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How to Service Three-Way Portable Receivers

If I Were a Serviceman

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Harvest Time

It means a lot to the farmer, harvest time.

It is toward the harvest, when he will receive the reward for his labors, that he works and sweats in the broiling fields all summer long.

And his reward, the abundance of his crops, will be in exact proportion to his labor in planting and caring for his fields.

There are other "harvests" than those of crops. In fact, there are "harvests"—or their absence—throughout the lives of everyone of us. Just as with the farmer, the abundance of our crops is in exact proportion to our effort; we "reap as we sow." If the farmer is lazy, careless and indifferent in sowing and tending his fields, at harvest his crops will be poor and scanty. So, too, with us. If we are lazy, careless, and indifferent in our efforts, our "crops"—our rewards—will be poor and scanty.

We all know this to be true. We all know that you can't "get something for nothing," that you can't command great rewards in return for poor or little effort. Yet many of us forget it at times or have become so lazy through habit that we can't make an "about-face" all at once, even when we do remember it.

It's therefore up to you and to me to keep it ever before us that we are going to "reap as we sow," and that we must "sow" to the very best of our ability in order to earn a harvest worth having.

E. R. Haas,
Executive Vice President.

How To Service Three-Way Portable Receivers

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Supervisor of Training

THE name three-way portable is given a certain class of receiver because it can be operated anywhere—in your home, in a train, in a row boat or while walking down the street. This unique ability to operate under widely varying conditions is due to the design of the receiver which permits it to obtain its operating voltages from any 110-volt a.c. or d.c. power supply or if no commercial power supply is available, from self-contained batteries.

You are already familiar with the power supply circuits used in a.c.-d.c. receivers. In these sets heater type tubes are used with their filaments in series so they can obtain their heater current from the power line. It would be possible to use 6.3-volt tubes with a switching arrangement to place the filaments in parallel for battery operation but this would require the use of a 6-volt storage battery for filament operation and any set which used a 30 or 40 pound A battery certainly could not be classed as a portable.

The light-weight battery requirements dictated the use of low-drain, low-voltage filament type tubes. These tubes have such a low current drain that their filament power can be derived from the B supply section of a slightly modified a.c.-d.c. power supply.

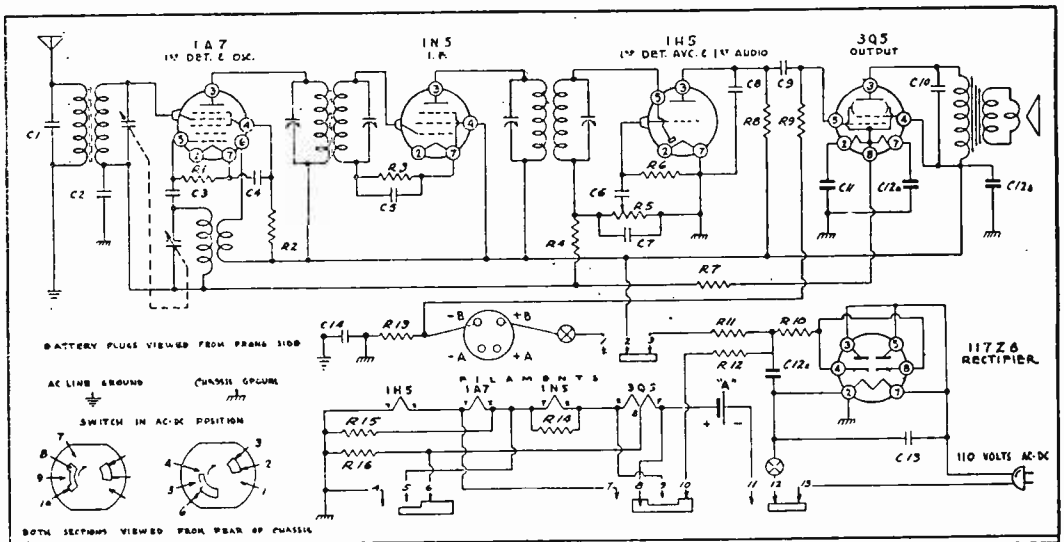
A typical three-way portable receiver is shown in Fig. *1*. At first glance the switching system which permits operation from either power line or from batteries looks quite complicated. However, when broken down, as illustrated in Fig. *2A* and Fig. *2B*, the method of operation from the power line or from batteries becomes easier to understand.

In Fig. *2A* the actual electrical circuit for battery operation is shown. For simplicity the switches which make the circuit changes from one type of operation to the other have been omitted. The only switches shown, SW_1 and SW_2, correspond to the crossed circle $\oplus$ switches on the diagram. These are the ON-OFF switches, mounted on the volume control. Notice that in Fig. *2A* all of the tube filaments are connected in parallel and are supplied with voltage from a 1.5-volt A battery. The filament of the 3Q5 can be supplied with either 3 volts or 1.5 volts. In the latter case, pins 2 and 7 are connected together and pin 8 is used as one of the A leads. This places both halves of the 3Q5 filament in parallel and is the connection always used with a single 1.5-volt A supply.

Notice that on battery operation SW_1 connects A— to the chassis ground directly. B— connects to the chassis ground through R_{13}. By examining the control grid return of the 3Q5 in Fig. *1* you can see that on battery operation the voltage developed across R_{13} biases the 3Q5 tube.

Switch SW_2 is employed only on battery operation and serves to disconnect the B battery when the receiver is turned off. This is necessary, for otherwise the B battery would slowly discharge (through the leakage afforded by electrolytic condenser C_{12b}) if the battery were constantly left in the circuit.

Fig. *2B* shows the arrangement for a.c.-d.c. operation. The rectifier filament is directly across the power line. The filaments of the other tubes are in series and are fed through current-regulating resistor R_{12}. This resistor with condenser C_{12a}



RESISTORS

NO	OHMS	WATT	NO	OHMS	WATT
R1	200,000	1/2	R10	30	1/2
R2	50,000	1/2	R11	3,500	1/2
R3	5,000 000	1/2	R12	2,600	6
R4	3,000 000 VOL CONT	1/2	R13	440 - 10%	1/2
R5	1,000 000	1/2	R14	360	1/2
R6	15,000 000	1/2	R15	300	1/2
R7	10,000 000	1/2	R16	3,000	1/2
R8	1 000 000	1/2			
R9	2 000 000	1/2			

CONDENSERS

NO	CAPACITY (MFD)	VOLT	NO	CAPACITY (MFD)	VOLT
C1	.00005	MICA	C10	.002	600
C2	.05	200	C11	100.	10
C3	.00005	MICA	C12a	100.	25
C4	.01	400	C12b	50	150
C5	.001	600	C12c	30.	150
C6	.001	600	C13	.05	400
C7	.00025	MICA	C14	25	200
C8	.00025	MICA			
C9	.01	400			

Fig. 1 Continental Model E-5

also acts as a filter, smoothing out the filament current so it is pure d.c. The control grid return of the 3Q5 is still made to the chassis ground through R_{13} in Fig. *1* but now no d.c. current flows through this resistor and there is no d.c. voltage across it. However, the voltage across the filaments of the 1H5, the 1A7, the 1N5, and half of the 3Q5 filament serve to bias the 3Q5 tube.

Notice the various shunt resistors in the filament circuit; R_{15} is across the filaments of the 1H5

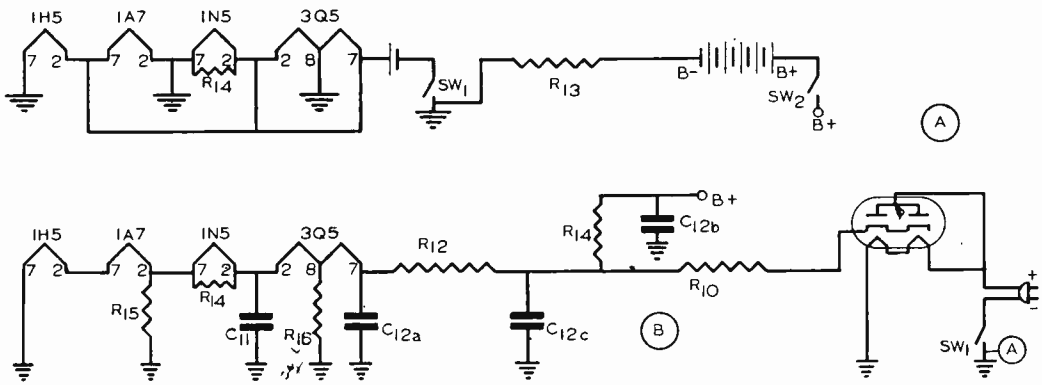


Fig. 2

and 1A7 tubes, R_{14} is in parallel with the filament of the 1N5, and R_{16} is in parallel with all the tube filaments with the exception of section 8-7 of the 3Q5.

In receivers using a series string of indirectly heated cathode tubes this would never be done if the filaments required the same amount of current because the same current would flow through each filament.

In Fig. 2, however, the plate and screen currents of the tubes flow through the filament circuit as well as the filament current. Resistors R_{15}, R_{14}, and R_{16} serve as shunts so excess current will not flow and damage the filaments.

Electrolytic condenser C_{11} serves as an a.f. bypass condenser so the a.f. component of the 3Q5 plate and screen current will not flow through the filaments of the other tubes. If C_{11} was not used the filament voltages of the other tubes would vary at an audio rate. This would result in degeneration or regeneration and the receiver would either oscillate at an audio rate or become quite insensitive.

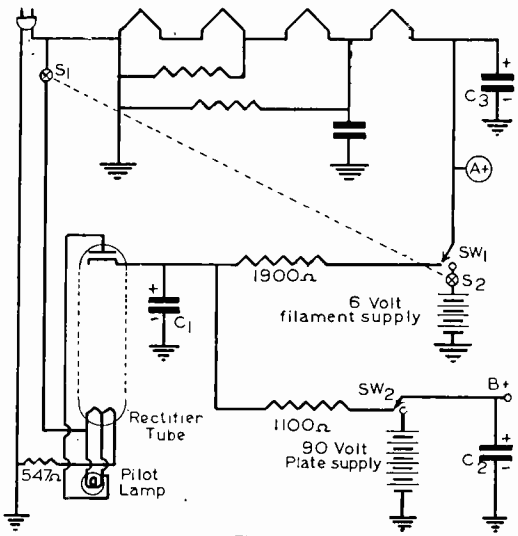


Fig. 3

Notice that on power line operation switch SW_1 closes the filament circuit of the 117Z6 rectifier tube and also connects the side of the line which is to serve as B— and A— to the chassis. On d.c. power line operation the power plug polarity must be as shown—if the receiver does not work after the rectifier heats up pull the power plug, reverse it and reinsert into the wall outlet so the positive side of the line connects to the rectifier plates. On a.c. operation line plug polarity is usually unimportant but sometimes hum can be cut down by reversing the plug.

Fig. 3 shows another three-way power supply circuit. Power Line or Battery operation may be had by throwing gauged switches SW_1 and SW_2.

Notice that the tube filament arrangement is the same for both line power and battery operation. Since the tube filaments are in series at all times and since each tube requires approximately 1.5 volts, the A battery must deliver 6 volts rather than 1.5 volts. In some receivers using this type circuit the A supply voltage may total as much as 9 volts, depending on the tube line-up which is employed.

In Fig. 3 the receiver is turned on and off by means of gauged switches S_1 and S_2 operated from the volume control shaft.

Another common type of three-way portable is shown in Fig. 4. Here it is unnecessary to break down the power supply circuits as they are not too complicated to follow on the diagram. The batteries are disconnected for power line operation. For battery operation the polarized line plug is inserted into the polarized female receptacle on the back of the chassis. Contact between B— and A— is made through prong Y on the power plug. Switch SW_1 connects B— and A— to ground and SW_2 connects A+ to the other side of the filament string. Switches SW_1 and SW_2 are the on-off switches and are mounted on the volume control. Note that the tube line-up requires a 9-volt A battery.

The 3Q4 output tube is used only on battery operation. You can trace its control grid return through R_4 to pin 7 on the 1S5 tube. By looking at the filament string circuit you can see that the voltage across the filaments of the i.f. mixer, and r.f. tubes is used to bias the 3Q4.

You will also find that there is a conductive path from the 3Q4 control grid through R_{12}, R_{11}, and R_{10} to the chassis. Due to the fact that the resistance of R_{12} is about 20 times that of R_4, the R_{12}, R_{11}, and R_{10} path has little effect on the bias. Resistor R_{12}, together with the R_{11}, C_{19} combination, forms an inverse feedback path to the input of the 1S5. This improves the tone quality.

Although the primary of output transformer T_4 is tapped, the 3Q4 tube uses the entire primary.

For power line operation the power plug is removed from the receptacle on the back of the chassis and is inserted in the power line outlet. When the plug is taken out of its receptacle the A and B battery circuits are broken and these batteries are then no longer a part of the receiver circuit. If the power supply is d.c. and

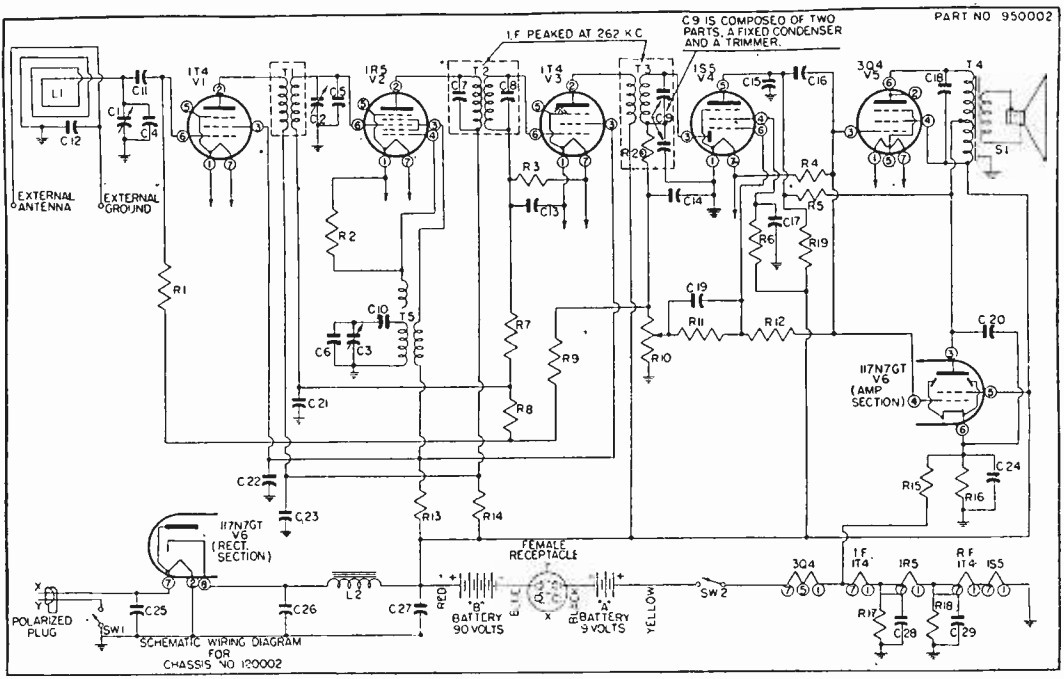


Fig. 4. Emerson Model 505

the receiver does not operate at first, remove the plug from the wall outlet, turn it half-way around and reinsert in the outlet, thus obtaining the proper polarity.

The rectifier is a dual purpose tube. One section is an ordinary half-wave rectifier and the other section is a beam power pentode. The latter section takes the place of the 3Q4 on power line operation.

Notice on power line operation that the 1.5 volt filaments are in series with the cathode of the beam power output tube. The filaments are protected against excess current by means of shunt resistor R_{16} and the a.f. component of the output tube cathode current is kept out of the filament string by means of cathode-by-pass condenser C_{24}.

When the set is turned on and the output tube begins to draw cathode current, part of this current will light the filaments of the other tubes (the 3Q4 is not used) and the receiver is then ready to operate. The filament string with shunt resistor R_{16} also acts as the bias resistor for the power output tube.

To properly match the loudspeaker voice coil to the power tube, the plate of the 117N7 is connected to the tap on the output transformer primary. That section of the winding between the tap and the plate of the now inoperative 3Q4 is not used.

Other Systems. In the cases which you have seen so far, provisions have been incorporated for switching from battery to power line operation. This is the usual procedure although in some receivers the batteries are left in the circuit at all times. It is claimed that this prolongs the useful life of the batteries. When operated from the power line and B and A supply voltages are usually a little higher than the corresponding battery voltages, especially if the batteries have begun to run down. This will cause a reverse current to flow through the batteries. The dry batteries cannot be recharged by this reverse current but the polarizing film of hydrogen which forms around the negative pole can be dissipated, thus lowering the internal resistance of the battery and prolonging its life.

Some receivers are equipped with a three-position switch which provides for straight battery operation, straight power line operation or for battery "recharging." In latter position the receiver will not play but the voltages from the

line supply are applied to the batteries for depolarization.

Then, too, there are some sets which use a special light-weight two-volt non-spillable storage battery as the power source. The B supply voltages are obtained by means of a step-up transformer and synchronous vibrator operated like those in auto radios. The battery is recharged by plugging it into the power line.

Servicing Three-Way Portables. The procedure to follow is somewhat different from that used in working on ordinary receivers. We can break down the servicing procedure by determining whether the trouble occurs on power line operation, on battery operation or on both. If the trouble is present on either type of power supply, a signal circuit, tube, or electrode supply defect is probably present. If the defect occurs only on battery operation, the trouble is in the batteries or in the circuits which are changed over or which are only used on battery operation. Trouble which is experienced only on power line operation is in the a.c.-d.c. power supply system or in the circuits which are changed over or which are only active on power line operation.

In general, the servicing procedures are the same as those employed on a.c.-d.c. sets and on battery sets. However, there are certain defects typical to these receivers and certain precautions which must be observed. These will be discussed in detail.

Power Line Service Procedures and Problems

Dead Receiver. If satisfactory reception is obtained on battery operation you should see if the rectifier tube lights up when the receiver is operated from the power line. If the tube does not light up, check it in a tube tester—also be on the lookout for a broken lead in the power cord, near the power plug. Since the plug is frequently pulled out of the power outlet a break in the power cord is more likely to occur than on ordinary receivers which are seldom unplugged. If a line cord resistor is used check it for an open.

Do not expect to see much light in the battery type tube filaments. Their filament power rating is so low that a visible light is not always present.

If the rectifier tube lights, the trouble may still be in the power supply. Check on this by measuring the plate to filament (or cathode) and filament voltage of the power output tube.

If the power output tube has an a.c.-operated filament, check the d.c. filament voltage of one of the 1.4-volt tubes. Lack of d.c. filament voltage, plate voltage or both points to trouble in the power supply.

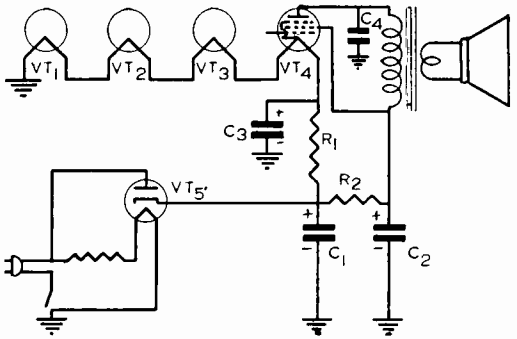


Fig. 5

If you obtain no d.c. filament voltage, remember that the filament string is a part of the filament supply circuit and that an open in one filament will remove all voltage from the other tube filaments.

To see if the trouble is due to an open, check the circuit continuity. Fig. 5 will serve as our example. First, turn the receiver off and discharge the electrolytic condensers C_1, C_2, and C_3 by shorting their positive and negative leads. Then check with your ohmmeter from B— (the chassis) to the junction of R_1 and C_3. This places the ohmmeter directly across the filament string composed of VT_1, VT_2, VT_3, and VT_4. A fairly low resistance reading should be obtained. If the reading is high, one of the tube filaments is open and you can check each filament with your ohmmeter.

If the circuit is not open at this point, put one ohmmeter test probe on the rectifier cathode and leave the other on the junction of R_1 and C_3. You should now read the resistance of R_1 if this resistor is not open.

Next, check C_3 for a short. To do this remove one of the filament type tubes and check the resistance between the junction of C_3, R_1, and the chassis. With the filament string broken by removal of one of the tubes, the resistance value you read on the ohmmeter scale is the leakage resistance of C_3. If the ohmic value is abnormally low replace this condenser.

Should you find the trouble to be due to lack of B supply voltage, you should make a continuity check from the plate socket terminal of VT_4 to the cathode of VT_5. Your reading should be equal to the resistance of the output transformer primary plus the value of R_2.

Check for a short by measuring the resistance from the plate of VT_4 to the chassis. One of the tubes in the filament string must be removed for

this test to prevent a reading through R_2, R_1, and the filament string. If the reading is lower than normal, note its value and leave one ohmmeter test probe on the chassis, moving the other to the screen of VT_4. If this new reading is higher than the one previously made the short is on the plate side of the primary of the output transformer. In this case, unsolder or clip one of the leads to C_4. If the reading is now normal, C_4 is leaky.

On the other hand, if the reading from the screen of VT_4 to the chassis is lower than from the plate of VT_4 to the chassis, C_4 is not at fault. Probably C_2 is leaky in this case but before disconnecting it check from the cathode of VT_5 to the chassis. *The point giving the lowest reading is connected to or is electrically closest to the leaky or shorted part.* This is a valuable service hint you should always remember when looking for a short or leakage in a multi-branched circuit.

It is entirely possible for the power supply to be in good condition and the receiver to still be dead even though it will operate from batteries. In such a case the wiring diagram should be examined to see if there are any tubes or parts outside of the power supply which are used only on power line operation. Such parts could be checked at once for defects, which if present, could cause the receiver to be dead. For example, in Fig. *4* the amplifier section of the 117N7 could be defective.

You could also start your hunt for the cause of the trouble with a localization procedure, and this is the usual approach. Later, when the defect has been localized, you could make a parts check.

A circuit disturbance test could be used to locate the defective stage or you could employ a signal generator or signal tracer. The usual methods of trouble shooting with a signal tracer or signal generator should be followed.

If you use the circuit disturbance test, *do not* pull out and replace the tubes. If you pull out and replace a tube while the set is turned on, damage will result as described later in this article.

To make a circuit disturbance, touch the control grid of each tube and listen for the resulting thud or click in the loudspeaker.

When you find the defective stage, concentrate on it, checking the parts and if necessary, trying others. Where there are no obvious preliminary defects discovered, the trouble will often be localized to the mixer section and will be found to be caused by oscillator failure.

As you will recall, you can readily determine if

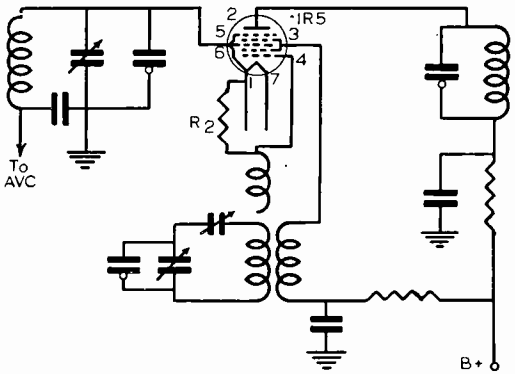


Fig. 6

the oscillator is working by measuring the voltage across the oscillator grid resistor. For this purpose, a high resistance voltmeter should be used. In Fig. *6* as an example, the oscillator grid resistor is R_2 and the negative voltmeter test probe should be placed on socket terminal *4* of the 1R5 tube while the positive meter probe should be placed on socket terminal *1*. An upscale reading of 10 volts or more indicates that the oscillator is working. No reading or a very low reading shows that the oscillator is not working. The first thing to do is to measure the operating voltages at the tube socket terminals. Pay particular attention to the filament voltage. If the voltages are normal, the oscillator tube is probably bad regardless of the manner in which it may test in a tube tester.

Low filament voltage is the most common cause of oscillator failure when battery operation is normal. You should check the line voltage first since low line voltage often results in this effect. Frequently you will find low line voltage to be the cause of the trouble when the receiver works all right at your shop but not at the customer's home.

Complaints of the set going dead at about the same time every day, when there is a high current demand on the power lines due to home owners turning on their lights early in the morning and early in the evening, may be attributed to line voltage fluctuations.

When the line voltage is consistently low you can arrange a small auto transformer in the circuit to increase the voltage to normal. The auto transformer should not be built into the receiver for if the set is moved to another location when the line voltage is normal the increase in voltage would damage the tubes.

In cases where the line voltage fluctuates, no changes should be attempted for this too would lead to receiver damage when the line voltage

increases. The customer can call this condition to the attention of the power company which may be able to remedy the condition.

The trouble may also be caused by the use of wiring in the customer's home which is not heavy enough to carry the full load put on it. Naturally it would not be practical to rewire the house and in many instances it would not be practical for the power company to correct the power line distribution system. In such cases the customer should rely on battery operation for those periods where power line operation is impossible.

If the power line voltage is normal but the oscillator filament voltage is too low to sustain oscillation, a new oscillator tube may clear up the trouble. Normally, however, this is not a permanent cure and as soon as the initial high filament emission wears off the oscillator will again stop working. In this case it is best to find out why the filament voltage is low and correct the cause.

First check the voltage across the input filter condenser. This should be somewhat greater than 100 volts. If it is less, the rectifier tube may have lost some of its emission or, what is more likely, the input filter condenser may have lost capacity or have developed a high power factor. In this case new filter condensers should be tried.

When the rectifier system is in good condition and the filament voltage is too low to sustain oscillation the circuit diagram should be analyzed to determine the probable causes of low filament voltage. Then you should test for probable defects to see which one is present. In general, you should be on the lookout for shunt resistors which values are too low and for filament by-pass condensers which have become leaky. Either of these defects would reduce the current through certain tubes and their filament voltage.

Since the tube plate currents also flow through the filament string, a tube which has lost emission, especially the power tube which should draw the most plate current, will reduce the oscillator filament voltage. A test in a tube tester will show which tubes should be replaced because of low emission. If the A supply is arranged as shown in Fig. 5 and you can find nothing wrong, you can reduce the value of resistor R_2 until the oscillator filament voltage is normal. Be sure, however, that this does not place more than 1.5 volts on the filaments of the other "1.4-volt" tubes.

If the circuit shown in Fig. 7 is used, check the emission of the 117N7 amplifier section because if this tube has lower than normal cathode current the filament voltages will be low. In this set, resistors R_1, and R_2 should be checked for correct resistance value and you must make certain that by-pass condenser C_3 is not leaky.

Receivers that are dead regardless of the type of power supply should be serviced in the same manner as ordinary sets. Usually it will be easiest to work on the set when batteries are used. If you get a set with this complaint working on batteries it will most likely work all right when switched over to power line operation.

Distortion. If distortion is present only on power

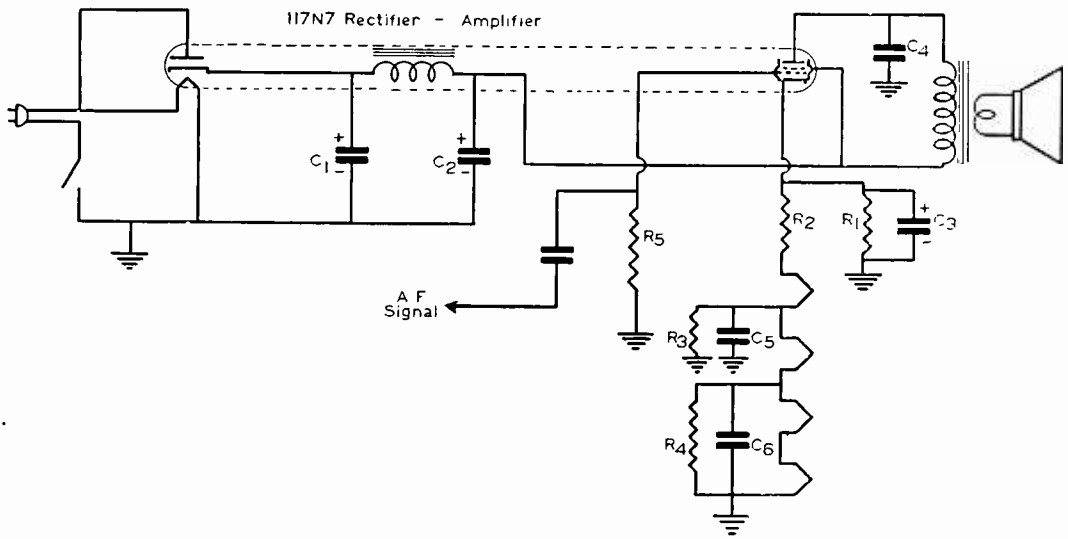


Fig. 7

line operation a careful check of the voltages at the various tube socket terminals will usually disclose a change from normal which will show the probable cause of the trouble. Bear in mind that the voltages on a.c. power line operation will be somewhat higher than those on d.c. power line and battery operation. The greatest difference will be observed in the B supply voltages.

In addition to voltage variations, be on the lookout for trouble in tubes or circuits used only on the power line. If a new power tube is switched into the circuit check it for gas by testing for the presence of d.c. voltage across the grid resistor. If an upscale meter reading results when the meter probes are placed across the grid resistor R_5 in Fig. 7 with the positive probe on the grid, the output tube is gassy or the coupling condenser is leaky.

With the higher d.c. voltages available on a.c. operation, greater gain is realized and distortion due to overloading may occur if the volume control is turned up too high. This is not due to a receiver defect and since it is natural, the customer should be instructed to keep the volume control turned down below the overload point when tuned to strong local stations. Improperly centered voice coils and unglued cones may only show up when maximum volume is used. In this case repairs should be made, or if necessary. a new loudspeaker should be installed.

If the receiver distorts when any type of power supply is used, try a new output tube, regardless of the manner in which the present one tests and check for the possibility of leakage in the coupling condenser connected to the power output tube control grid.

Also check the loudspeaker condition by substituting the voice coil of a small PM loudspeaker in place of the set loudspeaker voice coil. Disconnect one of the set voice coil leads while making this test.

Check the loop if one is used to make certain it is not open. This defect frequently occurs when the loop is built into the lid of a camera type receiver. Opening and closing the lid will in time break the flexible loop wires and if the loop is a part of the control grid return circuit of the first tube, distortion or perhaps no reception will result. With care the broken wire can be spliced or the open ends may be resoldered.

Hum. This trouble is confined to a.c. power line operation. In most cases, defective filter condensers may be blamed but you should also be on the lookout for cathode to heater leakage in the rectifier tube as this will inject a.c. into the filter circuits which cannot be reduced sufficiently to eliminate hum. The electrolytic filter condensers are best checked by substitution.

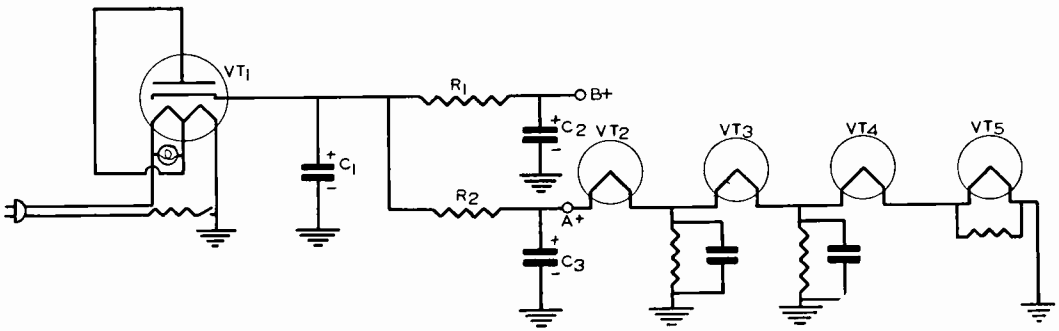


Fig. 8

Precautions When Servicing Three-Way Receivers

Shunt Testing Electrolytics. When you suspect that an electrolytic condenser has lost capacity or has developed a high power factor the easiest way to test it is by shunting it with a good condenser of about the same capacity. The working voltage of the test condenser must be at least as high as the original—it does not matter if it is higher. In the ordinary a.c. set you can simply shunt the receiver's electrolytics and if this improves the performance the condenser under test is leaky and should be replaced. In a three-way receiver you must not connect a discharged high-capacity electrolytic condenser across the input filter condenser. If you do the rectifier tube may be ruined.

The reason for this will be clear if you will refer to Fig. 8. Here the input condenser is marked C_1. The test condenser, when discharged, acts like a short and if the a.c. power line is apply-

ing maximum positive voltage to the rectifier plate at the instant you connect the discharged test condenser there will be such a rush of plate current through the tube that the tapped portion of the filament and the pilot lamp through which the plate current also flows will be burned out. This won't happen every time, but it occurs often enough to make it worth while to charge the test condenser before placing it across C_1. This may be done by first shunting C_2 with the test condenser, then taking care *not* to short its leads as this would discharge the test condenser, touch its leads across C_1. If the set now plays properly, C_1 is defective. You may now wish to check filament by-pass C_3, also in Fig. *8*. Here the test condenser should be discharged first because if you connect a high-capacity condenser, charged up to 100 volts, across the filament string the discharge current through the filaments will be sure to burn out one or more of the tubes. R_2 will allow the shunt condenser to charge slowly so there will be no danger of damaging the rectifier tube.

Of course you could check C_3, C_2, and C_1 in the order mentioned and there would be no danger of burning out tubes in the filament string or in overloading the rectifier tube.

As long as you know which condenser you are checking and take any necessary precautions, there is nothing to worry about.

When you wish to shunt check condensers test leads like those shown in Fig. *9* are quite useful. A pair of black and red test leads terminating in alligator clips make it easy to temporarily connect test condensers in place. Several pairs enable one to check more than one condenser at a time, as is sometimes necessary. The free ends of the leads are temporarily soldered to the condenser terminals. The color coding will make it easy to observe polarity. The red lead goes to the positive terminal of the test condenser while the black lead goes to its negative terminal.

In checking electrolytics and in replacing them, exact capacity values are not necessary. You are already familiar with replacement values in the B supply section from your study of a.c.-d.c. sets. Many receivers use condensers as large as 200 mfd. across the filament string. A 20-mfd. condenser will show an improvement in reception if the original is defective If a test shows that satisfactory results are obtained with a 50-mfd. or 100-mfd. condenser you can use it if the original value is not available. In most cases, little or no difference in results will be noted.

Another thing to be careful about is pulling tubes from their sockets and replacing them while the set is turned on. Suppose in Fig. *8* you were to pull out tube VT_2. This would break the circuit and since there would no longer be a load on the rectifier condenser C_3 would charge up to the peak line voltage—in the neighborhood of 165 volts. Now if you reinsert VT_2 there will be 165 volts across the filament string instead of the normal 6 volts. As a result, one or perhaps all of the filaments in the string will burn out. This can be avoided by turning the receiver off before pulling any of the tubes. In a half minute or so all of the electrolytics will discharge through the filament string and there will be no danger of damaging anything by removing or replacing tubes.

If your first inspection of the receiver discloses a tube with a burned out filament, turn the set off and short the condensers to discharge them before inserting another tube. You do not have to locate C_3 for this purpose. Shorting from the cathode of the rectifier to the set side of the on-off switch in Fig. *8* will discharge all of the filter

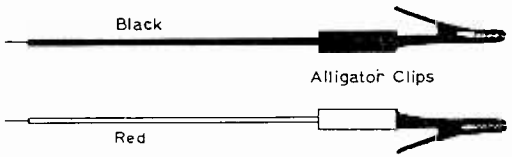


Fig. 9

condensers. Remember, however, that the condensers do not discharge at once. You must wait for C_3 to discharge throught R_2 and C_2 to discharge through R_1. Shorting C_3 would not speed matters up any because you would have to wait while C_1 discharged through R_2 and while C_2 discharged through R_1 and R_2. Keeping the short in place while you count to 60 will do the trick.

One final point to bear in mind is to *know* what you are doing and to *watch* what you are doing at all times. It's easy for a test probe to slip off a tube socket terminal, particularly if the tube has a miniature base. This is often the cause of burned out tubes as the test probe might touch a filament terminal and B+ (a screen or plate terminal) at the same time. Also, if you wiggle leads to parts when the set is on, don't let part leads touch each other.

Battery Troubles

Intermittent Reception. If, on battery operation, reception starts as soon as the set is turned on and then gradually fades out after a minute or so, the batteries are run-down. A no-load test will show normal voltage. However, they should be tested while the set is on and after it has faded. Usually you will find the A battery to be at fault although the difficulty may also be due to a run-down B battery.

No Reception. If a set works O.K. from the power line but is dead on batteries, you will probably find the batteries to be at fault. You should check the battery voltages under load as described in intermittent reception. If this does not disclose the trouble, check the voltages at the tube socket terminals of the mixer-oscillator, paying particular attention to the filament voltage. If this is normal, try a new tube here, otherwise try new batteries as the old ones may be down just enough to stop the oscillator.

If the batteries test good, localize the trouble to a section or to a stage using a signal generator, a signal tracer or the circuit disturbance test. While it's best never to get into the habit of pulling and replacing tubes in a three-way portable while the set is on, you can do it in this case when making a circuit disturbance test on battery operation if the A battery is rated at 1.5 volts. However, it's easy enough to make a circuit disturbance without pulling tubes and if yon make it a practice to leave the tubes in their sockets, you will never make a mistake and pull one on power line operation.

A final word about batteries—it is all right to remove the batteries permanently and operate the receiver from the power line. When this is done the battery plugs should be insulated with tape so they cannot short to each other or to chassis parts.

When you find it necessary to replace batteries, you can get the right replacements by ordering duplicates of the originals. The factory manual of the receiver will generally give battery model numbers of several different battery manufacturers that will fit the receiver. Your jobber can also suggest the right replacement from charts furnished by the Battery Companies if you tell him the make, model number, and types and numbers of tubes used in the receiver.

For home operation batteries which will not fit into the cabinet may be used but this destroys the portability of the set.

Troubles Not Due To Receiver Defects. Since three-way receivers are for the most part inexpensive and are made quite small, don't judge them by large receivers. Usually they will not have the tone quality of a large set and their power output will be far less. If you try to make up for this by turning up the volume, overloading and distortion will occur. In most cases full a.v.c. is not used so some blasting and volume control readjustment are to be expected—more so than on other type receivers. The ability to pick up distant stations will be apparently less for usually there is no provision for an outside antenna.

Due to their small physical size, all day long power line operation, day in and day out, is not a good thing. Lack of adequate ventilation will cause overheating of parts and due to the melting of sealing compound in the fixed condensers, more than normal cases of intermittently opening condensers will result.

———*n r i*———

Some Information on Pilot Lamps

A pilot lamp is a device that lights up and shows when the radio is turned on or off, on when lit and off when not lit. Sometimes the pilot light is referred to as a dial lamp or "bulb."

Expert servicemen check such dial lamps for continuity using an ohmmeter. One test prod tip may be placed against the metal shell of the base and the other is touched to the center contact on the base.

The 2.5 volt white bead lamps will have a resistance of about 1 ohm, the 6 volt blue bead about 3 ohms and the 6 volt brown bead about 10 ohms. The bead is a small insulator inside the bulb, used to support the filament wires. Holding the bulb up to the light and looking into it, you can see the colored bead.

The white bead lamp draws a larger amount of current than the others and is used in older a.c. receivers having 2.5 volt filament circuits. The blue and brown bead bulbs are used in the more modern a.c. and a.c.-d.c. sets.

These resistances, shown by an ohmmeter, are not the actual dial lamp resistances obtained under working conditions. When the lamp filament is "cold" and unlit, and does not have normal working current in it, its resistance is very low.

Applying a voltage to the lamp, the current at first may be high, due to the low lamp resistance. As the temperature of the tungsten filament in the bulb increases, the resistance rises and the current drops down to the normal working value when the temperature stabilizes. To protect the bulb from the effects of a current surge, resistance in series and in shunt with pilot lamps commonly is used in standard receiver circuits.

The protective series resistance in an a.c.-d.c. receiver may be a part of the series filament circuit, the filaments of tubes and a line cord, series resistor, or ballast tube. In such sets, an additional resistor shunt may be connected across the pilot lamp circuit.

In a.c. sets, the amplifier tube filaments may be in shunt with the dial lamp, but additional shunt resistance in the form of a center-tapped filament circuit resistor is sometimes found.

NEWS OF THE RADIO WORLD

BY Willard R. Moody

Radin may prove to be a great contribution to the safety of railroad passengers, employees and rolling stock. Radin was developed by Sperry Gyroscope and the Rock Island Railroad. It is not related in its form of operation to radar, yet it is used to indicate exactly in miles the distance from the locomotive to the rear car of a train ahead on the same track. Indication is obtained from a simple meter calibrated up to 8 miles, the maximum distance required. The radio equipment is extremely simple in design and operation. An f.m. transmitter on the locomotive sends the signal forward which is picked up by a receiver on the last car of the train ahead. The received signal is fed to an associated transmitter and is sent back to the locomotive. The distance between the two installations is measured by determining the phase difference between the out-going and incoming signals. The operation is not affected by other trains or steel structures. When a curve separates two trains on the same track, the indication is that of a chord rather than the distance over the roadbed. That is not objectionable, however, since the Radin indicator will then show that the locomotive and train ahead are a little nearer than they are actually.

Radical changes in receiver component design and application, based on war-time research, are soon to make their appearance. Of particular interest are miniature self supporting baseless tubes and dry-disc rectifiers. The dry-discs are expected to replace tube rectifiers in many types of sets. The miniature sizes of the components have already resulted in many unique circuit and layout applications, affording production of extremely small receivers with unusually high efficiency factors.

British manufacturers have adopted television training programs for servicemen on a large scale. In the not too distant future, in American radio, television probably will become quite important.

Recently, four youths headed by a former U. S. S. Lexington Electronic Technician brought to the ancient art of safe cracking all modern conveniences. Not only did the youngsters use a walkie-talkie to protect the inside gang, warning them to stop making a racket with their high-speed diamond pointed drills when a cop came by, but they had developed supersonic listening aids to tell them when the tumblers of the safe clicked, thus giving away the combination. They also had an infra-red flashlight. Had the gang not been too lavish with the proceeds of their ingenuity, they might not now be in jail, but, on the contrary, would be well on their way toward their ambition, putting crime on a modern scientific basis.

Remember the crystal detector in the first radios —hunting for the right spot with a cat's whisker? For years the detector lay discarded in favor of the vacuum tube. But when micro-waves came, and with them the need to convert the new energy to amplifiable frequencies, a Bell Laboratory scientist thought back to the old crystal. Silicon, of controlled composition, he discovered, excelled as a microwave detector. Unlike the old-style crystal, it was predictable in performance, stable in service. From 1934 to Pearl Harbor, the Laboratories developed Silicon units to serve microwave research wherever needed. Then, radar arrived. The silicon crystal came into its own and found application in long-distance microwave radar. Working with American and British colleagues, the Laboratories rapidly perfected a unit which the Western Electric Company produced in thousands. It became the standard microwave detector. Crystal detectors are destined to play a big role in electric circuits of the future. They will have, for example, an important part in Bell System microwave relay systems. In various forms, they may appear in radio sets.

Preparing the way for smaller, lighter and better portable radios, hearing aids and other devices, specialists in battery design are successfully packing their electrical punches in less and less cubic space. A dry cell about the size of a checker is the first radical achievement in fifty years of man's quest for packaged, portable electrical power. The new mercury-type cell has the same electrical capacity as its older and much bigger brother, the conventional flashlight cell. Furthermore, it works in full strength four to six times longer without rest periods and has a longer life on the shelf. Eventually, specialized batteries will be made available to radio distributors.

More than three out of every four occupied farms in the United States have radio receivers according to the first nation-wide figures released by the U. S. Census Bureau on the basis of its 1945 Census of Agriculture. The figures, as of January 1, 1945, show that of 5,877,000 farms, 4,237,000 had one or more radio receivers.

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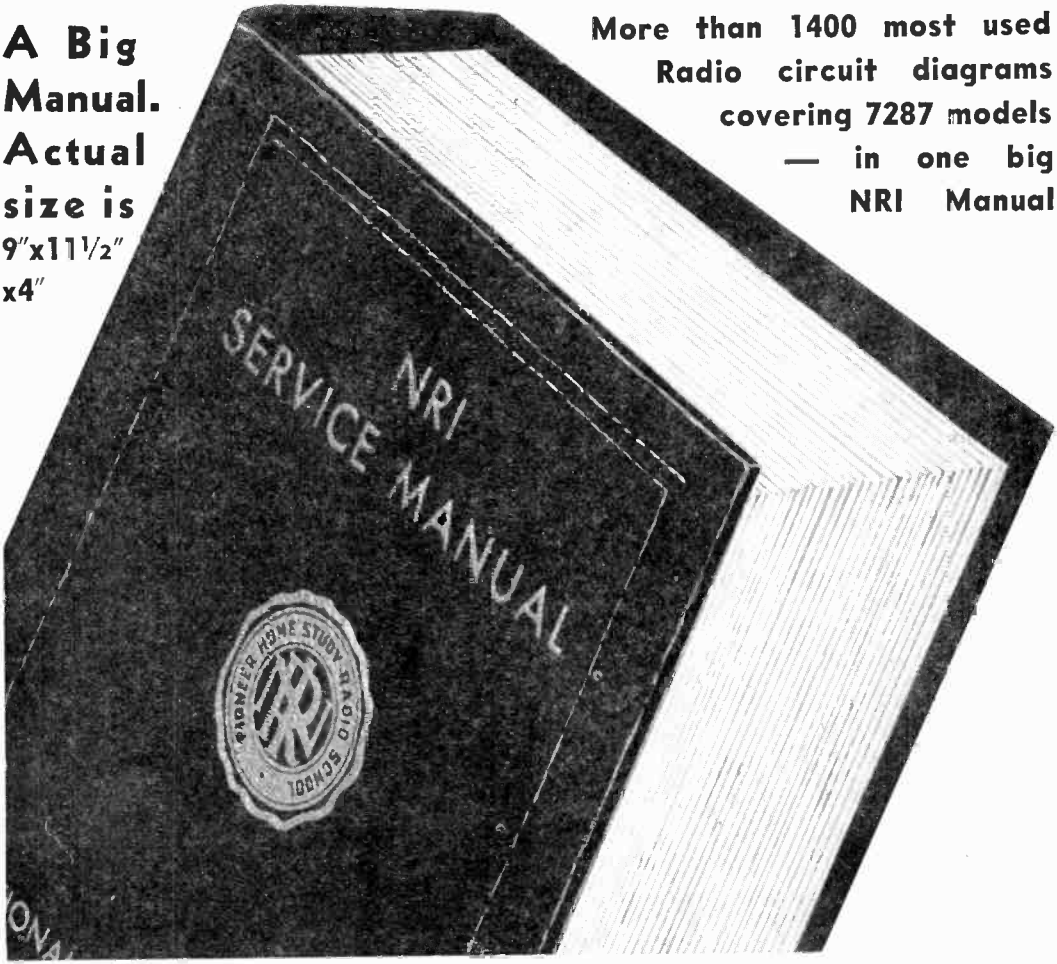

Covers only Radio receivers manufactured in the United States. Therefore, this Manual is not suitable for students in Canada and foreign countries.

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If I Were A Serviceman

Some interesting observations on the radio service business by Charles Golenpaul of the Aerovox Corporation

This interesting, down-on-the-ground, article, originally appeared in "Radio Maintenance Magazine" and is reprinted by permission of that publication, Mr. Golenpaul and the Aerovox Corporation.

Charles Golenpaul

I KNOW I can qualify as an expert, writing here to you about the radio service business, because of that definition I like best describing an expert. My friend the wit says: "An expert is one who is just beginning to understand how little he knows about the subject." And that, fellows, is Charley Golenpaul.

Also I can qualify as an efficiency expert, because my friend the wit again covers the situation adequately with this definition: "An efficiency expert is one who has no business of his own to wreck." Or putting it another way: "An efficiency expert is one who is smart enough to tell you how to run your business, and too smart to start one of his own." Again your correspondent Charley Golenpaul qualifies in a big way.

I just like to touch on a few subjects vital to our trade, giving you fellows the benefit of what I see and hear and read about the radio service business all over the country, so that your horizons may be extended by just that much. We can always learn something from the other fellow.

My main theme is PROFIT. My friend the wit says "Profits, not Prophets foretell the future." And that's the whole story of successful radio servicing in a nutshell.

You fellows are in business. The main point in business is to make a profit. And unless you are vitally concerned about profits, you won't stay in business very long.

Offhand I don't recall exactly what percentage of new businesses survive beyond the first year, nor the second year nor even the first five years. But I do know that most of them die in their infancy. You can get the exact percentages of those business fatalities from your local newspaper or from one of the financial journals. But I can tell you, without gumming up this chat with a lot of dry statistics, that less than 20% of all new businesses survive those first five years. And the reason for the 80% fatalities is simply the lack of profit.

Therefore, first and foremost, remember that you are in radio servicing to make a profit. Of course, if your old man or wife or some other relative has a boodle of money and can stake you indefinitely, that's another matter. But inasmuch as the vast majority of us have to paddle our own canoe, I take it that you've got to make a profit if you intend to keep the sheriff away from your door.

Now PROFIT is no simple matter although it sounds so simple. In its most elementary form, profit is simply the difference between what something costs you and what you sell it for. And in servicing, it is profit that pays your salary.

However, it isn't easy to figure profit, and even less easy to make a real profit. For example: The parts for that job cost you $1.00. You charge the customer $2.00. You've presumably made $1.00 for yourself. But hold on a minute—you're jumping at false conclusions. And it's because

of such hasty conclusions that many servicemen soon go broke.

The parts cost you $1.00 and you got $2.00 for the job. But you didn't make a whole dollar for your own personal services. No indeed. To that $1.00 for parts, you have got to add your OVERHEAD. By the time the proper overhead is added, the $1.00 cost became $1.25 or even $1.50, so that your own earnings are reduced to 75c or even 50c and very often even down to zero.

Overhead? some of you may ask. Overhead, why there is no overhead, some of you may say. But believe me, fellows, each and every one of you has overhead. Everybody's got overhead. As my friend the wit has it: "It's not difficult to meet expenses these days; one meets them everywhere." Yes, there are expenses to be met in your little setup. You must have some rent to pay. I don't care whether you operate out of a store on Main Street or out of your home basement. There's rent—more or less of it—and that rent must be charged proportionately against every job you handle, as part of the overhead.

Then there are the ordinary business tools. No doubt you've got a telephone. Again. I don't care whether it's your home 'phone or strictly a business telephone. Regardless, in whole or in part, that expense is part of your business overhead.

Then you must have electricity to pay for. Again, it makes no difference whether it's entirely business or part of your home life. Electricity is a legitimate expense—part of your business overhead. And you may have fuel, janitor service, the fellow who shovels the snow in front of the shop, and so on.

And what about traveling expenses? Are you using a car — even if it's the family jallopy? Or do you go by the street car or bus? Regardless, traveling expenses are part of your cost of doing business.

Then there are the books, service manuals, subscriptions to radio publications, memberships in radio organizations, and perhaps a correspondence course and other means of keeping abreast of radio knowledge. These are expenses—part of your business overhead.

There are your tools, test instruments, service benches. desk, typewriter, file and so on. These items don't last forever; they wear out in time, or again, they become obsolete and must be replaced by newer models. Will you have the necessary money saved when it comes time to replace those items? You will, if you charge off a good percentage of the cost of such equipment each year, and put the money aside as a trust fund. Your income tax permits such a reduction for depreciation.

These and many other items add up to your actual overhead. The total is really astounding. Your actual overhead can easily run 25% to 35%. Therefore, when you figure the cost of a job, include say 35% as your general overhead, include your own personal services or those of the men working for you, on top of the cost for actual materials. You'll then arrive at your actual cost, and the difference between that actual cost and what you get for the job will determine your net profit. And remember, it's NET PROFIT that keeps all of us going in business.

Right here we have the very essence of most business failures. Too many would-be businessmen simply don't know their costs. They are fooled into believing that gross profits are real profits. Especially these days, when Uncle Sam and local authorities take a healthy slice out of each and every one of us by way of income and business taxes. If you don't watch your overhead costs and make due provision for meeting them over and above your personal weekly "take," you'll be in the same predicament as the car driver who keeps right on driving blissfully without paying due attention to the gasoline gauge. Sooner or later he's got to get out and walk.

And so the very first point I wish to make is PROFIT, and I mean a sound, true, NET profit. Also, I want to stress over and over again that you've got overhead in your business, no matter how you operate, and you've just got to find out what that overhead amounts to, and then determine what percentage it amounts to on the basis of say $5,000 a year or $10,000 a year, or more, as the case may be. Naturally, the overhead percentage comes down somewhat as you do more business. But in any event, you should establish a percentage based on anticipated yearly business, and charge to each and every job you handle that 25 or 30 or 35 percent for overhead.

By this time most of you fellows are saying to yourself: that overhead and profit stuff may be okay, but my trade won't pay for all that freight. So now we go on in our discussion to the justification of fair and profitable prices.

A fair price in this radio servicing game is based on an HONEST repair job and covering the cost of parts, labor, your overhead, and your net profit. Worthwhile trade is willing to pay such a fair price. Those who are unwilling to pay a fair price are just not worth bothering with. And your competitors who cater to these cheap folks simply won't be around very long, I assure you.

The main thing the radio set owner wants is to get that inoperative set going again. When he calls you into the case, you can be sure he's usually fussed around with the trouble himself. He's had that smart son or nephew or brother-

in-law monkey around with it too. He's asked that friend who works in a radio factory to look at it. But present-day radios don't respond to such home remedies. The handyman with screwdriver and pliers doesn't get very far these days. It takes test instruments plus a lot of know-how to figure what's wrong with the set—to find that low-emission tube or that broken-down capacitor or that burned-out transformer.

Consider a parallel case: Little Annie is deathly sick, all of a sudden. Mother reads that family medicine book or the old almanac, and tries to fit some stock remedy to Annie's particular symptoms. Then the corner druggist is consulted. One or two patent medicines may be tried. But when all such makeshifts fail, the doctor is summoned. And his word goes. He scribbles some Latin and some numbers on a slip of paper and tells you to get the prescription filled at the corner drug store. There's complete confidence now that Annie will soon get well—even though the doctor knows darn well that nature and nature only will do most of the curing. At any rate, the doctor gets his three bucks for 15 minutes of his precious time, without any argument whatsoever.

Now you as a radio serviceman are very much in the same position. True, no life is at stake, but the family's routine entertainment is dead for the moment and you are the fellow to bring it back to life again. You're the doctor. You've got the savvy. You can make that radio play again. And you're entitled to your fair price.

How do you conduct yourself before customers? That's the real test in getting fair prices. I'll assume of course that you are neatly dressed, polite, businesslike, and speak convincingly. These basic points must be taken for granted. But—and please pardon the question—do you suffer from a BIG MOUTH? I find that many servicemen simply give away their savvy without realizing it, and having given away their main stock in trade, they are surprised at the loss of business. Let me illustrate:

You are checking a radio set in front of the customer. Incidentally, that's bad business to start with: all sets should be checked at your convenience and when the customer isn't around to bother you. But this is one of those exceptional cases—you've got to check the set while the customer is around. All right. You go to work with your test equipment. You soon find out that a tube has low emission; a capacitor is shot; a resistor is drifting excessively. Knowing what has to be replaced, you figure up the cost of materials, the amount of labor, that matter of overhead, and your fair net profit. You give the set owner the cost. PERIOD.

But now there is the big-mouth serviceman who wants to show how smart he is. Or at least he wants to prove that the price is correct. He may point out that this tube, Type XYZ, has to be replaced; that capacitor, an 8-mike 450-volt electrolytic, has to be replaced; and that carbon resistor, 1-watt 100,000 ohms, has to be replaced. He may even go so far astray as to quote net costs on those parts, rather than the full list to which he's entitled on resale. Whereupon foxy Mr. Set Owner says that the price seems kind of high and he'll have to think it over.

Mr. Set Owner in due course turns up at a jobber's store. In professional lingo he asks for a Type XYZ tube, and 8-mike 450-volt electrolytic, and a 1-watt 100,000 ohm carbon resistor. He gets them at your net cost because he speaks the language of the trade, duly taught him by the big-mouth serviceman. And if he's just a shade above a moron, he can install those parts and his set is as good as new again. Whereupon the big-mouth serviceman has done himself out of another job.

Don't talk! Don't give away valuable information. Be as concise as necessary to justify your estimate. That's enough. Remember, the doctor didn't go into lengthy explanations regarding Little Annie's ailment. Nor did he tell the family in plain English what those Latin words and numeral ment on the slip of paper. Nor does the druggist say that the $1.00 prescription could have been compounded at home from such common ingredients as baking soda and common salt at a cost of a couple of pennies in many cases. No sir! The family is paying for KNOWLEDGE. And that's mainly what you as a serviceman have for sale.

In your estimate or price, you are entitled to full list prices for parts and supplies. You are entitled to be paid for your time, even if it's only to check a set and give an estimate away from your shop. You are entitled to charge for your time the moment you leave your shop until you get back. Remember, doctors don't make many free calls.

Get fair prices for your jobs. Make a decent profit. But this does not mean that you are licensed to cheat or gyp. Cheating or gypping is the other extreme of working for nothing. And one extreme is as bad as the other.

Some servicemen don't take any chances with the making of ample profits. They just work customers for all they can get. The *Reader's Digest*, a few years ago, turned up some very flagrant cases of this sort and for a time made it pretty bad for all servicemen. We just cannot afford to have that sort of reputation get around.

Cheating or gypping just doesn't pay in the long run. I've seen one serviceman after another go

out of business because customers were simply robbed.

Today there is enough legitimate work to go around. We can well afford to be honest. So why tell a set owner that the job will cost $10 when all that is necessary is to solder a broken connection or push a loose tube down into its socket or tighten the antenna binding post that has become loosened. Of course the serviceman is entitled to charge for the call, no matter how simple the trouble may prove to be. But between such a legitimate fee and the charging of many extra dollars on trumped-up defects, there is all the difference between an honest living and downright crookedness.

The fact that a serviceman is a gyp gets around mighty fast. If the gyp is set up in a trailer and therefore can shift from place to place, he doesn't have to worry too much what people will think after a while. But if he's set up permanently in a community, then good reputation is an essential asset.

The RIGHT price for a job is that which constitutes a real bargain to you and to the customer. As my friend the wit puts it, "A bargain is a transaction in which each party thinks he has cheated the other." I rather like that definition although it is a bit smelly. If the customer thinks your price is reasonable, and you know you've made a fair profit, then it's really a bargain.

But to insure that bargain, it is necessary that your job stand up as it should. There are some servicemen who don't give a rap whether a job stands up or not, provided they have been paid. That's just another form of gypping, and leads to hard feelings and eventual exit from business.

If the set owner has paid your price without quibbling, he's entitled to have the repair job stand up for six months or a year. However—and this is a point I wish to emphasize—it is well to state in your bill, and even on a sticker fastened to the chassis, just what repairs have been made. I also like the idea of putting stickers on tubes that have been replaced, with the dates. If the set then breaks down from some other cause, the reasonable set owner can readily understand that you are not at fault. Also when you estimate on a repair job, it may be well to specify what you are going to do in general terms (don't give away the "savvy"), and also to mention other things that might be attended to for a 100% repair job, but which are not included in this particular estimate.

In connection with making those jobs stand up, I cannot emphasize too much the importance of using the best parts or components. There are many servicemen who are still penny-wise-pound-foolish to the extent of buying the cheapest parts they can find. And that situation is aggravated today when surplus war stuff is finding its way to the radio parts market. Of course, I realize the temptation it is to pick up 8-mike electrolytics for a dime apiece and power transformers for a half-dollar. But remember, fellows, you usually get just what you pay for. Much of that surplus stuff is just plain junk by now. It is usually sold "as is." Most of this war stuff was made several years ago. Much of it has been stored under questionable conditions.

Some of it has been used and even abused. You certainly take an awful chance when you install such unknown parts. It may be all right to use the junk in your own assemblies over which you have full control, but to put that stuff into customers' radios is simply to gamble with failures and bad feelings and the loss of money and good will. You can squander many times the few pennies you may have saved at first.

I cannot warn you too much on this point. If you would play safe and sound, continue to buy branded merchandise in original packages, carrying the manufacturer's original guarantee and not an outdated guarantee either. Don't be misled by those so-called war surplus bargains.

Lastly, keep your knowledge and equipment up to date. I cannot urge too much the importance of sound training in this servicing business. Radio sets are becoming increasingly complicated. Already we see signs of more expensive and more complicated sets coming on the post-war market. To the original broadcast receiver there is now being added the all-wave or short-wave feature, FM, phonograph and the record changer. Soon we shall have television in most metropolitan areas, and some already enjoy a telecasting service. Television receivers are really complicated. It will take a lot more knowledge and experience to install and service television sets, and a lot more equipment than even the better service shops have today.

I'd urge you to maintain a good working library of reference books, service manuals, informative house organs, catalogs, and radio publications. Aerovox publishes a monthly Aerovox Research Worker. My company spends a lot of money gathering the material for this informative journal. A free subscription is available to each and every one of you. You are missing much practical information if you are not on their mailing lists.

In conclusion, let me sum up the few points I have tried to put over:

1. Remember that you're in business to make a PROFIT.

2. Remember that gross profit is only the start-

ing point. It's the NET PROFIT that really counts.

3. Remember that in arriving at a net profit you must know your actual costs. And OVERHEAD is a big item in actual costs. Everybody has an overhead. Find out what your overhead is, and see that every job carries part of that burden called overhead.

4. Remember that your main stock in trade is knowledge and experience. Also, you need good test equipment for speedy and positive diagnosis of radio failures. Such equipment soon becomes obsolete or wears out, and must be replaced. In order to have the money ready for new equipment, be sure to charge off that equipment against current jobs.

5. Remember that your customer is entitled to know how you arrive at your estimate or price, but don't be too explicit. Charge list prices for all parts. Only you are entitled to net prices.

6. Remember that you cannot afford to make free calls. Regardless how simple the trouble may prove, you're entitled to payment for time and travel.

7. Remember that you've got to build up and maintain a reputation for honest dealings. Confidence is the main stock in trade.

8. Remember that you cannot afford to use anything less than the best parts available. Those war surplus bargains are a gamble. You cannot afford to gamble with set repairs.

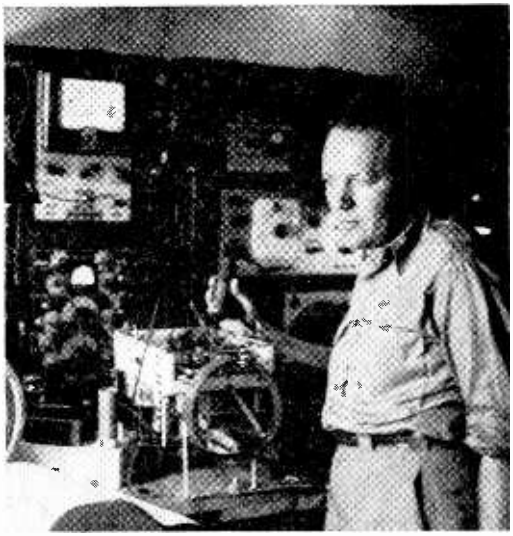
9. Remember that you must keep up with the rapid progress of radio by means of good reading matter. Keep up your working library.

10. Remember that there is more than enough servicing work to be had. You don't have to overcharge to make a good profit. You are in a good line of work. There is a great future ahead. The rest is up to you.

———————*n r i*———————

Men holding a *2nd class telegraph* license and *2nd* or *1st class 'phone* license are badly needed by Trans-World Airlines as "Flight Radio Officers" aboard C-54's and Constellations. There is an opportunity for rapid advancement to a salary of $400 per month. Most men will be stationed at overseas points.

If interested write to: International Division, Trans-World Airlines, Personnel Dept., AAF Annex No. 1, Washington National Airport, Washington, D. C. Full information will be furnished. If qualified, an air transport pass will be issued to you, so that you may be personally interviewed by TWA.



Purchase Price of New Business More Than Returned in First Year

Mr. J. E. Smith, President
National Radio Institute
Washington 9, D. C.

Dear Mr. Smith:

I am enclosing a snapshot of myself at the bench working on a combination AM and FM set. You will note that although we have other meters and test apparatus, an NRI Tester is included on our main test panel.

I believe that National Radio Institute training provides a most excellent basic training for work either in the service field, or in transmitter operation and maintenance. I can speak for both fields, having been an operator for Radio Station WKBH and now owning Manchester Radio Service. The course teaches fundamentals, and the "why" of Radio, without which Radio men will always remain "screw-driver mechanics" no matter how much practical experience they may gain in actual work.

I purchased a business which has been established about two years, and during my first year of operation it will return the purchase price and approximately $1500 net on the repair and service end alone, not counting profit from sales of new merchandise.

I believe that this store can be made to produce a net of about $6,000 per annum, and I have hopes that in future years I shall be able to open branch stores in other communities.

JOHN F. GRUBER,
73 Birch St.
Manchester, Conn.

TELEPHONE ON WHEELS

By Robert Bright, Jr. and Stanton Vanderbilt

Reprinted through the courtesy of the magazine "Western Electric OSCILLATOR," published by the Western Electric Company, New York, 7, N. Y.

(See Cover Photograph)

THE doctor driving down Main Street picks up the telephone in his automobile and is informed of an emergency call; the delivery man receives a change of orders over the phone in his delivery van; the power company truck while returning from an assignment is dispatched to the scene of a line break by telephone instructions from the home office. These events—not so long ago a part of the wide-eyed stories of the world of the future—are already being removed from the realm of the imaginary, for such easy mobile communication is now an actuality and is now being experimentally tested under conditions that will best bring out its unique usefulness in modern life.

The city selected for this first comprehensive test of Bell System general mobile radio service is St. Louis, Missouri, and the first license to operate radiotelephone service for vehicles on a commercial basis was granted by the Federal Communications Commission to the Southwestern Bell Telephone Company.

Participants in the trial will include such concerns as parcel delivery and express companies, newspaper publishers, power companies, contractors, bus, trucking and moving van concerns as well as oil burner, refrigeration and other servicing organizations which operate vehicles within the area and to whom keeping in touch with their drivers is important.

Three classes of service are being offered: (1) a general two-way telephone service between any vehicle and any wire telephone or other mobile unit; (2) a two-way dispatching service between a customer's office and his own mobile units only; and (3) a one-way signaling service to mobile units to notify the driver that he should comply with pre-arranged instructions.

The rates for a three-minute general service message range from 30 to 40 cents depending on the location of the wire telephone. The charge for a one-minute two-way dispatching call is 15 cents. If the calling or called land telephone is outside the St. Louis mobile service area, then toll rates would apply.

The mobile telephone service will operate like this:

Calls to and from vehicles will be handled by mobile service operators. The conversations will travel part way by telephone wire and part way by radio. For example, a man at his desk in St. Louis who wants to talk to the occupant of a certain car or truck will lift his telephone receiver and dial or ask for the mobile service operator to whom he will give the telephone number of the vehicle he wants, such as WJ-23873. The numbering will not conflict with any existing central office code.

The mobile operator checks channel WJ to determine whether it is in use. If the channel is idle the mobile service operator inserts a dial cord and dials 2-3873. The mobile station bell rings and the subscriber answers and talks to the wire line subscriber. The mobile service cord circuit supervisory lamp is extinguished. The operator starts timing the ticket covering the call. At the termination of the call, the supervisory lamp at the switchboard lights. The mobile service operator releases the channel and enters the ending time of the call on the ticket. The channel is now ready for the next call.

A call from the mobile station to a wire line subscriber is just as easily completed. The mobile subscriber removes the handset from the control unit and "monitors," i.e., listens to check that the channel is not in use. If the channel is idle, the mobile subscriber presses the "push to talk" button on the handset. The line lamp at the mobile service switchboard position lights. The mobile service operator answers, and asks for called number. The mobile service operator completes the call in the same manner as for a wire

line subscriber. As before, the cord supervisory lamp gives a continuous indication of the progress of the call.

As can be seen, the originating or the receiving of a mobile radiotelephone call is no more complex than performing the same operation from a regular wire line telephone. Transmission standards equal to wire line service can be maintained and no complex or tricky operating procedures are necessary.

Service Planned for 58 Cities

At the present time, in the Bell System, 37 cities have had FCC construction permits granted for urban mobile service, 7 cities have applications pending and 14 cities have applications in preparation, giving a total of 58 cities currently having plans for urban service.

The cities in which the construction of urban stations have been authorized to date include Boston, Springfield (Mass.), New York, Newark, Philadelphia, Baltimore, Washington, Pittsburgh, Miami, Atlanta, Minneapolis, Milwaukee, Chicago, Detroit, Toledo, Cleveland, Dayton, Columbus, Cincinnati, Louisville, Indianapolis, Memphis, Kansas City, Birmingham, New Orleans, Fort Worth, Dallas, Houston, Oklahoma City, Denver, Salt Lake City, Portland (Ore.), Los Angeles, San Francisco, St. Louis and Seattle.

Applications for authorization to construct urban stations in Worcester, Norfolk, Akron, Des Moines, Omaha, Providence and San Antonio are now pending before the Commission. Surveys to determine the desirability of extending the service to other cities are also under way.

Bell System plans for mobile telephone service to cover certain intercity highways were announced last December. Applications for authorization to construct transmitter-receivers along the highways between New York and Boston, New York and Buffalo, Los Angeles and San Diego, Cincinnati and Cleveland and between Chicago and St. Louis have either been granted or are pending.

When established, the highway stations will permit communication between vehicles traveling along the routes and any wire telephone. A number of companies, including truck and bus lines, long distance movers, utilities and other organizations have indicated interest in highway radiotelephone service and a desire to participate in experimental trials.

Characteristics of Equipment

Equipment for mobile telephone service has already been designed by Bell Telephone Laboratories and manufactured by Western Electric. Coded as the 238 and 239 Type Radiotelephone Equipments, they were developed to meet the rigid specifications of the Bell System as well as the requirements of the Federal Communications Commission.

The equipment is of two general types—the 238, operating in the 152-162 mc. band and the 239 operating in the 30-44 mc. band. The following description refers to the 238 Type, but is applicable in most cases to the 239 also.

The equipment consists of a radio receiver and transmitter, antenna, selective signaling device and telephone instrument. All controls and the instrument may be conveniently mounted under the instrument panel of the vehicle in a single unobtrusive unit.

Controls are few in number. One ON-OFF power switch and a simple "push to talk" switch in the handle of the handset. No tuning or adjustments are made by the vehicle operator. All such adjustments are made by the telephone company at the time of installation.

Transmitter. The transmitter has an output of 20 watts, sufficient power to give reliable service in the area served. The high voltages are supplied by a dynamotor, which receives its power from the battery in the vehicle. No additional battery is required although in general it will be desirable to provide a battery of larger capacity than the one normally supplied with the vehicle to care for the power requirements of the radiotelephone equipment. A larger generator is also necessary in most cases to maintain the charge on the larger battery.

Quartz plate control of the transmitter frequency is provided, with a thermostatically controlled, constant temperature oven enclosing the crystal. This insures operation of the transmitter on the proper frequency. The radio frequency carrier is modulated by a phase modulation circuit, resulting in excellent voice-quality transmission with an extremely low poise level. Minimum deviation plus frequency tolerance of the carrier under speech modulation is normally a swing of plus or minus 15 kilocycles.

Spurious radiation, that is, radiation of signals on other than the assigned frequency, is well below what is normally expected with mobile transmitters, an unusual double-tuned circuit in the first doubler stage providing one of the reasons for the absence of undesirable radiation.

All test and measuring points are brought out to a convenient jack on the front of the panel, adding to the ease with which adjustments are made by the installation or maintenance man. A meter test set is used with a plug to fit the test jack, and the value of the currents in the various sections of the transmitter circuit is

measured by simply rotating the test set switch to its various positions.

Receiver. The Western Electric 38 Type Radio Receiver, used in the 238 Type Radiotelephone Equipment, is of a sensitive triple detection superheterodyne type. It is fixed tuned, with quartz plate control for both conversion oscillators. Triple detection is a modification of the usual superheterodyne, having two converters and two intermediate frequencies. The great advantage of triple detection is effective image suppression with no loss in selectivity. Images in superheterodyne receivers are spurious responses to signals separated from the frequency to which the receiver is tuned by twice the intermediate frequency. Further image rejection, along with added sensitivity, is gained by having a tuned radio frequency amplifier ahead of the first converter stage. A non-synchronous vibrator is used in the power supply circuit. The advantage gained by using this type of vibrator is that no concern need be given as to whether the positive or negative side of the vehicle battery is grounded.

A switch is provided for ease in changing from a 6-volt battery supply to a 12-volt battery. The switch opens or closes the circuit to one-half of a tapped primary winding on the power transformer. While a tapped transformer is slightly more expensive than using a resistor to drop the voltage, the method used has the advantage of lower power requirements from the vehicle battery when used on a 12-volt source. The vacuum tube filament circuits are easily switched for operation from a 6-volt filament supply to a 12-volt supply.

The intermediate frequency stages of the 38 Type Receiver are designed to have bandpass characteristics that provide an unusual degree of selectivity.

Negative Feedback Improves Reception

The audio frequency response of the receiver is flat in the voice frequency range with the resultant faithful reproduction of the talker's voice. With less than a microvolt input to the receiver the signal-to-noise ratio is about +25 db. During the period when the voice circuit is in use, negative feedback is introduced, further providing for a high degree of distortionless reception.

The selective signaling device incorporated in the receiver requires slightly more output power than is available when the feedback circuit is operative. Consequently, when the handset is not in use, i.e., when it is in its cradle, the feedback circuit is disconnected, providing additional power to operate the selector.

A frequency modulation type of squelch is used to make the audio circuit operative whenever a usable signal is received. An outstanding feature of the squelch circuit is that selected noise is amplified to bias the audio circuit to cut-off, reducing the possibility of anything but the desired radio frequency carrier opening the squelch and making the audio circuit operative. Such an arrangement greatly reduces the possibility of false operation of the selective signalling equipment by noise.

Selective Signaling. Unique with the Western Electric equipment is the D-175279 Selector, incorporated as an integral part of the receiver. This selector and its associated filters and relays provide full selective signalling with 2030 combinations available. Each radio channel will serve a number of mobile stations. The "fully loaded" circuit condition will be determined by such factors as calls per station, holding time per call, and the grade of service for which the system or particular channel is designed. Each mobile station will be assigned a five digit number, prefixed by a channel designation of two letters. Because the number 1 will be used as the selector "return to normal" pulse, the station number will never include the digit one. The selector is designed so that the total of the five digits must always add up to 23. An example of a mobile station number would be WJ3-4727, WJ being the channel designation, and 34727 the mobile radiotelephone station number.

The mobile telephone traffic operator will dial the digits for the called station. In doing so, she causes the control terminal equipment to modulate the land transmitter with a series of pulses of 600 and 1500 cycles. These pulses, received and amplified at the mobile stations, cause all selector sets assigned to the same channel to be actuated. Stop pins in the code wheel of the selector in the receiver called will cause only that selector to be positioned to ring a bell and light a call lamp in the vehicle. All other selectors will fail to reach the final or signaling position.

Control Unit. The only part of the mobile radio equipment visible to the vehicle operator is the 41A Control Unit. (Illustrated in our cover photograph.) This is normally mounted under the instrument panel of the vehicle, convenient to the driver. On the left of the control unit panel is a lamp to indicate an incoming call. The lamp lights along with the ringing of a bell when the subscriber is called. However, the bell stops ringing after a short interval but the lamp remains lighted until the subscriber acknowledges the call by removing the handset from its cradle. By having the lamp signal lock in, the subscriber is notified that he has been called while he was not within hearing range of the audible signal.

Centered on the front panel of the 41A unit is

the main power ON-OFF switch. With the switch in the ON position, the receiver is in operating condition, ready to receive a call and the transmitter is in a standby condition. The transmitter is ready to operate when the handset is removed from the cradle, and operates when the "push to talk" button in the handle is depressed.

To the right of the switch is a lamp to indicate power ON. The lighted lamp will serve as a reminder to the driver to switch off the power when the vehicle is put in the garage for the night.

Bell Signals Incoming Calls

The bell is mounted inside the control unit; also internal to the control unit are contacts which operate the various control circuits when the handset is removed. Provision is made for optional wiring to connect an auxiliary horn or loud ringing bell into the circuit, so that an incoming call signal can be heard at a distance from the car, as might be wanted by a lineman on a pole with the car nearby.

Land Station Equipment. The transmitting equipments at the land station are coded 540A and 541A for the two different frequency bands. The 540A will be used with the 238 Type receivers. This has an output power of 250 watts. It is capable of being remotely monitored and controlled to facilitate maintenance by the telephone plant people. Ordinarily one 250 watt transmitter per channel will be required.

Land receivers, coded 40A and 41A and used with the 540A and 541A Type transmitters, are located at strategic locations, to best receive signals from the mobile transmitters. The number of receivers necessary in a particular area is dependent on coverage expected and on the topography of the countryside. The receivers are arranged to operate a relay when a usable signal is received. When the relay is operated the switchboard lamp at the mobile service operator's position is lighted to indicate an incoming call.

Also associated with an urban system is a test transmitting equipment coded 542A Radio Transmitting Equipment. It is used for routine testing of the land receivers, is low powered and is on the same frequency as the mobile transmitters.

Control terminal equipment of the G Type provides connection of the radiotelephone equipment with the wire line plant. The selective signaling oscillator is part of the G terminal for continuous monitoring of the channel. Alarms and signals are provided for "off frequency" indication and other trouble indications that might cause service interruptions. Jack strips are provided for testing and patching, and a Vogad (voice operated gain adjusting device) is incorporated in the transmitting circuit to keep the transmitter modulation at a predetermined value.

Many articles and stories have already been published on the variety of uses to which mobile service might apply. However the usefulness of mobile service does not end with the connection to the general telephone system. Calls can be made from vehicle to vehicle.

The 238 Type equipment may also be used in private systems provided by the telephone companies to customers such as trucking companies, taxicab companies and others who have sufficient need to justify the full use of a channel. The telephone companies have made proposals for such private systems in a number of cases where the proposed use warrants a channel being assigned by the FCC.

Early Development

Mobile Radio is not new. The Western Electric Company pioneered in mobile radio, and as early as 1930 equipped the Detroit, Michigan, Police department with a system for operation on the original low frequency police band.

In the Forestry Service over $100,000,000 worth of property has been saved by the prompt use of mobile radio. Municipal Fire Departments have come to depend on it, and, in the Public Utility field the mobile radio car is sent to repair service interruptions due to accident or the elements.

The superior operation offered by FM communications in the emergency services prior to the war and the successful operation of FM communications equipment in the armed services during the war created such an increased demand for channels in the emergency service bands that the Federal Communications Commission predicts that by July, 1947, over 11,000 two-way mobile installations will be in use in buses, trucks, ambulances and taxicabs for urban and highway service and by that same date 3,300 installations will be in operation by the railroads. This does not include fixed and mobile applications for new stations and additions to existing systems, applications for which are being received by the FCC at two to three times the prewar rate.

———— *n r i* ————

Liverpool, England, has a harbor which is very difficult to navigate because of fog most of the year. Using new radar equipment on ships, navigation has been made considerably easier. As a result, the U. S. Coast Guard has experimented with "radar cops" in Delaware Bay and expects to follow up with many Liverpool-like systems in the future.

HOW TO GET ALONG WITH OTHERS

Dr. James F. Bender, Director
The National Institute for Human Relations

Men and women who get along well with others are just as careful about checking up on their human relations as their health. For the know-how of getting along with others is based on self-analysis. That is why all of us are rewarded by looking within from time to time to see how we are growing in those attitudes and habits that make life really worth while.

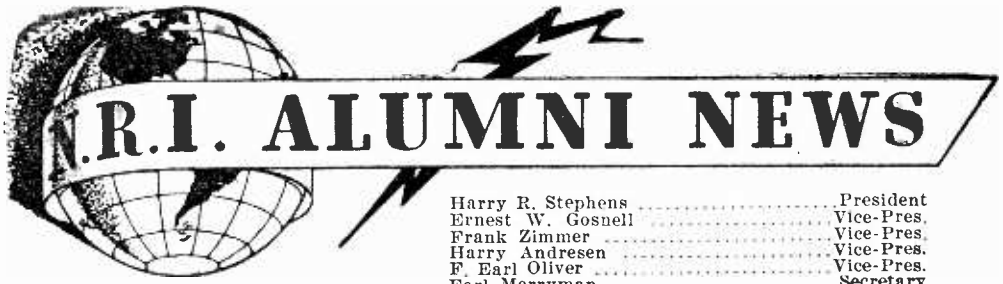
In this check-list of human relations you put a circle around the number in the column that most closely answers each question. (The ? column is reserved for "sometimes" and when you can't be sure.) Then add up the encircled numbers and compare your total with the average.

YOUR CHECK-LIST OF HUMAN RELATIONS

	Yes	No	?
1. Am I known for helping to spread happiness where I live and work?	25	0	10
2. Is there someone I wish hard luck because he has treated me unfairly?	0	25	5
3. Do I give something out of my earnings to charity?	25	0	10
4. Have I developed the habit of speaking softly in reply to a harsh remark or question?	25	0	10
5. Do I secretly enjoy listening about others' misfortune?	0	25	5
6. Have I learned to substitute action for worry?	25	0	10
7. Do I want those who have made a serious mistake to have another chance?	25	0	10
8. When good fortune comes my way, do I share it?	25	0	10
9. Do people feel better for associating with me?	25	0	10
10. Have I learned to accept disappointment without bitterness?	25	0	10
11. Do I seek out those who inspire me to do better?	25	0	10
12. Are my ambitions based on the wish to give more than I receive?	25	0	10
13. Have I earned the reputation of one who always keeps a promise?	25	0	10
14. Do I keep my head when others about me get excited?	25	0	10
15. Am I now working on a plan of self-improvement?	25	0	10
16. Do I make a daily practice of yearning for deeper understanding?	25	0	10
17. Is my personality more pleasant today than a year ago?	25	0	10
18. Do I make a practice of saying kind words to my associates?	25	0	10
19. Am I taking good care of my body, mind and spirits?	25	0	10
20. Do I look oftener to the future with hope than to the past with regret?	25	0	10
Total			

If your total score is 200 or above, your human relations are in all probability above the ordinary. That is, your attitudes are on the positive side of the ledger mainly. A perfect score is within the reach of everyone of us, once we consciously try to improve our human relations on a day by day basis.

OUR HUMAN RELATIONS NEED CHECKING UP FREQUENTLY



NOMINATIONS FOR 1947

Again it is time to call upon the members of the NRI Alumni Association to select candidates for offices in our organization to serve during the approaching year. This is in accordance with our Constitution which provides that two months prior to January 1 of the ensuing year, nominations for the various offices shall be called for from the membership through the columns of NATIONAL RADIO NEWS.

Then, the two candidates receiving the highest number of votes for each office shall be declared nominated and their names shall be submitted to the membership in the next issue of the NEWS, for the election of one to take office on January 1.

Our Constitution provides that all present officers may be candidates to succeed themselves, except the President. In order that the honor of holding office in our organization may come to a greater number of our members, the term of office for President is limited to one year.

This means that Harry R. Stephens of Detroit will retire as President on December 31. Until then, of course, he still has several months of his term to serve and he has mapped out a very active program for these remaining days. For one thing President Stephens is scheduled to visit headquarters in Washington. Our Alumni President will confer with executives at the National Radio Institute and the Executive Secretary of the Alumni Association on matters pertaining to the welfare of the NRI Alumni Association. Harry Stephens is a most conscientious man, has made an excellent President and always can be counted upon to give his very best in the interest of our Alumni members. He is a very active member in Detroit Chapter and, after his term as President expires, will continue to work with us through that very progressive chapter.

You are now called upon to choose the man you would like to have for President in 1947. Vote for any one you please. The only qualification is that he be a member of our Alumni Association. You may wish to vote for some officer of a local chapter or you may decide to vote for someone of the many fine members whose names appear on the opposite page. These names are given you merely so that you may have a wider choice. We have selected only a few names in order that we might suggest someone from each state and Canadian province. Do not hesitate to vote for someone whose name does not appear here if you wish to do so.

You may wish to choose your candidate for President from among our Vice Presidents. All of these men are well qualified to serve as President. Frank Zimmer is a member of New York Chapter where he is very highly regarded because of his tremendous enthusiasm and the energy which he put forth in aiding the members of that local. Frank Zimmer is one of the most loyal members in our organization and has all the qualifications to move up to the Presidency.

Ernest W. Gosnell served Baltimore Chapter for several years as Chairman. He too is a very loyal member of our Alumni. In fact, during the five years Mr. Gosnell served as chairman of Baltimore Chapter he did not miss a single meeting. He is excellent material for the Presidency.

Harry Andersen of Chicago has carried the torch for our Alumni Association in the middle West during the trying war years. In spite of tremendous handicaps Harry has carried on and has demonstrated his fitness for the highest office in our organization.

F. Earl Oliver of Detroit is a former President of our Alumni Association. Earl is one of those progressive fellows who simply must be in office somewhere because he is too good to sit on the side lines. Earl has the experience that would qualify him for the Presidency for a second time and there is no reason at all why you should not

vote for him for this office if you are inclined to do so.

The two men receiving the highest number of votes for President will be declared nominated and, in the next issue of the NEWS, we will have the run-off to elect one.

Eight candidates for Vice-Presidents will be placed in nomination. Four to be elected. All present Vice-Presidents may be re-nominated. You are requested to vote for four men to serve as Vice-Presidents.

Earl Merryman is a candidate for re-election as Secretary and L. L. Menne is a candidate for re-election as Executive Secretary. Merryman has been secretary since the Alumni Association was organized in 1929, and is a favorite with our members. Menne takes care of the executive duties of the Alumni Association at headquarters and also serves as editor of NATIONAL RADIO NEWS.

In order that our members may have a wide list of candidates to choose from we are submitting a list of names of members located in various parts of the country. These are submitted merely to be of assistance to you. Any member of the Alumni may be a candidate for office. Please use the ballot on pages 29 and 30.

Gorden E. DeRamus, Selma, Ala.
Don Smelley, Cottondale, Ala.
H. E. Nichols, Lowell, Ariz.
Edgar E. Joiner, El Dorado, Ark.
P. Rochelle, Little Rock, Ark.
Oliver B. Hill, Burbank, Calif.
John Jerry, San Francisco, Calif.
Dr. Geo. B. Thompson, Los Angeles, Calif.
P. A. Abelt, Denver, Colo.
A H. Wilson, Canon City, Colo.
W. R. Haberlin, Bridgeport, Conn.
David McKendrick, Devon, Conn.
Joseph Snyder, Danbury, Conn.
Wm. F. Speakman, Wilmington, Del.
Lambert P. Ayres, 3rd, Millsboro, Del.
J. J. Jenkins, Washington, D. C.
Robert E. Many, Washington, D. C.
Clyde D. Kielbach, Washington, D. C.
Wm. G. Spathelf, Washington, D. C.
Glen G. Garrett, Bonifay, Fla.
Austin L. Hatch, Ft. Lauderdale, Fla.
Stephen J. Petruff, Miami, Fla.
W. P. Collins, Pensacola, Fla.
Chas. W. Hardigree, Macon, Ga.
R. R. Wallace, Ben Hill, Ga.
L. E. McAllister, Mt. Berry, Ga.
Joseph Bingham, Twin Falls, Idaho.
Arvil H. King, Montpelier, Idaho.
Arthur E. Miller, Cicero, Ill.
Earl R. Bennett, Evanston, Ill.
Edward B. Jackson, Downers Grove, Ill.
Harry Andresen, Chicago, Ill.
Harold Bailey, Peoria, Ill.
Lowell Long, Geneva, Ind.
G. H. Millspaugh, Anderson, Ind.
Chase E. Brown, Indianapolis, Ind.
Russell Tomlinson, Marion, Ind.
Harry DeBolt, Cherokee, Iowa.
E. C. Hirschler, Clarinda, Iowa.
Elmer Dyer, Salina, Kans.
Louis A. Harrison, Ellis, Kans.
Wm. B. Martin, Kansas City, Kans.
K. M. King, Wichita, Kans.
Wm. S. Nichols, Cynthiana, Ky.
Ralph Banks, Whitesburg, Ky.
S. E. Banta, Gonzales, La.
L. H. Ober, Alexandria, La.
Lawrence Merz, New Orleans, La.
Aaron Grollman, Baltimore, Md.
E. W. Gosnell, Baltimore, Md.
J. B. Gough, Baltimore, Md.
Samuel Robinson, Hagerstown, Md.
G. O. Spicer, Hyattsville, Md.
Austin Vachone, Bath, Maine.
Harold Davis, Auburn, Maine.
Ralph E. Locke, Calais, Maine.
Laurence E. Grant, Belmont, Mass.
Louis Crestin, Boston, Mass.
A. Singleton, Chicopee, Mass.
Omer Lapointe, Salem, Mass.
Robert Swanbum, Duluth. Minn.
Arthur J. Haugen, Harmony, Minn.
J. I. Layman, Hector, Minn.
A. R. Stewart, Staples. Minn.
F. Earl Oliver, Detroit, Mich.
J. Stanish, Detroit, Mich.
Harry R. Stephens, Detroit, Mich.
Frederick Gaul. Freeland, Mich.
Al Fisher, Clarksburg, Miss.
Robert Harrison, West Point, Miss.
Orville Cook. Springfield. Mo.
C. S. Burkhart, Kansas City, Mo.
A. Campbell, St. Louis, Mo.
C. W. Wichmann, Inverness, Mont.
Carl M. Darner, Sweet Grass, Mont.
V. S. Capes, Fairmont, Nebr.
Albert C. Christensen, Sidney, Nebr.
C. D. Parker, Lovelock, Nev.
J. N. Hartman, Babbit, Nev.
Clarence Caraway, Las Vegas, Nev.
Arthur Cornellier, Dover, N. H.
Clarence N. George, Dover, N. H.
E. Everett Darby, Woodsville, N. H.
J. A. Stegmaier, Arlington, N. J.
E. Fonseca, Union City, N. J.
Delbert Delanoy, Weehawken, N. J.
Claude W. Longstreet, Westfield, N. J.
Ewell Wilkinson, Carlsbad, N. Mex.
George Baum, Hagerman, N. Mex.
John E. Kreitner, Buffalo, N. Y.
Alfred R. Guiles, Corinth, N. Y.
Jesse O. Starr, Dobbs Ferry, N. Y.
L. J. Kunert, Jamaica, L. I., N. Y.
Charles W. Dussing, Syracuse, N. Y
Irvin Gardner, Saratoga, N. C.
Max J. Silvers, Raleigh, N. C.
Arvid Bye, Spring Brook, N. Dak.

(*Continued on page* 30)

Phila-Camden Chapter

Harvey Morris and John Biacelli usually take over and do their stuff in the way of Radio servicing. Biacelli, by the way, has reenlisted in the Marine Corps with rank of Sergeant, and fortunately for us, is stationed at the Philadelphia Navy Yard as an instructor. He will still be with us.

Led by Harvey Morris we spent one evening on aligning super-hets. When it comes right down to fast and accurate trouble shooting and aligning, enough cannot be said for Harvey. We usually have about five or six sets in to service and all of us get a chance to ask questions and offer information.

New members since last report are as follows:
John W. Seibel, 3419 N. Orems Street,
Ray Hamilton, 2234 S. Lambert Street,
Llewellyn E. Henry, 3335 N. Bouvier Street,
Morris Segal, 3949 Wyalusing Avenue,
Clifford Hill, 1317 N. Alden Street,
Walter Yakowski, 1410 W. Tioga Street,
Nicholas Capozio, 224 N. Franklin Street,
Samuel D. Freeman, 1734 N. Lambert Street.

Meetings are held on the first and third Thursday of each month in the Post Office Building, 4706 Comly Street, Philadelphia. It is not at all difficult to reach our meeting place by auto, elevated or street cars. Meet with us once and you are sure to want to come again.

F. ARMSTRONG, *Secretary.*

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Baltimore Chapter

During the absence of our Chairman, H .J. Rathbun, our Vice Chairman Larry Arthur took over and things ran along smoothly right through the summer. Chairman Rathbun is now back with us after a trip which took him all through the West.

Mr. A. Chicknowski is the latest member to join our Chapter.

Now and then, just for relaxation instead of our usual meeting, we set aside a night for pleasure. A few weeks ago we adjourned early and went to Franks, Broadway and Oliver Streets, where we enjoyed a splendid dinner and refreshments. It was good entertainment and we enjoyed ourselves immensely.

Baltimore Chapter meets on the second and fourth Tuesday of each month, at Redmen's Hall, 745 West Baltimore St., at 8:15 P.M. You are cordially invited to meet with us.

P. E. MARSH, *Secretary.*

New York Chapter

We have been holding our meetings right through the summer and considering the warm weather our attendance has been very good. We have been averaging about sixty to a meeting. With the good fall days just ahead of us our attendance is sure to increase. We have plans for a busy winter season.

We have so many good speakers who impart such interesting information that our members feel they lose a lot by missing even a single meeting.

Alex Remer who started the Quiz program is still at it with new angles. It is strictly his pet idea and he always comes to meetings with a number of prizes—in fact each contestant gets something. The members like this part of our program very much.

Planning in advance and organization is the keynote of the fine progress we are making. Working on a definite schedule and a definite time limit promotes interest. Members are always wondering what is coming next.

Frank Zimmer explained how he constructed a Radio phonograph amplifier. Frank has a very sincere way of expressing himself and each one is held spellbound during his delivery. We all love to hear him speak. His workmanship is excellent. Pete Peterson is a "past master" in the manner he handles all the questions that are piled into the Question Box. The fellows can certainly think up some humdingers for Pete to answer.

Hans Bockelman and his relief, Pop Woodward, deserve a great deal of credit from all of us. They operate the P. A. system and certainly run it smoothly. During intermission Pop puts on popular music. There is something going on all the time at New York Chapter.

Already we are making plans for our annual meeting to be held sometime before Christmas. We expect a good delegation from Washington.

Meetings are held on the first and third Thursday of each month at St. Mark's Community Center, 12 St. Mark's Place—between 2nd and 3rd Aves., New York City. Meetings begin at 8:15 P.M. All NRI men whether students or graduates are welcome. Come to see us. Let's get acquainted.

L. J. KUNERT, *Secretary.*

Chicago Chapter

We continue to hold our meetings at the Golden Dome, 100 North Central Park Ave., Chicago. Our next meeting will be held on Wednesday, October 9 at 8 P.M. We will be glad to see all of our old members back with us now that the fall season is here again.

We held our picnic and for some reason hard to explain the attendance was far below expectation. We made preparations for a considerable number and therefore were overstocked with lots of good food, good drinks and ice cream. Apparently the war is not yet over, or at least we are still operating under war conditions.

We are still not satisfied with our meeting place because we cannot set up our own work bench. We hope to find more suitable quarters. Any suggestions will be very welcome.

HARRY COLTUN, *Secretary.*

n r i

Detroit Chapter

Detroit Chapter suspended meetings during July and August. But things will open with a bang on October 4 when we really get under way with a banner fall schedule. In the meantime we will have held our preliminary get-together on September 20.

Our regular meeting place is at the establishment of John Stanish, 2500 Joseph Campau, Northwest corner Vernor Highway. John has graciously donated the use of these quarters for many years. He and all of our members will be very glad to meet any NRI men in the Detroit area, who wish to come to our meetings.

VAL GUYTON, *Secretary.*

n r i

Notice To Holders of First-Class Radiotelephone Licenses

The Graduate Service Department at NRI has recently received several requests from broadcasting stations for NRI men to fill positions as radio operators. Frankly so many NRI men holding first-class 'phone tickets have neglected telling us about it, that we often experience difficulty in recommending anyone for these positions.

NRI men with at least a first-class radiotelephone license who are interested should write immediately in care of Graduate Service Department, stating *very briefly license qualifications,* experience, willingness to travel or locality preferred, minimum salary acceptable, and present occupation.

The number of these positions is very limited, so do not be disappointed if you write us and hear no more from the inquiry. We feel that this is an opportunity to help a few NRI men into better jobs. Your cooperation will be appreciated.

Nomination Ballot

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

After the ballots are returned to National Headquarters they will be checked carefully and *the two men having the highest number of votes* for each office will be nominated as candidates for the 1947 election. The election will be conducted in the next issue of NATIONAL RADIO NEWS.

The President cannot be a candidate to succeed himself but you may nominate him for any other office, if you wish. You may, however, nominate all other officers who are now serving, for President or any office, or select entirely new ones. It's up to you—select any men you wish as long as they are MEMBERS IN GOOD STANDING OF THE NRI ALUMNI ASSOCIATION. Be sure to give the city and state of your selections to prevent any misunderstanding. A list of the 1946 officers is given in the opposite column.

Detach this slip carefully from your NATIONAL RADIO NEWS so as not to damage the book. Tear off the slip at the dotted line, fill it out carefully and return it immediately to L. L. Menne, Executive Secretary, NRI Alumni Association, 16th and U Sts., N. W., Washington 9, D. C.

Your signature .....

City..... *State*.....

(over)

The 1947 nomination is a very important one. Choose carefully the men you desire to handle the reins of the Alumni Association for the coming year. Let's all do our part to help the staff handling the elections, by submitting ballots on or before October 29, 1946.

Nomination Ballot

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

I am submitting this Nomination Ballot for my choice of candidates for the coming election. The men below are those whom I would like to see elected officers for the year 1947.

MY CHOICE FOR PRESIDENT IS

.....

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

MY CHOICE FOR FOUR VICE PRESIDENTS IS

1. .....

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

2. .....

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

3. .....

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

4. .....

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

MY CHOICE FOR SECRETARY IS

.....

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

MY CHOICE FOR EXECUTIVE SECRETARY IS

.....

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

Directory of Officers

(To Serve Until December 31, 1946)

President Harry R. Stephens, Detroit, Mich.
Vice Presidents:
Ernest W. Gosnell, Baltimore, Md.
Frank Zimmer, New York, N. Y.
Harry Andresen, Chicago, Ill.
F. Earl Oliver, Detroit, Mich.
Secretary Earl Merryman, Washington, D. C.
Executive Secretary L. L. Menne, National Headquarters, Washington, D. C.

——— *n r i* ———

Stephens to Visit Washington

Alumni President Harry R. Stephens of Detroit is scheduled to visit National Headquarters on October 7, 8 and 9. He has made plane reservations in order that he might spend as much time as possible in Washington before hurrying back to his busy position in Detroit.

——— *n r i* ———

Nominations For 1947

(*Continued from page* 27)

Jacob J. Knaak, Cleveland, Ohio.
H. F. Leeper, Canton, Ohio.
Chas. H. Shipman, E. Cleveland, Ohio.
Byron Kiser, Fremont, Ohio.
P. E. Traylor, Maysville, Okla.
R. E. Fullhart, Bartlesville, Okla.
Emil Domas, Dale, Oreg.
Verl G. Walker, West Jackson, Oreg.
Elmer E. Hartzell, Allentown, Pa.
Chas. J. Fehn, Philadelphia, Pa.
William Dyson, Pawtucket, R. I.
James F. Barton, Greer, S. C.
Joel J. Lawson, Aberdeen, S. Dak.
Chester Warren, Lead, S. Dak.
Argil Barnes, Jonesboro, Tenn.
J. E. Collins, Paris, Tenn.
Dan Droemer, Ft. Ringgold, Texas.
Richard Mallard, Dallas, Texas.
Paul Boelten, Salt Lake City, Utah.
Walter Leland, Orleans, Vt.
J. W. Gladden, Alexandria, Va.
A. P. Caldwell, Buchanan, Va.
T. E. Ellis, Richmond, Va.
J. E. Thibodeau, Tacoma, Wash.
Alfred Stanley, Spokane, Wash.
G. Blomberg, Aberdeen, Wash.
G. McCollum, Weston, W. Va.
Wm. Wiesmann, Fort Atkinson, Wisc.
J. C. Duncan, Duncan, Wyo.
Robert Kirkham, Calgary, Alta., Canada.
M. Martin, New Westminster, B. C., Canada.
E. D. W. Smith, Winnipeg, Man., Canada.
John T. Dixon, St. John, N. B., Canada.
Russell Burhoe, Woodstock, N. B., Canada.
Donald Swan, Springhill, N. S., Canada.
G. C. Gunning, Smith's Falls, Ont., Canada.
E. Bergeron, Sherbrooke, P. Q., Canada.
J. W. Meadwell, Saskatoon, Sask., Canada.

Here And There Among Alumni Members

Cecil J. Giunipero is still with Radio Station WHJB, Greensburg, Pa., as assistant to the Chief Engineer. He received a nice boost in salary recently.

n r i

Jack Wagner of Lexington, N. C., has an excellent position with the Western Electric Co. in Winston-Salem, N. C., for which he gives NRI credit.

n r i

C. F. Smith, Sr. originally enrolled for the NRI Course sixteen years ago. He graduated and received his diploma. Recently he re-enrolled for the NRI Course because he wanted to bring his Radio knowledge up to date. He has a very fine Radio job and has sent us some good pictures. Mr. Smith is sixty years of age and writes Mr. J. E. Smith to say that a man is never too old to learn.

n r i

A great booster for NRI is Mrs. Kenneth C. Sanford of East Liverpool, Ohio. Her husband recently became a member of the U. S. Navy with a rating of Seaman First Class (Radio Technician). Previous to his induction he gave all of his time to Radio work and Mrs. Sanford said they lived very comfortably on his Radio income. His Radio business was growing rapidly. Things are in good hands at the Sanford establishment while Kenneth is in the service.

n r i

Clay Scott of Warsaw, N. C., who did such a great job in the Merchant Marine during the war, gave up a $100 a week Radio job to go back into the maritime service. He says that it is hard to estimate just how much his NRI training has helped him. Good luck, friend Scott.

n r i

Calvin Crowley of Evansville, Ind., is employed in one of the largest shops in Evansville and works on a percentage basis getting 50% of the labor charges. He has been ranging between fifty to seventy-five dollars a week. He looks forward to having his own shop one of these days.

n r i

William F. Temple of Baltimore Chapter was in for a visit at headquarters. Temple says things are going fine in Baltimore.

n r i

James Quinn, accompanied by Mrs. Quinn, while on vacation stopped at NRI for a visit. Quinn is Chairman of Detroit Chapter. From Washington he drove to Rehoboth Beach to spend a few days at the seashore. Quinn has a full time Radio business in Detroit. He was so impressed with the NRI Profcssional Radio Tube Tester that he bought one immediately, and took it back to Detroit with him.

Speaking of good fellows, what ever happened to Pete Dunn? The last we heard from him he was on the West Coast doing a war job of considerable importance. We hope Pete is all right and would be glad to get some news regarding him.

n r i

Arthur E. Reynolds of Sidney, N. Y., also was a visitor at headquarters in Washington. He has his own job and does repair work for two dealers.

n r i

Walter Radulovich of Detroit, Michigan came to Washington to visit his sister who is connected with one of the embassies. He had quite a visit with Chief Instructor Dowie.

n r i

Leon Thomas of Jacksonville, Florida is building an amplifier for a sight-seeing bus which he operates. He is having a lot of fun building it and expects it to be very useful to men who act as guides to tourists. You can expect to see more of these amplifiers on street cars and buses. Already they are being used to some extent on railroad trains.

n r i

Lester H. Corey of Norwich, Connecticut is a graduate of quite some years ago who recently called at NRI to visit.

n r i

We received numerous cards from H. J. Rathbun, Chairman of Baltimore Chapter, while he was on tour through the West. All of these cards are very much appreciated.

n r i

We received some pictures from Norman Kraft which were taken at the Phila-Camden Chapter picnic. The boys were having a great time.

n r i

W. W. Jordan, Jordan Radio Co., Lexington, Miss., is in need of an experienced Radio serviceman. He has a first class Radio repair business and offers a good opportunity to an NRI man who may be interested. He likes NRI trained men and will consider an advanced student. The telephone number is 10.

n r i

We hear that H. D. Rafferty, 40 W. South St., Uniontown, Pa., is now operating two Radio repair shops. There's a live wire.

n r i

Wayne E. McGinnis, Bartlesville, Okla., is another NRI man who is going places. He recently purchased a new store. We just received a very impressive photo of his new place of business.

n r i

Forrest H. Myers, Compton, Calif., writes that he has now found his "spot" as owner and operator of the FM Radio Service in Compton. Says sales and service business is booming out there.

Did Not Find A Dull Moment In Any Lesson

NRI Method of Teaching Enables Strickland to Turn Work Out Rapidly

Mr. J. E. Smith, President
National Radio Institute
Washington 9, D. C.

Dear Mr. Smith:

I have received my diploma and I'm really proud of it. I want to express my appreciation to you and the entire NRI staff for the wonderful co-operation I have received during the entire Course. From the first lesson all the way through to the last lesson, I found a continuous, easy-to understand story on Radio, Electronics, and Television.

When I began this Course I was anxious to learn Radio and I can truthfully say I did not find a dull moment in any lesson or experiment. When I had trouble with an experiment, or didn't fully understand something, I always felt free to write to you, and I always got a prompt, well explained reply.

I honestly believe that a man who has never seen a Radio, could study the NRI Course as you prescribe and fix any Radio receiver that exists. I could always picture in my mind what I was studying and everything is so well explained that anyone could learn it.

I have been getting receivers right along lately, and by using the methods taught me in the NRI Course, I don't have to spend much time on any of them. Effect to cause reasoning is my main tool, and thanks to NRI for teaching me such a way that I can use it.

STANLEY N. STRICKLAND
191 Dale Homes
Portsmouth, Va.

n r i

Department of Commerce Release

A very informative 200 page booklet entitled "Establishing and Operating an Electrical Appliance and Radio Shop," Industrial Series No. 28, is now ready for public distribution. Copies can be secured for 35 cents from Superintendent of Documents, United States Government, Washington 25, D. C. Remember, NRI cannot supply this booklet. It is a government publication and must be ordered from Superintendent of Documents, as mentioned above.

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

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