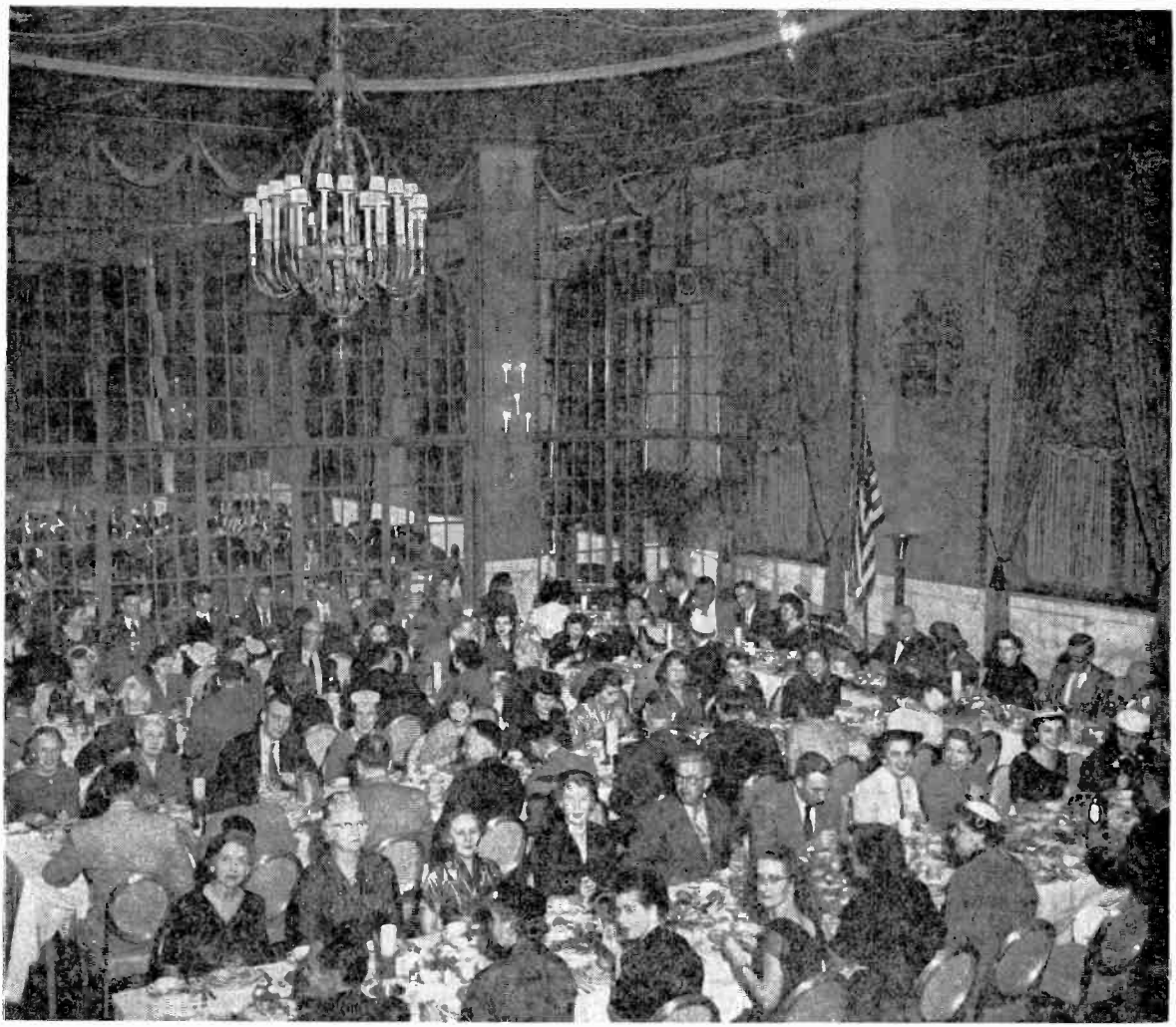
National RADIO-TV NEWS



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Using a Wide-Band TV Oscilloscope

Servicing Printed Circuits and Chassis

NRI Alumni Association News

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HE WON'T LET GO!

Off the coast of New England a fishing boat was being tossed about in a rough sea. Suddenly a seaman noticed a young man clinging to the mast, lashed by the biting wind. In horror the seaman ran to the Captain and exclaimed, "*Look, Captain, your son is up there in grave danger. If he lets go he'll be dashed to pieces.*"

The Captain looked up and calmly replied, "*He won't let go.*"

There is a moral in that little story. Many of us need to train ourselves to withstand set-backs. We must learn how to meet adversity. In every career, in every business, in every life, problems will present themselves. Some will be trivial. Some will be serious. Some will seem almost insurmountable. It is then we are put to the real test. To yield to strong resistance is a weakness. Someone has well said, "Only the game fish can swim upstream."

Here and there we find a strong man. His problems are many and no different from those of others. But he keeps on hustling. He knows that he is master of his own destiny. Whatever his future shall be, he knows depends upon him and him alone. While others are willing to float with the tide, he is swimming up-stream. He doesn't know defeat. *He won't let go.*

You've probably heard this philosophy before. But if only one man who reads this will hitch up his belt another notch and say, "I won't let go," this page has been worthwhile. Because, in time, that fellow will be a successful man. I hope it is you.

J. E. SMITH.
President.

Using a *Wide-Band* Oscilloscope In TV Servicing

By B. VAN SUTPHIN
NRI Consultant

B. van Sutphin

New Model 56 NRI Professional Wide-Band TV Oscilloscope.

MANY students request information about using the oscilloscope in TV servicing. To answer those requests, we are reprinting a portion of the instruction manual for the new Model 56 NRI Professional TV Oscilloscope dealing with general oscilloscope operating procedure.

Throughout this article, the names given for the various controls are those used on the front panel of the NRI Model 56. Because these control names are not necessarily those used on every oscilloscope, a brief discussion of the purpose of the various controls is in order.

INTENSITY: This control regulates the bias applied to the cathode ray tube and thereby controls the brightness of the trace obtained. In general, this control is set for satisfactory brightness and left in that position.

FOCUS: The FOCUS control should be adjusted after the INTENSITY control is set to the desired position. This control adjusts the voltage applied to the focusing electrode of the cathode ray tube. It should be adjusted to give the sharpest possible trace.

VERTICAL CENTERING: This control adjusts the dc voltage between the vertical deflection plates of the cathode ray tube. The control is initially adjusted so that the trace is centered vertically.

HORIZONTAL CENTERING: This control adjusts the dc voltage applied between the horizontal deflection plates of the cathode ray tube. It is initially adjusted so that the trace is centered horizontally.

HORIZONTAL GAIN: This control adjusts the amplitude to the horizontal sweep signal. In general, it is set to the position that gives a trace not quite as wide as the screen and left set to that position in all tests. It can, however, be turned further up to expand the trace horizontally.

SWEEP SELECTOR: In the Model 56 NRI Professional TV Oscilloscope, this is a dual purpose control. In other oscilloscopes two separate controls may be used to perform the functions.

When the control is set to the AMPLIFIER position, the horizontal sweep oscillator in the scope is disconnected and the horizontal sweep signal must be obtained from an external source. This position is used when aligning a receiver with a sweep generator; the horizontal sweep signal is then obtained from the generator.

When the control is set to the LINE position, the horizontal oscillator of the scope is automatically synchronized with the power line frequency when the SYNC SIGNAL control is turned up. This feature is desirable in some types of testing.

When the control is set to the EXTERNAL position, the horizontal oscillator is synchronized with the signal fed to the SYNC TERMINAL.

When the control is set to the INTERNAL position, the sweep is automatically synchronized with the pulses of the signal fed to the vertical amplifier. The control is left in this position for most tests.

SWEEP RANGE: This is a coarse frequency control for the horizontal oscillator circuit and is used in conjunction with the SWEEP VERNIER to obtain the desired number of traces on the screen.

SWEEP VERNIER: This control is a fine frequency adjustment for the horizontal sweep oscillator of the oscilloscope. On some scopes, it is called the FINE FREQUENCY control. This control is adjusted so that the desired number of traces are obtained on the scope screen.

SYNC SIGNAL: This control adjusts the amount of synchronizing voltage that is fed to the scope horizontal oscillator circuit. Some oscilloscopes, like the NRI Model 56, have provisions for synchronizing with both positive and negative sync pulses. In that case, the zero mark of the scale will be in the center. On other oscilloscopes, provision is made for synchronization with pulses of only one polarity. In discussing this control, it is important to mention that the control should never be turned up any further than is necessary to stabilize the pattern. Turning the control up too far will distort the pattern and produce unsatisfactory results. The SYNC CONTROL and the SWEEP VERNIER control should be adjusted at the same time so that best synchronization is obtained.

VERTICAL ATTENUATOR: The setting of this control determines what portion of the signal applied to the oscilloscope input circuit actually reaches the amplifier. Proper adjustment of this control is important to prevent overloading of the input amplifier in the oscilloscope and consequent distortion.

VERTICAL GAIN: This control adjusts the gain of the vertical amplifier circuit of the oscilloscope. The control is set to the position that gives a trace of satisfactory height.

Peak-To-Peak Voltage Measurements

With the oscilloscope, it is possible to measure the peak-to-peak value of the entire wave form, or of any part of the wave form. The Model 56 NRI Professional Oscilloscope has a calibrated VERTICAL GAIN control which allows direct reading of unknown voltages. Most oscilloscopes, however, do not have this feature and the voltages must be measured by comparison with certain known voltages.

Many oscilloscopes have a test signal of known peak-to-peak amplitude brought out to a test terminal on the scope panel. If the VERTICAL GAIN control of the oscilloscope is adjusted so that a pattern of known height is obtained when this test signal is fed to the scope, the value of an unknown voltage can be determined by comparing the height of the trace obtained with the known voltage fed to the scope vertical input circuit and that obtained with the unknown voltage fed to the vertical input circuit.

For example, suppose that the calibrating voltage provided is 2 volts peak-to-peak and the scope is adjusted so that a trace half inch high is obtained. If the unknown input voltage produces a trace two and one-half inches high. the peak-to-peak value of the unknown voltage is five times the calibrating voltage or 10 volts peak-to-peak.

This procedure can also be used in measuring reasonably small values of peak-to-peak voltage. For example, suppose that the test signal is 2 volts peak-to-peak and you adjust the oscilloscope VERTICAL GAIN control so that a pattern 3 inches high is obtained. Therefore, each inch of deflection indicates two-thirds of a volt peak-to-peak. If a trace one-half inch tall is obtained with the unknown signal fed to the scope. the peak-to-peak value of the unknown voltage is one-third of a volt.

If no calibrating voltage is provided on the front panel of the scope, you can always use the 6.3-volt filament supply in the receiver. The peak-to-peak value of 6.3 volts rms is 17.8 volts.

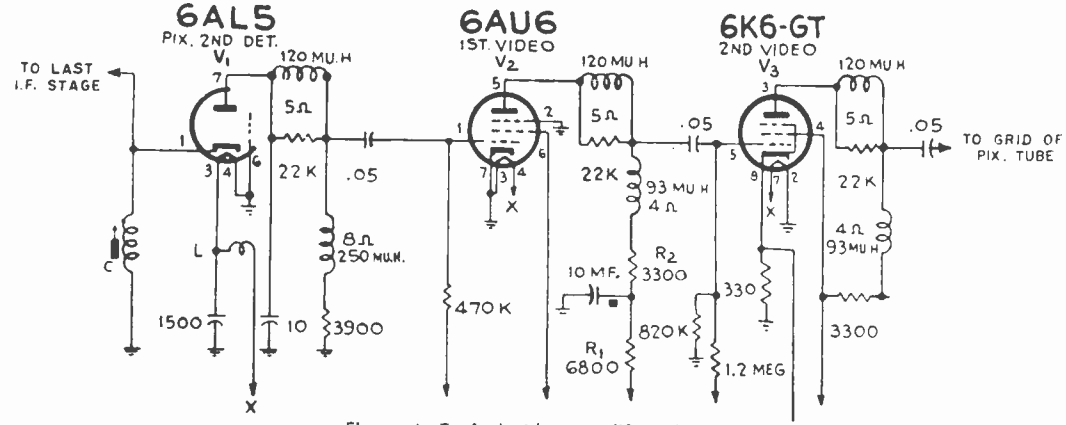

Figure 1. Typical video amplifier circuit.

or approximately 18 volts. By adjusting the VERTICAL GAIN control of the oscilloscope so that a pattern of some convenient height is obtained with this signal fed to the scope, and then comparing the height obtained with an unknown voltage fed to the scope, the approximate value of the unknown voltage can be determined.

This technique of measuring peak-to-peak voltages is very useful in TV servicing and should be practiced. The peak-to-peak value of the voltage in various points in the circuit is frequently given in Television service information, and that information can be used to good advantage in servicing many complaints.

TV Wave Forms

Video Amplifier Stages: Fig. 1 shows the video detector and the video amplifier circuit whch we will use as an illustration. You can use the oscilloscope to view the wave forms throughout the amplifier, to measure the gain per stage, and in the case of a defect in this section of the receiver, to locate the defect.

When viewing the wave forms in the video amplifier, you can view a complete field by setting the oscilloscope sweep rate at the field frequency, or you can view a single line by setting the sweep rate at the line frequency. The usual procedure, however, is to set the sweep rate at one-third the frequency of the incoming signal (field or line) and view two or three complete cycles.

Fig. 2A shows the wave form that will be obtained at the grid of V2 with the oscilloscope synced at one-half the vertical sweep rate. (The vertical sweep rate is 60 cycles per second; therefore, the oscilloscope sweep rate will be 30 cycles per second.)

To obtain this wave form, connect the ground terminal of the oscilloscope to the receiver chassis and the vertical input terminal to the grid of V2. Set the SWEEP RANGE switch to the position that allows you to adjust the horizontal oscillator in the oscilloscope to 30 cycles and adjust the SWEEP VERNIER control and the SYNC SIGNAL control to obtain the pattern shown.

To view a single line of the TV picture signal, set the SWEEP RANGE switch to the position that allows the oscillator to be adjusted to half the horizontal sweep frequency, 7825 cycles, and adjust the SWEEP VERNIER to obtain the pattern shown in Fig. 2B. Again, it may be necessary to adjust the SYNC SIGNAL control to stabilize the pattern.

Figure 2. Composite video signal at the input of the first video amplifier stage (V2) with the oscilloscope sweep synced at half the field rate (A), and half the line rate (B). A similar pattern of greater amplitude will be obtained at the output of V3.

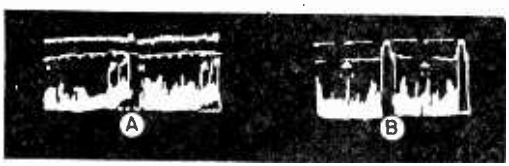

Figure 3. Video information at the input of the second video amplifier stage with the oscilloscope synced at half the field rate (A), and at half the line rate (B).

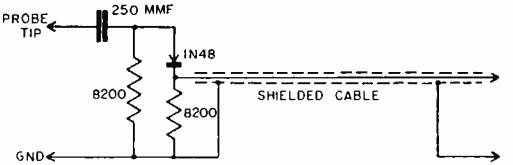

Figure 4. Detector probe that will demodulate the rf signal thereby enabling you to trace the signal through the video i-f stages.

The next point in the video amplifier to check the signal is at the grid of V3. If you have the oscilloscope sweep set at half the field rate, you will obtain a pattern similar to that shown in Fig. 3A. With it set to half the line rate, you will obtain a pattern similar to that shown in Fig. 3B. In each case, notice that the sync pulses are at the top of the pattern, but they were at the bottom of the pattern when the oscilloscope was connected to the grid of V2. This indicates a 180° phase shift.

The oscilloscope can be used to measure the peak-to-peak amplitude of these signals as mentioned previously. By measuring the peak-to-peak amplitude of the signal at the input of the stage, and then at the output, the stage gain can be determined by dividing the output voltage by the input voltage.

This procedure for measuring the stage gain can be used not only in video amplifier stages, but also in audio amplifiers.

Signal Tracing: In the case of a TV receiver where a raster is obtained, but there is no picture, there may be a defect somewhere in the video amplifier. The stages previous to this can be quickly checked by using the oscilloscope to check for a signal across the video detector load resistor. If a signal is present at that point, the tuner and video i-f amplifier stages must be operating. You can then use the oscilloscope to trace the signal from this point to the picture tube. You should check at the grid and at the plate of each video amplifier stage until you locate the point where the signal is lost. The defective component must be between the last point where the signal was obtained and the first test point where it is not obtained.

The video amplifier section in the TV receivers that you service will vary somewhat from the circuit shown in Fig. 1. Some sets may have only a single video amplifier stage; others may use triodes in place of pentodes. In some sets the video signal will be fed to the grid of the picture tube whereas in others it will be fed to the cathode. Regardless of the number of stages used, and the types of tubes used, or whether the signal is fed to the grid or the cathode of the picture tube, the procedures described above may be used to view the wave shape at any point or to check the peak-to-peak voltage and to trace the video signal through the video amplifier stage.

Video I-F Stages

Video i-f wave forms may be viewed but since the signal in the video i-f amplifier is an rf signal, you must demodulate it before applying it to the oscilloscope. By using a detector probe as shown in Fig. 4, it is possible to trace the signal through a good portion of the video i-f amplifier as well as through the video amplifier stages. This is particularly useful in servicing a dead receiver where the defect is previous to the video detector stage.

The procedure is as follows: Connect the probe output to the vertical input terminals of the oscilloscope. Connect the probe ground lead to the receiver B— connection and the probe tip to the point where you wish to check the signal. Turn the VERTICAL GAIN control up until a pattern of satisfactory height is obtained. You can set the SWEEP RANGE control and the SWEEP VERNIER control to view either a single line or a complete frame of the TV signal. (In some receivers the CONTRAST control adjusts the bias supply to the video i-f amplifier stages; for that reason, it is well to set that control to maximum when making these tests.)

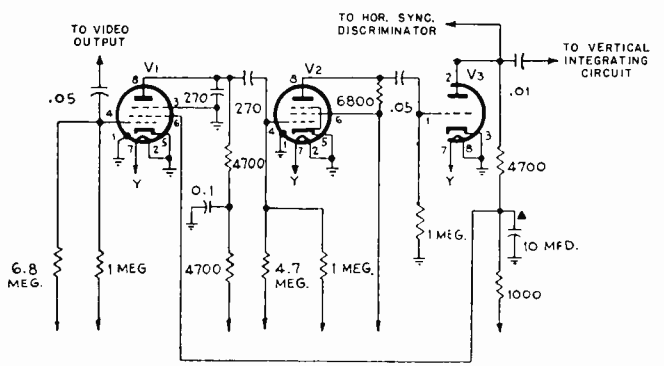

Figure 5. Sync separator-amplifier circuit.

It is difficult to say at what point in the video i-f amplifier circuit it will be possible to pick up the signal because that depends upon signal strength in your area and the gain of the various stages. Experience will teach you, however, where you should expect to pick up the signal.

If the signal can be picked up at the output of the first video i-f ampli-

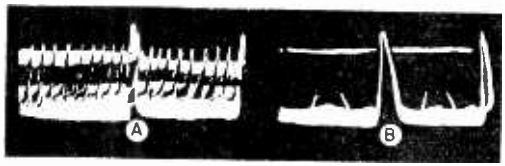

Figure 6. Waveform at the output of the first sync separator stage (V1) with the oscilloscope synced at half the field rate (A), and at half the line rate (B).

fier stage, you can trace the signal through the remainder of the set by moving the probe connection first to the grid of the second i-f amplifier, then to the plate, on to the grid of the following stage, and so on until you reach the video detector.

Once you reach the video detector, the probe can be removed and the oscilloscope used directly to trace the signal on through the video amplifier to the picture tube. If the video signals are not reaching the picture tube, you can easily locate the point at which the signal is lost.

Sync Circuits

Tracing the signal through the sync circuit or viewing the wave forms in the sync circuit is carried on in more or less the same manner as in the video amplifier. There are two groups of synchronizing pulses: one set with a frequency of 60-cycles per second; and the other set with a frequency of 15,750 cycles per second. The oscilloscope sweep should be set to operate at one-half or one-third the frequency of the pulses you wish to view so that two or three complete cycles will appear on the screen. The HORIZONTAL GAIN control can be used to spread out the wave form for careful study.

Fig. 5 shows a typical sync amplifier and sync separator circuit. As the name implies, the circuit is used to both amplify the sync pulses and to separate the synchronizing information from the composite video signal. When viewing the wave forms in this circuit, the manufacturer's instructions should be consulted to obtain information on the correct wave shapes.

Fig. 6a shows the wave shape that will be obtained at the plate of V1 when the sweep rate is set at half the vertical sweep frequency. Fig. 6b shows the wave form obtained by setting the sweep rate at half the horizontal sweep frequency. Fig. 7a shows the vertical pulse at the output of V2; Fig. 7b shows the horizontal pulse at the output of the same stage. Notice the absence of video information in Fig. 7. This indicates that the synchronizing pulses have been separated from the composite video signal.

Suppose you were servicing this particular receiver and the complaint was improper sync.

Figure 7. Waveforms at the output of the second sync separator stage (V-2) with the oscilloscope synced at half the vertical rate (A), and at half the horizontal rate (B). Note the almost complete absence of picture information; only the sync pulses remain.

In viewing the wave forms, you found the wave form at the output of V1 was correct, but that the wave form at the output of V2 varied from that shown by the manufacturer. This would indicate a defect between the output of V1 and the output of V2. The next step in isolating the trouble would be to view the pulse at the grid of V2 to see if distortion is occurring in V2 or ahead of that stage.

As you can see, the oscilloscope is very valuable in servicing this type of complaint as it makes it possible to quickly locate the stage causing the trouble whereas it might be extremely difficult by any other means. For example, the defect could be an open condenser which would not affect the operating voltages but would prevent the signal from passing through the various stages.

There are many variations that will be found in TV receiver sync circuits. In some sets, the circuit may be comparatively simple; it may consist of only one stage. In other sets, elaborate circuits employing many stages will be found. The procedure for viewing the wave forms and tracing the sync signal, however, is identical in all sets.

Sweep Circuits

In discussing the sweep circuits, both the vertical and horizontal circuits must be considered. In some respects, the circuits are similar but the vertical circuit is usually simpler. To give you as much help as possible, the two will be discussed separately.

Vertical Sweep

Fig. 8 shows a typical vertical sweep circuit consisting of a vertical blocking oscillator and a vertical amplifier stage.

Where the trouble is no vertical sweep, you face a number of possible defects. The trouble may be that the oscillator is not operating, or there may be some defect in the sweep output stage or the vertical deflection coils may be defective.

You can quickly determine whether the oscil-

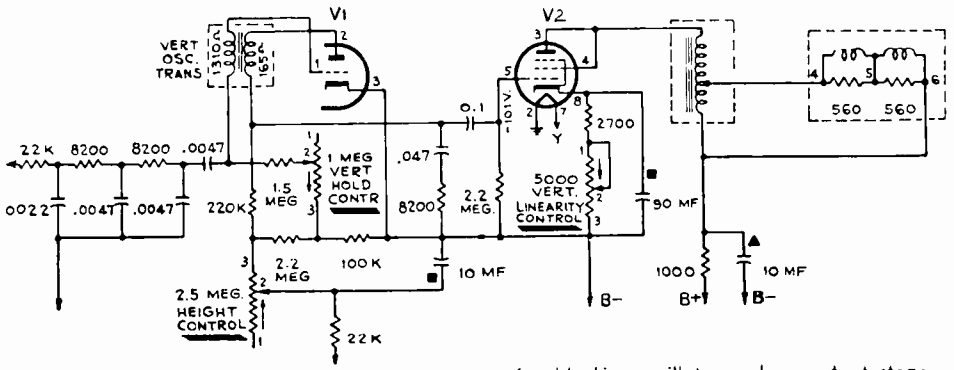

Figure 8. Typical vertical sweep circuit consisting of a blocking-oscillator and an output stage.

lator is operating by viewing the wave form at the output of the vertical oscillator stage or at the input of the vertical amplifier stage. If the oscillator is operating, you will obtain a pulse at the plate of V1, and if the coupling condenser is good, you will obtain a pulse at the grid of V2.

Actually, this is nothing more than the same process of signal tracing being repeated in the vertical sweep circuit. As we pointed out previously, the oscilloscope is invaluable as a signal tracer in all sections of the TV receiver.

Distortion in the Vertical Sweep can be located easily. It simply involves viewing the wave forms at the various points in the vertical sweep circuit starting at the oscillator and working toward the deflection yoke, and comparing the wave forms obtained with those shown in the service information. At some point, the wave form obtained will vary considerably from that shown in the service information; the defect is between this point and the last point at which the correct pattern was obtained. With practice, you will be able to recognize the correct wave forms in most circuits without referring to the service information.

Incorrect Sweep Frequency. When the vertical oscillator runs at the wrong frequency the trouble may be due to a defect in the vertical sweep circuit or in the sync circuit. If it is possible to sync the vertical oscillator, even though it may be at the wrong frequency, the trouble is invariably due to a defect in the vertical oscillator stage. If the vertical oscillator will pass through the proper frequency, but will not sync, the trouble is in the receiver sync circuit.

If the vertical oscillator will sync, even though at the wrong frequency, the chances are it is operating at either 30 cycles per second or 120 cycles per second. You can easily determine whether the oscillator is running too fast or too slow. You know that the vertical oscillator should operate at a frequency of 60-cycles per second. By feeding a 60-cycle power line frequency signal into the oscilloscope and adjusting the various controls so that a certain number of traces—four cycles are usually most convenient —are obtained. Then connect the oscilloscope to the vertical oscillator and compare the number of cycles present. If you have half as many as you had previously, the oscillator is operating at 30-cycles per second; if you have twice as many, the oscillator is operating at 120-cycles.

If the oscillator operates at a higher than normal frequency, usually a resistor has decreased in value or the capacity of a condenser has decreased. There could also be some defect in the blocking oscillator transformer. If you find that the oscillator operates at a lower than normal frequency, some component in the circuit may have increased in value or the blocking oscillator transformer is defective. It is unlikely that a condenser would be causing this trouble unless someone has worked on the set previously and installed a condenser of the wrong value somewhere in the circuit. Resistors, however, frequently increase in value. This is particularly true of the resistor connected between the vertical hold control and the grid circuit winding the vertical oscillator transformer.

The Horizontal Sweep

There are several different horizontal sweep oscillators commonly used in modern TV receivers. For illustrative purposes, we have chosen two of the most popular. You will encounter circuits of these two types many times in the future.

Saw-tooth AFC System. Fig. 9 shows a popular horizontal oscillator-control circuit. The wave forms that you can expect in typical circuits are also shown on this diagram.

In this circuit, the incoming horizontal sync pulses of equal amplitude but opposite polarity are fed to the two sections of the 6AL5 diode. The plate of one section of the tube receives a

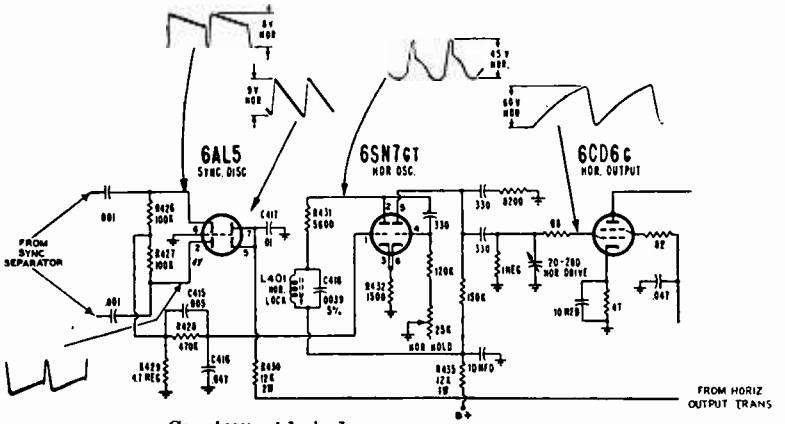

Figure 9. Typical horizontal oscillator-phase detector circuit with waveforms at various test points.

Courtesy, Admiral.

positive pulse at the same time that the cathode of the other section receives a negative pulse. Because of the polarity of these two pulses, both diodes will conduct, but during the interval between pulses, the diodes will be kept cut off. In addition, a saw-tooth voltage from the horizontal sweep output transformer is fed to the circuit.

If the horizontal retrace portion of the cycle fed from the horizontal output transformer occurs at the same instant as the horizontal sync pulses, the voltage at the junction of the two 100K-ohm resistors will be zero. Therefore, no control voltage will be fed to the 6SN7 horizontal oscillator stage.

If the horizontal sweep signal is not in step with the sync pulses, however, the circuit will develop a control voltage that will change the horizontal oscillator frequency and bring the oscillator in step with the incoming sync pulses.

In some cases, a defect in the sync discriminator stage will cause a relatively high control voltage to be developed. This will sometimes drive the horizontal oscillator so far off frequency that the efficiency of the horizontal output circuit will decrease considerably and no raster will be produced. When you are called upon to service this type of circuit, first short out the control voltage and see if the oscillator will operate normally. (In the circuit shown in Fig. 9, short Pin 1 of the 6SN7 tube to the chassis.) Then try to adjust the horizontal oscillator. If you cannot do so, there is some defect in the horizontal oscillator circuit. With the control voltage still shorted, check the voltages, etc., in that circuit.

If the horizontal oscillator is working, but the complaint is improper sync, check the wave forms in the entire circuit and the individual parts in the sync discriminator.

To adjust this type of circuit, short out the control voltage as mentioned previously, set the horizontal hold control to the center of its range, and adjust the slug in the plate circuit of the horizontal oscillator to approximately the correct point. Then remove the short and readjust the slug in the horizontal oscillator circuit if necessary.

The information on servicing this type of circuit will prove useful many times in the future because this type of oscillator is used in so many commercial receivers.

Pulse-Width Oscillator. Fig. 10 shows the pulse-width type of oscillator circuit used in many modern receivers. The wave form adjustment requires the use of an oscilloscope. Complete readjustment of the horizontal oscillator transformer is often desirable when you service the receiver because you may be able to prevent future trouble. This is particularly true if it is necessary to replace any component in the horizontal oscillator circuit.

The horizontal frequency must be adjusted first. To do this, tune in a reasonably strong TV station, set the horizontal hold control to the center of its range. The picture should sync. If it does not, adjust the horizontal frequency slug of the oscillator transformer.

Then turn the horizontal hold control fully counter-clockwise. Momentarily remove the signal by switching off channel, then back. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars just before the picture pulls into sync. If more than nine bars are present, just before the picture pulls into sync, adjust the horizontal locking range trimmer for slightly greater capacity; if less than seven bars are present, adjust the horizontal locking range trimmer for slightly less capacity. Then momentarily remove the signal and again recheck the number of bars present

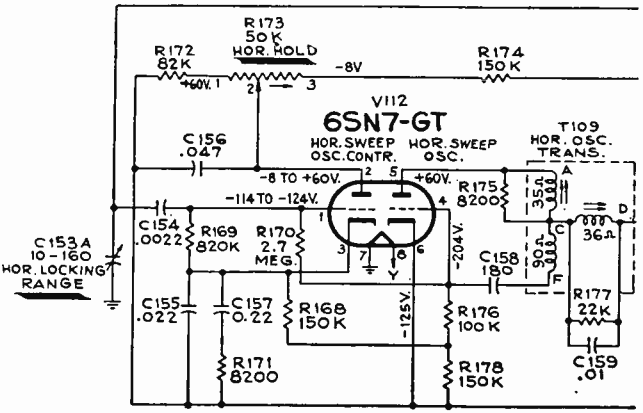

Figure 10. The pulse-width type of horizontal oscillator circuit.

at the pull-in point. Repeat this procedure until 7 to 9 bars are present.

Then connect a 25-mmf. condenser (or a low-capacity probe) to the oscilloscope input lead and connect the free end of the condenser to the junction of the two coils in the horizontal oscillator transformer (terminal C in Fig. 10). The signal obtained at that point will be similar to that shown in Fig. 11. The two peaks should be of equal amplitude. If the broad peak of the wave is lower than the sharp peak, the noise immunity of the circuit will be poor, the stabilizing effect of the tuned circuit will be reduced and the problem of oscillator drift will become more serious. On the other hand, if the sharp peak is lower than the broad peak, the oscillator will be over-stabilized, the pull-in range will become inadequate and the broad peak can cause double triggering of the oscillator when the horizontal hold control approaches the clock-wise position. Adjust the horizontal wave form control on the horizontal oscillator transformer so that the two peaks are of equal height as shown in Fig. 11.

After you have adjusted the horizontal oscillator wave form, set the horizontal hold control all the way counter-clockwise and momentarily move the signal by switching off channels and back. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync. If more than three bars are present, adjust the horizontal locking range trimmer for slightly greater capacity; if less than three bars are present, adjust the condenser for slightly less capacity. Turn the horizontal hold control counter-clockwise, momentarily remove the signal, and again recheck the number of bars present at the pull-in point. Repeat this procedure until three bars are present.

TV ALIGNMENT

An oscilloscope when used in connection with a sweep signal generator and a marker generator (like the NRI Model 89) is very useful in aligning TV and FM receivers. Fig. 12 shows the connections between the oscilloscope, the receiver, and the sweep generator when viewing the over-all video i-f response of a TV receiver. Fig. 13 shows the type of trace that will be obtained when the oscilloscope is properly adjusted. (To prevent the marker signal from distorting the trace as shown in Fig. 13a, connect a .001-mfd. condenser across the scope input circuit or use a resistive isolating probe. Fig. 13B shows the trace when the condenser is connected across the scope input circuit.)

When using the oscilloscope with a sweep signal generator, the horizontal sweep signal must be obtained from the generator and fed to the horizontal input circuit of the oscilloscope. Complete information on doing this is given in the instructions that accompany the sweep generator.

It is impossible to give general instructions for aligning the video i-f section of the TV receiver because the circuits vary considerably from one receiver to another, and the alignment procedures also vary. You should always consult the service information.

Figure 14 shows a typical discriminator "S" curve. Instructions for connecting the sweep generator and the oscilloscope to obtain this pattern will be given in the receiver service information. Also, there are other types of curves that may be obtained.

Conclusion

Only a few of the many uses of a *wide-band* oscilloscope have been discussed above. In addition, percentage of modulation in AM transmitters can be checked. Square-wave analysis can be used to check the frequency response of amplifier stages, including those used in hi-fi

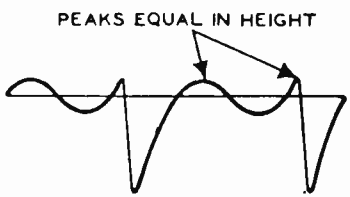

Figure 11. The pattern indicating correct adjustment of the waveform coil in the pulse-width oscillator circuit.

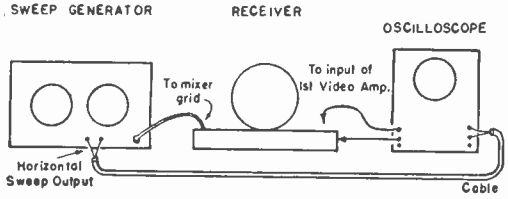

Figure 12. Diagram showing basic connections between the sweep generator, the TV receiver, and the oscilloscope.

equipment. Many other useful tests can be made.

Now that Color Television is a reality, the *wide-band* scope has become even more important to the Teletrician actively engaged in service work. For servicing color receivers, an oscilloscope with a vertical amplifier response flat to at least 3.58 mcs. is necessary. Even wider frequency response is desirable.

For latest technical specifications on the new *wide-band* Model 56 NRI Professional TV Oscilloscope, just drop a postcard to Supply Division, National Radio Institute, 16th and You Streets, N.W., Washington 9, D. C. A custom scope probe kit designed for use with this scope (and the previous NRI Model 55) is also available. Time payments can be arranged.

Figure 13. A pattern like that shown in A will be obtained when the input of a wide-band oscilloscope is used. To obtain a usable trace like that in B the frequency response of the scope must be temporarily decreased by connecting a small condenser across the input or by using a resistive isolating probe.

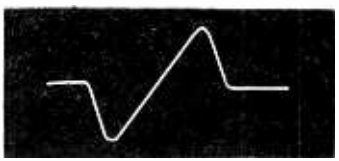

Figure 14. Typical discriminator "S" curve.

Brilliant Pupil

Teacher: Bobby, give me a definition of radio.

Bob: Well, if you had a long dog to reach from New York to Washington and if you stepped on his tail in New York you would hear his bark in Washington. That's telegraphy.

Teacher: What has that to do with radio?

Bob: Radio is the same, without the dog.

Submitted by Student M. Babrick
Sudbury,
Ont., Canada

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Telephone Company Needs Men in North Dakota With Radio-Electronic Background

A recent letter from NRI graduate Henry C. Grefe stated that his employer, the Northwestern Bell Telephone Co. is looking for men with training or aptitude in Radio-Electronics as applicants for positions in North Dakota. For information write to Henry C. Grefe, 69 North 18th Ave., Fargo, North Dakota.

Our Cover Photo

The NRI family of employees at a dinner in the East Room of the Mayflower Hotel in Washington, D. C. This photo was taken on December 7, 1954 on the occasion of completing the 40th anniversary of the founding of the Institute.

Mr. Smith, always thoughtful in his relations with his employees, is usually the one to plan and sponsor unusual events concerning NRI. This time we had a turn about—the employees arranged the dinner to honor Mr. and Mrs. Smith.

It was probably the only time in the 40 years employee-employer relations at NRI that Mr. Smith did not have to pick up the check—and he enjoyed it immensely.

More information regarding this event is given on pages 12 to 14.

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TV Servicemen Needed— Illinois and Iowa

NRI was recently contacted by the firm of Block & Kuhl Co., P. O. Box 839, Peoria, Ill. Qualified TV Servicemen interested in work in this area should send brief resumes direct to the firm.

A beloved couple, Mr. and Mrs. James E. Smith, who were the guests of NRI employees on a memorable occasion celebrating the completion of the 40th year since the founding of the National Radio Institute.

Mr. and Mrs. J. E. Smith are Honored At Dinner Given by NRI Employees

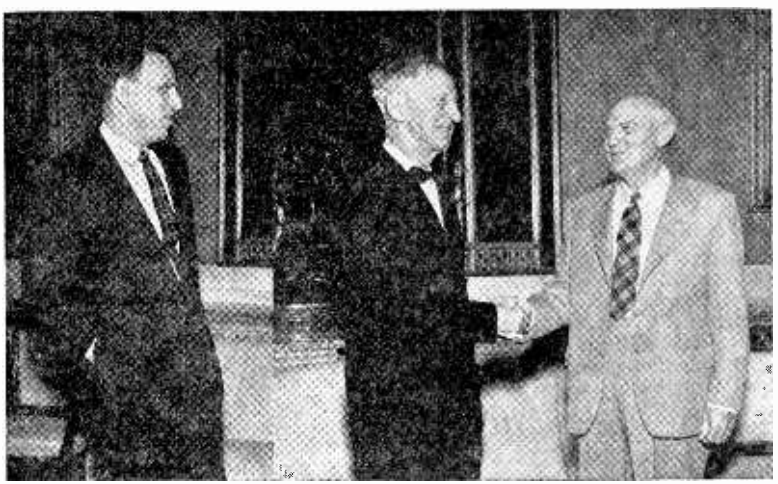
ON the evening of December 7, 1954, the employees of the Institute held a testimonial dinner in honor of the Institute's beloved founder and President, J. E. Smith and Mrs. Smith. It was a heartwarming affair in the East Room of the Mayflower Hotel in Washington. The occasion was to commemorate the fortieth anniversary of NRI and to honor Mr. J. E. Smith, who founded the Institute in 1914 and who has served as President for all these years.

Before the dinner Mr. and Mrs. Smith met and were congratulated by employees and talked over "old times." A photographer was on hand to catch a number of memorable shots, some of which appear in this issue of the NEWS. No detail was overlooked, thanks to the committee consisting of Bert Edgerton, Doris Jessie, Mary Pelton and George Hartman. Mr. Hartman did a splendid job as Master of Ceremonies.

Mr. Smith has always placed a high value on the element of time. Students and graduates who, because of other responsibilities, find it necessary to pursue their NRI Courses evenings and week-ends will be interested to know that in the early days of the Institute, Mr. Smith taught electricity in high school five days a week and in addition, had special evening and Saturday classes. Somewhere in between these activities he found time to teach his NRI students, too. It was part of his own moving story in responding to the presentation of a scroll bearing the signatures of all employees of the Institute, that more often than not, his family had retired for the night when he came home and that usually he left in the morning before they were up and about.

Mr. Smith receives hundreds of letters from students and graduates. Many of these are short success stories which are genuinely inspiring. On the day of the dinner one such letter was received which seemed to fit in so well with the spirit of the occasion it was deemed fitting to read it to the group. The letter was from Lawrence Martin of New Orleans, Louisiana, and reads as follows:

"As you know, about twelve years ago I came



J. E. Smith and E. L. Degener congratulate one another on their long association. Mr. Degener, who is General Manager and Treasurer, has been with NRI since 1918. That figures to be 37 years. J. Morrison Smith, son of J. E., and Vice-President and Secretary of the Institute, looks on approvingly.

Mrs. Smith and Mr. Smith, in the receiving line, chat with Mrs. Doris Jessie while other girls wait their turn. They are all part of the NRI family.

to you with only an 8th grade schooling. At that time you wanted to know if I had AC or DC in my home. I told you I had DC and it was not until I received my first lesson that I found I had AC. That's how much knowledge I had about electricity.

"Twelve years ago I did not own a home or auto—not even a good suit. Now, twelve years later I have just finished your latest TV Course. As you know, I did not have to write to ask one question. Everything was so clear. I have fixed many TV sets, thanks to NRI.

"Some people invest $200 in banks and stocks and get back $10 or $15. I invested $300 with you over a twelve year period. Now, let's see what I got in return: A home, a car, a rented apartment, security for my family, a complete TV set that I assembled, a scope, a signal generator and many other instruments.

"I have a son six years old and there is money in the bank for him to take the NRI Course when age permits.

"How can you give so much for so little! Radio men stop to talk and get advice. I tell them the best advice I can give them is to take the NRI course. Your records will show that at least ten took my advice.

"One of the main things I liked about taking your course was that you seem so glad to help one get ahead.

"How can I ever thank NRI for what you have done for me and my family?"

During the informal program which followed the dinner, Mrs. Smith was presented with a lovely corsage from the employees of NRI. She responded with appropriate remarks, expressing her appreciation of the occasion.

There were brief talks by many employees including some who have been with Mr. Smith almost since the founding of the Institute. There were many references to the early struggles of the Institute and the many sacrifices made by Mr. and Mrs. Smith to lay the solid foundation upon which the Institute has been built to its present place of leadership in the field of home study Radio, Television and Electronics training.

A most enjoyable evening was concluded with the singing of Auld Lang Syne.

RISE OF ELECTRONICS GIVES INDUSTRY NEW IMPETUS

By GEORGE ERICSON

Financial Editor of the *Christian Science Monitor*

Reprinted through the courtesy of "The Christian Science Monitor"

THERE was a time when the widespread use of electricity induced people to speak of the Age of Electricity. Today the talk is about the Age of Electronics, even though electricity is at the base of it. Hardly a week goes by without the announcement of some new electronic development which seems likely to change old processes, old applications, old habits.

A short while ago came the news of a device developed by the Army which shows hidden defects in armor plate, in cannon, or in steel, regardless of thickness, by means of ultrasonic sound waves. In the development stage is an electronic apparatus that will thaw frozen foods quickly. Then there is the device, attachable to a telephone, which permits everyone in the room to hear and converse with a person a thousand miles away without being near the telephone but grouped as in ordinary party conversation. Recently developed is a new "thinking" machine which can perform 10,000,000 operations an hour.

The foregoing are but a few illustrations of a natural science which is changing the face of industry. It took the automobile industry 16 years to reach the stature of a billion-dollar business. Electronics jumped to a $5 billion sales level in six years, and hardly anyone is inclined to scoff at the estimate of a $20 billion production total by 1965. It is probably just as true that electronics is creating a revolution in industry as that the automobile caused a revolution in transportation.

The offices of today are being gradually transformed by the products of electronics—devices such as the electronic calculator and computer, the intracompany closed circuit television, the electric typewriters and adding machines, the telepax, the teletype, the use of tape for recording data, etc.

Factories are being modernized and speeded up by automation, another term for the use of automatic devices which chart control, scan, and measure operations, and at the same time give warning of changes that may require adjustment. Ford and General Motors are spending hundreds of millions of dollars on processes that can be automatically directed.

Electronics and the Home

The home also feels the effect of the electronic invasion. The radio and the TV are the leading examples, but electronics is tied in with air conditioning, with burglar alarms, with incinerators, with cooking foods in a matter of seconds, and with many of the appliances used in the kitchen.

The armed forces are today dependent on electronic devices, like airborne television, radar, sonar, etc., for much of its mobility, efficiency, and striking force. They direct gunfire from the ground with pinpoint accuracy; they function with an electronic computer in defense aircraft, controlling the plane's flight and automatically firing rockets at the exact split second required after the enemy has been sighted on the radar scope. The Lockheed F-94-C carries 1,200 pounds of electronic equipment.

Even more intriguing is an electromatic machine which decodes messages from guided missiles broadcast back to earth during tests, the readings from the transmitters being derived from variations in pitch which come out on punched cards for electronic computation. The cost of these devices in a new type military plane is put at 40 per cent of the total cost of the craft.

Indispensable in Communication

In the communications field electronics today is indispensable. There are at present between 525 and 550 telecasting stations authorized, of which more than half are reaching 170 markets. It is expected that before very long 1,000 stations will be on the air. Merely furnishing the transmitting equipment is a billion-dollar operation, supplied by such concerns as Radio Corp., General Electric, and DuMont.

Another side of communications is to be seen in the production and use of electronic photo composition. Various firms have developed typeless typesetting machines which make possible the printed page without the usual type slugs. Photon Company has pioneered in this field, and others, like Mergenthaler Linotype and Consolidated Vultee Aircraft, have developed electronic devices which obviate the use of bulky machine composition.

Other improvements in this field are the Bell Laboratory card translator, the magnetic drum storage system of Magnafiles, Inc., which makes available at a moment's notice the data on millions of documents. Outstanding in communications advance is the closed circuit television, which is finding great favor with industry, com-

merce, and merchandising. A recent illustration was the bringing together by this means of the officers of all the units of a nationwide hotel system on screens where they could see and talk with each other as the audience looked on.

Electronic Revolution in Industry

The industrial uses of electronics are too numerous to mention in detail. A few such are the automatic elevator control systems developed by Westinghouse Electric and Otis Elevator, the TV eye which watches over the strip mill operations of U. S. Steel's Gary, Ind., plant, RCA's magnetic tape which eliminates the need for film processing, Raytheon's single-motion duplicator which helps make duplicate machined parts from a master pattern, and Goodrich's radioactive eye which controls the rubber coating of fabrics to within a millionth of an inch.

Again, there is the axle-testing machine used by Detroit-Timken Axle Co. which subjects axles to tests that simulate actual driving conditions, Beckman Instruments devices which measure the alkalinity of solutions and others which measure precisely electrical resistance, Clark Controllers machines which control the operation of "continuous lines," etc. These are but an indication of the vast substitution of mechanization for human hand and eye.

Nothing has been said of the transitor, the tiny power-saving substitute for the vacuum tube which makes possible the construction of lighter, more compact electronic devices in commercial and armed services applications. Other basic functions are aided by such comparatively new things as microwave apparatus, the resistor, the diode, the rectifier, and the capaciator. Industries are being built on their uses and scores of old and new concerns are finding profit in their production.

nri

Thanks For Your Greetings

For the many cards and letters sent to us by our students and graduates during the Holiday Season, we want to give our sincere thanks.

These expressions of good will and loyalty to NRI are greatly appreciated.

J. E. SMITH and STAFF

Now—Traffic Lights to be Controlled by Electronics

The General Electric Company announced that it has received a contract to design, develop and manufacture a radio controlled traffic light system for the City of Chicago.

The electronic system, the first of its kind in the world, will be used to control traffic signals in a heavy traffic area just north of Chicago's Loop. Initially, traffic lights at thirteen intersections will be radio controlled.

The system, to be supplied by GE, features the use of electronic tones which are transmitted by FM radio like that widely used by fire and police departments.

According to Chicago's traffic engineer, Ralph Michel, the cost of installing conventional means of controlling the traffic signals was prohibitive. After several years of intensive investigation, it was found that radio control would be much less expensive. In addition, the necessity of laying underground cable with accompanying torn up streets and inconvenience to traffic is avoided.

It is expected that the equipment will be installed and operating within the next six months.

The radio antenna and transmitter for the new system will be located on top of the Board of Trade Building, the highest point in Chicago. The central control station, which will be located a short distance away in City Hall, will be connected to the transmitter by an existing underground cable.

At pre-determined times each day, a master mechanism in the central control station will activate a tone signal. The signal will be carried by the underground cable to the transmitter and broadcast to the lights. In the receiver, at each intersection that the signal is intended to control, will be a corresponding tone switch, or de-coder. Each decoder will select the signal designed for its intersection, and ignore those intended for other intersections.

The corresponding tone switch in the traffic light control box at the intersection will respond to the received tone signal by changing the program (the length of time of green, yellow and red) of the traffic light. Each change of program will be accomplished in a fraction of a second.

In addition to pre-determined program changes accomplished automatically, the radio controls can be operated manually. This will allow the programs of the traffic lights to be operated in the most desirable sequence during an abnormal condition such as bad weather.

Servicing Printed Circuits and Chassis

Advantages of P-C Networks. Testing for Trouble. Replacing Individual Components. Soldering Cautions.

By JOHN ROGERS

Reprinted from TECHNICIAN Magazine, Caldwell-Clements, Inc., 480 Lexington Ave., New York, N. Y.

LIKE every development with which the man on the bench is not yet fully familiar, the printed circuit gets its share of hostile scrutiny. It seems like just one more gimmick designed to add to the serviceman's problems. Nevertheless, the use of these units does provide a number of advantages.

For one, the problem of stocking replacements is minimized. Consider, for example, the fact that two widely-used vertical-integrator assemblies account for millions of TV receivers produced by close to a hundred manufacturers. For another thing, once a successful test procedure is worked out for a given network, this same technique may be applied to the same and similar units every time they come up for servicing.

These advantages will be even more tangible with the newer units involving inductors. I-F systems are a conspicuous case of circuit variation from one receiver to another. The advent of printed i-f transformers and traps can conventionalize design around these units to a far greater extent than has been true in the past. In addition, these new i-f components permit the kind of chassis mounting that makes alignment mechanically convenient.

Recently developed i-f units are a good case in point. In Fig. 1, a printed i-f transformer and its shield can are shown. (A conventional i-f transformer and can are shown below this sketch for comparison purposes.) The rectangular-spiral tracings on the plate are the printed i-f coils; the screws mounted on the metallic discs are adjustable for alignment purposes. The holes punched in the *side* of the can provide access to the adjustments when the assembly is mounted on a chassis.

Two advantages accrue from this arrangement: 1—All adjustments are available from the *top* of the chassis, making a touch-up alignment possible without removal of the receiver from its cabinet. 2—Since many manufacturers find it convenient to place i-f cans under the bell of the picture tube, manipulating the top adjustment of the conventional transformer is made difficult. Side mounting of the adjustments on the printed transformer simplifies the adjustment problem.

Notwithstanding their real advantages, printed networks present a challenge when something goes wrong in a circuit where one is used. Checking them involves a little forethought. Some key questions have to be considered in advance: Should you replace the complete printed unit, or is it practical to replace a single defective component within the network? If so, how closely can you isolate defects in part of the network only? Is there some special technique for checking the entire assembly?

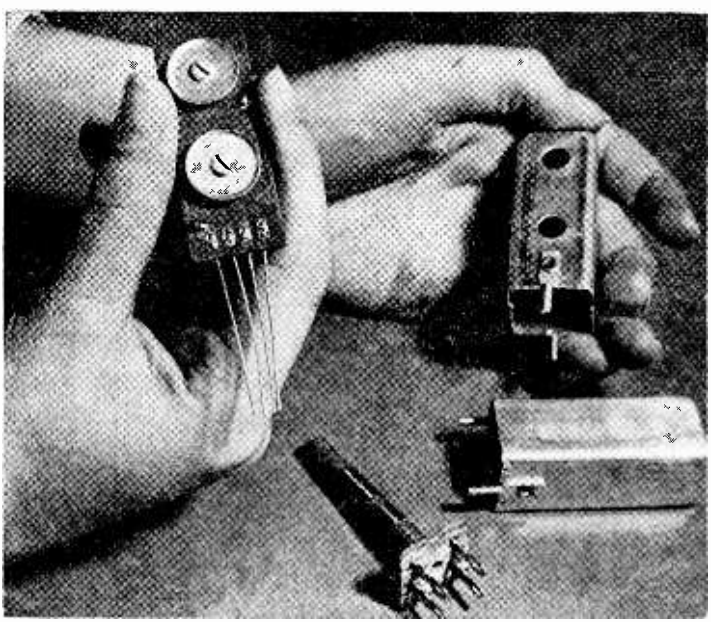


FIG. 1. A printed-circuit i-f transformer compared with a conventional one (courtesy RCA).

Troubleshooting Procedure

Inspection of the network schematic will provide some of the answers. Consider the rather simple ones shown in Fig. 2. In A or B, either of the two components can be checked directly between the tap connection and either of the two end leads. In C, a little more ingenuity is involved. If an ohmmeter placed across the combination yields a reading equal to R-1's value, the resistor is (unless an intermittent is present) normal, and the possibility of a short in the condenser is eliminated.

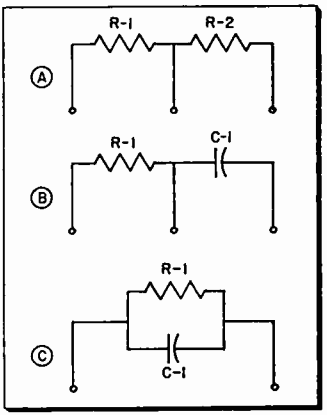


FIG. 2. Schematics of several printed circuits.

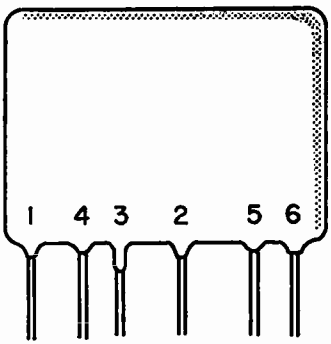


FIG. 3. Typical printed-circuit audio couplate.

The capacitor may, however, be open. This possibility can be checked by temporarily shunting a substitute capacitor across the terminals of the printed unit. When either the resistor or condenser is open, a repair may be accomplished by permanently installing a substitute for whichever component is defective, across the terminals of the printed combination.

When an ohmmeter across the network's terminals indicates a reading lower than the rated value of R-1, the entire unit will require replacement.

The problem is somewhat more difficult when a rather complex network, like the audio couplate shown in Fig. 3 is present. There are six leads on this unit. There are also, as Fig. 4 indicates, six components. These facts do not automatically establish the checking procedure; a little analysis, however, will promote the working out of a suitable test procedure.

The resistors can be handled rather easily. Leads 3 and 4 go across R-1; R-2 connects to leads 3 and 5; leads 2 and 6 come from R-3's terminals. Two of the three capacitors can readily be tested for open circuits, shorts, or leakage; C-1 and C-3 are, respectively, accessible through leads 1 and 4, and leads 5 and 6. A short in C-2 will show up in a resistance check between leads 1 and 5, but be careful about drawing conclusions concerning the presence of such a short, in making the check cited. There is a shunt path between leads 1 and 5, consisting of C-1, R-1 and R-2, which must be considered. In fact, whenever the necessity of testing C-2 arises, the three elements in this parallel leg should be tested *first*. In the latter case, each of the three components is checked individually.

Other networks are tackled differently, of course, but the example shows how the printed circuit can be broken down for troubleshooting purposes. You can work out similar test procedures of your own.

Replacement Techniques

When replacement of a printed network becomes necessary, reference to the schematic and serv-

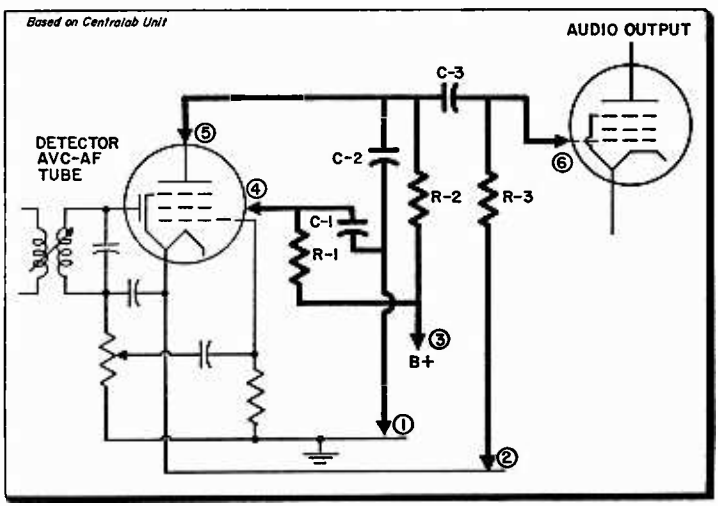


FIG. 4. Schematic diagram (heavy lines) of printed-circuit couplate shown in Fig. 3.

ice data of the receiver involved yields helpful information. In addition to a listing of component values in the circuit, a numbered identification of the leads is generally given. A replacement obtained from some source other than the manufacturer of the original unit may use a different lead numbering system, but this is a minor matter. The replacement unit will generally come with an instruction sheet; if it doesn't, the manufacturer's catalog will provide the desired information.

The mechanics of removing or connecting the printed network, while they differ somewhat from techniques applied to conventional individual components, are equally simple. Excessive heating should be avoided; a low-heat soldering iron is recommended on such jobs. Little heat should be necessary, since these units have mechanical connections that are easily made and severed. The solder originally used for connecting printed assemblies is often of a type that has a low melting point. For this reason, application of excessive heat, when it is desired to disconnect only one of two leads for testing, may melt all connections. A mild withdrawing force applied to the lead with the long-nose pliers while heat is being applied, will promote a more rapid withdrawal. If the lead to be severed is gripped with the pliers close to the point of contact, the pliers will aid in dissipating heat.

Often the printed circuit, instead of being a separate, removable unit, is an integral part of the chassis. This is the case with miniaturized equipment, such as hearing aids or midget portable receivers. In a printed-circuit chassis, considerations concerning the choice of chassis base material are usually very different from those determining the choice in the case of a conventional receiver design. Instead of a sheet of good conducting material, like aluminum, a non-conductive plate is used. The plate is often of bakelite or some other plastic. On this plate are sprayed, stamped or engraved all connecting leads and some components. Good leads are obtained by spraying one or more layers of conducting material on the insulating plate.

Printed Chassis

The underside of a chassis made up in this way, is shown in Fig. 5. In this portable Admiral receiver, printing techniques are used, in the main, to eliminate the use of hook-up wire. Resistors, condensers, tubes and other components, most of which are of the conventional type, are mounted above the chassis board (see Fig. 6). Connections are made to the printed leads through eyelets cut through the chassis. When a section of printed lead is damaged, a jumper of ordinary hook-up wire, soldered across the connecting terminals of the original lead material results in a quick and satisfactory repair. When a resistor or condenser requires replacement, it is most convenient to clip the defective component out of the circuit and to solder the new part to the connecting wires remaining from the original part.

In many pieces of equipment, resistors and capacitors are printed directly on the chassis insulating board, as well as leads. Resistors are

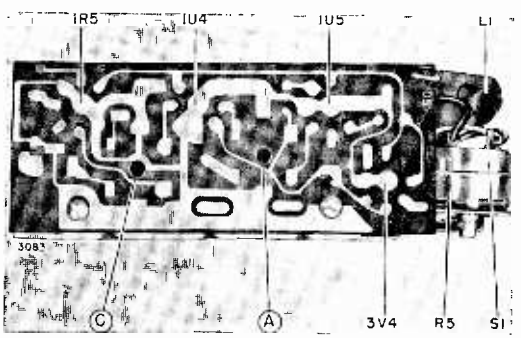


FIG. 5. Underside view of a printed chassis (Admiral 4X1 battery portable), showing routing of printed leads.

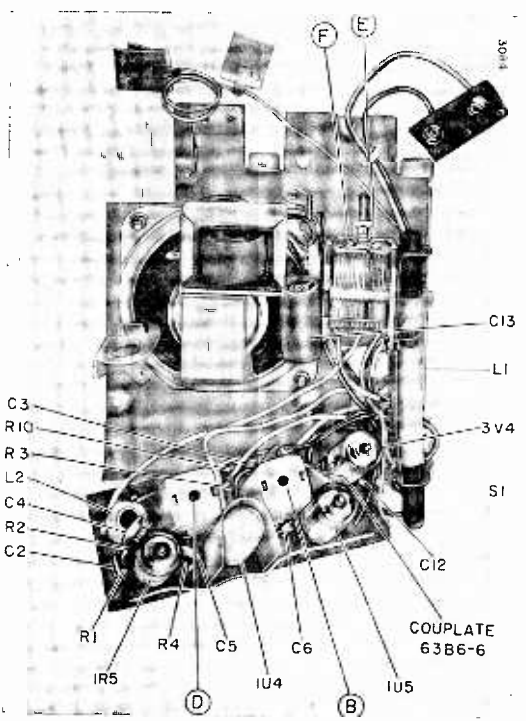


FIG. 6. Top view of the printed chassis shown in Fig. 5, illustrating the arrangement of components.

made by spraying an appropriate resistive material over one area, instead of a good conductor. When such a resistor open-circuits, and it is desired to shunt a conventional replacement across its terminals, it is advisable to scrape away some of the material of which the resistor is made. This is done to make certain that the defective part remains open-circuited.

Condensers are printed on a chassis in a simple fashion. Areas representing the conducting plates are sprayed on either side of an insulating strip or the chassis board itself. When these capacitors give trouble, the cause is usually the formation of dirt or moisture around the plates, which results either in leakage between the plates, or between one of the plates and one of the leads, or between one of the plates and other circuit components. Cleaning away the accumulated foreign matter with a soft brush will eliminate the defect. Coating the affected part with an insulaing spray will prevent a recurrence.

After a little familiarity, the compact printed circuit becomes a friendly and appreciated arrangement, with some distinct advantages over a sprawling, 3-D array of hard-to-find individual components. There is no chance of mis-wiring during assembly, nor can wiring layout vary among individual examples of the same model. In this connection, refer again to Fig. 5. Notice how the clear-cut layout simplifies the problem of circuit tracing.

Admiral offers the following helpful hints on the servicing of its printed chassis, which can no doubt be applied to many other printed chassis as well:

To avoid damaging printed circuits with excessive heat, use a soldering iron (60 watts maximum) with a small tip when replacing parts.

To remove defective parts, apply the tip of the soldering iron to the connection at the underside of the chassis. Keep soldering iron on connection just long enough to melt the solder, then quickly tap the chassis against the service bench to shake the solder away from the connection. After the solder is removed, untwist or separate connections. A pick will be helpful for untwisting or separating connections. After disconnecting wires or lugs, carefully remove parts from the top of the chassis. Before installing the replacement parts, clean the solder from the connection, so the wires or lugs may pass through the holes in the chassis panel. To avoid running solder into adjoining circuits, use as little solder as necessary.

To avoid need for complete tube socket replacement, defective tube socket terminals may be replaced individually.

Note: The tubular shield (center connection) at the bottom of each tube socket must be securely soldered to the printed circuit, otherwise hum or oscillation will result.

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COMMENTS FROM READERS OF NATIONAL RADIO-TV NEWS

"This is to let you know I enjoyed Mr. Straughn's article 'Analyzing a 5 tube AC-DC Superhet' in the latest NRI Magazine. It was very helpful, and I'd like more articles of this type. My boy and I are very interested in Electronics as a hobby, and this article sort of 'ties together' many facts which we'd ordinarily gather from many separate articles. I find it's helpful to trace over the diagram with various colored pencils to show how different circuits perform. Also blackboard work helps.

"With transistors rapidly gaining popularity and becoming cheap enough for experimenting, I'd like to see articles about them, explaining how they work, theory, kinds, etc.

"I like your magazine because it's aimed at the average fellow, not Engineers."

ROBERT J. WERNER
321 North Tenth St.
Allentown, Penna.

"In answer to your recent inquiry (page 15) found in the Dec.-Jan. Issue of NATIONAL RADIO-TV NEWS, please be advised that probably no other method of teaching theory has contributed as much to my learning as has circuit analysis articles found both in the course and in the National RADIO-TV NEWS.

"In studying a receiver in this way, the component takes on a new meaning in relation to the other parts and thusly the set can be viewed as a unified whole.

"Yes, give us more articles of this nature."

MARTIN C. BOVEE
7 Benton Ave.,
Walton, New York

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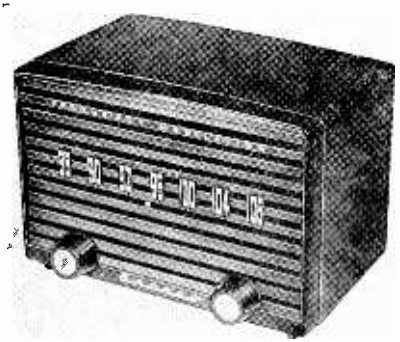
Ed. Note—Another "circuit analysis" article by Mr. J. B. Straughn is scheduled for the next issue of this magazine.

Low-Cost Coaxial-Tuned FM Radio

A complete FM set no bigger than the usual table-model radio and in the same price class, is announced by Granco Products, Inc., 36-17 20th Ave., Long Island City 5, N. Y. Despite compactness and low cost, the Granco Model 610 FM radio, with self-contained antenna, is said to give fine FM performance.



The receiver measures only 7½" w. x 4¾" h. x 4½" d., and weighs 5 lbs. Price is $29.95 in ebony, and slightly higher in blond or walnut.

Exceptional compactness, low price and extraordinary performance are due primarily to the adaptation of the Granco UHF coaxial tuner to FM frequencies and circuitry. The smooth continuous tuner covers the 88-108 mc FM spectrum. The 300-ohm FM antenna is incorporated in the power cord, so that no special installation is required. Model 610 FM radio is strictly package merchandise in the same sense as usual table radios.

Technical details are: Sensitivity of 5 microvolts for 20 db quieting. Stability in terms of frequency drift is plus/minus 5 kc over entire band. Hum level of 80 db below full output. Audio output of 1½ watts, driving the 6" oval Alnico V permanent-magnet speaker. The six-tube complement includes: A 12BA6 rf; 12AT7 Mixer-Oscillator; two 12BA6 i-f; 19T8 Detector-Audio Amplifier; 35C5 Audio Amplifier; and a Selenium Rectifier Power Supply. Operates on ac or dc. 35 watts.

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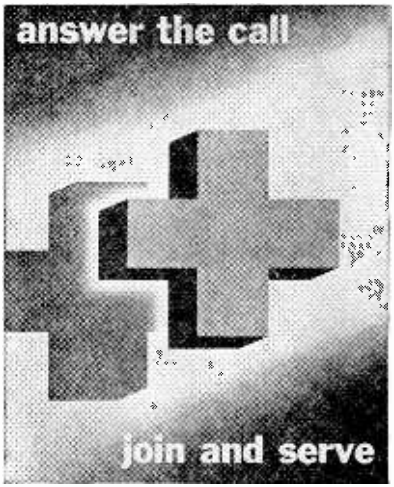
Job Leads

Both TV Benchmen and Outside TV Technicians are needed by the Video Engineering Co., 518 Rhode Island Ave., N.W., Washington, D. C.

Kohler Radio and Electric, Inc., 2221 First Ave., Hibbing, Minn.; need one TV Technician. Contact Mr. A. M. Kohler, President, who is, by the way, an NRI Graduate.



Globe Home Furnishing Co., 17 South Dorcas St., Lewistown, Penna.; need one TV Technician. Contact Mr. Stewart Taub.

Station WTOC (AM & TV), of Savannah, Georgia, recently reported openings for men with 1st. class and 2nd. class radiotelephone licenses. Contact Mr. Kyle E. Goodman, 516 Avercorn St., Savannah, Georgia.

Ed. Note—Because of delay in getting notices in print, some of these jobs may be filled. We advise making initial contact by mail.

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President of Andrea Radio Corporation Gives Credit to Home Study for Beginning of Career in Radio

"Because of the necessity, in my youth, of contributing to family support, the advantages of higher education were denied me. I realized that a specialized education was essential to success in competition with college trained men. Therefore, in the early days of the industry, I turned to home-study to train me for a career in Radio manufacturing. My success as a pioneer in Radio and Television may be credited in a large degree to the excellent training I received from home-study courses."

Cordially yours,

F. A. D. ANDREA, President
Andrea Radio Corporation

A PREVIEW OF 1955

By DR. W. R. G. BAKER

General Electric vice president and general manager of the Company's Electronics Division, Syracuse, New York.

THE electronics industry will follow in 1955 the same fast pace of development and advancement that has marked its progress through the years.

These, I believe, will be the principal developments during the coming year:

Television

The estimated retail sales of 5,800,000 monochrome television units in 1955 will represent a reduction from the near record level in 1954. However, this decline will be offset by the 200,000 expected sales of color television sets. Since each color set is equivalent in dollar value to about three monochrome units, the total TV industry will operate at substantially the same dollar level in 1955.

In color television, tremendous strides were made in engineering laboratories toward increasing the screen size to an acceptable 21-inch size. The laboratories have continued to improve the picture quality.

Radio

The retail radio sales expectancy of 6,500,000 units in 1955 indicates a good comparative standing with previous years. It is an indication that radio has been making a satisfactory adjustment to the expansion of television.

The application of printed wire boards in one of General Electric's new table model radio sets has illustrated the many advantages of the printed wire chassis. The radio set is lighter, more efficient and easier to service and maintain. It also has attractive cost reduction possibilities.

Television Broadcast Equipment

The number of television stations in the United States continues to increase. By the end of 1954 there should be 430 in operation. We are looking forward to the same rate of growth in 1955, which means that at least 530 will be operating by the end of the year.

In 1954, equipment was made available to enable stations to increase power to the maximum limits allowed by the FCC. General Electric was the first to announce a UHF amplifier allowing transmission of 1-megawatt of power, the FCC maximum. G.E. also announced a 23-kilowatt unit for areas needing more than a 12-kilowatt amplifier but not the maximum 45-kilowatt amplifier.

In 1954, we also shipped our first 50-kilowatt VHF units, which with a high gain antenna provide VHF broadcasters with the maximum allowable power. For broadcasters desiring maximum power with a low-gain antenna, the company also has announced a 100-kilowatt VHF amplifier.

The television broadcasting industry also is beginning to swing to color TV. By year end, close to 150 stations will be able to transmit network color and 98 cities will have color network facilities available to them. By the end of 1955, it is believed more than 50 per cent of the operating stations will have equipment to transmit network color.

Equipment to handle color slides and film was shipped to stations in 1954, and the rate of these shipments will continue to increase in 1955.

Another trend in 1955 is the possibility of TV satellite and booster operation. G.E. announced in August the availability of necessary equipment and the first order calls for a 1-kilowatt UHF transmitter to be located in Pasco, Wash., with programming originating in Yakima. Many stations are considering similar operations and this could be a very significant trend in the broadcasting industry.

Germanium

The first quantity production of general purpose transistors in 1955 will constitute a milestone in the electronics industry. Development of these devices has progressed to the point where excellent performance can be obtained. Two transistor types destined largely for military and commercial equipments will be available.

Three sizes of germanium rectifiers are now available which feature improved efficiency and smaller size than alternative methods. Design of these components into all types of equipment will nearly quadruple the volume of business in 1954.

The growth of the computer industry is provid-

ing an expanding market for high quality diodes which improved technology will be able to satisfy.

The significant area of development in semiconductors is towards higher power devices and the design of silicon diodes, rectifiers and transistors for higher temperature operation.

Communication Equipment

Continued growth is expected in sales of two-way communication equipment for use in mobile applications. More and more manufacturers are finding two-way radio a valuable cost reduction tool in the plant. There also is considerable evidence that the trucking industry will greatly expand its use of radio communications during the year. Total industry sales of mobile radio equipment will be approximately 10 per cent above those of 1954.

There is increased interest in the use of microwave equipment for point-to-point radio communications by governmental and private organizations, especially power, petroleum and turnpike users.

Sales of carrier current equipment, which provides telemetering, protective relaying and telephone communications for private utilities, are expected to continue at 1954 levels.

Future applications of new components such as transistors, miniaturized parts and printed circuits to communication equipment will continue the trend toward smaller gear with reliability increased above the present high standards.

Military Electronics

Continued advancement in many phases of military operations impose greater complexity and dependence on electronics equipment. This brings out the need for integration of more and more individual functions. In 1955, greater emphasis will be placed on the need for systems development on a broader scale than ever before.

General Electric's Heavy Military Electronics Equipment Department in Syracuse is on the threshold of electronics advancements which in the near future will increase further our military defensive and offensive capabilities. These advances cover many fields including volumetric scanning radar, air surveillance radar, height finding radar, communications, sonar, guidance and control mechanism, techniques and systems. With added emphasis by the Department of Defense on air defense, quantity production of powerful radar has been required, and the Heavy Military Department is supplying a large percentage of the radar used in our far-flung network. This includes the recently announced powerful height-finding radar for the Air Force. It is being produced in both mobile and fixed versions and has contributed greatly to bolstering the radar defense of the North American continents. This equipment also is going to countries receiving aid from the U. S. under the Mutual Defense Assistance Pact.

Shipments of airborne military electronics equipment by General Electric's Light Military Electronics Equipment Department in Utica, N. Y., during 1954 were at the highest level since World War Two.

Military sponsored research and development projects involving electronics continue in substantial amounts, and the long-range prospects for production of military electronics equipment appear good.

The Light Military Department is active in many fields including fire control radar for bombers and fighters, airborne early-warning radar, communication and navigation systems, indicators and display equipment, and guidance and control equipment for guided missiles.

Electronic Tubes

Next year will see the first use of an improved electrostatic gun which will lower black-and-white picture tube costs while retaining the performance of the more expensive electromagnetic tube now in general use. The new gun offers improved picture detail and good focus across the face of the screen.

The industrial and transmitting tube field continues to expand and become more critical in requirements of its products.

Research

The General Electric Electronics Laboratory is convinced that advancement of the electronic industry depends on development in two major areas—solid state devices, such as ferrites, semiconductors, dielectrics and phosphors, and the applications of information theory.

During 1955, a Signal Corps contract will be completed at the G-E Advanced Electronics Center at Cornell University for automation equipment to assemble automatically electric components onto printed wiring boards.

At the new G-E Microwave Laboratory at Stanford University, four tube development programs were initiated during 1954, and will be continued through 1955. They will be supplemented by eight to ten more applied research programs. These cover the development of high power klystrons, microwave receiving tubes and microwave oscillators. Studies also will be made of the application of these tubes to radar, communications, and countermeasures problems.

Letters from NRI Graduates Show That Training is Key to Success

Obtained FCC License and Job In Radio Station

"I think NRI training is great. I enrolled at the age of seventeen, and decided I would like to enter the Communications field. After forty-two lessons I was the proud holder of a first-class Radiotelephone license. I was immediately employed by a 5,000 watt radio station.

"Since then I have completed my course and received my NRI Diploma. I also hold an amateur radio license, W4QDC.

"My experience proves one point—NRI training is complete, practical and gives a good foundation to build on in the future."

JAY MERLYN SUTER,
Park View, Box 49,
Harrisonburg, Va.

—nri—

Happy In Job as Electronics Draftsman

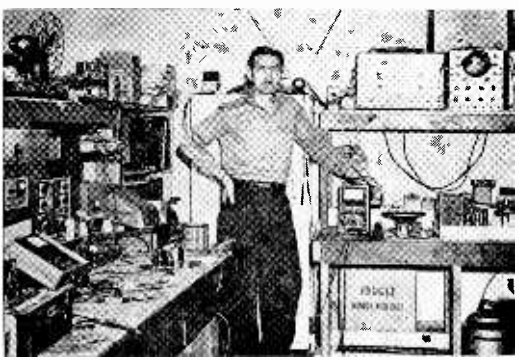
"Through some previous drafting education and the electronics knowledge obtained from your course, I got a job with the General Electric Company Advanced Electronics Center, Cornell University, Ithaca, New York. It is the finest job that I have ever had. The future looks good.

"My immediate superior is also an NRI alumnus. So, thanks to NRI, I have a job which I enjoy and which pays well. My past, present, future, all greatly influenced by NRI. My wife and I realize that the NRI diploma has played an important part in our lives."

THOMAS BILAK, JR.,
RFD 2,
Cayuga, New York

—nri—

Full-time Radio-TV Sales and Service Grew from Spare-time Start



"With time on my hands due to a strike in my regular work, I enrolled with the National Radio Institute. I felt I had nothing to lose. With the coming of each lesson, I became more enthusiastic about the course. Spare time radio repairing became my hobby. I could see television coming to our city in the near future. With this in mind, I bought a store building, heavily mortgaged, of course, and opened my store part-time.

"I obtained franchises from GE, Philco, Motorola, and Emerson distributors. I also became service agency for their sets. Finally, the day came, and now I am devoting full time to radio and television sales and service. For all this I can only thank the NRI which has given me the correct start in the electronic field."

SLAVKO J. PETRICH,
5901 W. Vliet St.,
Milwaukee, Wis.

Praises NRI's Television Training

"What amazes me is the cost of the NRI courses. With today's high prices for almost everything, I don't see how you do it. The Radio-TV course which I completed, is probably the best buy I will have in many years to come.

"If a person is capable of learning TV at all, they certainly will know TV when they finish NRI training. It covers just about any phase of repair, adjustment and installation—one of the most complete courses I have ever seen or taken."

JOHN H. JOHNSON,
Box 267,
Boise City, Okla.

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Handicapped—Has Shop in Home

"I have to work from a wheelchair. When I took your course, all the money I had was the $5 down payment. After about fourteen lessons I started repairing radios, bought test equipment, and made the monthly payments on my course with my earnings.

"At the present time I have my shop in the back of my home. I do not have any signs outside, and all the advertising I get is from satisfied customers.

"Your course means more to me than words can express. If it had not been for this training. I would have to do without a lot of things that I now buy out of my own earnings. Thanks to everyone at National Radio Institute for the wonderful help."

LIONEL VERBLE,
Box 116,
Vanduser, Mo

Former Textile Factory Worker—Now Independent Businessman

"When I received my diploma from NRI, I was working in a textile factory, renting my house, and trying from week to week to make ends meet. Today, less than four years later, I own two homes, have a new Chevrolet station wagon, and also own one of the most modern TV-Radio service shops in this section.

"We specialize in service only. This gives us all the work from furniture, appliance, and department stores. Some fellows tell me that we have the headache department. However, anyone who has mastered NRI's Servicing Course doesn't consider servicing a headache. He considers it a pleasure."

ARGIE C. TAYLOR,
824 W. Main St.,
Glasgow, Ky.

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As space permits, from time to time, we plan to devote a page or two in NR-TV NEWS *to short success stories such as above. They are taken from testimonial letters we have on file. Photographs and letters of this kind are always greatly appreciated by us. We feel we should pass them on to our readers for the inspiration to be gained from a reading of them.*

N.R.I. ALUMNI NEWS

Thomas Hull of New York City, 1955 President of the NRI Alumni Association.

Chapter Chatter

Philadelphia-Camden Chapter members visited WCAU Skytower and were very courteously received by the engineers in charge. It was an interesting and educational tour.

Henry Lapinski, one of our honorary members, who is service manager of the Motorola Corporation in Philadelphia, will give a talk on Motorola color TV at our next meeting. Mr. William Heath, Service School Supervisor for Westinghouse, has also agreed to pay our chapter a visit in the very near future and talk on Westinghouse color TV.

Our own Harvey Morris gave a talk on how to arrive at proper charges for servicing a Radio or Television receiver in the home or at the shop. He also gave some very valuable tips on how to conduct ourselves while in the home of the customer to help build better relations between the customer and the technician.

On December 13 the chapter elected officers for 1955 and, as well, held a Christmas party. Ted Rose and L. L. Menne of Washington were present on that occasion. The results of the election are as follows:

Chairman .....Fred Seganti
Vice Chairman .....Harvey Morris
Financial Secretary ....Al Schwartz
Recording Secretary ...Jules Cohen
Treasurer .....Charles J. Fehn
Librarian .....John Pirrung
Sergeant-at-Arms .....Ken Smith

Jules Cohen extended himself to do more than

Seated is Bill Morrison, Engineer of WCAU and standing in center with white shirt is Jack Jones who conducted tour of Philadelphia-Camden Chapter members through WCAU Skytower Transmitting Center. Boy in front row standing, is son of Clyde Meadows.

his share to make this party a huge success, as indeed it was. He is particularly anxious to have us mention the hot dogs and sauerkraut of which there was plenty. As much can be said for a great variety of food to suit the taste of all present. And, of course, liquid refreshments were on tap.

New members are Oscar Jacobs, Philadelphia, George D. McCaughey, Hammonton, N. J., Wilson Fernandes, Woodbury, N. J., and Israle Miller, Jr., of Camden, N. J.

Meetings are held on the second and fourth Monday of each month at the Knights of Columbus Hall, Tulip and Tyson Streets. Secretary Jules Cohen will be glad to supply information. His telephone number is FI 2-8094.

Pittsburgh Chapter also elected officers for 1955. They are as follows:

Chairman	Frank P. Skolnik
Vice Chairman	W. R. Elter
Treasurer	H. A. Tate
Secretary	W. L. Roberts
Executive Committee	T. D. Schnader
	W. J. Lundy
	D. C. Benes

The chapter also enjoyed one of its socials in December which was attended by J. B. Straughn and L. L. Menne. There were door prizes galore.

Tom Schnader spoke on ac-dc receivers, William Roberts spoke on Video amplifier design which was augmented by a film through courtesy of the Philco distributor.

Meetings are held on the first Thursday of each month at 134 Market Place. You will like our pleasant meeting hall and you are cordially invited to attend meetings, whether student or graduate.

Flint, Michigan Chapter finds the experiment of meeting on Sunday to be working out very nicely. In fact, their attendance averages about thirty-two to a meeting, which is very good for a small chapter.

The past several meetings have been devoted to a study of the theory and servicing of color TV receivers presented through the courtesy of RCA. An intensive winter program is also being finalized to give the members a thorough training in the use of all servicing instruments used in TV. Members of the chapter act as instructors in demonstrating the use of the instruments.

The chapter is growing. New members are constantly coming in, both students and graduates. In this area some service companies have reduced the service call rate on TV to $3 and $3.50. The chapter takes a dim view of this reduction and has gone on record of adhering to a minimum of $4. Chapter members have been informed that TV customers, generally, are reluctant to call cut-rate servicemen because they fear inferior workmanship and the possibility of extra charges after the call is made.

The Secretary is David J. Nagel, 3135 E. Mt. Morris Road, Mt. Morris, Michigan, who will be glad to supply information regarding future meetings to all students and graduates in the Flint area.

Chicago Chapter reports they have been doing TV servicing just as it is done in the shop. Opportunity is given to ask questions as things progress.

Members are invited to bring a chassis or other electronic problems to the meetings. Secretary Edward Shapel with Chairman Charles C. Mead are giving much of their time to plan good meetings for our Chicago Chapter members. Mr. Mead can be reached on the telephone, Superior 7-4100. He will be glad to speak with any students and graduates in the Chicago area who may be interested in attending meetings.

Meetings are held on the 33rd Floor, Tower Space, 666 N. Lake Shore Rd., at 8 P.M., on the second Wednesday of each month.

Detroit Chapter elected officers for 1955, who were installed immediately. They are, as follows:

Mr. John Nagy of Detroit Chapter, demonstrating tape recording techniques.

If you look close you'll see one candle on the cake in celebration of the first anniversary of Springfield Chapter. Chairman Howard Smith took the picture.

Chairman	Stanley Szafran
Vice Chairman	Harry Stephens
Treasurer	Earl Oliver
Secretary	Ken Kacel
Financial Committee	Percy Brow
	Asa Belton
Program Committee	John Korpalski
	Leo Belton
	Jack Shupak
Sergeant-at-Arms	Charles Mills

A big vote of thanks was extended to all retiring officers with special mention to John Kehoe, retiring Chairman, and Bob Kinney, retiring Secretary, who gave so much to advance Detroit chapter to the high place it holds in our Alumni affairs.

John Nagy, a fellow member, gave a comparison of old and new speakers and sound techniques. Mr. Nagy is a technician with KLA Sound Laboratories and specializes in this field. His talk was very interesting.

At another meeting, a representative of the Michigan Bell Telephone Company spoke on transistors.

The address of Secretary Ken Kacel is 5700 St. Clair, Detroit.

Baltimore Chapter elected the following to serve during the year 1955:

Chairman	Joseph B. Dolivka
Vice Chairman	E. M. Gosnell
Secretary	Joseph M. Nardi
Treasurer	John E. Hard
Librarian	James A. Hurka
Sergeant-at-Arms	A. G. Hooper
Auditor and Technical Consulant	H. Rathbun

Some members of Springfield, Mass., chapter. Note the nice seating arrangement they have at the Army Reserve Armory, through courtesy of Lt. Col. J. J. Sullivan.

Our twentieth anniversary celebration was held on December 16 with a dinner at Munders, one of Baltimore's leading restaurants. It was a gala event, well attended.

Our new National Vice President, Elmer E. Shue, was installed by past National President H. J. Rathbun. Mr. Shue then installed the 1955 officers of Baltimore Chapter.

In February the chapter will hold an "Old Timers' Night." Vice Chairman E. M. Gosnell is heading a committee to contact as many former members of the chapter as possibly can be reached. The report of the committee, made at our last meeting, is very gratifying and we look forward to a big night on this occasion.

An inventory was taken of all chapter equipment. Credit is given to librarian Jim Hurka who did a particularly fine job of cataloging all items.

As this issue goes to press, arrangements are being completed for a tour through Station WAAM in Baltimore.

Meetings are held on the second and fourth

That's a chimney Roy Nystron, Vice Chairman of Springfield, Mass., chapter is reaching into at Christmas party.

Tuesday of each month at 100 N. Paca Street. The Chairman, Mr. Joseph B. Dolivka, can be reached at 717 North Montford Ave., and the Secretary, Mr. Joseph M. Nardi, resides at 4157 Eierman Ave. Contact either for information regarding future meetings.

Springfield, Mass. Chapter is fortunate to have very capable leaders, any one of whom can give a sound talk on Radio and TV servicing. Mr. L. Lyman Brown gave our members some very enlightening information on how to price for service work. In another talk, he devoted himself to the part capacitors play in electronic circuitry.

Mr. Brown and Chairman Howard B. Smith teamed up in an installation of a 21" Sylvania No. 518 chassis, utilizing a fireplace in a home. It is quite a job. Fortunately a photograph has been received. This will be published in a forthcoming issue of NATIONAL RADIO-TV NEWS when we have more room. A full description of this interesting installation will be given at that time.

On December 10 the Chapter held a Christmas party. The members exchanged gifts. Howard Smith, Ray Nystrom and Lyman Brown were kept busy reaching into the improvised chimney that contained the gifts. Some of the gifts afforded good laughs. It was a very fine event topped off with refreshments, including a very tasty cake with one candle on it to signify the completion of the first year since the chapter was chartered.

A nice gesture was a proposal by one of the members that each make a small contribution toward the Toy for Joy Fund for underprivileged children. The members responded nobly.

The nominating committee reported that the members were unanimous in advocating the re-election of all current officers. Thereupon the Secretary was instructed to cast one ballot for the unanimous election of the following:

Chairman	Howard B. Smith
Vice Chairman	Raymond Nystrom
Secretary	A. L. Brosseau
Treasurer	L. Lyman Brown
Executive Committee	Edward A. Kazunas
	Arnold I. Widler
	Nicholas Arthur

L. L. Menne was on hand to immediately install the newly elected officers.

On January 7th Mr. Brown conducted a two-hour question and answer period on Audio-Detectors and Amplifiers, their relation one to the other, their purposes and troubles. On January 21st and again on February 18th, Ray Nystrom will lecture on Electric Organs and Amplifiers.

As the year came to a close, the members expressed great appreciation to Lt. Col. J. J. Sullivan, Army Officer in charge of U. S. Army Reserve Headquarters, 50 East Street in Springfield, where the chapter meets twice a month, beginning at 7:30 P.M., on the second and fourth Friday of each month. The twice a month meetings, instead of the one a month as formerly, was voted for by the members because of great interest in the fine program announced by the officers.

Chairman Howard B. Smith is located at 53 Bangor Street, and Secretary A. L. Brousseau can be reached at 56 Gardner Street in Springfield. Students and graduates in this area are invited to pay us a visit. We are very proud of our comfortable meeting quarters.

New York Chapter announces the election of the following officers:

Chairman	Thomas Hull
Vice Chairman	Phil Spampinato
Secretary	E. E. Paul
Treasurer	Frank Catalano

Executive Committee members in addition to officers, are as follows: Bert Wappler, Lou Kunert, Frank Zimmer, Emil Ruocco, William Fox and Alex Remer.

A loud vote of thanks is given to former officers Bert Wappler, Lou J. Kunert and Frank Zimmer who have served the chapter continuously for eleven years. Their interest in New York Chapter is as great as ever. They will attend meetings regularly. They feel, however, much as the members would like them to continue in office, that the reins should be turned over to others. Moreover, because of personal responsibilities the retiring officers found it increasingly difficult to make the sacrifices necessary to do the good

job they are accustomed to doing. It is for these reasons that they withdrew as candidates this year. The new officers have been well schooled by those who are retiring and New York Chapter will continue to go forward with new blood in this progressive, pulsating organization.

As this is written, news comes to us that Bert Wappler has been confined to a hospital suffering considerable pain from an illness which may be a nerve condition. We sincerely hope Bert recovers rapidly.

Speakers at recent meetings were Edward J. McAdams, who spoke on trade school experiences, Thomas Hull, whose subject was "High Voltage Power Supplies," and William Fox, who spoke on "Field Experiences." Other speakers were Alex Remer, who spoke on "Essentials of TV Trouble-shooting," Phil Spampinato, who spoke on "Oscilloscopes," and again our new National President Tommy Hull, who related some of his experiences in servicing TV and radio receivers. At still another meeting, Spampinato spoke on "Photo-flash Circuits," Hull spoke on "Radio A.B.C.'s," David Spitzer spoke on "TV Repairing," Crez Gomez and Willie Fox gave interesting talks on their servicing experiences.

Meetings are held on the first and third Thursday of each month at St. Mark's Community Center, 12 St. Mark's Place, between Second and Third Aves. in New York City.

Milwaukee Chapter elected the following officers to serve during 1955:

Chairman	Phillip Rinke
Vice Chairman	Robert H. Weining
Secretary	Wallace H. Smith
Treasurer	Louis Sponer
Educational Committee	C. S. Keller
	S. J. Petrich
	J. C. Reed
Finance Committee	Robert Krauss
	C. Kleier

Our new Chairman, Phillip Rinke, took over and immediately promised to donate a duplicating machine and a motion picture projector. He also outlined his program for the year. It sounds mighty good. Incidentally, the new officers have promised sandwiches and drinks at every meeting during the year.

Until further notice, meetings will be held at Petrich's Recreation Room, 5901 West Vliet Street, Milwaukee. Secretary Wallace H. Smith, 1710 East Newport Ave., will be glad to furnish information regarding future meetings.

St. Paul-Minneapolis Chapter is growing steadily. They now have double the space at the Midway YMCA in St. Paul where they meet on the second Thursday of each month. Meetings begin at 8 P.M. An entertainment committee, composed of Robert Cheeseman, George Rail, Paul Donatell and John Balkus, have things in development, soon to be announced, that will appeal strongly to our members.

For the January meeting there is scheduled a service clinic for TV. We have four or five scopes lined up. The members will be split into small groups so that everyone will have a chance to signal trace and find a few defects which we will deliberately install in the TV sets.

We plan to again have with us Mr. Mike Kushill, of the Philco organization, who will speak to us on Philco color TV just as soon as the receivers are on the market. We are making similar arrangements with an engineer from the local RCA organization.

Mr. James Thirtyacre, one of our members, who is employed by KSTP-TV, arranged for us to visit the studios. We were amazed at all we saw. Many of our members had their first opportunity to see a color TV receiver in operation. The staff members of KSTP-TV and KSTP Radio were extremely cooperative and earned the plaudits of all of our members.

Other things on our programs were a talk by Mr. Bransen of Seco Manufacturing Company, who demonstrated the Seco Flyback checker. Mr. Dick Swanson and Mr. Bonament Heyda of the Lew Bonn Company, Electronic Parts Distributors, gave a demonstration of the new Cathode Beamer. The Lew Bonn Company also contributed three fine door prizes in the form of TV lamps which were won by Walt Berbee, Bob Cheeseman and A. K. Placzek. Our thanks to these gentlemen for the excellent contributions to our meetings.

At various meetings, other door prizes were won by Nicholas Barrett and John Berka who received equipment donated by Radio Maintenance Company of Minneapolis. Elmer Buck and A. Wallace won valuable prizes donated by F. C. Hayer Co., local distributor of RCA.

The news from St. Paul, Minneapolis Chapter is prolific, denoting great enthusiasm on the part of the officers.

The Chairman of this Chapter is John Berka, 2833 42nd Ave., So. Minneapolis, and the Secretary is John I. Babcock, 3157 32nd Ave., So., also Minneapolis.

New Orleans Chapter went all out, as the saying goes, at a recent social which was held at the Electrical Workers' Hall through arrangements made by Secretary Anthony H. Buckley. Chairman Louis E. Grossman, working with Mr. Buckley and other officers, made this an outstanding event.

It was a shrimp feast. If you like shrimp you

Here and There Among Alumni Members

Russell A. Thatcher of Delaware, Ohio, now has his own Servicing Business. He was formerly a radio operator for the Ohio State Patrol, and also worked for a while as a laboratory technician in the Applied Physics Laboratory, John's Hopkins University.

———n r i———

Amateur call letters of Art Toneatti, Jr., of Dedham, Mass., are W1ZOC.

———n r i———

Graduate Delbert J. Bohnert of Perryville, Missouri, has been appointed authorized dealer for Bendix Television. Is expanding his business quarters.

———n r i———

Edward Holmes of Randolph, Massachusetts, is a Senior Electronic Technician with Trace Lab., Inc., and doing well in the Engineering Division. Also is an Advance Class Radio Amateur, Call W1NBT.

———n r i———

Denis Blanchon is the proud owner of a thriving business, Pemberton Radio-TV Service Station, Pemberton, New Jersey.

———n r i———

Forrest G. Sealy of Broderick, California, has founded the East Yolo TV Service. Says business is very good. Does service work only, no sales.

———n r i———

John Dohoda, Jr., of Jerome, Pennsylvania, has just received his first-class radiotelephone license.

Graduate John G. Ricklin is establishing his own Radio-TV business in El Monte, California.

———n r i———

Congratulations to George J. Gottsche, Jr., of Saratoga Springs, New York, who has just received his first-class radiotelephone license. He is now contacting radio and TV stations about a position.

———n r i———

Logan P. Stowe, Jr., is Service Manager for Reamond and Hutchins Appliance in Konersville, North Carolina, who are G.E. and Sylvania dealers.

———n r i———

Peter Hnat of Buffalo, New York, now has his 2nd-class radiotelephone license. He says NRI's Communications course gave him the knowledge needed to pass the FCC exam.

———n r i———

Ted Parker, who graduated 20 years ago, writes to say he is General Manager of Waters Mfg. Co., Waltham, Massachusetts, manufacturing potentiometers.

———n r i———

Gred E. Brabandt is Chief Engineer-Announcer at WAYZ in Waynesboro, Pennsylvania, and very happy in his work.

———n r i———

R. C. Robertson and his wife operate Robertson Radio Co. in Shattuck, Oklahoma. He graduated in 1934 and has been doing all right ever since. They handle radios, pianos and music records, according to their letterhead.

———n r i———

Ralph Cates of Haw River, North Carolina, is another graduate of 20 years ago who has had his own Sales and Service business ever since.

Chapter Chatter (continued)

should have an opportunity to attend one of these affairs given by your New Orleans Alumni friends. Mr. L. L. Menne was present at this dinner and confessed that for the first time he had more shrimp than he could eat.

After the dinner there was a short program, during which Mr. Menne brought the chapter up to date on Alumni activities. Then followed a business session at which a full program for 1955 was outlined with Mr. C. E. Davidson, chapter member and prominent distributor in New Orleans, promising to be present at all meetings or arrange for one of his men to conduct the proceedings.

At the next meeting, in line with the above mentioned program, Mr. Davidson gave the members a stage by stage explanation of the building of a TV set, using a blackboard for explanation. Mr. Davidson pointed out various circuit changes and made clear the separation of sound and video in a TV circuit from antenna to speaker and picture tube. Mr. Davidson was assisted by Mr. Mike Schanack.

Officers for 1955 are as follows:

Chairman .....Louis E. Grossman
Vice Chairman .....V. J. Cornelius
Treasurer .....Octave Jumonville
Secretary .....Anthony H. Buckley
Executive Committee ...Alfred Francis
Milton Fogarty

All of the above-named officers were elected without opposition. They were immediately installed. Each officer in turn expressed his thanks to the members and pledged his best efforts at all times to the responsibilities of his office.

At one meeting each member present received two books, one on *TV Principles and Practices*, and the other, *GE Advanced Course in Television Servicing*, which were donated by Mr. Davidson.

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