Tele VUE

TROUBLE SHOOTER

AM/FM RADIO & TRANSISTORS

For Service Technicians

The Tele-vue Trouble-Shooter
Instructions for Using

Simply determine the type of Radio you are working on. Either AC-AC/DC-PORTABLE-CAR-or TRANSISTOR. Check index for that type, and locate trouble you have in set. Turn to chart indicated.

AC/DC SECTION

CAR RADIO SECTION

3 WAY PORTABLE SECTION

AC SECTION

TRANSISTOR SECTION

NATIONAL TECHNICAL

RESEARCH LABORATORIES

WHITTIER, CALIFORNIA

THE PRACTICAL APPROACH TO RADIO THEORY

INTRODUCTION

The material contained in the Tele-Vue troubleshooter was obtained under shop conditions. Radios brought in for repair were checked using the same time proved techniques as are used in top quality shops all over the nation. From the hundreds and thousands of cases tested it was soon evident that troubleshooting is a case of certain quick checks to determine the defective sections, then voltage and resistance analysis to locate the defective component. The same procedures were used over and over again, and always the same answer, use certain quick checks, then voltage and resistance analysis. This system has been captured for you in the Radio Tele-Vue Troubleshooter.

REVIEW OF RADIO

Sound waves produced in the studio, pass across the microphone. The microphone turns these sound waves into electrical impulses that are amplified by an audio amplifier. Since audio cannot be transmitted, it is necessary to combine the audio with a high frequency carrier. In the broadcast band, the carrier frequency can range from a low of 550 kc, to a high of 1600 kc. Each radio station is assigned a frequency by the F.C.C. The combined signal, called a MODULATED signal, is passed through the air in the form of electromagnetic waves travelling at the speed of light, refer to Fig. 1.

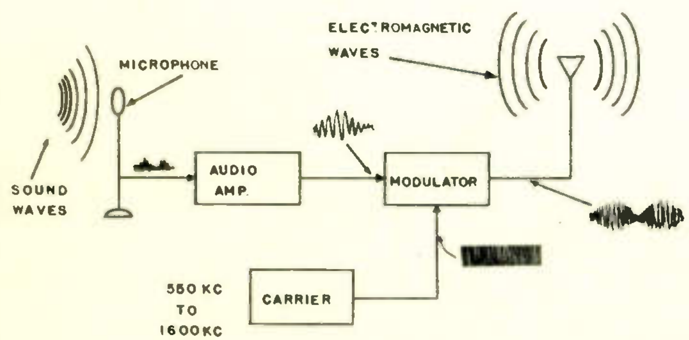


FIG. 1

The modulated signal is picked up by the antenna, and is either amplified by an RF amplifier, or passed directly to the MIXER. Also going into the mixer is a signal produced in the radio itself called the LOCAL OSCILLATOR signal. The combination of the incoming modulated signal and the local oscillator signal in the mixer, produces the Intermediate Frequency commonly called the I.F. A radio station signal CANNOT pass through the I.F.s unless it has first mixed with the local oscillator signal. The I.F. signal is amplified by the I.F. amplifier, and then passed to the detector. It is the purpose of the detector to remove the carrier that has brought the audio signal to the radio receiver, and to pass the audio signal to the audio amplifying stages. After leaving the detector, the signal is amplified greatly by the 1st audio amplifier, then is passed to the audio output circuit.

It is the job of the audio output stage to provide the power necessary to operate the loudspeaker, that is why sometimes the audio output stage is called the Power output. Once the signal has left the output stage, it goes to the last link in the radio chain, namely the Loudspeaker. Here the signal is turned back into sound waves, just as they were when they entered the microphone back in the broadcasting studio, see Fig. 2.

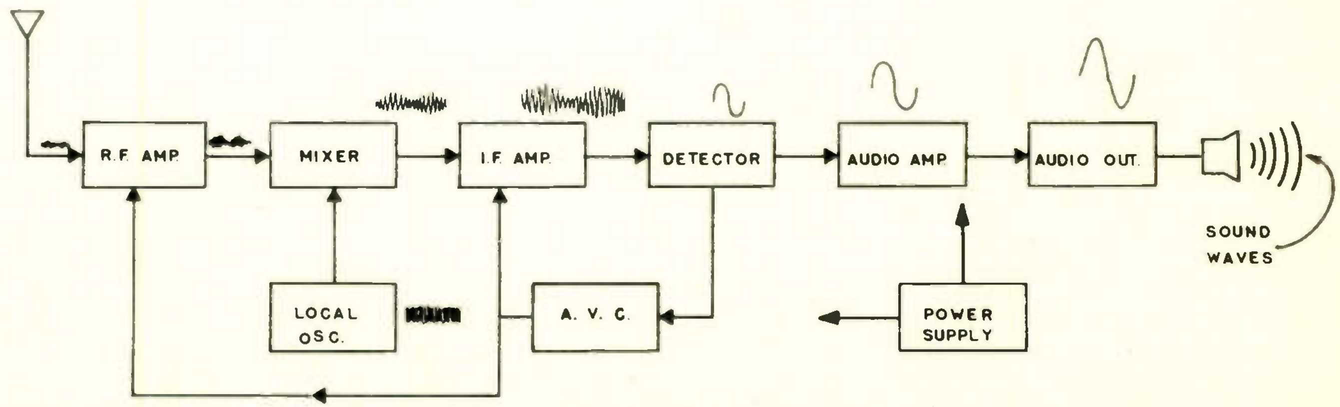


FIG. 2

TROUBLESHOOTING PROCEDURES

In troubleshooting a radio receiver, it is always a good idea to have in mind the overall radio system as described in the radio review. The reason for this, is that a faster method of isolating the source of trouble is possible if we understand the purpose of each section of the radio, and, if we have the use of a signal generator, locating the defective stage should hold no problems at all. Let us dwell on the signal generator for a moment. If a radio is not functioning correctly, it would be of great advantage to us if we could say for sure that the audio circuits are operating normally, or that the I.F. amplifier is doing its job. This is **possible** if we use the signal generator because it is a device that is capable of providing a signal for us that can take the place of the signal normally passing through the radio. For example, if a radio has no sound, we can connect the signal generator at the grid of the audio output stage and feed in an audio signal from the generator. If we hear that signal coming out of the loudspeaker WE WILL KNOW THAT THE AUDIO OUTPUT STAGE AND THE SPEAKER ARE WORKING. Now, this fact alone is invaluable to us because we need not waste any time at all in checking these circuits. The same conditions are applied to each and every circuit in the radio receiver. We can check to see if the 1st audio stage is working, or the I.F. amplifier, oscillator, or mixer stage. The generator can also be used to find the solution to weak sound, intermittent sound, fading, alignment, etc. When we come to the stage that doesn't pass the signal as it should, then all efforts are concentrated on that circuit until the defective component is found. This method of troubleshooting eliminates unnecessary checks and provides a SURE FIRE answer to receiver troubles. The Tele-Vue Troubleshooter is based upon these procedures, although it is also possible to approach the troubles without the use of the signal generator. This is done for the benefit of those that do not have a generator available.

The steps found most desirable, and producing the best results, are listed here at this time so that a discussion on the reasons for them can be given to see how they tie in to our overall troubleshooting procedure.

1. Visual inspection
2. Tube substitution
3. Signal injection
4. Voltage and resistance checks
5. Component substitution

Let us discuss them one at a time.

VISUAL INSPECTION

This can be done as we are in the process of removing the set from the cabinet, or even before that, by looking the set over as we listen to the trouble. Often such things as a broken antenna wire, loose tube in its socket, or a corroded electrolytic capacitor, can be easily noticed and corrected without using any of the instruments at all. If the set has to be removed from the cabinet, then such things as broken or burned resistors, poor solder connections, a broken wire, a loose component, can be seen and the repair effected without too much difficulty, and certainly with profitable results.

TUBE SUBSTITUTION

For the professional technician, tube substitution is very important. According to national surveys, over 60% of all troubles in radio are caused by tube failure. If this is true, then we are taking a better than average chance that a tube is the cause of the trouble in the radio you are working on. Of course the thought comes to mind, How many tubes must I have on hand in order to be able to substitute them in a radio receiver? Well, in radio the answer is, very few. Most AC/DC receivers use one of the two following tube lists. The older types used 35Z5, 50L6, 12SK7, 12SA7, 12SQ7. Modern types use 35W4, 50C5, 12BA6, 12BE6, 12AV6. AC receivers use 5U4 or 5Y3 or sometimes 6X5, 6V6, 6SQ6, 6SK7, 6SA7. The 3 way portable often uses 3V4 or 3S4, 1U5, 1U4 or 1T4, 1R5 or 1L6. As for the car radio it uses the same tubes as the AC type, or in a 12 volt system, it will use the same tubes as the 12 volt AC/DC tubes. The exception to this is the rectifier, in a car radio it is either the 0Z4, 6X5, or the 6X4. The output tube in the 12v car system will be the 12V6.

SIGNAL INJECTION

Of course, we have already indicated the importance of using a signal generator, now we find that if we have had a visual inspection, and the tubes have been substituted, we should proceed to try and find the defective stage. This can be done with the generator, starting at the audio output stage and working back toward the antenna.

VOLTAGE AND RESISTANCE CHECKS

Once the trouble is isolated to a defective stage, voltage readings should be taken. With a little thought, any voltage reading of a defective stage will almost pinpoint the defective component, or at least isolate it to a few parts. Let us take an example. Suppose that a radio had no sound, and after the visual check, tube substitution, and signal injection, we find that the 1st audio amplifier is not passing the signal. If it is an AC/DC receiver, the operating voltages should be as follows: Plate – 55v. Grid – -1v. Cathode – Ov. If the measured values were Plate – Ov, grid – Ov, cathode – Ov, we must suspect either an open plate resistor, or a shorted plate capacitor if one is used. The fact that the grid voltage should be -1v, and is now Ov, should be ignored because if there were no plate voltage, then the -1v will not be present on the grid, since in the 1st audio stage the bias is provided by current flowing through the tube, and with no plate voltage, there will be no current. From the voltage readings we determine the path of trouble in the stage, either the cathode, screen, control grid, or plate. Then resistance checks are made to find the defective part.

COMPONENT SUBSTITUTION

Once the defective part has been determined, usually by a resistance check, it must now be replaced. However, this may not be as easy as one might think. As far as resistors are concerned, the three things to keep in mind are: 1) Resistance value. 2) Wattage rating. 3) Physical size. The resistance value should be the same as the one in the set. If the resistor is charred beyond recognition, refer to the manufacturers schematic, or contact the local wholesaler and give the model number, and resistor location, such as, plate resistor of the 1st audio amplifier, and they will be able to find the resistor value for you. As far as the wattage goes, it must be the same value or larger, than the one in the receiver, never a smaller wattage. Remember, the wattage rating of a resistor determines its ability to dissipate the heat. If it is too small, it will overheat and burn up. One thing of importance to mention at this time is that if a resistor is burned or charred, you should investigate the reason for this, since a resistor by itself cannot burn up, something (usually a shorted capacitor), has caused this to happen. The final point to discuss is the physical size of the resistor. You should always be sure that the resistor will fit into the space provided for it. In most radios of the AC/DC and AC type, this is not much of a problem, but in some of the small portable and transistor radios, space is at a premium.

If the defective component is a capacitor, we must check for 1) Capacity value. 2) Working voltage. 3) Physical size. If a capacitor is used for coupling, or to bypass a signal, the same capacity as the one in the circuit or slightly larger will do. For example, if the avc bypass capacitor has to be replaced, and its value is .05 mfd, replacing it with a .1 mfg will be alright, this is double the value, but since it is there to bypass a signal, being a larger value will make it do its job that much better. When the capacitor is in the RF, Mixer, or Local Oscillator circuit, then exact values should be used. As for the voltage rating, these values should never be less than that of the one in the circuit. In fact, in almost all instances, it is perfectly alright to use a larger working voltage than the one that was in the circuit. The exception to this is in the case of electrolytics. These must be about the same working voltage as the one they are replacing. The reason for this, is that it has been found that the dielectric (insulator between the plates), will deteriorate if the voltage applied to it is much lower than its normal working voltage. As for size, the same things apply to the capacitor as have been mentioned for the resistor.

Finally, we come to coils and transformers. Here we have the problem of step up or step down ratio, and of impedance matching. Great care should always be taken to make sure that the replacement part IS a replacement for the transformer or coil in question. Even in the case of a defective I.F. transformer, you must specify whether it is the input or the output transformer when ordering the new I.F. The input transformer is the one going from the plate of the mixer, to the grid of the I.F. amplifier. As for output transformers they can be replaced in most cases with a universal type, if the exact replacement is not available. A chart comes with the universal type that shows the correct connections for the particular type of circuit you have in the receiver.

The information covered here, together with the introduction to the operation of the Transistor and FM, the troubleshooting digests on each chart, and the check points in the charts themselves, should enable you to become a competent service technician.

THE PRACTICAL APPROACH TO TRANSISTOR THEORY

INTRODUCTION

The purpose of this material, is to acquaint the reader with sufficient information to enable him to troubleshoot transistorized radios in the service field. Today, the transistor is becoming more and more a part of everyday servicing, and it is important that the technician have the ability to understand and work with the transistor receiver.

"N" AND "P" TYPE GERMANIUM

Due to the atomic structure of germanium, it is found in crystal form. This means that groups of atoms are clinging together to form a crystal. By itself the germanium crystal is an insulator. A group of scientists working for the Bell telephone company in the late forties, found that by adding small amounts of material to the germanium crystal, they could turn the germanium into a semi-conductor that would allow an electron flow, or "hole" flow, through the crystal. A "hole" flow is considered as an electron from one atom, filling the outer orbit of another atom, thus leaving a "hole" in the atom that it left. This action is mentioned here, because by germanium having "hole" movement, it is quite different than germanium having an electron movement. In order to tell them apart, the germanium with the electron movement is called "N" type, and germanium with hole movement is called "P" type. If a piece of germanium of the "N" type is placed in contact with a piece of "P" type, and a battery is placed across the two, current flow will occur. Refer to FIG. 1a.

If the battery is reversed as shown in FIG. 1b, current flow will stop. The reason for this is that in FIG. 1a, the negative terminal of the battery is forcing electrons from the "N" section into the "P" section, where they will go from hole to hole and back to the positive terminal of the battery. In FIG. 1b, the electrons from the "N" section are being pulled *away* from the "P" section, by the positive terminal of the battery, therefore they cannot complete the circuit, and current flow will stop.

FORWARD AND REVERSE BIAS

When the battery is connected as in FIG. 1a, we say that the crystal has *FORWARD BIAS*. Perhaps a good way to remember this, is to note that the negative terminal of the battery is connected to the "N" section, and the positive terminal is connected to the "P" section. When the battery is reversed, FIG. 1b, we say the crystal has *REVERSE BIAS*. Perhaps you have heard of a germanium diode?, well the illustration of FIG. 1 can be applied to the germanium diode. It allows current flow in one direction, but stops current flow in the reverse direction. A diode vacuum tube uses this same principle for its operation, however, the advantage of a germanium diode, is that it does not require a heater nor a vacuum, therefore would tend to be longer lasting with less possibility of breakage. When forward bias is applied, the resistance to current flow is low, somewhere in the hundreds of ohms. If reverse bias is used, the resistance to current flow is high, somewhere in the hundreds of thousands of ohms. As a result, we can check a germanium diode by connecting a meter across the diode one way, and then reversing the leads of the meter, one reading should be high, the other low.

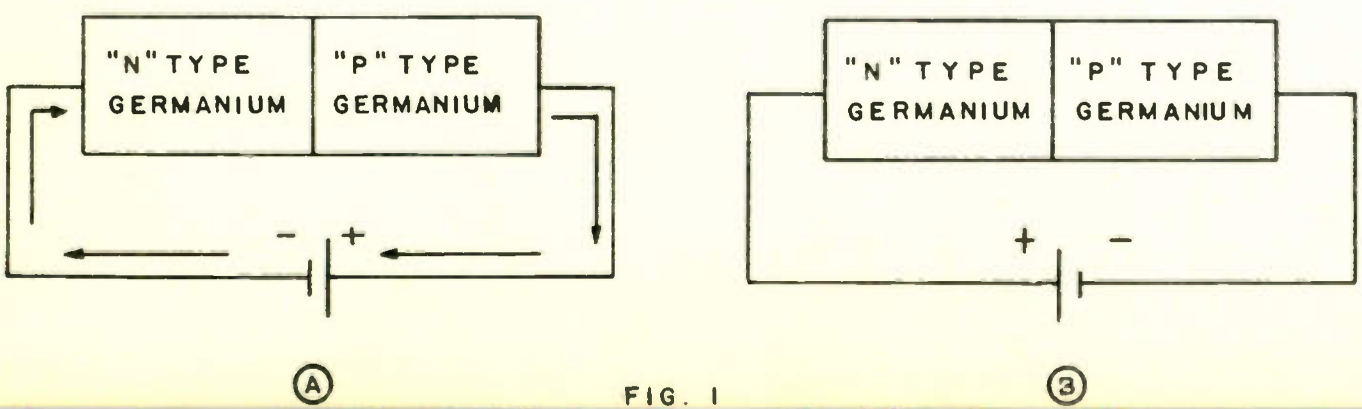


FIG. 1

THE TRANSISTOR

The transistor is constructed of three sections of germanium. It can be either of the "N" "P" "N" type, or the "P" "N" "P" type. One section of the transistor is forward biased, and the other section is reverse biased. The key to the operation of the transistor is the thinness of the middle section, it is usually no more than one thousanth of an inch thick (.001"). Let us refer to FIG. 2 as we discuss its operation.

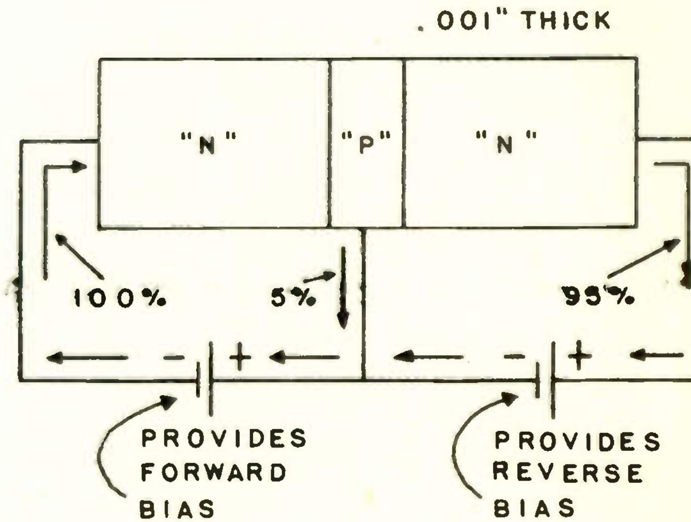
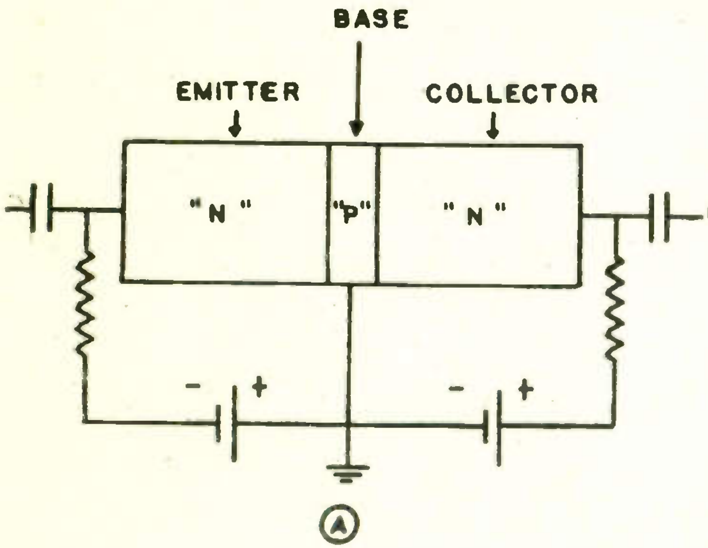


FIG. 2

You will notice that the first section of the transistor is forward biased, and the last section is reverse biased. The forward bias is forcing the electrons in the first "N" section to go into the "P" section. However, because the "P" section is so thin, almost all of the electrons pass right through into the second "N" section. The second section of the transistor is reverse biased, having a high resistance to current flow, but we have forced electrons into the reverse bias section because the middle "P" section is so thin. The extra electrons in the second "N" section are removed by the positive terminal of the battery, thus completing the path of current flow. What has happened here, is that the current started by the low resistance forward bias section, has passed through the high resistance reverse bias section, this action gives the transistor its amplifying characteristics. By adding some resistors and feeding in a signal, we will have our transistor amplifier. The names, and the amplifier circuit of the transistor amplifier are shown in FIG. 3a. The same circuit, using the transistor symbol, is shown in FIG. 3b.



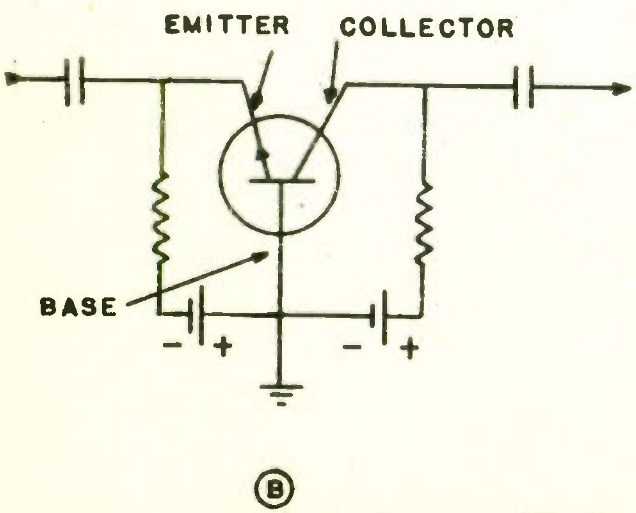


FIG. 3

THE GROUNDED BASE AND GROUNDED EMMITTER AMPLIFIER

As the input signal varies, it will add and subtract from the forward bias of the first section of the transistor, this will vary the current flow through the whole transistor, and cause the collector voltage to vary as the signal varies. However, the varying collector voltage will be an amplified version of the input signal. This type of a circuit is known as the *GROUNDED BASE AMPLIFIER*, it requires two batteries, and is seldom used today. By far the most popular of the transistor amplifiers is the *GROUNDED EMITTER AMPLIFIER*, it can be operated with one battery, and has a larger amplifying ability than the other types. The grounded emitter amplifier is used in almost all transistor amplifiers, and will be the one that we shall discuss and use throughout our trouble-shooting charts. The circuit of this type of an amplifier is shown in FIG. 4.

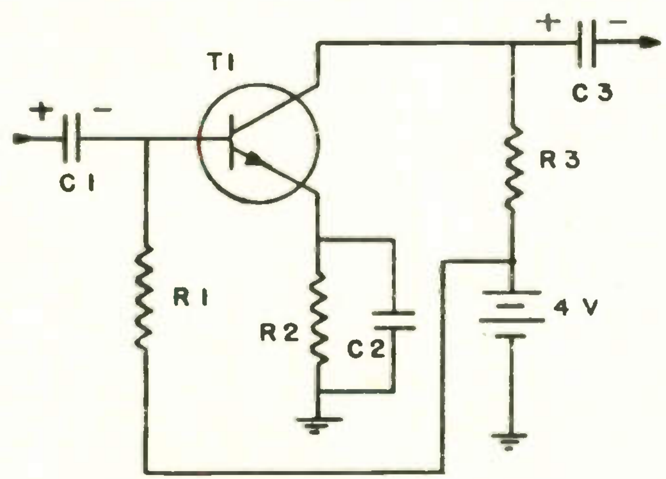


FIG. 4

Since this is the most likely transistor amplifier that you will come across, let us make sure that we understand how it is forward and reverse biased. In order for the forward bias to be on the base emitter, the base must be positive with respect to the emitter. As you can see, the emitter is connected to the ground through R2, this connects it to the negative side of the battery that is also grounded. The base is connected to the positive side of the battery through R1. With the base positive, and the emitter negative, we have forward bias. In order to have reverse bias the collector must be positive with respect to the base. Since it is connected to the positive terminal of the battery through R3, it will be positive. The values of R1 and R3, and the current flow through them will determine if the collector is more positive than the base, and of course it must be in order to operate correctly.

C1 is the coupling capacitor that couples the signal to the base of the transistor. It is a large value electrolytic capacitor so as to couple as much of the signal as possible to the transistor. Electrolytics are *NOT* used in radio sets of the vacuum tube type because of the higher voltages used, and the more likelyhood of breakdown of the capacitor. In transistor radios, the voltage seldom exceeds 9 volts. R2 is used in the emitter circuit to compensate for temperature changes and any differences in transistors should it be necessary to replace the transistor for any reason. Without R2, a change in temperature, say from a cool room to the hot sand on the beach, would cause the radio to become distorted, or perhaps weak. C2, across R2, keeps the emitter voltage constant for a constant value of forward bias.

As the incoming signal is coupled through C1 to the base of the transistor, it will cause the current through the transistor to vary as it adds and subtracts from the forward bias. Collector voltage will vary due to the varying current through the transistor, and this varying voltage will couple through C3 to the next circuit. The battery used for this operation is usually a 4 volt or 9 volt type. In some of the amplifiers, C2 is omitted so that a better frequency response is provided. In the RF and IF circuits of a transistor, different methods are used to couple the signal from one transistor to the next. In most cases it will be done by means of transformers, FIG. 5, shows a typical transistor IF amplifier.

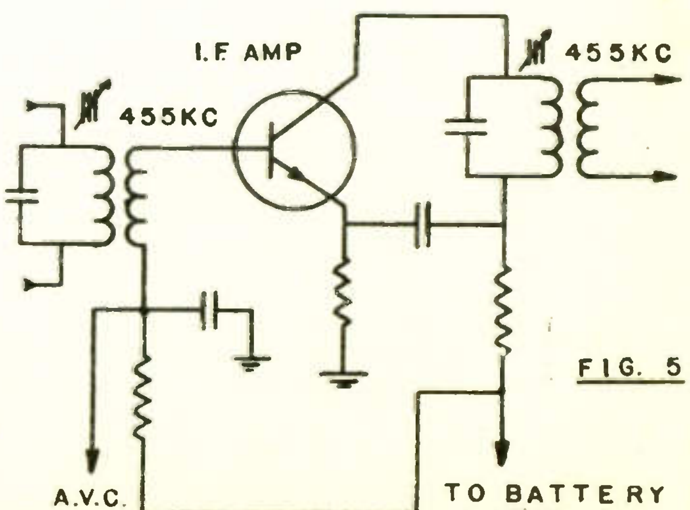


FIG. 5

In most of the detector circuits of a transistor amplifier a germanium diode is used in place of the conventional diode tube, since we have already discussed the operation of the germanium diode, we can go right to the circuit of the detector as shown in FIG. 6.

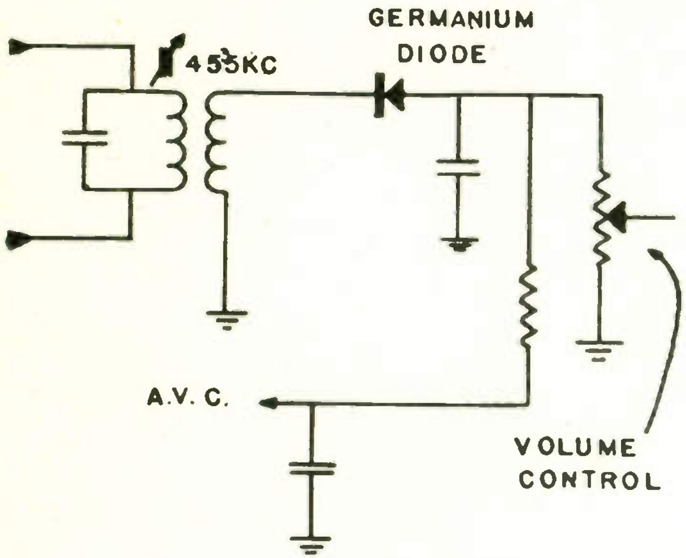


FIG. 6

TROUBLESHOOTING THE TRANSISTOR RADIO

When working on the transistor radio, you will find that the troubleshooting procedures you have used in radios of the vacuum tube type, can be applied to the transistor radio. For example, suppose that a transistor radio were given to you for repair, and after switching on the radio you found that it had no sound. After making sure that the batteries were okay, you would now go to the input of the last transistor in the radio, the audio output transistor, and feed in an audio signal to the base. If you heard a tone, you would proceed to the volume control with the audio generator, and try to pass an audio signal from that point. If a tone is heard, then feed in a modulated IF signal to the base of the IF transistor, if a tone is heard, move back to the base of the next transistor, and so on. If at any of the above points a tone is *NOT* heard, why you would troubleshoot that circuit and find out why the the tone did not go through. The above example can be applied to *ALL* of the troubles found in transistor radios, you simply apply the same procedures that you have used all along.

At first some difficulty may be experienced in locating the correct transistors to feed a signal to, or you may find that because most transistor radios are made with the use of printed circuits, that it will take some time to get used to the printed circuit board.

Another point that I know will be hard to adjust to, is the compactness of the entire radio, for as you know, it is the desire of the manufacturer to make these radios as small as possible. Remember, be patient, for all of the above mentioned conditions can be overcome, and the ability to repair transistor radios will, I can assure you, be very profitable to you.

All of the discussion on transistors has been pertaining to the "N" "P" "N" type. If the "P" "N" "P" type of transistor is used, then the battery connections to the transistor and the direction of the arrow of the emitter will be reversed. The base of the transistor is the middle lead, and the collector is identified by either being farther away from the other two leads, or having a colored dot by its lead.

THE PRACTICAL APPROACH TO FM THEORY

INDEX AND INSTRUCTIONS FOR USING THE TELE-VUE TROUBLESHOOTER FOR FM.

Simply determine the chart that covers the trouble occuring in the FM receiver from the index of troubles listed below. Turn to that chart and place plastic cover over chart so that information, schematic, and photo show through window in plastic.

INTRODUCTION

Frequency Modulation, or more simply FM, has been increasing in popularity ever since its introduction in the field. Today, because of Television and High Fidelity, more and more FM receivers are being sold than ever before. As a result, the serviceman is finding more need for an understanding of FM theory and Troubleshooting techniques. It is the purpose of this article and subsequent charts, to provide a clear path to the theory and service of FM receivers.

FREQUENCY MODULATION

The outstanding advantages of FM are its low noise factor, and its ability to provide high fidelity. This is possible because of the limiting action of the detector in the receiver, and the high transmitting frequency that is used, (from 88 mc to 108 mc). The carrier frequency that brings the audio signal through the air, has a *constant* amplitude as it leaves the transmitter. This differs from the Amplitude Modulated signal that is transmitted for our broadcast band, since, as its name implies, it *varies* in amplitude. As the FM signal passes through the air, it picks up noise impulses, (these are due to arcing of electric motors, etc.), these impulses attach themselves to the top and bottom of the carrier signal, and are brought into the FM receiver along with the signal. However, due to the operation of the FM detector, the amplitude of the signal is limited, and any noise riding along with the signal is removed. This action *cannot* be done in AM, because it is the amplitude variations that represent the the audio intelligence. Refer to Fig. 1.

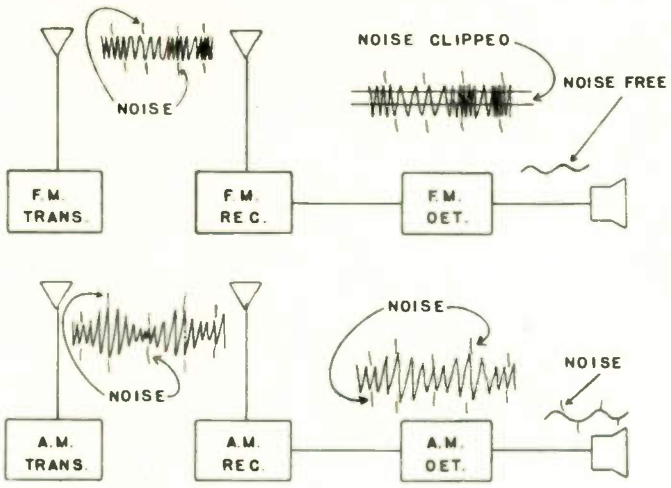


FIG. 1

High Fidelity is possible with FM because the carrier frequency is so high that it permits a relatively large amount of modulation to occur without interfering with other stations. This is not true in AM, since the stations are only a few kilocycles apart.

THE F.M. ANTENNA AND R.F. STAGE

The FM antenna differs from the AM type, in that it requires a twin lead in wire connected to a dipole Hertz antenna. For best results the antenna should be mounted on the roof facing the direction of the transmitting antenna. However, since many of the stations transmit from different locations, it would require a rotating antenna to be moved as we select various stations. This is undesirable for obvious reasons, therefore, the antenna is set to receive as many stations as possible for best all-around results.

In almost all of the FM receivers sold today, some form of indoor FM antenna is provided. This usually consists of twin lead in wire stapled to the inside of the cabinet and attached to the antenna terminals of the set, or capacity coupling from the ac line cord to the antenna terminals. The latter consisting of a metal clamp around the ac line cord and connected to the antenna terminals. Refer to Fig. 2.

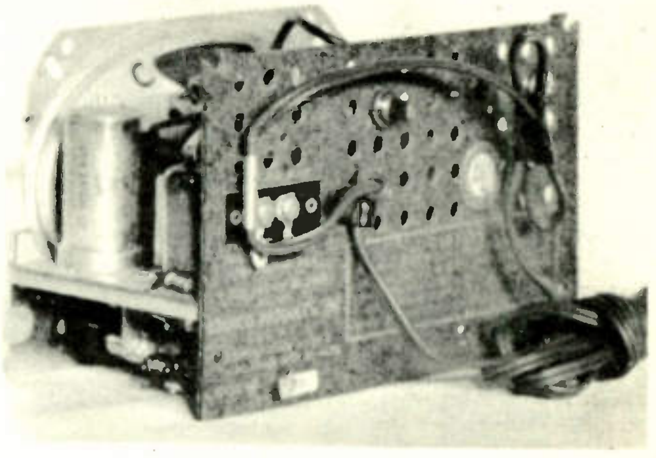


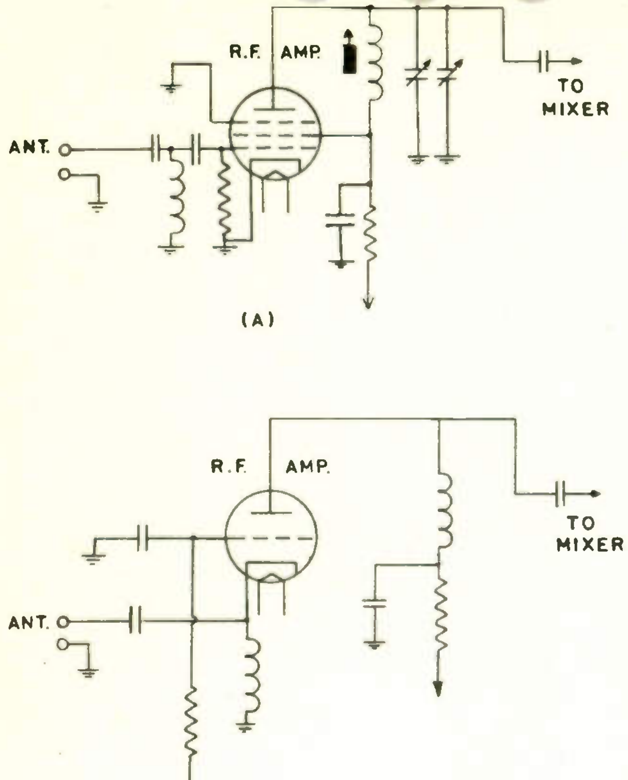
FIG. 2

From the antenna terminals the signal is applied across the antenna coil. This may be in the cathode circuit of a grounded grid triode amplifier, or in the grid circuit of a pentode amplifier.

The disadvantage of the pentode RF amplifier stage is its high noise factor. Even though FM is relatively noise free, it is still undesirable to have noise in the signal. To overcome the disadvantage of the pentode amplifier, an RF amplifier of the triode type is sometimes used. A triode has less noise than a pentode, and the undesirable effect of high interelectrode capacity is almost eliminated by feeding the signal into the cathode circuit, and grounding the grid through a capacitor. Both of the circuits mentioned aboved are shown in Fig. 3.

MIXER AND OSCILLATOR STAGES

Heterodyning is used in FM just as it is used in AM, however, due to the higher frequencies, certain differences do exist. The mixer must receive two signals, one from the RF amplifier, and the other from the Local Oscillator. We have already noted that the signal from the antenna is amplified by the RF stage using a conventional pentode, or a grounded grid triode. From the RF stage, the signal is coupled to the grid of the Mixer. The Mixer is usually a triode, using one half of a duo-triode tube as



(B)

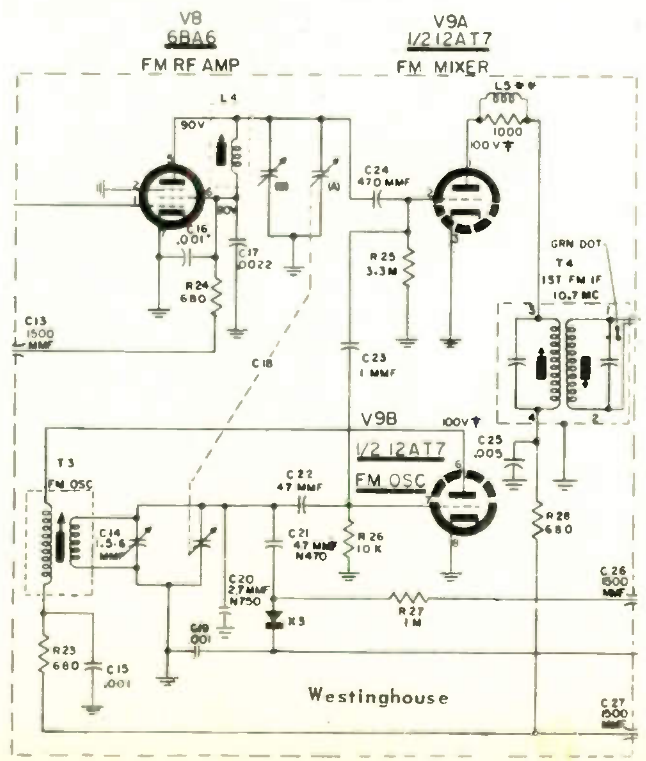
FIG. 3

a Mixer, and the other half as an Oscillator, or a single triode operating as a Converter (combination mixer and oscillator). Some of the models are using a duo-triode with one half as an RF amplifier, and the other half as a Converter. The other signal that is applied to the Mixer stage, comes from the Local Oscillator, and is also applied to the Mixer grid. In the cases where the tube is a converter, the signal from the Local Oscillator section is at the Mixer grid simply because the one tube is performing dual functions, Mixer action AND oscillations. Where a separate Oscillator tube is used, the signal will be applied to the Mixer grid either by capacitive or inductive coupling. Fig. 4 shows the various Mixer Oscillator circuits.

The components that are used in the FM Mixer and Oscillator, perform the same functions as those found in the AM radio. The actual difference between them is their electrical values. Since FM is a high frequency, the components will be much smaller and more critical. Great care must be taken to avoid moving parts or rerouting wires, either action could lead to serious misalignment. With both signals present at the Mixer, heterodyning will occur and the Intermediate Frequency (IF), of 10.7 mc will be present for the IF transformer in the plate circuit of the Mixer. Fortunately, the IF in FM is standard at 10.7 mc.

FM IFs

The signal passing through the IFs of an FM receiver, is constantly changing frequency with intelligence present. The amount of frequency change permitted in an FM system for radio is plus or minus 75 kc. This gives a maximum deviation of 150 kc. Compared to the AM deviation with intelligence of only 10 kc, you can readily see that the IFs in FM must be capable of a broad bandwidth. This also calls for very special alignment with instruments. In AM it is possible to align the IFs by listening to the radio station and adjusting the IF screws for maximum sound. This cannot be done in FM. UNDER NO CIRCUMSTANCES ATTEMPT ALIGNMENT WITHOUT THE CORRECT EQUIPMENT. Since the bandwidth of the IFs is broad, it is often necessary to use more than one stage of IF amplification because you must sacrifice amplification in order to obtain bandwidth. Another point to mention at this time is the use of a combination AM/FM reciever. Under these circumstances the IFs can handle both AM and FM by using a double IF coil in the plate circuit. One will respond to the AM IF, and the other to FM IF. Fig. 5 shows such a circuit.



THE FM DETECTOR

Perhaps one of the greatest differences between the AM receiver and the FM type, is the detector. In AM the detector must detect a change in amplitude. In FM, the amplitude of the signal is constant, therefore, an AM detector could not possibly work for an FM signal. Instead, a special type of detecting circuit is used, one that will detect changes in frequency. Two basic type of FM detectors are in common use today, one is the Discriminator, and the other is the Ratio Detector. The Discriminator requires a Limiter stage prior to the detector circuit, for purposes of limiting the amplitude of the FM signal being applied to the detector. A schematic diagram of the Limiter is shown in Fig. 6.

The output of the Limiter stage is a constant amplitude signal ready for the detector. The input to the Limiter may have amplitude variations present due to noise and uneven amplification of the tubes that the signal has passed through. Limiting action is accomplished by using grid

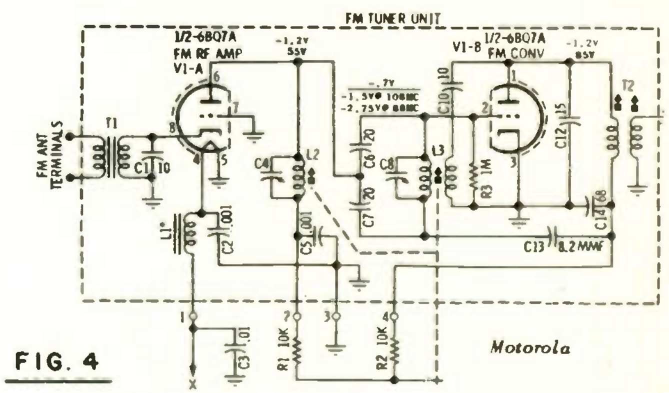
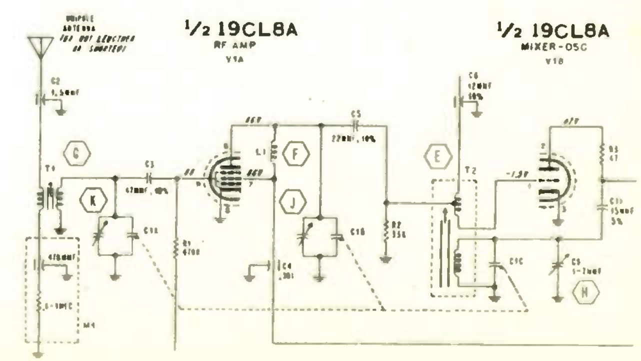


FIG. 4



Admiral

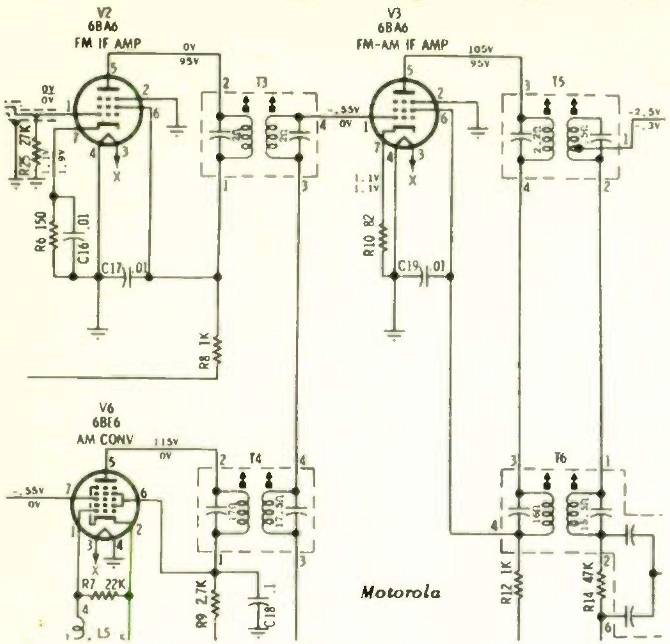


FIG. 5

leak bias provided by R13 and C20, the action is as follows. Signal applied to grid of limiter will cause grid current to flow on positive half cycle, this will charge C20 to peak of signal. As signal goes into negative half cycle, C20 will discharge through R13 and develop a voltage across R13 that will cut limiter tube off. The entire negative half cycle of input signal will not pass through tube because it is in this state of cut-off. When the Limiter stage conducts on the positive half cycle, the tube is driven into saturation because of low plate voltage due to the large value of R18. Therefore, both

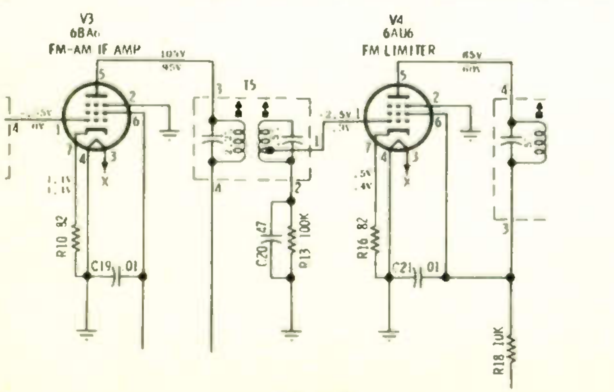


FIG. 6

the top and bottom of the input signal have been clipped, and only a small portion of the entire signal will pass through the Limiter stage, giving us a constant amplitude limited output. All of this action is necessary because the Discriminator WILL detect changes in amplitude if any are present, and the result of this would be noise. Taking this one step further, if a weak signal is applied to the Limiter stage, and it does not limit the signal properly, some amplitude changes will get through and cause noisy reception. Therefore, an FM receiver using a Limiter and Discriminator will only perform well if the signal is strong enough to provide correct Limiting action. Let us now refer to Fig. 7 to study the operation of the Discriminator.

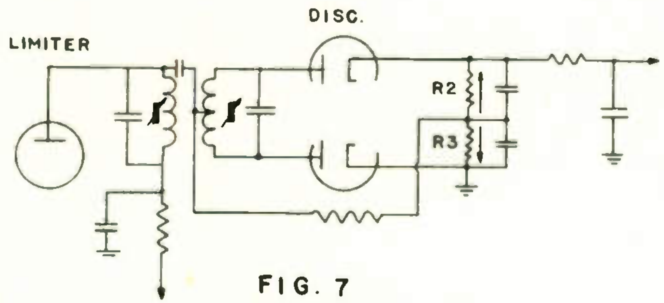


FIG. 7

The theory behind the operation of the Discriminator is quite complex and beyond the scope of this material. However, we will be able to have a very good understanding of its operation for practical and troubleshooting purposes. To begin with, we know that the signal applied to the detector transformer from the Limiter is of a constant amplitude. The signal is now coupled to the two plates of the Discriminator. If only the IF signal is present, then both tubes will conduct equally and produce equal voltages across R2 and R3, but due to the direction of current flow through each resistor, the total voltage across both of them will be zero. This is as it should be, since with only the IF present, there is no modulation, and therefore no output. As the frequency varies above and below the IF due to modulation, the signal at the plates of the Discriminator will no longer be equal, this is due to circuit design and operation, and one of the diodes will conduct more than the other. This will produce an unequal voltage across R2 and R3, and their combined value will no longer be zero and there will, be an output. Since the modulation will cause the frequency to vary above and below the IF at an audio rate, the output of the Discriminator will be an audio signal. Once detected, the signal is applied to a deemphasis network that compensates for certain changes in the high audio frequencies that are transmitted. The deemphasis network consists of a resistor and capacitor combination that bypasses some of the high audio frequencies to ground, and provides a uniform output for all frequencies. From the deemphasis network the signal is applied to the volume control. Once at the volume control the circuit becomes identical with any audio amplifier found in AM.

The second type of detector is the Ratio detector, and is perhaps the more common of the two since it has less circuitry, for example it does not require a Limiter stage before the detector. The Ratio detector is also a double diode, but in this instance the signal is applied to the cathode and plate of the two diodes rather than to the two plates as in the case of the Discriminator. At the far right of the diagram in Fig. 8, you will notice an electrolytic capacitor, this capacitor absorbs amplitude variations of the signal. Its value is usually between 4 and 8 mfd and is often called a stabilizing capacitor. The operation of the Ratio detector is somewhat similar to the operation of the Discriminator with the exception of the output points. In the Ratio detector, with only the IF applied, both biodes conduct equally and charge C25 and C26 the same amount. The output is tapped off between these two capacitors, with the other lead at ground. When the modulation is present, the two diodes do not conduct equally, and the charge on C25 and C26 will no longer be equal. This unbalances the circuit, and an output is noticed. It is the ratio of charge on C25 and C26 that produces the output from the Ratio detector circuit. There are a number of ways of producing an output from the Ratio detector circuit, but one can always recognize that it is a ratio detector by the use of the electrolytic capacitor and the detector transformer connecting to the cathode and plate of the two diodes. The output of the ratio detector is applied to the deemphasis network, just as with the Discriminator, and from there to the volume control. Once again, the audio circuit is identical with the circuit found in any AM receiver.

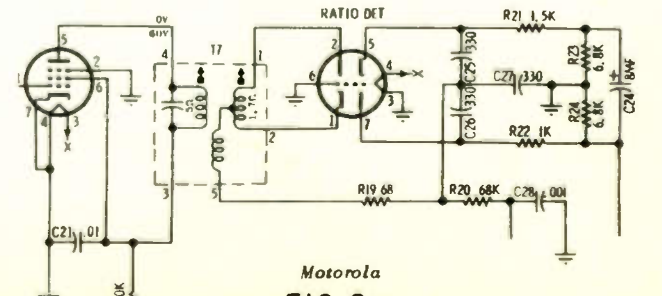
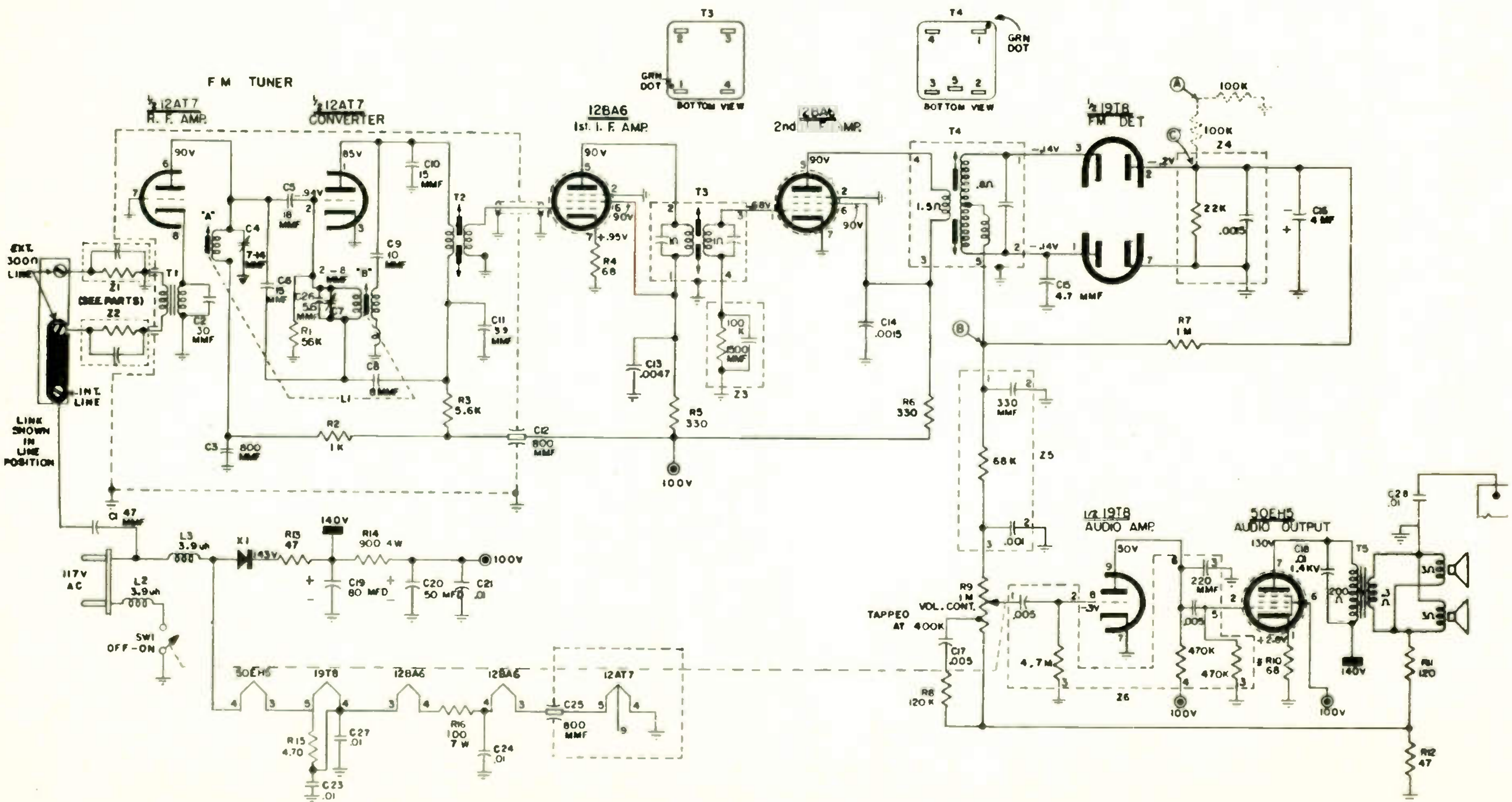


FIG. 8

TROUBLESHOOTING THE FM RECEIVER

Troubleshooting the FM receiver is in most cases similar to that used in AM. Some of the differences come in the IFs and alignment. As far as the audio section of the FM receiver is concerned, there are no differences at all. In trying to pass a signal through the IFs however, it becomes necessary to set the generator at 10.7 mc with modulation, and then rock the dial back and forth around that frequency. The reason for this, is that at the IF of 10.7 mc, there should be no output, and only by rocking the dial will an output be possible. As for the alignment, great care must be taken in aligning the detector. This can be done with the generator and VTVM, or for an even better alignment an oscilloscope can be used. Once again to repeat, do not attempt alignment without the proper instruments.

Since many of the F.M. receivers sold today are of the combination AM/FM type, it will be worth while to dwell upon some troubleshooting features of these receivers so that we may make use of their dual operation. In the combination receiver, the audio circuits are common to both AM and FM. If for some reason the FM section is inoperative, and yet the AM is working, we will already have a clue as to the area of trouble. For example, we will know that the audio circuit is working, and that the power supply is okay, now, with a few other checks, we can determine the actual area that is defective. Another example of troubleshooting can be seen if we consider an AM/FM combination that is completely inoperative. This should lead us to the conclusion that the trouble is common to both sections, and continuing the thought, this must be either the audio section or the power supply. The troubleshooting charts indicate the checks that should be made for a combination AM/FM receiver, or for an FM type.



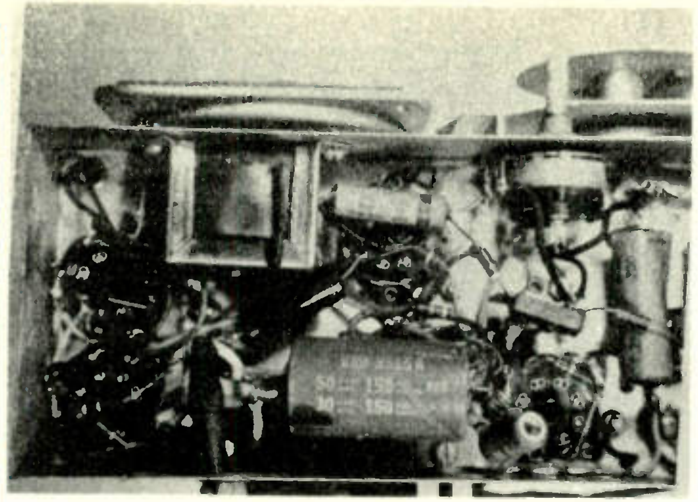
1. VOLTAGES TAKEN WITH A VTVM FROM POINTS INDICATED TO B-. TUNING INDUCTANCE AT MAXIMUM. VOLUME CONTROL AT MINIMUM, LINE VOLTAGE AT 117V AC. NO SIGNAL INPUT.
2. ALL CAPACITANCE VALUES ARE IN MFD. & ALL RESISTANCE VALUES ARE IN OHMS 1/2 WATT UNLESS STATED OTHERWISE.
\# FUSIBLE RESISTOR, REPLACE ONLY WITH WESTINGHOUSE APPROVED PART

Courtesy of Westinghouse Tech-Lit Service.

TROUBLE — TELEVUE SHOOTER

DIGEST (A)

MOST OF THE TROUBLES THAT CAN CAUSE HUM IN A RADIO ARE DUE TO THE A.C. POWER THAT IS APPLIED TO THE RADIO. ONE OF THESE SOURCES IS THE POWER SUPPLY ITSELF. AS THE A.C. IS APPLIED TO THE RECEIVER, IT IS TURNED INTO A FAIRLY PURE D.C. BY MEANS OF THE RECTIFIER TUBE AND FILTER NETWORK. IF THE FILTERING IS POOR, THEN THE A.C. WILL PASS INTO THE RADIO CIRCUITS THROUGH THE POWER SUPPLY. THE INPUT AND OUTPUT FILTER CAPACITORS ARE THE MAIN CAUSE OF THIS.



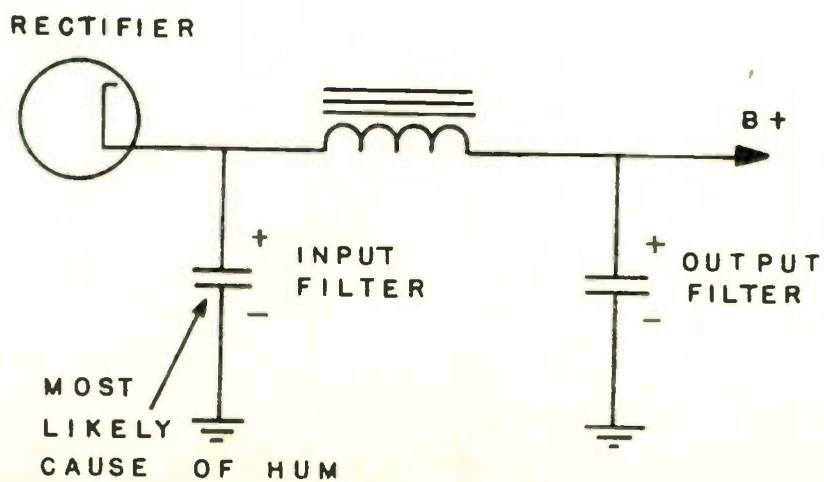
HUM

SYMPTOM

DIGEST (B)

ANOTHER WAY THAT THE A.C. POWER CAN ENTER THE RADIO CIRCUITS, IS THROUGH THE FILAMENTS OF THE TUBES.

ONE OF THE TUBES WILL HAVE A SHORT OR LEAKAGE FROM THE HEATERS TO THE CATHODE. THIS WILL ALLOW THE 60 CPS OF THE HEATER LINE TO VARY THE CATHODE EMISSION, AND THE RESULT WILL BE HUM. IF THE HUM IS PRESENT WHEN THE VOLUME CONTROL IS TURNED DOWN, THEN THE AUDIO OUTPUT TUBE IS THE CULPRIT. IF THE HUM APPEARS ONLY AS THE VOLUME CONTROL IS TURNED UP, THEN ANY OF THE TUBES BEFORE THE VOLUME CONTROL CAN BE AT FAULT.



CIRCUIT DIAGRAM

1
First determine if the hum is still present with the volume control all the way off.

2
If hum still present, trouble most likely due to an open filter capacitor.

3
Place a good electrolytic of the approximate size as the one in the circuit, across the input filter.

4
If hum stops, and set operates normally, remove old capacitor and replace with new one.

5
If hum still present, bridge output filter capacitor.

6
If hum stops, and set plays normally, remove old capacitor and replace with new one.

7
If, as each one was bridged the hum was reduced but did not clear, replace both capacitors.

8
With hum still present after bridging both capacitors, replace audio output tube.

9
If audio output tube didn't help, replace 1st audio amplifier.

10
In the case of a push pull circuit, replace BOTH audio output tubes.

11
Only other possible cause of hum is an ungrounded shield wire in 1st audio grid circuit.

12
If hum only present with volume control turned up, suspect defective tube.

13
Replace the R.F. amp, mixer, local osc, I.F. amp, and detector.

14
Check antenna loop for an open, or avc line for an open.

1

Replace R.F., I.F., mixer, and local oscillator tubes.

2

If tubes had a shield around them, make sure it is firmly in position.

3

Bridge both electrolytic capacitors in the power supply.

4

Most likely cause of this trouble is the output filter capacitor in power supply.

5

If trouble stops as filter capacitor is bridged, replace old capacitor.

6

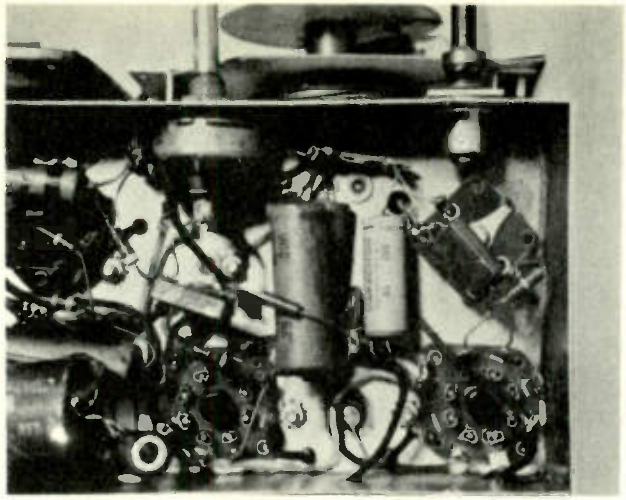
If power supply circuit appears normal, trouble must be in a.v.c., or due to alignment.

7

AVC line is tied to top of volume control through usually a 1 meg resistor.

DIGEST (A)

THIS CONDITION WILL BE NOTICED AS THE DIAL IS ROTATED FROM ONE END TO THE OTHER. TROUBLE MAY OCCUR AT ONE OR TWO SPOTS ACROSS THE DIAL, BUT SELDOM AT ALL POINTS. AT SOME SETTINGS A MOTORBOATING MAY BE NOTICED, WHILE AT OTHER DIAL SETTINGS A HOWL OR A SQUEAL MAY BE HEARD. WHAT IS HAPPENING IS THAT PART OF THE SIGNAL THAT IS PASSING FROM TUBE TO TUBE, IS BEING ALLOWED TO GO BACK TO SOME OF THE PRIOR TUBES. THIS IS KNOWN AS FEEDBACK.



HOWLS, SQUEALS MOTORBOATING

SYMPTOM

DIGEST (B)

WHEN FEEDBACK OCCURS IN A RADIO IT MUST BE DUE TO THE SIGNAL GOING ALONG A CIRCUIT THAT IS COMMON TO MANY TUBES. ONE SUCH CIRCUIT IS THE POWER SUPPLY, ANOTHER IS THE AVC. THEREFORE, OUR TROUBLESHOOTING SHOULD BE DEVOTED TO THESE TWO CIRCUITS. IF AFTER CHECKING BOTH CIRCUITS, WE FIND THAT THE TROUBLE STILL EXISTS, THEN ALIGNMENT IS INDICATED. HOW RAPIDLY THE FEEDBACK OCCURS DETERMINES WHETHER IT CAUSES A HOWL, SQUEAL, OR MOTORBOAT.

8

Bridge all capacitors connected along this line. Capacitors will have one side grounded.

9

In small ac/dc radios, only one avc capacitor is used.

10

In larger sets, the RF, mixer, and IF, each have an avc capacitor.

11

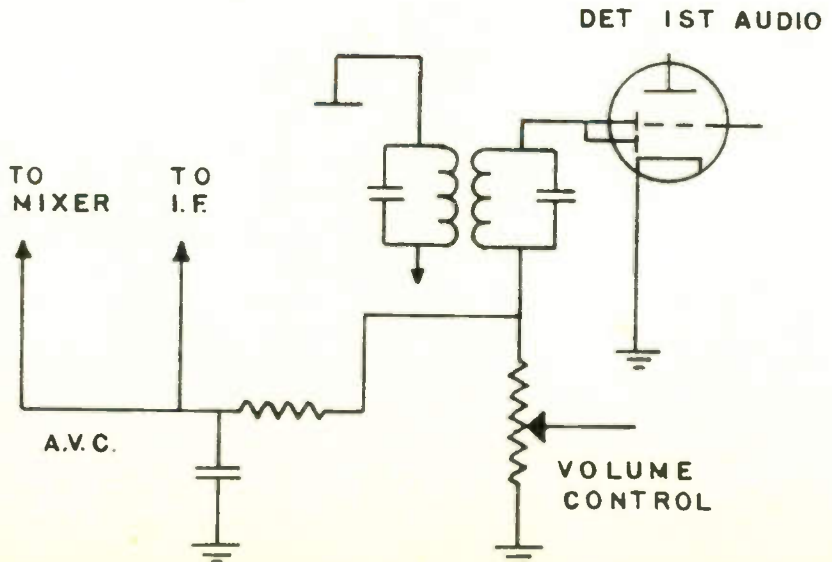
If none of the above help, check charts on alignment.

12

13

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Replace all tubes one at a time.

2

Check to see if speaker is causing the distortion by GENTLY applying pressure to cone.

3

If distortion clears as pressure is applied, try substitute speaker.

4

If speaker appears normal, connect a signal generator with an audio tone, to grid of output tube.

5

If tone appears distorted (two tones are heard) then trouble is in output stage.

6

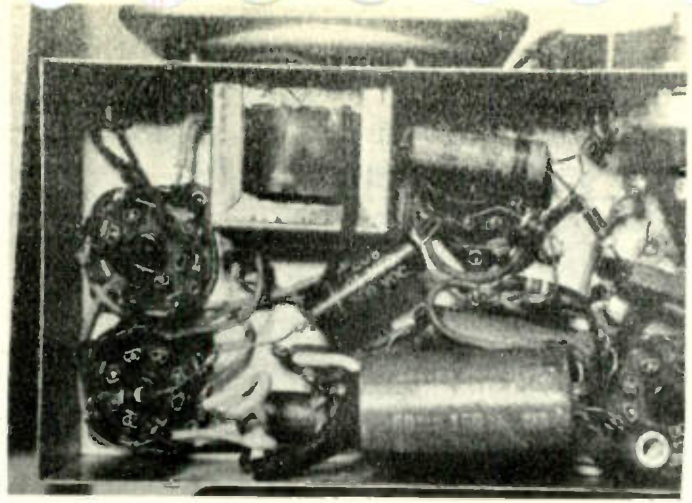
Check cathode resistor for a change in value, or coupling capacitor for being leaky at grid.

7

If cathode capacitor is used, check it for a short.

DIGEST (A)

IN ALMOST ALL CASES, DISTORTION IS CAUSED BY A CHANGE IN BIAS ON ONE OF THE TUBES. THIS MAY BE DUE TO A LEAKY COUPLING CAPACITOR, OR PERHAPS A SHORTED TUBE, HOWEVER, IT WILL STILL UPSET THE BIAS ON THAT CIRCUIT. WITH THE WRONG BIAS, THE GRID WILL NOT CONTROL THE ELECTRON FLOW TO THE PLATE CORRECTLY, AND DISTORTION WILL RESULT. THE PROBLEM IS TO FIND THE CIRCUIT THAT IS CAUSING THE TROUBLE.



DISTORTION ON ALL STATIONS

SYMPTOM

DIGEST (B)

ONE OF THE THINGS TO DO WITH DISTORTION, IS TO TRY AND ISOLATE THE TROUBLE TO THE DEFECTIVE STAGE AS QUICKLY AS POSSIBLE, AND THE SIGNAL GENERATOR CAN BE A GREAT HELP IN DOING THIS. HOWEVER, IF YOU DO NOT PLAN ON USING A GENERATOR THEN FOLLOW THE STEPS BELOW CHECKING THE PARTS AS INDICATED. IF THIS DOES NOT CLEAR THE DISTORTION, THEN MOVE ON TO THE NEXT STEP. KEEP IN MIND THAT WE ARE LOOKING FOR A TROUBLE THAT IS UPSETTING THE BIAS.

8

If tone is normal at output grid, move generator to grid of 1st audio. Feed in an audio signal.

9

If tone is distorted, check value of grid resistor and plate resistor. Also check for leaky coupling capacitor.

10

The above circuits are the most common causes of distortion, however, complete loss of avc can also cause this.

11

Measure voltage on avc line. Should be –2v to –5 v. If zero, then avc line is shorted.

12

If trouble is in avc, then disconnect each avc capacitor, if distortion clears, replace that capacitor.

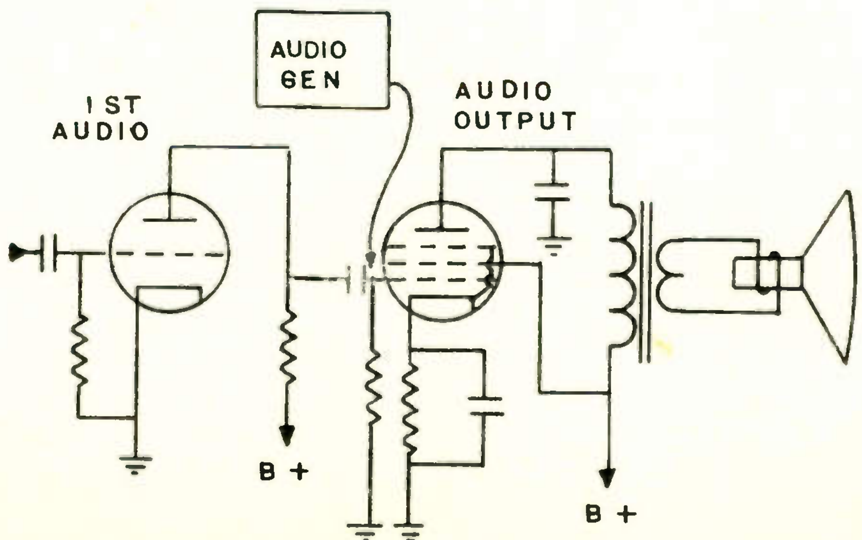
13

If avc line normal, then check bias on each of the following. RF, IF, mixer.

14

Look for change in cathode resistor, or leaky or shorted cathode capacitor.

TELEVUE TROUBLE SHOOTER

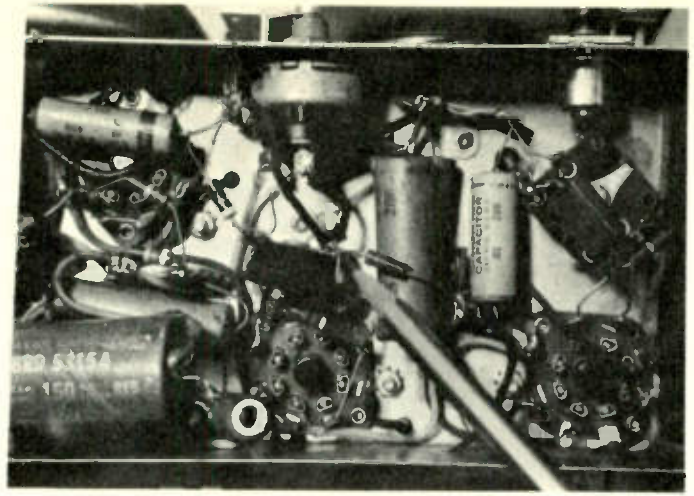


CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

DISTORTION ON SOME STATIONS



DIGEST (A)

DISTORTION ON SOME STATIONS, AND NORMAL OPERATION OF OTHERS, IS AN INDICATION THAT THE TROUBLE MUST BE IN THE AVC SYSTEM. SINCE THE AVC CONTROLS THE STRENGTH OF THE SIGNAL PASSING TO THE DETECTOR, THEN IT MUST NOT BE DOING ITS JOB IF IT ALLOWS SOME OF THE STATIONS TO DISTORT. THE FACT THAT SOME STATIONS ARE COMING IN NORMALLY, WOULD TELL US THAT THE AUDIO SYSTEM IS IN WORKING CONDITION, SINCE IF IT WERE BAD, ALL STATIONS WOULD DISTORT.

DIGEST (B)

DISTORTION IS DUE TO A CHANGE IN BIAS OF AN AMPLIFIER, AND INSTEAD OF OPERATING AT THE CORRECT POINT ON THE EgIp CURVE, IT IS OPERATING TOO FAR UP OR DOWN. THE AVC CONTROLS THE BIAS ON THE IF AMP, MIXER, AND RF AMP. IF THERE IS NO AVC, THESE TUBES WILL AMPLIFY STRONG SIGNALS TOO MUCH, WITH THE RESULT OF DISTORTION DUE TO THE LARGE SIGNAL BEING APPLIED TO ONE OR MORE OF THE TUBES.

1

Replace all of the tubes one at a time.

2

Connect meter on avc line. Should be negative volts.

3

Vary dial from one station to the next. Reading should vary.

4

With this trouble, reading will probably vary a small amount, or not at all.

5

If voltage zero, suspect a shorted avc capacitor. Disconnect it to check.

6

If voltage low, about 1 volt, suspect a short or leak in one of the avc capacitors.

7

Take resistance check along avc line, looking for low resistance or short to ground.

8

Trouble may be due to leakage from primary to secondary of IF transformer.

9

To check this, unsolder all leads from secondary of IF transformer.

10

Now, with set switched on, measure voltage from disconnected leads to ground.

11

If a voltage is present, say 50v, then transformer is defective.

12

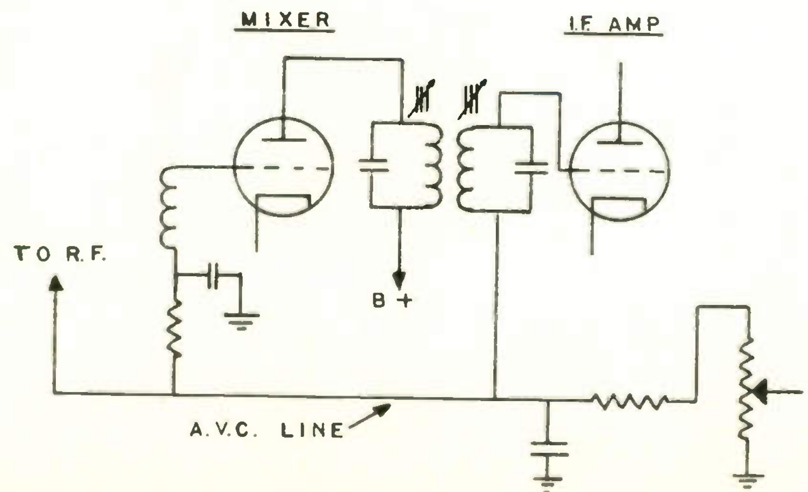
When replacing IF transformer, be sure to get correct one. 1st IF or 2nd.

13

If trouble still present check for change in cathode resistor in IF or RF amps.

14

CIRCUIT DIAGRAM



TELEVUE TROUBLE SHOOTER

SYMPTOM

DISTORTION WHEN SET WARMS UP

1

Replace all tubes. In particular the audio output tube.

2

If trouble still present, connect meter on low volts scale to grid of output tube.

3

With set operating normally, the grid should have zero volts.

4

If grid has some positive voltage, and the tube has been replaced, suspect grid capacitor.

5

Remove old capacitor and place new one in circuit, this should cure trouble.

6

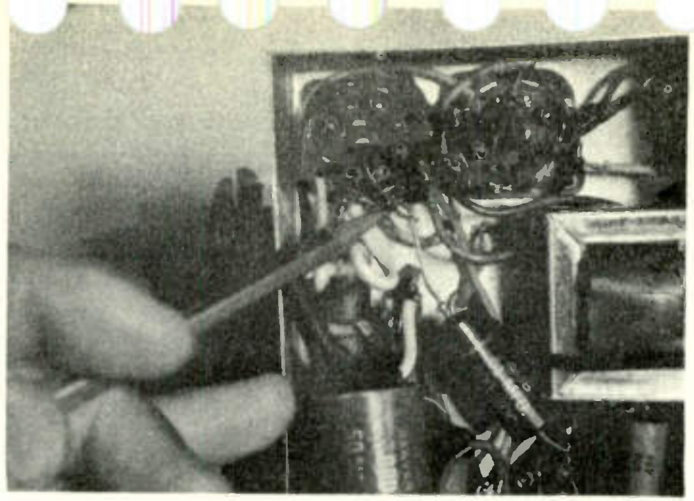
If bias on output is normal, check bias on 1st audio amp.

7

This tube should have about -lv on the grid, zero on the cathode.

DIGEST (A)

WHENEVER TIME IS INVOLVED IN A TROUBLE, IT USUALLY MEANS TUBE FAILURE UNDER HEAT VARIATIONS. IT IS POSSIBLE TO HAVE COMPONENT PARTS CHANGE WITH TIME, BUT THIS IS DUE TO HEAT FROM NEARBY PARTS SUCH AS VACUUM TUBES OR A WIRE WOUND DROPPING RESISTOR. IN THIS CHART WE ARE REFERING TO A SET THAT PLAYS WELL FOR A FEW MINUTES, THEN SLOWLY, BEGINS TO DISTORT.



DIGEST (B)

HEAT, CAUSING METALS TO EXPAND, CAN MAKE A TUBE HAVE LEAKAGE OR EVEN SHORT. MOST LIKELY CULPRIT IS THE AUDIO OUTPUT TUBE BECAUSE THIS TUBE USUALLY HAS THE MOST CURRENT FLOW, GREATEST POWER OUTPUT, AND HIGHEST OPERATING VOLTAGES. WHAT HAPPENS INTERNALLY, IS THAT THE CONTROL GRID HAS LEAKAGE TO THE CATHODE, OR SCREEN GRID. IF THE TUBES DO NOT CURE THIS TROUBLE, THEN CHECKS ON THE BIAS OF EACH TUBE MUST BE MADE.

8

If grid voltage incorrect, check grid resistor and coupling capacitor.

9

With normal bias on 1st audio, check avc line voltage.

10

Avc should vary between –2v to –5v depending on the station.

11

If avc bias is low, or zero after set warms up, suspect defective avc capacitor.

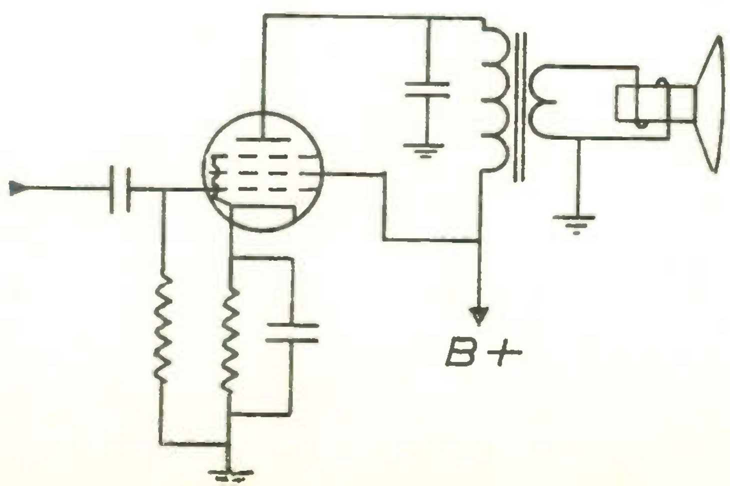
12

Disconnect one capacitor at a time in the avc line until voltage jumps to normal.

13

14

CIRCUIT DIAGRAM



1

Replace all audio tubes.

2

Check amount of bias on audio output tube.

3

For an AC set 10v to 15v. This will be measured on cathode.

4

For AC/DC set 5v to 8v. Also measured on the cathode to common negative.

5

For a 3 way portable, about 6v. This is measured between grid, and filament of output tube.

6

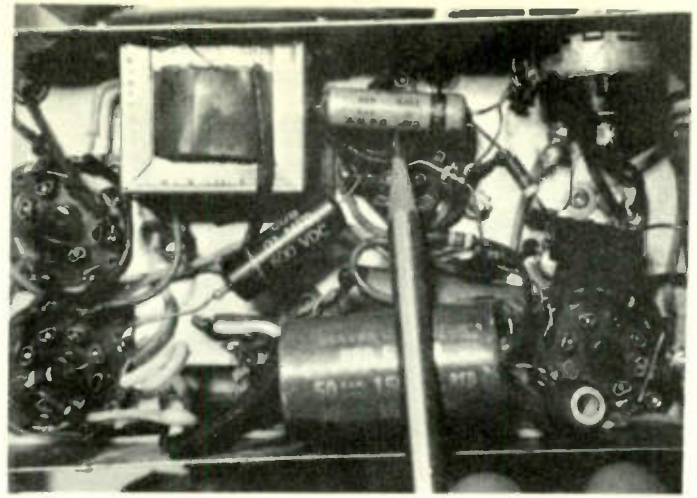
If bias on audio output seems normal check bias on 1st audio.

7

In all types of receivers, this bias is the same, about –1v.

DIGEST (A)

THIS TYPE OF A TROUBLE IS LIMITED TO THE AUDIO CIRCUITS. THE REASON FOR THIS, IS THAT IF THE TROUBLE WERE CAUSED BY ANY CIRCUIT IN THE IF RF STAGES, IT WOULD CAUSE THE DISTORTION TO APPEAR REGARDLESS OF THE SETTING OF THE VOLUME CONTROL. THIS MUST MEAN THAT THE TROUBLE IS EITHER IN THE 1ST AUDIO CIRCUIT, OR THE AUDIO OUTPUT STAGE. A VOLTAGE CHECK SHOULD SHOW UP THE TROUBLE.



DISTORTION AS VOLUME CONTROL INCREASED

SYMPTOM

DIGEST (B)

WHAT IS HAPPENING IN THIS TROUBLE, IS THAT THE BIAS OF ONE OF THE AUDIO TUBES MUST BE OFF A LITTLE. THIS WOULD ACCOUNT FOR NORMAL OPERATION AT LOW VOLUME SETTINGS, AND DISTORTION AS THE VOLUME CONTROL IS TURNED UP, AND THE INPUT SIGNAL TO THE AUDIO AMPS GETS LARGER. IF IT IS NOTICED THAT AT HIGH VOLUME CONTROL SETTINGS THE SET STOPS PLAYING, WE CAN SUSPECT THE COUPLING CAPACITOR FROM THE VOLUME CONTROL TO GRID OF 1ST AUDIO.

8

Vary volume control to see if it changes the bias.

9

If it does, then suspect the coupling capacitor from volume control to 1st audio grid.

10

If volume control has no effect on 1st audio bias, but bias is wrong value, check grid resistor.

11

If bias seems constant, and of the right value, check plate load resistor.

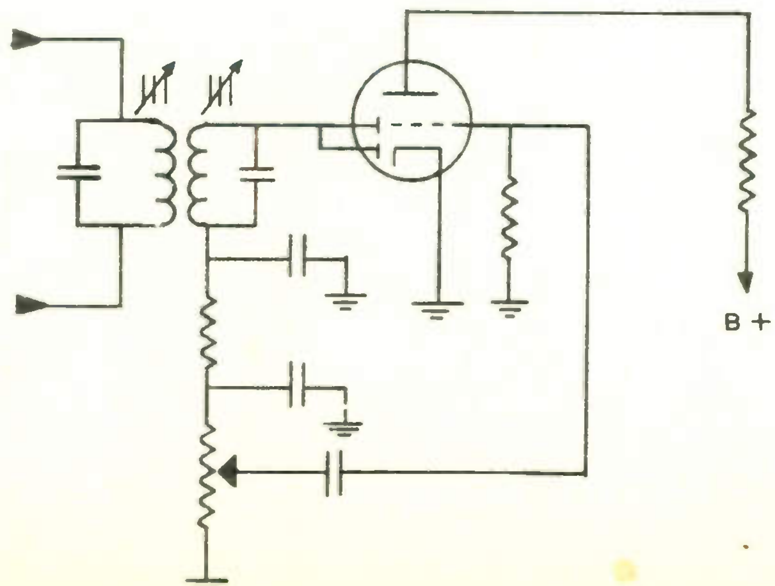
12

If plate load increases, it will drop plate voltage too far, and will distort on large signal.

13

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Replace all tubes.

2

Measure B plus voltage. AC=250v. AC/DC=90v.

3

If B plus low, bridge filter capacitors in power supply.

4

With normal B plus, connect audio gen to grid of audio output tube.

5

With maximum output, tone should be loud. If weak, substitute speaker, bridge cathode capacitor.

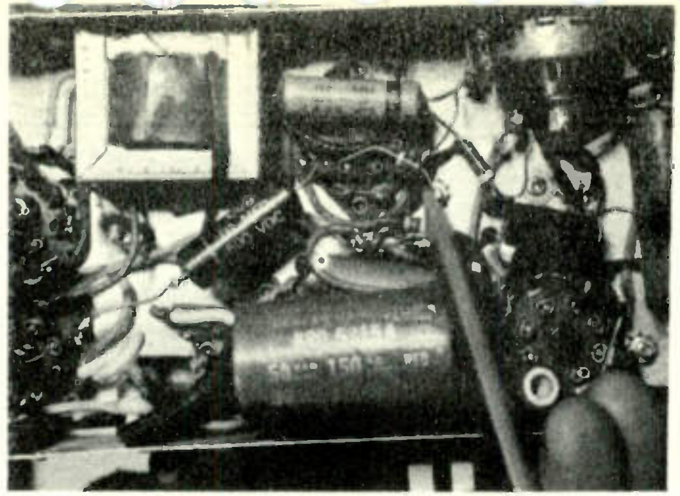
6

If loud at grid, move gen to 1st audio grid. Should hear VERY loud tone.

7

If weak tone, check plate resistor for decrease, bridge coupling capacitor to audio output grid.

THE VOLUME CONTROL IN MOST RADIOS WILL INCREASE THE VOLUME OF SOUND TO A POINT WHERE IT IS JUST TOO LOUD TO LISTEN TO. IF THE VOLUME CONTROL IS TURNED ALL OF THE WAY UP, AND THE SOUND IS STILL BELOW NORMAL LISTENING LEVEL, THEN THE RADIO HAS A CONDITION OF WEAK SOUND. THIS TYPE OF TROUBLE CAN BE CAUSED BY ALMOST ANY PART OF THE RADIO, AND SHOULD BE LOCALIZED TO A CERTAIN STAGE AS SOON AS POSSIBLE.



WEAK SOUND

SYMPTOM

TUBES AND LOW POWER SUPPLY VOLTAGE ARE THE MOST COMMON CAUSES OF THIS TROUBLE. HOWEVER, SUCH THINGS AS AN OPEN CATHODE CAPACITOR ACROSS THE AUDIO OUTPUT TUBE CATHODE, AND A DECREASE IN VALUE OF A COUPLING CAPACITOR, MAY ALSO CAUSE THIS CONDITION. BY FEEDING IN A SIGNAL FROM A GENERATOR, WE CAN USUALLY DETERMINE THE STAGE THAT IS AT FAULT. ONCE THE STAGE HAS BEEN FOUND, THEN A FEW VOLTAGE CHECKS AND COMPONENT SUBSTITUTIONS WILL LOCATE THE TROUBLE.

8

Connect gen to tap of volume control, control fully on. Should hear VERY loud tone.

9

If weak, bridge coupling capacitor from volume control to 1st audio grid.

10

If ok at volume control, feed in mod IF signal to IF amp grid. Should hear loud tone.

11

If weak, check cathode resistor, and detector resistance. Include volume control.

12

If tone still weak, try adjusting IF transformer, then replace transformer.

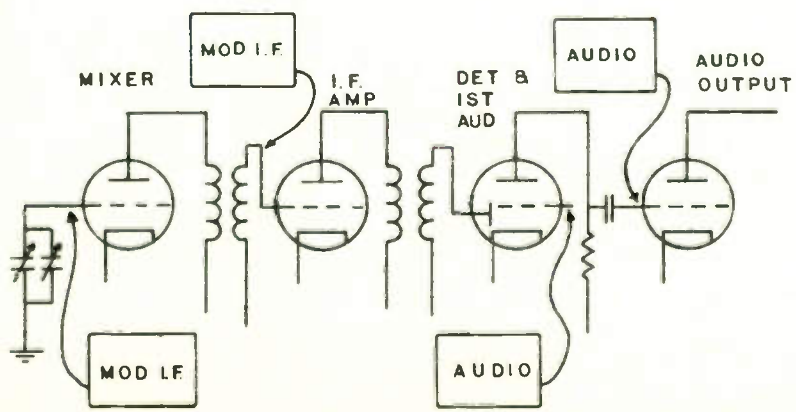
13

Use same procedure on mixer grid, if weak at this point, try IF alignment.

14

If normal tone at mixer, then trouble must be in RF amp (if used), or antenna.

TELEVUE TROUBLE SHOOTER



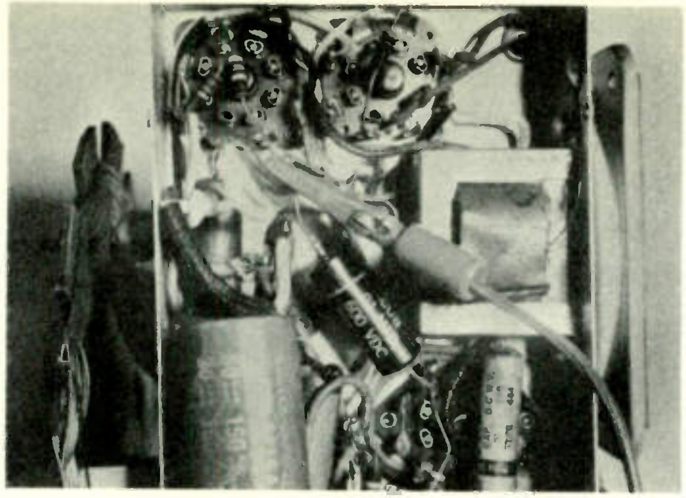
CIRCUIT DIAGRAM

NTRL WHITTIER, CALIF U S A

TROUBLE SHOOTER

DIGEST (A)

THIS IS PERHAPS THE MOST COMMON TROUBLE IN A RADIO, AND AN ATTEMPT SHOULD BE MADE TO ISOLATE THE CAUSE OF THE TROUBLE TO EITHER THE AUDIO CIRCUITS, OR THE IF RF CIRCUITS. ONCE ISOLATED, THE DEFECTIVE CIRCUIT CAN BE FOUND BY MEANS OF A GENERATOR, AND FINALLY A VOLTAGE CHECK WILL INDICATE THE DEFECTIVE COMPONENT. IF A GENERATOR IS NOT GOING TO BE USED FOR THIS, THEN ONCE THE TROUBLE IS ISOLATED TO EITHER THE AUDIO OR IF RF, VOLTAGE CHECKS SHOULD BE MADE AS INDICATED. IN THIS CHART WE ASSUME TROUBLE TO BE IN THE AUDIO STAGES.



SYMPTOM: NO SOUND

DIGEST (B)

THERE ARE CERTAIN CHECKS THAT CAN BE MADE ON A RADIO, THAT WILL TELL IF SECTIONS ARE, OR ARE NOT, WORKING. FOR EXAMPLE, BY SIMPLY REMOVING AND REINSERTING QUICKLY, THE AUDIO OUTPUT TUBE, WE SHOULD HEAR A DOUBLE CLICK IN THE SPEAKER. THIS WILL TELL US THAT THE POWER SUPPLY, SPEAKER, AND OUTPUT CIRCUIT ARE ALL WORKING. ONE THING TO KEEP IN MIND HOWEVER, IS THAT THIS STEP MUST NOT BE USED ON 3 WAY PORTABLES, AS WE MAY DAMAGE ONE OR MORE OF THE TUBE HEATERS BY REMOVING ONE OF THE TUBES.

1 Replace all tubes one at a time. If rectifier is bad, and new one also burns out, refer to chart on that trouble.

2 If tubes do not help, remove and reinsert audio output tube quickly, a double click should be heard.

3 Do not use step #2 on 3 way portable receivers. You may damage filaments.

4 If there is no click, measure voltage of power supply and audio output.

5 If there is no voltage from power supply, then troubleshoot that circuit.

6 With no plate voltage, suspect an open transformer or shorted tone capacitor.

7 If cathode voltage measures high, suspect an open cathode resistor.

8 If voltages are normal try a substitute speaker. Also check output transformer secondary for an open.

9 If a click is heard as output tube is removed, then turn volume full on and touch center tap of control.

10 A buzz should be heard in the speaker as control is touched with finger.

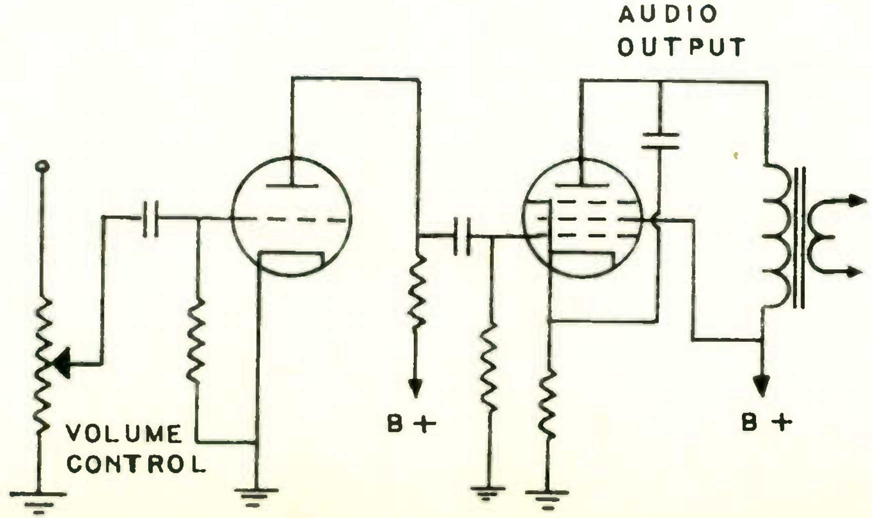
11 If there is no buzz, then touch grid of 1st audio amp. If buzz now, check capacitor at center tap of control.

12 If no buzz as grid is touched, then take voltage check of 1st audio.

13 If, as you touch center of volume control a buzz is heard, then entire audio is okay.

14 Check volume control for an open. If okay, then use next chart on No Sound.

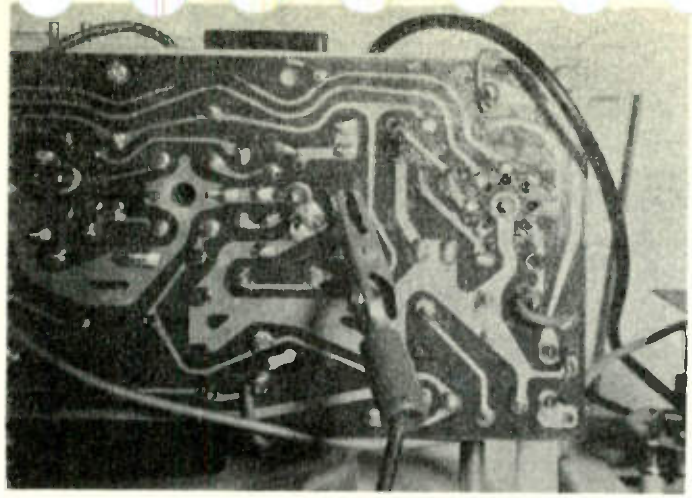
TELEVUE



CIRCUIT DIAGRAM

GES (A)

IN THIS CHART, WE ARE ASSUMING THAT THE PRELIMINARY CHECKS HAVE BEEN MADE, AND THAT THE CENTER TAP OF THE VOLUME CONTROL HAS BEEN TOUCHED, AND A BUZZ IS PRESENT. IF THERE WERE NO BUZZ, THEN REFER TO THE PREVIOUS CHART ON NO SOUND. SINCE WE NOW KNOW THAT THE TROUBLE IS IN THE RF IF CIRCUITS, IT WILL BE AN ADVANTAGE TO FIND OUT WHICH CIRCUIT IS AT FAULT. A SIGNAL GENERATOR SHOULD NOW BE USED.



NO SOUND

SYMPTOM

DIG (B)

IF THE IF AMPLIFIER AND THE DETECTOR CIRCUITS ARE WORKING, THEN A TONE SHOULD BE HEARD IF WE FEED IN A MODULATED (VARIED WITH AUDIO) CARRIER SIGNAL AT THE IF OF THE SET. IN ALMOST ALL SETS, THIS IS AT 455KC. IF WE DO NOT HEAR THE TONE, THEN WE WOULD KNOW THAT EITHER THE IF, OR THE DETECTOR IS AT FAULT. BY USING THE SAME PRINCIPLES, BUT DIFFERENT FREQUENCIES, WE CAN DETERMINE IF THE OSCILLATOR OR THE RF AMPLIFIER (IF USED) IS AT FAULT.

1

Be sure that all tubes have been changed first.

2

Connect a signal generator to the grid of the IF amp. If tone heard, IF and detector O.K.

3

If no tone, take voltage check of IF amp. If normal take resistance check of detector.

4

If all appear normal, adjust IF transformer. If this doesn't help, replace transformer.

5

If tone is heard at IF, move gen back to grid of mixer. Be sure you are at mixer grid.

6

Feed in an IF signal at mixer grid. Should hear a tone in speaker.

7

If no tone, take voltage checks of mixer tube. If voltage normal, take resistance check.

8

If a tone is heard, then mixer is okay but oscillator may be defective.

9

To check osc, feed in a tone at 1000kc. Set radio dial to same frequency (1000kc).

10

If a tone is heard, then oscillator is working. You may have to move gen dial back and forth a few kc.

11

If no tone, check osc coil for an open, if ok, check grid resistor. Replace grid capacitor.

12

If osc is working, check loop antenna for a break, or if an RF amp is used, check below.

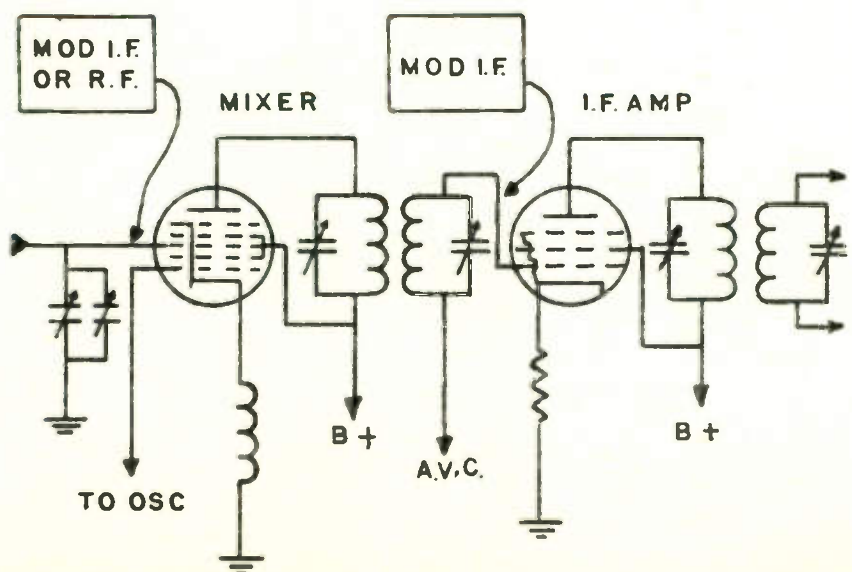
13

Go to grid of RF amp feed in a 1000kc modulated signal. Set radio dial to 1000kc.

14

If no tone, take voltage and resistance checks of RF amp. If tone heard, check antenna to set.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

TUBES DO NOT LIGHT

1. Make sure that tubes are in their right sockets.

2. Check each tube for an open filament.

3. If rectifier filament is open, check for a short in B plus line before replacing tube.

4. If tubes okay, check on/off switch to see if it makes and breaks contact.

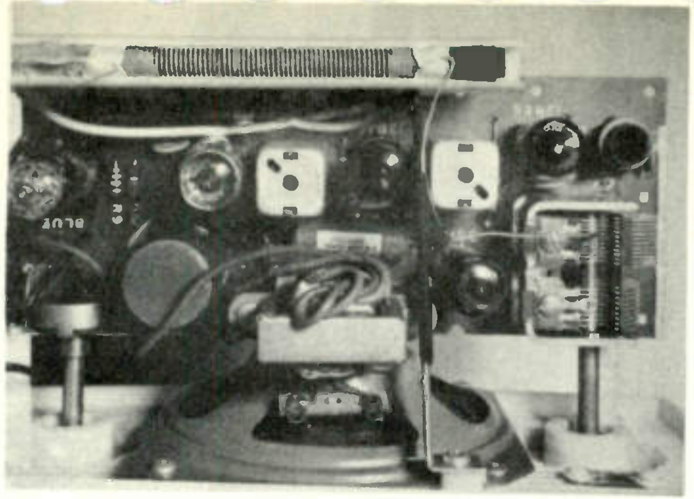
5. If switch is bad, it may be necessary to replace volume control as well.

6. With switch okay, check line cord for break.

7. Most common point for line cord to break is at ac plug, or where line enters set.

DIGEST (A)

IF NONE OF THE TUBES LIGHT IN AN AC/DC RECEIVER, THE TROUBLE MUST BE DUE TO EITHER A DEFECTIVE TUBE, A BREAK IN THE LINE CORD, OR A BAD ON OFF SWITCH. ALL OF THESE CAN BE CHECKED WITH AN OHMMETER. ANOTHER COMMON METHOD OF CHECKING FOR A BREAK IN THE AC LINE, IS TO PLACE A METER, ON AC VOLTS, ACROSS EACH ONE OF THE TUBES AND ON/OFF SWITCH. WHERE THE BREAK IS, YOU WILL MEASURE FULL AC LINE VOLTAGE.



DIGEST (B)

IN SOME CASES, ALL TUBES ARE GOOD, BUT SOMEONE HAS PUT THEM IN THE WRONG SOCKETS. THIS WILL BREAK THE CONTINUITY OF THE LINE, AND NONE OF TUBES WILL LIGHT BECAUSE IN AC/DC RECEIVERS THE TUBES ARE IN SERIES. THERE IS THE RARE POSSIBILITY THAT A BREAK HAS OCCURED IN THE WIRING OF THE FILAMENTS, BUT THIS IS NOT COMMON. IN SOME OF THE NEW SETS, WITH PRINTED CIRCUIT BOARD, POOR SOLDERING COULD OCCUR TO BREAK THE FILAMENT LINE.

8. If receiver is a clock radio, make sure that clock control is in the on position.

9. Be sure that clock plug is in socket on radio chassis. If out, it will break filament line.

10. If all appear normal, take ohmmeter and follow line from plug through switch to filaments.

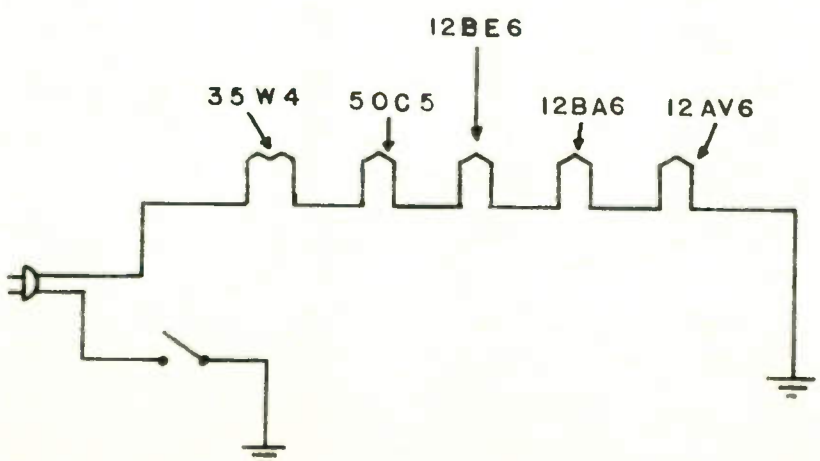
11. Trouble must be in filament line.

12.

13.

14.

CIRCUIT DIAGRAM



1

Replace the converter tube.

2

Make sure that the dial shaft is rotating the tuning capacitors.

3

Check tuning capacitors for a broken lead.

4

Check for a short in tuning capacitors. This can be done visually, or as follows:

5

Unsolder all leads from tuning capacitor. Ground casing, and apply a voltage to terminal not grounded.

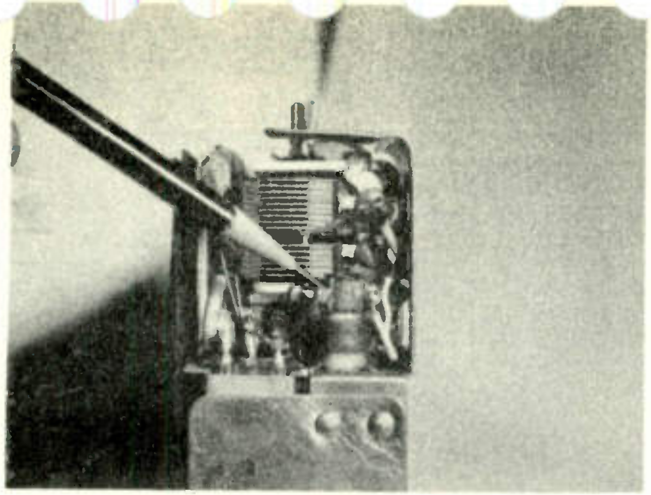
6

Fully open tuning capacitor, then slowly mesh plates. If plates arc, then they are shorted.

7

If tuning capacitor appears okay, then trouble must be in oscillator circuit.

WHEN THE DIAL IS ROTATED FROM ONE END TO THE OTHER, AND ONLY ONE STATION IS PRESENT ALL OVER THE DIAL, IT INDICATES THAT THE OSCILLATOR CIRCUIT IS DEFECTIVE. THIS MUST BE SO SINCE THE OSCILLATOR IS SUPPOSED TO CHANGE FREQUENCY AS THE DIAL IS VARIED, SO THAT IT CAN PRODUCE THE IF AS DIFFERENT STATIONS ARE DESIRED. WHEN THE OSCILLATOR STOPS, THE CIRCUIT MAY START TO OSCILLATE AT ONE FREQUENCY REGARDLESS OF POSITION OF RADIO DIAL, AND ONLY ONE STATION WILL PASS.



ONLY ONE STATION ON DIAL

SYMPTOM

ANOTHER CAUSE OF ONLY ONE STATION ALL OVER THE DIAL, IS THE TUNING CAPACITOR, IF FOR SOME REASON IT BECAME DISCONNECTED, OR THE DIAL SHAFT DID NOT ROTATE THE MAIN TUNING ASSEMBLY, THEN ONLY ONE STATION WOULD BE PRESENT. IN MOST CASES HOWEVER, THE TROUBLE IS IN THE OSCILLATOR CIRCUIT.

8

Take resistance check of osc coil and grid resistor. Bridge all capacitors.

9

Check wiring of circuit. Sometimes someone has rewired circuit.

10

If circuit uses a padder adjustment, it may be shorted. Disconnect and check.

11

Replace oscillator coil.

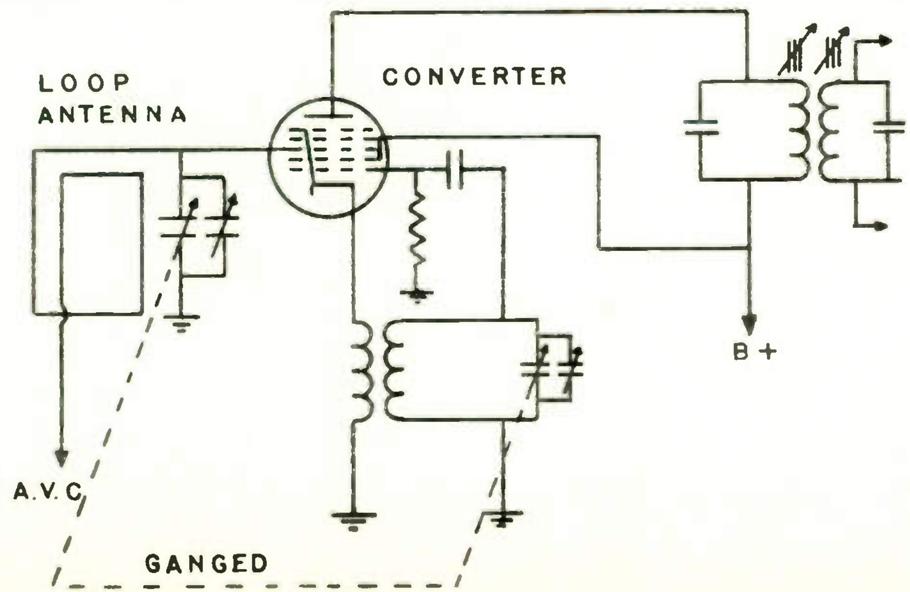
12

13

14

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

1

Replace the converter tube. If a separate osc tube is used, replace it.

2

Check for normal B plus.

3

AC = 250v.
AC/DC = 90v.
3 Way = 90v.
Auto radio = 200v.

4

Readings should be within 10% except 3 Way radio. If low replace rectifier.

5

Check tuning capacitor plates for excessive dirt or shorted plates.

6

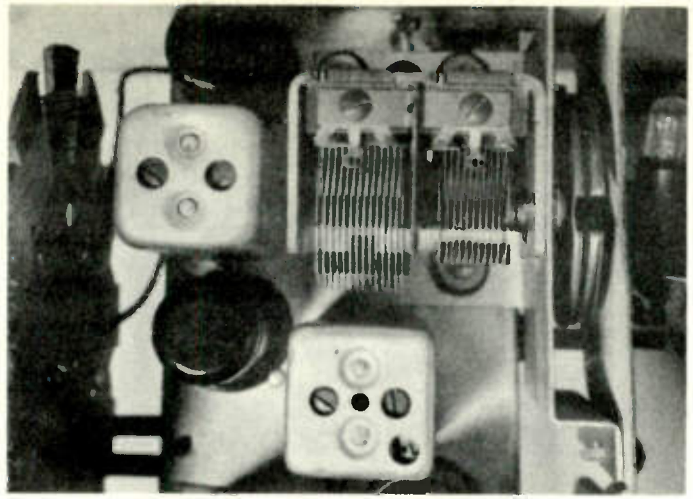
If very dirty, use air compressor at gas station to blow out dirt.

7

If still dirty, remove tuning capacitor and soak in carbon tetrachloride for an hour or more.

DIGEST (A)

WHEN A RECEIVER OPERATES ACROSS ONLY PART OF THE TUNING BAND, IT IS DUE TO EITHER A CRITICAL OSCILLATOR CIRCUIT, OR TO DIRT AND DUST IN THE MAIN TUNING CAPACITOR, PERHAPS ONE OF THE PLATES IS TOUCHING ANOTHER AT SOME POINT ON THE TUNING RANGE. HOWEVER, THE TROUBLE IS LIMITED TO THE OSCILLATOR, MIXER, RF CIRCUITS, SINCE THE FACT THAT ONE SIGNAL IS PASSING THROUGH THE IF, DET, AND AUDIO STAGES MEANS THAT THEY ARE WORKING OKAY.



SET PLAYS ON HALF OF DIAL

SYMPTOM

DIGEST (B)

ALL OSCILLATOR CIRCUITS ARE FAIRLY CRITICAL. THAT IS, THEY OPERATE BETTER AT HIGHER FREQUENCIES THAN AT LOWER FREQUENCIES UP TO A POINT. WE FIND THAT THE AMOUNT OF BIAS THE OSCILLATOR HAS, INCREASES AS THE FREQUENCY INCREASES, AND THIS MAKES THE CIRCUIT MORE EFFICIENT. FAILURE OF THE OSCILLATOR MAY BE DUE TO SLIGHTLY LOWERED B PLUS, ESPECIALLY IF IT IS A 3 WAY PORTABLE.

8

If tuning cap ok, check value of oscillator grid resistor.

9

Replace grid capacitor. Use same value as one in the set.

10

Oscillator may be out of alignment. Check chart on RF alignment.

11

If set will not align at one end of dial replace oscillator coil.

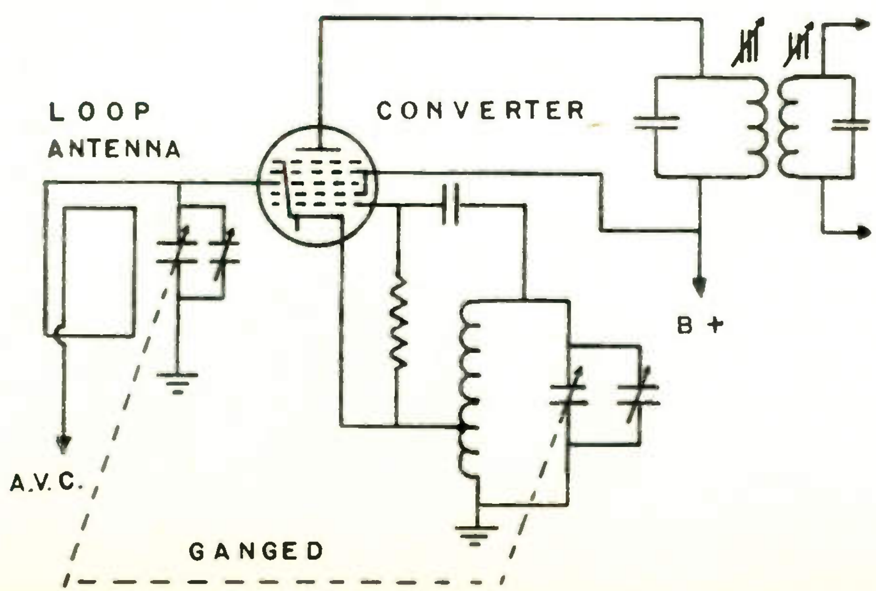
12

13

14

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

1

See if any of the tuning plates are touching. Outside ones are the likely ones.

2

Sometimes it helps if a piece of white paper is placed under the plates.

3

If plates appear dirty, try to clean with rag or paint brush.

4

May have to remove capacitor and take to gas station to use air compressor.

5

Do not use air compressor while capacitor in set, it may damage parts due to force.

6

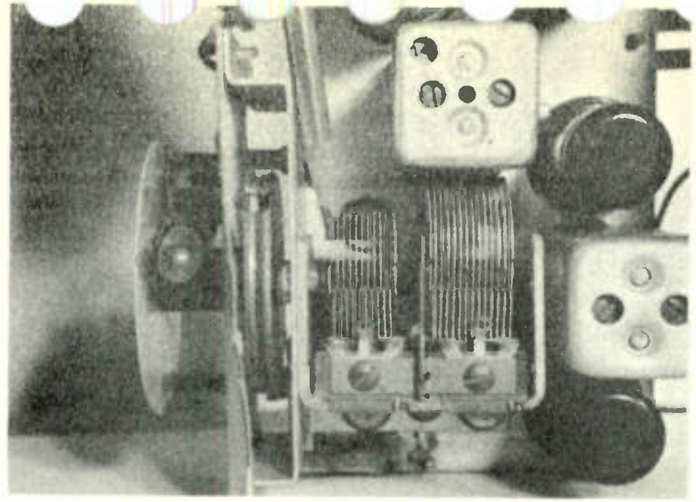
If blowing out dirt doesn't help, soak overnight in carbon tetrachloride.

7

Do not use tetrachloride in a closed room, fumes are dangerous.

GES A)

WHEN A SCRAPING SOUND IS NOTICED AS THE DIAL IS ROTATED, IT IS USUALLY DUE TO DUST AND DIRT IN THE TUNING CAPACITOR, OR TO PLATES THAT ARE TOUCHING AS THE TUNING CAPACITOR IS VARIED. ONCE IN A WHILE IT WAS FOUND THAT THE TROUBLE WAS DUE TO A DIRTY TUNING SHAFT EITHER DIRECTLY CONNECTED TO THE TUNING CAPACITOR, OR TO A DIAL STRING ARRANGEMENT.



SCRAPING SOUND AS DIAL MOVES

SYMPTOM

DIG (B)

SOME OF THE OLDER RADIO RECEIVERS HAD TUNING CAPACITORS THAT USED PLATES VERY CLOSE TOGETHER. THESE ARE VERY LIKELY TO CAUSE THIS TROUBLE BECAUSE OF DIRT BUILDUP OVER THE YEARS. IF THE TROUBLE IS FOUND IN A FAIRLY MODERN RECEIVER, THEN THE CHANCES ARE THAT IT IS DUE TO PLATES TOUCHING EACH OTHER. VARIOUS METHODS ARE DISCUSSED HERE AS TO REMOVING THESE TROUBLES.

8

If short is not apparent, unsolder tuning capacitor, and remove from set.

9

Connect about 50v ac or dc across one section. From one lug to chassis of cap.

10

Rotate plates and observe closely where arcing is occuring.

11

Use thin bladed screwdriver to straighten plates.

12

If arcing in many areas, may be better to replace capacitor.

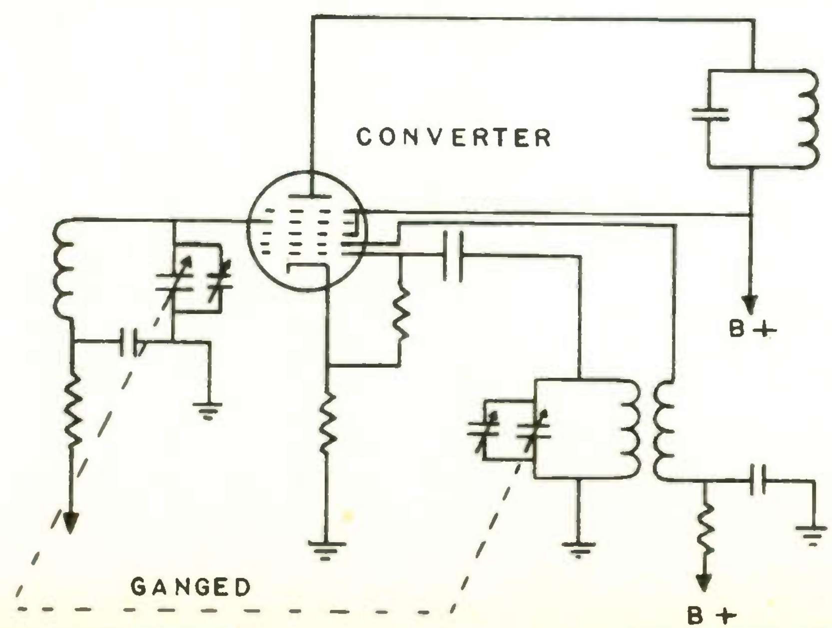
13

If tuning cap appears ok, place a few drops of thin oil on all shafts.

14

Great care must be taken to avoid getting oil on dial string, if used.

TELEVUE TROUBLE SHOOTER

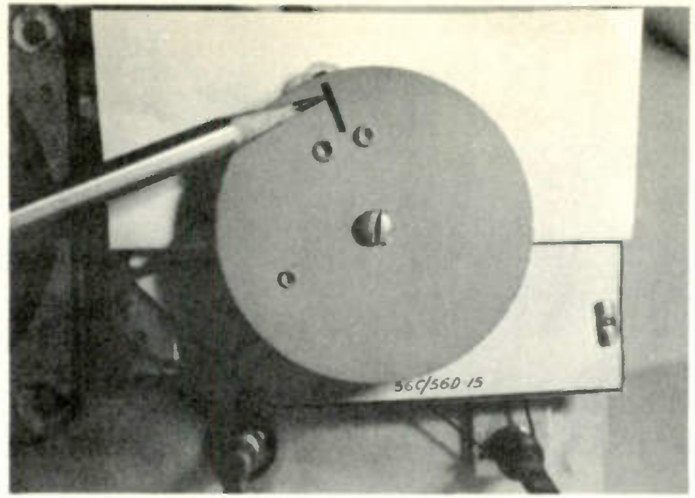


CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

STATIONS AT WRONG POINT ON DIAL



DIGEST (A)

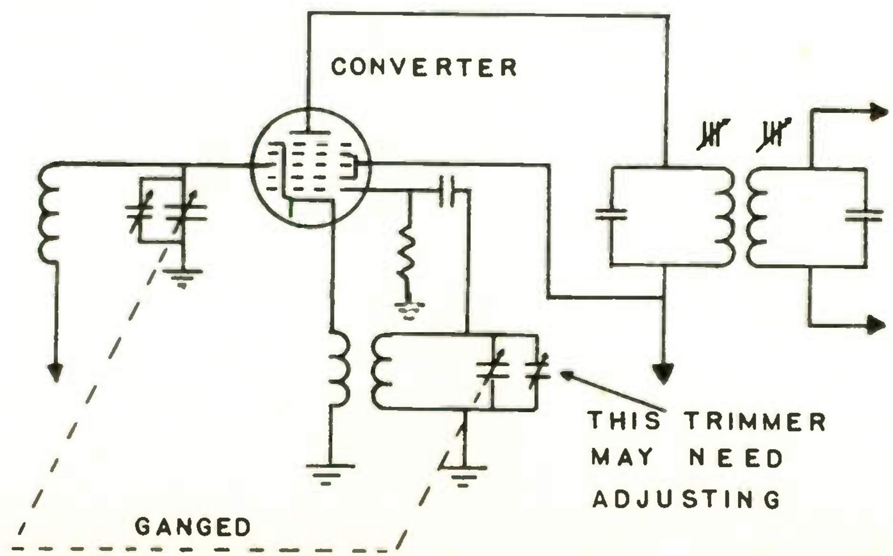
WHEN THE STATIONS DO NOT COME IN AT THE RIGHT POINTS ON THE DIAL, IT MAY BE DUE TO ALIGNMENT, INCORRECT DIAL POINTER SETTING, OR INCORRECTLY SPACED TUNING PLATES. AS FOR ALIGNMENT, YOU WILL PROBABLY NOTICE THAT THE LOWER FREQUENCY STATIONS COME IN CLOSER TO THEIR CORRECT POINT THAN THE UPPER FREQUENCY STATIONS. THIS IS DUE TO THE MORE CRITICAL ADJUSTMENTS THAT MUST BE MADE AT THE HIGH FREQUENCY END OF THE DIAL.

DIGEST (B)

IF THE DIAL POINTER IS OFF OF ADJUSTMENT, THEN ALL STATIONS WILL BE OFF BY THE SAME AMOUNT. THE THING TO LOOK FOR, IS IF THE POINTER TRAVELS ALL THE WAY FROM ONE END TO THE OTHER. THIS WOULD BE A CLUE AS TO THE POSSIBILITY OF THE POINTER BEING SET WRONG. SOMETIMES THE PLATES OF THE TUNING CAPACITOR ARE MOVED APART, AND ALTHOUGH TRACKING AT ONE END OF THE DIAL MAY BE NORMAL, IT WILL BE OFF AT THE OTHER END.

1. See if all stations are off by the same amount.
2. If they are, trouble may be dial pointer out of position.
3. Move dial from one end to the other, if pointer won't go all the way, adjust it.
4. If pointer set okay, but stations still off, try oscillator adjustment as follows.
5. Set dial to a known station at high end of dial around 1200kc.
6. Adjust oscillator trimmer until known station is present. This may do it.
7. If stations still at wrong point along dial, refer to R.F. alignment chart.
8. If aligning does not help, then tuning plates may be set wrong.
9. Check plates carefully to see if they are out of line, or bent.
10. Use ruler to readjust plates. Get them evenly spaced.
11. After adjusting plate spacing, realign radio.
12.
13.
14.

CIRCUIT DIAGRAM



TELEVUE TROUBLE SHOOTER

1

Replace all tubes one at a time. Allow time for trouble to develop.

2

When set stops, apply pressure to speaker. Cone may stick.

3

Check B plus. If off more than 10%, try bridging filter capacitors.

4

In the 3 way portable, B plus must be almost perfect, 90 volts.

5

Take visual check, while applying slight pressure to components.

6

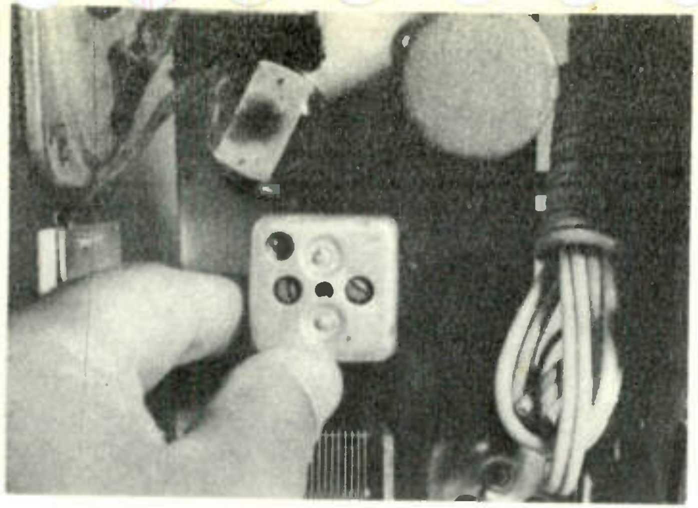
If set goes on and off as pressure applied, check parts close by.

7

If set plays normally for a long time, throw blanket over set, or place in box.

DIGEST (A)

AN INTERMITTENT RADIO CAN KEEP THE SERVICEMAN BUSY FOR A LONG TIME UNLESS A DEFINITE PROCEDURE IS USED. ONE MUST KEEP IN MIND THAT ANY PART OF THE RADIO CAN CAUSE THIS KIND OF A TROUBLE, THAT IS WHY IT MUST BE LOCALIZED AS SOON AS POSSIBLE. BEFORE USING ANY EQUIPMENT HOWEVER, A CHECK SHOULD BE MADE ON THE TUBES, SPEAKER, AND IF COILS. ALSO A VISUAL INSPECTION INCLUDING PRESSURE APPLIED TO COMPONENTS UNDERNEATH CHASSIS.



INTERMITTENT OPERATION

SYMPTOM

DIGEST (B)

USING A SIGNAL GENERATOR WILL PINPOINT THE TROUBLE TO ONE OF THE STAGES, AND THEN COMPONENT SUBSTITUTION, AND RESOLDERING, ESPECIALLY ON A PRINTED BOARD, WILL CURE THE TROUBLE. SOME SETS WILL PLAY FOR DAYS WITHOUT STOPPING, AND THEN MAY QUIT FOR A FEW MINUTES, AND BEFORE YOU HAVE TIME TO CHECK, THE SET PLAYS AGAIN. SUCH TROUBLES ARE BEST HANDLED BY THROWING A BLANKET OVER SET, AND GETTING IT TO HEAT UP FAST, THUS BRINGING TROUBLE TO A HEAD.

8

Sometimes taking a hot iron, and holding under parts, will bring on trouble.

9

If trouble persists, feed in audio signal to grid of output tube.

10

If there is no tone, troubleshoot output circuit. If tone, go to 1st audio grid.

11

If tone passes here, then move to grid of IF amp, feed in Mod IF signal.

12

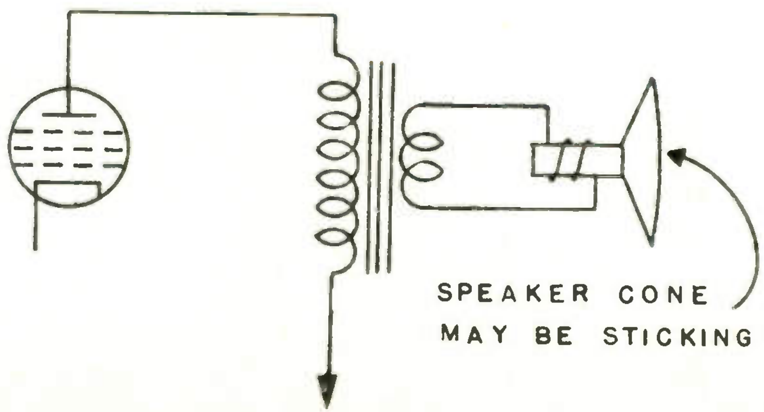
Continue this method of checking each stage until bad stage found.

13

To check osc, go to grid of mixer, feed in 1000kc, and set radio dial to 1000kc.

14

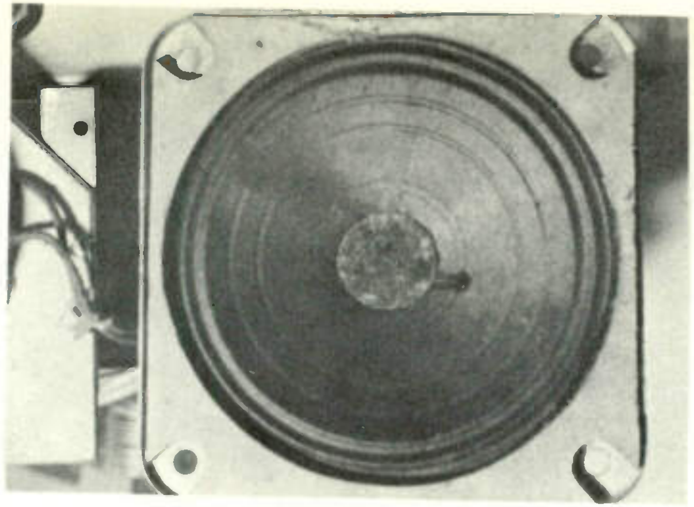
If tone present, then osc ok. If no tone, then check osc circuit.



CIRCUIT DIAGRAM

DIGEST (A)

WHEN A SET RATTLES AND CAUSES VIBRATIONS, IT IS OFTEN DUE TO A DEFECTIVE LOUDSPEAKER OR A LOOSE PART ON THE CHASSIS. MOST COMMON IS THE LOUDSPEAKER, HERE THE CONE MAY BECOME LOOSE FROM ITS BASKET, SOME DUST MAY GET INTO THE VOICE COIL AREA, OR THERE MIGHT BE A TORN CONE. SOME OF THE PARTS THAT MIGHT GET LOOSE AND CAUSE A RATTLE ARE THE AUDIO OUTPUT TRANSFORMER, IF TRANSFORMERS, OR PERHAPS THE ELECTROLYTIC CAPACITOR CONTAINER.



RATTLES AND VIBRATIONS

SYMPTOM

DIGEST (B)

THE LOUDSPEAKER OPERATES ON THE PRINCIPLE OF MAGNETISM. A SMALL COIL SUSPENDED IN A STATIONARY MAGNETIC FIELD, HAS AN AUDIO CURRENT PASSED THROUGH IT. DUE TO THE VARYING MAGNETIC FIELD SET UP, THE COIL WILL BE REPELLED AND ATTRACTED TO THE STATIONARY FIELD, AND SINCE IT IS GLUED TO THE CONE, THE CONE WILL MOVE. ANY DUST OR DIRT CAUGHT IN THE SPEAKER CONE SYSTEM, WILL CAUSE A RATTLING TO BE HEARD. IF CONE IS TORN, THE LOOSE EDGES WILL VIBRATE.

1

Remove speaker from cabinet and see if cone is loose.

2

If cone loose, or has been torn, use speaker cement to repair. DO NOT USE GLUE.

3

If there is a hole in the cone, patch with piece of cone from old speaker.

4

If torn too badly, have speaker re-coned, or buy new speaker.

5

If cone appears normal, and speaker is rattling, check for dust in voice coil.

6

Remove dust cover at center of cone and blow out area gently.

7

If this works, glue dust cover back in place.

8

If rattles still persist, try new speaker.

9

If rattles appear as set plays, and speaker is okay, then some part is loose.

10

See if loose part can be found by touching components mounted on chassis.

11

Tighten down all transformers, make sure all tubes are firm in socket.

12

Vibrations may be due to loose part inside cabinet.

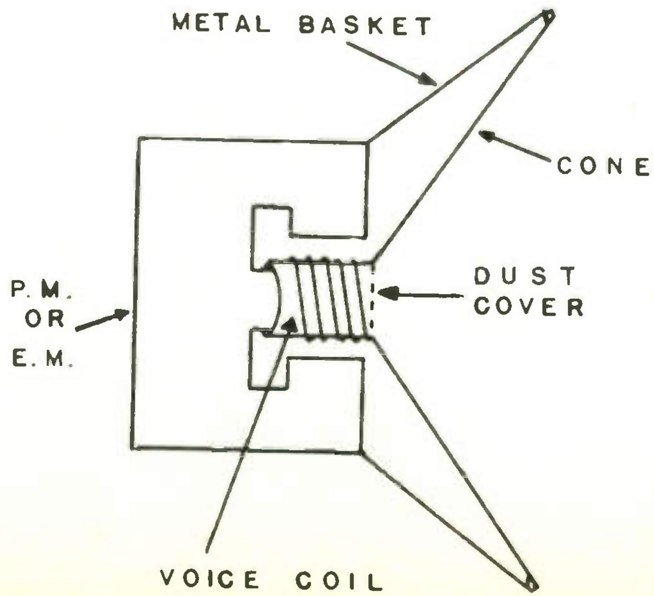
13

Look for loose glass dial, or section of cabinet.

14

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

1

Replace tubes one at a time. Wait to see if trouble occurs before replacing next tube.

2

Take visual check of set. Look for loose part, or poor soldering.

3

Turn down volume control. If noise continues, trouble must be in audio circuits.

4

If noise stops as volume control turned down, trouble is in IFs or RF circuit.

5

If trouble in audio, short grid of output tube to common negative.

6

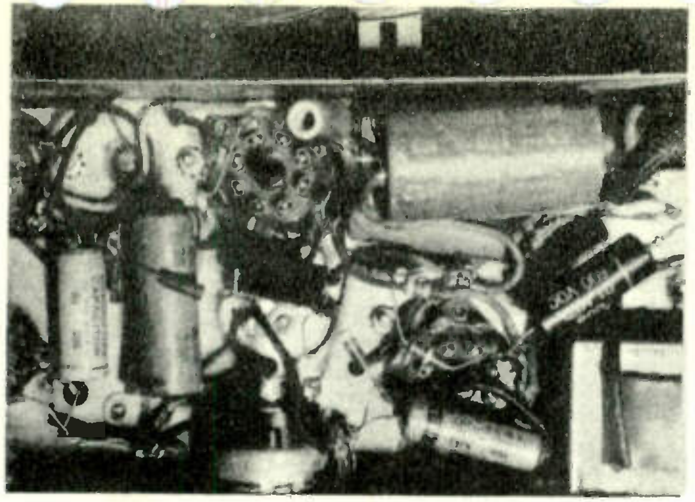
If noise continues, then trouble in output circuit. Check parts. Replace output transformer.

7

If trouble in IF or RF, measure avc voltage, if zero or positive, suspect IF transformer.

DIGEST (A)

NOISY OPERATION OF A RADIO IS OFTEN DUE TO A BREAKDOWN INSIDE ONE OF THE IF CANS. THIS IS USUALLY AN INTERMITTENT CONDITION, WHERE SEVERE CRACKLING OCCURS FOR A PERIOD OF TIME, THEN NORMAL OPERATION. DURING THE NOISE PERIOD, THE RADIO STATION MAY NOT BE HEARD. IF THE VOLUME CONTROL IS TURNED DOWN, AND THE NOISE FADES AWAY, IT ONCE AGAIN POINTS TO A DEFECT IN THE IFS.



NOISY OPERATION

SYMPTOM

DIGEST (B)

IF THERE IS AN INTERMITTENT SHORT BETWEEN PRIMARY AND SECONDARY OF THE IF TRANSFORMER, IT WILL PLACE A POSITIVE VOLTAGE ON THE AVC LINE, THIS WILL PRODUCE A CRACKLE IN THE RECEIVER. OF COURSE OTHER COMPONENTS CAN CAUSE NOISY OPERATION, SUCH AS TUBES, POOR CONTACT, CAPACITOR BREAKING DOWN, AND A DEFECTIVE RESISTOR. HOWEVER, AFTER A FEW QUICK CHECKS, THE POSSIBILITY OF A BAD IF SHOULD BE LOOKED INTO BEFORE OTHER TROUBLES ARE CHECKED.

8

Unsolder all connections from IF secondary of last IF.

9

Switch set on and measure voltage on disconnected secondary leads.

10

Voltage should be zero. If positive, then IF transformer is bad. Replace.

11

If IF transformer okay, repeat on 1st IF trans. Replace if necessary.

12

If IFs appear okay, and avc is normal, place jumper from IF grid to common neg.

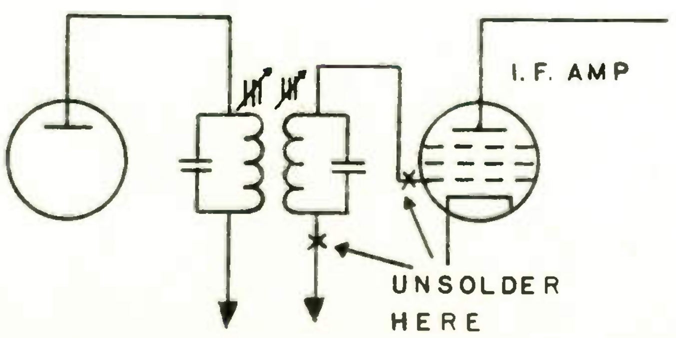
13

If set still crackles, then trouble in IF amp circuit or detector.

14

Short out each grid in turn working back to RF, until bad stage isolated.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

1

Remove rectifier and measure resistance from cathode pin to common neg.

2

Needle should indicate low resistance rising rapidly above 20,000 ohms.

3

If zero, or low resistance (few hundred ohms) present, unsolder electrolytics.

4

Measure resistance again to see if short still present.

5

If short gone, then one of the electrolytics must be defective.

6

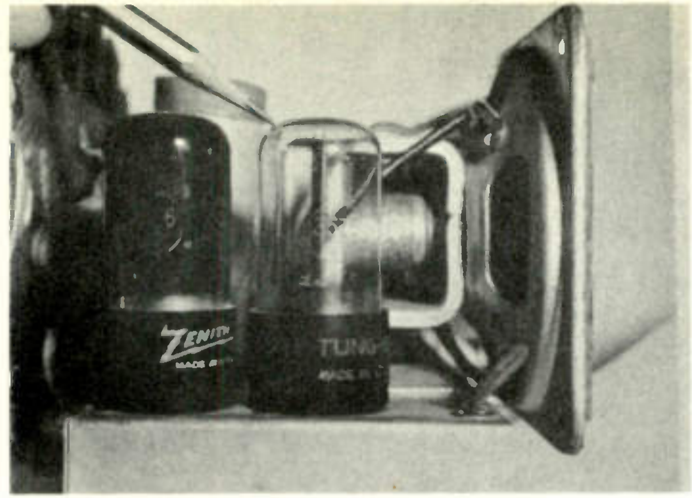
If short present, leave meter connected to cathode pin of rectifier.

7

Remove each tube one at a time. If short clears, then tube removed is bad.

DIGEST (A)

THE RECTIFIER CIRCUIT OF A RADIO, SUPPLIES THE OPERATING VOLTAGES TO THE VARIOUS TUBES THAT ARE USED IN THE RECEIVER. IF THIS TUBE IS DEFECTIVE, AND ANOTHER ONE IS INSERTED, AND IT BURNS OUT, THEN SOME TROUBLE MUST EXIST EITHER IN THE RECTIFIER CIRCUIT ITSELF, OR IN THE CIRCUITS THAT IT FEEDS. USUALLY, A CHECK WITH THE OHMMETER WILL SHOW THE DEFECTIVE SECTION.



SYMPTOM

RECTIFIER KEEPS BURNING OUT

DIGEST (B)

TO AVOID POSSIBLE DAMAGE TO A NEW RECTIFIER TUBE, IT IS SUGGESTED THAT A RESISTANCE CHECK BE MADE FROM THE CATHODE PIN OF THE RECTIFIER, TO COMMON NEGATIVE, WHENEVER A BAD RECTIFIER TUBE IS FOUND IN ANY RADIO. IF A SHORT IS INDICATED ON OHMMETER, THEN A NEW TUBE HAS BEEN SAVED. NORMAL RESISTANCE FROM CATHODE TO COMMON NEGATIVE IS INDICATED WHEN METER NEEDLE JUMPS TO LOW RESISTANCE, THEN RISES RAPIDLY ABOVE 20,000 OHMS.

8

If tubes are ok, unsolder any circuit connected to B plus.

9

Start with lead going to plate of output tube.

10

Leave meter connected to rectifier cathode.. If short clears, check that circuit.

11

Continue to disconnect each line on the B plus until short clears.

12

Common causes are: Output transformer, IF transformer, decoupling capacitors.

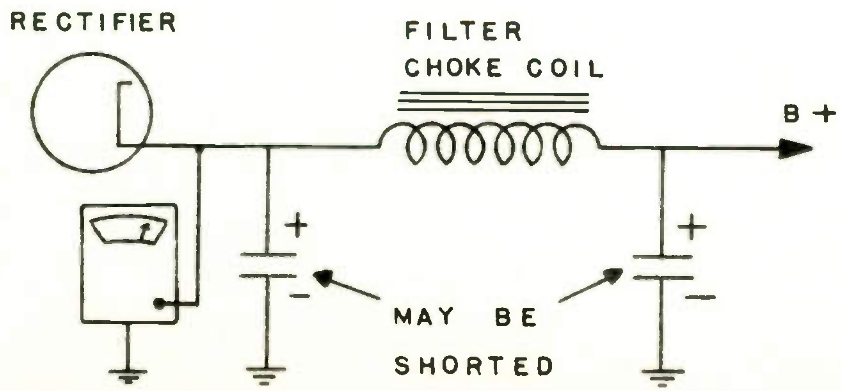
13

If normal reading in step #2, check filament line for a short.

14

Remember, it may have been a bad new tube, if all appear normal try another tube.

CIRCUIT DIAGRAM



SOME TUBES DO NOT LIGHT

SYMPTOM

1
Switch off set and check for short internally with ohmmeter.

2
Look for short between heater and cathode.

3
Short most likely to be in 1st audio amp, or converter.

4
1st audio is usually 12SQ7, or 12AV6.

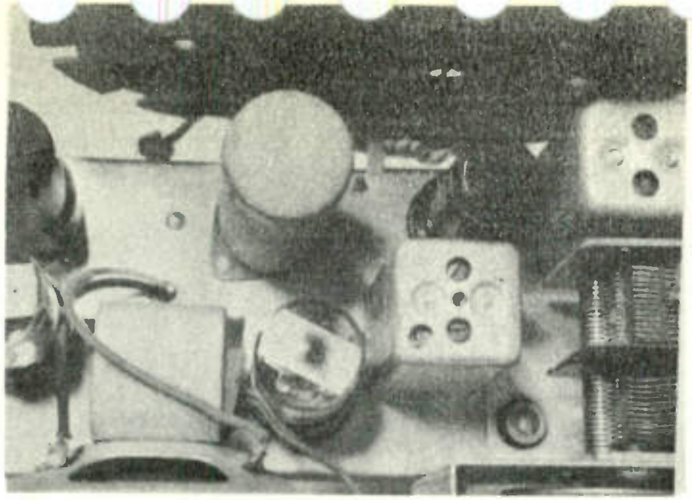
5
Converter is usually 12SA7, or 12BE6.

6
If all tubes appear okay, make sure they are in their right socket.

7
Follow filament wiring, make sure they are wired correctly.

DIGEST (A)

WHEN SOME TUBES LIGHT AND OTHERS DO NOT IN AN AC/DC RECEIVER, THE TROUBLE MUST BE DUE TO SOME SHORT IN THE FILAMENT LINE. MOST COMMON IN THIS TYPE OF TROUBLE, IS A HEATER TO CATHODE SHORT INSIDE ONE OF THE TUBES. THIS SHORTS OUT PART OF THE FILAMENT LINE, SINCE THE TUBES ARE ALL IN SERIES, AND SOME OF THE TUBES WILL NOT LIGHT. THE REMAINING TUBES IN THE SET WILL BE OVERHEATING DUE TO THE EXTRA VOLTAGE ON THEIR FILAMENTS.



DIGEST (B)

IF THE TUBES USED ARE OF THE GLASS BULB TYPE, YOU WILL BE ABLE TO ACTUALLY SEE THAT SOME TUBES ARE NOT LIGHTING WHILE OTHERS ARE VERY BRIGHT. IN THE CASE OF ALL METAL BULB TUBES, A QUICK CHECK SHOULD ALWAYS BE MADE BY TOUCHING THE TUBES TO SEE IF THEY ARE WARM. WITH A TROUBLE OF THIS TYPE, SOME WILL BE COOL, WHILE OTHERS WILL BE VERY HOT.

8
Look for excessive solder on filament line wiring.

9
In a printed circuit board look closely at printed wiring.

10
A long lead of a component board may be cause of short.

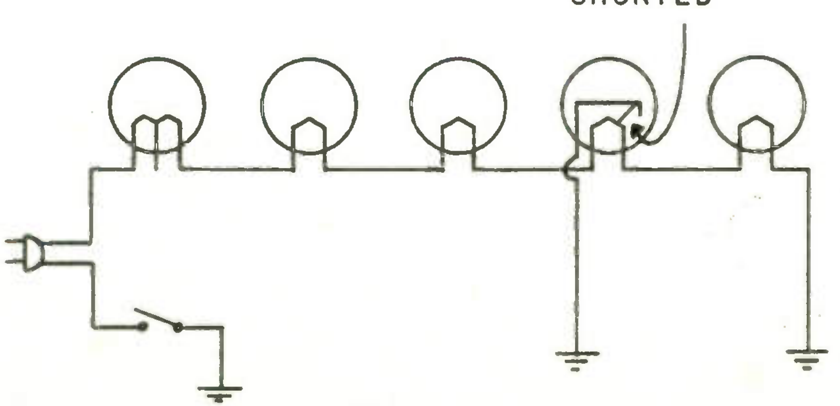
11
Final possibility is a defective tube socket.

12
Check for this by removing tubes and checking socket for short.

13

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Disable the local osc by placing jumper across osc tuning capacitor.

2

Connect signal generator to grid of IF amp. Feed in a mod IF signal.

3

Connect voltmeter from avc line to common neg on minus volt range.

4

Turn volume control to convenient level.

5

Adjust output of generator so that meter reads about −2v.

6

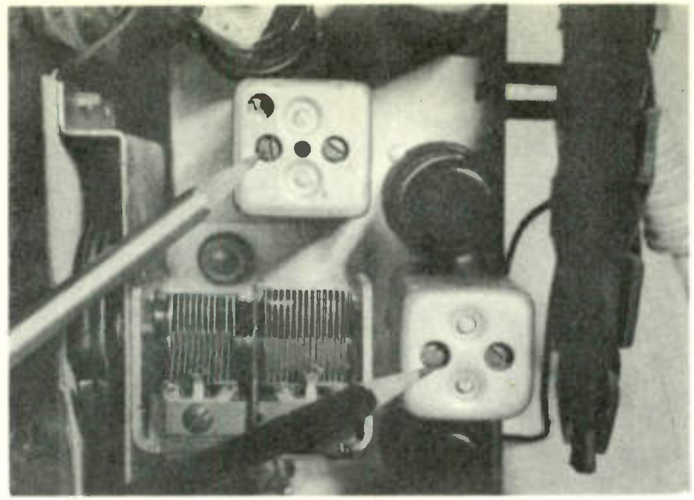
Now adjust screws in last IF can for a maximum reading on meter.

7

At this point a turn of the screw left or right, will cause reading to decrease.

DIGEST (A)

CORRECT ALIGNMENT OF THE IF STAGES OF A RADIO RECEIVER CAN IMPROVE THE OVERALL OPERATION OF THE RADIO BY INCREASING THE SELECTIVITY AND SENSITIVITY OF THE RECEIVER. IMPROVING THE SELECTIVITY MEANS, TO BE ABLE TO REJECT ALL OF THE UNDESIRED SIGNALS. INCREASING THE SENSITIVITY, IS TO HAVE MORE AMPLIFICATION, THUS ABLE TO HEAR WEAKER STATIONS BETTER.



SYMPTOM

DIGEST (B)

WHEN ALIGNING THE IFS OF A RADIO, WE ARE SIMPLY ADJUSTING THE IF TRANSFORMERS SO THAT THEY WILL PASS THE CORRECT FREQUENCY WITH AS MUCH AMPLIFICATION AS POSSIBLE. ALIGNMENT CAN BE DONE BY EAR, OR BY EQUIPMENT, WHICH IS THE MORE ACCURATE METHOD. DURING THE ALIGNMENT, THE LOCAL OSCILLATOR SHOULD BE DISABLED, SO THAT IT DOES NOT INTERFERE WITH THE READINGS. THIS IS BEST DONE BY PLACING A JUMPER ACROSS THE OSC TUNING CAPACITOR, FROM THE MOVING PLATES TO THE STATIONARY PLATES.

8

Move gen back to the grid of mixer.

9

Keep gen at mod IF, and adjust output so reading is about −2 v on meter.

10

Now adjust 1st IF screws for maximum on meter.

11

This should complete the IF alignment.

12

Remove jumper from osc tuning capacitor, and continue with RF alignment, if necessary.

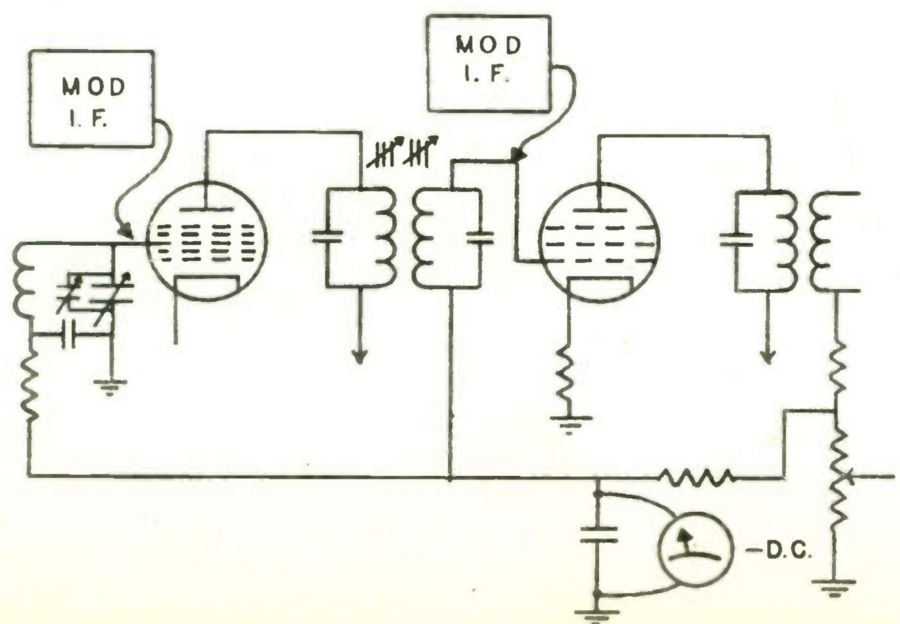
13

If, after aligning IFs, set has a whistle or squeal check below.

14

Readjust all IF screws about one eighth turn each either way.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

RF ALIGNMENT

SYMPTOM

1

Connect signal gen to mixer grid. Feed in 1400kc mod signal.

2

Set radio dial to 1400kc. This must be set accurately.

3

Turn volume control to a convenient level.

4

If a tone is not present, turn gen dial above and below 1400kc.

5

A loud tone should be present close to 1400kc.

6

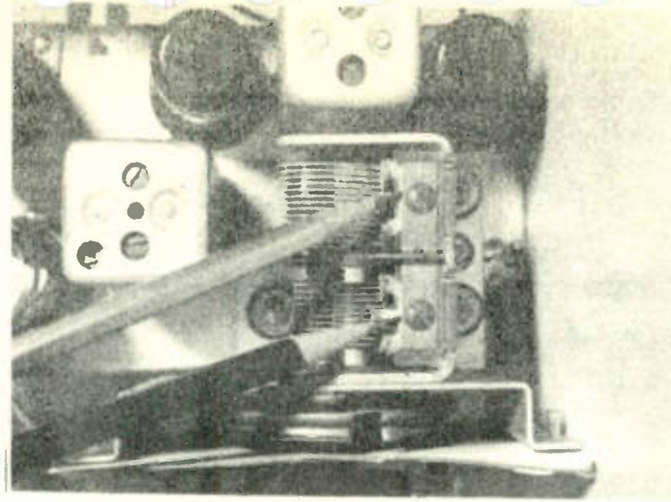
Reset gen dial to 1400kc, and adjust osc trimmer on tuning cap until tone heard.

7

Be sure to adjust for loudest tone. Other weak tones may exist close by.

GEST)

ALIGNMENT OF THE RF CIRCUITS IN A RADIO RECEIVER, PROVIDES BETTER RECEPTION, AND MAKES POSSIBLE DESIRED STATION RECEPTION AT THE CORRECT POINT ON THE DIAL. THIS IS SOMETHING THAT YOU SHOULD CHECK BEFORE A SET LEAVES THE SHOP. IT WILL MAKE THE CUSTOMER FEEL CONFIDENT IN YOU IF THE SET IS IN TIP TOP SHAPE, AND YOU WILL FEEL SATISFACTION IN A JOB WELL DONE.



DIG (B)

IN ORDER FOR A SET TO BE OPERATING CORRECTLY, THE LOCAL OSCILLATOR MUST BE OPERATING AT EXACTLY THE IF ABOVE THE INCOMING SIGNAL. THIS SHOULD HAPPEN WHEN THE DIAL IS SET TO THE DESIRED STATION. FOR THIS ALIGNMENT, WE WILL BE ADJUSTING THE TRIMMERS MOUNTED ON THE TUNING CAPACITORS. SOME OF THE OLDER SETS ALSO HAD A PADDER ADJUSTMENT FOR THE LOCAL OSCILLATOR. THIS WILL BE ADJUSTED AT 600KC.

8

If set uses loop antenna, wrap 2 turns of wire around loop.

9

Connect gen to ends of wire, and feed in 1500kc mod signal. Set dial to 1500kc.

10

Adjust mixer trimmer and RF trimmer, if used, until maximum tone heard.

11

These trimmers are mounted on tuning capacitors.

12

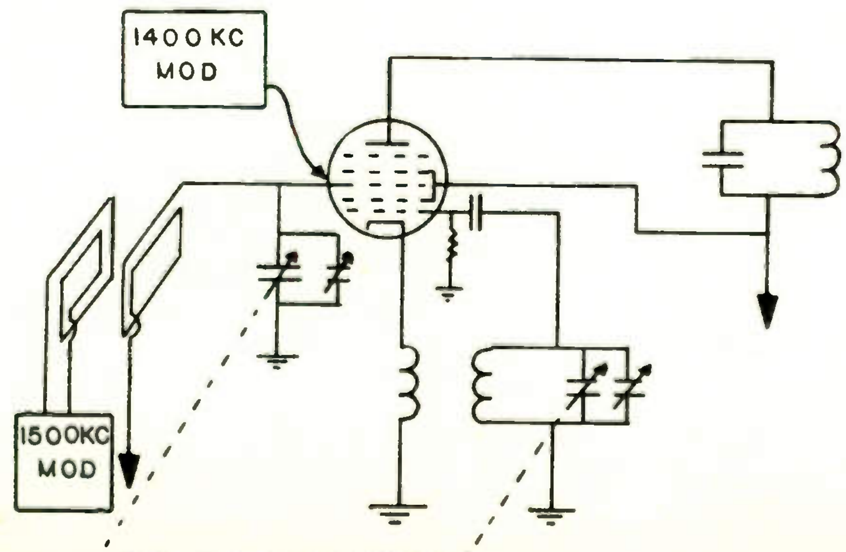
If set has antenna terminal instead of loop, connect gen to antenna and ground.

13

If old set, may have osc padder. Feed in mod signal at 600kc to mixer grid.

14

Set dial to 600kc and adjust padder for maximum tone.

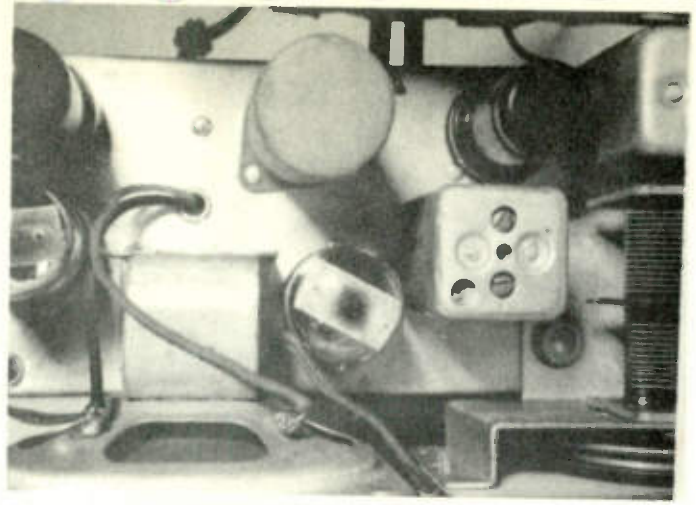


CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

TUBES DON'T LIGHT IN AC RADIO



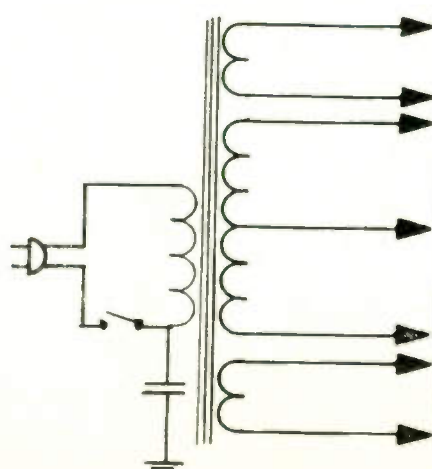
DIGEST (A)

SINCE THE TUBES IN AN AC RECEIVER ARE CONNECTED IN PARALLEL, THE FACT THAT NONE OF THEM LIGHT, WOULD JUST ABOUT ELIMINATE THE POSSIBILITY OF TUBE TROUBLE, SINCE IT IS MOST UNLIKELY THAT *ALL* OF THE TUBES WENT BAD AT ONCE. WITH THIS THOUGHT IN MIND, OUR ATTENTION POINTS TO THE LINE CORD, ON/OFF SWITCH, OR POWER TRANSFORMER.

DIGEST (B)

THE AC RECEIVER TAKES THE 117 VOLT INPUT, AND APPLIES IT TO A POWER TRANSFORMER. THE TRANSFORMER STEPS THIS VOLTAGE UP AND DOWN. UP FOR THE POWER SUPPLY RECTIFIER, AND DOWN FOR THE HEATERS OF THE TUBES. IN SOME OF THE MORE EXPENSIVE RADIOS, THE TRANSFORMER IS FUSED, SO THIS SHOULD ALSO BE CHECKED. ONE OTHER THING TO POINT OUT IS THAT IN SOME SETS, A SEPARATE WINDING IS PROVIDED FOR THE RECTIFIER HEATER, SO IT IS POSSIBLE THAT IT MAY STILL LIGHT.

CIRCUIT DIAGRAM



1 If set has fuse, check this first.

2 If fuse open, try another. If this blows, check chart #23.

3 If fuse ok, or no fuse used, check to see if rectifier lighting.

4 If it is, but all other tubes not lighting, suspect an open transformer secondary.

5 Disconnect secondary that feeds tube heaters. Check for open.

6 If rectifier doesn't light either, remove plug from wall socket.

7 Place ohmmeter across on/off switch. See if it makes and breaks contact.

8 If switch ok, check line cord for an open.

9 Break in line cord usually occurs at plug or where line enters radio.

10 If line cord ok, check primary of transformer for an open.

11 Make sure voltage is present at wall socket.

12 In some combination sets, AM FM PHONO TV, switch may be in TV position.

13 This will break heater line, if set in shop may have to use jumper.

14 Refer to set schematic to see position of jumper to play radio.

1

Switch set off and remove rectifier tube.

2

Switch set on and see if smoking continues.

3

If smoking has stopped, rectifier circuit is defective.

4

Tube itself may be internally shorted, or filter network defective.

5

Measure resistance from common neg to cathode pin of rectifier socket.

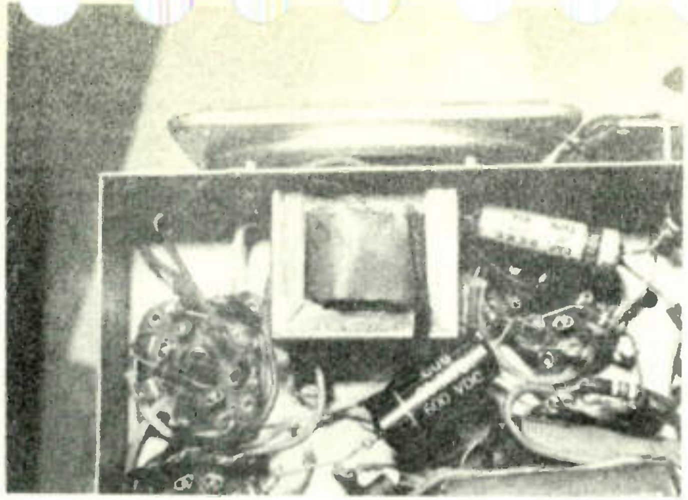
6

Should get a low reading rising rapidly to above 20,000 ohms.

7

If normal, replace rectifier tube. If low or zero, check filter network.

A SMOKING OR OVERHEATING TRANSFORMER IS AN INDICATION THAT THERE IS A SHORT IN THE POWER SUPPLY. THIS MIGHT BE THE POWER TRANSFORMER ITSELF, OR IN THE RECTIFIER CIRCUIT. IN ORDER TO CHECK TO SEE WHICH CIRCUIT THE TROUBLE IS IN, A FEW SIMPLE CHECKS CAN BE MADE. IN SOME RECEIVERS, THE POWER TRANSFORMER HAS A FUSE IN ITS PRIMARY, IF THIS KEEPS ON BLOWING, A SIMILAR TROUBLESHOOTING PROCEDURE CAN BE APPLIED AS THE ONE GIVEN HERE FOR A SMOKING TRANSFORMER.



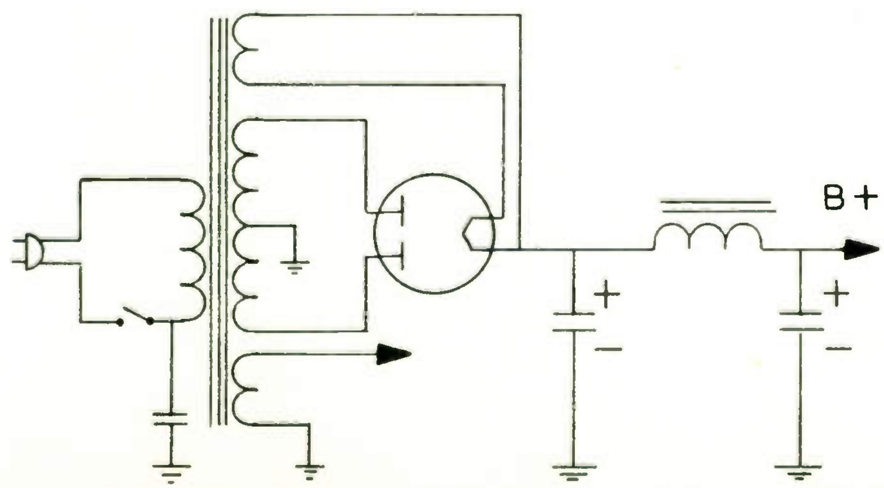
A TRANSFORMER WILL START TO OVERHEAT IF THERE IS A HEAVY CURRENT DRAIN IN ANY OF ITS SECONDARIES. WHAT IS HAPPENING, IS THAT THE HEAVY CURRENT REQUIREMENT, DUE TO A SHORT IN THE SET OR THE TRANSFORMER, IS CAUSING THE WIRE TO OVERHEAT. THIS IN TURN IS OVERHEATING THE INSULATION AROUND THE WIRE, AND CAUSING THE SMOKE. IF THE TROUBLE IS NOT IN THE TRANSFORMER ITSELF, THE OVERHEATING MAY DAMAGE THE TRANSFORMER AND REQUIRE IT TO BE REPLACED.

OVERHEATING AND SMOKING POWER TRANSFORMER

SYMPTOM

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

8

If transformer still smokes with rectifier tube out, unsolder any secondary.

9

If smoking stops, check where secondary connected.

10

Look for frayed wire, shorted terminal, too much solder.

11

If smoking continues, unsolder another secondary.

12

If smoking stops, check as indicated in 9 and 10 above.

13

Continue to disconnect one secondary at a time as above.

14

If, with all secondaries disconnected, it still smokes, replace transformer.

TELEVUE TROUBLE SHOOTER

1

If tubes do not light in car, check fuse.

2

If fuse okay, set must be removed.

3

Trouble must be in switch or heater lead line.

4

Use meter to check for open switch.

5

If meter not available, place jumper across switch contacts.

6

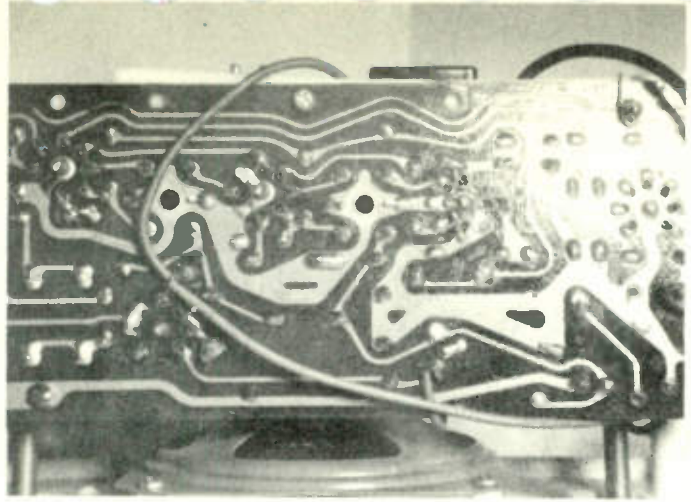
If, switch okay, check for a break in battery lead going to switch.

7

In series with battery lead, is RF choke made of a few turns of heavy wire.

DIGEST (A)

WHEN THE TUBES DO NOT LIGHT IN A CAR RADIO, IT USUALLY MEANS THAT THE FUSE IS OUT, THE ON/OFF SWITCH IS DEFECTIVE, OR THERE IS A BREAK IN THE LINE TO THE HEATERS OF THE TUBES. IF THIS TROUBLE IS ENCOUNTERED IN THE SHOP, AFTER THE RADIO HAS BEEN REMOVED FROM THE CAR, THEN IT PROBABLY MEANS THAT THE 6 OR 12 VOLT LINE TO THE RADIO IS NOT CONNECTED CORRECTLY.



SYMPTOM

TUBES DO NOT LIGHT IN A CAR RADIO

DIGEST (B)

SINCE THE TUBE HEATERS OF A CAR RADIO ARE CONNECTED IN PARALLEL, IT IS MOST UNLIKELY THAT ALL OF THE TUBE HEATERS BURNED OUT, UNLESS TOO MUCH VOLTAGE WERE APPLIED BY ACCIDENT. THEREFORE, IT WOULD MEAN THAT SOMETHING COMMON TO THE HEATER LINE IS DEFECTIVE, SUCH AS FUSE, SWITCH, ETC. WHEN CONNECTING THE BATTERY ELIMINATOR TO THE RADIO IN THE SHOP, BE SURE THAT ONE SIDE IS GROUNDED, AND THE OTHER GOES TO THE ON/OFF SWITCH.

8

This may have broken, or come unsoldered.

9

If tubes do not light in shop, but did light in car, check connections.

10

One lead of battery eliminator must be grounded to radio chassis.

11

Other lead goes to fuse line of radio.

12

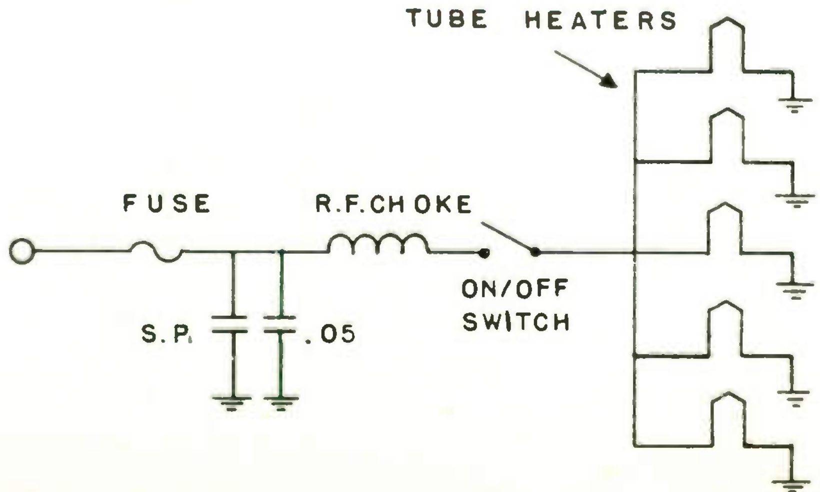
May have connected eliminator to pilot light line instead.

13

Make sure eliminator is working correctly by measuring output voltage.

14

CIRCUIT DIAGRAM



1

If fuse blown, set should be removed to find cause.

2

In shop use ammeter on battery eliminator to check current drain.

3

6v radio uses about 5 to 8 amps. 12v uses 3 to 5 amps.

4

If ammeter shows excessive current pull out vibrator.

5

If high current present, check capacitors in battery line and vibrator circuit.

6

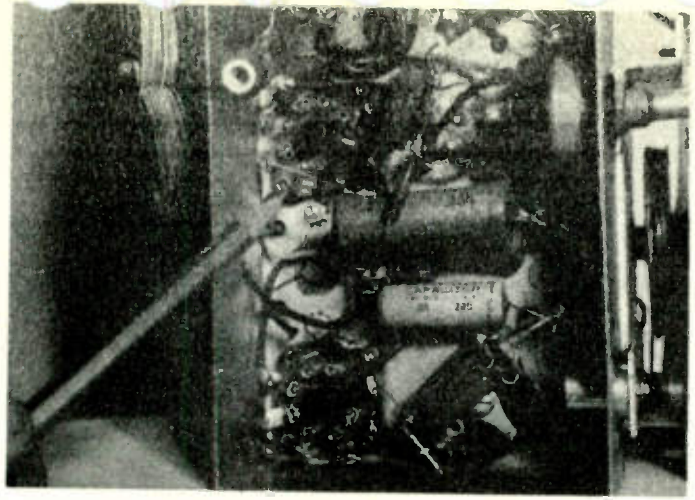
If short clear with vibrator out, pull out rectifier and put vibrator back.

7

If short still present, replace vibrator. Check for shorted buffer.

GEST)

A BLOWN FUSE IN A CAR RADIO IS AN INDICATION OF EITHER A DEFECTIVE VIBRATOR, OR A SHORT SOMEWHERE IN THE POWER SUPPLY. SOMETIMES REPLACING A BLOWN FUSE WILL RESTORE OPERATION TO WHAT APPEARS TO BE NORMAL. HOWEVER, AFTER A SHORT PERIOD OF TIME THAT MAY BE HOURS, OR DAYS, THE FUSE BLOWS AGAIN, AND THE CUSTOMER MAY OR MAY NOT BRING THE SET BACK TO YOU. IF A FUSE IS BLOWN, *SOMETHING* IS WRONG.



CAR RADIO BLOWS FUSES

SYMPTOM

DIGE (B)

AS VOLTAGE IS APPLIED TO THE VIBRATOR, IT ACTS LIKE A SWITCH GOING ON AND OFF, MAKING AND BREAKING THE CIRCUIT, THIS TENDS TO TURN THE DC INTO A PULSATING DC THAT CAN BE STEPPED UP BY A TRANSFORMER. A RECTIFIER IS NOW USED TO TURN THIS VOLTAGE INTO RECTIFIED DC, AND THEN THE FILTER TURNS IT INTO A DC FOR RADIO OPERATION. ANY DEFECT IN THIS SYSTEM, AND THE FUSE BLOWS. THE BUFFER CAPACITOR, ACROSS RECTIFIER PLATES, MUST BE CHANGED IF VIBRATOR IS CHANGED.

8

If these are normal, suspect power transformer of a short

9

If short has cleared with old vibrator in and rectifier out, check below.

10

Put new rectifier in set. If short present now, then filter network bad.

11

Unsolder filter capacitors and check for short.

12

If filter capacitors ok, refer to chart #18.

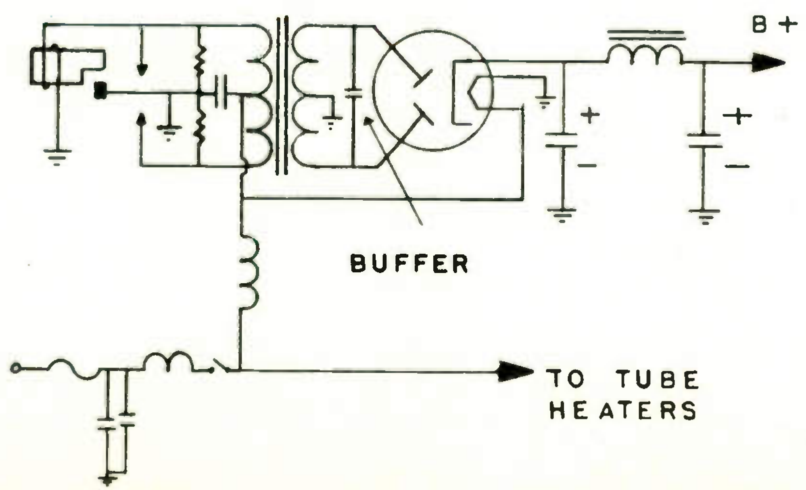
13

If vibrator has to be replaced, be sure to replace buffer capacitor.

14

Must get same value as one in set. Usually has 1600 working volts.

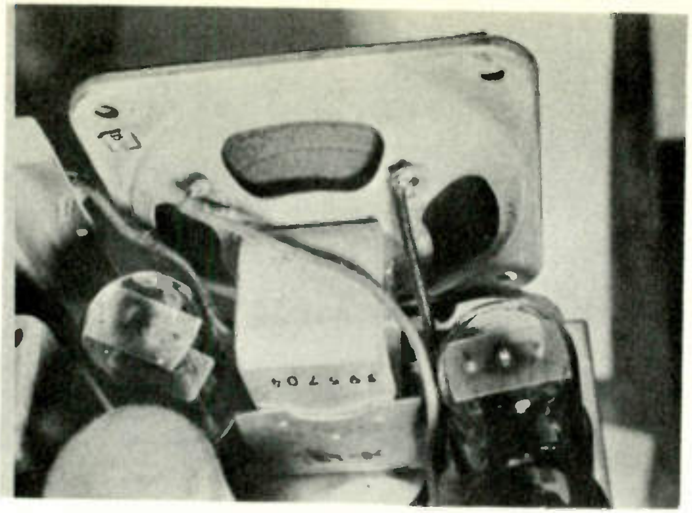
TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

SOUND FADES IN AND OUT

SYMPTOM



DIGEST (A)

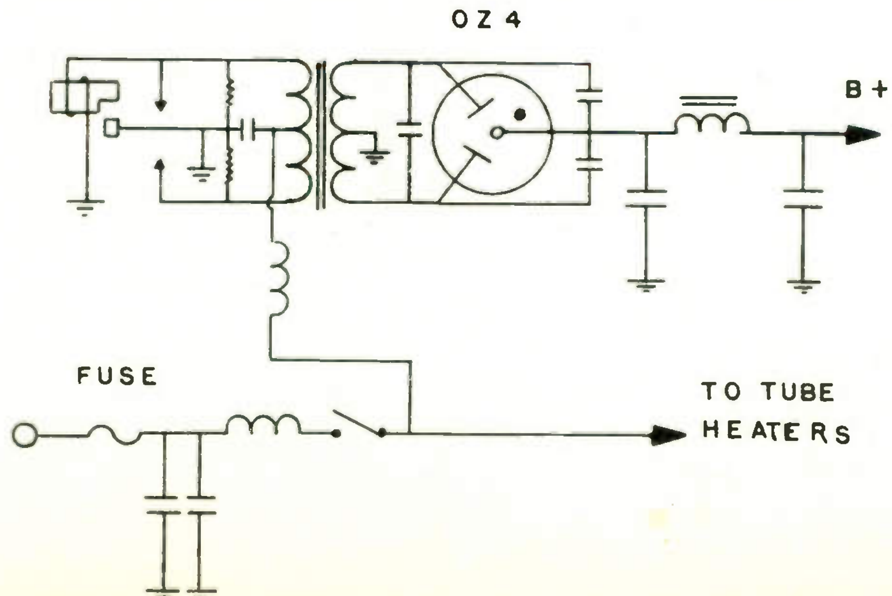
A COMMON TROUBLE IN A CAR RADIO IS THIS FADING IN AND OUT OF THE SIGNAL. SET WILL PLAY FOR A MOMENT, THEN IT WILL FADE OUT, BUT COME IN AGAIN. THE RAPIDITY OF THIS FADING VARIES FROM MANY TIMES A SECOND, TO ONCE IN SEVERAL SECONDS. ALSO, IT MAY BE FOUND THAT THE SPEED MAY VARY RATHER THAN BE CONSTANT. MOST COMMON CAUSE OF THIS TROUBLE IS THE VIBRATOR OR RECTIFIER.

DIGEST (B)

ONE OF THE COMMON TUBES USED AS A RECTIFIER, IS THE OZ4. THIS IS A GAS FILLED TUBE THAT IONIZES AS THE VOLTAGE IS APPLIED. THE GAS GIVES OFF A PURPLE GLOW WHEN IONIZED, AND SHOULD NOT BE CONFUSED WITH A DEFECTIVE TUBE. SOMETIMES THIS TUBE CANNOT CONTINUE TO BE IONIZED, WITH THE RESULT OF FADING. ANOTHER CAUSE OF FADING, IS THE VIBRATOR. THIS OFTEN BECOMES INTERMITTENT.

TELEVUE TROUBLE SHOOTER

1. Replace all tubes, especially the rectifier if its an OZ4.
2. Replace vibrator.
3. If new vibrator not available, but you want to check it, do as follows.
4. Place meter on high ac range, across plates of rectifier tube.
5. Remove rectifier tube. If voltage is rising and falling vibrator is bad.
6. If fading continues, and vibrator and tubes have been checked, trouble in set.
7. Use generator to feed in audio signal to audio stages.
8. If audio tone fades, then trouble in audio system.
9. If audio tone constant, feed in mod IF to IF amp.
10. If tone fades in and out, check IFs and Detector.
11. If tone constant at IFs, feed in mod IF to mixer.
12. If tone fades at this point, then check mixer circuit.
13. Continue this method of checking for fading, in osc and RF circuits.
14.



CIRCUIT DIAGRAM

1

Switch set off, discharge all electrolytics, remove tubes.

2

Check filaments for an open. Do not use the Rx1 range of meter.

3

If a tube has an open filament, replace with new one, and reinsert all tubes.

4

Switch set on. If set doesn't play, repeat steps 1 and 2.

5

If another filament is open, check value of filament dropping resistor.

6

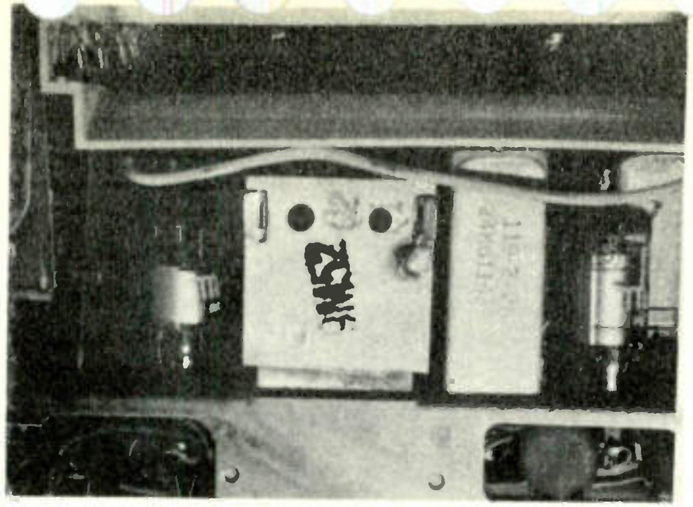
If all tube filaments are okay, try tube substitution.

7

Measure voltage at output of selenium or silicon rectifier.

GES… …)

WHEN A THREE WAY PORTABLE HAS NO SOUND, GREAT CARE MUST BE TAKEN IN WORKING ON THE SET AS THE TUBES ARE SO FRAGILE AS FAR AS THE FILAMENT IS CONCERNED. EVEN CHECKING FOR CONTINUITY, MAY BURN OUT THE FILAMENTS IF PRECAUTIONS ARE NOT TAKEN. ONE OF THE THINGS TO DO IS TO MAKE SURE THAT YOU NEVER USE THE Rx1 RANGE TO CHECK THE FILAMENTS. IN SOME METERS THE BATTERY USED TO OPERATE THE OHMS SCALE IS OVER 1.5 VOLTS, AND WILL DAMAGE FILAMENTS ON Rx1 SETTING.



NO SOUND IN A
3 WAY PORTABLE

SYMPTOM

DIG… (B)

UNDER NO CIRCUMSTANCES SHOULD A TUBE BE REMOVED AND PUT BACK IN THE SOCKET WHILE THE SET IS ON. THIS CAN CHARGE ONE OF THE ELECTROLYTICS INSIDE THE SET, AND IT WILL DISCHARGE THROUGH THE FILAMENT CIRCUIT, BURNING OUT ONE OR MORE OF THE FILAMENTS AS IT DOES SO. ANYTIME A TUBE HAS TO BE REMOVED, BE SURE THAT THE ELECTROLYTICS ARE DISCHARGED BY TAKING A JUMPER, AND PLACING IT ACROSS THE CAPACITOR TERMINALS.

8

If low, or none at all, refer to chart #28. Should be 120 volts.

9

Trouble must be localized to defective circuit by use of gen.

10

Feed in audio signal to top of volume control, control full on.

11

If no tone, troubleshoot audio. If tone, feed in mod IF to IF amp.

12

If no tone, check IF amp and detector. If tone, move to mixer grid.

13

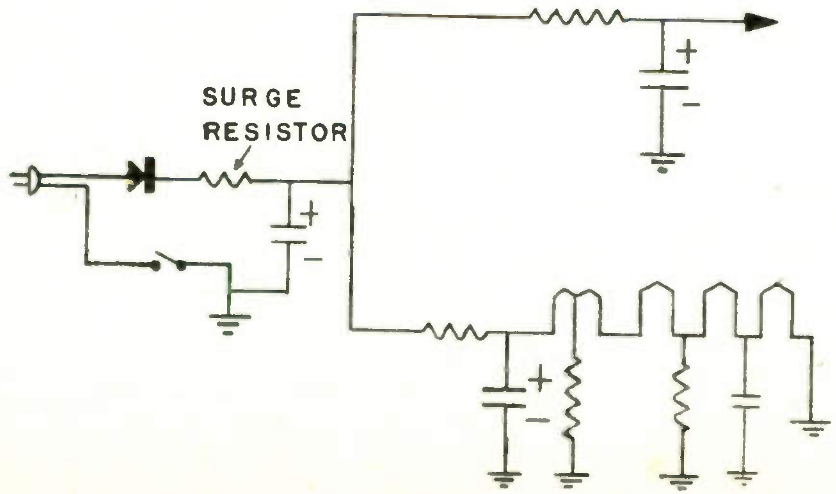
If IF tone passes, feed in 1000kc mod. Set radio dial to 1000kc.

14

If no tone, troubleshoot osc circuit. If tone, go to RF or antenna.

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

1

Measure output voltage at terminals of rectifier. Should be 120v.

2

Since the 3 way portable is so critical, voltage should be within 5%.

3

If off more than 5%, try bridging input and output filter capacitors.

4

If capacitors appear normal, try substitute selenium or silicon.

5

Be sure that you place new one in circuit with correct polarity.

6

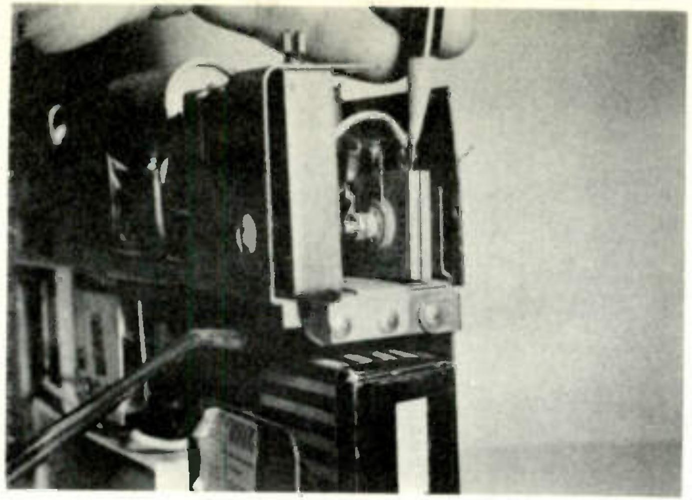
The arrow side should go toward the AC, and the bar to the input filter.

7

If backward, it will damage input filter capacitor and selenium.

DIGEST (A)

MOST 3 WAY PORTABLE RADIOS USE A SELENIUM RECTIFIER AS A MEANS OF TURNING THE AC INTO PULSATING DC. THE SELENIUM RECTIFIER CONSISTS OF A SERIES OF ALUMINUM PLATES COATED WITH SELENIUM. THIS HAS THE PROPERTY OF ALLOWING CURRENT FLOW FROM SELENIUM TO ALUMINUM, BUT ALMOST NO CURRENT FROM ALUMINUM TO SELENIUM. THUS IT HAS RECTIFYING PROPERTIES. THE SYMBOL OF THE SELENIUM RECTIFIER IS A BAR AND ARROW. THE BAR REPRESENTS THE SELENIUM.



SELENIUM OR SILICON RECTIFIERS

SYMPTOM

DIGEST (B)

RECENTLY, SINCE THE DEVELOPMENT OF SEMI-CONDUCTORS, THE MARKET HAS BEEN USING THE SILICON RECTIFIER TO REPLACE THE FAMILIAR SELENIUM TYPE. NOW THE SILICON RECTIFIER IS SMALLER AND PLUGS INTO A HOLDER THAT LOOKS LIKE A FUSE HOLDER, THUS MAKING IT EASY TO REPLACE. WHETHER IT IS A SELENIUM OR SILICON RECTIFIER THAT IS USED, THE OUTPUT SHOULD BE 120 VOLTS DC AT THE TERMINAL.

8

If there is no voltage at rectifier, check surge resistor.

9

This resistor is in series with rectifier. Often on AC side.

10

Value of resistor is low, around 50 to 100 ohms.

11

If burned open, check chart #18 before replacing resistor.

12

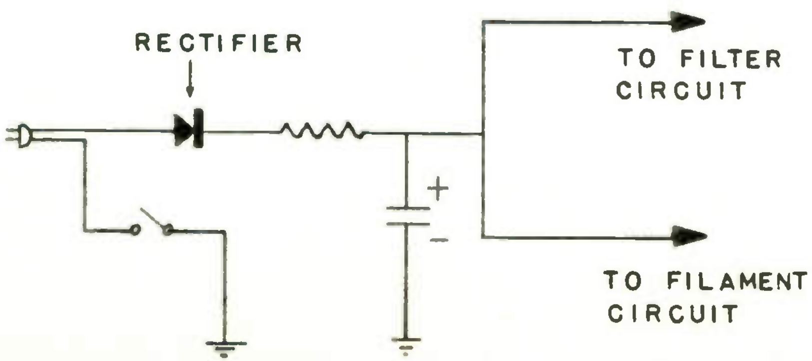
If selenium has to be replaced, be sure it has same current rating.

13

3 way portables use about 65 to 75 ma current rectifiers.

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Switch to AC operation and see if AC is getting to rectifier.

2

This can be checked by measuring voltage from common neg to rectifier.

3

If there is no voltage, check from AC input through Battery AC switch.

4

Switch is usually operated by AC plug being plugged into it.

5

If AC present at rectifier, check for DC output.

6

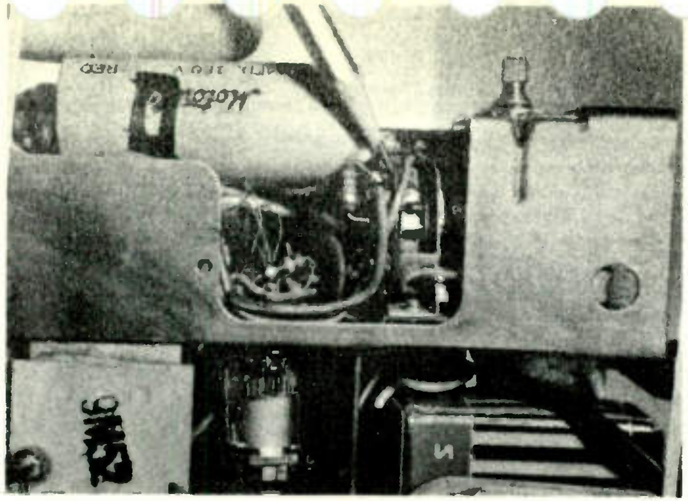
Output at rectifier terminals should be 120 v. If zero, check surge resistor.

7

Surge resistor is in series with rectifier. If open, refer to chart #18.

GEST)

IF A THREE WAY PORTABLE PLAYS ON BATTERIES, BUT NOT ON THE AC LINE, THEN THE TROUBLE IS IN THE POWER SUPPLY CIRCUIT, OR THE SWITCH THAT CHANGES THE OPERATION FROM BATTERY TO LINE. SINCE THE SET IS WORKING ON BATTERIES, IT MEANS THAT THE RF, OSC, IF, AND AUDIO ARE WORKING, AND NO TIME NEED BE SPENT ON THEM. THERE IS ALSO THE POSSIBILITY THAT THE FILAMENT LINE CIRCUIT ON AC OPERATION, IS DEFECTIVE.



PLAYS ON BATTERIES BUT NOT ON AC

SYMPTOM

DIGE (B)

WHEN THE 3 WAY PORTABLE OPERATES ON AC, THE 117 V INPUT IS RECTIFIED BY THE SELENIUM OR SILICON, AND FILTERED BY THE FILTER NETWORK. FROM HERE IT FEEDS THE B PLUS CIRCUITS, AND ALSO GOES TO A DROPPING RESISTOR SO THAT THE HIGH DC, AROUND 120V, IS REDUCED TO THE CORRECT AMOUNT TO OPERATE THE FILAMENTS THAT ARE IN SERIES. THEY REQUIRE USUALLY 7.5 VOLTS DC.

8

If voltage high, around 160v, suspect an open in filament line.

9

Check filament dropping resistor in series with filaments.

10

This resistor is usually around 2200 ohms.

11

If voltage at rectifier fairly normal, check B plus line.

12

Voltage at B plus should be around 90 volts.

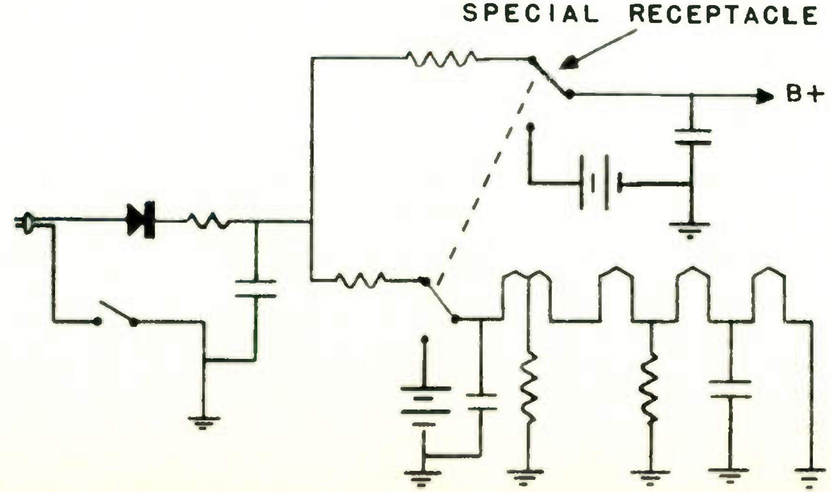
13

If B plus low or zero, check filter resistor between filter capacitors.

14

TROUBLE

TELEVUE SHOOTER

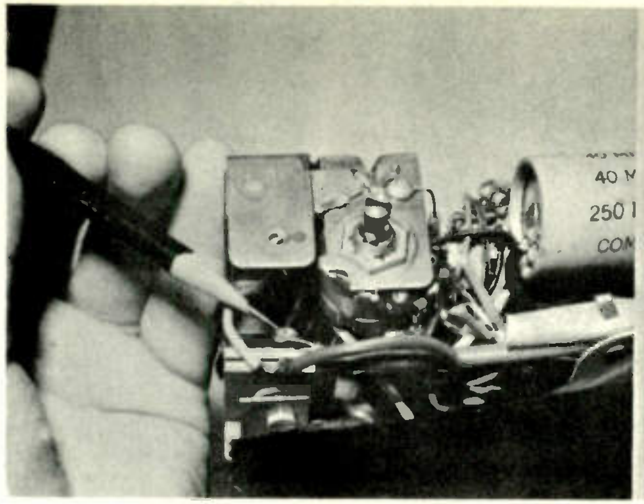


CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

PLAYS FOR A FEW MINUTES THEN STOPS



DIGEST (A)

WHEN A 3 WAY PORTABLE PLAYS FOR A FEW MINUTES, THEN STOPS, THE TROUBLE IS USUALLY TUBES, OR THE RECTIFIER. THIS TYPE OF A TROUBLE IS QUITE COMMON AND VERY OFTEN WILL PLAY WELL IN THE SHOP, BUT STOPS IN THE CUSTOMERS HOME. THING TO DO IS TO MAKE SURE THAT THE TROUBLE HAS BEEN CURED, AND NOT JUST COMPENSATED FOR. A CLOSE CHECK OF THE FILAMENT LINE IS ADVISED FOR THIS TROUBLE.

DIGEST (B)

ONE OF THE MOST CRITICAL CIRCUITS IN A 3 WAY PORTABLE, IS THE OSCILLATOR. IF THE FILAMENT VOLTAGE TO THE OSC TUBE HAS DROPPED SLIGHTLY, CIRCUIT MAY STOP AFTER A FEW MINUTES. THE DANGER HERE IS THAT REPLACING THE OSC TUBE WITH A NEW ONE MAY SEEM TO CLEAR THE TROUBLE, BUT AFTER A FEW DAYS, IT WILL RECUR. REASON FOR THIS, IS THAT A NEW TUBE HAS MORE CURRENT THAN AN OLDER ONE, AND THIS WILL KEEP OSC OPERATING FOR A SHORT TIME.

1 Replace tubes to see if they restore operation.

2 Remember, always switch off set and discharge electrolytics.

3 If set plays or not after tube replacement, check power supply voltage.

4 Voltage at rectifier terminals should be 120v DC.

5 If 115 v or less, measure filament voltage of each tube.

6 The 1.5 volt tubes such as 1R5, 1U5, should be at least 1.3 volts.

7 If power supply voltage low, and filament voltage less than 1.3v, check as follows.

8 Bridge input and output filter capacitors.

9 See if voltage output of rectifier has increased.

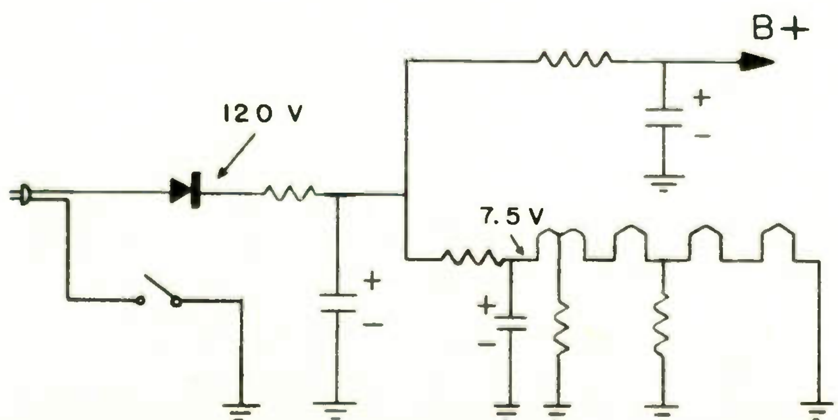
10 If no increase noticed, replace rectifier.

11 With new rectifier in circuit, remeasure filament voltage.

12 Voltage on filament line should be 1.5 volts for most tubes.

13 Usually a 3V4 or 3S4 is used, and this will require about 3v.

14 If still low, check filament dropping resistor for an increase.



CIRCUIT DIAGRAM

1

Check battery under load for correct amount, if off more than 20%, replace.

2

With volume control full on, touch center tap of control with finger, should hear a buzz.

3

If no buzz at this point, connect audio gen to base of audio output transistor.

4

If a push pull system is used, connect generator to either transistor.

5

If there is still no tone, then take voltage check of transistor, and resistance check of speaker.

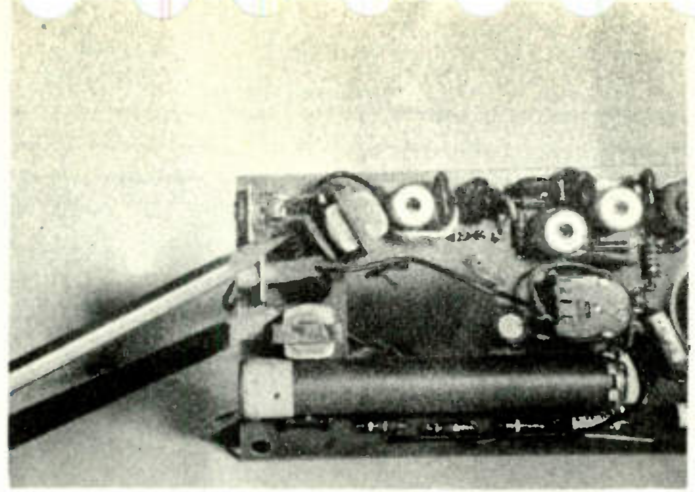
6

When taking voltage check of transistor watch for forward and reverse bias values.

7

If there is a tone at output base, move gen to 1st audio base, if 1st audio stage is used.

WHEN A TRANSISTOR RADIO HAS NO SOUND, ONE OF THE FIRST THINGS TO DO, IS TO FIND OUT IF THE BATTERY IS OKAY. THIS MUST BE CHECKED WITH THE BATTERY CONNECTED TO THE RADIO, AND THE RADIO SWITCH ON. THIS WILL CHECK THE BATTERY UNDER LOAD. NORMALLY, A BATTERY WILL OPERATE A TRANSISTOR RADIO UNTIL IT HAS DROPPED BEYOND 20% OF ITS RATED VALUE. FOR EXAMPLE, A 4 VOLT BATTERY WILL OPERATE THE RADIO UNTIL IT HAS DROPPED BEYOND 3.2 VOLTS.



NO SOUND

SYMPTOM

AFTER THE BATTERY HAS BEEN CHECKED, IT IS ADVISABLE TO USE AN AUDIO GENERATOR TO SEE IF THE AUDIO SECTION IS WORKING, THEN FEED IN AN IF SIGNAL MODULATED, TO CHECK THE IF STAGES. FINALLY, AN RF SIGNAL TO CHECK THE OSC AND RF AMPLIFIER IF USED. ONCE THE TROUBLE IS LOCALIZED, A VOLTAGE AND RESISTANCE CHECK CAN BE USED TO FIND THE DEFECTIVE COMPONENT.

8

If no tone at this point, take voltage and res check of 1st audio stage.

9

If a buzz IS heard at volume control, then feed mod IF signal to base of IF amp.

10

If a tone is heard at this point, move gen back to next transistor base.

11

If there is no tone at IF amp, then troubleshoot that stage.

12

At base of mixer, feed in a 1000kc signal and set radio dial to 1000kc. A tone should be heard.

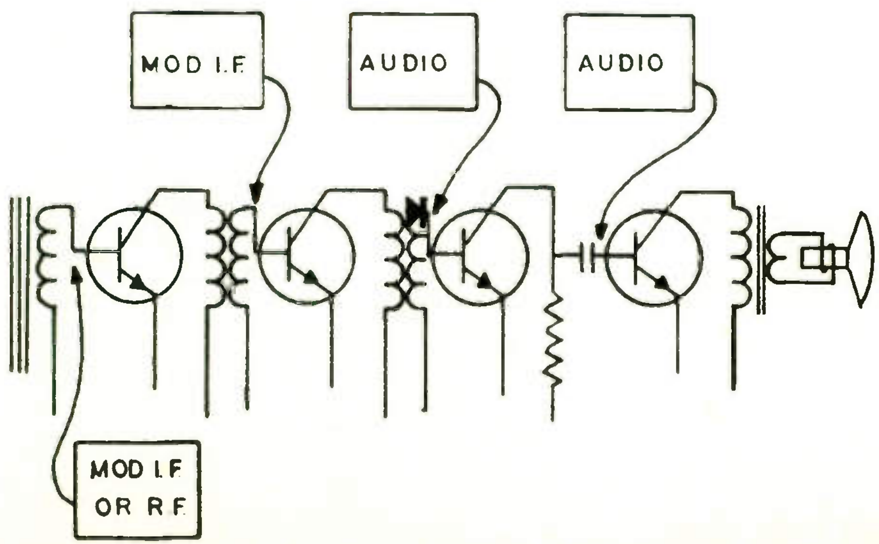
13

If there is no tone, then check osc coil for open, if ok then change osc parts.

14

If osc ok, check antenna for a break, or if RF amp used troubleshoot it.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Check battery voltage by leaving connected to set with set on.

2

If battery voltage is below 20% of rated value, replace.

3

Locate all electrolytic capacitors and bridge them with another capacitor.

4

Leave set on while bridging. If sound increases as one is bridged, replace that capacitor.

5

If all capacitors have been checked, connect audio gen to base of output transistor.

6

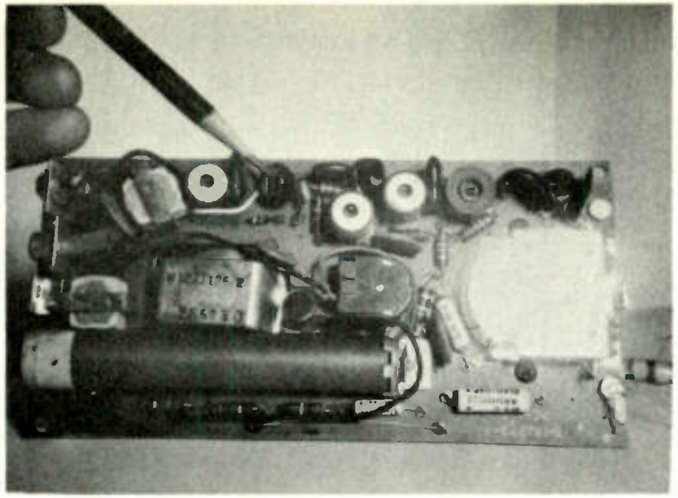
If push pull circuit, go to base of either transistor. Tone should be the same at each base.

7

It is normal for a weak tone to be present at this point. If very weak take voltage check.

DIGEST (A)

THE CAUSE OF WEAK SOUND COULD BE A BATTERY THAT IS LOW IN VALUE, OR A CIRCUIT THAT IS NOT AMPLIFYING AS MUCH AS IT SHOULD. MOST TRANSISTORS ARE NOT OF THE PLUG IN TYPE, AND THIS MEANS THAT WE CANNOT REPLACE THE TRANSISTORS FIRST, AS WE MAY TEND TO REPLACE THE TUBES FIRST IN A RADIO USING VACUUM TUBES. UNDER THESE CIRCUMSTANCES, IT IS ADVISABLE TO LOCATE THE TROUBLE TO A DEFECTIVE CIRCUIT BY MEANS OF A SIGNAL GENERATOR.



WEAK SOUND

SYMPTOM

DIGEST (B)

THERE IS A VERY COMMON CAUSE OF WEAK SOUND IN A TRANSISTOR SET, AND THAT IS AN OPEN CAPACITOR. IN MOST CASES THIS WAS FOUND TO BE AN ELECTROLYTIC, AND UNDER THESE CONDITIONS IT WILL BE SUGGESTED THAT ALL ELECTROLYTIC CAPACITORS BE BRIDGED ONE AT A TIME AFTER THE BATTERY HAS BEEN CHECKED. IF THIS DOES NOT HELP, THEN THE GENERATOR CAN BE USED TO LOCALIZE TO ONE STAGE.

8

Measure resistance values carefully. Substitute speaker. If still weak, replace transistor.

9

If tone ok at output base, move gen to center tap of volume control, with control full on.

10

If a 1st audio transistor is used in set, then a loud tone should be heard at this point.

11

If volume control goes directly to output transistor, then tone will be weak.

12

If normal at volume control, feed in Mod IF at IF amp base. If weak check voltage

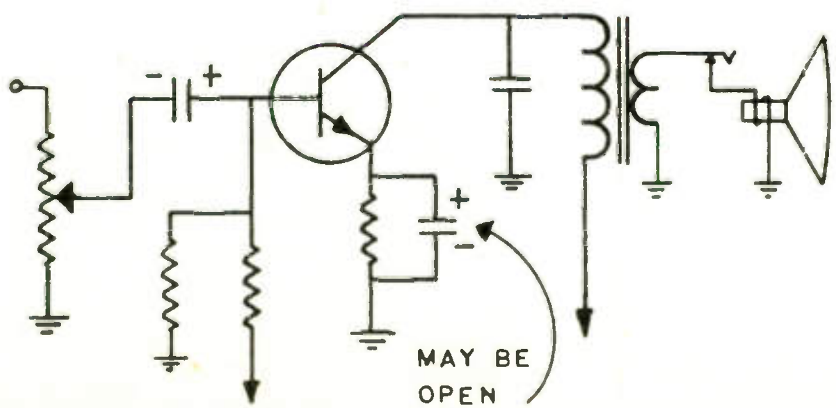
13

Continue moving gen back one stage at a time listening for a decrease in amplification.

14

If all stages appear fairly normal, check chart on alignment.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

EST

1

Replace all batteries.

2

Check for a poor battery contact due to corrosion.

3

Make sure that batteries have correct polarity.

4

Locate electrolytic capacitor on battery line to ground.

5

This capacitor is the most likely cause of feedback.

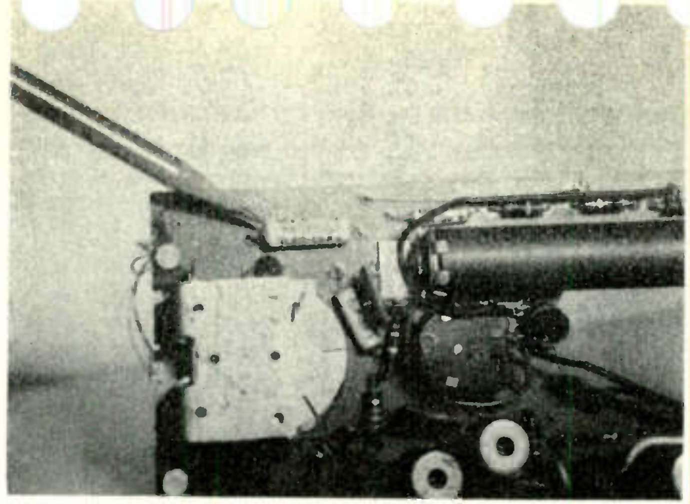
6

Bridge this capacitor with good one, replace if it cures trouble.

7

Bridge all capacitors on battery line to ground.

A VERY COMMON TROUBLE THAT OCCURS IN A TRANSISTOR RADIO IS THIS HOWL, SQUEAL, AND MOTORBOATING. IT IS CAUSED BY SIGNAL FEEDBACK, WHERE AT SOME POINT IN THE RADIO THE SIGNAL IS GOING FROM TRANSISTOR TO TRANSISTOR. ONE OF THE CAUSES OF THIS FEEDBACK IS A BAD BATTERY. THEREFORE, IT IS DESIRABLE TO CHANGE THE BATTERY FIRST. THIS IS MUCH BETTER THAN CHECKING ITS OPERATING VOLTAGE, BECAUSE IT WAS FOUND THAT THIS CONDITION OF FEEDBACK WOULD OCCUR EVEN WHEN THE BATTERY APPEARED NORMAL.



HOWLS, SQUEALS, MOTORBOATING

SYMPTOM

GES B)

MANY OF THE TRANSISTOR RADIOS USE A SERIES OF BATTERIES THAT MAKE UP THE TOTAL VOLTAGE. IF ONE OF THESE IS DEFECTIVE, OR IS MAKING A POOR CONTACT DUE TO CORROSION, THEN IT CAN BE THE CAUSE OF FEEDBACK. AFTER THE BATTERIES HAVE BEEN CAREFULLY CHECKED, AN OPEN CAPACITOR MAY BE SUSPECTED OR PERHAPS POOR ALIGNMENT.

8

Bridge capacitor connected from avc line to ground.

9

AVC line is tied to top of volume control through a resistor.

10

Some transistor radios use a special network in the IFs to prevent feedback.

11

This network may be defective. Check for resistor capacitor circuit in IFs.

12

This circuit will go from base to base of the two IF stages.

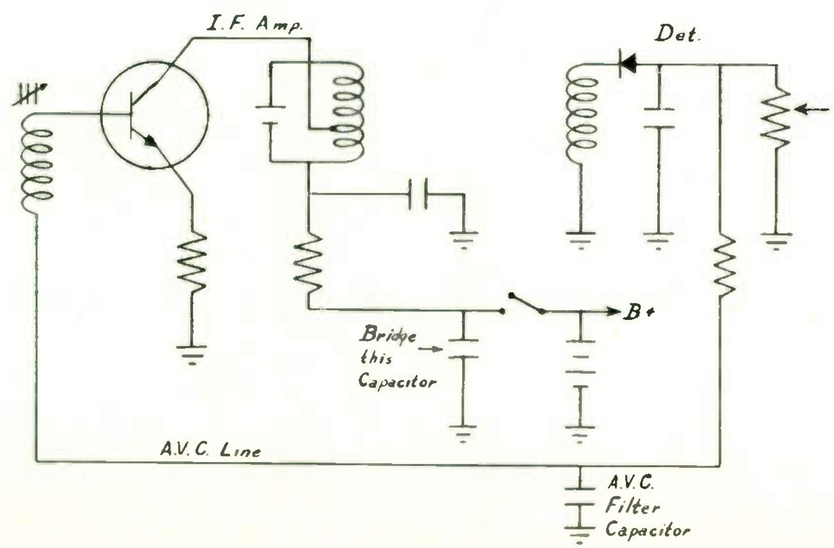
13

If all appear normal, realign radio.

14

TROUBLE

TELEVUE SHOOTER



CIRCUIT DIAGRAM

1

Check the battery voltage with battery connected and set on.

2

If more than 20% below rated value replace.

3

Some transistor radios require almost full rated voltage to operate correctly.

4

If in doubt, replace battery anyway.

5

Substitute speaker, be sure to disconnect speaker in set first.

6

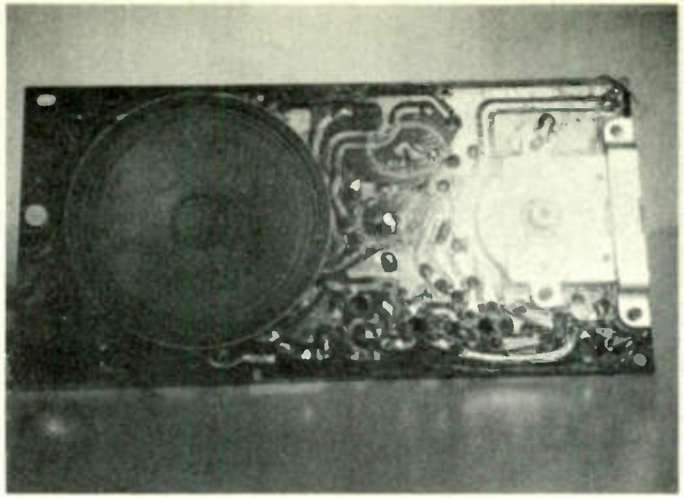
If speaker is ok, connect audio signal to base of output transistor.

7

If distortion present, two tones instead of one, take forward bias check. Check resistors.

DIGEST (A)

WHEN A TRANSISTOR RADIO HAS DISTORTION, IT CAN MEAN THAT THE BATTERY IS LOW ON OUTPUT, OR THAT ONE OF THE TRANSISTOR CIRCUITS HAS INCORRECT FORWARD BIAS. OF COURSE ONE OF THE FIRST THINGS TO DO, IS TO CHECK THE BATTERY. IF THIS APPEARS NORMAL, THEN THE TROUBLE SHOULD BE LOCALIZED TO ONE OF THE TRANSISTOR CIRCUITS BY MEANS OF A SIGNAL GENERATOR IF POSSIBLE. IF A GENERATOR IS NOT USED, THEN A CLOSE VOLTAGE CHECK MUST BE MADE FOR CORRECT FORWARD BIASING.



DISTORTION ON ALL STATIONS

SYMPTOM

DIGEST (B)

THE AMOUNT OF FORWARD BIAS THAT A TRANSISTOR CIRCUIT USES, DEPENDS UPON THE AMOUNT OF SIGNAL THAT IT MUST HANDLE. FOR EXAMPLE, THE MIXER STAGE WILL BE HANDLING A VERY SMALL AMOUNT OF SIGNAL, PERHAPS DIRECT FROM THE ANTENNA STAGE, WHEREAS THE AUDIO OUTPUT TRANSISTOR WOULD HAVE A FAIRLY LARGE INPUT SIGNAL SINCE IT HAS BEEN AMPLIFIED ALL OF THE WAY THROUGH THE RADIO. HOWEVER, THE AMOUNT OF FORWARD BIAS ON ANY TRANSISTOR WILL SELDOM BE LARGER THAN .3 VOLTS.

8

In push pull output, tone should sound same at base of both transistors.

9

If one is different, run a voltage and resistance check on both transistors.

10

In push pull, all components in each stage should be the same.

11

If output stage appears normal, move gen back to 1st audio base.

12

If sound is distorted here, take voltage and resistance check of circuit.

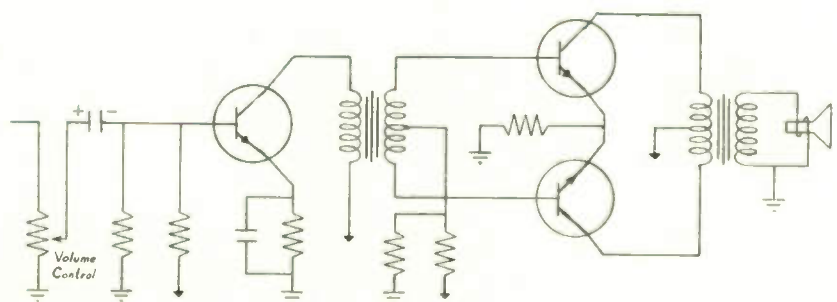
13

If distortion is on all stations it is likely to be in the audio circuits.

14

Check the coupling capacitors for a short or leakage. Replace transistors.

TELEVUE TROUBLE SHOOTER



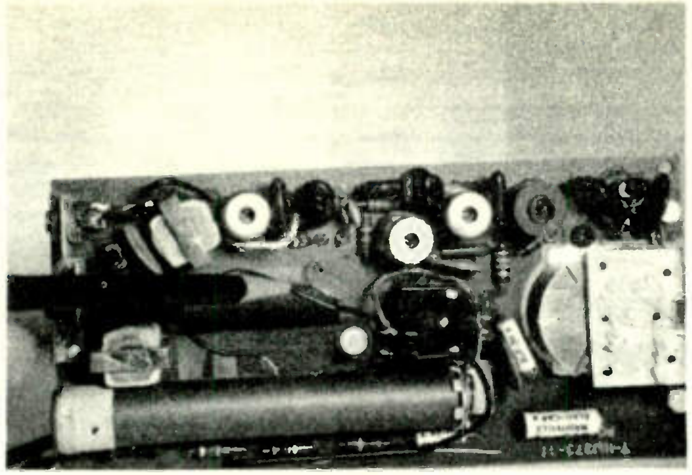
CIRCUIT DIAGRAM

TROUBLE SHOOTER

TELEVUE TROUBLE SHOOTER

SYMPTOM

DISTORTION ON SOME STATIONS



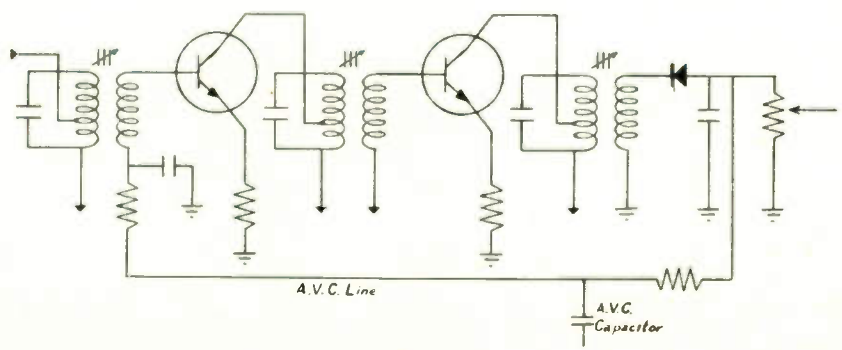
DIGEST (A)

WHEN A RADIO, ANY RADIO, DISTORTS ON SOME STATIONS, BUT APPEARS NORMAL ON OTHER STATIONS, IT IS A GOOD INDICATION THAT THERE IS SOME TROUBLE IN THE AVC LINE. THE REASON FOR THIS, IS THAT IF THERE IS NOT ENOUGH BIAS ON THE IFS, THEN A WEAK STATION MAY PASS WITHOUT BEING TOO LARGE TO OVERDRIVE THE TRANSISTOR, BUT IF A STRONG STATION COMES ALONG IT WILL OVERDRIVE THE TRANSISTOR, CLIPPING THE SIGNAL, WITH ITS RESULTANT DISTORTION.

DIGEST (B)

SINCE IT IS THE PURPOSE OF THE AVC LINE, TO CONTROL THE STRENGTH OF THE SIGNAL, THE FACT THAT SOME STATIONS ARE OPERATING NORMALLY, WOULD INDICATE THAT THE AUDIO STAGES ARE OKAY, AND THAT THE TROUBLE MUST BE BACK OF THE DETECTOR. ONCE AGAIN, SINCE THE STATIONS ARE PASSING THROUGH THE MIXER, OSC, AND IFS, WE MUST CONCLUDE THAT THE TROUBLE IS DUE TO INCORRECT BIAS, AND THE BIAS IS CONTROLLED BY THE AVC. SOME TRANSISTOR RADIOS USE GERMANIUM CRYSTALS FOR THE AVC.

1. Replace batteries.
2. Connect meter across volume control with a distorted station tuned in.
3. Should have a small negative voltage present.
4. Now switch to a good station, amount of negative voltage should have decreased.
5. Move meter to avc line going to the base of one of the transistors.
6. Vary station selector, amount of base voltage should change as stations change.
7. With this trouble, base voltage will probably remain constant as dial is varied.
8. If base voltage does vary as dial is moved, then suspect bad transistor.
9. If base remains constant, check for shorted avc capacitor.
10. AVC capacitor will be connected from the avc line to ground.
11. This capacitor is usually an electrolytic type.
12. If avc capacitor is good, check for an open resistor on avc line.
13. If set uses crystal diode in the avc line, then try replacing crystal.
14. When soldering crystal, be sure not to apply too much heat, as it will damage it.



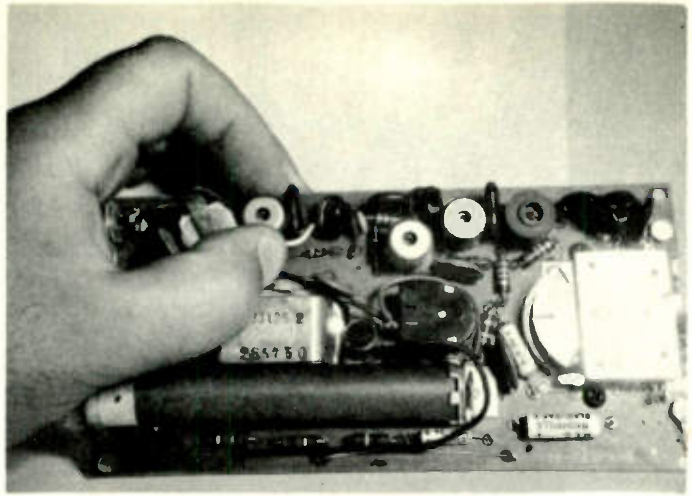
CIRCUIT DIAGRAM

TROUBLE SHOOTER

TELEVUE

SYMPTOM

INTERMITTENT OPERATION



DIGEST (A)

ONE OF THE MOST DIFFICULT TROUBLES WITH TRANSISTOR RADIOS IS THEIR INTERMITTENT OPERATION. MOST COMMON CAUSE OF THIS IS A POOR CONTACT WITH THE PRINTED CIRCUIT BOARD. VISUAL INSPECTION IS NOT TOO REWARDING, BECAUSE MOST OF THESE TROUBLES ARE UNDERNEATH THE SOLDER WHERE THEY CANNOT BE SEEN EVEN WITH A MAGNIFYING GLASS. BEST THING TO DO, ONCE A FEW QUICK CHECKS HAVE BEEN MADE, IS TO RESOLDER ALL TERMINALS ON THE PRINTED BOARD.

DIGEST (B)

INTERMITTENT OPERATION CAN BE THE RESULT OF POOR BATTERY CONTACTS, A BROKEN WIRE MAKING AND BREAKING CONTACT, OR A COMPONENT PART BREAKING DOWN FOR A PERIOD OF TIME. ONCE THE NORMAL CHECKS HAVE BEEN MADE, IT MAY BE NECESSARY TO USE A SIGNAL GENERATOR SO THAT THE DEFECTIVE STAGE CAN BE ISOLATED. APPLYING SLIGHT PRESSURE TO THE PRINTED BOARD SOMETIMES HELPS, ALTHOUGH IT MAY ALSO TEND TO BE CONFUSING BECAUSE PRESSURE AT ONE POINT ON THE BOARD, MAY AFFECT A SECTION FAR AWAY.

1. Check battery for good connections to leads or metal contact.

2. Use fine sandpaper to clean off any corrosion of battery contacts.

3. Take visual check of radio, apply slight pressure to parts mounted on chassis.

4. If set goes off and on as pressure to a part is applied, resolder part in circuit.

5. If set uses printed circuit board, apply pressure to board at various points.

6. If a particular area appears to make set go off and on, resolder around that area.

7. If pressure at many points appear to affect set, resolder entire board.

8. Use small wattage iron to avoid damage to printed board.

9. If trouble persists, use gen and feed in audio signal at top of volume control.

10. If intermittent at this point, concentrate on audio circuit for poor contact.

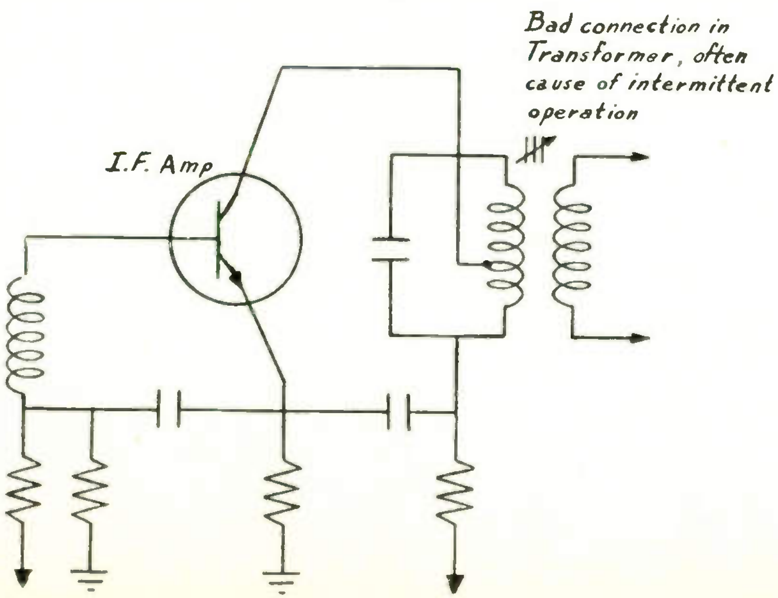
11. If sound remains constant at volume control, feed in signal at IF, mod, to mixer base.

12. If intermittent here, then concentrate trouble shooting to mixer, IF, and det.

13. If constant tone at mixer base, feed in 1000kc mod and set dial at 1000kc.

14. If intermittent, then trouble in osc. If constant, check antenna or RF.

CIRCUIT DIAGRAM



TELEVUE TROUBLE SHOOTER

SYMPTOM: SET PLAYS THEN STOPS

1

Replace battery.

2

If battery not available, check voltage output under load.

3

Connect meter across battery then switch set on. If voltage drops slowly to low value, battery is bad.

4

If battery appears normal, then trouble is in receiver.

5

Connect gen to audio output base after set has stopped operating.

6

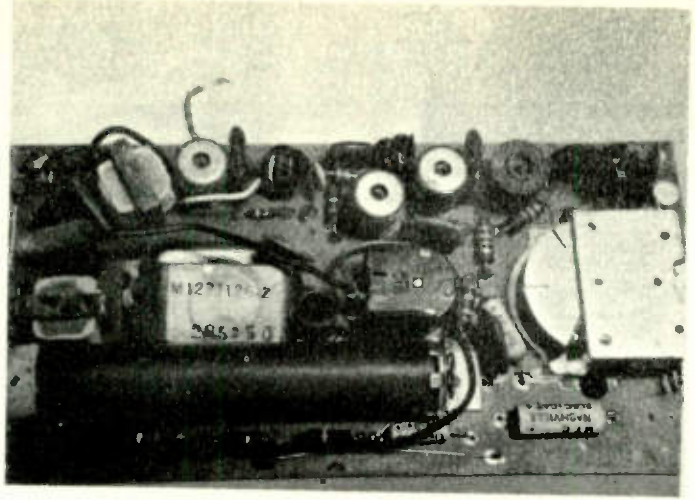
If a tone is heard, audio output is okay.

7

If there is no tone, then check speaker, and operating voltages of transistor.

DIGEST (A)

A DEFECTIVE BATTERY CAN BE THE CAUSE OF THIS CONDITION. WHAT TAKES PLACE IS THAT WHEN THE SET IS SWITCHED OFF, BATTERY HAS MAXIMUM OUTPUT, AS RADIO IS SWITCHED ON, CURRENT STARTS TO FLOW, AND A DRAIN IS PLACED ON THE BATTERY, IF BATTERY IS OLD IT WILL SUPPLY THE AMOUNT OF CURRENT FOR A FEW MINUTES ONLY, THEN ITS OUTPUT DROPS TO A VALUE TOO LOW TO OPERATE RECEIVER.



DIGEST (B)

THERE IS ALWAYS A POSSIBILITY THAT SOME COMPONENT PART IS BREAKING DOWN UNDER OPERATION, A RESISTOR MAY BE OPENING UP, OR A CAPACITOR SHORTS. IF THIS IS THE CASE, THEN THE BEST APPROACH IS TO LET THE SET STOP PLAYING, THEN USE A GENERATOR TO FEED IN A SIGNAL STARTING AT THE AUDIO OUTPUT STAGE AND WORK BACK TOWARD THE ANTENNA. AT THE POINT WHERE THE SIGNAL WILL NOT PASS, YOU WILL FIND YOUR DEFECTIVE COMPONENT.

8

If tone is at output transistor, move gen back to 1st audio transistor base.

9

If no tone at this point, then check operating voltages of 1st audio transistor.

10

With tone at 1st audio, move gen back to base of IF transistor.

11

Feed in a mod IF signal and listen for tone.

12

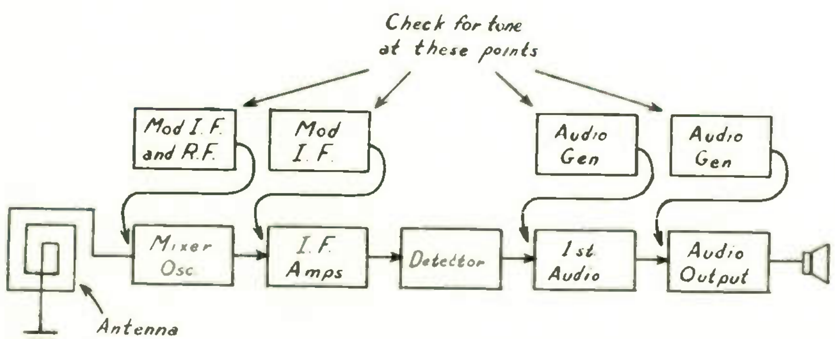
If no tone, then check voltages of IF transistor and resistance check of det.

13

If tone passes IFs, use same procedure on mixer base.

14

Feed in 1000kc mod to mixer base, set dial to 1000kc. If no tone check osc circuit.

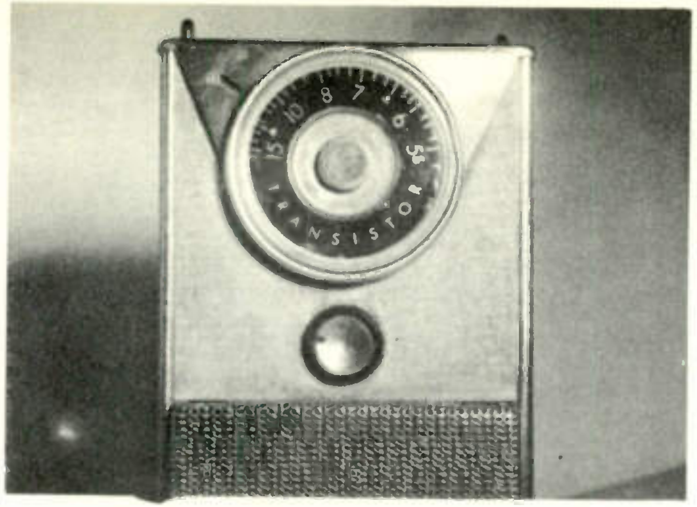


CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

DIGEST (A)

ONE OF THE BIG ADVANTAGES OF A TRANSISTOR RADIO IS THAT THE CURRENT DRAIN ON THE BATTERY IS SO LITTLE. MAIN REASON FOR THIS IS THE FACT THAT THE TRANSISTOR HAS NO HEATER, AND THEREFORE THE ONLY CURRENT DRAIN ON THE BATTERY IS THE TRANSISTOR CURRENT THAT IS VERY SMALL. UNDER NORMAL OPERATION, THE BATTERY OF A TRANSISTOR RADIO SHOULD LAST AT LEAST 3 MONTHS.



BATTERIES ARE USED UP TOO FAST

SYMPTOM

DIGEST (B)

IF A TRANSISTOR RADIO BATTERY REQUIRES CHANGING EVERY MONTH, OR PERHAPS SOONER, THEN SOME SHORT SHOULD BE SUSPECTED IN THE BATTERY LINE. BEST METHOD TO USE WITH THIS KIND OF A TROUBLE IS TO TAKE RESISTANCE CHECKS ALONG THE BATTERY CIRCUIT. WHEN DOING THIS, IT WILL BE FOUND NECESSARY TO DISCONNECT CERTAIN SECTIONS OF THE RECEIVER IN ORDER TO DETERMINE IF THE SHORT EXISTS IN THAT PATH.

1

Disconnect battery, and measure resistance across terminals with switch OFF.

2

Should have an infinite reading. If some reading present, trouble due to leakage.

3

Make sure that switch turns set off.

4

Check leads from battery to chassis for possible short to some part.

5

If switch reading infinite, then trouble is occuring when set is on.

6

Leave battery off, and unsolder any capacitor connected from battery line to ground.

7

Check each one of these capacitors for leakage.

8

Bear in mind that electrolytics will have a high leakage resistance.

9

If all of these capacitors are okay, take resistance checks of each transistor circuit.

10

Look for a decrease in the normal resistance to common negative.

11

Keep in mind that transistors have a low resistance between base and emitter.

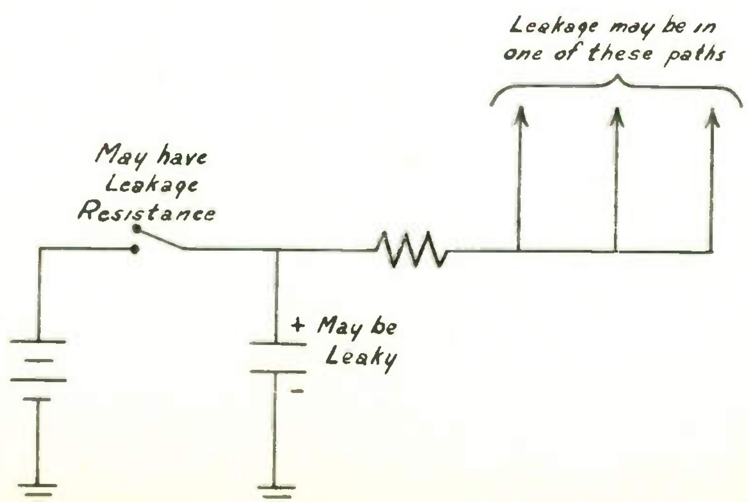
12

It may be necessary to unsolder each transistor in order to eliminate a parallel path.

13

In some cases, the speaker will cause a partial short due to its metal frame.

14



CIRCUIT DIAGRAM

1

Check for a poor battery contact. If necessary bend metal clips.

2

Apply slight pressure to parts mounted on chassis.

3

If noise varies as pressure is applied, check connections at that point.

4

May have to resolder circuit if a printed board is used.

5

If trouble persists, try to isolate to one stage by using signal generator.

6

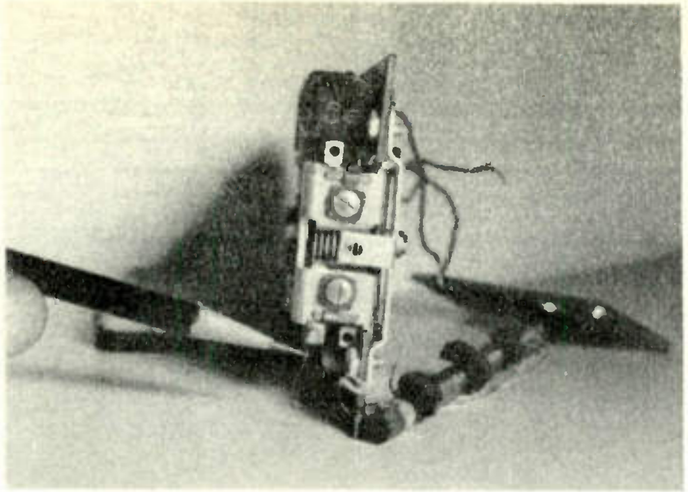
Connect audio gen to base of output transistor, unsolder coupling capacitor to base.

7

If tone is noisy, then trouble is in output transistor stage.

DIGEST (A)

NOISY OPERATION CAN OCCUR IN A TRANSISTOR RECEIVER FOR THE SAME REASONS AS IN A VACUUM TUBE TYPE OF RECEIVER. POOR CONTACTS, CAPACITOR BREAKING DOWN, IF TRANSFORMER SHORTING FROM PRIMARY TO SECONDARY, ETC. THE SAME TYPE OF TROUBLESHOOTING PROCEDURE CAN BE APPLIED IN THE TRANSISTOR RECEIVER, AS IN ANY OTHER TYPE. OF COURSE, THE TROUBLE COULD BE CAUSED BY A DEFECTIVE, TRANSISTOR, BUT SINCE THEY ARE USUALLY OF THE TYPE THAT IS SOLDERED IN POSITION, THEY ARE NOT REPLACED FIRST.



DIGEST (B)

ONE THING TO CHECK, IS FOR LOOSE CONNECTIONS. COMMON AMONGST THESE ARE THE ANTENNA AND BATTERY LEADS. IN MANY CASES THE METAL CLIPS, CONNECTING THE BATTERY TO THE RADIO, WERE LOOSE OR CORRODED. IF SOME COMPONENT IS AT FAULT, THEN THE TROUBLE MUST BE LOCALIZED TO THE DEFECTIVE CIRCUIT BY MEANS OF THE SIGNAL GENERATOR.

8

If tone is clear, then reconnect coupling capacitor and put gen at base of 1st audio.

9

Unsolder coupling capacitor to 1st audio. If tone is noisy, trouble is in 1st audio.

10

With clear tone at 1st audio, reconnect capacitor and connect gen to IF base.

11

Feed in a mod IF, if a noisy tone present move gen to collector.

12

If noisy at collector suspect a defective IF transformer. Replace.

13

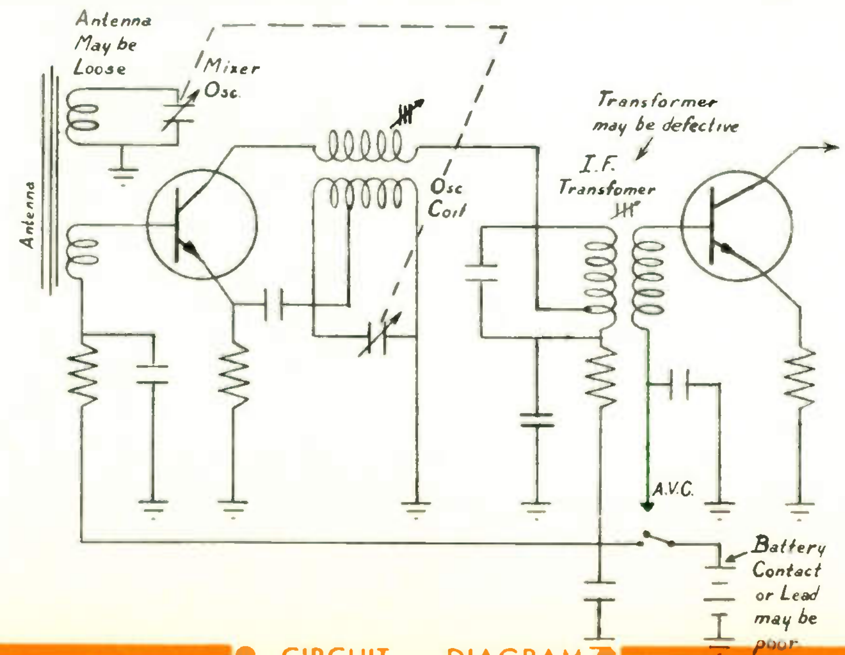
Continue this method of injecting a signal until noisy stage isolated.

14

NOISY OPERATION

SYMPTOM

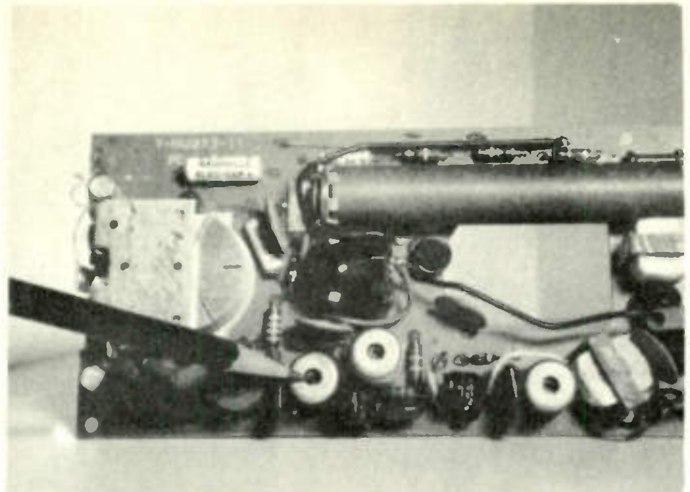
TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

ALIGNING TRANSISTOR RADIOS

SYMPTOM



DIGEST (A)

ALIGNMENT OF A TRANSISTOR RECEIVER CAN IMPROVE THE AMOUNT OF VOLUME, DECREASE THE NOISE IN THE BACKGROUND, AND IN GENERAL IMPROVE THE OVERALL RECEPTION OF THE RECEIVER. TECHNICALLY THIS IS REFERRED TO AS INCREASING THE SENSITIVITY AND SELECTIVITY, AND REDUCING THE NOISE LEVEL. MOST TRANSISTOR RECEIVERS ARE EASY TO ALIGN, AND SIMPLY REQUIRE A MEANS OF COUPLING THE SIGNAL TO THE ANTENNA OF THE RECEIVER FROM A FEW TURNS OF WIRE CONNECTED TO THE SIGNAL GENERATOR.

DIGEST (B)

ONCE THE SIGNAL FROM GENERATOR IS COUPLED TO THE RECEIVER, THE IF SIGNAL IS FED IN, AND THE IF TRANSFORMERS ARE ADJUSTED TO GIVE A MAXIMUM READING ON THE METER SCALE. MANY TIMES IT IS NOT NECESSARY TO USE A METER, FOR THE IFS AND RF CIRCUITS CAN BE ADJUSTED BY SIMPLY LISTENING FOR THE LOUDEST TONE. USING THE METER IS A MORE ACCURATE METHOD OF ALIGNMENT.

1

Wrap two turns of wire around loop antenna and connect to signal gen.

2

Place meter across volume control, dc volts range 3v.

3

Output may be negative or positive, be sure meter has correct polarity.

4

Feed in a mod IF signal. Meter should indicate, and a tone should be heard.

5

Adjust all IF transformers while observing meter. Obtain maximum reading.

6

Tone will also increase or decrease with adjustments.

7

Most transistor IFs have only one adjustment screw.

8

Now feed in a 1400kc signal and set radio dial to the 1400kc point.

9

Locate osc trimmer screw mounted on side of tuning cap.

10

Osc section of tuning cap has the small plates.

11

Adjust osc trimmer until maximum reading, or tone, is present.

12

Now feed in 1500kc signal, and set radio dial to 1500kc point.

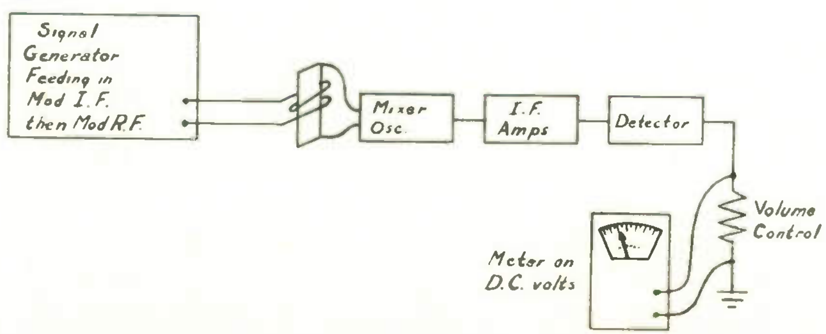
13

Adjust mixer trimmer on tuning cap for max. reading, or tone.

14

Alignment is now complete.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Replace Oscillator, R.F. amplifier, and Mixer tubes.

2

If set still drifts, check to see if AFC is used.

3

If set uses AFC, a line from detector to oscillator will be present.

4

In schematic this line comes from det., through C26, R27, to X3 afc diode

5

If there is no AFC used, trouble must be in Oscillator circuit.

6

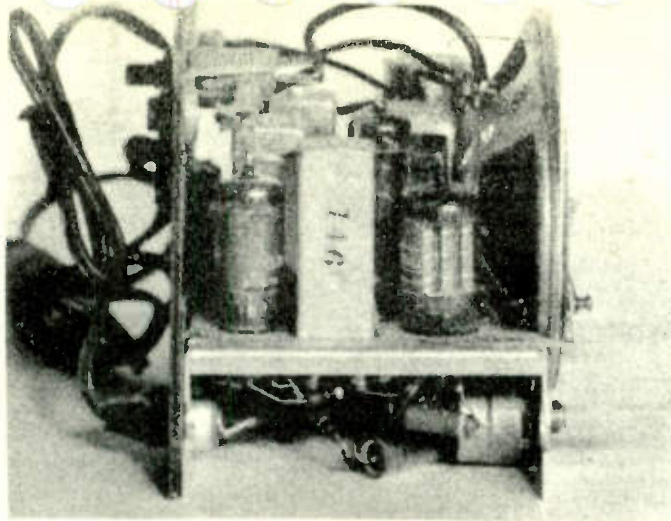
Replace all capacitors associated with oscillator.

7

In most cases these will be special temperature compensated types.

DIGEST (A)

WHEN A RECEIVER DRIFTS ON FM OPERATION, IT INDICATES THAT THE LOCAL OSCILLATOR IS CHANGING FREQUENCY SLIGHTLY CAUSING THE STATION TO FADE OUT. MANY OF THE FM SETS INCORPORATE AN AUTOMATIC FREQUENCY CONTROL SYSTEM (AFC) TO PREVENT SUCH A DRIFT FROM OCCURING. HOWEVER, IF THE SYSTEM IS DEFECTIVE, THEN THE DRIFTING SYMPTOM WILL BE NOTICED.



DRIFTS OFF STATION

SYMPTOM

DIGEST (B)

AFC SYSTEMS ARE SIMILAR TO AVC FOUND IN AM. ONE OF THE MAIN DIFFERENCES IS THAT THE CORRECTION VOLTAGE IS FED TO THE OSCILLATOR CIRCUIT IN FM, WHEREAS IT IS FED TO THE IF AND RF CIRCUITS IN AM. IN THE AFC CIRCUIT, THE OSCILLATOR FREQUENCY IS MAINTAINED BY VARYING THE AMOUNT OF GRID VOLTAGE. IF THE OSCILLATOR TENDS TO DRIFT, THEN A CORRECTION VOLTAGE IS FED TO GRID BRINGING OSCILLATOR BACK ON FREQUENCY.

8

Be sure to replace with exact same type.

9

If set uses AFC circuit, check or replace all components in circuit.

10

In a weak signal area, AFC may not operate well.

11

Try an outside antenna, or check one that set is using.

12

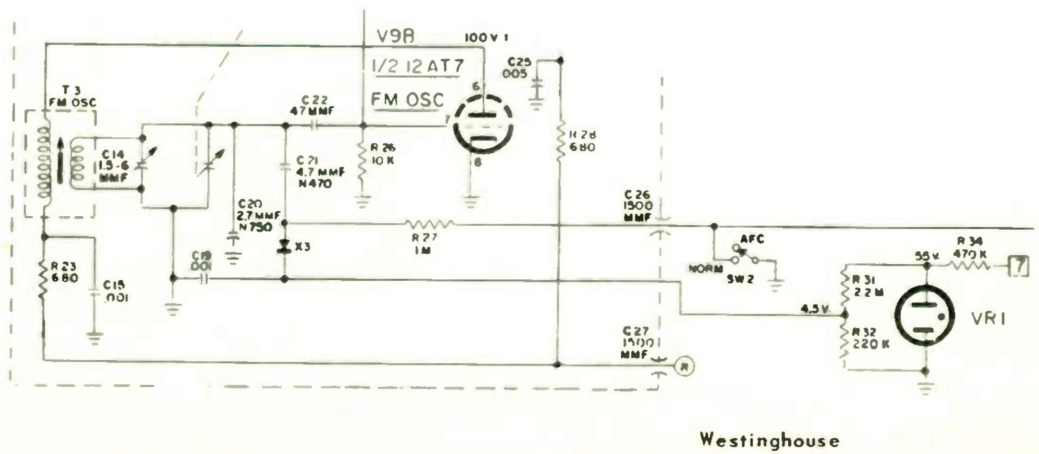
If indoor type, may be broken or not connected.

13

If strong stations are normal, but weak ones drift, then signal is too weak.

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

TELEVUE TROUBLE SHOOTER

SYMPTOM

INTERMITTENT OPERATION

1

On AM/FM combinations check operation of AM section.

2

If AM normal, trouble must be in FM det. circuit or IF RF stages.

3

If AM also intermittent, Trouble is in power supply or audio stages.

4

On FM receiver only, check for audio operation by placing finger at top of volume cont.

5

If buzz constant, then audio section okay. If buzz intermittent, then trouble in audio.

6

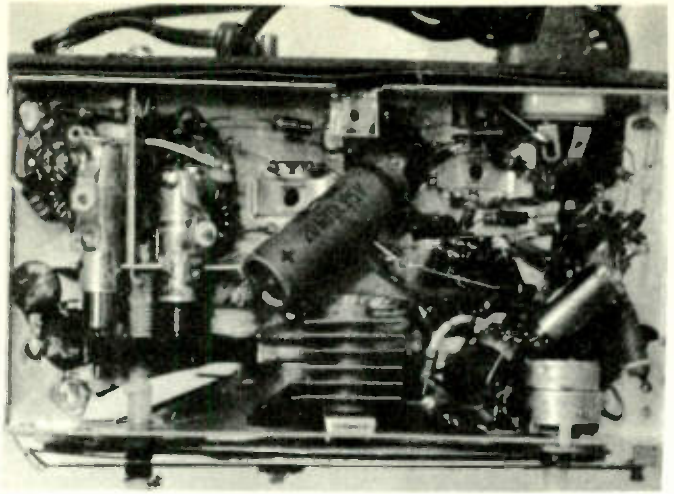
If trouble isolated to audio, use audio gen. at grids of tubes to find bad stage.

7

Be sure to replace tubes first with this condition.

DIGEST (A)

WITH INTERMITTENT OPERATION OF FM ON AN AM/FM COMBINATION RECEIVER, CHECK TO SEE IF THIS CONDITION EXISTS ON THE AM SETTING. IF IT DOES, THEN THE TROUBLE IS EITHER IN THE POWER SUPPLY, OR THE AUDIO SECTION OF THE RECEIVER. ON AM FM SET ONLY, THEN THE TROUBLE CAN BE AT ANY POINT IN THE RECEIVER. USE OF A GENERATOR WILL HELP IN DETERMINING THE SECTION AT FAULT.



DIGEST (B)

IF THE AM SECTION OPERATES NORMALLY, BUT THE FM IS INTERMITTENT, THEN THE TROUBLE IS ISOLATED TO THE FM DETECTOR, FM I.FS, OR THE FM R.FS. SINCE ANY SECTION OF THE RECEIVER CAN CAUSE THIS CONDITION, IT IS ADVISABLE TO ISOLATE IT TO THE DEFECTIVE STAGE AS QUICKLY AS POSSIBLE. THE PURPOSE OF THIS CHART IS TO PROVIDE A PROCEDURE TO ISOLATE THE TROUBLE TO A DEFECTIVE STAGE.

8

If trouble is in FM detector or IF, RF stages, follow procedure indicated below.

9

Connect sig. gen. to grid of last I.F. Feed in 10.7 mc unmodulated.

10

Connect meter as indicated in steps 3 and 4 of FM R.F. alignment chart.

11

Use low volts DC range and note if reading is constant, if not, trouble in last I.F. or det.

12

If meter shows constant reading move gen. back to each I.F. grid until mixer.

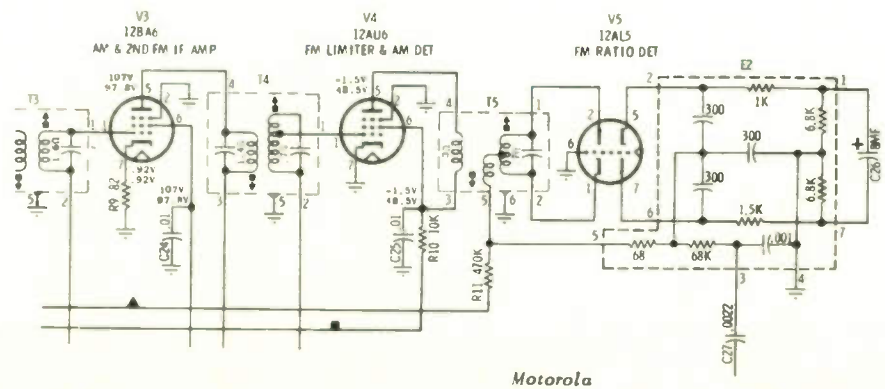
13

Look for fluctuating reading. If all normal, set radio dial and gen. to 98mc.

14

If meter varies now, osc. circuit defective. If normal then trouble in R.F. stage.

CIRCUIT DIAGRAM



TELEVUE TROUBLE SHOOTER

1

Replace all tubes.

2

If a combination AM/FM set, check operation on AM.

3

If normal on AM, then trouble is in FM detector or FM circuit before detector.

4

If noisy on AM, trouble in audio circuit or common IFs.

5

Troubleshoot for noisy AM operation, use chart #17 of radio Tele-Vue.

6

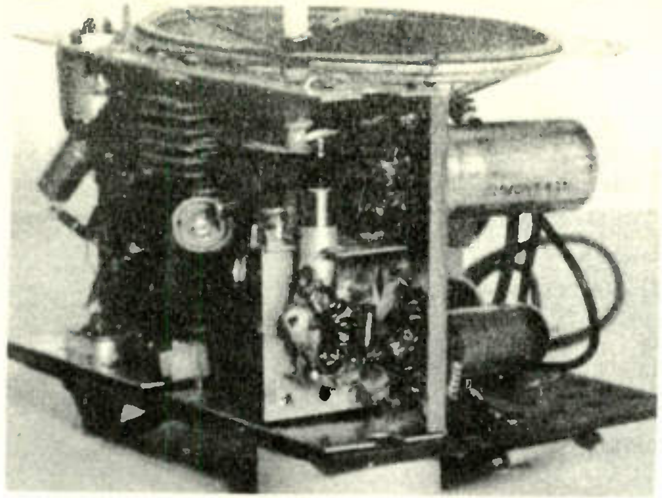
If FM only is noisy, check detector circuit.

7

If a ratio detector is used, change stabilizing capacitor.

DIGEST (A)

NOISY OPERATION ON AN FM RECEIVER, MAY BE DUE TO DEFECTIVE COMPONENTS IN THE SET, POOR ALIGNMENT OF THE DETECTOR, OR TOO WEAK A SIGNAL INPUT. THE LIMITING ACTION OF THE DETECTOR CIRCUIT IS ONE OF THE MAIN REASONS THAT FM IS SO NOISE FREE. IN THE DISCRIMINATOR, LIMITING IS DONE BY A SPECIAL CIRCUIT CALLED THE LIMITER. WHEREAS, IN THE RATIO DETECTOR, THE LIMITING IS DONE BY THE ELECTROLYTIC STABILIZING CAPACITOR ACROSS DETECTOR TUBE.



NOISY OPERATION

SYMPTOM

DIGEST (B)

IF A RECEIVER USES A DISCRIMINATOR, THE STRENGTH OF THE INPUT SIGNAL IS VERY IMPORTANT BECAUSE TOO WEAK AN INPUT WILL PREVENT THE LIMITER FROM OPERATING CORRECTLY, AND AS A RESULT SOME OF THE AMPLITUDE VARIATIONS WILL PASS TO THE DETECTOR STAGE AND CAUSE NOISY OPERATION. INCORRECT ALIGNMENT WILL ALSO REDUCE THE SIGNAL TO THE LIMITER, WITH THE SAME RESULTS.

8

If a Discriminator is used, check limiter components.

9

Connect generator to last IF grid, feed in a 10.7 mc modulated signal.

10

Move off station and rock gen dial around IF. Listen for tone.

11

If tone noisy, check IF components and detector parts.

12

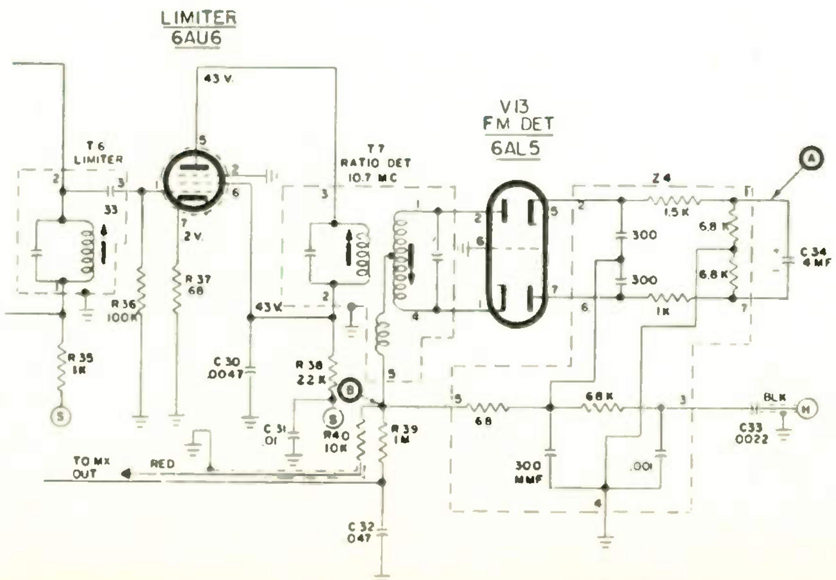
If parts appear okay, try aligning detector. If still noisy, replace detector transformer.

13

If tone at last IF is normal, move gen back to 1st IF. If noisy, check parts.

14

Continue checking Mixer and RF as above. If normal, try aligning IF & RF



Westinghouse

CIRCUIT DIAGRAM

1

If set is a combination AM/FM, check operation on AM.

2

With distortion on AM and FM, trouble is in audio stages. Check tubes.

3

If distorted on FM only, change detector, IF, and RF tubes.

4

If set is FM only, change all tubes and troubleshoot audio stages.

5

Use same procedure as for distortion on an AM set.

6

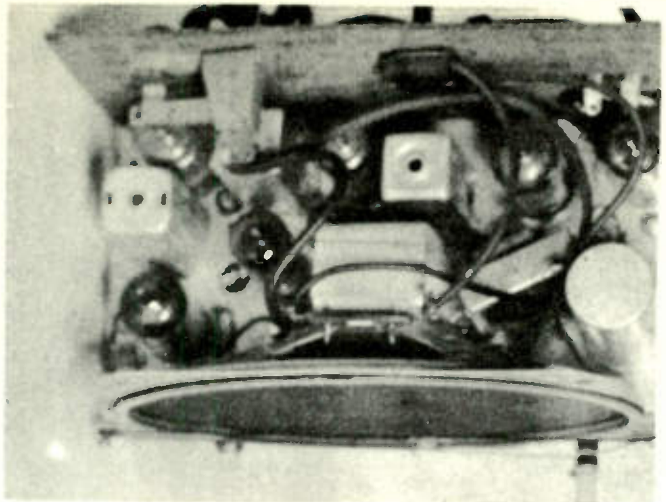
If trouble appears to be other than in audio, check detector first.

7

Take resistance checks of all resistors around detector.

DIGEST (A)

DISTORTION CAN OCCUR IN AN FM RECEIVER DUE TO TROUBLE IN THE AUDIO SECTION AS WELL AS TROUBLE IN THE DETECTOR AND POOR ALIGNMENT OF THE IFS. TROUBLESHOOTING THE AUDIO STAGES OF AN FM SET SHOULD HOLD NO PARTICULAR TROUBLES SINCE THEY ARE THE SAME AS FOUND IN AM. THE DETECTOR CAN CAUSE DISTORTION BECAUSE ITS OUTPUT DEPENDS ON THE CORRECT OPERATION OF ITS TWO SECTIONS.



DISTORTION

SYMPTOM

DIGEST (B)

FM DETECTORS OPERATE ON A CHANGE IN FREQUENCY RATHER THAN A CHANGE IN AMPLITUDE AS FOUND IN AM RECEIVERS. IF THE DETECTOR IS NOT ALIGNED OR BALANCED CORRECTLY, THEN IT WILL NOT PRODUCE THE SINE WAVE OUTPUT THAT IT SHOULD. THE RESULT OF THIS WILL BE DISTORTION. SEPARATE CHARTS ON THE ALIGNMENT OF THE DISCRIMINATOR AND RATIO DETECTOR ARE INCLUDED IN THIS PACKAGE. RATIO DETECTOR HAS A PLATE AND A CATHODE OF TUBE TIED TO DETECTOR TRANSFORMER.

8

Look for leaky or shorted capacitors around detector.

9

In ratio detector, replace electrolytic across output of circuit. (Usually 4 - 8 MFD.)

10

In discriminator, check stage before detector. This is called the limiter.

11

Limiter load resistor may have changed value, or open plate decoupling capacitor.

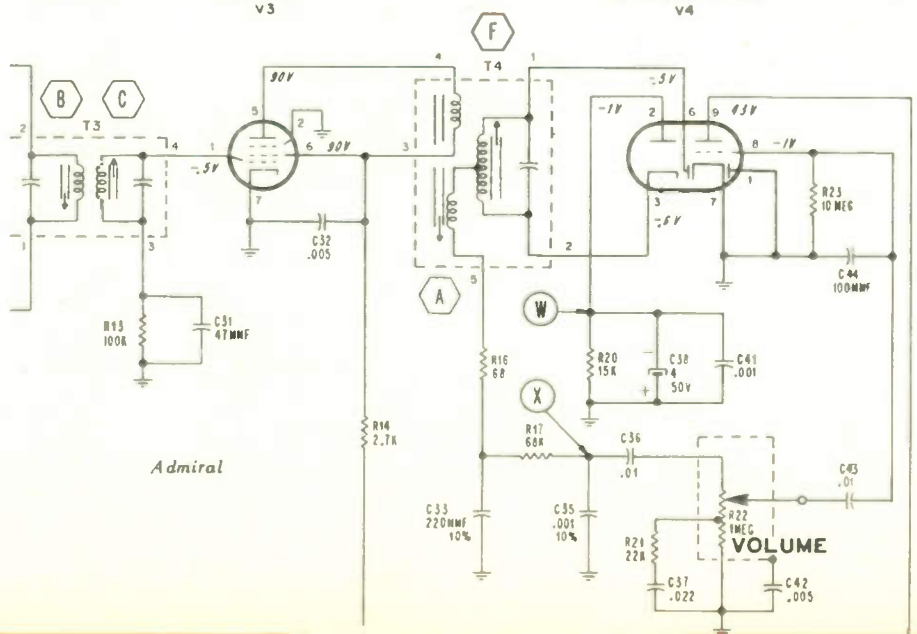
12

If all of the above appears to be normal, check alignment of detector & IFs.

13

14

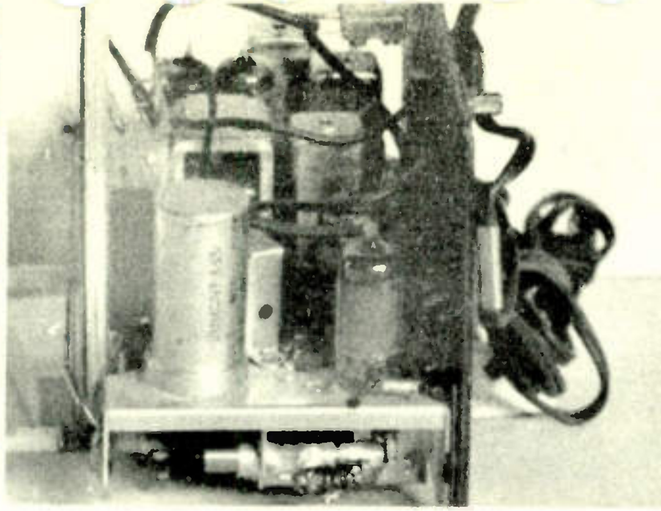
TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

GES (A)

WEAK SOUND IN AN F.M. RECEIVER MAY BE DUE TO A DEFECTIVE AMPLIFIER IN THE AUDIO, IF, OR RF STAGES, OR POSSIBLY POOR ALIGNMENT. HOWEVER, TUBES SHOULD BE CHECKED FIRST, THEN A GENERATOR CAN BE USED TO CHECK EACH OF THE STAGES. ALIGNMENT SHOULD BE THE LAST THING TO THINK OF AS THE CAUSE. UNDER NO CIRCUMSTANCES SHOULD YOU ATTEMPT AN ALIGNMENT BY EAR.



WEAK SOUND

SYMPTOM

DIG (B)

SIMILAR METHODS OF TROUBLESHOOTING CAN BE APPLIED TO AN F.M. SET WITH WEAK SOUND, AS ONE WOULD USE ON AN A.M. SET WITH WEAK SOUND. HOWEVER, BECAUSE OF THE TYPE OF DETECTOR AND FREQUENCIES USED, THE IF AND RF STAGES REQUIRE SPECIAL ATTENTION. THE AUDIO CIRCUITS CAN BE CHECKED IN THE SAME MANNER. IF THE RECEIVER IS OF THE A.M./F.M. TYPE, THEN THE TROUBLE CAN BE LOCALIZED BY CHECKING OPERATION OF THE A.M. SECTION.

1 If receiver is AM/FM comb, check operation of AM.

2 If AM weak, then trouble is in power supply or audio.

3 If AM normal, trouble in FM IF or RF stages.

4 If receiver is FM only, check operation of audio section.

5 In any case, replace tubes first.

6 If audio weak, concentrate on power supply and audio stages.

7 If audio normal, connect gen to grid of last IF. Feed in 10.7 mc modulated.

8 Rock gen. dial back and forth around 10.7 mc. Should hear clear tone.

9 If tone weak at last IF, take Voltage and resistance checks.

10 With normal tone at last IF, move gen to next IF and repeat steps.

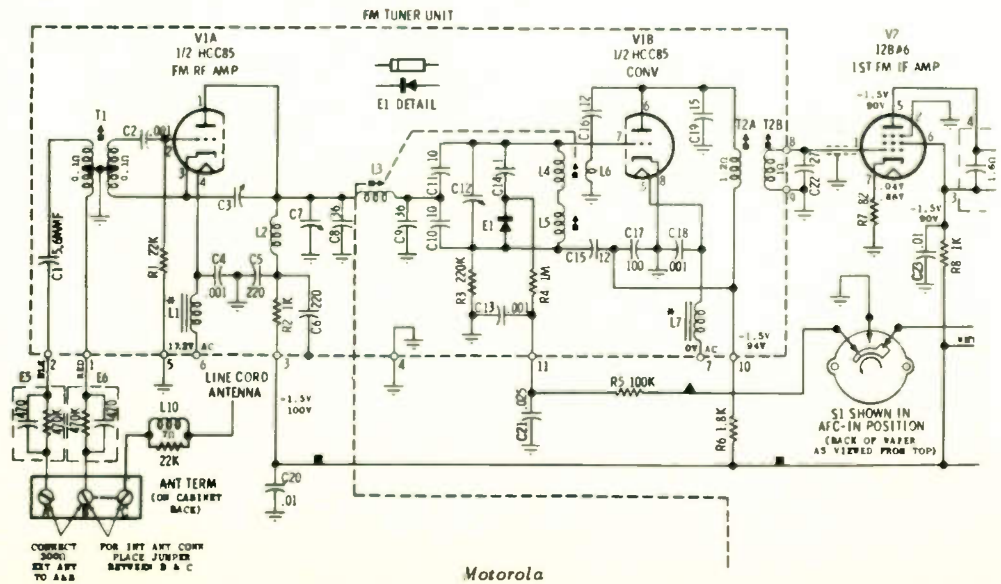
11 Repeat above steps at mixer grid. If tone normal here, move to RF grid.

12 Feed in 100 mc at RF grid, and set radio dial to 100mc

13 If tone weak at this point, then troubleshoot RF stage.

14 If all appear normal, check alignment charts Detector first, then IFs & RFs.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

If an AM/FM combination, check to see if the AM is working.

2

If set is completely dead, check all tubes, power supply, and audio stages.

3

If AM still working, trouble is either in FM detector or IF, RF stages.

4

If set is FM only, check all tubes, power supply, and audio stages for operation.

5

To check operation of detector connect generator to grid of last IF at 10.7 mc.

6

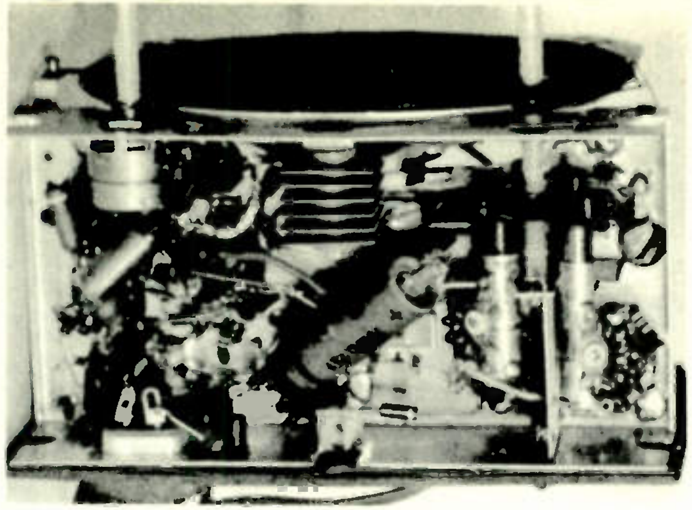
Modulate signal and move generator dial back and forth around 10.7 mc.

7

If a tone is heard, then detector is okay. Be sure audio stages are working when you do this.

DIGEST (A)

WHEN AN FM SET STOPS PLAYING, IT MAY BE DUE TO TROUBLE IN ANY SECTION OF THE SET. IF IT IS AN A.M./F.M. COMBINATION, FIRST DETERMINE IF THE A.M. IS STILL WORKING. IF SO, THEN THE POWER SUPPLY AND AUDIO SECTIONS ARE OKAY. IF THE SET IS OF THE F.M. TYPE ONLY, THEN IT BECOMES A CASE OF ISOLATING THE TROUBLE TO EITHER THE AUDIO OR IF RF CIRCUITS.



NO SOUND

SYMPTOM

DIGEST (B)

TROUBLESHOOTING THE AUDIO SECTION OF AN F.M. SET SHOULD HAVE NO PROBLEMS SINCE THE SAME PROCEDURES CAN BE APPLIED AS IN THE CASE OF NO SOUND FOR AN A.M. RADIO. HOWEVER, THE DIFFERENCES COME IN WHEN THE TROUBLE IS IN THE IF OR RF STAGES, AS HIGHER FREQUENCIES AND DIFFERENT DETECTORS ARE FOUND. GREAT CARE MUST BE TAKEN WHEN PROBING AROUND THE RF STAGES IN CASE THE ALIGNMENT IS DISTURBED.

8

If there is no tone, move gen. to last IF plate and repeat step #6.

9

If still no tone, then detector is defective. Take resistance check of circuit.

10

If tone is heard at last IF plate, but not at grid, then IF is bad. Take E and R checks.

11

If signal passes at IF grid, move gen back to next IF and repeat steps.

12

Use same procedure at mixer grid, if tone heard feed in 100 mc and set radio dial at 100mc

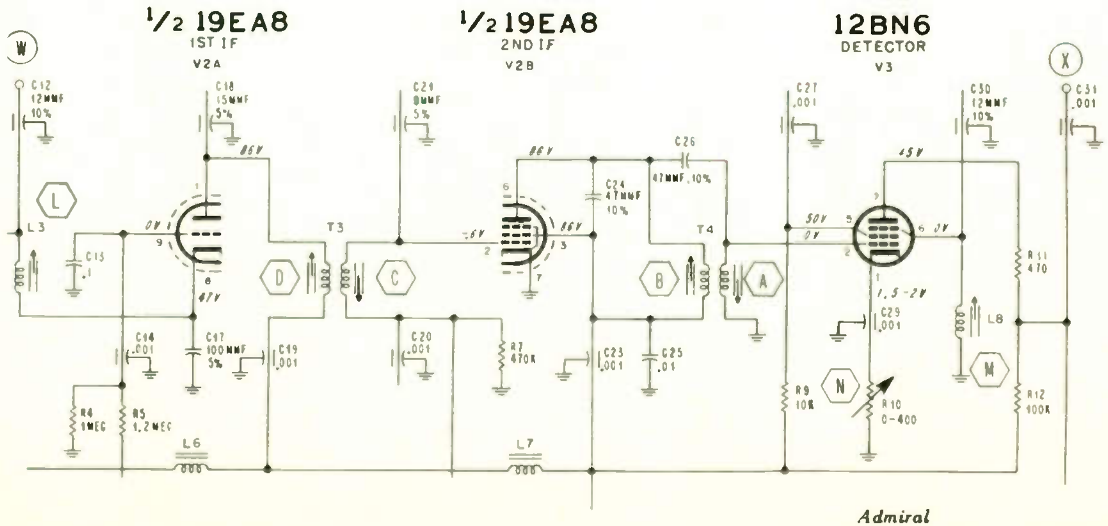
13

Rock dial of gen around 100 mc, if no tone, osc not working take E and R checks.

14

If Mixer and Osc appear okay, then trouble in RF amp. Take E and R checks of RF.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

ALIGNING THE RATIO DETECTOR WITH VTVM

SYMPTOM

1. Move to an off station or disable Local Osc to prevent interference.

2 Place VTVM across electrolytic stabilizing capacitor on low DC volts. (Point C & ground)

3 Connect signal generator to grid of last IF amp.

4 Feed in a 10.7 mc unmodulated signal. Maximum output.

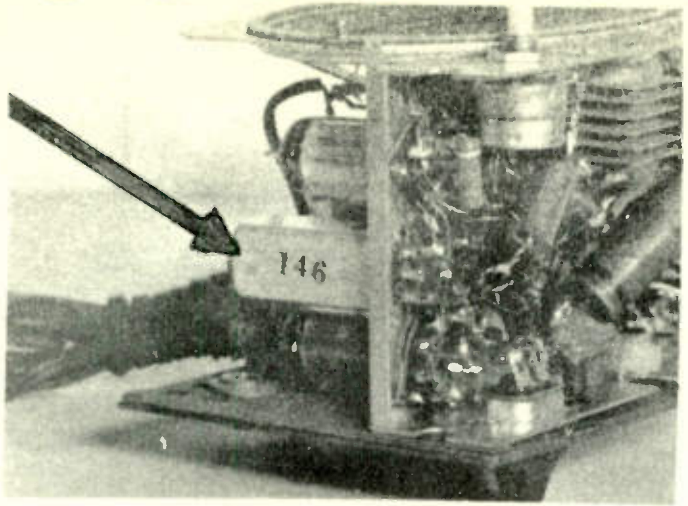
5 Adjust primary of detector transformer while observing VTVM reading.

6 Adjust for a maximum reading on meter.

7 Remove VTVM and set needle at zero center position

DIGEST (A)

IN FM CIRCUITS, ALIGNMENT IS VERY IMPORTANT. GOOD ALIGNMENT INSURES NOISE FREE, UNDISTORTED OPERATION WITH HIGH FIDELITY. POOR ALIGNMENT CAN RESULT IN DISTORTION, NOISY RECEPTION, AND WEAK SOUND. HOWEVER, CERTAIN IMPORTANT STEPS MUST BE TAKEN BEFORE ATTEMPTING ALIGNMENT. CORRECT USE OF THE PROPER EQUIPMENT, AND THE KNOWLEDGE OF WHERE TO PLACE THE EQUIPMENT, ARE ALL PART OF THE PRELIMINARY WORK.



DIGEST (B)

THERE ARE BASICALLY TWO TYPES OF DETECTORS USED. ONE OF THESE IS THE RATIO DETECTOR, AND THE OTHER IS THE DISCRIMINATOR. IN THIS CHART WE SHALL DISCUSS THE ALIGNMENT OF THE RATIO DETECTOR. THE ALIGNMENT CAN BE DONE WITH A GENERATOR AND VTVM, THIS WILL USUALLY SUFFICE. FOR A MORE ACCURATE ALIGNMENT, THE SCOPE CAN BE USED IN PLACE OF THE VTVM.

8 Connect VTVM between junction of resistors and audio take off. (Points A & B)

9 May be necessary to add two 100k resistors as shown in diagram.

10 Some receivers have resistors in circuit already.

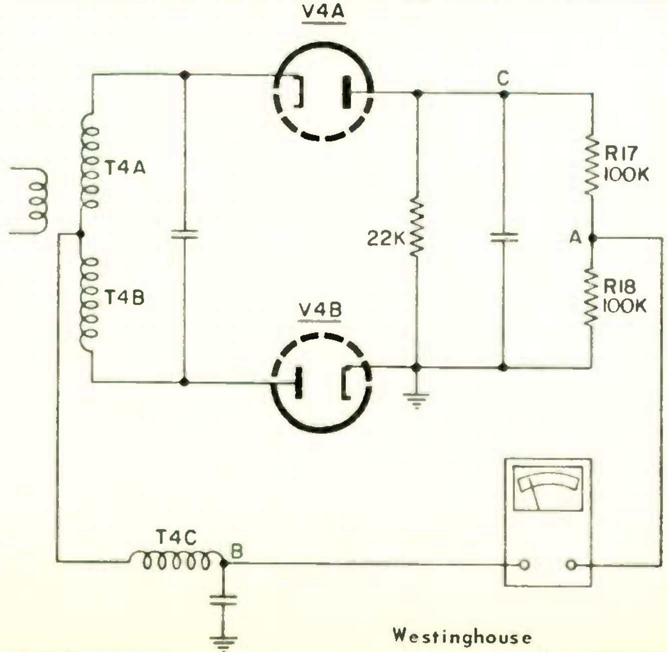
11 Audio take off leads to deemphasis network and volume control.

12 Use low DC volts scale. Adjust secondary of det transformer for zero center reading.

13 Be sure that needle rests on zero center position, after aligning.

14 Slight movement of secondary adjustment screw should swing needle right or left.

TELEVUE TROUBLE SHOOTER



Westinghouse

CIRCUIT DIAGRAM

1

Disconnect the antenna and ground the grid pin of osc. if possible.

2

Connect gen. to grid of tube before detector. (this should be limiter stage.)

3

Connect meter at junction of cathode resistors of detector and ground. (Point A.)

4

Set gen at 10.7 mc unmodulated, with maximum output. Put meter on low D.C. volts.

5

Detune secondary of Det. transformer by turning adjustment screw several turns.

6

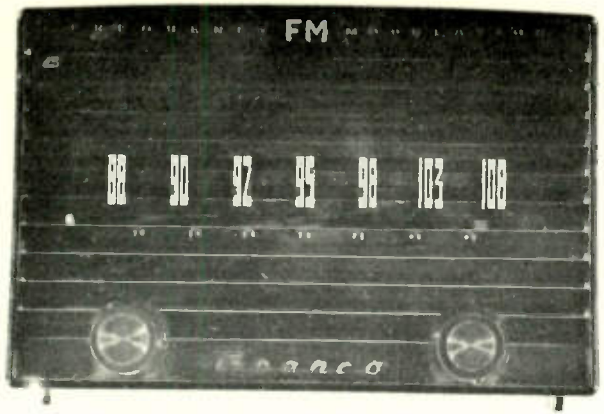
Adjust primary for a maximum reading on meter.

7

Remove meter and adjust needle for zero center setting.

DIGEST (A)

THE DISCRIMINATOR USED IN FM PROVIDES A GREATER OUTPUT THAN THE RATIO DETECTOR, BUT IT REQUIRES THE USE OF A LIMITER STAGE PRIOR TO THE DETECTOR. SINCE THIS MEANS AN ADDITIONAL CIRCUIT, AND THEREFORE A GREATER COST FOR THE RADIO, MOST RECEIVERS USE THE RATIO DETECTOR. THE DISCRIMINATOR CIRCUIT CAN BE RECOGNIZED BY THE DETECTOR TRANSFORMER SECONDARY THAT CONNECTS TO THE PLATES OF THE DETECTOR DIODE.



ALIGNING THE DISCRIMINATOR WITH THE VTVM

SYMPTOM

DIGEST (B)

THE ALIGNMENT PROCEDURES FOR THE DISCRIMINATOR ARE VERY SIMILAR TO THOSE USED FOR THE RATIO DETECTOR. THE POSITION OF THE METER DURING ALIGNMENT IS PERHAPS THE GREATEST DIFFERENCE BETWEEN THE PROCEDURES. IT IS VERY IMPORTANT THAT THE GENERATOR USED FOR THE ALIGNMENT BE AS ACCURATE AS POSSIBLE, AND CHECKED FREQUENTLY FOR CALIBRATION.

8

Connect meter across both cathode resistors of detector. (Points B & C)

9

With gen. still connected, meter will show reading above or below center zero.

10

Adjust secondary of det. transformer for a zero center reading on meter.

11

With correct alignment, needle will move above and below zero as screw is rocked.

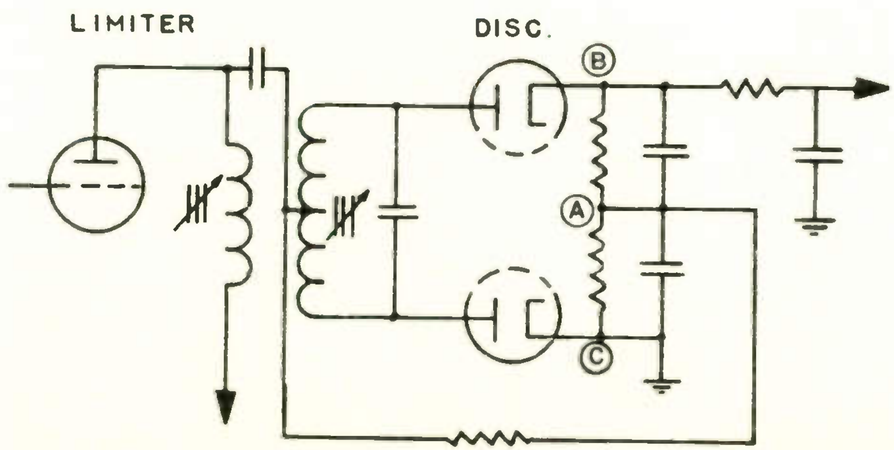
12

Do not use a metal screwdriver for this alignment. It will cause detuning due to metal.

13

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

For Ratio detectors, connect meter across stabilizing capacitor at detector.

2

For Discriminators, connect meter across grid resistor of limiter tube.

3

Connect Signal generator to grid of stage before last IF.

4

Feed in a 10.7 mc unmodulated signal. Set meter to low voltage setting.

5

Meter may have to be set on negative volts range.

6

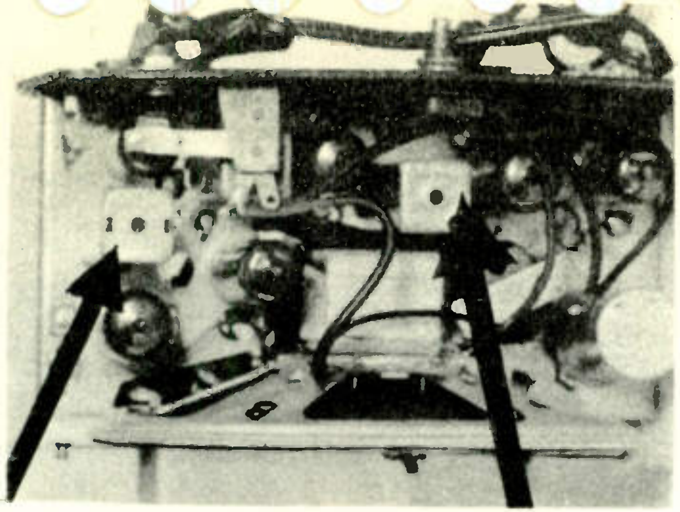
Increase output of gen. to give noticeable reading on meter.

7

Adjust Transformer in plate circuit of stage gen. connected to, for max. reading on meter.

GES. A)

ALIGNING THE I.F.S IN AN FM RECEIVER CANNOT BE DONE WITHOUT THE USE OF ALIGNMENT EQUIPMENT IF THE RESULTS ARE TO BE CORRECT. THE GENERATOR USED SHOULD BE WELL CALIBRATED AND CHECKED AGAINST A CRYSTAL FOR ACCURACY. IT IS POSSIBLE TO ALIGN WITH ANY TYPE OF SIGNAL GENERATOR, BUT THE MORE ACCURATE THEY ARE, THE BETTER THE RESULTS.



F.M. I.F. ALIGNMENT

SYMPTOM

DIG (B)

THE DIFFERENCE BETWEEN ALIGNING THE I.F.S OF A RECEIVER USING A RATIO DETECTOR, OR A DISCRIMINATOR, ARE ONLY IN THE POINTS OF CONNECTION FOR THE METER. SINCE THE ALIGNMENT OF A RECEIVER SO GREATLY IMPROVES THE OPERATION AND QUALITY OF SOUND, IT IS RECOMMENDED THAT ALIGNMENT BE CHECKED ON ALL FM RECEIVERS BROUGHT IN FOR REPAIR.

8

Move generator back to next previous stage. This may be mixer grid.

9

Feed in same frequency of 10.7 mc and adjust plate transformer for maximum on meter.

10

Continue moving gen. back until Mixer plate trans. has been adjusted.

11

This should complete I.F. alignment.

12

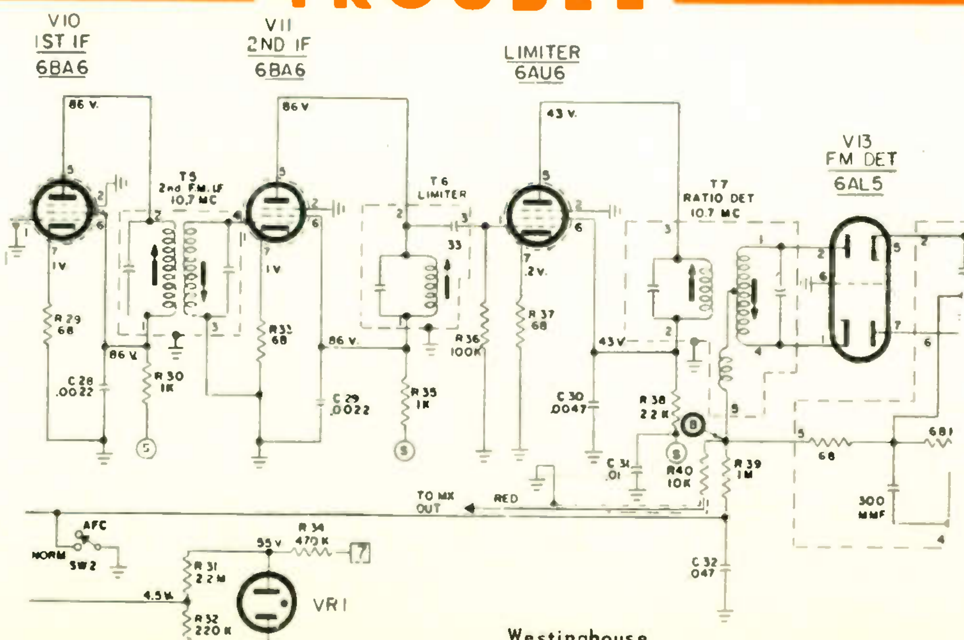
Do not attempt to readjust each IF transformer while gen. at mixer grid.

13

This may tend to peak the I.F., and narrow the bandwidth.

14

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM

1

Disconnect antenna.

2

Connect signal gen. to antenna terminals. Insert 270 ohm res. in series with hot lead.

3

In Discriminator type det., place meter across grid res. of limiter.

4

In Ratio type det., place meter across electrolytic stabilizing cap.

5

Make sure that dial pointer sets at end of dial when tuned to end.

6

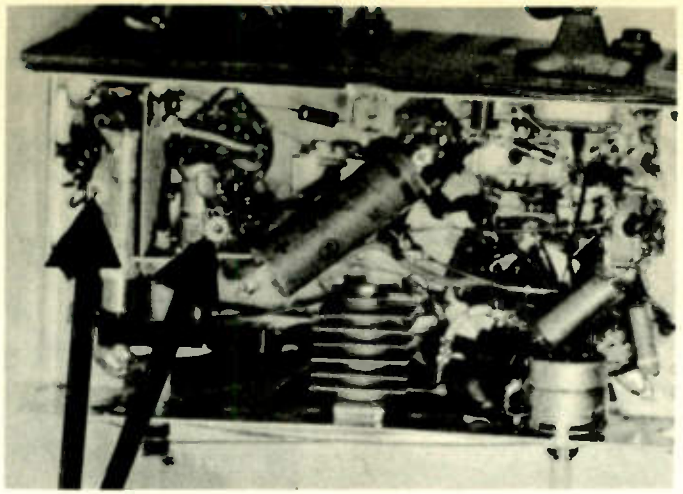
If it doesn't, adjust it to correct position manually.

7

Now set dial to 98 mc, and gen frequency to 98 mc also, unmodulated.

DIGEST (A)

IF THE FM STATIONS DO NOT COME IN AT THE CORRECT POINTS ON THE DIAL, AND RECEPTION APPEARS WEAK OR NOISY, IT MAY BE AN INDICATION OF POOR FRONT END ALIGNMENT. FRONT END ALIGNMENT INCLUDES ADJUSTMENT OF THE LOCAL OSC. MIXER INPUT CIRCUIT, AND THE RF STAGE. EQUIPMENT USED FOR THIS ALIGNMENT SHOULD BE WELL CHECKED FOR ACCURACY.



ALIGNING THE R.F. STAGES

SYMPTOM

DIGEST (B)

THE PROCESS OF ALIGNING THE FRONT END OF AN FM RECEIVER, INSURES THAT THE INCOMING SIGNAL WILL MIX WITH THE LOCAL OSCILLATOR AND PRODUCE THE I.F. OF 10.7 MC. IF THE OSCILLATOR IS SET AT THE WRONG FREQUENCY, THE MIXING ACTION WILL OCCUR AT THE WRONG POINT, AND THE RADIO DIAL WILL NOT INDICATE THE CORRECT FREQUENCY.

8

If set uses afc, or has afc switch, short afc to ground, or switch off.

9

Adjust gen output to keep meter reading below 6 volts. (usually this is neg)

10

Adjust Local Oscillator alignment screw for max. reading on meter.

11

Set radio dial and gen. frequency to 108 mc.

12

Adjust Mixer input circuit for max. reading on meter. (some sets do not have adj.)

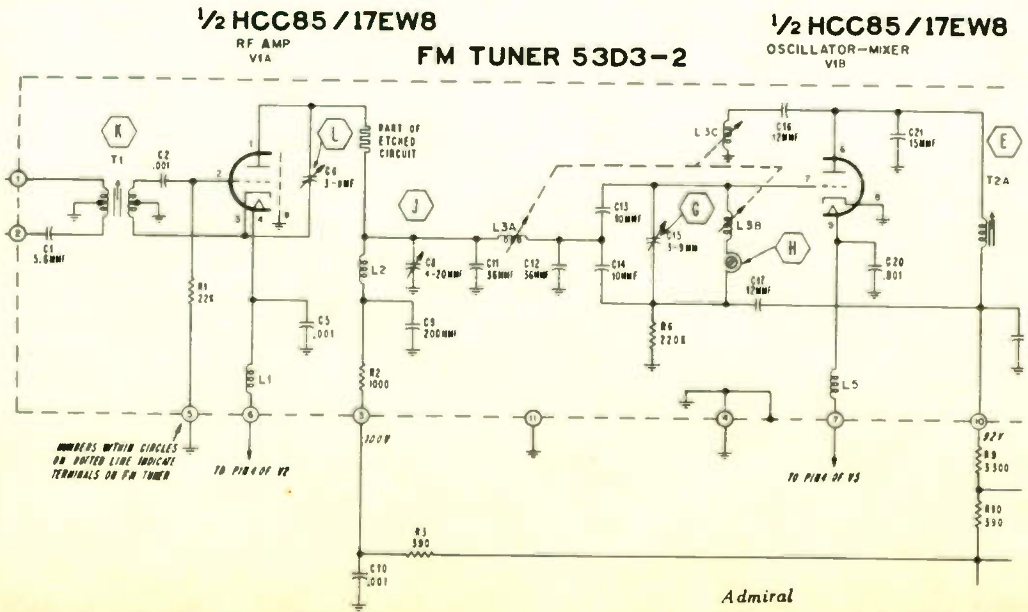
13

Set Radio dial and gen frequency to 88 mc.

14

Adjust RF stage circuits for max. on meter. Recheck osc. adj. at this frequency also.

TELEVUE TROUBLE SHOOTER



CIRCUIT DIAGRAM