NRI news

October/November 1961

USING THE NEW CONAR MODEL 230 TUNED SIGNAL TRACER IN CHECKING A TRANSISTOR RADIO. SEE PAGE ONE.

ALSO IN THIS ISSUE

BUILDING A BABY-MINDER

TROUBLESHOOTING HORIZONTAL SWEEP CIRCUITS

NRI NEWS

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Editorial: WHAT IS HI-FI?

Ask three audiophiles to describe hi-fi, and you'll get three different answers. It's like the story of the three blind men and the elephant. The one who felt its trunk described it as a tree; the one who patted its side said it was like a door; and the one who pulled its tail thought it was a snake.

And so it is with hi-fi. A system that completely satisfies one individual can be plain annoying to another. There are many reasons why this is so. One is the volume of the sound. Another is the matter of personal taste for a particular selection.

And there are many other factors that influence the acceptance or rejection of certain qualities of sound by the listener.

The location of loudspeakers, distance to the listener, spacing of speakers when playing stereo, dispersion of sound, reflection, absorption, echo, etc. all influence the manner in which a system will be described by different people. As a matter of fact, if a particular system were played in four different rooms for a group of blindfolded people - chances are they would insist that they had heard four different systems.

Choosing hi-fi equipment is a matter of personal taste. Your system can be of modest cost or very expensive. It's like choosing between a Cadillac and a compact. They'll both get you there. One will be of better quality, more expensive to own and to operate than the other, but they are both capable of doing the job.

Hi-fi equipment selection is much the same. It's a matter of taste and your pocketbook.

Even more important is to realize that our ability to hear sounds accurately depends on our own individual ears. It is the effect of sound that stimulates our hearing.

Therefore, the reproduction of sound is controlling the cause so as to produce the desired effect. Any hi-fi system that sounds pleasing to your ears is the logical choice for you.

Many of our students and graduates are in the business of selling hi-fi. The most successful of these men, we think, recognize the matter of individual taste and have learned not to force hi-fi components upon a prospect who has indicated his preference for a console package, or a particular system upon someone who likes another one better.

Establishing the buyer as a steady customer should be your prime objective. It can be the difference between success and failure!

J. M. Smith
President

Something New Has Been Added . . . CONAR!

An unfamiliar name? Surely. But you'll be hearing more about CONAR -- and soon.

In keeping with expanded activities in the field of Electronics Kits, NRI recently established the CONAR INSTRUMENTS DIVISION. All products sold under the name "NRI Professional" now will carry the CONAR label.

Long before the first radio broadcast in 1920 on station KDKA, NRI kits were already well-known throughout the country. As the first, oldest, and largest Radio-TV-Electronics School, NRI designed and sold more educational kits than any other organization in the world!

The unsurpassed experience that made NRI the leader is now inherited by CONAR. For the first time, high-quality NRI products -- bearing the name CONAR -- are available to ANYONE.

In addition to Radio-TV test equipment, CONAR will have a complete line of kits for experimenters, hobbyists, ham radio operators, and hi-fi and stereo enthusiasts. Superbly designed to meet rigid specifications, CONAR Kits are easy -- FUN -- to build. Only the highest-grade, American-Made components are used.

As you see CONAR products advertised in leading publications, we hope you will come to recognize this name as assurance of quality, dependability, and value -- second to none!

New CONAR Tuned Signal Tracer

By J. B. Straughn

Chief, Consultation Service

The CONAR division of NRI proudly presents a tuned signal tracer especially designed for use on transistor receivers. It works just as well on vacuum-tube radios and hybrid auto sets. Special features, such as the cathode-follower probe, make this a truly good test instrument.

The tuned signal tracer is available in wired or kit form. Wiring the kit yourself will save you money, and with the detailed instructions and drawings, the instrument is easy to assemble.

WHAT IS SIGNAL TRACING

Signal tracing means sampling or examining a signal voltage at various points in a receiver as it passes from the antenna to the loudspeaker. In using a signal tracer, when you pass from a point of normal signal to the point at which your signal tracer verifies a complaint, you have just passed into or through the defective stage.

The signal tracer enables you to examine the frequency, the quantity, and the quality of the signal. If the set is dead, you can determine where the signal stopped. If the complaint is weak reception, you can find which stage is causing a loss rather than a gain in signal strength. If distortion, noise, hum, or oscillation is the symptom, the signal tracer will quickly narrow your search to the defective stage, and in many cases to the defective part. The signal tracer's tuning eye and calibrated attenuator controls will show the relative amount of signal present and the relative signal voltage gain, if any, contributed by each stage. The signal tracer's loudspeaker, which enables you to listen to the actual signal as it is traced through the set, gives an "ear" check on the signal quality.

Now let's examine the controls of the Model 230 Signal Tracer so we can see how they should be set for troubleshooting radio receivers. Refer to the schematic of the signal tracer in Fig. 1 to see where the controls are located in the circuit.

FUNCTION OF THE CONTROLS

There are six operating controls on the front panel of the Model 230. We will describe the function of each control.

Volume Control. Adjusts the loudness of the sound from the signal tracer speaker. Its setting has no effect on the attenuator control adjustments. Regardless of the setting of the attenuator controls, the volume control is adjusted to produce the sound level you desire.

RF-AF Switch. Decides the basic function of the signal tracer. It is also called the func-

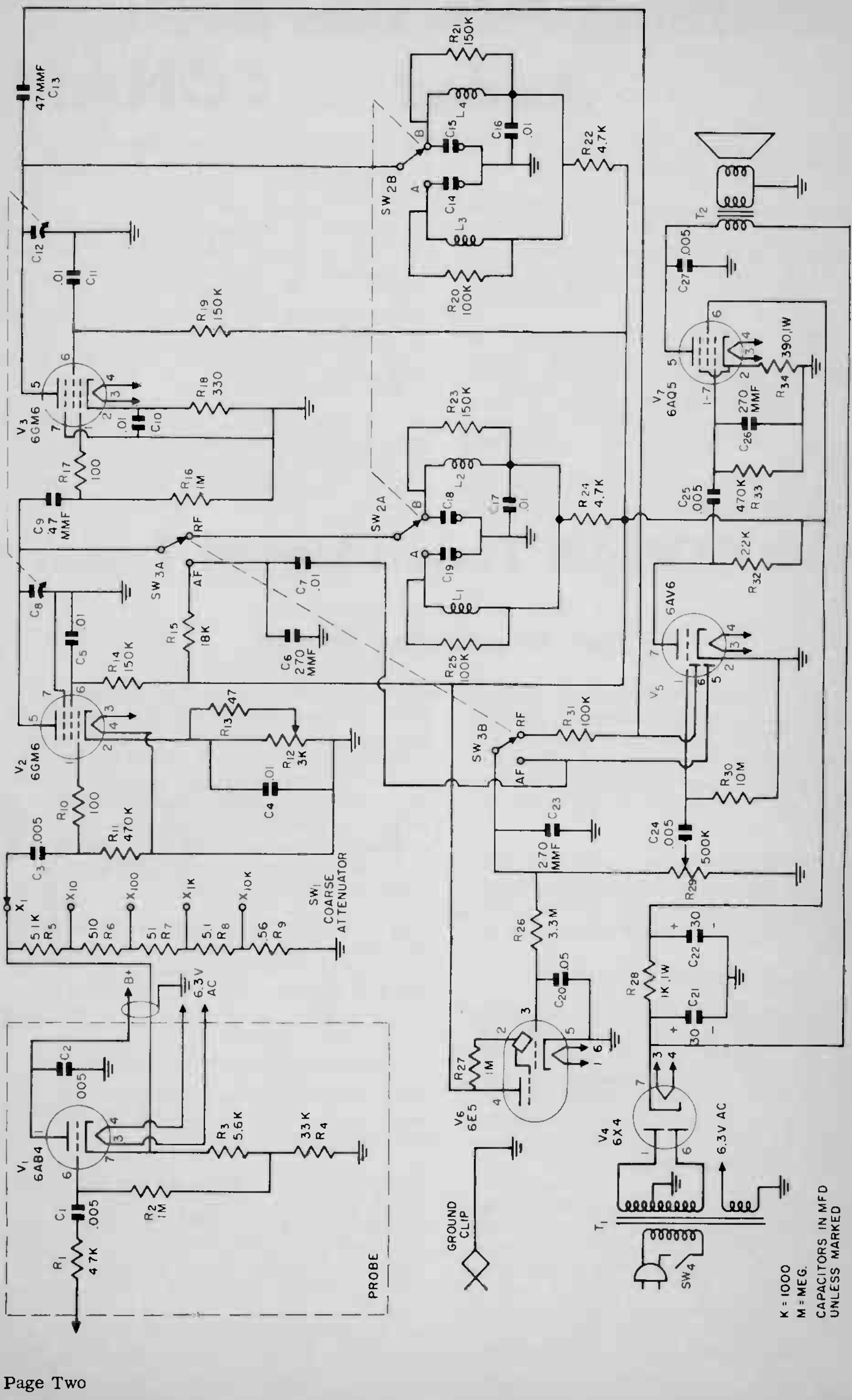

FIG. 1. Schematic diagram of the Model 230 Signal Tracer.

tion switch. When it is in the RF position, the signal tracer will pick up RF signals; when it is in the AF position, the signal tracer will pick up only audio signals.

Band Selector Switch. Governs the RF coverage of the signal tracer. In position A, the tracer tunes from 170 kc to 500 kc, and in position B, from 500 kc to 1500 kc.

Tuning Knob. Tunes the tracer over the A and B bands. The frequency of either band is indicated by the double pointer. The knob drives a planetary gear, which in turn drives the tuning-capacitor gang and pointer. Approximately three complete turns of the knob are required to cover the band.

Coarse Attenuator. Enables you to vary the strength of the signal before applying it to the amplifier system of the signal tracer. This switch works in steps from 1 (zero attenuation) to 10,000. Each step gives a signal one tenth as strong as the preceding one, so that the last position delivers only one ten-thousandth of the original signal to the amplifier.

Fine Attenuator. Gives continuous control of amplifier gain, with full gain at a setting of 1, and one-tenth full gain at a setting of 10.

In addition to these controls, we have the tuning eye, the ground lead with clip, and the probe.

The tuning eye is a level indicator used in making gain measurements. In using a signal tracer, the attenuators are set so the eye does not over-close.

The ground lead and probe are the input leads to the signal tracer. The ground lead is clipped to the low potential side of the receiver. In an ac set, this is the chassis. In a 3-way portable or ac-dc receiver, the low potential side is the lug on the on-off switch that connects to the receiver circuits. Any point in the receiver connected to this lug can be used as the ground lead connection point.

In transistor receivers any point shown in the schematic as ground may be used to attach the ground lead. In general, you can clip to the frame of the tuning capacitor or to the low potential side of the volume control.

The needle-sharp point of the probe is touched to the receiver circuits where you wish to sample the signal. The sharp probe tip enables you to pierce insulation and cut through the lacquer spray used on printed circuit boards.

DESCRIPTION OF THE MODEL 230

An understanding of the internal operation of the signal tracer helps you in using it to troubleshoot the receiver. The simplified block diagram shown in Fig. 2 gives you an over-all view of the instrument circuitry. The circuit consists basically of an isolation probe, calibrated attenuator, high gain amplifier, detector, tuning eye indicator, and loudspeaker. The high gain amplifier can be switched to act as either a tuned rf amplifier or an audio amplifier.

A signal picked up by the isolation probe drives the cathode follower stage in the probe. The output of the cathode follower is fed to the calibrated coarse attenuator. Here the amplitude of the signal is adjusted by a known amount. Next, the signal goes to the amplifier. With the control set for rf operation, the frequency of the signal can be determined. The tuning dial is used to adjust the tuned circuits to resonate at the frequency of the incoming signal. Exact resonance is indicated by maximum closure of the tuning eye and the frequency is read on the tuning dial. The detector demodulates the rf signal producing the audio signal and the voltage for operating the tuning eye. The audio signal is further amplified and used to drive the loudspeaker. With the function switch in the AF position, the first amplifier tube plate load is changed so that the tube will handle audio signals. At the output, this tube delivers a signal to the tuning eye and to the regular audio amplifier. The probe and the attenuator controls work on either RF or AF signals.

SIGNAL TRACING STEPS

Let's see how to trace signals through a tube receiver, using the Model 230 Signal Tracer. Later on you will see that the procedure on a

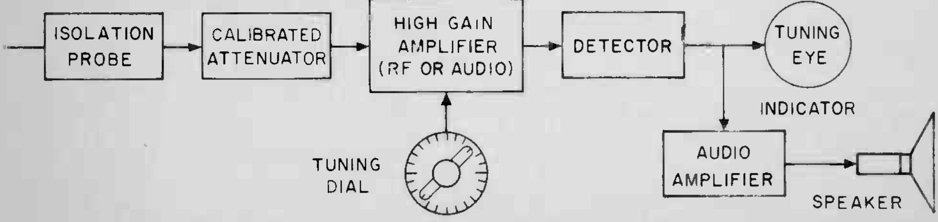

FIG. 2. Simplified block diagram of the signal tracer.

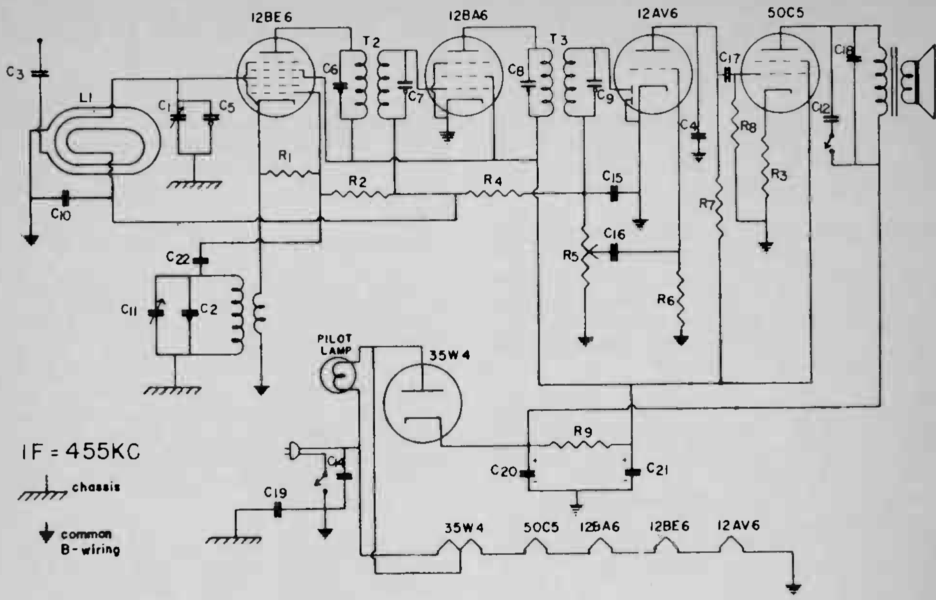

FIG. 3. A vacuum-tube radio receiver.

transistor set is almost exactly the same. Fig. 3 shows a complete schematic of the receiver. The various signal tracing steps are as follows:

1. Plug the receiver and the Model 230 into an ac power line and allow both to warm up.

2. Clip the "ground" lead of the Model 230 to a B- point on the receiver.

3. Set both attenuators to their lowest calibration numbers. (Fine to 1, Coarse to 1). Set the volume control to 5.

4. Throw the RF-AF switch to RF.

5. Tune in a strong station between 500kc and 1450kc on the receiver.

6. Set the Model 230 band selector switch to Band B, which covers the frequencies mentioned in Step 5.

7. Touch the probe to the antenna lead on the receiver (free lead at C_3).

8. Tune the Model 230 until you hear the same program that is coming from the receiver's loudspeaker. (Make any attenuator adjustments necessary to prevent overloading).

9. Move the probe to the signal grid of the mixer tube. If necessary, retune the receiver for maximum closure of the signal tracer tuning eye. If the tuning eye overlaps, increase the setting of the Fine or Coarse attenuator as necessary, so the tuning eye just closes.

10. Remove the probe from the mixer grid and retune the receiver if you changed its dial setting in Step 9.

11. Turn the signal tracer band selector switch to Band A which covers the intermediate frequency of this receiver. Tune the Model 230 to 455kc (half way between 450 and the next scale mark counterclockwise).

12. Touch the probe at the plate terminal of the mixer tube. The i-f signal of the receiver should now be audible in the speaker of the Model 230. If not, tune the Model 230 on both sides of 455 kc, as the i-f of the receiver may be slightly misaligned or the receiver slightly mistuned. If necessary, adjust the attenuators until the eye just closes and turn the volume control so that the program is audible in the Model 230 loudspeaker.

13. Move the probe to the control grid of the first i-f amplifier tube. The eye will open up, showing a decrease in amplitude of the receiver's i-f signal. This is correct as there is normally a voltage loss in a double-tuned, i-f transformer.

14. Shift the probe to the plate socket terminal of the i-f amplifier tube. The tuning

eye should overlap because of the gain in the i-f stage. It should be necessary to turn the Coarse attenuator control from 1 to 10, 100, 1000 or even 10,000 before you can adjust the closure of the tuning eye with the Fine attenuator. (The gain of the i-f tube should also be apparent by increased audible output from the Model 230 loudspeaker).

15. Touch the probe to the diode detector plate of the 12AV6 tube. Some decrease in signal strength will be noticed.

16. Next shift the probe to the ungrounded side of the volume control, R_5. To pick up the i-f signal, you must set the attenuator for maximum sensitivity, as only a small amount of i-f signal should exist at this point. Most of the i-f signal has been filtered out by C_{15} leaving the audio signal across R_5. This completes the signal tracing in the rf and i-f sections of the receiver.

17. Slide the RF-AF switch to the AF position and touch the probe to the hot (ungrounded) side of volume control R_5, and listen to the audio signal at this point. The attenuator and volume control may be used to decrease the output of the Model 230.

18. Move the probe to the plate of the first af amplifier tube (plate socket terminal of the 12AV6). A large increase in volume should result. This may be decreased to a reasonable level by turning the attenuators to a higher setting or by turning down the volume of the signal tracer or of the receiver.

19. Next touch the probe to the control grid of the 50C5 output tube. The signal level from the Model 230 loudspeaker should be about the same as in the preceding step.

20. Move the probe to the plate socket terminal of the output tube. An increase in the signal level should be noticed.

21. Disconnect the "ground" lead clip of the Model 230 from the receiver and connect it to one of the receiver loudspeaker voice coil leads. Touch the probe to the other voice coil lead. A large drop in signal level is to be expected because of the stepdown action of the output transformer. It will probably be necessary to change both attenuator settings.

We have traced the signal through each stage of the receiver from the antenna to the loudspeaker voice coil. These are the points where you will make tests on an improperly operating set.

TEST PROCEDURE FOR TRANSISTOR RECEIVERS

Fig. 4 shows a typical transistor radio receiver. It uses a loopstick antenna, L_1, a mixer-oscillator, two i-f stages, germanium crystal in the second detector-AVC stage, a driver stage, and two transistors in the class AB push-pull output stage. There are some slight differences in signal tracing techniques used on tube and transistor receivers. In a transistor set a strong signal from the local oscillator is present in the loopstick.

To avoid swamping the signal tracer with the oscillator signal, the receiver is turned off when checking the input of the mixer base (point 3). A short-cut check of the front end with the receiver turned "on" is to pick up the rf signal at point 4. If the rf signal is picked up at this point you know that the antenna circuit is working, that rf signals are being applied to the mixer base and that the rf signal current flows in the collector circuit. If you can also pick up the i-f signal at point 4, the local oscillator is working. If it is necessary to determine if the loop stick is working and signals are reaching the mixer base, proceed as directed in the following discussion of each test point. The test points for signal tracing are marked 1 through 17 on the schematic diagram in Fig. 4. For all tests the ground lead of the signal tracer is connected to the receiver chassis.

We heard about a husband who had eaten so many TV frozen dinners that when he gets sick he doesn't go to a doctor -- he calls a TV serviceman.

POINTS 1, 2, AND 3

Set the signal tracer to Band B and tune in a station somewhere near the middle of the broadcast band. Turn the receiver off, clip the ground lead of the signal tracer to the receiver chassis and touch the probe to point 1. This will probably reduce the strength of the signal in the tracer although you may still hear something if the attenuators are turned up for greater sensitivity. Now tune the receiver over the broadcast band. At some point the signal level of the tracer should increase. If it does, it shows that the primary of the antenna coil L_1 and the tuning capacitor are in good condition. Move the probe to point 2 and repeat the procedure. You should be able to

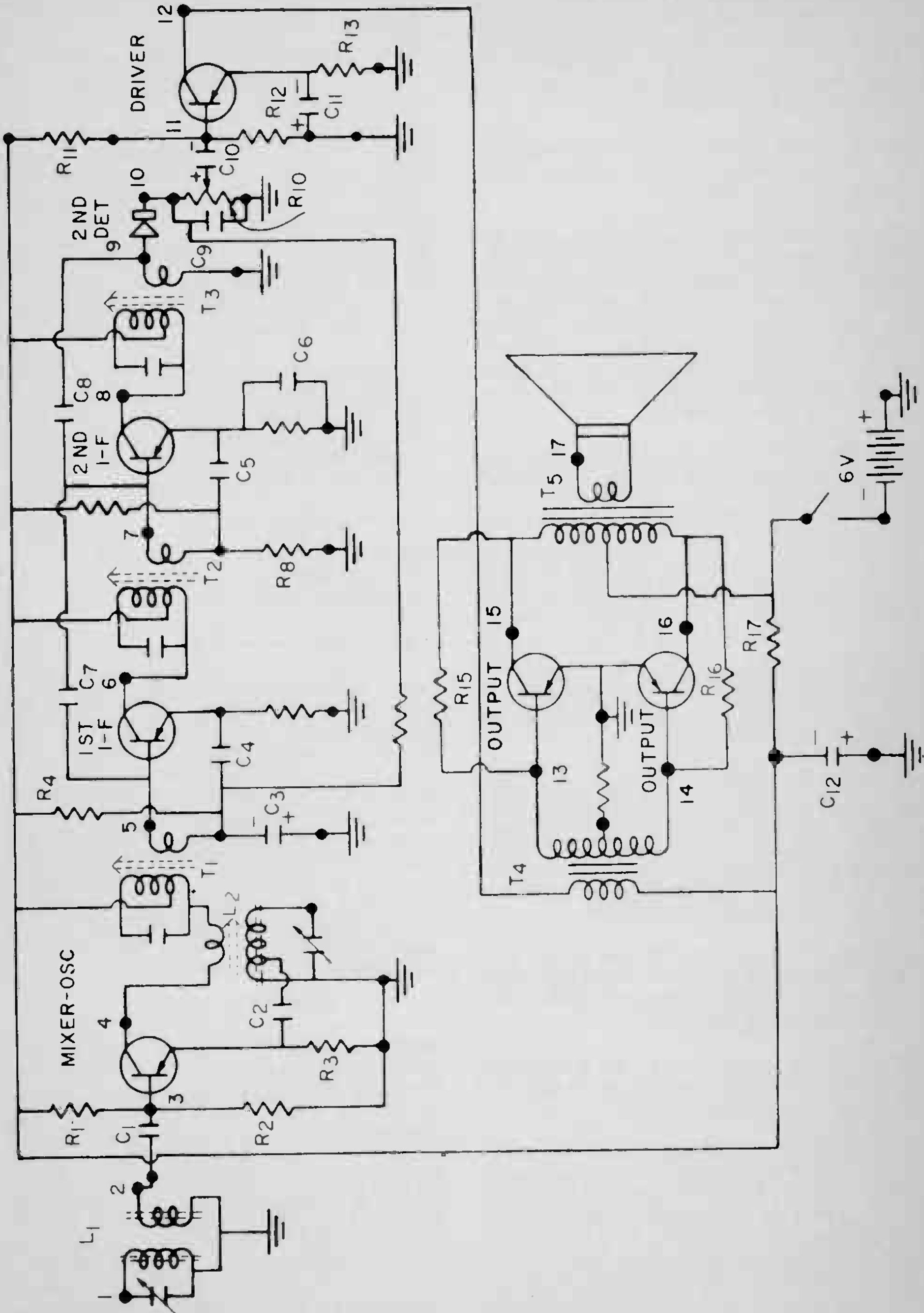

FIG. 4. A transistor radio receiver.

pick the station up again after retuning the receiver but with reduced strength because of the step-down action of the loop antenna and its secondary. Now, without retuning the receiver you should again be able to pick up the signal at point 3 which shows that capacitor C_1 is not open.

POINT 4

Turn the receiver on, set the band switch of the signal tracer to "A" and tune the signal tracer to approximately 455kc. Touch the probe to point 4 and retune the receiver slightly, if necessary, to pick up a signal. You might also find it necessary to slightly retune the signal tracer because the i-f of the receiver may not be exactly 455kc. In some cases, an i-f of 262kc is used but this will be indicated on the receiver's schematic.

POINT 5

With the signal tracer probe touched to point 5 you should still pick up the signal but with greatly reduced volume due to the step-down action of the i-f transformer. Remember that the i-f transformer secondary delivers power to the input of the first i-f transistor, not maximum voltage.

POINT 6

At point 6 a very large increase in signal strength will be noted and it will be necessary to set the attenuators to higher numbers.

POINT 7

Again a decrease in signal will be noted at point 7. The signal at point 7 will be greater than at point 5.

POINT 8

A very great increase in signal strength will be noted at point 8.

POINT 9

At point 9, a decrease in signal voltage strength will be noted but the signal will be greater than at point 7. If signals are picked up at this point you know that everything between points 9 and 1 are working properly.

POINT 10

This is an audio point and the function switch of the signal tracer should be pushed to the AF position. Touch the probe to point 10 and listen to the audio signal. If no audio signal is present at point 10 but you were able to obtain the i-f signal at point 9, the diode detector is probably defective.

POINT 11

Here you should be able to pick up practically as much signal as at point 10 if volume control R_{10} of the receiver is advanced to maximum.

POINT 12

An increase in signal voltage over that obtained at point 11 will be noted.

POINTS 13 AND 14

Low level signal voltages are present at these points because of the step down action of T_4. The signals will be audible but will be weaker than at point 12.

POINTS 15 AND 16

The signals at these points have a high level and it will be necessary for you to reduce the attenuator settings.

POINT 17

Here a signal is available but the level is far less than at points 15 and 16 due to the step-down action of output transformer T_5.

You have now traced the entire circuit of the transistor receiver. Any interruption of the signal or a change in the tone quality would indicate a defective stage or part.

While the presence of an i-f signal at point 4 shows that the local oscillator is working, you can pick up the oscillator signal by holding the probe near the oscillator coil with the switch set to Band B. The local oscillator frequency will be the frequency of the incoming signal plus the value of the i-f. For example, if a receiver with a 455kc i-f is tuned to a station at 780kc, the local oscillator frequency should be 780 plus 455 or 1235kc. You can pick up this local oscillator frequency by tuning the Signal Tracer to 1235kc.

SHORT CUTS IN CHECKING TRANSISTOR RECEIVERS

After you become familiar with the use of your signal tracer on transistor sets, you can save time by applying some of the short-cut methods listed below.

The first quick check should be the i-f stages because this immediately enables you to determine whether the trouble is in the rf-if or audio sections. The signal tracer is extremely sensitive and it is not always necessary to get at the bottom of the receiver chassis to locate test points. Very often you need only hold the tracer probe near the i-f stages to pick up an i-f signal. A better pick-up can be obtained by touching the probe to the case of the transistor. If the transistor case is not grounded, considerable signal will be present. Also, where powdered iron cores are used in the i-f transformers, you can touch the probe tip to the core and pick up the signal at this point. As you progress from the output of the mixer toward the second detector, each succeeding stage will deliver a stronger signal.

In many instances signals may be picked up in the audio section with the FUNCTION switch set to AF by touching the probe tip to the cases of the i-f transistors. If this is not possible, it will be necessary to remove the chassis from the cabinet so you can get at the various electrode connections of the audio transistors.

GAIN MEASUREMENTS

The signal tracer can be used to measure the voltage gain of stages in a receiver. This procedure is particularly useful in troubleshooting weak receivers. It enables you to pinpoint the faulty stage that is not contributing the proper gain.

The gain of a stage is determined by comparing the amount of signal at the input of the stage with the amount of signal at the output of the stage. For simplicity, instead of determining the exact amount of signal in volts you get a comparison by determining how much greater the signal is at one point than it is at another point. This comparison, or ratio, gives the gain of the section or stage and tells you at once whether or not things are normal within that portion of the radio.

Of course, you must know what gains to expect in each portion of the receiver. Many manufacturers include stage-by-stage gain measurements in the information on their tube-type sets. Some do not and for these sets you will have to rely on average gain values. As a matter of fact, average gain values are generally more reliable because set manufacturers may take their measurements with a particular make of instrument, and an instrument of another make may not give exactly the same results. This is particularly true where a change in frequency is involved as it is when measuring converter gain from the input of the mixer of a superheterodyne to its output. The reason for inaccuracy at this point is that the sensitivity of most signal tracers is not constant over a given band or between bands. However, we have worked out a very simple system for obtaining tube converter gain with the Model 230 as you will learn now.

In a transistor receiver no attempt is made to amplify signal voltage. Therefore, measurement of relative signal voltage is not a true indication of stage gain. In many cases the signal voltages at the base of the transistor, near the input of the set, may be too small to close the tuning eye. However, there is some relationship between the signal voltage and gain at the output of i-f stages in a transistor receiver.

In the receiver shown in Fig. 4, for example, it is possible to compare the signal voltage at points 4, 6, and 8. The comparison will give some idea of the stage gain. For instance, the signal voltages at points 1 and 4 will give some idea of converter gain, but the signal at point 3 would not be great enough to close the eye of the tracer. However, the signal can be followed and its condition examined and this is

(cont'd on page ten)

A few weeks ago while sitting in a restaurant, I overhead two fellows at the next table who were looking over the business section of a newspaper. They were discussing a man they both knew whose picture was in the paper as the key figure in a million-dollar real-estate deal.

One of these fellows remarked to the other, "Why, I went to school with that guy. Nobody ever thought he was anything very special. I'd like to know what he's got that I haven't." His friend answered dryly, "A million dollars, that's what." He might have mentioned too, he also had courage.

A country parson who became Canon of St. Paul's Cathedral in London, once wrote: "A great deal of talent is lost in the world for want of a little courage. Every day sends to their graves obscure men whom timidity prevented from making a first effort; who, if they could have been induced to begin, would in all probability have gone to great lengths in a career of fame. The fact is, that to do anything in the world worth doing, we must not stand back shivering and thinking of the cold and danger, but jump in and go through the best we possibly can."

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10% down buys any CONAR instrument on time - write for details.

Input Frequency	I-F	Multiply by
1000 kc	175 kc	.5
1000 kc	256 kc	1.0
1000 kc	370 kc	2.0
1000 kc	456 kc or 455 kc	2.9
1000 kc	470 kc	2.9

Table I. Correction factors for i-f's of standard AM receivers.

of extreme importance. Audio gain measurements are also impractical to make in a transistor receiver, but again the presence or absence of the signal, as well as the quality of any signal present, can be determined.

In making stage gain measurements, it is only necessary to determine how many times stronger or weaker the signal is at the input of a stage than at its output. With the Model 230, you do not measure the signal level in volts, but in the attenuator value required to close the tuning eye for the particular signal in question. Suppose that to close the eye at the grid of a tube, the fine attenuator is set half way between 3 and 4. This is read 3.5. Also you find that the coarse attenuator is set to 10. Multiply the coarse and fine settings together (3.5 × 10 = 35), which is the relative signal strength at the grid of the tube. Now move the probe to the plate of the tube. The signal will be much stronger here and you may find it necessary to set the coarse attenuator at 100 and the fine attenuator at 7. Again multiplying fine and coarse settings we obtain 100 × 7 or 700 as the relative signal strength at the plate of the tube. THE RELATIVE SIGNAL STRENGTH AT THE PLATE DIVIDED BY THE RELATIVE SIGNAL STRENGTH AT THE GRID IS THE GAIN OF THE STAGE. Thus, the gain of this stage is 20 (700 divided by 35). If the relative signal strength at the plate were 70 instead of 700, the stage gain would be 70 divided by 35, or 2. But suppose the relative signal strength at the plate were 7. At once you would know that there was less signal at the plate than at the grid and that a loss rather than a gain had occurred. The "gain" would be found by dividing the plate reading by the grid reading. In this case 7 divided by 35 would equal .2 and we say that the gain is .2.

Since gain measurements on a superheterodyne mixer stage are taken at two frequencies, the signal frequency and the i-f, division of the output reading by the input reading will not always give the true gain. However, if the gain value you obtain is multiplied by the right correction factor, the result will be quite accurate. The correction factor will vary with the difference between the i-f frequency at the mixer grid and the intermediate frequency at the mixer plate, as this factor depends on the difference in signal tracer sensitivity at the two frequencies involved. Table I gives the correction factors for the i-f found in standard AM receivers. Note

STAGE	MEASUREMENT	GAIN MIN	GAIN MAX
RF	Antenna to 1st grid	2	10
	Antenna to 1st grid, auto sets	10	50
	RF amplifier, superheterodynes	10	40
	RF amplifier, trf, broadcast	40	100
MIXER	Converter grid to 1st i-f grid (single i-f stage)	30	60
	Converter grid to 1st i-f grid (two-stage i-f)	5	30
I-F AMP.	I-F stage (single stage)	40	180
	I-F stage (two-stage i-f, per stage)	5	30
DET.	Biased detector, 57, 6J7, 6C6, etc. (depends on % modulation)	5	40
	Grid-leak detector, square law	5	50
	Diode detector (a loss - depends on % modulation)	.2	.5
AUDIO AMP.	Triode (low-gain)	5	14
	Triode (high-gain)	22	50
	Pentode	50	150
POWER OUTPUT	Triode	2	3
	Pentode and beam	6	20

Table II. Average gain data for tubes.

STAGE	MEASUREMENT	GAIN	
		MIN.	MAX.
MIXER	Antenna to mixer collector	1.3	12
I-F (2 i-f stages)	Base of 1st i-f amplifier to base of 2nd i-f amplifier	2	12
	Base of 2nd i-f amplifier to 2nd detector	100	125
I-F (1 i-f stage)	Base of i-f amplifier to 2nd detector	15	50

Table III. Average gain data for transistor receivers.

that in each case the input frequency must be 1000 kc, which can be obtained from a station or from a signal generator. As a matter of fact, any station between 900 kc and 1100 kc can be used and the results will still be acceptable.

Table II lists what are considered to be average gain values in tube receivers. You can't rely on average values absolutely -- you will have to supplement them with what you learn from experience with specific receivers. Even when you get a reading that is within the average limits, you will have to be careful. It may be below normal for that particular radio. That is, if you get a reading near the minimum value as shown in Table II, you won't always know whether this is natural for the receiver or whether the gain for this particular stage should be near the maximum and is actually far below normal. Be guided in cases like this by the gain values you get in the rest of the receiver. If the manufacturer designed one section to have fairly low gain, another section must make up for this by having a higher gain.

Table III gives average signal voltage gain value in the converter and i-f section of transistor receivers. The signal at the antenna, point 1 in Fig. 4, is obtained with the receiver turned off while the i-f signal at the mixer output is obtained with the receiver turned on and retuned to the same station picked up at point 1.

Notice that when two i-f stages are used, the gain of the second stage is very high compared to the first stage. In reflex receivers using a single i-f stage, the i-f stage gain may vary from a low of 15 to a high of 50.

ALIGNING WITH THE SIGNAL TRACER

Faster alignment can usually be made with a signal generator. However, the Model 230 signal tracer may be satisfactorily used to align a receiver. The signal tracer is used to align the i-f amplifier and also the broadcast preselector and oscillator sections. However, once the receiver i-f is properly adjusted, stations may be used for oscillator and preselector adjustment. To align the broadcast band of a receiver, proceed as follows:

1. Clip the probe to the output of the mixer. Clip the "ground" lead to B-.

2. Set the receiver dial to the frequency of a broadcast station in the neighborhood of 1400 kc and tune the signal tracer exactly to the same frequency as the station. You should hear the station from the loudspeaker of the signal tracer. (Do not tune the signal tracer to the i-f frequency of the receiver).

3. Block the oscillator of the receiver by shorting the oscillator section of the receiver tuning capacitor.

4. Adjust the receiver rf trimmer or trimmers for maximum closure of the signal tracer indicator eye. (If the indicator eye overlaps, adjust the attenuators for some indicator eye shadow).

5. Tune the Model 230 to the i-f specified by the receiver manufacturer, remove the short across the oscillator tuning capacitor and adjust the oscillator trimmer for maximum closure of the signal tracer indicator eye.

6. If the oscillator is not equipped with a low frequency adjustment such as a padder capacitor or variable slug in the oscillator coil, omit steps 6, 7 and 8. Go right to Step 9.

If the receiver has a low frequency oscillator slug or padder capacitor, proceed as follows: Tune the signal tracer to a station near 600 kc with the probe connected to the receiver antenna. Next, clip the probe to the mixer output, block the receiver oscillator and manually tune the receiver to the station for maximum closure of the signal tracer eye.

7. Tune the signal tracer to the receiver's

correct i-f frequency, as in Step 5, unblock the oscillator and adjust the oscillator low frequency padder capacitor or oscillator slug for maximum signal tracer indicator eye closure.

8. Tune the receiver to a station near 1400 kc and repeat the oscillator trimmer adjustment in Step 5. Now repeat Steps 6 and 7.

9. Move the probe to the output circuit of the first i-f amplifier, and adjust the first i-f transformer trimmer for maximum signal tracer indicator eye closure. Repeat for the second i-f stage if one is used.

10. Move the probe to the ungrounded side of the diode load resistor. Adjust the attenuators for maximum signal tracer sensitivity. A small signal should be present. Adjust the output i-f transformer trimmers for maximum signal tracer indicator eye closure. This completes the i-f alignment.

A signal tracer has long been recognized as an ideal "first" test instrument for the beginner in radio servicing because it is an excellent teaching tool. However, the advent of transistor radios has put new emphasis on the value of a good tuned signal tracer for radio servicing. The signal tracer enables you to find out quickly what is going on in the maze of printed wiring in a transistor receiver. The extremely high gain of the Model 230 lets you check those very low signal levels with ease. The Model 230 Signal Tracer can be a real help in getting those transistor radios fixed and off the bench fast.

How to Build a Baby-Minder

By
Dale Stafford
NRI Consultant

Dale Stafford

Is your wife a worrier? Does she wear herself out running back and forth to see if the baby is still sleeping? Does she wish she had someone to sit and watch the baby while she gets her work done?

If so, give her a break. Build her an electronic "baby minder" that will allow her to go about her housework, listen to her favorite radio program, and still hear baby's first whimper when he wakes up.

Various gadgets have been tried for this purpose. An intercom works pretty well. However, if she turns the radio on, she may fail to hear the baby unless she turns the radio way down or turns the intercom volume up enough to blast the pictures off the walls.

A phono oscillator could also be used. However, a phono oscillator must be set to some spot on the broadcast band where no station is being received. This stops her from listening to her favorite soap opera, and she'll never know whether Jane divorced Harry to marry Bill or not. That could get downright frustrating.

Also, just try to find a vacant spot on the broadcast band big enough to poke a clear signal from a phono oscillator through. That can get frustrating, too.

It is possible to build a rig that will overcome these disadvantages. Let's look at the diagram shown in Fig. 1. At first glance, it looks vaguely familiar. Then we see that it resembles an ordinary AC-DC radio that has been scrambled. Well, it's close enough so that if we can find an old AC-DC set using these tubes, we've got a start on the things we'll need.

(cont'd on page sixteen)

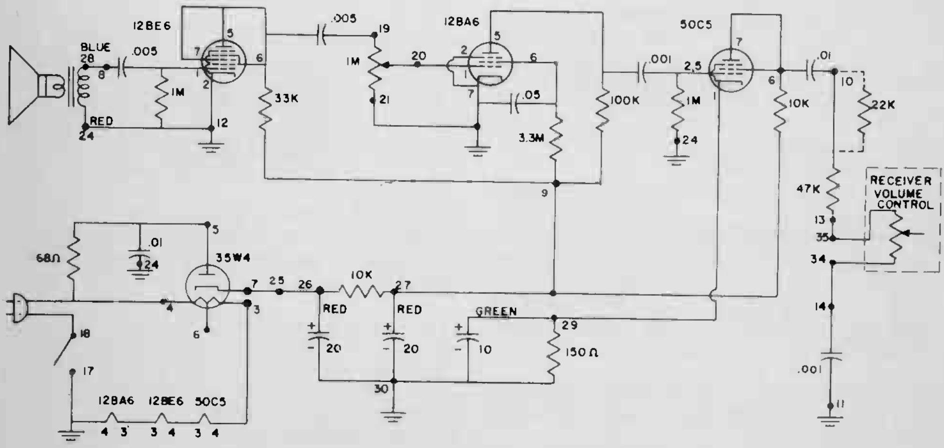
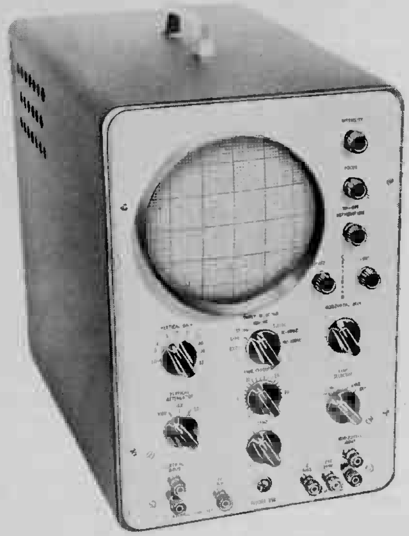


FIG. 1. Schematic diagram of the baby minder.

CONAR 5-Inch Wide-Band Oscilloscope

Model 250



KIT: $89.50

Assembled: $139.50

SPECIFICATIONS

Vertical sensitivity: .023 VRMS after internal calibration is adjusted.

Frequency Response: Flat from 13 cps to 2.5 mc. Down .5 db at 11 cps. Down 1.5 db at 3.58 mc. Down 3.5 db at 4.5 mc.

Horizontal Sensitivity: 1.0 VRMS.

Frequency Response: Flat from 20 cps to 90 kc. Down .8 db at 12 cps. Down 3 db at 250 kc.

Uses 11 tubes including dual types, giving the equivalent of 19 tubes.

Rise time: .05 μs.

Sweep Frequency: 10 cps to 500 kc.

Push-pull on-off switch.

Operates from 110-120 volts, 60-cycle, only.

Rugged construction; built to last. Truly professional appearance. Sturdy cabinet finished in handsome black wrinkle. 9-3/8" × 13-3/4" × 15-1/5". Brushed aluminum panel with black lettering. "Five-way" binding posts. Shipping weight, 25 lbs.

Quality American-made components throughout. Standard 90-day EIA parts and labor warranty.

Available on low monthly terms.

Designed for your complete satisfaction. Use in servicing black and white or color TV, AM-FM and transistor radios, hi-fi equipment, industrial electronic equipment.

Uses two printed circuits; clear instructions; easy to build.

Read peak-to-peak voltages directly - no calculations required.

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Uses phase-inverter tubes in horizontal and vertical push-pull output stages.

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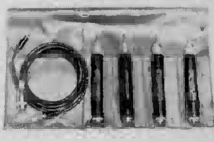
Accurately measures ripple output of any power supply. Checks auto radio vibrators dynamically.

Plenty of brightness. No need to turn off or dim lights to see trace. 2400 volts on crt.

Perfect for square-wave analysis and FM-TV alignment with a sweep generator.

Can be used by itself to accurately check the horizontal output transformer, yoke, width coil, linearity coil, or ringing coil while a TV receiver is turned off. Eliminates the need for a separate expensive flyback tester.

CONAR DELUXE PROBE SET



Most scope observations can be made with ordinary test leads, but special probes are necessary to get maximum use from this instrument.

This DeLuxe Probe Set, designed exclusively for use with the Model 250, includes complete instructions, sturdy roll-up carrying case, shielded cable, and these probes: 1. High-impedance, low-capacity probe. 2. Crystal demodulator probe. 3. Resistive isolating probe. 4. Shielded direct probe. Price complete - only $16.95.

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Model 240

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Shipped complete with assembly and operating instructions.

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We can salvage the four tubes we need if the tubes are good. (We won't need the second detector). Also, we'll use four of the tube sockets, the speaker, and the output transformer. We'll keep the line cord and the rubber grommets that protect it, and the output transformer leads. We'll leave the tuning capacitor in place - it makes convenient tie-points as we'll see later.

Strip the rest of the parts and wiring. It is easier to put the wiring back than it is to change it around. It probably needs replacing anyway. Then check the parts list in Table I to see what else you need to assemble the "baby minder." If you don't have a receiver you can modify, you'll need all the parts listed in the parts list.

The parts arrangement is not too critical. However, the chassis should be punched so the parts can be mounted about as they are shown in the pictorial diagram in Fig. 2. The chassis shown is the one used in the NRI "Adventures In Electronics" kit and in the 7W receiver. You may be able to find an old chassis punched in a similar fashion. Possibly, you may need to drill a few extra holes.

For the output transformer, just tell your dealer that you want one to match a 50C5 to an ordinary PM speaker, or select one from a catalog. If you don't find them listed this way in the catalog, look up the load resistance of a 50C5 in a tube manual. Get a transformer with a primary impedance to match this load resistance, and a secondary impedance of 3.2 ohms.

Get a 4- or 5-inch PM speaker. One with a bracket like that shown in Fig. 3 offers the most convenient way of mounting the output transformer.

The size of the rubber grommets needed will depend on the size of the holes you find (or drill) in the chassis.

Whether you are starting fresh or modifying, the construction is similar. Turn your chassis as shown in Fig. 2 and use this figure and Fig. 1 as your guides.

First, mount the volume control on the chassis as shown in Fig. 2. Then mount the four 7-pin tube sockets in the holes along the back of the chassis (next to you as the chassis is turned), using 4-40 screws and nuts. Turn each tube socket so that the wide space between the lugs faces as in Fig. 2.

Put a solder lug under the left-hand screw on the 12BA6 tube socket and one under the nut of the right-hand screw on the 12BE6 tube socket.

1	chassis
1	loudspeaker
1	output transformer
1	1-meg volume control and on-off switch with mounting nut
1	knob
1	7-lug terminal strip
1	4-lug terminal strip
2	1-lug terminal strips
1	3-section electrolytic capacitor, 20-20-10 mfd, 150 WVDC
1	line cord
4	7-pin miniature sockets
1	68-ohm, 1/2-watt resistor
1	150-ohm, 1/2-watt resistor
2	10K-ohm, 1/2-watt resistors
1	22K-ohm, 1/2-watt resistor (see text)
1	33K-ohm, 1/2-watt resistor
1	47K-ohm, 1/2-watt resistor
1	100K-ohm, 1/2-watt resistor
2	1-meg, 1/2-watt resistors
1	3.3-meg, 1/2-watt resistor
2	.001-mfd, 500-volt capacitors
2	.005-mfd, 500-volt capacitors
2	.01-mfd, 500-volt capacitors
1	.05-mfd, 500-volt capacitor
8	4-40 screws and nuts
7-9	6-32 screws and nuts
2	rubber grommets
1	35W4 tube
1	50C5 tube
1	12BE6 tube
1	12BA6 tube
	Hookup wire
	300-ohm twin lead or lamp cord

TABLE 1. Parts list for the baby minder.

Mount the 4-lug terminal strip on the chassis as shown in Fig. 2, and number the terminals as shown.

Mount the 7-lug terminal strip, using one of the mounting screws to hold the speaker bracket unless the speaker is already mounted. Secure the speaker bracket with another 6-32 screw and nut. Number the terminal-strip lugs as shown.

Mount the output transformer as shown in Fig. 3 if the speaker has a mounting bracket. Otherwise, mount it close to the speaker on top of the chassis. Solder the secondary leads to the voice-coil terminals.

Bring the output transformer leads down through a hole in the chassis, protecting them by means of a rubber grommet as shown in Fig. 2.

Slip a small rubber grommet into the hole for

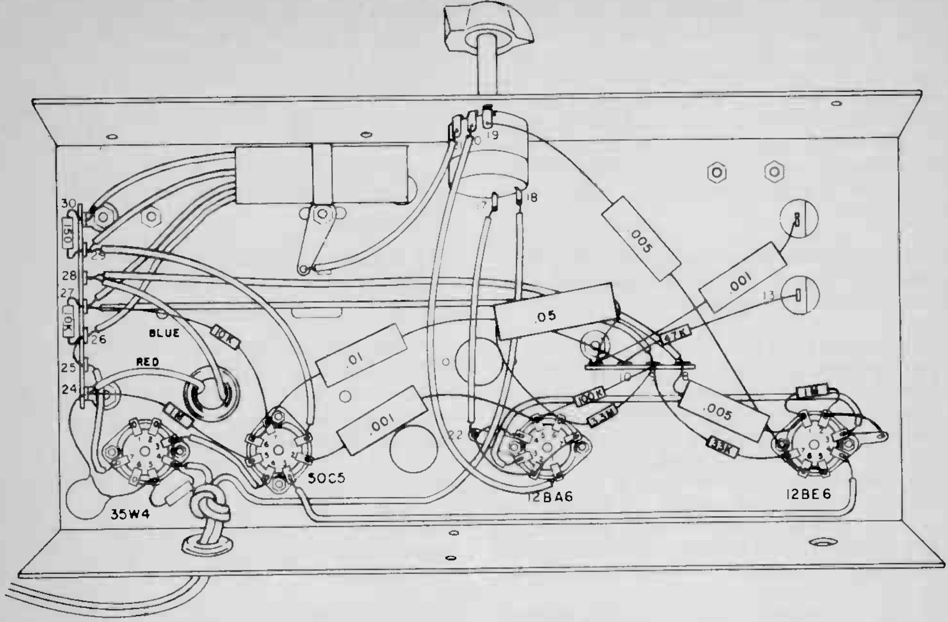

FIG. 2. Pictorial diagram of the baby minder.

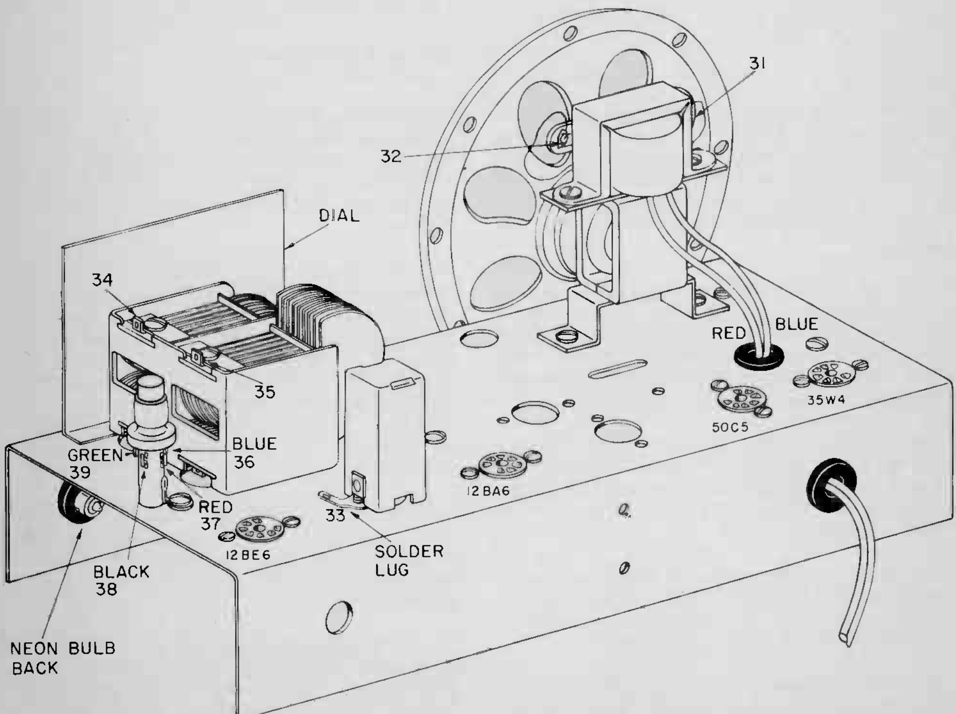

FIG. 3. Speaker and output transformer mounting. (Some parts shown are not used in baby minder.)

the line cord and insert the line cord into the hole. Pull it through far enough for the wires to reach the terminals of the On-Off switch. Tie a knot in the cord as shown in Fig. 2. Separate the leads, soldering one of them to terminal 18 on the switch. Measure off enough of the other lead to reach lug 4 on the 35W4 tube socket, and cut off the excess wire. Connect this wire to lug 4, but do not solder this connection yet.

Mount the 3-section electrolytic capacitor as shown in Fig. 2, putting a solder lug under the nut of the mounting screw.

Now, number the rest of the terminals on the chassis to correspond to Fig. 2. In the pictorial diagram, terminals 13 and 14 are the bottom stator terminals of the tuning capacitor. The tuning capacitor is not used. We are merely using the stator lugs as tie-points, the bottom lugs as terminals 13 and 14, and the top lugs as terminals 34 and 35. The stator connects terminal 13 to terminal 35 and terminal 14 to terminal 34. We are going to connect a cable to terminals 34 and 35.

If you don't have a tuning capacitor mounted on the chassis you are using, you can install two 1-lug terminal strips at about this point on the chassis. You can number one of them 13 and 35 and the other 14 and 34. Then you can connect your cable to these terminals - it doesn't have to be connected on top of the chassis.

Now, using the schematic diagram in Fig. 1, and the pictorial diagram in Fig. 2 as your guides, wire up the "baby minder." Leave the connections to terminals 34 and 35 until last. When you have made all the other connections, check your work carefully.

Then connect your cable to terminals 34 and 35, the top stator lugs of the tuning capacitor. If you are using a pair of 1-lug terminal strips as terminals 13 and 14, the cable should go to these terminals.

The cable can be ordinary lamp cord or a length of 300-ohm twin lead. Either is satisfactory. You can get both from most radio-supply stores or hardware stores.

Connect the other end of the cable to the two outside volume control terminals of the radio receiver you intend to use with the "baby minder." The wire from terminal 34 should go to the grounded side of the receiver volume control. This is the side connected to the terminal of the On-Off switch (the volume control terminal farthest counterclockwise, looking at the back of the control). The other side of the volume control connects to terminal 35.

If you can't tell which is which, try it one way and if that doesn't work, reverse the connections.

Do not make any additional connections to the center terminal of the radio-receiver volume control.

Make these connecting wires rather long. You will be operating the radio and "baby minder" in separate rooms with the door closed. If you try to use them in the same room, you'll probably get feedback and howling.

After you have finished your wiring and checked your work, turn on both the radio receiver and the "baby minder." If you get a loud hum, reverse the line-cord plug of the "baby minder."

Adjust the volume control of the radio to a comfortable listening level. Now any sounds made near the speaker of the "baby minder" should be heard above the program on the radio. You can adjust the loudness of these sounds with the volume control of the "baby minder."

If connecting the "baby minder" to the radio seems to reduce the volume of the radio too much, connect a 22K-ohm resistor in series with the 47K-ohm resistor connected to terminal 10. To do this, disconnect the 47K-ohm resistor from terminal 10 and solder one lead of a 22K-ohm resistor to the free lead. Connect the other lead of the 22K-ohm resistor to terminal 10. This connection is shown in dotted lines in Fig. 1.

Now that we've built it, what do we have? Well, first of all, we have a speaker acting as a microphone, and an output transformer connected backwards to serve as a microphone transformer.

Sounds striking the cone of the speaker cause it to move back and forth. As the voice coil cuts across the lines of flux of the speaker magnet, a voltage is induced in the voice coil. This is applied across the primary (normally the secondary) of the transformer. In turn, a

> I often quote myself. It adds spice to my conversation.
>
> George Bernard Shaw

voltage is induced in the secondary winding (normally, the primary). This is applied to the cathode, and, by means of the .005-mfd coupling capacitor, to the grid of the 12BE6.

We connected pins 5, 6, and 7 of the 12BE6 together so it is now operating as a triode amplifier. The amplified signal appears across the "baby minder" volume control.

Any part of this signal can be applied between the grid and the cathode of the 12BA6, which operates as a high-gain audio amplifier. The amplified audio signal appears across the 100K-ohm plate-load resistor. It is applied through the .001-mfd coupling capacitor and the output filter capacitor to the grid resistor of the 50C5.

The 50C5 amplifies the signal still further and it is fed through the .01-mfd capacitor and the .001-mfd capacitor to terminals 13 and 14 and on to terminals 34 and 35. The cable connected to terminals 34 and 35 carries the signal to the volume control of the receiver. The radio amplifies the signal still more, and the resulting sound is heard over the other sounds coming from the radio loudspeaker.

After the "baby minder" is completed, your wife can put the baby in his crib in the bedroom, set the "baby minder" on a stand near the crib, turn it on, and close the bedroom door to keep out noises that might wake the baby. The radio can be set wherever she is working, and turned on. Then, she can go about her work knowing that she'll hear baby's first wail when he wakes up and wants attention.

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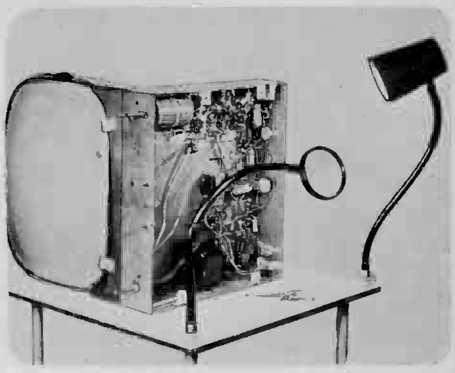

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Troubleshooting Horizontal Sweep Circuits

By E. B. Beach

Technical Editor

Trouble in horizontal sweep circuits very often needlessly plagues the TV service technician. The horizontal deflection circuits are really no more difficult to service than any of the other TV circuits. However, since extremely high voltages and relatively high frequencies are involved in these circuits, they are more apt to develop trouble than some of the other circuits.

Horizontal deflection trouble may be conveniently grouped into two categories:

(1) Those in which there is no deflection at all (no raster) and
(2) Those in which there is deflection but the picture cannot be brought into synchronization horizontally.

In addition to the two groups above we should also consider briefly nonlinear sweep.

Let us first examine the causes of no raster.

NO RASTER

A failure of any one of the stages in the horizontal section can cause a loss of the raster. The horizontal section of a typical receiver is shown in Fig. 1. First check for the presence of high voltage RF at the plate of the high-voltage rectifier, V102 in Fig. 1. This is most easily done by touching the plate cap with the blade of an insulated screwdriver. High-voltage RF, if present, will arc to the screwdriver blade. You should be able to draw at least a 2" arc from this point if all the preceding stages are "healthy." If so, check R119, V102, and the crt. A very weak arc, or no arc at all, indicates that the horizontal output, oscillator, or damper tubes are weak or inoperative. They should be checked. If the tubes are O.K., try the same test at the plate of the output tube. The arc here will be much smaller than that at the rectifier plate; about 1/4" blue arc is a healthy indication. Check R102. If no arc is available at this point, we must next turn to the VTVM.

Check for grid drive to the output stage. A reading of -20 to -40V DC is normal for most circuits. Lack of required drive is probably due to a bad oscillator. If this is the case, the set should be operated for as short a period of time as possible, since the output stage will draw excessive plate and screen currents without grid drive. Such operation will ruin the output stage and may possibly damage the output transformer.

Check the plate and cathode voltages of the damper tube. The plate is usually connected directly to the B+ line. The cathode should be 200 to 300V more positive than the plate. Identical readings at plate and cathode tells us there is no B+ boost voltage being produced and is the usual condition when there is no raster.

If all of the tests to this point have been negative, we must now find the cause. With equal plate and cathode voltages on the damper it is safe to measure the DC plate voltage of the output stage. It should be the same as the cathode voltage of the damper. No DC voltage at this point indicates an open output transformer.

RASTER, BUT NO HORIZONTAL SYNC

Let us next consider category number two - raster, but no horizontal sync. By using very simple instruments and our old friend effect-to-cause reasoning, we shall see it is a fairly simple matter to run down even the toughest dog.

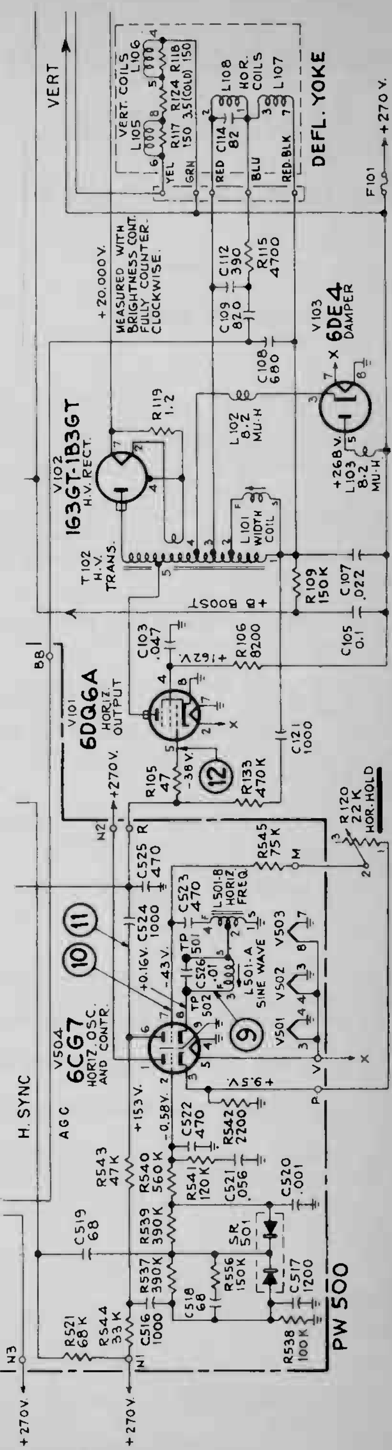
There are two possible causes of horizontal instability; the oscillator and the oscillator control system. The first thing to check, of course, is the oscillator tube itself. This is best done by substituting a tube that is known to be good for the suspected oscillator tube.

If the tube checks out OK, the next step is to determine whether the oscillator or the control stage (AFC) is the culprit. This is most easily done by disabling the AFC circuit. With a station tuned in and the AFC disabled, it should be possible to obtain a fairly stable picture by adjusting the horizontal hold control. The resultant picture may drift slowly left or right, but should remain upright, with little tendency to "slip" horizontally.

If, after making the above test, the picture still refuses to stay in sync even momentarily, then the oscillator circuit is suspect. If disabling the AFC circuit does produce a stable picture, then the trouble must lie in the disabled AFC network.

There are quite a number of combinations of oscillator-AFC circuits in common use today. Perhaps the most frequently encountered is the multivibrator oscillator, dual selenium AFC arrangement, illustrated by Fig. 2.

In Fig. 2, the AFC is disabled by shorting together test point X and test point IX. Try adjusting R267. If the picture will not lock in, there is a defect in the oscillator circuit. Cri-



Courtesy RCA

FIG. 1. Horizontal section of a typical TV receiver.

tical frequency-determining components are C267 and R271. C260 and R262 contribute to the shape of the signal coupled to the output stage. C259 affects the amplitude of the signal coupled to the output stage.

If the oscillator circuit is all right you should be able to bring in a picture by adjusting R267, and you know the AFC circuit is the trouble-maker. Remove the short from test point X and test point IX, and check AFC components. The most critical components are R252, R251, and the dual selenium rectifiers Y251 and Y252. Y251 and Y252 should have nearly identical forward resistances.

To properly adjust the horizonal stabilizing control L251, tune to a station and short test point XI to the +135V line. Adjust the horizontal hold (R267) for a locked-in picture, remove the short from test point XI to the +135V line, and adjust L251 until the picture again locks in.

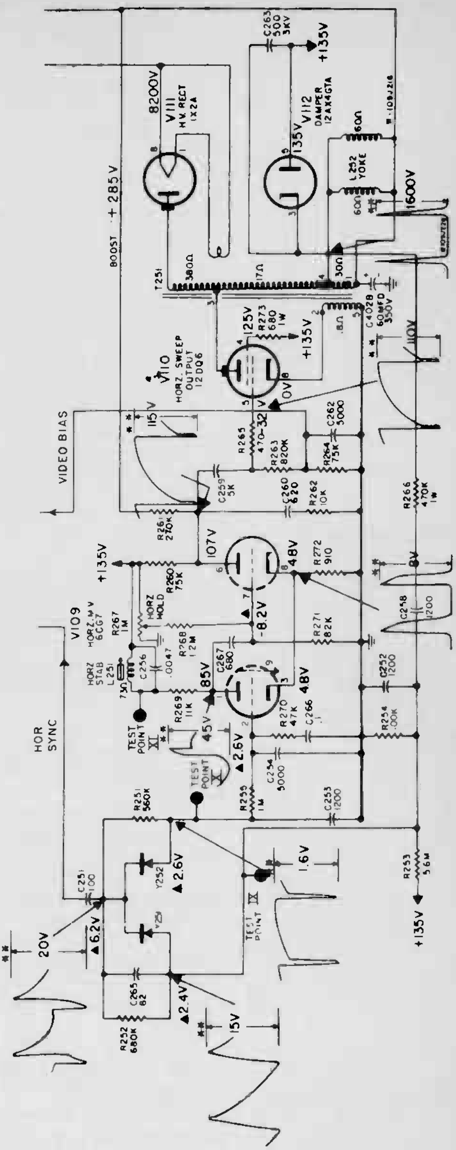
In Fig. 1, which uses one version of the popular synchroguide oscillator AFC circuit, the AFC is disabled by shorting R537 and R539. If a locked-in picture can be obtained by adjusting R120, the oscillator is OK. If you cannot lock in the picture even momentarily, the oscillator frequency is incorrect. To check this oscillator circuit, short out L501A, the waveform coil, and adjust L501B and R120 controls for a locked-in picture. Remove short and adjust L501A until the picture again locks in. If you cannot lock in the picture with L501B, then R545 or C523 may be defective.

If the trouble appears to be in the AFC, remove the short across R537 and R539. Check these resistors and SR501 as before.

NONLINEAR SWEEP

Nonlinear horizontal sweep can usually be traced to a defect in either the horizontal output stage or the damper stage. These two stages supply the actual deflection currents for the right- and left-hand portions of the screen, respectively.

In the simple circuit of Fig. 2, there are not many components which can contribute to nonlinearity. Causes of nonlinear sweep would be V110, V112, C402B, R273, R263, C259, and the yoke itself, L252. Very close matching of the output transformer, T251, to the yoke, L252, is necessary for linear sweep. A momentary surge of current through the output transformer may possibly cause a short between adjacent turns, reducing the inductance slightly. This fault may not be severe enough to cause a loss of high voltage, or even a reduction in the width, but may very easily cause the sweep to be nonlinear. A resistance check with an accurate ohmmeter between 3 and 4 and 3 and 1 on T251 will reveal shorted turns.



Courtesy General Electric

Fig. 2. Horizontal section of TV receiver using a multivibrator oscillator and a dual-selenium AFC arrangement

In Fig. 1, in addition to the faults mentioned above, any of the various capacitors shunting the yoke, C108, C109, C112, C114, as well as inductors L101, L102, and L103 may affect the linearity of the horizontal sweep.

SYMPTOM	STEP	TEST	NEGATIVE RESULTS	POSITIVE RESULTS
NO RASTER	1	Touch plate of V102 with insulated screwdriver. Check for arc.	Proceed to Step 2.	Check R119, V102, crt.
	2	Check V101, V102, V103.	Replace tube.	Proceed to Step 3.
	3	Touch plate of V101 with insulated screwdriver. Check for arc.	Check R106, V103, V504.	Check T102.
	4	Check for grid drive of -20 to -40V to output section.	Check oscillator tube.	Proceed to Step 5.
	5	Check to see if cathode voltage of damper tube is 200 to 300V higher than plate voltage.	Check F101, C107, C105.	Check L107, L108, T102.
	6	Check to see if plate voltage of V101 and cathode voltage of V103 are equal.	Check T102.	
UNSTABLE HORIZ. SYNC	1	Check V504.	Replace tube.	Proceed to Step 2.
	2	Short R537 and R539, adjust R120 for stable picture.	Proceed to Step 3.	Proceed to Step 5.
	3	Short L501A, adjust L501B and R120 for locked-in picture.	Check R545, C523.	Proceed to Step 4.
	4	Remove short across L501A, adjust L501A for locked-in picture.	Check C256,L501A.	Proceed to Step 5.
	5	Remove shorts. Check R537, R539, SR501.		
NONLINEAR SWEEP	1	Replace one at a time, C108, C109, C112, C114.	Adjust L101; check C105, C107.	
	2	Check R133, C121.		
INSUFFICIENT SWEEP	1	Check low-voltage line for +270 V.	Check low-voltage supply.	Proceed to Step 2.
	2	Check dc voltage at pin 5 of V101.	Check V504, C254, C525, V101.	Proceed to Step 3.
	3	Check B+ boost voltage.	Check V103, C105, C107.	Proceed to Step 4.
	4	Check dc voltage at pin 4 of V101.	Check C103, R106.	
VERTICAL WHITE LINE IN PICTURE		Check voltage at pin 5 of V101.	Check C525, C524, V101, R104, C105, C107.	
WATERY VERTICAL LINE		Replace V101.		

TABLE I

SERVICING TRICKS

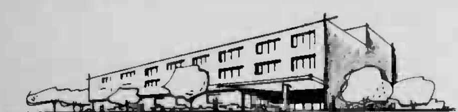
One of the tricks familiar to the old-time radio repairman is signal substitution servicing. An operating receiver is used as a signal source for injecting a signal into various stages of a non-operating receiver. This same procedure may be used in trouble-shooting horizonal sweep circuits. An operating TV receiver is a convenient source of sweep signals. For example, with C524 in Fig. 1 disconnected, the oscillator signal from the test set may be applied to the defective receiver to check oscillator operation. Or, the plate lead of the output tube can be replaced with the plate lead of the operating set. This test will not work when the oscillator supply voltage is developed from B+ boost, however.

A more satisfactory signal substitution source is the B and K Analyst Model 1076. The output stage may be directly substituted with no harmful effects. The Analyst offers, in addition, a means of checking yokes and output transformers for shorts and leakage, as well as providing a stable test pattern for linearity checks. For more uses of the Analyst, see the June-July issue of the NRI NEWS.

Table I is a summary of the symptoms and probable suspects in horizontal sweep circuits. All parts values refer to the schematic of Fig. 1.

> Who but Americans can afford chairs that vibrate and cars that don't?
>
> Philip Lindner

NRI ALUMNI NEWS



Jules Cohen	President
F. Earl Oliver	Vice President
John Babcock	Vice President
J. Arthur Ragsdale	Vice President
Howard Smith	Vice President
Theodore E. Rose	Executive Sect.

SKOLNIK IS LEADING CONTENDER FOR NRIAA PRESIDENCY

Frank Skolnik of Pittsburgh is easily the leading candidate for President of the NRIAA in 1962. The runner-up is John Berka of the Minneapolis-St. Paul Chapter.

A former chairman of the Pittsburgh Chapter, and continuing as an active and outstanding leader of the Chapter, Skolnik is well fitted for the presidency, particularly by reason of his connection and experience with the Radio and Television Serviceman's Association of Pittsburgh, as indicated in the August-September issue in which he was introduced as a candidate.

Berka is also a former chairman of his Chapter, the Minneapolis-St. Paul Chapter. Like Skolnik, since he completed his term of office as chairman of his Chapter, he has continued as one of its leaders.

Oddly enough, Skolnik hails from the same state as our current president, Jules Cohen, who is from Philadelphia. Should Skolnik win this election it will be the first time that two members from a state have served successive terms as President.

In former years there was a strong tendency to return Vice-Presidents to office repeatedly, some of them year after year for long periods. But because of restrictions now in effect on the number of times a Vice-President can run for re-election, the only current Vice-President eligible to be a candidate is J. Arthur Ragsdale, Secretary of the San Francisco Chapter. He easily received enough nominating votes to put him in the running.

The other nominees are Walter Berbee of St. Paul; James Kelley of Detroit; David Spitzer of Brooklyn; Patrick Boudreaux of New Orleans; Eugene DeCaussin of Hollywood; Howard Tate of Pittsburgh; and Michael Lesiak of Taunton, Mass. All these candidates are either current or former Chairmen of their respective chapters, and have proved their loyalty and their fitness for office.

Only members of the NRI Alumni Association may vote in these elections. Vote for one man for President and four for Vice-President. Use the ballot included in this issue. The polls close at midnight, October 25. Be sure to mail your ballot to reach National Headquarters by that time. The winning candidates will be announced in the next issue of the NRI News.

ELECTION BALLOT

All NRI Alumni members are urged to fill in this ballot carefully. Mail your ballot to National Headquarters immediately.

FOR PRESIDENT (Vote for one man)

- ☐ Frank Skolnik, Pittsburgh, Pa.
- ☐ John Berka, Minneapolis, Minn.

FOR VICE PRESIDENT (Vote for four men)

- ☐ Walter Berbee, St. Paul, Minn.
- ☐ James Kelley, Detroit, Mich.
- ☐ David Spitzer, Brooklyn, N.Y.
- ☐ Patrick Boudreaux, New Orleans, La.
- ☐ J. Arthur Ragsdale, San Francisco, Calif.
- ☐ Eugene DeCaussin, Hollywood, Calif.
- ☐ Howard Tate, Pittsburgh, Pa.
- ☐ Michael Lesiak, Taunton, Mass.

SIGN HERE:

Your Name ....

Your Address ....

City .... State ....

Polls close October 25, 1961. Mail your complete Ballot to:

T. E. Rose, Executive Secretary

NRI ALUMNI ASSOCIATION

3939 Wisconsin Ave.

WASHINGTON 16, D.C.

Chapter Chatter

CUMBERLAND VALLEY CHAPTER skipped its meetings for only one month this summer, August, as compared with some of the other Chapters which suspended meetings in both July and August.

A banquet was planned for early this Fall. This banquet may possibly have been held by the time this issue of the NRI News is distributed. Those interested in finding out about this should get in touch with the Chairman.

DETROIT CHAPTER held its customary June Stag Party by way of winding up the season before taking a vacation from meetings in July and August.

The party was definitely a big success. Stereo music was furnished by Mr. Smith. A surprise was a taped message from Ted Rose, Executive Secretary of the NRI Alumni Association, which was enjoyed by all the members. Chairman Kelley played the tape at the very beginning of the party.

Two very welcome visitors were Jim Joseph and Bud Champlin, both of the Radio Supply and Engineering Company. The membership voted both of them Honorary Memberships in the Chapter.

FLINT (SAGINAW VALLEY) CHAPTER has admitted two new members, George Martin of Flint, and Raymond Kitt. The latter has found the meetings interesting enough to justify the 75-mile trip from his home in Marlette. Our congratulations to these two members!

Another meeting was held at Andrew Jobbagy's shop at which Professor DeJenko of the University of Flint was the featured speaker. At this meeting he concentrated on flyback transformer substitution. Among the highlights of his talk, he included an explanation of why substitution does not always work.

The Chapter has an ambitious program for this season, including three lectures on the oscilloscope. Another meeting will be devoted to the Electronic stove, radio-wave dishwasher, and clothes washer. At another meeting Industrial Electronics will be taken up.

MILWAUKEE CHAPTER did not hold any meetings during July and August -- hence no report of its activities could be included in this issue. But the meetings have now been resumed and the Chapter is going ahead with its programs.

All members of the Chapter and also interested students and graduates in the Milwaukee area should note particularly that the Chapter's meeting night has been changed. Meetings were formerly held at 8:00 P.M. on the third Monday of each month. They are now held at 8:00 P.M. on the third Tuesday.

MINNEAPOLIS-ST. PAUL (TWIN CITIES) CHAPTER after the business part of each meeting has been devoting the following period to general discussions.

Just as other Chapters have discovered, such general discussions have a tendency to turn into "bull sessions."

But the Chapter now turns over such periods to a discussion leader who guides the discussion and holds it on the subject before the group. The Chapter finds it gets much better member participation and greatly improved results with all the members getting far more out of these periods than they did before.

The first of such discussion periods was held under the leadership of John Berka, a former chairman of the Chapter, and a full-time Radio-TV serviceman of wide knowledge and experience, who is a candidate for the National Presidency of the NRI Alumni Association for 1962. It was the results obtained under his guidance that decided the Chapter to continue with this type of discussion program.

NEW YORK CITY CHAPTER, like so many of the others, suspended its meetings during July and August as it has always done. There are therefore no meetings to report on for this Chapter in this issue of the News.

The Chapter customarily holds a banquet in November and one has tentatively been planned for this year. This is always a pleasant social that is thoroughly enjoyed by all the members.

The folks at NRI were very pleased with a surprise visit from Mr. and Mrs. Zimmer and friends, who dropped in at the Institute while passing through Washington in August. The only trouble was, it was such a short visit. Next time, Frank, plan to stay longer, won't you?

PHILADELPHIA-CAMDEN CHAPTER, to start its 1961-1962 season with a bang, completed plans to hold a banquet on October 7. The banquets held by this Chapter are something to write home about, and this one promised to be no exception.

There were no regular meetings during July and August. Consequently, this issue of the News contains no report on the Chapter's activities other than that of the scheduling of the banquet in October. But this is one of the busiest of all the local chapters. Judging by past seasons, there will be plenty to report from this chapter in subsequent issues of the News.

PITTSBURGH CHAPTER members always welcome the opportunity to hear Honorary Member McKelvey, an instructor in Electronics in a local school, give a lecture or demonstration on radio and television. On one recent occasion he took a Westinghouse TV receiver with gated AGC and demonstrated how different defects in the filter circuit will cause picture and horizontal pulling as well as sync trouble. This demonstration gave the members a different slant on the approach to servicing AGC troubles and showed how easy it can be.

Former Chairman Tom Schnader has a thorough knowledge of transistor receivers; he makes his living by specializing in this field -- and shares many tricks of the trade with the members. At one meeting he gave a very interesting talk on the Motorola Transistor Radio. Using a parts layout, he went through it from one end to the other, showing what different voltages would do to the operation of the set and demonstrating how to use the Motorola Transistor Checker to check the transistors. This was a well-spent hour and a half. The members were so highly pleased that they asked Tom to give them more of the same at a later meeting.

The Chapter had admitted John Korpita, Fairmont, W. Va., and Elden Harris, Torrence, Pa., to membership. A warm welcome to these new members!

SAN ANTONIO "ALAMO" CHAPTER has been very active and has put on some fine programs since it was organized last spring.

There were excellent talks by Chapter member Tom Love on capacitors, and by Joe Garcia on service charges. Then there was a tour of Station KENS-TV which the members found fascinating, particularly the opportunity to observe programming by the various studio personnel.

At a subsequent meeting the Chapter welcomed guest speakers G. C. Hartley, Service Manager, Philco Corporation; D. E. Sylvester, Assistant Service Manager, PFSS; and George Saylor, Service Manager, Appliance Division, Philco Corporation. Mr. Hartley delivered the main talk of the evening. He showed a film covering a complete television set and discussed the approach to troubleshooting, analyzing, and repair techniques in the many sections necessary to good-quality

Southeastern Mass. Chapter's Chairman Ed Bednarz and John Alves in latter's well equipped shop where the Chapter holds its meetings.

reception in a television system.

Because of the importance of the subject, the Chapter hopes to devote one meeting a month to trouble-shooting and circuit analysis of radio and television receivers.

SAN FRANCISCO CHAPTER members were very interested in a talk by Secretary Art Ragsdale on TV interference with regard to the Federal Communications Commission's Rule 315, which requires a seal guaranteeing non-radiation on all new radio and television receivers.

The FCC promised to provide an engineer to deliver a lecture at a subsequent meeting.

Chairman Ed Persau reported completion of the power supply and audio section of the Chapter's experimental radio receiver. He also demonstrated the operation of these sections.

Daniel Yeh is the latest member admitted to membership in the Chapter. A warm welcome to you, Dan!

SOUTHEASTERN MASSACHUSETTS CHAPTER members were pleased with a talk by John Alves on the CRT tester and demagnetizing meters. They were somewhat startled by a talk given by Les Corey at the same meeting.

Les, who is connected with mobile and marine radio, discussed the principles of magnetism and marine electrolysis. The startling part

Organization meeting of the San Antonio "Alamo" Chapter. Officers are, front row, l to r: Tom Dubose, Chairman; Joe Garcia, Vice-Chairman; Ted Rose, Ex. Sec'y. of NRIAA; Tom Love, Treasurer; and William Jones, Secretary.

of his talk was on electrolysis when he discussed the complete disappearance of a bronze propeller from one boat and its reappearance as a coating on the steel hull of another boat 275 feet away. This happened not once but three times while these boats were on their respective moorings, and took only two weeks per propeller.

At the following meeting Manuel Sousa and John Alves undertook a discussion and demonstration of high voltage problems in a TV set. The set was that of a prospective new member and was repaired on the spot for poor focus and vertical collapse.

Along with plans for future programs, the Chapter expects to continue to work through the Chapter's TV set, stage-by-stage, demonstrating defects, and the use of schematic diagrams.

SPRINGFIELD (MASS.) CHAPTER is getting ahead with its programs for the new season following its summer "vacation."

The Chapter holds its regular meetings on the first Friday of each month and a service or "shop" meeting on the Saturday following the third Friday of each month at the home or shop of one of its members. These service meetings are particularly helpful to those members with service problems which require the knowledge and skill of the more experienced members.

Directory of Local Chapters

Local chapters of the NRI Alumni Association cordially welcome visits from all NRI students and graduates as guests or prospective members. For more information contact the Chairman of the chapter you would like to visit or consider joining.

CHICAGO CHAPTER meets 8:00 P.M., 2nd and 4th Wednesday of each month, 666 Lake Shore Dr., West Entrance, 33rd Floor, Chicago. Chairman: Edwin Wick, 4928 W. Drummond Pl., Chicago, Ill.

DETROIT CHAPTER meets 8:00 P.M., 2nd and 4th Friday of each month, St. Andrews Hall, 431 E. Congress St., Detroit. Chairman: James Kelley, 1140 Livernois, Detroit, Mich.

FLINT (SAGINAW VALLEY) CHAPTER meets 8:00 P. M., 2nd Wednesday of each month, Andrew Jobbagy's Shop, G-5507 S. Saginaw Rd., Flint. Chairman: William R. Jones, 610 Thomson St., Flint, Michigan.

HAGERSTOWN (CUMBERLAND VALLEY) CHAPTER meets 7:30 P.M., 2nd Thursday of each month, at homes or shops of its members. Chairman: Harold J. Rosenberger, R.D. 1, Waynesboro, Pa., 1650R11.

LOS ANGELES CHAPTER meets 8:00 P.M., 2nd and last Saturday of each month, 5938 Sunset Blvd., L.A. Chairman: Eugene DeCaussin, 5870 Franklin Ave., Apt. 203, Hollywood, Calif.

MILWAUKEE CHAPTER meets 8:00 P.M., 3rd Tuesday of each month, Radio-TV Store and Shop of S. J. Petrich, 5901 W. Vliet St., Milwaukee. Chairman: Philip Rinke, RFD 3, Box 356, Pewaukee, Wis.

MINNEAPOLIS-ST. PAUL (TWIN CITIES) CHAPTER meets 8:00 P.M., 2nd Thursday of each month, Walt Berbee's Radio-TV Shop, 915 St. Clair St., St. Paul. Chairman: Kermit Olson, 5705 36th Ave., S., Minneapolis, Minn.

NEW ORLEANS CHAPTER meets 8:00 P.M., 2nd Tuesday of each month, home of Louis Grossman, 2229 Napoleon Ave., New Orleans. Chairman: Herman Blackford, 5301 Tchoupitoulas St., New Orleans, La.

NEW YORK CITY CHAPTER meets 8:30 P.M., 1st and 3rd Thursday of each month, St. Marks Community Center, 12 St. Marks Pl., New York City. Chairman: David Spitzer, 2052 81st St., Brooklyn, N.Y.

PHILADELPHIA-CAMDEN CHAPTER meets 8:00 P. M., 2nd and 4th Monday of each month, K of C Hall, Tulip and Tyson Sts., Philadelphia. Chairman: Herbert Emrich, 2826 Garden Lane, Cornwell Heights, Pa.

PITTSBURGH CHAPTER meets 8:00 P.M., 1st Thursday of each month, 436 Forbes St., Pittsburgh. Chairman: Howard Tate, 615 Caryl Dr., Pittsburgh, Pennsylvania.

SAN ANTONIO ALAMO CHAPTER meets 7:30 P. M., 2nd and 4th Thursday of each month, National Cash Register Co., 436 S. Main Ave., San Antonio. Chairman: Thomas DuBose, 127 Harcourt, San Antonio.

SAN FRANCISCO CHAPTER meets 8:00 P.M., 1st Wednesday of each month, 147 Albion St., San Francisco. Chairman: E. J. Persau, 1224 Wayland St., San Francisco, Calif.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets 8:00 P.M., last Wednesday of each month, home of John Alves, 57 Allen Blvd., Swansea, Mass. Chairman: Edward Bednarz, 184 Grinnel St., Fall River, Mass.

SPRINGFIELD (MASS.) CHAPTER meets 7:00 P.M., 1st Friday of each month, U.S. Army Hdqts. Building, 50 East St., Springfield, and on Saturday following 3rd Friday of each month at a member's shop. Chairman: Norman Charest, 43 Granville St., Springfield, Mass.

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