

# NATIONAL RADIO NEWS



## IN THIS ISSUE

Oscillator Troubles in Superheterodynes  
How to Read the Condenser Color Codes  
Alumni Association News

Feb.-Mar.  
1949

VCL. 13  
No. 7



---

---

# GET ALONG WITH PEOPLE

In a recent study covering the activities of several hundred successful men, this question was asked:

“What single ability is most essential to success?”

The almost unanimous answer was:

**THE ABILITY TO GET ALONG WITH PEOPLE.**

You will agree with this, I am sure.

The successful technician—engineer—businessman—must *get along with* other people, if he is to gain the greatest success, and earn the greatest profit from his technical abilities.

Keep this in mind in your everyday life. *Practice getting along* with people. We can all improve on our abilities in this “art”—and will profit by doing so.

J. E. SMITH, *President*



J. B. Straughn

# How to Cure Oscillator Troubles In Superheterodynes

By J. B. STRAUGHN

NRI Supervisor of Training

IN considering oscillator troubles we will not talk about those involving alignment. In general when the local oscillator of a superheterodyne is defective it does not work, either over a portion of the dial or over the entire dial. In some cases this action will be intermittent.

The surest sign that an oscillator is at fault is when the set sounds alive and yet no stations can be tuned in. At other times a peculiar effect will occur in that one station, usually a fairly powerful local at the low frequency end of the dial comes in over the entire tuning range.

At other times the receiver may work properly either at the high or at the low end of the dial but not at the other end. Again a set may work during the day time, but at night when a heavy load is placed on the power line and line voltage drops, the oscillator may fail to function and the receiver will be dead.

It is a rather simple matter to determine whether or not the oscillator is at fault. If you make a circuit disturbance test on a dead receiver by touching the top cap of the mixer or by shorting the tuning condenser plates of the mixer section a click will be heard in the loudspeaker. This indicates that the mixer, i.f. stages, detector and audio amplifier are in working condition. In general when the oscillator is dead a click will not be heard when its tuning condenser plates are shorted. This, however, is not a final test. In most oscillators using self-bias, obtained by means of an oscillator grid leak resistor, you can measure the d.c. bias voltage across the oscillator grid resistor. If the oscillator is working it's grid is drawing current, producing a d.c. voltage across

this resistor. The end of the resistor connected to the grid of the tube will be negative with respect to the grounded end of the resistor. You should be able to measure at least 5 to 15 volts d.c. across this resistor. Failure to do this or the presence of only a low voltage indicates that the oscillator is dead. If bias voltage is present the oscillator may be operating, although at an incorrect frequency. Note: A high resistance d.c. volt meter with a sensitivity of at least 10,000 ohms per volt should be used for this test.

Another way to check on a dead oscillator is to tune the receiver to a point where a station is normally received and to then feed into the oscillator circuit the unmodulated output of a signal generator, tuned above the desired station by the receiver i.f. The signal generator then provides a signal of correct frequency to take the place of the oscillator signal. If the station is now received it shows that either the oscillator was not working or was working at the wrong frequency.

To check both for oscillation and the frequency of oscillation you may use a tuned type signal tracer such as the NRI Model 33. Simply tune the signal tracer to the dial setting of the receiver plus its i.f. value. This is the frequency at which the oscillator should be working. Then touch the r.f. probe of the signal tracer to some point in or near the oscillator tank circuit, for example, the stator of the oscillator tuning condenser. If the oscillator is working the signal tracer's tuning eye should close or even overlap. By varying the tuning of the signal tracer you can find if the oscillator is off frequency.

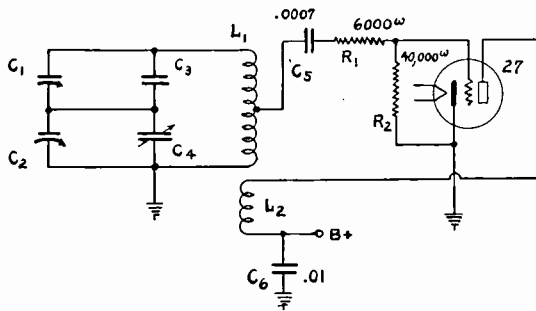


Fig. 1. Triode Oscillator With Tickler Feed Back.

You can also check on the oscillator frequency and activity by tuning another receiver, located physically near the one under test. When it is tuned to the oscillator frequency of the suspected set (the receiver dial setting plus its i.f. value) a rushing sound should be heard in the second receiver's loudspeaker. If a station appears at this point a squeal will be heard due to the oscillator in the set under test beating with the signal from the station.

All oscillators are not alike and because they employ different circuits are subject to different defects resulting in oscillator failure. Let us consider the typical circuits you will encounter in servicing receivers.

The circuit shown in Fig. 1 was employed in the early superheterodyne receivers. Feedback was obtained by means of the tickler coil which was inductively coupled to the tank circuit.  $C_5$ , the coupling condenser is connected to a tap on the tank coil rather than across the entire coil. This reduced the harmonic content of the oscillator signal and also prevents the grid-to-cathode tube capacity from affecting the tuning. Few later broadcast receivers use a tap of this sort. Resistor  $R_1$  also aids in preventing the production of oscillator harmonics and reduces the tendency towards parasitic oscillation.

To check if this oscillator is working, measure the d.c. voltage across resistor  $R_2$  by placing the negative voltmeter lead of a d.c. voltmeter on the grid and the positive lead on the chassis.

This type of oscillator seldom fails and when trouble is encountered it is usually due to a defective tube, shorted oscillator tuning condenser plates or an open in one of the oscillator coil windings.

If a type 56 tube which is also a triode, using the same base connections and filament voltage as the 27, is inserted in this circuit the oscillator will work intermittently as the 56 tube has a higher mutual conductance and the resulting

voltage developed across  $R_2$  is so great that the oscillator blocks. It is necessary for  $C_5$  to discharge through  $R_1$  and  $R_2$  before oscillation can be restored.

The circuit can be made to work with the 56 type tube if the value of  $R_2$  is decreased. It is better, however, to install the right replacement tube.

The mixer circuit shown in Fig. 2 employs the so-called Meissner oscillator. It was very popular in the mid-thirties, being used in thousands of receivers and is often encountered in servicing today.

This oscillator is quite critical. Feedback occurs through condensed  $C_4$  which is also the i.f. trimmer for i.f. primary  $L_6$ . The feedback energy passes through coil  $L_3$  and is induced into coil  $L_4$  which together with condensers  $C_5$ ,  $C_6$  and  $C_7$  determine the oscillator frequency. Energy is picked up by coil  $L_5$  in the cathode circuit of the tube and this serves to vary the grid voltage at the oscillator frequency.

Conditions for oscillation are set by the grid bias developed across resistor  $R_2$ . As the tube ages the oscillator may fail to function at the low frequency end of the dial. Oscillation can normally be restored by installing a new tube. However, in time it, too, will fail and in practice it has been found best to reduce the value of resistor  $R_2$  by about a third of its original size.

On the other hand, if the oscillator fails at the high frequency end of the dial the trouble is probably due to moisture absorption by the oscillator coil with consequent lowered Q. The oscillator coil may in some instances be removed and baked in an oven. This will temporarily restore the Q but the trouble may re-appear. Replacement of the oscillator coil is the usual remedy.

Today, however, these coils are not always available and in such a case if a customer desires to retain the receiver it is best to replace the tube with a pentagrid converter such as a 6A7. A new oscillator coil designed for the i.f. frequency in use and for a pentagrid converter circuit should be used. A new socket will be required and the wiring will have to be changed to conform to that of a standard pentagrid converter as will be shown later. In some instances the first i.f. transformer may be built in the same container with the oscillator coil and in such a case not only will you need a new oscillator coil but also a new i.f. transformer.

Frequently resistor  $R_3$  may open, increasing the screen voltage of the tube. This will upset the action of the oscillator.

In these older receivers the stator plates clamp into a strip which centers them between the rotors

and connections were made to them through two screws. These screws sometimes corroded, thus placing a high resistance in series with the oscillator tuning condenser plates. Loosening and tightening the screws one at a time removes the oxidation and reduces the undesired resistance. We say one at a time. If both are loosened at the same time the oscillator stator plates may shift out of position and short against the rotor plates.

Rosin joints are also found at times in oscillator and other tuned circuits. When the oscillator refuses to function and this difficulty is suspected, it is well to go over such joints with a hot soldering iron. Hold the iron in place until the rosin bubbles out of the joints and the solder becomes molten.

A standard pentagrid converter circuit which is only just now losing popularity is shown in Fig. 3.

The most frequent cause for trouble in this oscillator circuit is a breakdown in condenser  $C_5$  with consequent burning out or resistor  $R_3$ . This removes the oscillator anode grid voltage, effectively stopping oscillation. However, if the antenna or the control grid of the tube is touched a click will be heard in the loudspeaker.

Less frequently the anode winding will open up. This necessitates replacement of the oscillator coil.  $L_4$  shown in the schematic serves to give capacity coupling between the oscillator grid and the tank circuit. When using a standard replacement oscillator coil winding  $L_4$  is not included and must be replaced with an actual condenser. This frequently fools many servicemen. A condenser having a capacity of about .0001 mfd. may be used.

Oscillator failure may sometimes be traced to grid resistor  $R_2$ . If this resistor has changed and become lower in value the oscillator will fail to function. Sometimes increasing the value of this resistor to as much as 75,000 ohms will restore oscillation. If the value is made too large, however, blocking will take place and you will only get chopped up reception.

The circuit shown in Fig. 4 is the one which is currently standard and is found in most receivers. It is quite similar to the one shown in Fig. 3 with the exception that a separate oscillator anode is not used. As you can see this is a variation of the Hartley circuit with the cathode connected to a tap on the tank coil. The screen acts as

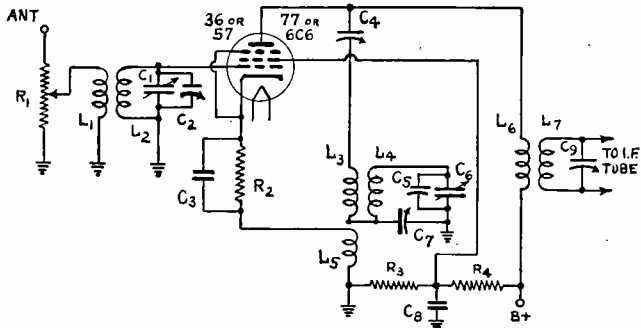


Fig. 2.

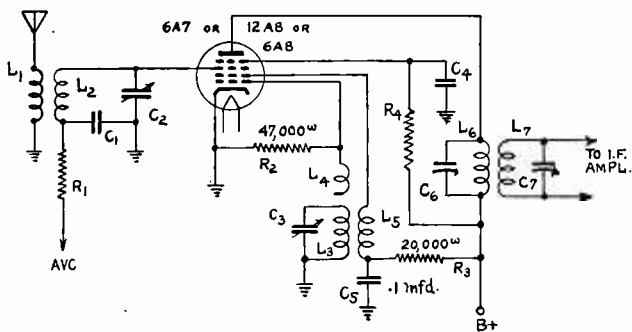


Fig. 3. Pentagrid Converter, Using Oscillator Anode and Gimmick to Couple Oscillator Grid to Tank.

the oscillator plate and is effectively kept at r.f. ground potential by condenser  $C_3$ . Opening up of this condenser will result in oscillator failure. Cathode to heater leakage in the tube will short out the lower section of the tank circuit and prevent proper operation.

A reduction in value of the oscillator grid resistor  $R_2$  will also prevent the oscillator from working. A somewhat higher value may be tried at this point when oscillator failure exists. Resistor  $R_4$  is used to prevent parasitic oscillations.

Note that an actual coupling condenser ( $C_2$ ) to the grid is used instead of the "gimmick" shown in Fig. 3. However, a gimmick may be used with this circuit in some receivers instead of an actual condenser. At times you may find a high value resistor, on the order of 15 megohms, connected between the oscillator grid and the avc circuit. The purpose of this resistor is not to apply avc to the oscillator grid but to make use of the oscillator grid voltage as the minimum (no signal) voltage for the avc controlled tubes.

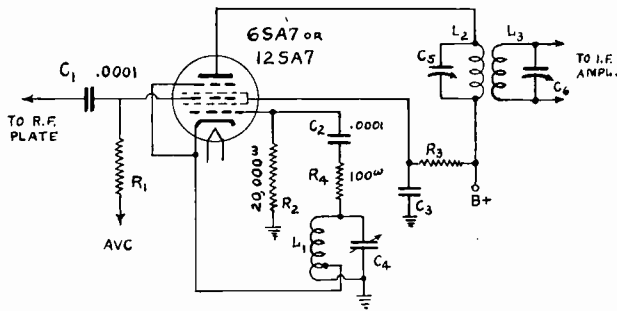


Fig. 4. Pentagrid Type Converter Using Screen Grid as Oscillator Anode.

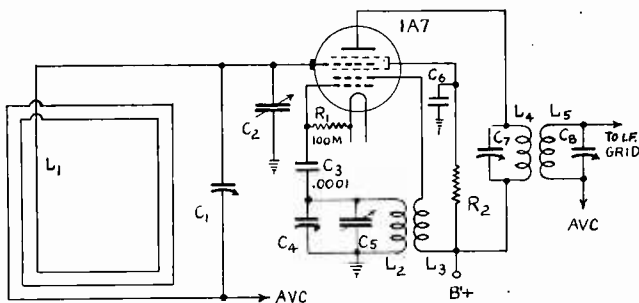


Fig. 5. Battery or Three Way Type Pentagrid Converter.

Fig. 5 is typical of the mixer circuits found in many battery operated and three-way portable type receivers.

Again in the case of oscillator failure you should be on the lookout for lowered oscillator grid resistor values, low Q oscillator circuits and short-circuited tuning condensers.

Most of the trouble encountered with mixers of this type is due to low filament voltage. If less than about 1.4 volts is applied to the tube filament the oscillator will not work although the receiver may give all symptoms of being alive.

The filament voltage should be measured with a d.c. voltmeter while the tube is in the circuit and the receiver is turned on.

When operated from the power line you may find that during certain hours of the day the receiver goes dead. This is generally due to a drop in power line voltage which in turn reduces the oscillator filament voltage.

In general, it is best not to do anything to the

receiver which will raise the filament voltage because when the line voltage is normal excess voltage will be applied to the filament quickly ruining the tube. The customer should be made aware of the cause of the trouble and the condition called to the attention of the power company. If they are unable to correct the situation, as may be possible in some industrial areas, it is best for the customer to use another type receiver when the voltage is low or to switch to battery operation at such times.

If the line voltage is normal but the receiver is dead on power line operation and works on battery operation check the B supply circuits. The rectifier tube may be defective or the filter condensers may have become leaky or lost capacity. This will lower the operating voltages and stop the oscillator. Where a selenium rectifier is used the same effect may occur and in addition as the selenium rectifier becomes defective the hum level will rise. All resistors in the filament string circuit should be checked as to resistance. A change in these resistor values may lower the oscillator filament voltage and prevent oscillation.

To make matters complete we are showing the push-button oscillator circuit of the Hallicrafter's T54 television receiver in Fig. 6.

This circuit is comparatively free from trouble. However, the 1000 micro-microfarad plate by-pass condenser occasionally breaks down and causes the 100 ohm plate supply resistor to burn out. The oscillator employs an ultra-audion circuit, depending on inter-electrode tube capacities for proper feedback from the plate to the grid circuit. This is a modification of the Colpitts oscillator described in your regular lessons.

Since tuning is to some degree dependent on the grid-to-cathode capacity of the tube, replacing the tube will often change the oscillator tracking. Rather than attempt re-alignment of the oscillator channels a serviceman will usually try a number of 6C4 tubes until he finds one which allows proper station reception without re-alignment of the oscillator circuits.

Occasionally increasing the capacity of the grid coupling condenser from .68 micro-microfarads to 1.5 micro-microfarads increases the sensitivity on channel number 7.

Fig. 7 shows a rather unique mixer circuit found

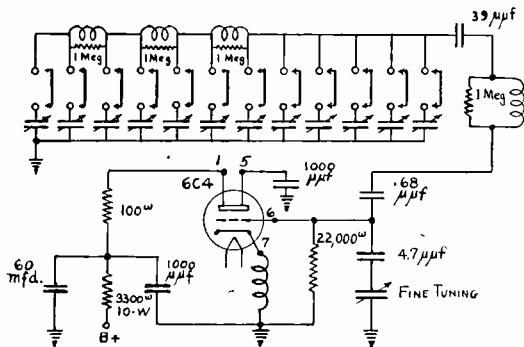


Fig. 6. Hallicrafters Model T-54 T.V. Oscillator Circuit.

in some Philco A.M.-F.M. receivers. The oscillator circuit is subject to the troubles we have previously described and is of the Hartley type. The diagram is introduced because some servicemen have encountered considerable trouble with these receivers. The set acts as though the oscillator was not working, yet the correct d.c. voltage may be measured across oscillator grid resistor  $R_4$  and oscillator signals at the correct frequency may be picked up with a signal tracer. Actually resistor  $R_3$  increases in value, reducing the bleeder current through resistor  $R_3$ . The mixer action of the left-hand section of the tube depends upon the bias voltage developed across resistor  $R_2$  and with  $R_3$  increased in value or open insufficient bias for mixing will be developed and this section of the tube will no longer function as a mixer. Consequently no i.f. signal is produced at the output of the tube, even though the oscillator is working and the incoming signal feeds into the input of the mixer.

The receiver acts alive, yet just as though the oscillator were dead. Replacing resistor  $R_3$  with one of the correct value restores mixing action.

In general, remember the following points. Oscillator troubles are present when the receiver acts alive yet will not pick up stations, particularly when a circuit disturbance test causes clicks in the loudspeaker from the mixer input. Reception of one station over the entire dial is almost a sure sign of oscillator failure. You can check for oscillation in most oscillator stages by measuring the d.c. voltage across the oscillator grid resistor. In other cases you may inject a signal from a signal generator and pick up stations. Also you can check on the presence of oscillation and the frequency by tuning the oscillator signal in on another receiver or on a signal tracer.

In servicing an oscillator circuit never hesitate to try a new tube even though the original tube may test o.k. A check in a tube tester is not always conclusive where oscillators are concerned. Go over the various circuits with a hot soldering iron, check for open oscillator coils, changed values of resistance, shorted tuning condenser plates and lowered operating voltage, particularly the filament voltage in filament type tubes. Be on the lookout for cracked or dirty mica insulation in trimmer and padder condensers.

By keeping the above points in mind you should find it much easier to clear up receiver complaints due to oscillator failure.

— n r i —

## Safety Note

Here is a gadget for throttling speedsters.

Father of the device is a theology student. When you drive 25 miles per hour a white light on your instrument panel flashes. At 30—a green light. Get up over 39 and a red light appears, reminding you that death begins at 40.

Still more is in store for you, for at 60 miles per hour a phonograph under the seat begins playing. "Nearer My God To Thee."

The inventor is considering the addition of a trumpet rendition of "Blow, Gabriel, Blow" to burst forth at 80. Being music lovers, we're afraid this would only encourage us to speed.

— n r i —

Enthusiasm is the greatest asset in the world. It beats money, power and influence. It is nothing more or less than faith in action,—HENRY CHESTER.

— n r i —

Genius is talent set on fire by courage.

— n r i —

When a man does things, he hasn't much time to talk about them.—*Mirabeau*.

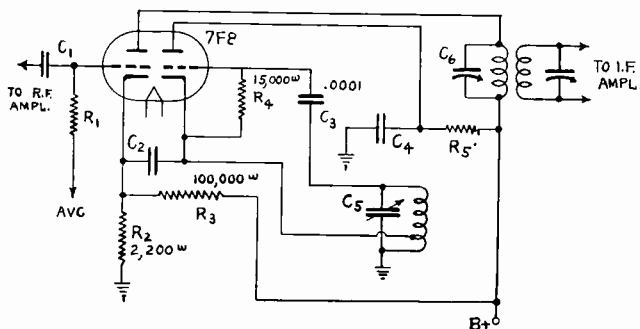


Fig. 7. Dual Triode Converter with Bleeder Bias on the Mixer.

# How to Read the Condenser Color Codes

By GEORGE J. ROHRICH

NRI Laboratory Instructor



George J. Rohrich

THE trend toward progressively reducing size and weight on some radio components makes it necessary either to omit labels or use a code for identifying their values. Midget sized resistors and condensers are examples where twelve colors are used to impart coded information.

Two arrangements of the twelve colors are used to give ohmic value with tolerance on resistors, according to the standard Radio Manufacturers' Association (RMA) color code. These two arrangements are listed for your practical experience with Radio Kit 2RK. They are reproduced in the accompanying Fig. 1.

Nine arrangements of the twelve colors also have been used extensively for identifying small radio condensers. These codes are found chiefly on the ceramic and mica condensers. Their capacity values ordinarily range between .00001 mfd. (10 mmfd.) and .0015 mfd. (1500 mmfd.). Condensers with greater capacity than 1500 mmfd. ordinarily use different dielectrics than mica, resulting in physical size which permits attaching a printed label, so the color codes are not used.

## Why Nine Codes Exist for Condensers

The color code for resistors has never needed revision since its inception in 1938. Things have been different for condenser requirements. Several revisions were desirable over a period of approximately eight years, including special requirements for meeting Army, Navy and various other Government specifications for condensers during the World War II period, 1941 through 1946.

Two systems originated in 1938. See Table 1. (The system identifying numbers are given in the second column under the heading "Description of System.") System No. 1 covered the basic 3-dot arrangement, while System No. 9 made use of six dots, of which the first three dots show three significant figures of the capacitance value. System No. 9 never was popular and it is doubtful if you will find many condensers coded with it.

The first revision was made about 1942 by the RMA. It was called the Army War Standard (AWS) Code. The AWS code was officially adopted soon by joint agreement between Army and Navy procurement Offices and, where designated for standardized Joint Army Navy (JAN) equipments, it became the official JAN Code.

In their application you will find there is no difference between the JAN and AWS Codes, although some publications may list them separately, or may identify one code without mentioning the other.

Following the war period, the RMA is identifying its latest (1947) 6-dot color code with an initial white dot. See System No. 8 in Table 1. This white dot is intended only for identifying mica condensers and corresponds to JAN mica condensers marked with an initial black dot.

Thus, if you find a condenser is marked either with a black or white dot in the initial position of a 6-dot series, you will know at once that it is a mica dielectric type of condenser. But, if the initial dot is silver, then you know the condenser has paper for its dielectric and that it is marked in accordance with System No. 7 in Table No. 1.



## RMA COLOR CODE FOR RESISTORS



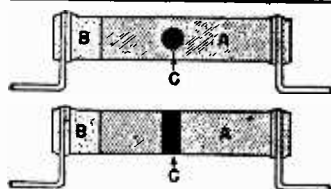
<p><b>BACKGROUND COLOR</b></p>  <p><b>METHOD I</b>          COLOR BANDS A, B, AND C GIVE VALUE.          GOLD OR SILVER BAND D, USUALLY OMITTED, INDICATES TOLERANCE.          BLACK BACKGROUND — UNINSULATED.          TAN BACKGROUND — INSULATED.</p>	 <p><b>METHOD II</b>          BODY COLOR (A), END COLOR (B), AND DOT OR BAND COLOR (C) GIVE VALUE.          GOLD OR SILVER BAND D, USUALLY OMITTED, INDICATES TOLERANCE.</p>																																		
<table border="0" style="width: 100%;"> <tr> <td style="width: 10%;">Color</td> <td style="width: 10%;">Figure</td> <td></td> </tr> <tr> <td>BLACK</td> <td>.....0</td> <td></td> </tr> <tr> <td>BROWN</td> <td>.....1</td> <td></td> </tr> <tr> <td>RED</td> <td>.....2</td> <td></td> </tr> <tr> <td>ORANGE</td> <td>.....3</td> <td></td> </tr> <tr> <td>YELLOW</td> <td>.....4</td> <td></td> </tr> <tr> <td>GREEN</td> <td>.....5</td> <td></td> </tr> <tr> <td>BLUE</td> <td>.....6</td> <td></td> </tr> <tr> <td>VIOLET</td> <td>.....7</td> <td></td> </tr> <tr> <td>GRAY</td> <td>.....8</td> <td></td> </tr> <tr> <td>WHITE</td> <td>.....9</td> <td></td> </tr> </table>	Color	Figure		BLACK	.....0		BROWN	.....1		RED	.....2		ORANGE	.....3		YELLOW	.....4		GREEN	.....5		BLUE	.....6		VIOLET	.....7		GRAY	.....8		WHITE	.....9		<p><b>COLOR A GIVES FIRST FIGURE OF RESISTOR VALUE.</b></p> <p><b>COLOR B GIVES SECOND FIGURE OF RESISTOR VALUE.</b></p> <p><b>COLOR C GIVES NUMBER OF CIPHERS FOLLOWING THE FIRST TWO FIGURES.</b></p> <p><b>COLOR D: GOLD BAND INDICATES <math>\pm 5\%</math> TOLERANCE.          SILVER BAND INDICATES <math>\pm 10\%</math> TOLERANCE.          NO BAND INDICATES STANDARD <math>\pm 20\%</math> TOLERANCE.</b></p>	
Color	Figure																																		
BLACK	.....0																																		
BROWN	.....1																																		
RED	.....2																																		
ORANGE	.....3																																		
YELLOW	.....4																																		
GREEN	.....5																																		
BLUE	.....6																																		
VIOLET	.....7																																		
GRAY	.....8																																		
WHITE	.....9																																		

Fig. 1. The two methods being used for marking resistors according to the standard R.M.A. Color Code are given here.

the same as body color A; thus, an all-red color-coded resistor would be 2,200 ohms.

When a color band is missing in non-insulated (black background) resistors marked according to Method I, assume that the color of the missing band is black.

When end color B, or dot or band C, is missing in a resistor marked by Method II, the missing marking is

Note that with Method I markings the color bands are all equal in width, while with Method II markings on resistors having leads coming straight out from the ends, the color bands are of different widths; this serves as a clue for telling which method of marking is employed. Resistors with side leads (shown at the right above) are not insulated.

These nine arrangements for coding the information on condensers can be separated into the nine systems shown in the second column of Table No. 1.

Reading the condenser codes is just as easy as reading the resistor codes *after the first dot is identified* so you can read the remaining dots in sequence. Capacitance values are expressed in micro-microfarads with all nine systems.

Confusion could arise if a code is read backward. However, if you do read the code backward, the values are usually unreasonable, falling outside the range between 10 and 1500 micro-microfarad which the condenser color code is intended to cover. So you can readily arrive at the proper sequence by accepting only the reasonable interpretations.

### Aids for Distinguishing Condensers From Resistors

Some small condensers are made tubular in shape and their outward appearances make it difficult to distinguish them from small resistors. (Tubular ceramic dielectric capacities are used for temperature compensation of tuned circuits.)

A glance into a television or FM receiver would verify these statements. However, distinction can be made readily in most cases because the manufacturers name is commonly stamped on the part. This information gives a clue when we realize that condensers are made exclusively by such well known manufacturers as Aerovox, Cornell-Dubilier, Erie, Sangamo, and Solar. The abbreviations MMFD or MFD, and CERAMIC-ON, which may be stamped on the part will identify condensers exclusively.

Look at Table No. 1. A summary of all nine codes appears here. The simplicity of each code can be realized by noting that "the special information" does not apply to Systems 1 and 2. Note further that the last column on special information about "voltage rating" applies only to Fig. 4 and Fig. 7 and the last color in either system then applies. Similarly, note that the final dot of Fig. 6 calls your attention to getting the special information from Table 2.

Under the special information column in Table No. 1 now note that Fig. 5 is the only one which deals with a ceramic condenser's performance when subjected to temperature changes. The

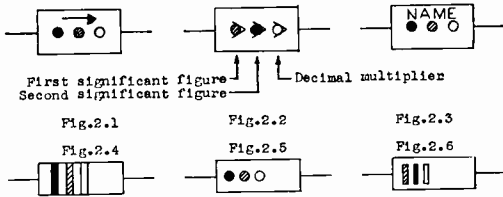


Fig. 2. Aids found in 3-DOT SYSTEM for reading the colors from left to right. Note arrow in Fig. 2.1 and arrowheads in Fig. 2.2. The name is placed upright in Fig. 2.3 while the bands, dots and stripes are bunched at the left in Figures 2.4, 2.5 and 2.6 for the purpose of reading the colors from left to right. The key for Fig. 2.2 applies to all of the arrangements in Fig. 2.

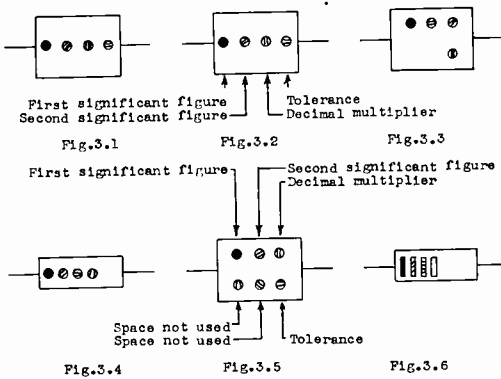


Fig. 3. The same aids used in Fig. 2 are found in this Fig. 3 for reading the 4-DOT SYSTEM from left to right. Although SIX spaces are found on a condenser marked like Fig. 3.5, two spaces are not used. Note the similarity between Fig. 3.3 and Fig. 3.5.

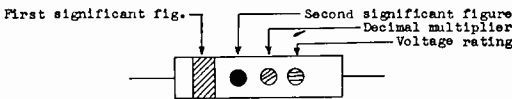


Fig. 4. A band with three dots differs from other four-color arrangements only in the meaning of the final color.

widest band of color gives the information.

Through a process of elimination, we see that "Capacity Tolerance" is determined by the fifth color of Figs. 5, 6 and 7. No trouble is experienced in selecting the first percentage column when the color is restricted to either gold or silver.

Other colors than gold or silver will be read in percentage from the middle tolerance column,

unless restricted to the code in Fig. 5 and finding the capacity is less than 10 mmfd. Under this latter restriction the tolerance shows how many mmfd. are involved.

Look at Table No. 1 after eliminating the special information and tolerance factors we have just considered. Remaining is the information which deals with the condenser's capacity. It is this information on capacity which interests most servicemen. Eight of the systems use an identical procedure (See Fig. 2 to Fig. 6 inclusive) with three colors for designating how much capacity the condenser contains. In other words, each of these eight systems is based on the 3-dot system shown in Fig. 2.

Refer to Fig. 2. The first dot represents the first significant figure, the second dot the second significant figure and the third dot tells by what number the first two are multiplied. For example, a code reading green, black, brown would designate 50 multiplied by 10 or 500 mmfd. Another example, a code reading violet, green, gold designates 75 multiplied by .1 or 7.5 mmfd.

When we examine Figs. 5 and 6 we see similarity to Fig. 3 by noting that the second, third and fourth colors impart information exactly as above for designating how much capacity the condenser contains.

The next step is to insure reading the colors in their intended sequence.

#### Aids for Reading Colors in the Intended Sequence

The manufacturer uses one of several means for aiding anyone later to read the colors in their correct sequence. Refer to Fig. 2 where you will find how this is done for the 3-dot system. Fig. 2.1 shows how an arrow is molded in the bakelite case so the dots can be read from left to right, by starting at the tail and ending with the point of the arrow. In Fig. 2.2 the manufacturer uses a slight variation by including individual arrowheads around each dot to show that the dots are read from left to right.

Fig. 2.3 makes use of the manufacturer's name so the name can be placed upright for subsequently reading the colors from left to right.

In practice, bands or stripes of color are used interchangeably with dots. This is shown in Figs. 2.4, 2.5 and 2.6 where you also find the colors are bunched at the left, so the colors can be read in sequence from left to right. If you find the colors appear bunched at the right end of a condenser, which you are holding in your hand, then you must turn the condenser around before interpreting the colors.

Refer to Fig. 3 which shows several variations

Reference Diagram	Description Of System	Condenser Capacity					Capacity Tolerance			Special Information	
		Number of Micro-Micro-Farads					Capacity Tolerance			Special Information	
		1st Dot	2nd Dot	3rd Dot	4th Dot	5th Dot	Tolerance	Tolerance	Temperature Coefficient parts/million/°C	Characteristics (See Table #2)	Voltage Rating
Fig. 7	1938 RMA Mica 6-Dot System #9				4th Dot	5th Dot	±20%	±2 mmfd	0	A	—
Fig. 6	1947 RMA Mica 6-Dot System #8 (First Dot White)	2nd Dot	3rd Dot		4th Dot	Alternate 5th Dot	±1%	—	—30	B	100
Fig. 6	AWS & JAN Paper 6-Dot System #7 (First Dot Silver)	2nd Dot	3rd Dot		4th Dot	5th Dot (Silver-Only)	±2%	—	—80	C	200
Fig. 6	AWS & JAN Mica 6-Dot System #6 (First Dot Black)	2nd Dot	3rd Dot		4th Dot		±3%	—	—150	D	300
Fig. 5	10-mmfd or Less Ceramic 5-Band System #5	Narrow Band #2 (or Dot)	Narrow Band #3 (or Dot)		Narrow Band #4 (or Dot)		±5%	±.5 mmfd	—220	E	400
Fig. 5	More Than 10-mmfd Ceramic 5-Band System #4	Narrow Band #2 (or Dot)	Narrow Band #3 (or Dot)		Narrow Band #4 (or Dot)		—	—	—330	F	500
Fig. 4	Ceramic 4-Band-Dot System #3	Wide Band #1 (Dot #1)	2nd Color Band #1 (Dot #1)		3rd Color Band #2 (Dot #2)		—	—	—470	G	600
Fig. 3	4-Dot System #2	1st Dot	2nd Dot		3rd Dot	4th Dot	±.25 mmfd	±.25 mmfd	±30	—	700
Fig. 2	1938 RMA Mica 3-Dot System #1	1st Dot	2nd Dot		3rd Dot	No Color	±10%	±1.0 mmfd	±500	—	800
Reference Diagram	Color	Significant Figure		Decimal Multiplier	Tolerance	Tolerance	Tolerance	Temperature Coefficient parts/million/°C	Characteristics (See Table #2)	Voltage Rating	
	BLACK	0		1	—	±20%	±2 mmfd	0	A	—	
	BROWN	1		10	—	±1%	—	—30	B	100	
	RED	2		100	—	±2%	—	—80	C	200	
	ORANGE	3			—	±3%	—	—150	D	300	
	YELLOW	4			—	—	—	—220	E	400	
	GREEN	5			—	±5%	±.5 mmfd	—330	F	500	
	BLUE	6			—	—	—	—470	G	600	
	VIOLET	7			—	—	—	—750	—	700	
	GRAY	8			—	—	—	+30	—	800	
	WHITE	9			—	±10%	±1.0 mmfd	±500	—	900	
	GOLD	—		.1	±5%	—	—	—	—	1000	
	SILVER	—		.01	±10%	—	—	—	—	2000	
	No Color	—		—	±20%	—	—	—	—	500	

Table 1

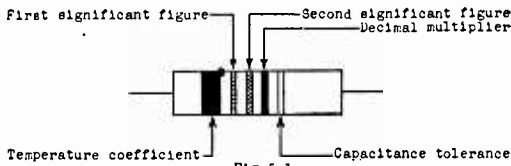


Fig. 5.1

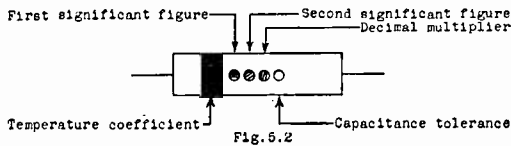


Fig. 5.2

Fig. 5. Five colors identify a ceramic condenser which alters its capacity in known amounts with temperature changes. A wide band is used with either four narrow bands or four dots. The wide band is an aid for reading the five colors in their intended sequence, from left to right.

of the 4-dot system. Notice the similarity between the 3-dot and 4-dot systems. The latter system is treated just like the former for its first three dots. The fourth dot in Fig. 3 gives the tolerance as shown from Table No. 1. This fourth dot is limited to using either gold or silver to designate respective tolerances of five or ten per cent.

In practice, stripes or bands are frequently used interchangeably with dots. However, in Fig. 4 distinction is made on ceramic condensers, which shows one band used with three dots, giving a total of four colors to be interpreted. The band is read as the first of the series of colors and identifies the first significant figure. See System No. 3 in Table No. 1. Note that the sequence then continues from the band to its following dot for reading the second significant figure of the capacity. The third color of the series gives the decimal multiplier. There is no departure from the previous systems for handling the first three colors. However, from Table No. 1 note that the last color of the series of Fig. 4 gives the voltage rating of the condenser. Capacity tolerance is not identified with this system but it is understood to be plus or minus 20%.

Look at Fig. 5 then refer to Table No. 1 for interpreting the five bands of color. Notice that the wide band identifies the first color to be considered and that it gives special information about the temperature coefficient which the manufacturer has coded to show those factors on the condenser's performance when subjected to temperature changes. A negative sign tells us that the capacity decreases when the temperature is raised. A positive sign shows that the capacity increases when the temperature is raised. The numerical value shows the "number

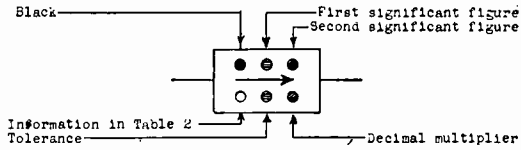


Fig. 6.1 Black first dot identifies MICA condenser in JAN or AWS Code.

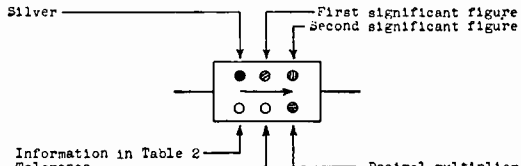


Fig. 6.2 Silver first dot identifies PAPER condenser in JAN or AWS Code.

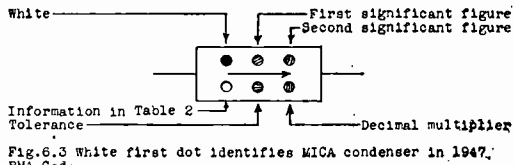


Fig. 6. The first dot is restricted to black, silver and white for distinguishing mica from paper insulation and for distinguishing government from commercial condensers. Otherwise, the remaining portion of the code is identical.

of millionth parts" by which the total capacity changes for each Centigrade-degree variation of temperature. (Briefly, such condensers can be combined with coils in tuned circuits to maintain constant frequency, although, subjected to varying temperature.)

Having identified the first color from the wide band in Fig. 5, the next color (either a dot or a narrow band) identifies the first significant figure of condenser capacity. Reference to Table No. 1 shows that three of the narrow bands give the same information as obtained from the 3-dot system No. 1.

The last dot (or last narrow band) of Fig. 5 is interpreted from the specified tolerance column after finding how much capacity the condenser contains. If it contains more than 10 mmfd. then read the tolerance from the percentage column. However, if it contains less than 10 mmfd. then read from the final tolerance column. It shows how many mmfds. are involved.

Fig. 6 is easily interpreted after noting the color of the first dot is limited always to black, white or silver. Black tells you it is a mica condenser

Sixth Dot Color	Temperature Coefficient parts/million/°C	Maximum Capacitance Drift	Verification of Characteristics By Production Tests	Defined Characteristic
BLACK	Not Specified	Not Specified	Not Required	A
BROWN	Not Specified	Not Specified	Not Required	B
RED	-200 to +200	0.5 per cent	Not Required	C
ORANGE	-100 to +100	0.2 per cent	Not Required	D
YELLOW	0 to +100	0.05 per cent	Not Required	E
GREEN	0 to + 50	0.025 per cent	Required	F
BLUE	0 to - 50	0.025 per cent	Required	G

Table 2

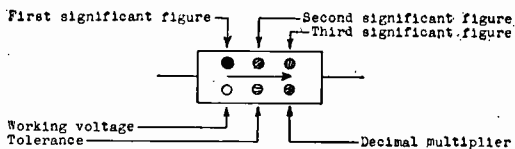


Fig. 7. Obsolete 1938 RMA 6-DOT SYSTEM can be readily distinguished from the others when you find the FIRST dot is NOT black, white or silver. Black and silver were never used in this system while white has only a remote chance of being used for a first significant figure.

while silver designates it is a paper condenser moulded in a moisture-resisting compound.

Either color tells you further that it was made for Government purposes. Similarly, an initial white dot tells you it is a mica condenser made since World War II.

Fig. 7 identifies an obsolete system originated in 1938. More than likely you will seldom find a condenser which uses this code. However, it would be identified readily by noting its initial color is not black, white or silver in a six-dot system. It was intended to specify capacity with greater accuracy than with two significant figures but the intended accuracy could not be achieved in practice of manufacture, while limited to small capacitors where the color code is

used. However, for your information on Fig. 7, the first three dots give the first three significant figures of capacitance in micro-microfarads and the fourth dot, directly below the third, tells by what number the first three are multiplied. For example, a capacitor with .0005 mfd. (500 mmfd.) plus or minus ten per cent, 800 volts D.C. working voltage is marked green (5) black (0) black (0) brown (multiplied by 1) silver ( $\pm 10\%$ ) and gray (800 volt).

— n r i —

### Philip Space Says:—

A friend of mine is a crack radio operator on a ship. He can even send S.O.S. backwards!

— n r i —

I was watching the horse races on my television set yesterday. I must have had two stations on at the same time, one a baseball game, because the horse I was rooting for was tagged out at first base.

— n r i —

Television isn't so good. The other day I was broadcasting when a lady was taking her bath and she threw soap in my eyes.

— n r i —

The Radio will never replace the Newspaper. Ever try getting a Radio into your torn shoe?

# Servicing the Hallicrafters Model T-54 Television Receiver

By WILLIAM F. DUNN

NRI Consultant



William F. Dunn

THE Hallicrafters Model T54 television receiver is one of the best seven inch television sets on the market at the present time. Certainly it is among the most popular of the smaller television receivers. This company has made every effort to put out a good television receiver in the lower price field and the number of satisfied owners certainly indicates that they have been successful.

The company's service policy is very liberal. They have established a number of service centers throughout the country and while the receiver is guaranteed only for ninety days we understand they have informed their service centers to take care of the customer insofar as possible even though the ninety day guarantee period may have expired. The service policy of this company is accomplishing a great deal towards creating good will and this in turn is helping the already rapid increase in television's popularity.

The schematic diagram shown on pages 16 and 17 is one of the later models and it, as well as the material in this article, may be used in servicing the Hallicrafter model 505 and the similar Montgomery Ward and Western Auto receivers. The earlier models were somewhat different; the major difference being in the use of type 6SI17 tubes in the video and sound i.f. stages in place of the 6AU6 miniature tubes shown on the diagram. A few other minor changes have been made, but these changes will be discussed later.

The Hallicrafters Company is continuing its research and as new improvements in television receivers are brought out they will probably be incorporated in this set.

The most common defect encountered in this

receiver is due to the failure of the .001 mfd 6000 volt condensers. There are two of these condensers used in the set and they are marked  $C_{81}$  and  $C_{82}$  on the diagram. Even a small amount of leakage in either one of these condensers is sufficient to load the circuit enough so the high voltage oscillator will fail to oscillate or so there will be insufficient voltage available to operate the 7JP4 kinescope.

The entire high voltage unit which consists of the 6C4 high voltage oscillator, the coil and the 1B3 rectifier tube is mounted in a metal enclosed case at the rear of the chassis. When  $C_{81}$  breaks down it's necessary to remove this entire case in order to replace the condenser.

When removing this case there are six leads to disconnect. The yellow, orange and black leads, shown on the diagram, come out of the lower part of the enclosed case. These leads connect to a terminal strip mounted beneath the chassis. In addition to these leads there are also the two heater leads going to the 6C4 high voltage oscillator tube. These leads also connect to the terminal strip mounted beneath the chassis.

After these leads have been disconnected and also the high voltage lead coming out of the unit the four self-tapping screws that hold the unit on the chassis can be removed and  $C_{81}$  can be reached by removing the bottom plate from the power unit.

The other .001 mfd. condenser is much easier to reach. It's mounted on the bottom of the chassis and connects between one of the terminals of the terminal strip, that's located at the rear of the chassis, and ground. It can simply be cut out and a new condenser installed in its place.

It's comparatively easy to tell when either  $C_{81}$  or  $C_{82}$  is defective. The picture tube serves as an excellent indicator that something might be wrong in the high voltage supply. When the high voltage supply fails there will be no raster on the picture tube. The sound section of the television receiver will continue to function normally. Whenever you encounter a situation of this type in this set remove the four screws holding the top plate on the high voltage unit. Then with an insulated screwdriver touch the top cap of the 1B3 rectifier tube. Do not let your hand come in contact with the metal part of the screwdriver.

If the high voltage oscillator is operating there will be a sparking as you touch the top of the rectifier tube with the screwdriver blade. If this sparking occurs it indicates that the high voltage oscillator is operating and that  $C_{81}$  and  $C_{82}$  are in good condition. On the other hand, if the sparking does not occur it could be due to some defect in the high voltage oscillator circuit itself, but it's usually due to a defect either in  $C_{81}$  or  $C_{82}$ .

A discussion of the high voltage power supply used in this set would not be complete without mentioning oscillator stability. It's possible to adjust the trimmer condenser  $C_{80}$  to obtain too high a voltage from the high voltage oscillator. When this occurs the oscillator will become unstable and you'll find that you obtain a raster on the picture tube, but if you touch the top cap of the 1B3 tube with a screwdriver there will be a sparking and then the raster will disappear. The oscillator condenser should then be adjusted, using an insulated tool, so that you can touch the top cap of the 1B3 and obtain the arcing without causing the 6C4 oscillator stage to stop oscillating.

In the discussion of the high voltage supply used in this receiver it was brought out that you might discover that the high voltage oscillator was operating even though you did not have a raster on the picture tube. This would be indicated by an arcing when you touched the top cap of the 1B3 rectifier tube with the insulated screwdriver.

In a case of this type the trouble is usually due to leakage in one of the coupling condensers used to couple the horizontal and vertical sweep circuits to the picture tube. Frequently you can determine which condenser is causing the trouble by shutting off the receiver and watching the picture tube.

If, as you shut off the set, you can see the electron beam come from one side of the picture tube towards the center it indicates that the horizontal coupling condensers are causing the trouble whereas if the electron beam comes from either the top or bottom it indicates that the

trouble is probably in the vertical coupling condenser. The horizontal coupling condensers are marked  $C_{71}$  and  $C_{72}$  on the diagram. They are .0005 mfd. 6000 volt condensers. The vertical coupling condensers are .03 mfd. 6000 volt condensers.

In some of the earlier models of this receiver .05 mfd. condensers rated at 6000 volts are used. Considerable difficulty was experienced with these condensers and the company went to some trouble replacing condensers in sets as they were brought to their various service centers for repair and adjustment.

In addition to the complete failure of these coupling condensers, which will drive the electron beam right off the face of the tube, the condensers occasionally develop a small amount of leakage after the set has been in operation for some time. This trouble is most noticeable in the .03 mfd. 6000 volt condensers used to couple the vertical sweep to the picture tube. When the set is first turned on and the controls adjusted so the picture is properly centered the set appears to be operating satisfactorily. However, as the receiver warms up the picture will move either up or down depending on which condenser is developing the leakage. Readjusting the vertical centering control will usually eliminate this difficulty, but after some time the picture has again moved. Eventually it reaches the position where the vertical positioning control usually fails to move it back to the proper position. The remedy in a situation of this type is to replace the vertical coupling condensers.

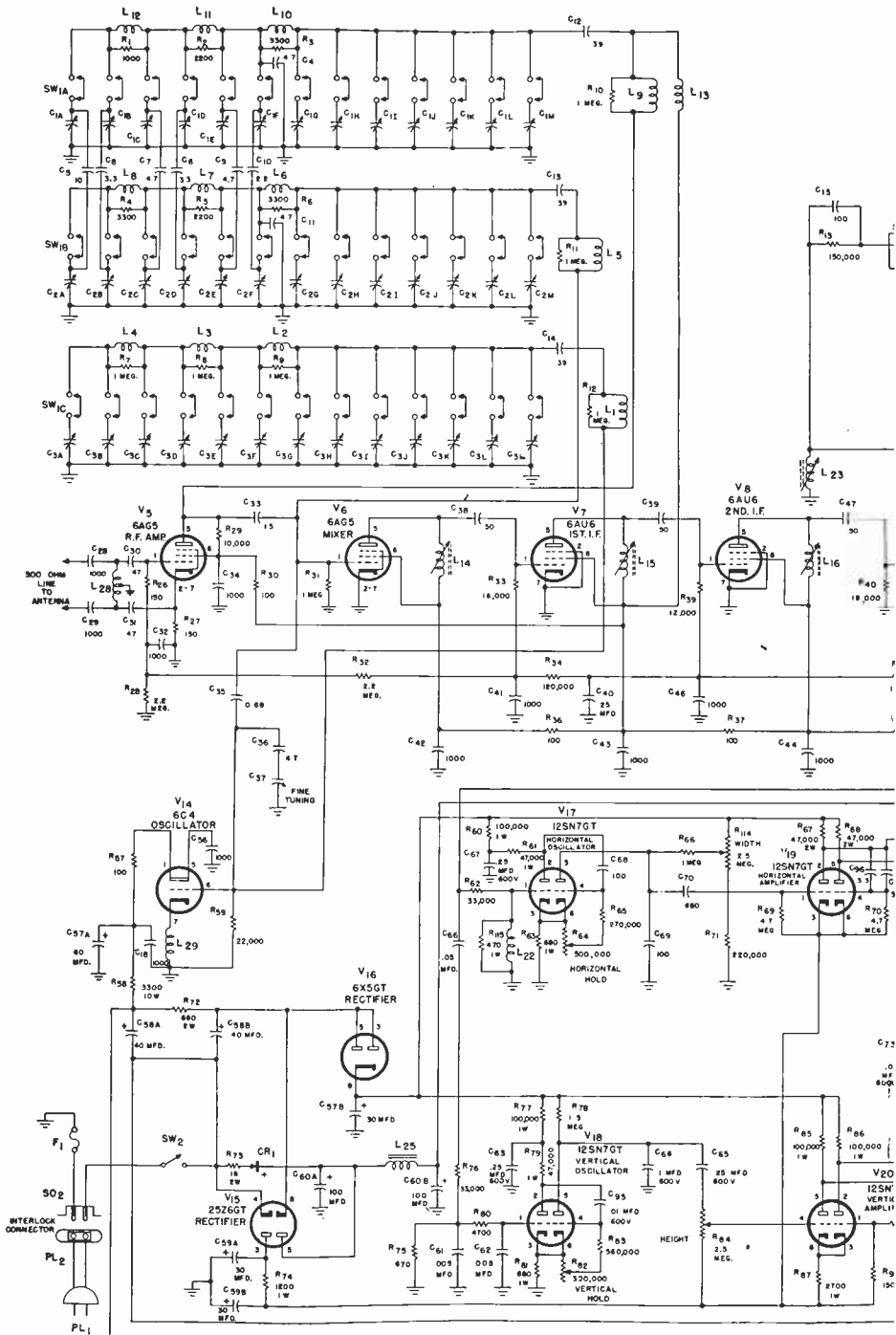
The same defect develops occasionally in the horizontal coupling condensers. In this case the picture moves to one side. The trouble occurs in exactly the same way, but it's not as common in these condensers as it is in the vertical coupling condensers.

A horizontal line on the face of the picture tube that cannot be expanded by adjusting the height control is usually due to failure of the vertical oscillator. This is ordinarily due to a defective tube. Whenever this situation is encountered, a new 12SN7 vertical oscillator tube should be tried. It's not sufficient to simply test the tube and if it tests good to assume that it is all right because frequently this tube will test good in a tube tester and fail to work in the vertical oscillator circuit.

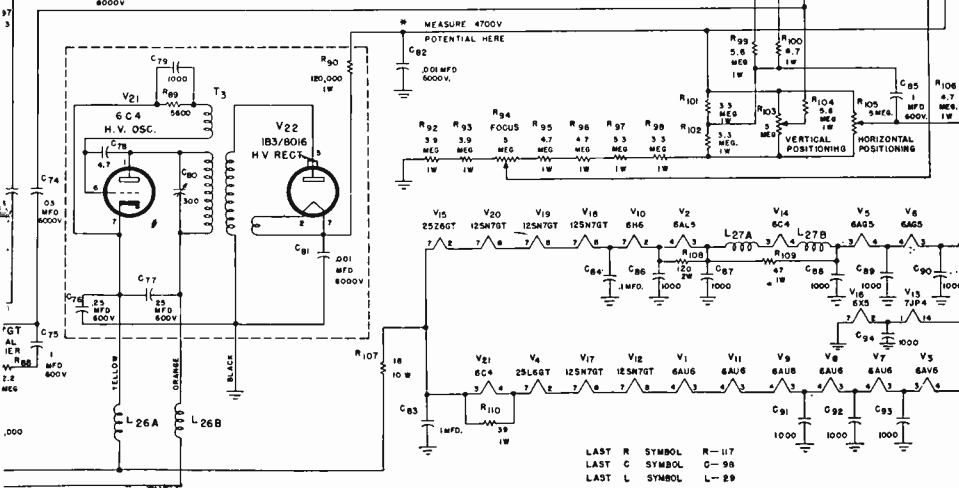
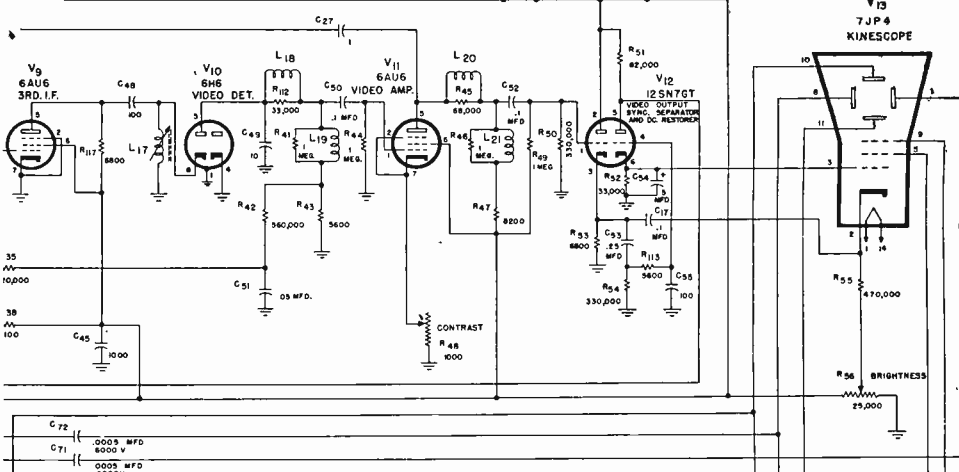
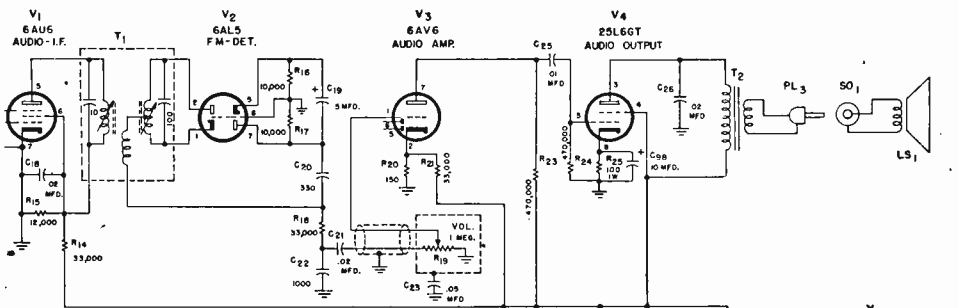
In addition to tube failure, condensers  $C_{63}$  and  $C_{64}$  sometimes break down. This can readily be detected by a lack of plate voltage on the vertical oscillator tube when voltage is available at the cathode of the 6x5 rectifier tube.

Sometimes it's impossible to obtain sufficient vertical sweep. In other words, no matter how you adjust the height control the picture will

# Schematic of the Hallicrafters Model T-54 Television Receiver







LAST R SYMBOL R-117  
 LAST C SYMBOL C-98  
 LAST L SYMBOL L-29

not cover the top and bottom of the picture tube. This is usually due to a defective vertical amplifier tube, although sometimes it's due to the fact that one of the resistors in the plate circuit of the vertical amplifier or vertical oscillator tube has changed value. This defect can be detected by checking the plate voltages on these two tubes and also by checking the values of the resistors used in the plate circuits.

The horizontal oscillator and horizontal amplifier are subject to the same defects that are encountered in the vertical sweep circuits. The most common cause of trouble is defective tubes and again new tubes should be tried in these circuits.

In addition to these defects you'll sometimes find it impossible to obtain sufficient width, and you'll notice that the picture has a tendency to fold over on the left side of the picture tube. Sometimes it simply becomes extremely bright on the left of the picture tube. This defect is due to the fact that the high voltage is too high and the condition can be corrected by adjusting the high voltage trimmer condenser  $C_{80}$  until the correct output voltage is obtained. This can be determined either by actually measuring the high voltage at the point indicated on the diagram or simply adjusting the high voltage oscillator until it's possible to obtain sufficient horizontal sweep without the fold over or bright line on the left of the picture tube.

The low voltage power supply in this receiver is comparatively trouble free. The electrolytic condensers used in the set are apparently of a very good quality and they give less trouble than the electrolytics in most AM-FM receivers on the market at the present time.

The selenium rectifier does give some trouble. This can be readily detected by checking the screen voltage on the 6AU6 tube used in the third video stage. If the screen voltage on this tube has dropped below 110 volts it is frequently due to a defective selenium rectifier. Usually the set will continue to operate even though the voltage has dropped somewhat, but the receiver will lack sensitivity. When this condition is encountered it's worthwhile to try a new selenium rectifier. The replacement unit should be capable of handling at least 200 milliamperes.

You'll notice on the diagram an 18 ohm 2 watt resistor marked  $R_{73}$ . This resistor is connected to the selenium rectifier. The manufacturer has recommended that this carbon resistor be removed and an 18 ohm 10 watt wire wound resistor be installed in its place. If you should have occasion to service any of these sets you'll find that the carbon resistor heats excessively and if the receiver has been in service for any length of time the resistor is pretty well charred.

In addition to this, the resistor marked  $R_{58}$  on the diagram frequently requires changing. This resistor is shown as a 3300 ohm 10 watt resistor on the diagram. In earlier models two 6800 ohm resistors were connected in parallel and used in place of  $R_{58}$ . These two resistors are located on the bottom of the chassis. The Hallicrafters Company has recommended that these two resistors be removed and a terminal strip be used to mount a 3300 ohm 10 watt resistor on top of the chassis in place of the two 6800 ohm resistors.

You'll find a hole already drilled in front of the picture tube socket to one side of the selenium rectifier. This hole can be used to mount the terminal strip for the resistor.

On the schematic diagram you'll notice four 1000 mmfd. condensers marked  $C_{42}$ ,  $C_{43}$ ,  $C_{44}$  and  $C_{45}$ . These condensers are separated by 100 ohm resistors. Frequently you'll find that these condensers break down. When they break down they usually destroy the selenium rectifier and also in sets using the 18 ohm 2 watt resistor in series with the selenium rectifier they burn out this resistor.

It's comparatively easy to tell which of these condensers is causing the trouble. For example, if  $C_{44}$  were defective then  $R_{38}$  would have a burned appearance whereas  $R_{36}$  and  $R_{37}$  would be undamaged. Similarly, if  $C_{43}$  was causing the trouble  $R_{37}$  and  $R_{38}$  would be burned, whereas  $R_{36}$  would be undamaged. In other words, the defective condenser can quickly be located without taking any measurements simply by examining the condition of these resistors.

A lack of sensitivity in this receiver is ordinarily due to low operating voltages which, as pointed out previously, is frequently caused by a defective selenium rectifier. However, in addition to low operating voltage, poor sensitivity is also caused by improper alignment. The alignment is quite broad, but nevertheless, on the higher bands especially, trouble is sometimes encountered.

The front end of this receiver is comparatively easy to align. You can align it simply by setting the fine tuning control in the center position and then adjusting the three trimmer condensers used on that particular channel. When aligning the receiver you should start by aligning the lowest channel in use in your particular vicinity.

Adjust the oscillator trimmer first, next the mixer, and finally the r.f. These adjustments should be made without touching the fine tuning control. The adjustment should be made for best test pattern reception.

The alignment of the i.f. stages is comparatively simple. To align the receiver, connect a vacuum tube voltmeter across the 5600 ohm resistor

marked  $R_{43}$  in the 6H6 video detector plate circuit. Connect the output from a signal generator to the receiver's transmission lines through two 150 ohm resistors. With the signal generator adjusted to 24 mc., adjust coil  $L_{17}$  for maximum output.

Next, adjust the signal generator at 24.7 mc. and adjust  $L_{16}$  for maximum output. With the signal generator at 22.9 mc. adjust  $L_{15}$  for maximum output and as a final adjustment tune the signal generator to 26 mc. and adjust  $L_{14}$  for best output.

Occasionally this alignment procedure does not work out. The set sometimes is so far out of alignment that it's impossible to obtain sufficient output to give an indication on the vacuum tube voltmeter.

In a case of this type you can start by feeding a signal of 24 mc. directly into the grid of the 6AU6 third i.f. stage. Then adjust  $L_{17}$  for maximum output. The next step is to move the signal generator connection to the grid of the second i.f. stage and feed a signal of 24.7 mc. into it. Then adjust  $L_{16}$  for maximum output.

Next, move on to the grid of the first i.f. stage and feed a signal of 22.9 mc. into it and adjust  $L_{15}$  for maximum output. Finally, you can probably feed the signal of 26 mc. directly into the transmission line and adjust  $L_{14}$  for maximum output. You should then carry the alignment procedure one step further by going back over the alignment of the set and carrying out the first alignment procedure outlined.

The sound i.f. can be very easily adjusted when a station is transmitting a test pattern. To do this, first adjust  $L_{23}$  for maximum output and then adjust the screw on the bottom of  $T_1$  for maximum output. The final adjustment is to adjust the screw on the top of  $T_1$  for best sound and minimum buzz.

Complaints will frequently be received of a loud buzz in the sound system. This is usually due to improper adjustment of the screw on the top of the discriminator transformer  $T_1$ .

Before attempting to adjust this transformer, the station should be carefully tuned in and best

sound should be obtained by adjusting the fine tuning control. Then the screw adjustment on top of the ratio detector transformer should be adjusted until the buzz is at a minimum. Frequently it will be impossible to completely eliminate this buzz as it is characteristic of most intercarrier sound systems such as used in this television receiver. However, it usually can be adjusted to a very low level so it will not be objectionable and in most cases not even noticeable unless trouble (overmodulation) occurs at the transmitter.

The schematic diagram shows a 10 mfd. 25 volt condenser used as the cathode by-pass condenser on the 25L6 output tube. Many of the receivers, particularly the older sets do not have this condenser in the circuit. The addition of this condenser is recommended because it results in a considerable increase in the sound level.

A fairly common complaint in this receiver is that the fine tuning knob is tight and it's practically impossible to turn it. Sometimes this is simply due to the fact that the control is binding and in a case of this type a few drops of fine oil on the shaft where it goes through the chassis bushing will usually eliminate this difficulty.

However, the shaft on the fine tuning control is soldered in place. On some receivers this shaft was not soldered exactly on the center. As a result, as the fine tuning control is rotated it moves off center and will strike the front plate of the receiver. Once this happens it is impossible to turn the control any further.

To eliminate this difficulty, the knob should be removed from the shaft and then the solder melted and the shaft re-centered.

Some complaints have been received that the receiver lacks sensitivity on the higher channels. The manufacturer has recommended that the .68 mmfd. condenser marked  $C_{35}$  on the diagram be changed to a 1.5 mmfd. condenser. This condenser is used to inject the signal from the local oscillator into the grid of the 6AG5 mixer stage.

Another fairly common defect in this receiver is failure of the local oscillator. When this occurs a raster will be obtained on the screen and noise



Courtesy "Radio-Electronics" Magazine

"Ah, Ah, Don't Touch That Dial!"

can usually be seen on the face of the picture tube. Sometimes noise can be heard in the speaker, but no stations can be picked up. The 6C4 local oscillator tube will almost always check good in a tube tester, but the replacement of this tube ordinarily clears up the difficulty.

The heaters of the various tubes used in the set are connected in series. Two series strings are used and these strings are brought together so that the current from both strings will flow through the 6X5 and 7JP4 tubes. If you notice that none of the tubes in the set light it's due either to a defective 6X5 or a defective 7JP4 tube or else (and this will be a coincidence) one tube in each of the series strings is open. Sometimes the 6X5 and 7JP4 tubes will fail to light and also one of the series strings will fail to light. This is due to a defect in the particular series string that does not light. If the 6X5 and 7JP4 tubes fail to light, it's simply caused by insufficient current flowing through these tubes due to one open filament string.

You'll notice that several of the tubes have resistors in parallel with their heaters. As a result, it's possible for these tubes to burn out and for the remaining tubes in the filament string to continue to light.

A discussion on servicing this receiver would not be complete without mentioning how the chassis is removed from the cabinet.

The first thing to do is to remove the knobs, which simply pull off. Next, remove the two screws located one on each side of the front panel. Then lift up the perforated top of the set and on the top of each side you will find another screw used to hold the front panel on. When these two screws are removed disconnect the plug going into the speaker and then remove the front panel leaving the picture tube and the rubber mask around the picture tube in place.

The next step is to remove the picture tube. This must be done carefully since the picture tube will break if it's twisted or accidentally struck on the chassis. Leave the rubber mask on the picture tube at all times, this will serve as additional protection and it provides convenient means of standing the tube up on end when it is out of the receiver.

To remove the picture tube grasp the tube close to the base with one hand and holding the socket with the other gently work the tube out of the socket. You might find it more convenient to use one hand to hold the tube around the base and use your thumb to work the tube socket back and away from the tube while using the other hand to support the face of the tube.

Remember when handling the picture tube that you cannot be too careful. Even a scratch on

the surface of the picture tube could cause it to collapse with destructive violence and send glass flying in all directions.

After the picture tube has been removed and placed in a convenient, safe spot, the four rubber feet that the receiver cabinet rests on should be removed. Once these four feet have been removed you'll notice on one side of the cabinet a portion of the safety interlock bolted to the side of the cabinet. The two bolts holding this portion of the interlock in place should be removed. Next, pull the antenna lead-in inside of the cabinet and slide the receiver out the front of the cabinet.

— n r i —

## Unchanging Humanity

What remains eternally the same is human nature and the human heart. That basic truth has been recognized by all the immortals, and because they presented life whole, and not in segregated chapters, they achieved their immortality.

Love, work, courage, endurance, endeavor, and achievement—those are the keys to the great human drama, the essence of its finest and most satisfying dream. Those who seek to ignore or belittle them find, after a time, that they are worshipping false gods, which have no power to satisfy the needs of soul or heart.

— n r i —

When a man is in earnest and knows what he is about, his work is half done.

The rule of my life is to make business a pleasure and pleasure my business.—*Aaron Burr*.

Be not afraid of enthusiasm; you need it; you can do nothing effectually without it.—*Goethe*.

Every great and commanding movement in the annals of the world is a triumph of enthusiasm.

— n r i —

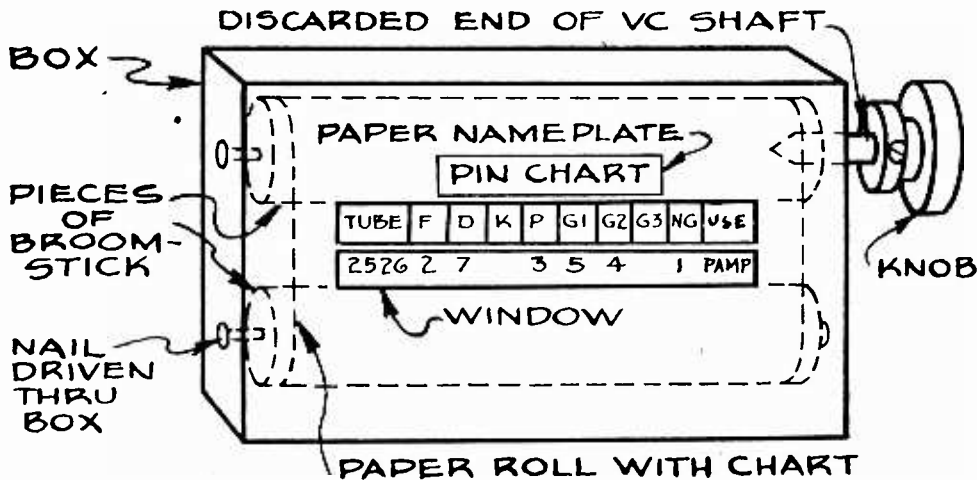
## 1948—A Great Year for Television

TELEVISION BROADCASTING IN THE UNITED STATES ENJOYED ITS GREATEST YEAR DURING 1948 as the nation became intensely television-minded and television itself became a by-word in every home from coast-to-coast. Television stations climbed from a mere 16 in 1947 to 49 in 1948 and video receiver production which hit what was considered the remarkable pace of 30,000 a month in January 1948, soared to 122,300 by November of 1948. Continued expansion of transmission line facilities, video stations, and video networks should be among top events for the year of 1949.

# Convenient Tube Base Chart For Easy Reference

NRI Graduate Alexander Remer, of New York City, N. Y. submitted an idea of his to the "Idea Department" of the magazine *Sylvania News*. His idea was accepted for publication and appeared in a recent issue of that magazine. The Editor of

Remer is an active member of the New York Local Chapter of the NRI Alumni Association. He says that several of their members have built this roll tube chart, and are saving a great deal of time in their service work through using it.



NRI's *National Radio News* felt that this gadget would be of interest to our readers, too.

Remer found that he lost time and became irritated now and then because in checking voltages or taking resistance measurements at tube prongs, he had to stop to make sure that he was touching the right prongs. In order to overcome this handicap, Mr. Remer made a simple device which can be used as a quick reference guide to the pin locations of a tube. The sketch above illustrates the gadget. It can be made inexpensively from discarded materials from around your shop.

In the actual working model, one end of each of the rollers was grooved with a round file. A belt made of dial cord and a spring connected the two rollers together, so that both rollers turn simultaneously in either direction. Another scheme would be to construct a knob on one end of each roller. One knob can then be used in turning the chart in one direction, and the other knob for turning the chart in a reverse direction.

Remer also wired a small bulb, switch, and two flashlite cells into the box to illuminate the chart when in use.



Courtesy "Radio-Electronics" Magazine

"I Think The Dial Cord Is Too Tight"

Page Twenty-one

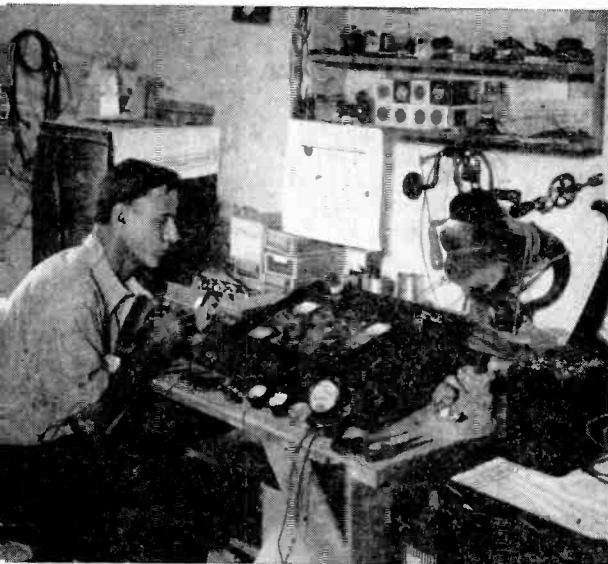


Photo above shows the original shop of Graduate Curtis Stath. This photo was taken in 1934, several years after Stath's graduation from NRI.

This recent photo shows Graduate Stath in the modern service section of the "Radio Hospital" he now owns and operates.



# NRI Graduate Curtis Stath of Fort Madison, Iowa Owns and Operates A Modern Radio Hospital

Curtis Stath of Fort Madison, Iowa, sent us a recent photograph of his Radio Hospital. We went to our files and there we found another photograph which Mr. Stath had sent to us in 1934. The contrast was so pronounced we thought this might make a nice short story for NR News.

Mr. Stath started his Radio career in a very modest way. His experience is typical of so many NRI Graduates. For some time he did only spare time Radio work. He made his first big forward move when he accepted the position of Service Manager for a prominent Radio Dealer in his home town, Fort Madison, Iowa. The photo (upper left) shows Mr. Stath at work in 1934. The shop is a good illustration of those in common use during the days of servicing regenerative and T.R.F. Receivers.

At that time Mr. Stath wrote us as follows: "I am getting along fine in Radio, making plenty of extra money. I am Service Manager for a Radio Dealer in Fort Madison."

By 1939 Mr. Stath was in business for himself. "I have opened up an up-to-date Radio Hospital, and will devote all my time to service work."

Came 1946 and a letter from Mr. Stath in which he told us he now had a thoroughly modern shop, equipped with the very best, up-to-date instruments. "I owe all this to NRI and I advise all young men interested in Radio to take your course."

Recently came the photograph on the left which is an indication of the substantial business establishment Graduate Stath has built up for himself. We are mighty proud of this typical NRI Graduate and his progress with his "one man shop."

# Our Cover Photo

## CIVILIAN WALKIE-TALKIES ANNOUNCED BY THE CITIZENS RADIO CORPORATION

*First portable transceivers with F.C.C. approval  
for public use are now in pilot plant production.*

**Cleveland, Ohio.** The first portable radio transceivers for public use between homes, automobiles, offices, plants, farms, and many other person-to-person radio telephones applications are now in pilot plant production according to Al Gross of the Citizens Radio Corporation which has received the first F.C.C. type approval for equipment to be used on the 465 megacycle band allocated for civilian use.

The equipment, according to Gross, is one fourth the size of the famous wartime, walkie-talkie, and is the result of more than two years of research and engineering in which many new techniques, including subminiature tubes and the use of silver-on-ceramic circuits, have been perfected for practical push-button, person-to-person radio communication for public use.

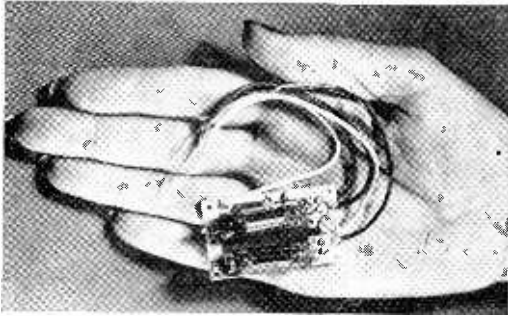
Experimental units, he said, have been given exhaustive field tests between auto and home; home and office; boats and shore; planes and ground; person to person on city streets. They have also been tested for communication between cemetery ground keepers; hunters; mountain climbers; farm and field; and surveyors. He also predicted that this revolutionary type of personal two-way radio will soon become a standard means of eye-witness reporting of sports and spot-news events to radio and television audiences and newspapers.

The transceiver, two of which are required for person-to-person air contact, is housed in a tiny case measuring only 6" x 2 $\frac{7}{8}$ " x 1 $\frac{1}{4}$ " topped by a small folding antenna. This pocket-sized radio station includes all necessary equipment except a tiny headphone and batteries carried in a separate case about the size of a miniature camera.



Compact and lighter than a pocket camera this is the new citizen's radio station developed by the Citizens Radio Corporation of Cleveland, Ohio for person-to-person communication. The transceiver has a range of several miles, may be carried anywhere since it weighs only two-and-one-half pounds complete. Receiver and transmitter shown above includes microphone, antenna and four Sylvania subminiature tubes for oscillator and super regenerative receiver.

Development of the citizen's radio, Gross said, was made possible largely through the availability of subminiature tubes manufactured by Sylvania Electric Products Inc. and the cooperation of Sylvania's advanced development laboratories. However, he admitted that many practical design problems, without which, F.C.C. type approval CR-401 could not have been obtained, were



Receiver audio section of new transceiver developed by the Citizens Radio Corporation of Cleveland, Ohio embodies new silver-on-ceramic circuit techniques. This audio section uses two 1V5 Sylvania subminiature tubes.

solved in the laboratories of the Citizens Radio Corporation.

He described the model 100-B citizen's radio as a transceiver for Class B stations only; operating at 465 mc., tolerance 0.4; input 3 watts; emission A-3 with 30% maximum modulation. The transmitting section uses a Sylvania 6K4 subminiature oscillator and the receiver is super regenerative using three Sylvania 1V5 subminiature tubes. The transceiver weighs only 11 ounces including antenna and total station equipment, including batteries is only two-and-one-half pounds.

NRI cannot give further information on this equipment. Address inquiries to the Citizens Radio Corporation, Cleveland, Ohio.

### TELEVISION BOX SCORE

Stations Operating .....	51
Construction Permits Granted .....	73
Applications Pending .....	310

(AS OF JAN. 6, 1949)

## A Mystery Play in Three Acts

### "THE UNIDENTIFIED PAYMENT" OR "WAS THIS YOURS?"

#### ACT I

NRI student (we'd like to know who) in a hurry to send a payment, slips a five dollar bill in an envelope, stamps and mails it—no name, no address, no student number—not anything to identify the person who sent that payment.

#### ACT II

Young lady employee of National Radio Institute receives aforementioned payment postmarked only "El Paso, Texas;" shrugs her shoulders wearily and puts it aside with other similarly unidentifiable payments in her collection.

#### ACT III

(One month later)

Student who sent that payment writes in and irately accuses NRI of all sorts of carelessness, dishonesty, etc. because his latest bill did not show credit for that payment.

**MORAL:** Be sure to write your full name, complete address, *and* student number on the envelope and with every payment, lesson, letter, piece of mail, etc. you send us. It's the only way we can give our students the prompt and efficient service we want them to have.

— n r i —





# ANTENNA CONSIDERATIONS FOR HI-LO BAND TELEVISION RECEPTION

*Reprinted through the courtesy of General Electric,  
from their Electronic Television Service Bulletin  
RSM-3, No. 23.*

WITH the advent of many high frequency channel (Channels #7—#13) television stations, numerous complaints have arisen in the field concerning the operation of the original antenna installation on all channels. The purpose of this bulletin is to point out some of the reasons why the original antenna installation has proven inadequate in many instances for hi-lo channel reception and what measures can be taken to correct this condition.

Listed below are typical questions received from the field concerning this problem with their answers which we believe will clarify the situation.

## 1. IS A STANDARD FOLDED DIPOLE ADEQUATE FOR SATISFACTORY HI-LO CHANNEL OPERATION?

The folded dipole is most widely used for television reception because of its broadband characteristics. A folded dipole cut for resonance at about 65 mc will provide a very satisfactory impedance match between transmission line and antenna for all television channels, both high and low frequency. This is the first requisite for broadband operation. As a result, this antenna will provide essentially uniform transfer of signal from antenna to receiver input for all channels, which results in satisfactory reception possibilities from all sections.

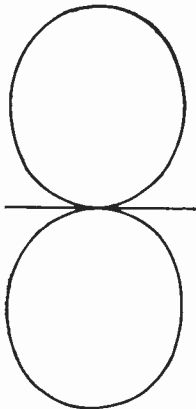


FIG. 1

If signal transfer were the only consideration involved in the choice of an antenna, there would be little or no problem. However, another very important characteristic of all antennas is directivity. Due to this characteristic, a stand-

ard folded dipole may or may not provide satisfactory hi-lo channel reception, depending upon local conditions. Figure 1 shows an approximate field pattern for a 65 mc antenna operating in channel #1 through #6. This indicates the optimum signal pick-up on these low frequency channels is broadside to the antenna. Thus, for any one station on a low frequency channel, the broadside of the antenna would be oriented at right angles to the direction of the station.

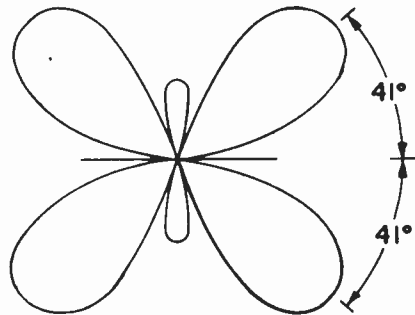


FIG. 2

If there are a number of low-frequency channels located close together so that the relative directions of the signal is approximately the same, orienting the antenna for anyone of these stations will be satisfactory for the others. However, if stations are separated to any extent, a compromise in orientation must be made. Assuming the absence of multi-path reception and the installation is made within the service area, satisfactory signal pick-up for the low frequency channels can be obtained in the majority of cases.

When a folded dipole cut for 65 mc is used for reception in the high frequency channels (#7—#13), the directivity pattern changes to that shown in Figure 2. This indicates that the opti-

mum signal pick-up on these high frequency channels is at approximately  $40^\circ$  to the broadside of the antenna for the major lobes with minor receptive lobes at right angles. Therefore, if the high channel stations are located such that the signal arrives from the same general direction as the low frequency channels, then when the antenna is oriented for best reception on low frequency channels, the signal pick-up on the high frequency channels will be poor. This is shown by combining Figures 1 and 2 as in Figure 3. From Figure 3 it will be seen that there is an overlapping shaded area that will provide optimum reception on all channels (#1—#13). If the antenna is reoriented so that any one of these shaded lobes shown in Figure 3 is pointed in the direction of the station, satisfactory reception should be obtained if all stations are located so the signals come from the same general direction. *From the foregoing, it is evident that antennas installed prior to the advent of the high frequency channels, must be re-oriented.*

Where the high and low channel stations are located so that their signals do not arrive from the same general direction, the folded dipole by itself may be inadequate.

## 2. IF ORIENTING THE ANTENNA DOES NOT GIVE ADEQUATE RECEPTION, WHAT MUST BE DONE?

The obvious answer to this question is to have separate antenna systems (including separate transmission lines) for the high and low frequency channels. Unfortunately, this requires the use of two transmission lines and a method of switching antennas. However, a compromise can be made by combining the signals from these two antennas into one transmission line without serious loss in efficiency. This can be done by combining our standard G.E. Folded Dipole UKR-005, which is cut for the low frequency channels, with our High-Frequency Adapter UKT-002, which is cut for the high frequency channels. Provision is made so that each antenna can be oriented independently of the other.

## 3. WHAT ABOUT THE EFFECT OF USING REFLECTORS ON HI-LO RECEPTION?

The use of a reflector will: (1) increase signal pick-up; (2) increase the front-to-back ratio; (3) make directivity somewhat critical.

Where necessary the reflector may be used to increase signal pick-up and/or decrease pick-up of unwanted signals, such as noise. The only objection to the use of reflectors for hi-lo reception is that the directivity of the antenna becomes sharper, making orientation more critical.

## 4. WHAT ABOUT THE USE OF ANTENNA ARRAYS FOR HI-LO RECEPTION?

Page Twenty-six

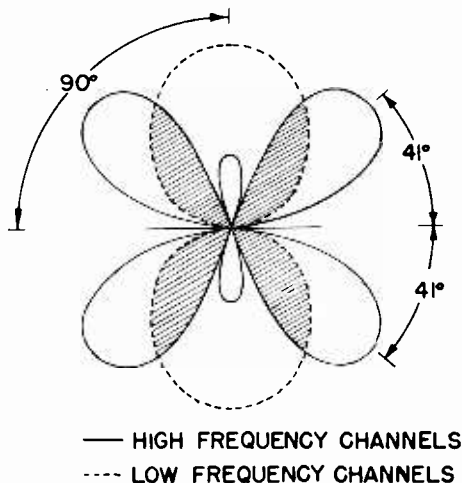


FIG. 3

The majority of antenna arrays are designed for a single, or, at the most, two channel operation. These make use of a matching section between elements of the array which are critical as to frequency and, thereby, limits the frequency range of the antenna.

An array, G.E. UKR-007, has been designed which does not require a matching section and has good frequency characteristics over Channels #2 thru #6. However, this array will not give satisfactory reception on the upper channels, due to very poor directivity characteristics over these channels. In general, arrays are used only in areas where the signal is very low, where reception at best would be from one or two stations and is, more or less, a specialized installation problem.

## 5. SHOULD YOU CONTINUE TO INSTALL STANDARD INSTALLATIONS OF A SINGLE DIPOLE WHEN IT IS KNOWN THAT A NEW STATION ON THE HIGH CHANNELS IS SCHEDULED FOR OPERATION IN THE NEAR FUTURE?

Yes, under the following conditions: (1) Where the receiver is located in the primary service area for all stations received; (2) Where multi-path or reflected signals are not present; (3) Where high and low channel signals arrive from the same general direction.

Where the above conditions are not met, a standard folded dipole will not prove adequate and it will be necessary to use a more complex antenna system, using the high frequency adapter as discussed previously. Also, it may be necessary to use reflectors in conjunction with the antenna system.

# HOW TO GET ALONG WITH OTHERS

By

DR. JAMES F. BENDER, DIRECTOR

THE NATIONAL INSTITUTE FOR HUMAN RELATIONS

*copyrighted — all rights reserved*

DO you agree that *feeling hurt* causes more preventable unhappiness than any other attitude? How often we meet the thin-skinned man or woman who can't take it!

Hurt feelings are reported everywhere: in offices, workshops, homes. Because they are so widespread, each one of us may wish to understand what is in back of the hurt feeling. That way, we protect ourselves from becoming a sensitive plant. Through our deepened understanding we can also help others grow a thick skin.

People whose feelings get hurt all the time take casual remarks too seriously. They put more value on the fleeting word than the enduring deed. Ever know a sarcastic sort of a fellow with a generous heart and a helping hand? There are many like him—ashamed of their tender feelings. So they hide them under gruff words and kind deeds. Emerson used to say, "What you are speaks so loud, I can't hear what you say." People who get along well with others never get unnecessarily hot about a few barbed words.

Hurt feelings become the rule with those who expect the worst rather than the best of others. You perhaps remember a gracious, kind, and intelligent teacher whose classes were always well-

behaved. Why? She expected her youngsters to be well behaved. And then perhaps you sat under one who didn't trust her students. She had to scold a lot, simply because she brought forth resentment.

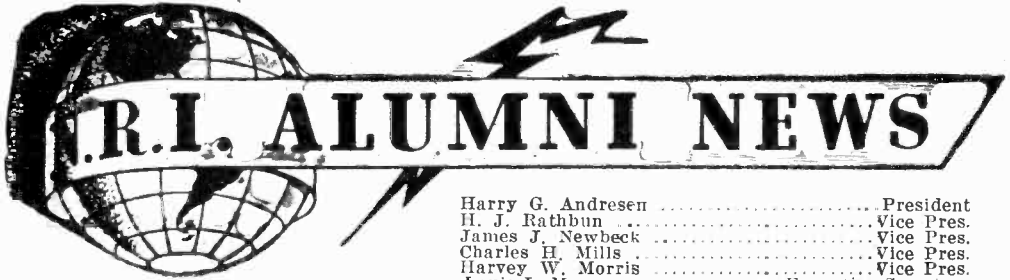
Men and women whom we vote into positions of responsibility very rarely feel hurt. They like people and want to be liked. They forgive readily.

They don't hold grudges. They know that leadership cannot thrive on hurt feelings. One of the best ways to get over the chronic hurt feeling is to study and follow in the footsteps of those whom we admire most.

A fourth way is to chuckle more and frown less. To take ourselves less seriously—to be humble of spirit—to have faith in human nature; these things define the robust sense of humor. A beautiful prayer ends with:

"Give me a sense of humor, Lord.  
Give me the grace to see a joke.  
To get some happiness from life  
And pass it on to other folk."

There are many other ways to squelch the impulse to feel hurt, but these four do as well as any.



# R.R.I. ALUMNI NEWS

Harry G. Andresen ..... President  
 H. J. Rathbun ..... Vice Pres.  
 James J. Newbeck ..... Vice Pres.  
 Charles H. Mills ..... Vice Pres.  
 Harvey W. Morris ..... Vice Pres.  
 Louis L. Mienne ..... Executive Secretary

## A Typical Alumni Chapter Meeting



A familiar scene at local Chapter meetings. Here we see some of our Chicago members huddled around a radio while one of the members probes for the trouble. That's our new Alumni President, Harry G. Andresen, third from right.

# CHAPTER CHATTER

## Chicago Chapter

In Chicago Chapter things are coming along nicely under the leadership of Chairman Albert Horvath. This is the home chapter of Alumni President Harry Andresen. Harry is always active in Chapter affairs.

Joe Oehmann made a gavel for the Chapter. His friend, Frank Lucas made the presentation speech. Frank laid it on while Joe beamed. Nice talk. Fine spirit. Very much appreciated by the chapter.

Executive Secretary Menne was a visitor. Andresen was sworn in by Menne and everybody gave



Another picture of Chicago Chapter on the occasion when NRI Alumni President Harry Andresen was sworn in by Lou Menne.

the new President a big hand . . . Fred Korn will put some more howls into his howling good radio set and then lead the discussion in methods to take them out. Fred Korn is quite a photographer. Please note some pictures in this issue.

Chairman Horvath gave us a fine talk on "The A.C. Power Pack." At another meeting Chairman Horvath discussed Power Supply Problems. This led to a lively discussion and many members took part. The blackboard was put to good use. This was a very interesting meeting.

We have had some visitors recently. They are always welcome . . . We meet once a month on the second Wednesday at 2759 South Pulaski Road . . . Our ever efficient Secretary, Louis Brodhage, 4820 North Kedzie Avenue, Chicago, will be glad to have letters or phone calls regarding Chicago Chapter matters.

## Detroit Chapter

Officers for the year 1949 were elected at Detroit Chapter. The new Chairman is Robert Mains . . . Vice Chairman is Clarence McMaster, Financial Secretary, Harry R. Stephens, Recording Secretary, F. Earl Oliver, Financial Committee, Charles H. Mills and E. C. Baumgarth, and Librarian, Floyd Buehler . . . Bob Mains will make an excellent Chairman. He is a very capable Radio man, a good administrator. He will get results. He is quite a magician too. A year ago gave a wonderful exhibition at our party at the Copacabana Club . . . Clarence McMaster was a keynoter at our last Windsor party . . . Harry R. Stephens remains in our official family by taking over the job of Financial Secretary and F. Earl Oliver will do the chores of Recording Secretary . . . Financial Committee made up of Charles H. Mills, our new National Vice President, and ever faithful E. C. Baumgarth. Good hands there . . . Librarian is Floyd Buehler who does so much for our Chapter and who makes many of our talks. A mighty fine slate of officers . . . Looks good for 1949.

Charlie Mills was sworn in as Vice-President by F. Earl Oliver, the retiring Chairman. After that, refreshments were served and a "good time was had by all" . . . Philco Television receivers will be discussed at our January 28 meeting. Some of the experts from their Service Department are to conduct this meeting. We are looking forward to it and will make a report in the next issue of the News.

Meetings are held on the second and fourth Friday of each month at Electronics Institute, 4th floor, 21 Henry Street in Detroit.

## Baltimore Chapter

The Baltimore members cut up a little bit too. They held their semi-annual party, just before Christmas, and it was a success. Although the attendance was not up to expectations the spirit was certainly there. The members met first at the regular place of meeting and then moved to Cook's Tavern for a very tasty dinner . . . Medallions were presented to retiring National Alumni President Ernest W. Gosnell as well as to our still Vice President H. J. Rathbun and Chairman P. E. Marsh. The Medallions were presented by Executive Secretary Menne . . .

Annual election was held and Percy Marsh was re-elected Chairman. Vice Chairman is Cliff M. Whitt, Secretary, Arthur F. Lutz, Treasurer, Elmer Shue, Librarian, J. Hasselberger and Sergeant-at-Arms, George Phillips. Have a good pro-

gram on Television lined up for the near future . . . Better not miss any meetings this winter . . . H. J. Rathbun, our National Vice President, gave an interesting talk on Auto Radio Power Pack . . . A recent visitor was F. O. Anderson . . .

## Philadelphia Chapter

The new Chairman in Philadelphia is Robert Meili, a very faithful member who deserves the honor. Harvey Morris who said he was willing to give the "honors" to someone else this year has been Chairman for a long period. Harvey, however, has been elected Vice Chairman and will be at the side of our new Chairman right through the year. Recording Secretary is Robert L. Honnen, an office he held last year. He is a very efficient and energetic worker and the Chapter members are happy to have him continue in this office . . . The Financial Secretary is Morris Segal who tried to get out of the job this year by voting for his opponent but the members would have none of it. Segal is a very good man in his job . . . The old Standard Bearer, Charles A. Fehn was re-elected Treasurer . . . He is as strong as the Rock of Gibraltar and for many years has held one office or another. In fact, Charlie has held every office in our Chapter and is a past President of our National Organization. For many years previous to being elected President Charlie was Vice President . . . C. Lutz is Librarian and our former Secretary, Clifford N. Hill, who did such a fine job, has been elected Sgt.-at-Arms.

We still hold our Television class, led by Harvey Morris. Members who miss this part of the meeting certainly miss a great deal. Any NRI students in this area who would like to hear these lectures are very welcome at our meetings. All questions are answered by the leaders. We are learning a great deal about Television from Harvey Morris who is a Specialist in this subject.

Recently we had the honor of having present with us Lt. Cmdr. Howard C. Arnold, U.S.N.R. He is an NRI Graduate and liked our Chapter so well he decided to join . . . Other new members are Francis Sereno, Raymond Weidner, Charles E. Lutes, Robert H. Laurens, Norman R. Enker, Michael J. Dutko, Robert Arnold, Joseph G. Foy, Walter Giberson, Raymond M. Haines, Jr., and George M. Gibson. We welcome these new members . . . We are always glad to have visitors whether graduates or students. We meet at 4510 Frankford Avenue, second and fourth Monday's, eight P.M. in Philadelphia.

## New York Chapter

Over in New York things are moving serenely as always. Chairman Wappler doing his usual

good job ably assisted by Lou J. Kunert, Alex Remer, Ralph Georg, Dick Patten, Ralph Baer and Frank Zimmer, to mention just a few.

Alex Remer spoke on Trouble Shooting in the I.F. Section of a Receiver . . . Dick Patten delivered a very amusing talk on Servicing his own Television Receiver . . . Ralph Georg spoke at another meeting on the subject of the I.F. Section of the Receiver. After hearing both Mr. Baer and Mr. Georg our members feel they know a good deal more about this subject than they did before these good talks . . . A new speak-



New York Chapter in session. Notice the interest being displayed while Chairman Wappler spoke.

er, one of our members, is Mr. M. Soyka who comes from Newark and who spoke on Servicing . . .

We always conduct our Question and Answer Forum led by Alex Remer . . . Ralph Baer, as previously mentioned, has been very active in our Chapter. We are happy indeed to have Ralph back with us. Ralph has been taking some post graduate work but he is now able to attend meetings regularly again. A very interesting speaker and well versed on Television . . . Chairman Bert Wappler not feeling too well these days. Missed a meeting recently. Vice Chairman Remer presided . . . Wappler has been running a temperature and has the doctors puzzled . . . Probably working too hard.

Held our annual election and all officers who served in 1948 were re-elected which is certainly a compliment . . . New York Chapter meets on the first and third Thursday of each month at St. Mark's Community Center, 12 St. Mark's Place—between Second and Third Avenues, New York City. Visitors are always welcome. Come to see us. You will find fifty or sixty fellow NRI men present at each meeting. You will enjoy this fellowship and you are sure to learn something about Radio.

# Here And There Among Alumni Members

Roy L. Gallagher reports that he is successfully handling the job of studio engineer with Station WMCK, McKeesport, Pa. He's been in Radio for the past five years since graduating from NRI.

— n r i —

One of our young graduates, Eugene Linderkamp, from Rockford, Iowa, reports fine progress. Eugene is now only 19 years old and one year out of high school. He has a full time Radio servicing and Public Address business. Averages as high as \$100 per week.

— n r i —

Graduate Lyndon E. Wilcox of Watervliet, New York is employed by the RCA Service Company as a Television Technician. We are proud to hear him say that his NRI training qualified him for this work.

— n r i —

Sounds like an interesting job Alumnus Robert Laurens has with the Electronic Computer Corp. Norwood, Penna. He has a real opportunity to advance with the company.

— n r i —

During the past nine years, John F. Monath, Jr., of Baltimore, Md., has made excellent progress. He has progressed from a machine shop to an Army Civil Service job and doubled his income. He also mentions having recently changed his Naval Reserve rating from Boatswain Mate to Electronic Technician.

— n r i —

Graduate Lloyd A. Woodyatt, of San Diego, Calif., writes to inform us that he is now home and settled after an extensive career at sea. He is very much interested in further training in Radio Communications.

— n r i —

A recent graduate, Lawrence Childers, is serving in the Navy aboard the USS Curtiss (AV-4). He has recently been transferred from the 2nd division on his ship to the "E-R" division, which is a real "break" for him.

— n r i —

On January 15, Clive W. Keemer opened the Keemer Radio Service on the main street in Asheville, N. C. He feels it is a good location. We wish Graduate Keemer the best of luck.

— n r i —

William E. Copeland, of Cleveland, Ala., now has a fine position as a Radio repairman in his home town. Mr. Copeland says, as he looks forward into the field of Radio as a growing industry, he gives thanks to NRI for his good fortune.

Television is the big interest of Graduate William H. Danner. Danner has a service business in Tatamy, Pa. He's been selling and servicing Hallicrafter TV sets with good results. We enjoy hearing from all NRI Graduates who are selling, servicing, or experimenting with Television.

— n r i —

A graduate (name undisclosed) recently wrote us about a T.V. complaint as follows: The customer complained that the picture had disappeared, and some black smoke came from the back of the cabinet. The customer said that since many electrical appliances carry the notice "This appliance may smoke somewhat when first turned on," he disregarded the smoke, thinking

it was only due to the "newness" of the T.V. set. Finally the smoke did disappear, and tests showed a broken down oil-filled paper condenser, explaining the black smoke. Also, the linearity control was burned out as a result. Maybe we should emphasize to customers that T.V. sets do not smoke even when new!

— n r i —



Canadian Alumnus, Richard B. Earl, of Portage La Prairie, Man., Canada, now owns the

largest electrical store in his city. Business is steadily increasing, and he now has a staff of five people. Radio and appliance sales are handled along with service. Earl still thanks NRI for his start.

— n r i —

W. R. Nichols, Jr., Chief Engineer of the Alaska Broadcasting Company still finds time to write us occasionally. He has just completed construction of the fifth station of the Alaska Broadcasting Co. Says he has never been so busy before!

— n r i —

Interesting letter along Television lines from Charles E. Sears, who is a member of the Engineering staff of the Florida Broadcasting Co., Jacksonville, Fla. Says his company has been granted a T.V. construction permit, and they expect to begin T.V. construction soon.

— n r i —

Graduate Harold Sedgwick, Raynham, Mass. has all latest T.V. test equipment. Says he is doing swell, and will send a photo of his new equipment soon.

— n r i —

Joseph Travers has opened a new business in Asbury Park, N. J. For the time being Travers expects to specialize strictly in Radio and Television servicing.

# NATIONAL RADIO NEWS

FROM N.R.I. TRAINING HEADQUARTERS

Vol. 13 February-March, 1949 No. 7

Published every other month in the interest of the students and Alumni Association of the

NATIONAL RADIO INSTITUTE  
Washington 9, D. C.

The Official Organ of the N. R. I. Alumni Association.  
Editorial and Business Office, 16th & You Sts., N. W.,  
Washington 9, D. C.

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

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

## Index

Article	Page
Editorial .....	2
How to Cure Oscillator Troubles in Superheterodynes .....	3
How to Read the Condenser Color Codes ..	8
Servicing the Hallicrafters Model T-54 Television Receiver .....	14
Our Cover Photo .....	23
Antennas for Hi-Lo Band Television Reception .....	25
How to Get Along with Others .....	27
NRI Alumni News .....	28
Alumni Association Local Chapter News ..	29
Here and There Among Alumni Members ..	31

**NATIONAL RADIO NEWS**  
16th & U Sts., N.W., Washington 9, D. C.  
Published every other month by  
National Radio Institute

FOR:

Sec. 562, P. L. & R.  
U. S. POSTAGE  
1c PAID  
Washington, D. C.  
Permit No. 7052