel, or by removing the entire push-button escutcheon (the ornamental plate surrounding the buttons on the panel). In a few sets, the push-buttons themselves can be rotated, and serve also as locking screws; rotating the cylindrical-shaped button one complete turn counter-clockwise unlocks the finger, and tightening the button by rotating clockwise locks the finger.



Courtesy Radiocraft

FIG. 3. Typical rocker bar mechanism employed in mechanical automatic tuning systems.

The set-up procedure is essentially the same for all rocker bar or similar mechanisms which have individual locking adjustments for each button. After a station has been assigned to each button and the receiver has reached normal operating temperature, set up one button at a time as follows: Release its locking adjustment; press the button (or the plunger if the button was removed) as far as it will go and hold it there; tune in manually the station assigned to that button; tighten the locking adjustment; release the button, completing the set-up for that button. Repeat for each other button. Be sure to tune in each station as accurately as possible during the set-up operation.

Cam-and-Lever Mechanisms. A typical mechanism of this type is illustrated in Fig. 4. Each station button is on a pivoted lever having at its other end a roller which can be pressed against a heart-shaped cam (irregular-shaped metal disc) on an extension of the gang tuning condenser shaft. Pressure on the button forces the roller against the cam, making the cam rotate until the roller is at its lowest point (closest to the cam shaft). Somewhere on the mechanism is a locking adjustment which when tightened locks each cam to the shaft, by squeezing the cams between friction washers which are keyed to the shaft. Pressure on a button will thus cause rotation of the gang tuning condenser.

The set-up procedure for all cam-and-lever mechanisms is essentially the same even though many different cam-and-lever designs and many types of locking adjustments will be encountered. After a station has been assigned to each button and the receiver has reached normal operating temperature, the locking adjustment is loosened. This releases the pressure on the friction washers, making it possible to turn any one cam without rotating the shaft or disturbing the other cams. There will still be sufficient friction to hold the cams in whatever position they are set.

Having loosened the locking adjustment, press the first button which is to be set up, and hold this button down firmly while you tune the receiver accurately to the desired station by means of the manual tuning knob. Release the button now, and do not touch it again until after all buttons have been set up and the locking adjustment tightened. In the same way, set up each other button, then tighten the locking adjustment. Now, whenever a button is pressed, its corresponding cam will take the position to which you originally set it, thus rotating the gang condenser to the correct position for the station assigned to that button.

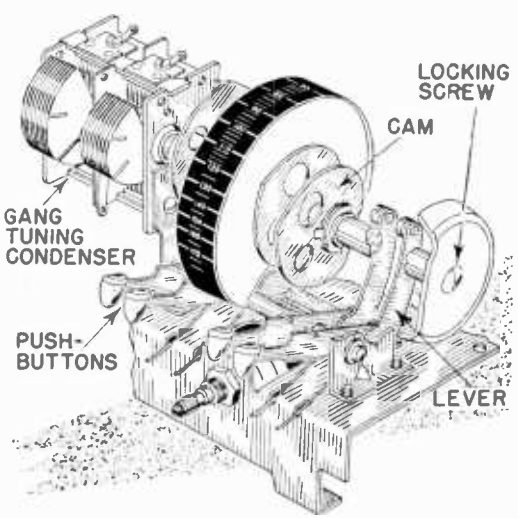


FIG. 4. Typical cam-and-lever mechanism employed in mechanical automatic tuning systems.

The diagrams in Figs. 1, 2A, 2B, and 4 are reprinted from Supplement No. 8, "Automatic Tuning," to the Third Edition of the Mallory-Yaxley Radio Service Encyclopedia, copyrighted 1940, by P. R. Mallory & Co., Inc., Indianapolis, Indiana.

In the mechanism shown in Fig. 4, the locking screw is in the center of the manual tuning knob which is located on the side of the receiver cabinet. This screw can be loosened or tightened with a screwdriver or coin.

In other mechanisms, the locking adjustment may be a knurled screw on the side of the receiver, a screw located behind a removable metal button on the side of the receiver, a wing nut on the side of the dial assembly, a screw accessible from the back of the receiver and having a pin going through its shaft, a screw which is exposed by removing the push-button escutcheon, a screw which is adjusted by inserting a screwdriver in a hole located below the tuning unit, or a screw located behind a snap-in button on the dial escutcheon.

On a few receivers, the tuning knob itself must be either pushed in or pulled out, then turned counter-clockwise, to unlock the cams.

Final Check. With all systems, it is highly desirable to make a final check of your work by comparing push-button and manual reception for each station. If reception is clearer on manual tuning for any station, repeat the adjustment procedure for that station button.

Insert Call Letter Tabs. Printed tabs containing the call letters of all broadcast stations in this country are usually supplied with receivers having automatic tuning. When the button set-up job is completed, the tabs for the selected stations should be cut out of the printed sheet and placed on the buttons or in slots provided for this purpose in the escutcheon which surrounds the buttons.

———— *n r i* ————

Did You Get Your Ohm's Law Calculator?

Last month, Chief Dowie offered every N. R. I. Student and Graduate a very useful Ohm's Law Calculator for sending him the name of *one good* prospective student for the Institute.

Most of you fellows responded immediately by sending the name of a man you believed should be interested in N. R. I. Training. As rapidly as possible, your Ohm's Law Calculators are being mailed—and the prospects whose names you submitted are being sent N. R. I.'s Catalog "Rich Rewards in Radio." (If you fail to get your Calculator within a reasonable time, be *sure* to notify us so we can send a duplicate.)

Did YOU send the name of a good prospective student and qualify to get your Ohm's Law Calculator? If not, you still have time to get your valuable, practical Calculator. Right *now*, send Chief Dowie the name of *one* man who you believe can be—and should be—interested in the N. R. I. Course.

If you have misplaced the card Chief Dowie sent you last month—or if by any chance you did not get one—simply write a note asking for your Ohm's Law Calculator when you send the prospective student's name.

———— *n r i* ————

When You Want Speedy Service

Whenever you use the N. R. I. technical consultation service to ask for diagrams or information on a radio receiver, be sure to give the name of the receiver, the manufacturer's name, the model number and a list of the tubes used in the set. Spaces for all this data are provided on the consultation service sheet which you have.

It is human to make mistakes, particularly when copying a model number which may be somewhere inside a dark chassis, partly worn off, or mixed in with a lot of other numbers on the label.

Scarcely a day passes without our receiving a request for information on a model which we know does not exist. With our elaborate cross-indexing system for radio receivers, however, we can almost always find the correct model number by checking against the list of tubes and the name of the receiver. Naturally, this delays the reply a bit, for it takes time to check over up to a hundred cards until we find the right combination of tubes; when the additional data is not supplied, however, we have to write to the student for it, thereby delaying the reply for several days.

Remember—if you want speedy consultation service on any technical question whatsoever, be sure to give *all the information asked for* on the consultation service sheet.

J. A. DOWIE, *Chief Instructor.*

———— *n r i* ————

P.A. System Reproduces Sounds From Under Water

In the world's only oceanarium at the Marine Gardens near St. Augustine, Florida, a public address system reproduces comments of a deep sea diver as he feeds an eleven-foot shark and other great ocean fish by hand. Visitors watch through portholes in the two huge tanks while listening to the explanations, descriptions, or recorded music coming from 34 RCA loudspeakers in the corridors and from a battery of 25-watt directional loudspeakers mounted above the tanks.

RADIO-TRICIAN
REG. U.S. PAT. OFF.
Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

FARNSWORTH

MODELS: AT-10 AT-11 AT-12 ATL-10 ATL-11 ATL-12 AT-14 AT-15 AT-16 ATL-14 ATL-15 ATL-16
CHASSIS: C1-1 C1-2 C1-5 C1-6

This 5 Tube AC-DC Superheterodyne Receiver has a built-in loop antenna for normal reception. An outside antenna will result in better reception over long distances, and should be used in locations where the loop does not give satisfactory reception. Care should be exercised in locating the set, as radiators, and other metal objects may shield the loop, preventing good reception. Unless an antenna is used the loop is directional, so care should be exercised when installing the set to see that it is located to keep noise pickup at the lowest point consistent with good signal pickup.

In aligning this receiver, a signal generator calibrated at 455kc, 600kc, 1400kc, and 1730kc, and an output meter are required. All adjustments should be made with the volume control set for maximum volume, keeping the signal generator output as low as possible to prevent A.V.C. action and false readings.

With the low side (G) of the signal generator connected to the chass's through a .01 mfd. 200 Volt condenser, the following procedure should be used when a igning the receiver:

TABULATION FOR ALIGNMENT

Steps	Connect High Side of Generator to	Set Generator at	Set Gang at	Adjust the following	Located	To Obtain
1	SET VOLUME CONTROL AT MAXIMUM					MAXIMUM OUTPUT
2	12K7GT I.F. Grid Cap in Series with .01 Mfd.*	455 Kc.	A Quiet Point	2nd I.F. Trimmer Only One	Top of Chassis	
3	High Side of Loop in Series with .01 Mfd.			1st I.F. Trimmers 2 used	End of Chassis	
4	Antenna in Series with 1000 mmf.	1730 Kc.	Minimum Capacity	Oscillator Trimmer	Side of Gang Condenser	
5		1400 Kc.	1400 Kc.	Antenna Trimmer		
6		600 Kc.	600 Kc.	End Plates of Gang		
7	RECHECK ALL ABOVE ADJUSTMENTS					

*Do not remove grid cap.

1	VOLTAGE	RESISTANCE
1	NONE	NONE
2	22 AC	24Ω
3	80+	INF *
4	82+	INF *
5	6-	20MΩ
6	NONE	NONE
7	11 AC	12Ω
8	NONE	2.5 MEGΩ

2	VOLTAGE	RESISTANCE
1	NONE	NONE
2	33 AC	36Ω
3	80+	INF *
4	82+	INF *
5	NONE	NONE
6	NONE	2.5 MEGΩ
7	22 AC	24Ω
8	NONE	CAP. NONE

3	VOLTAGE	RESISTANCE
1	NONE	NONE
2	NONE	36Ω
3	NONE	INF *
4	NONE	INF *
5	NONE	NONE
6	55 + †	2.5 MEGΩ
7	11 AC	24Ω
8	NONE	CAP 2.5 MEG

4	VOLTAGE	RESISTANCE
1	NONE	NONE
2	5 MEGΩ	36Ω
3	NONE	INF *
4	500MΩ	500MΩ
5	500MΩ	500MΩ
6	INF *	INF *
7	12Ω	12Ω
8	NONE	NONE

5	VOLTAGE	RESISTANCE
1	NONE	INF
2	33 AC	36Ω
3	120+	INF *
4	82+	INF *
5	NONE	500MΩ
6	----	OPEN
7	78 AC	77Ω
8	6+	150Ω

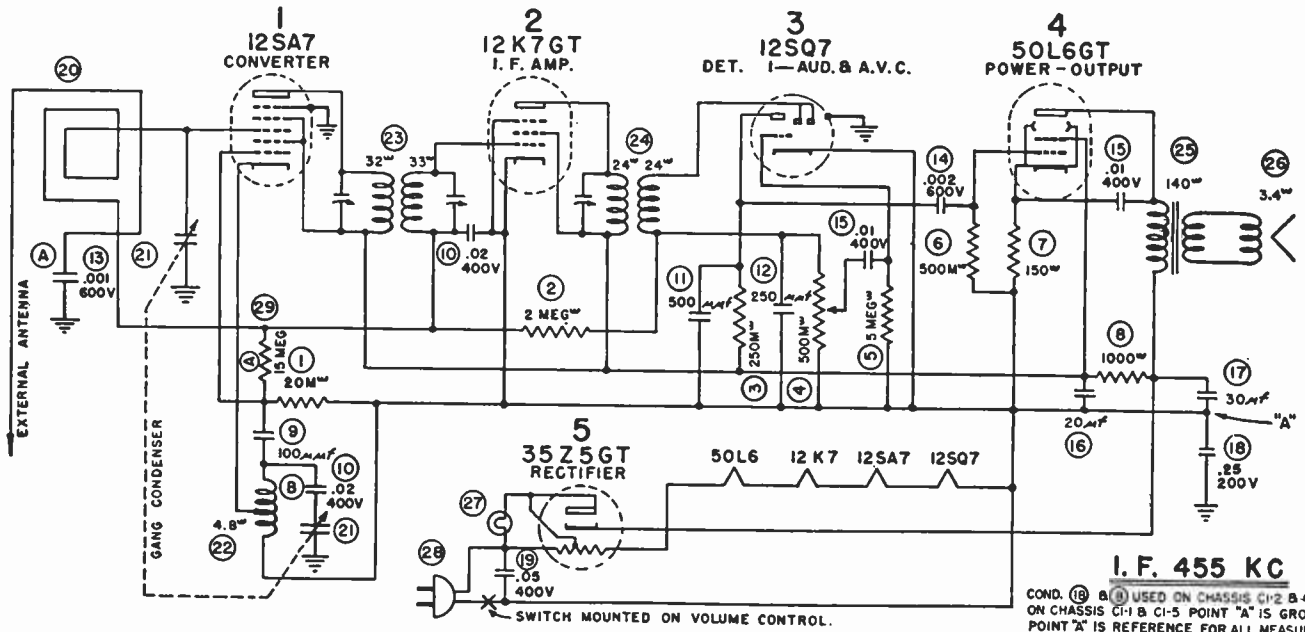
6	VOLTAGE	RESISTANCE
1	NONE	120Ω
2	115 AC	100Ω
3	110 AC	100Ω
4	NONE	NONE
5	110 AC	100Ω
6	82 +	INF *
7	78 AC	77Ω
8	130+	INF *

† – THIS VALUE WILL VARY WITH VOLTMETER DUE TO SERIES RESISTOR.

* – RESISTANCE WILL DEPEND ON CONDITION OF ELECTROLYTIC CONDENSER.

BOTTOM VIEW OF SOCKETS

VOLTMETER RESISTANCE 1000Ω PER VOLT.
LINE VOLTAGE 117 VOLTS.



I. F. 455 KC

COND. (18) & (R) USED ON CHASSIS C1-2 & C1-6 ONLY. ON CHASSIS C1-1 & C1-5 POINT "A" IS GROUNDED. POINT "A" IS REFERENCE FOR ALL MEASUREMENTS. WHERE (18) IS USED - RESISTANCE 1 IS INF.

The Service Forum

Conducted by

J. B. Straughn, N. R. I. Service Consultant

Send in your service notes. We will re-word them for publication. To qualify your note for the NEWS *you must have observed the same trouble on two or more identical receivers.*

ZENITH CHASSIS 5410 5411, 5653, 5654 AND 5715 — HASH ON AUTOMATIC POSITION

This is caused by the automatic assembly touching the power pack. To clear up the difficulty insulate at the point of contact.

———*n r i*———

ZENITH CHASSIS 5659 — EXCESSIVE REGENERATION

This may be corrected in most cases by moving the grid lead of the 12AS6 tube away from the oscillator section of the gang condenser.

———*n r i*———

PHILCO 41-90 — OSCILLATION

If this difficulty will not yield to the usual remedies, try a new volume control.

———*n r i*———

PHILCO MODEL 37-38 — INTERMITTENT

This is often caused by failure of the input audio transformer and the only remedy is the installation of a new transformer. Oftentimes a check on the transformer winding with an ohmmeter will show up the defect as a fluxation in the ohmmeter reading.

———*n r i*———

EMERSON CHASSIS EC, EM, DB, DL AND DW — DIAL CORD REPLACEMENT

For those chassis using the narrow "V" shaped notch in the drive pulley, use a half turn of cord, part No. 6RZ-870. For those chassis using the drive pulley with a broad "U" shaped groove, use a turn and a half of cord, part No. 7BZ-867-A. Draw the cord tightly around the condenser pulley and knot it, without any slack, near the notch in the pulley. The spring may then be hooked to the cord and pulley. The dial face should bear against the fiber washer when finally assembled.

———*n r i*———

CROSLEY MODEL 885 — REGENERATION ON HIGH END OF SHORT WAVE BAND

This may be eliminated by placing a 50,000 ohm resistor from the grid end of the oscillator coil to the chassis.

PHILCO MODEL 40-180 — PUSHBUTTON DRIFT

To eliminate this, replace the 370 micro-microfarad mica silver condensers on each side of the oscillator coil.

———*n r i*———

PHILCO MODEL 40-150T — WEAK AND DISTORTED

Check for leakage in the .01 mfd. screen bypass condenser connected to the push-pull 41 output tubes. As a replacement use a condenser of the same capacity rated at 600 volts.

———*n r i*———

RCA MODELS 7T AND 8T — FAILURE OF TUNING EYE TO CLOSE

This is generally due to a change in value of the 2.2 megohm resistor marked 1220 in the diagram. Install a new resistor.

———*n r i*———

RCA MODEL 10T — INSENSITIVE

Check the candohm bleeder resistor which is mounted under the right side of the chassis. If it has increased in value and this will be indicated by an increase in screen voltage which should be around 100 volts, install a new resistor.

———*n r i*———

SILVERTONE MODELS 6403 6404, 6405 AND 6406 — LOW VOLUME AND HUM

Check the antenna loop for opens at the corners of the loop. In addition this may also cause an intermittent howl if the broken circuit at times make contact.

———*n r i*———

STROMBERG CARLSON — DIAL POINTER RUBS

If the dial pointer is bent so that it rubs either against the background of the dial or against the glass, you can correct the condition without removing the chassis from the cabinet. First adjust the pointer so that it is approximately in the middle of the dial and then reach in from behind and lift the slide, to which the pointer is attached, until it is just off the slide bar. Holding the slide between the thumb and first finger, bend it in the correct direction so that when it is replaced on the slide bar, the pointer will be in the proper operating position.

(Page 29, please)

Frequency Modulation Ushers in Thrilling New Era of Radio Enjoyment

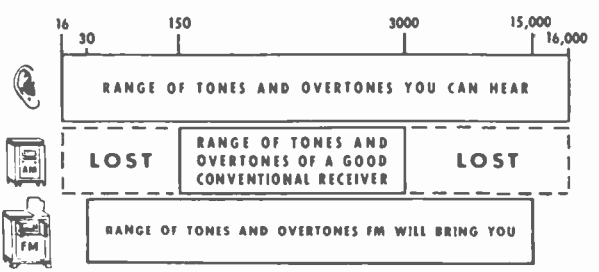
(Reprinted from an FM folder published by General Electric Co.)

Today, America has a new kind of radio. It is the radio the world has been waiting for. Radio—now again, conquers nature—develops and perfects itself into a precious new marvel called FREQUENCY MODULATION. Here is the culmination of the scientists' search for perfection. Here is the dream of radio artists for a perfect performance come true.

Called FREQUENCY MODULATION, as distinguished from the conventional method of broadcasting and reception known as amplitude modulation, the new system is now familiarly known as FM. This superior method of sending radio programs into your home has many outstanding advantages.

Reception of FM programs in your home is crystal clear and smooth—unmarred by the crashing roars of lightning that streaks across the skies—free from the too-familiar buzzes and crackles of your own or your neighbor's electric razor, oil burner or vacuum cleaner.

The FM broadcasting system is so designed that nature's and man-made static can be separated from the FM signal; FM sidesteps static. In the midst of a severe storm, programs broadcast by FM are received with absolute clarity.



Background noises and static interference which often mar the clarity and quality of program reception are, therefore, noticeably absent on FM. Even in between program announcements, when no sound is being broadcast, the effect on the listener is virtually no noise at all, as if the receiver were turned off.

You'll marvel when you hear your favorite programs reproduced by FM with such life-like faithfulness, for you will have the illusion that the artists were hidden just behind the loudspeaker grille.

In the average conventional AM radio receiver, the tonal range is limited approximately to 3000 cycles per second. This tonal range is considerably less than the complete range covered by musical instruments. But in FM the tonal range runs out to 15,000 cycles per second—practically the entire limit of frequencies heard by the human ear. The conventional radio broadcast programs sound lifeless and become increasingly difficult to listen to, after you are accustomed to the high-fidelity reception of FM.

The announcer whispers, and you startle at the distinctness of his words. A match strikes, and you hear the crackle as it bursts into flame. When water is poured from one glass to another you hear the liquid slosh. The ping of a hammer striking a nail . . . the toll of a bell . . . the rich tones of a gong— all these and other hard-to-reproduce sounds are heard in their natural range of loud and soft passages and in their true variations of volume.

In the FM system of broadcasting, the volume range more closely approaches that of the original orchestration in a studio or in a concert hall. Audiences have not been able to tell whether they were listening to FM radio or to the piano on the stage before them, without watching the pianist's hands.

An FM receiver can be so located between two FM broadcasting stations of equal power, transmitting on the same channel, that it selects the station nearer it and excludes the other. With FM you enjoy the program you have tuned in, without the usual chattering cross-talk and echoes of other unwanted stations creeping in on the program. In FM broadcasting, the signal strength remains practically at the same level of intensity at all times during day and night transmissions. FM broadcasting may be compared to the light beam of a searchlight, which projects its beam steadily forward without flickering.

N.R.I. ALUMNI NEWS

Dr. Geo. B. Thompson ..... President
Edward Sorg, F. E. Oliver ..... Vice-Pres.
Alfred E. Stock, Peter J. Dunn ..... Vice-Pres.
Earl Merryman ..... Secretary
Louis L. Menne ..... Executive-Secretary

Education and the Diffusion of Knowledge

In 1825, at the dedication of the monument to commemorate Bunker Hill, a great American, Daniel Webster, was one of the speakers. The words he spoke are still so alive in meaning and application that, if we actually heard them today few would guess that they originated more than a century ago. Here is what Daniel Webster said on that occasion.

"If the true spark of religious and civil liberty be kindled, it will burn. Human agency cannot extinguish it. Like the earth's central fire, it may be smothered for a time; the ocean may overwhelm it, the mountains may press it down; but its inherent and unconquerable force will heave both the ocean and the land, and at some time or other, in some place or other, the volcano will break out and flame up to heaven. . . . God grants liberty only to those who love it and are always ready to guard and defend it. . . . America has furnished to Europe proof of the fact that popular institutions, founded on equality and the principle of representation, are capable of maintaining governments, able to secure the rights of person, property and reputation.

"America has proved that it is practicable to elevate the mass of mankind . . . to raise them to self-respect, to make them competent to act a part in the great right and great duty of self government; and she has proved that this may be done by education and the diffusion of knowledge."

Detroit Chapter

We are enclosing some photographs taken at one of our recent meetings. We had an attendance of forty.

L. L. Menne was our guest and one of our speakers. Other guests were Mr. Henry Kilgus, Executive Secretary, A.M.A. of Michigan, J. Spath, Secretary, A.M.A., Detroit Local, D. Phillips of Cedar Rapids Engineering Company, Leon Dahlem, General Sales Manager of Automotive Parts Corporation.

Chairman John Stanish (left) and Secretary Earl Oliver presiding at a meeting of Detroit Chapter.

Mr. Henry Rissi and his able assistant W. L. Wayman of Radio Supply and Engineering Company gave us a practical demonstration of the use of the Rider Junior Volt-Ohmist and the Hickok Indicating Traceometer. Mr. Rissi is a Radio technician with twenty-six years' experience. He delivered a splendid technical talk and concluded his remarks with emphasis on the importance of constant study to keep abreast of new developments.

Mr. Wayman, affectionately known as "Slim" Wayman to most Radio Servicemen in Detroit, invited those present to drop in to see him at either of their branches, for any necessary help they may need on troublesome Radio jobs. The branches of Radio Supply and Engineering Company, Inc. are at 6353 E. Jefferson and 7667 Grand River Avenue. All N. R. I. men in Detroit and vicinity will find it advantageous to cultivate the acquaintance of Mr. Rissi and Mr. Wayman, who are ever ready to extend a helping hand to a brother Radio man.

Mr. Leon Dahlem, who was kind enough to take the pictures by the way, told of his experiences as a naval aviator and gave a graphic description of cruises and scouting duties and the important use of Radio.

Chairman Stanish gave us a good pep talk. There is never a dull moment in our Chapter meetings with Stanish in the chair. He pointed out that future meetings would be very interesting and mentioned a number of subjects which will be discussed, including Frequency Modulation, Push-Button Setting, Meter Uses and Signal Tracing. Stanish also asked for more questions for the Question Box, so that a greater variety of Radio problems might be discussed.

Door prizes were won by William Ankeny, who drew Rider's book on "Signal Tracing." This prize was donated by Radio Supply and Engineering Company. Louis Kolp and Joseph McKlin each won a copy of Mallory-Yaxley Radio Service Encyclopedia, donated by Radio Specialties Company, 325 E. Jefferson, Detroit. We are very grateful to these concerns for their contribution and fine cooperation.

Executive Secretary Menne addressing a meeting of Detroit Chapter.

After the meeting adjourned there was a good old-fashioned get-to-gether in which many of our ever-steadfast members such as Charley Mills, James Quinn, Phil Howard and Robert Briggs took part. Menne told us it was one of the most enthusiastic meetings he has ever attended.

Remember we meet at John Stanish's place, 2500 Jos. Campau, in Detroit every second and fourth Friday of the month. Drop in on us.

F. Earl Oliver, Secretary.

A group of Detroit Chapter members display deep interest in the remarks of their Chairman, John Stanish.

New York Chapter

Officers elected for the current year are as follows:

Chairman—Irving Gordy
Vice Chairman—Archie Burt
Secretary-Treasurer—Louis J. Kunert

We have been reviewing some of the N. R. I. textbooks. We will continue to do this until we have reviewed the entire course. Not all of the time at any one meeting is devoted to this review. We always have our service forum.

Chairman Gordy is writing an article for a service magazine on the subject, "Saturable Reactor." That's quite a title but we have learned much about it because Gordy has been giving us some good talks on the subject.

During the brief illness of our Chairman, Vice Chairman Archie Burt took over one meeting devoted chiefly to our service forum.

Gordy was back for our next meeting and gave us a demonstration and talk on Vacuum Volt Meters. At still another meeting we discussed Tuning Indicators. From this you will see that our meetings are fruitful for those who attend regularly.

An invitation was received from Gosnell and Dunn to attend the dance sponsored by Baltimore Chapter. It is hoped that some of us may be able to make the trip.

We have dusted off the old welcome sign and put it out for all students and graduates of N. R. I. to meet with us at 8.15 P. M. on the first and third Thursday of each month at Damanzeks Manor, 12 St. Marks Place, New York City.

LOUIS J. KUNERT, Secretary.

———n r i———

Count the day lost, whose low descending sun views from thy hand no worthy action done.

Baltimore Chapter

Things are humming over here. True to his promise Chairman Gosnell has been giving us some fine meetings.

Mr. Rathbun, our Vice Chairman, gave us a good blackboard talk at one of our meetings. Members were requested to ask questions. This led to a lively discussion—always beneficial.

Mr. Menne and Mr. Straughn visited us several times. Mr. Straughn, as always, gave us a good technical talk. He is very popular with our members and we greatly appreciate his interest in our Chapter.

Our Question Box is getting results, although Chairman Gosnell would like more questions from the members. What could be nicer than that? You have a Radio problem—you write it out, drop it in the box, and, in due time, our Consultants discuss the problem and give you the solution. Rathbun and Snyder are Radio men of long experience. They are more than glad to help our members with their problems. Gosnell appointed them as Consultants on Radio problems for the very purpose of giving our members real practical help. So, bring in your questions. Let's make the most of this fine service.

We are delighted to be able to report a steady increase in our attendance. Some of our old stand-bys, such as Giese and Haehmeister, are meeting with us regularly.

Our dance is scheduled for March. We look forward to a good number of guests from Philadelphia-Camden Chapter and we hope some of our New York friends will also be able to accept our invitation. This is to be a private dance for N. R. I. members and their ladies. A good program has been arranged.

All in all, Baltimore Chapter is doing all right for itself. Watch us go.

PETER J. DUNN, Acting Secretary.

———n r i———

Chairmen of Chapters

Irving Gordy, New York Chapter, 1746 Bathgate Ave., Bronx, N. Y.

Stanley Lukes, Chicago Chapter, 4364 W. 25th Pl., Chicago, Ill.

John Stanish, Detroit Chapter, 12551 Camden Ave., Detroit, Mich.

E. W. Gosnell, Baltimore Chapter, 5222 St. Charles Ave., Baltimore, Md.

Norman Kraft, Philadelphia-Camden Chapter, 6 S. 8th St., Perkasie, Penna.

Chicago Chapter

Those of our members who have not attended our last several meetings will be pleasantly surprised when they see our new quarters at Douglas Park Field House, 14th and Albany. In contrast to our previous quarters where we were handicapped for room we now have a commodious meeting place with every facility.

Chairman Lukes and Secretary Cada were appointed a committee of two to purchase a suitable steel cabinet for storing our equipment. Mr. Striepling volunteered to donate two locks. This locker has now been secured and properly placed in our meeting hall. We therefore again have full use of all of our equipment.

Chicago Chapter meets. Reading from left to right, James Cada, Secretary, Stanley Lukes, Chairman, L. L. Menne speaking and Clarence Schultz, Past Chairman.

New members are E. A. Appelgren, John Striepling and Henry Knoops. They were given an enthusiastic welcome.

Ed Sorg was warmly congratulated upon his election as a Vice President of our National organization. Sorg and Eric Johnson were appointed to act as our entertainment committee for the year of 1941. These fellows know how to do things up right and we look for some interesting announcements soon.

The business portion of our meetings is usually disposed of in short order after which we go to work on Radio problems. Members bring in their sets, we diagnose the trouble and often are able to do the complete repair job. If time does not permit this, enough information is volunteered so that the member can proceed with the job after he leaves the meeting. In this work our good friends Bennett, Morehead, Sorg, Schultz, Ketelhut and others of long experience are of great help to us.

At another of our meetings Ketelhut and Schultz gave us some valuable technical information through blackboard talks.

L. L. Menne from Washington visited us. He brought us an interesting message from Mr. Smith and contributed a number of ideas of his own all of which were intended to help us get more fellows out to the meetings and give them more help with their problems.

We meet every first and third Thursday at 8:15 P. M. at Douglas Park Field House, 14th and Albany. We wish to emphasize that all students of N.R.I. are welcome, whether just beginning or graduating. Drop in on us anytime –you will find it worthwhile.

JAMES CADA, Secretary.

Philadelphia-Camden Chapter

We are pleased to announce the election of officers for this year, as follows:

Chairman .....Norman Kraft
Vice Chairman .....Marcel Coulon
Secretary .....Louis Michalski
Financial Secretary .Bert Champ
Treasurer .....Charles Fehn
Librarian .....James McCafferty
Sergeant-at-Arms ....Charles Haraburda

Installation of officers has been completed and we are now well on our way to another constructive year.

We have changed our meeting place. Our new quarters are at 3622 Frankford Avenue, Philadelphia. Meetings are held on the first and third Thursday of each month, at 8 P.M.

In order that we might have as much time as possible for the purpose of discussing Radio problems and doing practical Radio work our officers decided, this year, to make the business sessions of our meetings very brief. All administrative questions which usually require considerable time for discussion are to be considered by the Executive Committee at their regular meetings which are independent from our Chapter meetings.

We spend most of our time in our Round Table Forum, the demonstration and operation of instruments, the diagnosis of Radio problems and actual repairs.

Quite a number of our members with their wives and sweethearts are going to attend the dance in Baltimore in March. We are looking forward to meeting many of our Baltimore and Washington friends who attended our party in Philadelphia a short time ago.

LOUIS MICHALSKI, Secretary.

The Service Forum (Continued from page 23)

STROMBERG CARLSON 430PL — RATTLE
A rattling sound similar to a dried out speaker cone may be eliminated by removing the labyrinth and tightening the wire screen which covers the cut-out at the bottom of the cabinet.

—r r i—

STEWART WARNER — PICKUP CABLE
MODEL 01-5D
When the receiver is removed for servicing, the phonograph pickup cable must be plugged in and the "Radio-Phono" switch placed in the "Radio" position before the set will operate.

—r r i—

STEWART WARNER — I. F. OSCILLATIONS
CHASSIS 07-31
Should oscillation be encountered when aligning the receiver, observe the following precautions: Keep the bottom plate cover on during alignment. Keep the signal generator leads as far from the chassis as possible. Connect the ground lead of the signal generator through a .25 mfd. condenser to some part of the chassis in the vicinity of the gang condenser. The frame of the gang condenser will do nicely. Keep the orange lead of the volume control away from the second I.F. trimmer. Separating this lead from the others surrounding it at the base of the 25B8GT tube will help.

—r r i—

STEWART WARNER — MICROPHONICS
MODEL 11-7A — AND RUMBLE
To eliminate microphonics and rumble at higher volume levels, remove the bracket between the gang condenser and the metal dial plate on the push button tuning unit. This is most easily done by unscrewing the screw holding the bracket to the frame of the condenser, and bending the bracket back so it is clear of the condenser frame. Condenser 41 and condenser 47 should be .002 mfd.; early sets have different values. Changing these condensers to .002 mfd. eliminates rumble and microphonics.

—r r i—

ZENITH MODEL 98365 — DEAD
Lack of screen grid voltage due to an open in the 11,000 ohm section of the voltage divider. A 10,000 ohm 10 watt replacement resistor will be satisfactory.

PETER A. MYERS, Wisconsin.

—r r i—

MIDWEST MODEL 1836 DEAD AND SMOKES
This is due to burning up of the small resistor in series with the primary of the first I.F. transformer. The resistor overheats and smokes due to a break down in the .05 mfd. plate by-pass condenser. Install another condenser of the same capacity rated at 600 volts and a half watt resistor.

FRANK J. GARENTY, Pennsylvania.

WESTINGHOUSE — NOISY AND HUMS
MODEL WR-303
Replace the electrolytic filter condensers.

FRANK J. GARENTY, Pennsylvania.

—r r i—

SILVERTONE MODELS 1721 AND 1722 DEAD
Check the condition of the large candohm resistor in the back of the set with an ohmmeter. If open, install a replacement.

FRANK J. GARENTY, Pennsylvania.

—r r i—

RCA MODEL 240 — DEAD
Check the primary of the output transformer to see if it is open.

FRANK J. GARENTY, Pennsylvania.

—r r i—

AIRLINE MODELS — NOISE AND FADING
901, 902, 1100 AND 1101
This was due to the design of the original volume control. The replacement control has been tinted on the knob end with a copper color. The installation of the new control will clear up the trouble. If the set cuts off after about ten minutes operation or changes in frequency, replace the 6U5 cathode ray tuning indicator tube.

CLAIRE DYE, Ohio.

—r r i—

AIRLINE MODEL — BLOWS HOUSE
62-420 — FUSE
A few of the first models that came out were without the small moulded by-pass condenser from the back plate to the antenna coil. Consequently when the antenna was attached to a water pipe a direct short of the power line occurred and this would damage the antenna coil. The first I.F. primary is in the same circuit and is almost invariably damaged at the same time so be sure and pull the can off and check this coil and install a moulded condenser having a capacity of .00025 mfd. in the antenna circuit.

CLAIRE DYE, Ohio.

—r r i—

AIRLINE MODELS — MOTORBOATING
62-425, 62-288 AND 62-475
Replace the dual filter unit. Many of these sets employing a 6A8 metal or glass tube may be dead and the tube may test O.K. but try replacing the tube as a test in a tube tester is not always conclusive.

CLAIRE DYE, Ohio.

—r r i—

AIRLINE MODEL 230 — DEAD
Check the primary of the oscillator coil for a corroded open winding. It is best to install a new replacement but the old coil can be satisfactorily repaired.

CLAIRE DYE, Ohio.

Here and There Among Alumni Members

Byron I. Judy is now transmitter engineer at WBLJ, Dalton, Ga. He graduated in 1937. Since then he has had service with WHIS, Bluefield, W. Va. and WAKR, Akron, Ohio.

———n r i———

In Athens, Pennsylvania, James A. Raub was happy in his Radio work which he did with his Dad. But Jimmy was in poor health and news just comes to us that he passed away. Our sympathies are extended to his mother and father.

———n r i———

Finley Ferrell, Monticello, Ky., fractured his foot while putting up a yard fence. But he was thankful to still have use of both hands and went right on with his Radio servicing.

———n r i———

Cecil Wallace is control operator at KRLS, Dallas, Texas. A new job for him.

———n r i———

George C. Ruehl, Jr., former Secretary of Baltimore Chapter is now teaching Radio at the Boy's Vocational School in Baltimore and in addition is teaching Radio to a National Defense Training Class, three nights a week. He has a first class Radiotelephone operators license and also operates amateur station W3LJQ.

———n r i———

T. L. Kidd started with Douglas Aircraft Co. about ten months ago. After seven months he was promoted to Inspector. Two months later he was promoted to Electrical and Radio Inspector for an entire branch plant. Some job! And some pay!

———n r i———

In 1935 Clarence C. Stine of Los Angeles, Calif. graduated. He has built a fine Radio business. His son, Clifford, now an N.R.I. student is working for his Dad and expects to follow in his foot steps.

———n r i———

B. J. Valour, Suffern, N. Y., has a fine business and now has a new branch store in West Haverstraw. They carry a large stock of Radios and electrical appliances. Their latest business getter is bottled gas for cooking. No kidding!

———n r i———

James Dempsey is operator with the Air Ministry Radio Station, Newfoundland Airport, Newfoundland.

———n r i———

Norman Miller of Hebron, Nebr., is coming right along. Now has two men in his employ, one of which is Harry Glawitz, who will graduate soon.

———n r i———

From Tumkur, South India, comes word that our fellow member K.S.V. Rajan was awarded the Association Membership Degree by the British Institute of Radio Engineers. Congratulations.

———n r i———

When Chairman Gordy of New York Chapter has a message to deliver he doesn't fool with it. Gordy is a good speaker. Knows what he wants to say, and knows how to say it. And that's what the fellows like about him.

———n r i———

A. J. Harcharick has gone to camp with the 109th Field Artillery, Pennsylvania National Guard, as a Technical Sergeant. His Radio training is going to mean much to him while in the service and when he returns he will probably go back to his job as transmitter operator at Station WBAX, Wilkes-Barre, Penna.

———n r i———

Leland R. Stowe passed the F.C.C. exam for an amateur license. His call letters are W7HNN. Not to be outdone Mrs. Stowe also passed the exam and was assigned call letters W7HHQ. There's teamwork in the household for you!

———n r i———

Menne visited Station WXYZ while in Detroit and bumped into Alvin Schaub, who is Control Operator, doing mighty well.

———n r i———

R. A. Youngs, Los Angeles, Calif., is working in the Electrical Assembly plant of the North American Aviation, Inc. He is about ready to try for a Radiotelegraph license.

———n r i———

Paul C. Seymour, Jr. is at the Franklin County Sanitorium, Columbus, Ohio., where he expects to remain for eight or ten months. Our very best wishes go to him.

———n r i———

John Keller is Senior Communications Operator at the Pennsylvania State Airport (Core Valley), Martinsburg, Penna.

———n r i———

It's a boy at the home of Mr. and Mrs. Phil Stearns, San Francisco, Calif. His daddy says the baby looks like his mother and that's all right with papa.

———n r i———

Roy Barford of New Brighton, Penna., also tells us that some four months ago a baby boy came to his house. Roy explains that the reason he is so slow in reporting is because he is just getting down to business again.

———n r i———

"See here," said the Lieutenant to our Alumni member, Oliver Ruth of Baltimore, a rookie in the Army, when he failed to salute, "how long have you been here?" "Three days," replied Ruth, "How long you been here?" "Never mind that," snapped the Looie, "I want you to respect an officer." "An officer," exclaimed Ruth, "you lucky stiff, they made me only a private."

A Few Words From Our Alumni President

This is to acknowledge receipt of notice of my election as President of the N.R.I. Alumni Association. This is an honor of which any member of the association should be justly proud.

In accepting this honor it gives me an opportunity to say that no one officer, however well qualified, can make any organization a success; he must have cooperation, and I feel impelled to ask it believing you will heartily give it. I pledge myself to carry out the object of our Association which is, "To cultivate fraternal relations among the Alumni of the National Radio Institute, to foster the spirit of unity and loyalty to our Alma Mater, to encourage the Institute in its dissemination of Radio knowledge and to promote the welfare of the members by interchange of helpful information."

I wish N.R.I. Alumni— each and every individual — good health and prosperity, and National Radio Institute another year of helpful service.

DR. GEORGE B. THOMPSON, Los Angeles, Calif.
President N.R.I. Alumni Association.

Thanks For Many Letters Like This

Reading the article in the February-March, 1941 issue of NATIONAL RADIO NEWS, "Developing the Ability to Diagnose Receiver Troubles" by J. B. Straughn prompts me to say I like this article and would like to see more on similar subjects appear in future issues.

W. M. CHRISTIANSEN,
Hyrum City, Utah.

Likes Questions and Answers

Please continue the fine feature "Questions by Students and Answers by Experts." I am a member of four Radio organizations and a good N.R.I.A.A. man. I read a lot of Radio magazines, but the NATIONAL RADIO NEWS is like the meat in a nutshell.

FRED APPLETON,
Rossland, B. C., Canada.

Bouquets Galore

I just had to write you to let you know how much I have enjoyed the February-March issue of NATIONAL RADIO NEWS, and other things that have happened during the past month.

First of all, I would like to compliment Mr. Straughn on his article namely, "Developing the Ability to Diagnose Receiver Troubles." This news really hit the spot. The issue as a whole is very interesting from cover to cover, and to add a little humor to our NEWS, I noticed with interest "How to Court a Radio Girl."

Now—the local news. I had the pleasure of attending our Local Chapter meeting, also the pleasure of meeting Mr. Meune in person. I must say it was quite a thrill to see our Executive Secretary, and hear him talk. Enjoyed the talk immensely. Some meeting, I would say.

Just between us friends I think we have the greatest Chapter Chairman of all. I think Mr. Stanish a very fine fellow, and a wonderful Chairman. N.R.I. should be proud to have such a fine man connected with their organization. I must say he is tops with me. All in all I think we have a grand bunch of fellows.

WALTER YOUNG,
Detroit, Michigan.

Mr. Markus, Please Note

A word for NATIONAL RADIO NEWS. I think it is A-1 and I would not want to miss an issue. I like Electronics, Inc. very much.

ALBERT H. ROTHBAUGH,
Hanover, Penna.

Another Request For Jay and Ozzie

I wish to inform you that I like reading the NATIONAL RADIO NEWS very much. Would like to have another article on Jay and Ozzie.

K. F. NOYES,
West Granby, Conn.

Plug-In Interference Filter

Recognizing the inefficiency of ordinary plug in filters, engineers of the Sprague Products Company, North Adams, Mass., have designed LF-2, a special multiple section and inductance and capacity filter for use on very troublesome sources of Radio interference. Designed for installation at the power outlet to which the interfering device is connected, the Sprague LF-2 takes much of the guesswork out of selecting the proper filter for any electrical device drawing up to ½ ampere. It has proved unexcelled for troublesome electrical shavers, hair dryers, erasing machines and similar electrical equipment which so frequently causes the most troublesome kind of noise on nearby Radio receivers.

Supplied in a good-looking, rounded corner rectangular case only 2½" x 1¾" x 1 7/16", the filter is designed for use on 115 volt, AC or DC lines only. A ground connection is provided and should

be used for maximum effectiveness. For convenience, this ground may be made to the chassis or frame of the offending device. The filters are obtainable through your local parts dealer or direct from Sprague Products Company, North Adams, Mass.

— — *n r i* — —

Radio Amateurs

From time to time the Editor of NATIONAL RADIO NEWS is glad to publish a list of Radio "Hams" who have reported their call letters to us. The following were reported since the last listing.

W6SPE—Les Haughs, San Francisco, Calif.
W8VIP—Albert J. Citruelo, Minersville, Penna.
W3IZF—Richard Campbell, Jr., Strasburg, Va.
W3JEQ—Arthur Wake, Strasburg, Va.
W9IIPD—Jim Swisher, Anoka, Minn.
W8TQC—Roland R. Johnson, Dayton, Ohio.
W4FPN—W. A. Manley, Birmingham, Ala.
W9MSS—Edward W. Andrews, Chicago, Ill.
W1MZL—John P. Pollitt, Portsmouth, R. I.
W9IIVZ—Albert Stahl, Joliet, Ill.
W5JLT—James W. Birdsong, Port Arthur, Texas
K6PIR—A. Anderson, Waialua, Hawaii
W7IIXN—Leland R. Stowe, Kellogg, Idaho
W7IIIQ—Mrs. Leland R. Stowe, Kellogg, Idaho
W3IJQ—George C. Ruehl, Jr., Baltimore, Md.

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FROM N.R.I. TRAINING HEADQUARTERS

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