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# NRI NEWS

Vol. 19, No. 8

April-May, 1961

Published every other month by the National Radio Institute, 3939 Wisconsin Ave., N. W., Washington 16, D. C. Subscription \$1.00 a year. Printed in U.S.A. Second class postage paid at Washington, D. C.

## EDITORIAL: SEEING DOTS . . . . ?

Here's a story I heard some time ago which made a lasting impression. I'd like to pass it on to you.

It's about the sales manager of a well-known firm who, naturally, was disturbed over a sudden drop in business. In an effort to determine why sales were off, he called a meeting of all his salesmen covering a 15 state area.

In front of the meeting room, he placed a large white sheet of cardboard and on it drew a black dot large enough to be seen by all. He asked his men to study the sheet carefully and tell him what they saw. The reply was unanimous -- "We see a black dot."

He asked the salesmen to observe more closely. The answer was the same -- a black dot.

Finally, in desperation the manager said, "All of you see the black dot. Doesn't anyone see the large white surface?"

Anyone who has gone thru the fairyland of childhood has learned life is full of black spots. They seem constant -- frustrations, disappointments, obstacles, or just plain "hard luck." But we don't stop to realize the black spots are the contrast forming the very picture of life itself.

Too many of us look upon life in terms of "spots." We see nothing else. But any realistic examination of happenings of life will prove this sort of outlook is plainly contrary to fact!

Life is actually an abundance of the things that favor us. For every frustration or disappointment you'll find a multitude of good things that further our welfare and happiness. After all, our mere existence as human beings is intended to be a way of fulfillment -- certainly not an instrument for destruction. Yes, the trouble often lies with our outlook --

not life. We're so blinded by things we DON'T like that we only daydream about the riches of life without even knowing these riches constantly surround us.

For instance, how often do we think about the beauty of the earth; the forces and powers of the universe? Isn't this a part of our life? What about the food we eat, the clothes, the homes that shelter us? Or consider the great country we live in, our families, friends? Think of the courtesies, considerations, understandings, sympathies from associates?

Why -- our friendships alone are worth a hundred times more than any obstacle that besets our daily paths.

Once in a while, let's try to pay a little less attention to the black spots and concentrate on the tremendous white surface. It'll make us happier and healthier individuals.

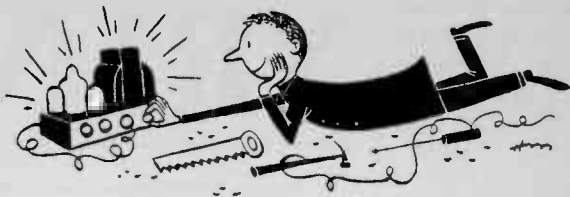
J. E. SMITH

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# Hi-Fi Corner

by  
John G. Dodgson



## Product Report:

COMMAND CSC 100 TEST RECORD

Product report...a test record? Why not? It, like all records, is a component in that it provides a signal source. More important, though, this Command disc is a test instrument - the only type instrument that can be used to check cartridges, tone-arms, and turntables (at least in the field).

**Quick Look:** An excellent and very versatile test record. Although the Command CSC 100 is designed as a demonstration-test record for the technician or audiophile, it is accurate enough for laboratory use.

**In General:** Side No. 1 of the record is devoted to straight tests; side No. 2 contains four demonstration bands (each from a different Command record.) But let's start from the beginning...

The front cover of the album (there are four covers - it opens like a book without pages) is in good taste - a graph of recording and playback curves and the correct name of the record which I neglected to mention: "Command Stereo Check Out." The back cover simply tells what's on the record.

The inside covers of the album provide some interesting notes on sound and its reproduction. Then there is a suggested VU meter circuit - we'll come back to this later. Finally, there is a complete description of the test bands, what they mean, and how to use them. This is the "meat of the information", of course, and it is complete and well written.

So let's look at the record now; first, side No. 1 - the technical data. Bands are provided to identify and then adjust the output level of each channel. The channel identification band, a 1kc tone at 100% modulation, first in the left and then in the right channel can be used to check the separation. Then there is a frequency run from 30 cps to 10kc cut monophonically. Next, there is a metronome type test - series of clicks in each channel - to test speaker phasing. Finally, a piano selection is heard first on one channel and then on the other to help equalize the speakers, acoustically that is, adjust the tone controls,

crossover attenuators, etc., so that the speakers sound alike in the listening room. The last band on the first side is unmodulated, lasts 60 seconds, to check turntable rumble.

The fact that the frequency run does not extend below 30 cps or higher than 10kc and, more significant, that it is cut monophonically seemed surprising to me. However, a discussion with Bob Fine of Recording Studios, who is responsible for the record, was enlightening. He felt that it was of prime importance that the frequencies cut on the record be of utmost accuracy and this could not be guaranteed if range was extended beyond 10kc. Moreover, his test results showed that interference of the right and left channel cartridge elements prevented accurate analysis of the cartridge response unless only lateral modulation (monophonic) was employed.

No one will argue the fact that it is better to have some limits on the tests and be confident that what is there can be entirely relied upon.

The flip side of the record contains four musical selections from four different Command records as follows: Band No. 1 - "Hernando's Hideaway" from "Provocative Percussion Vol. 2; Band No. 2 - "Cumana" from Provocative Piano; Band No. 3 - "Tenderly" from Bongos; Band No. 4 - "Enjoy Yourself Cha Cha" from Pertinent Percussion Cha Chas. My comments on these bands are as follows but note that, not pretending to be a music critic, the comments are from a technical viewpoint only.

Band No. 1: Extreme separation - tending to the gimmick category but certainly excellent demonstration material. The cymbal ride in the left is particularly clean and bright.

Band No. 2: Surprisingly, the piano is recorded at natural volume - not closely milked to over-ride the orchestra. This band provides a full curtain of sound - no exaggerated separation and yet there is definite instrument placement.

Band No. 3: Impossible to fairly comment on this since I dislike both bongos and the flute as solo instruments.

Band No. 4: This appears to be recorded at a slightly higher level than the previous bands. Over-all fidelity also appears superior. The transients, in particular, are sharper and cleaner than any I've yet heard on any recording, stereo or mono.

Complaints: There's entirely too much talking on both sides of the record to suit me. However, one must realize that this is a commercial record made to be sold to the layman as well as to the audiophile and it is designed to sell more Command records.

As mentioned previously, a circuit is given to build a decibel meter, and in addition, a semi-log chart accompanies the record so the owner can plot the response of his own system. It is suggested that a matching transformer, resistor, potentiometer, and decibel meter be purchased, the circuit built and then connected to one of the speakers. First of all, the cheapest decibel meter listed in the current Allied catalog is \$16 - and this alone is enough to kill the whole idea. But if the owner goes ahead with the plan, he's going to upset the impedance match to his speaker and his results are likely to be disastrous since his readings will be affected by the response of the entire system, the changing impedance of the speaker, and the response of the required matching transformer. In short, don't follow the suggested measuring system.

The chart supplied with the record is handy but does not follow IHFM standards in that a 20 db change of level does not correspond to the length of one frequency decade. The chart's error would improve the curve appearance.

Furthermore, it is over-optimistic to expect only a 2 db variation in response with even the best of today's cartridges.

It would have been helpful to provide means of adjusting optimum tracking pressure, say, a 30 cps to 100 cps sweep at 100% modulation.

Finally, when using the rumble band, adjust the treble control for maximum cut to mask noise.

Conclusion: Despite my criticism, this is the most useful and accurate test-demonstration record I've yet come across. The technician audiophile should not discount the "music side" of the record - a listening test is still essential and the Command CSC 100 provides,

without doubt, the highest fidelity available today.

## PRODUCT REPORT NRI AUDIO SALES ITEMS

Audio product reports are not written just to help the prospective buyer. If they do this, fine. But the basic purpose of the evaluation is to inform - to graphically demonstrate the state of the art. As such, then, the report must be complete, honest, and free of prejudice to be of any use, or it merely becomes a consumer's report of "best buy."

The purpose of the reports is pointed out here because of the audio equipment offered by the NRI Supply Division in this issue. This equipment will not affect the product reports in this column. The reports will continue on new products, as well as older ones, regardless of what is offered by our Supply Division. Moreover, evaluations of the equipment offered by the NRI Supply Division will be treated the same as the others; any criticisms will be honestly given as they always have been (see this month's report).

I do feel obligated to followers of this column, however, to point out that all of the components offered by our Supply Division have been carefully checked out and evaluated. Not only were the units thoroughly tested in our laboratories, but I also took the systems home and lived with them - there is no other way to properly appraise a system designed to reproduce music in the home. I am satisfied that these are outstanding systems in their price class.



"That stereo record sounds as though a train is really coming through the house."



J. B. Straughn

# The Schematic Diagram as a Service Tool

By  
J. B. Straughn

## Chief, Consultation Service

The service man finds many uses for schematic diagrams. Experienced men find more uses for diagrams than beginners. This is true because, with experience, servicing can be speeded if you have the schematic of the equipment before you.

At first thought it seems that a schematic shows only the electrical connection of parts. If this were the only use of a schematic, a pictorial diagram would be just about as valuable. However, and this is a big "however," no one can read a pictorial diagram! A pictorial of the underside of an ac-dc receiver is shown in Fig. 1. Even an experienced man would spend considerable time in deciding from the pictorial that this is an ac-dc receiver. The schematic shown in Fig. 2 gives this information immediately. In addition to letting you see the circuitry, the schematic helps you locate parts and locate them faster than from the set itself.

Suppose the complaint is intermittent reception and you want to find the two audio coupling capacitors so you can wiggle them while a program is being received. If wiggling a capacitor causes the set to cut on and off, the capacitor is defective. How fast can you pick out these capacitors, looking at the set wiring in Fig. 1? I can't do it very quickly. The expert sees the same jumble of wires and parts as the beginner. After deciding which tubes are in the audio section, he has to use a tube chart or rely on memory to find the tube grid and plate socket terminals to which these capacitors should be connected.

Just a glance at Fig. 2 identifies the tubes and shows the capacitors in question to be C12 and C13. C12 connects from pin 1 of the 12AT6 to the volume control and C13 connects from plate pin 7 of the 12AT6 to either pin 2 or 5 of the 50C5. Locate these pin connections on the tube sockets in the set. At once you see C13, the .05 mfd capacitor near the upper right center of the chassis. Locate pin 1 of the 12AT6 socket. Here you find connected a .001 mfd capacitor which is C12 in

Fig. 2. In the same manner any other part can be located quickly with the aid of a schematic diagram. Schematics also give the electrical size of parts and this is valuable because the parts on the receiver may not be marked or the markings may be faded or hidden. Knowing the size of a resistor lets you know what to expect when it is checked with an ohmmeter.

Perhaps the greatest value of a schematic is in aiding the serviceman to answer the most important question on every service job -- WHY?

Why does this receiver distort, why does it oscillate, what part defect causes it to hum, etc. through the list of possible set defects.

How can you decide from a schematic diagram what not to check, what to check, and how it should be tested?

This ability comes from a thorough familiarity with receiver circuits. You must know the job accomplished by each and every part. You must know how the part does its job and the different ways in which a part can fail. Also, you must know from carrying out the NRI Practical Training Plan the possible results of each type of failure. Then, when you look at a schematic and think about the cause of some symptom such as distortion or hum, you can visualize the incorrect circuit operation and decide which parts to check and how they should be tested.

This is important because the symptom will be tied in with a particular kind of part defect. As you know, a paper capacitor may become open, may lose capacity, may become leaky or completely shorted. A resistor may burn out (open), increase in value, or decrease in value. An electrolytic capacitor is subject to all the troubles found in paper capacitors but, in addition, may develop a high power factor. Transformers can open, can develop shorted turns, can short between windings, can short to their cores, and can have their Q reduced by moisture absorption or by rosin and cold

solder joints. Remember, a part is supposed to perform a certain job and cannot do so if it is defective. The particular kind of failure which occurs in a part determines the resultant receiver symptom and the kind of test you will make. Let's take some typical examples of part failure in the receiver.

### C13 LEAKY

Look at the circuit in Fig. 3. If C13 is leaky the effect is the same as if a resistor, equal in value to the leakage resistance, is connected across the terminals of C13. You know that the purpose of C13 is to couple the af signal from the plate of V3 to the control grid of V4. Leakage in C13 will not prevent this signal transfer. However, C13 is also supposed to keep the positive plate voltage of V3 off the control grid of V4. With C13 leaky the B supply voltage divides between R7, the dc path created by the leakage in C13 and R8. As a result, pin 2 of V4 becomes + with respect to B-. This overcomes the bias voltage across R9 and we have a condition where the grid of V4 is + with respect to its cathode. The positive voltage on the grid causes the tube to operate off the straight portion of its eg-ip curve and distortion results. Looking at Fig.

3 you can see how to check C13 for leakage. You could, of course, disconnect one lead of C13 and check the capacitor with an ohmmeter. However, the diagram shows there is an easier and quicker test. You know that normally the grid of V4 is at the same dc potential as B-. In other words there is no dc voltage across R8. But if C13 is leaky there will be a dc voltage across R8 and its grid end will be positive. To check on this thought you connect your VTVM, set to measure positive voltage, between pin 2 of V4 and B-. If there is no positive voltage, even on the lowest range of the VTVM, C13 is not leaky and the trouble is elsewhere.

If there is a positive voltage, it is due either to leakage in C13 or to gas in V4. To check further, clip either lead of C13 from its connection point. If the voltage drops to zero, C13 is defective and must be replaced. If the voltage remains constant, C13 is OK and the tube is gassy. In this case resolder the lead of C13 and install a new 50C5.

Suppose, however, that when you clip the lead of C13, the voltage decreases but is still present. This can only mean (because of the decrease) that there was some leakage in C13.

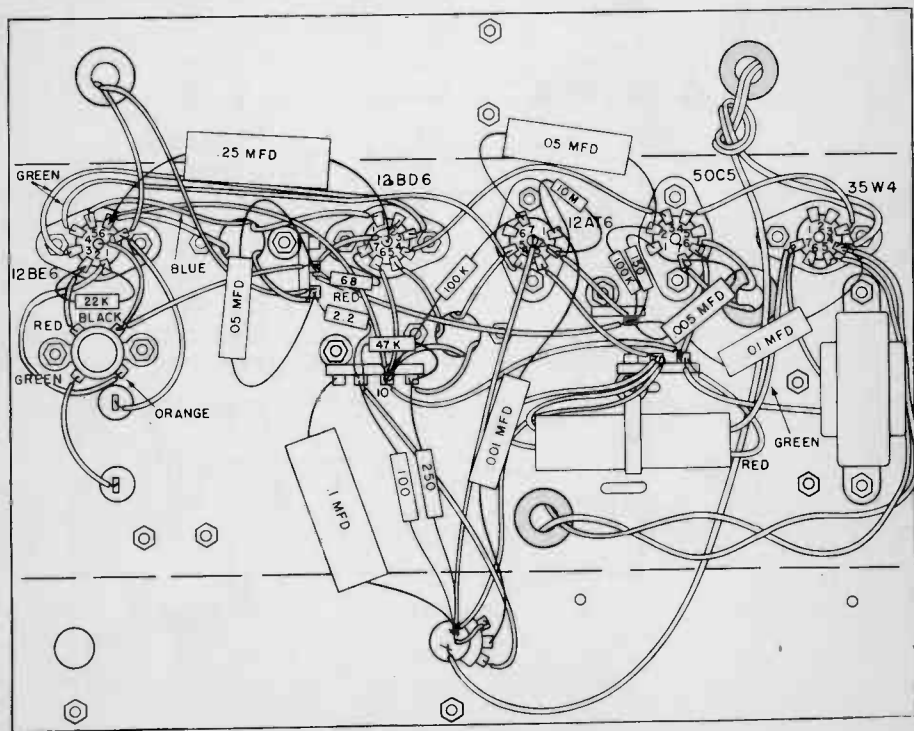


FIG. 1. Pictorial of an ac-dc receiver chassis.

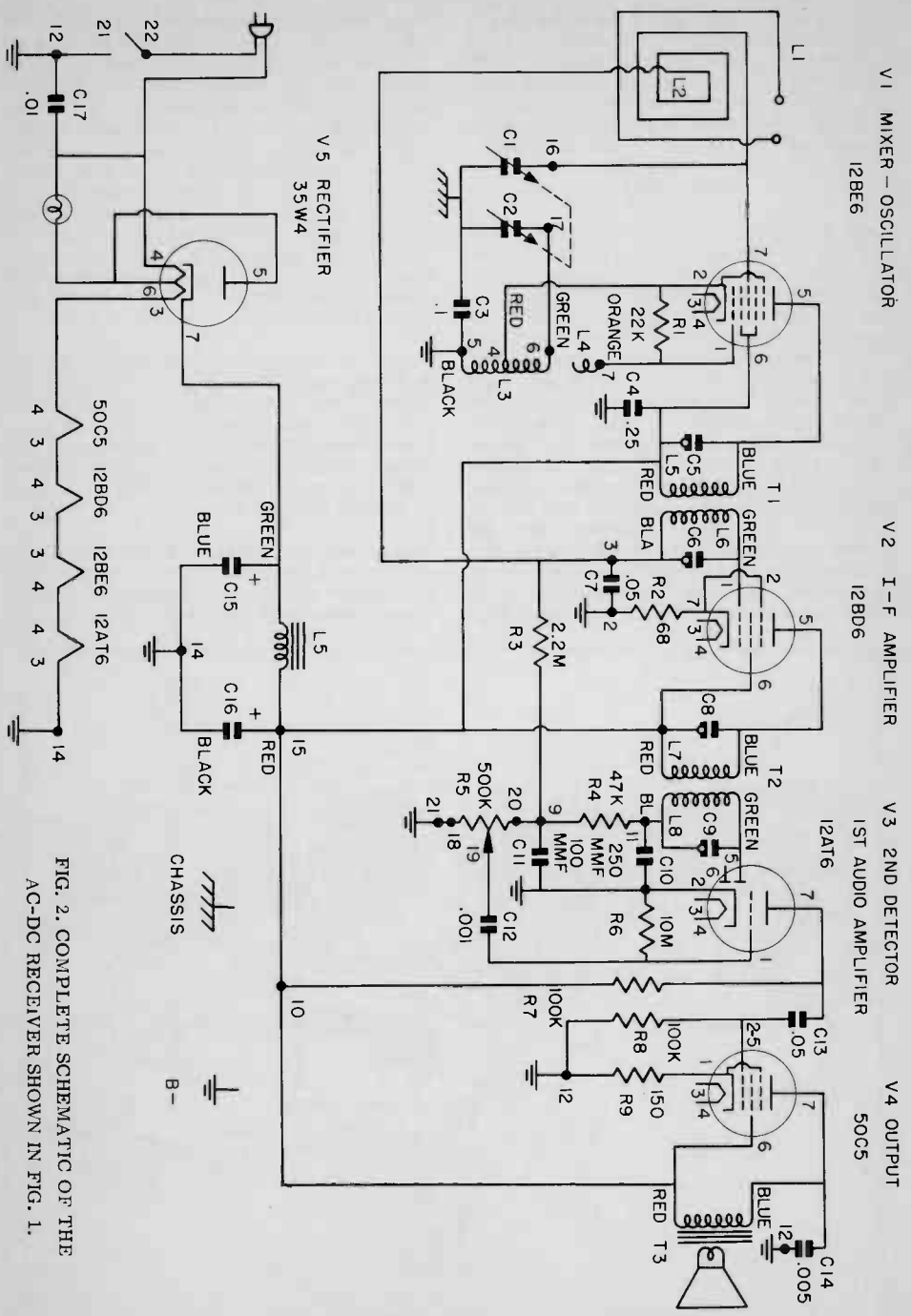


FIG. 2. COMPLETE SCHEMATIC OF THE AC-DC RECEIVER SHOWN IN FIG. 1.

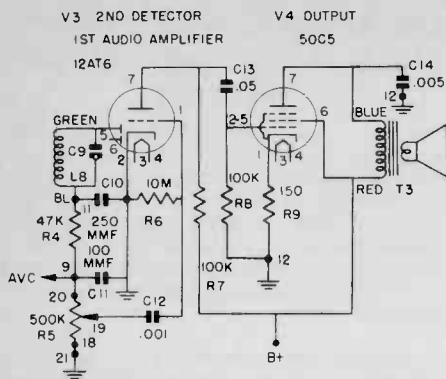


FIG. 3. Audio system of the receiver shown in Fig. 2.

The fact that the voltage did not drop to zero shows that there must be some gas in V4. In this case replace both C13 and V4 to eliminate the distortion.

With experience, all these thoughts run through your mind while you look at the diagram and it is possible to locate the cause of trouble and actually repair the receiver in less time than it has taken you to read about it.

### OPEN IN C13

If C13 becomes open, the effect is the same as if C13 were not in the circuit. In this case, since C13 is supposed to transfer the signal from the 12AT6 to the 50C5, there will be no signal transfer and the set will be dead. To check C13 for an open, take another .05 mfd unit and hold it so its leads touch the leads of C13. The new capacitor will couple the signal

from the plate of V3 to the control grid of V4 and operation will be restored. This proves C13 to be open and it should be replaced.

Other part failures may be analyzed in the same manner. First, know the purpose of the part in the circuit. Then decide on the types of defects that can occur in the part. Next, decide the circuit trouble possible with each defect and the symptom which will be produced by such circuit trouble.

### C15 AND C16 DEFECTS

Let's take filter capacitors C15 and C16 as examples. Table I covers defects, circuit troubles, and symptoms possible in these capacitors. Let's analyze each case and see how we would go about finding the trouble.

Case 1. If you have a dead set with a burned out rectifier, would you install a new rectifier and turn on the set? No, because the filament of the new rectifier would burn out. You would first check the resistance between the rectifier cathode and B-. The normal resistance can be found by looking at the schematic in Fig. 4. It shows no shunt paths across the B supply so the normal resistance is the leakage resistance of C15 and C16 in parallel. A good electrolytic should have a leakage resistance of more than 100,000 ohms so C15 and C16 in parallel should measure more than 50,000 ohms. If the measured resistance is considerably less than this, disconnect the + lead of C15 and check the capacitor by itself. If its leakage resistance is low, replace both C15 and C16. Then, install the new rectifier tube and try out the set.

Cases 2 and 3. Low B supply voltage coupled with weak reception points to inefficiency in

TABLE I

DEFECTS, CIRCUIT TROUBLES, AND SYMPTOMS FOR C15 AND C16 IN FIG. 2.				
Case No.	Part	Defect	Circuit Trouble	Symptom
1	C15	shorted	excess current in V5 V5 filament 4-6 burns out	dead set no tubes light
2	C15	high power factor	low B supply voltage	weak set
3	C15	loss in capacity	low B supply voltage	weak set
4	C15	+ lead shorts to + lead of C16	L5 shorted - no change in DC voltage but AC ripple increases	hum
5	C16	shorted	B supply voltage drops L5 may burn out tubes light	dead set
6	C16	high power factor	AC ripple increases	hum
7	C16	loss in capacity	AC ripple increases	hum

the filtering action of C15 or to a weak rectifier. A new rectifier can be tried or the original may be tested for low emission. C15 may be checked for high power factor and a loss of capacity at the same time. Observing polarity, shunt C15 with a capacitor of equal size and

## NRI COURSES HELP INDUSTRY SOLVE ELECTRONIC TRAINING PROBLEMS

NRI's courses, particularly the ELECTRONICS and COMMUNICATIONS training, are making significant contributions toward filling the need for competent Electronic Technicians. These courses are designed to prepare technicians, through additional technical knowledge, to perform more demanding tasks -- thus freeing engineers for truly engineering-level work.

A rapidly growing number of firms throughout the country are sharing the cost of NRI job-related training with their employees. Tuition assistance or reimbursement plans have become widespread in all phases of industry.

Top management in numerous Electronic firms recognizes tuition assistance for employees as a practical solution to reduce the shortage of good technicians -- men with know-how and know-why. Employees with ambition -- those willing to put forth genuine effort toward self-improvement through home-study -- are, in turn, discovering a new and rapid way to move "up through the ranks."

To management, tuition assistance represents an investment paying handsome dividends. Here's a company benefit which does away with costly on-the-job training programs but still gives the preferred policy of promotions from within. Greater opportunities for all employees are created by moving trained men upward instead of looking outside for help. The end product -- engineering technicians where they're needed most -- better efficiency -- increased production -- and most important -- higher company profits.

### Attention Management:

Inquiries about company sponsored NRI courses may be directed to Mr. E. A. Corey, Assistant to the President, Dept. N, National Radio Institute, 3939 Wisconsin Ave., Washington 16, D.C. Mr. Corey will gladly answer questions as to how other companies are now using NRI courses for the technical training of present employees.

After taking his friend thru some hair-raising loops and turns, the daring pilot remarked, "No doubt half the people down there thought we were going to crash."

Quavered his companion, "Half the people up here thought so too."

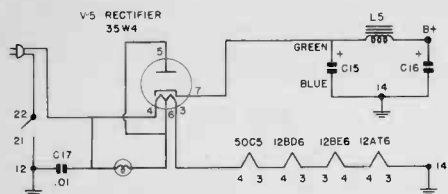


FIG. 4. Power supply of the receiver shown in Fig. 2.

working voltage. Replace C15 and C16 if the symptom disappears.

**Case 4.** An ohmmeter check between the + plates of C15 and C16 probably will not show up the trouble. Shunting C15 or C16 with a test capacitor will not eliminate the hum because the filter choke is shorted. To prove the capacitors are at fault, disconnect the + lead of C15 or C16 and shunt a test capacitor from B- to the point where the lead was removed. If the trouble clears up, replace C15 and C16.

**Case 5.** Since L5 burns out, the short is on the set side rather than the rectifier side of the circuit. Check the resistance across C16. If it is low, disconnect and check C16, replacing it if it is lower than normal. Otherwise, check for a short in the B+ circuit. This could be due to frayed wiring, solder bridging a path to B- or a short in some part. To localize the short, disconnect branches of the circuit and check them individually.

**Cases 6 and 7.** Shunt C16 with a suitable test capacitor. If the hum disappears, replace C15 and C16.

Notice that if either C15 or C16 is defective, both must be replaced. C15 and C16 are in the same container and if one fails, the other will go bad in a short time.

Other circuits and parts can be examined and considered in the same way with the aid of a schematic. Your ability will increase with experience and you can get a big head start by carrying out the Practical Training Plan described in the NRI Servicing Course. With increased experience, you can mentally visualize many of the circuits but I find that I can think and diagnose trouble more rapidly with the actual schematic diagram before me in black and white.



# Not Just Another Intercom— The NRI Transistor Intercom!

By  
John G Dodgson

"Not an intercom article again!"... "Are you working on another intercom?"... and on and on went my colleague's encouraging, enthusiastic remarks!

But what could I do? There I was, sitting at my desk, minding my own business (mostly anyway), and along came our NRI News technical editor, J. Blan Straughn. "Jack," he said (and I should have guessed from his sick smile), "I've put you down for an intercom article for the next NEWS."

So there you are -- don't blame me. But don't blame Blan either - it wasn't his idea. For some reason or other we keep getting requests from students and graduates for an article on how to build an intercom and we honestly do try to get in this NEWS just what you want.

If you're wondering why I got the job, it's because I once volunteered to write an intercom article about 6 or 7 years ago. How was I to know I'd still be writing them - thanks to my friends here? Whenever the subject comes up they all kindly say, "Better have Jack do it - he's experienced at it."

To start with I must admit the last few intercoms I worked out and wrote up were nothing to get excited about. Oh, they all worked as they were supposed to work, but despite the

fact that I used different tubes and circuits, they all ended up with pretty much the same features and quality.

This time Blan and I decided to try an all-transistor intercom if I could beat the problem of continual battery rundown and their frequent replacement.

To save time I decided to modify the amplifier system from the NRI Model 291 transistor radio. Besides saving time this is an excellent amplifier; it provides plenty of gain and has exceptional tone quality. A trip to the local wholesaler for a few switches and a pair of loudspeaker baffles completed the parts list.

The loudspeaker wall baffles that were chosen are quite small, as shown in Fig. 1. They were obtained for several reasons - availability, small size, and fine appearance. Since it was decided to construct a transistorized intercom I felt I might as well keep the size down. Moreover, using a transistorized circuit eliminated the problems encountered with heat-producing tubes and the need to provide extra space for ventilation.

Of course, no matter what type of circuit is used, it is necessary to mount the components somewhere. The switches and speaker are



FIG. 1. Putting the NRI Transistor Intercom to enjoyable use.

normally mounted on the cabinet or baffle itself while the amplifier is mounted on a chassis. However, because of the lack of space in the unit, a large chassis could not be used.

One of the main problems encountered with tube type intercoms is that circuits are subject to hum and noise pick-up since they are high gain, high impedance stages. A transistor circuit eliminates one of these problems since they are inherently low impedance devices. Thus, shielding and isolation of different sections and parts need not even be considered. To ease construction, and since it wasn't necessary, a metal chassis was discarded. Instead, the components are mounted on a small wooden board which is placed in the baffle and held in place with one screw. The output transformer is mounted on the speaker frame and the "listen-talk" and "on-off" switch are mounted on the side of the speaker baffle. The battery power supply, utilizing four penlite cells in two battery clips, is mounted on top of the speaker baffle, as shown in Fig. 2.

But to get back to the beginning, the audio circuitry of the Model 291 transistor radio was rewired on a small board and placed inside one of the speaker baffles. The speaker in this baffle was connected directly to the output transformer and the input transformer was connected through a 75-foot length of wire to a second speaker in the remote station baffle. Thus, the system was initially wired as a remote microphone without a switching system to determine its capability.

With the system wired this way it was found that the unit worked much better than expected. With the volume control turned onfull, there was satisfactory volume. In fact, the unit was sensitive enough to pick up conversation ten feet away from the speaker and yet, when the person speaking moved to within one or two feet of the remote station, the voice did not overload the loudspeaker if the person talked in a normal manner. It was not necessary to shout, in any case.

Some changes were tried in the audio amplifier circuit to increase the sensitivity but it was found that with increased sensitivity the volume control always had to be turned down to prevent speaker blasting. The original circuit was then re-installed and the volume control was removed from the circuit. This was judged to be the best system: it provided sufficient sensitivity and eliminated another control that would require adjustment.

Finally, a standard intercom switching system was installed in the master station to provide talk-listen facilities. This worked fine; with the switch in the normal or "listen" position, any sound in the room where the remote

station was placed could be heard over the master station. When the master wished to talk to the remote, the spring-loaded switch was turned to the "talk" position and held there. Again it was found that it was not necessary to raise one's voice. A normal conversation level was completely satisfactory.

This is the switching system used in most home type intercoms and works quite well. The only "fly in the ointment" is that the unit must be left on at all times or the remote stations cannot call the master station. The only problem with a transistor intercom is that leaving the intercom on at all times would quickly run down the batteries. This problem is overcome in many of the larger and much more expensive commercial intercom systems by providing a relay-operated, on-off switch controlled by the remote stations. Unfortunately, this greatly increases the cost and complexity. It was evident that some other system had to be devised.

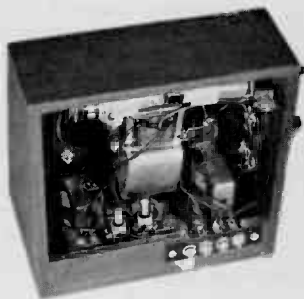


FIG. 2. A view of the back of the intercom.

It was decided that one solution would be to place an on-off switch at both the remote and master stations. As shown in Fig. 3 one side of the switching system and one of the leads to the remote station speaker are grounded. Notice also that the on-off switch is connected between the transistor amplifier and battery power supply. The positive end of the power supply is grounded. Now if a separate on-off switch were installed on the remote speaker, it would be necessary to run two more wires to the remote.

However, with the one ground wire already going to the remote station, changing the position of the on-off switch could eliminate the extra wire. Fig. 4 shows that the negative end of the power supply is connected directly to the transistor amplifier and the on-off switch has been moved to the positive side of the power supply and ground. A separate lead has been added from the positive end of the power supply to the remote station. At the remote station this end of the power supply connects to

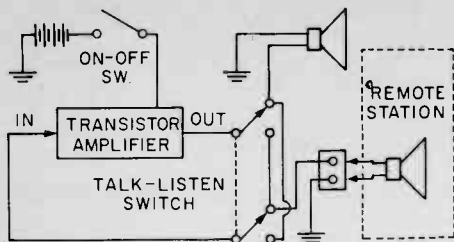


FIG. 3. Simplified diagram showing the listen-talk and on-off switch circuits.

a single pole-single throw switch while the other end of the switch goes to the grounded wire of the cable.

In effect, then, there are two on-off switches for the unit connected in parallel with each other. One switch is at the master station while the other is at the remote station.

This seemed like a fine idea on paper but its inherent problem was expected: all of the signal (and direct) current of the entire amplifier must flow through this long ground wire. Although the low impedance of the transistor is an asset in that it does not tend to pick up hum and noise, it is a problem in that small voltages appearing across ground loops, such as this remote on-off switch, are a large part of the total signal and can cause considerable trouble. It was expected that this remote on-off switch could cause oscillation and it might be necessary to bypass both switches with large electrolytic capacitors.

Keeping in mind the problems that might occur, the switch was installed and the stations were connected together with the cable. The master station was then turned on and the unit worked fine in both talk and listen functions. It was then turned off.

To test the operation of the remote on-off switch, the remote switch was turned on and, as expected, a loud buzz was heard from the speaker of the master station. This was better than expected! Although I fully expected some howling and whistling or some other indication of oscillation, the buzz sounded like a doorbell buzzer and was a perfect "call" to the master station. With the switch on the remote station turned on, the "buzz" called attention to the person in the room with the master station that the remote wished to talk to the master. This person could then walk over to the master station and turn the on-off switch to the "on" position. Doing this immediately stopped the buzz and a normal conversation could be carried on. In other words, the remote on-off switch became a call switch. To perfect the situation, the toggle switch (which is shown in the photos) was replaced

with a momentary contact push-button switch.

This "call" system meant that the transistor intercom could be left turned off and only turned on for conversation. The buzzer system from the remote speaker meant that the master station could be called at any time with no difficulty.

Completing this call switch circuit, of course, solved the major problem of the transistor intercom. It would not be necessary to leave it turned on to fully utilize it. Thus, the batteries would only be used during conversation and with normal use in the home the batteries would last a considerable length of time. In fact, when installed in the home (and if you keep children away from it) you should expect the batteries to last normal shelf life -- about one year. Even with children playing with it or when installed in an office the battery should last for several months. There are many other advantages. For example, if the unit is left on accidentally for any length of time, it is only necessary to replace inexpensive penlite cells. With a tube type intercom one could expect considerable damage. The excessive heat produced by the tubes has been known to melt down plastic cabinets and cause fires in wooden ones.

One other apparent advantage of the transistor intercom is that it need not be placed near a wall outlet since it operates on self-contained batteries. Since it operates on such a low voltage (6 volts), it is perfectly safe even with small children. As a matter of fact, as one check of the unit, I took it home to try it out on the family. I placed the master station in my den on the first floor and the remote station in one of the children's bedrooms on the second floor using the entire 75-foot length of cable. I then showed my two oldest boys (7 and 8) how to use it and "let them loose" on it. They literally "had a ball" with the unit even to the point of forgetting their favorite TV shows. As pointed out, there are no high voltages used and there is no worry about getting shocked. Moreover, the rugged

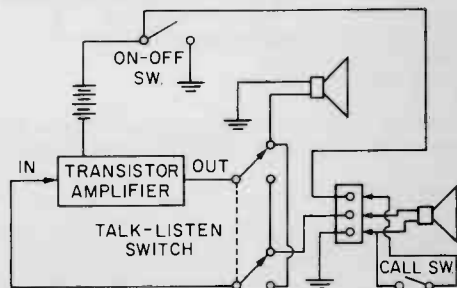


FIG. 4. The revised listen-talk and on-off switch circuits including the remote station call switch.

construction minimizes damage even if it is dropped several feet to the floor.

After deciding that the development was completed and the unit was satisfactory, it was demonstrated here at NRI. Everyone was so enthused about it, it was decided to offer it as another NRI kit through our supply division.

The kit is now available and can be obtained by sending in the order blank at the end of this article. The kit contains two baffles and all of the necessary parts including the batteries. Since each purchaser will require a different length of cable, cable is not offered with the kit. It can be purchased locally or from any mail order house such as Allied. The best type wire to use is Beldontype 8443 which costs less than three cents per foot -- you can order as many feet as you need. This is a three conductor cable in a plastic jacket and the wires are color-coded so that there is no trouble in connecting the units to each other. However, since shielded wire is not needed, you can use practically any wire that's handy. Three lengths of bell or hook-up wire, for example, will work fine.

To conclude, we are very pleased and I might add, a bit proud, to offer this unit to our students and graduates. After considerable use we have found it to be an excellent intercom with features not found, so far as we know, in any other intercom at anywhere near the price of this one.

Naturally, it is designed primarily for the home. However, it has also been put to use here in the office and works quite well. It should be excellent for, say, a doctor's or dentist's office or any similar place where a very high noise level is not encountered. I would expect that it would be quite profitable to purchase the kit, build the intercom and then sell the installation to such professional or business men. Because of its portability a simple demonstration would show its value.

## TEN THINGS YOU CANNOT DO

1. You cannot bring about prosperity by discouraging thrift.
2. You cannot strengthen the weak by weakening the strong.
3. You cannot help small men by tearing down big men.
4. You cannot help the wage earner by pulling down the wage payer.
5. You cannot further the brotherhood of man by encouraging class hatred.
6. You cannot help the poor by destroying the rich.
7. You cannot establish sound security on borrowed money.
8. You cannot keep out of trouble by spending more than you earn.
9. You cannot build character and courage by denying man's initiative and independence.
10. You cannot help men permanently by doing for them what they could and should do for themselves.

- Abraham Lincoln -

How to figure postage charges from D. C.	
Local	.....\$ .30
1st and 2nd Zone, up to 150 mi.	..... .48
3rd Zone, 150 to 300 mi.	..... .53
4th Zone, 300 to 600 mi.	..... .63
5th Zone, 600 to 1000 mi.	..... .75
6th Zone, 1000 to 1400 mi.	..... .90
7th Zone, 1400 to 1800 mi.	..... 1.06
8th Zone, Over 1800 mi.	..... 1.21

### ORDER COUPON FOR TRANSISTORIZED INTERCOM SYSTEM

National Radio Institute Supply Division  
3939 Wisconsin Ave.  
Washington 16, D.C.

I enclose \*\$19.50 plus \$\_\_\_\_\_ for postage. Please rush me a complete Transistorized Intercom System including one master station and one remote station with batteries. This is a Kit.

Name . . . . . Student No. . . . .

Street Address . . . . .

City . . . . . Zone . . . . . State . . . . .

\*(If you live in Washington, D.C., add 2% sales tax)



# Facts About the Citizen's Radio Service

By

Louis Frenzel, Jr.

K3CTX, 24W0937

After reading the title of this article you're probably saying to yourself, "Oh brother, not another article on Citizen's Radio." Yes, it is true that most of us have heard of Citizen's Radio a lot in the last year or so. Almost every popular, monthly electronics publication has carried at least one article per issue on Citizen's Radio for the past year. And why shouldn't they? This Citizen's Radio has really become a big thing, and you can be part of it.

To see just how big Citizen's Radio has become, just look at what has happened to the electronics industry since the introduction of the class D Citizen's band in September of 1958. Since that time, approximately 100,000 citizen's licenses have been issued by the FCC for class D stations alone, and the FCC is now trying to find new ways to process even more license applications at a faster rate. Also, there are now over fifty different manufacturers of citizen's band equipment. Two years or more ago, many of these companies were not even in existence. In addition, many businesses are now profiting by the use of Citizen's Radio.

All of this could mean more jobs for qualified persons to build, test, service and maintain this Citizen's band equipment. It could mean a solution to your personal communications problem or an easier, more convenient way of life. Almost all of you could find a place for Citizen's Radio in your lives, and I'm almost certain that it would benefit you in some way.

None of the information presented here is new, but it is intended to sum up the information on Citizen's Radio to give you a guide to help you decide if you can benefit from Citizen's Radio.

## WHAT IS CITIZEN'S RADIO?

The main purpose of the Citizen's Radio Service is to provide personal, short-range communications for citizens. Citizen's Radio can also be used for business purposes.

There are so many uses to which Citizen's Radio could be put that it would take a complete article to cover them all even briefly. In short, however, as mentioned above, the two main uses of Citizen's Radio are personal and business communications.

An example of personal use would be family communicating. Citizen's Radio would act just like a telephone, but with even greater convenience and portability. Probably the ideal setup for personal, family use would be one transmitter-receiver unit in the car and another at home. A setup like this has all kinds of possibilities. Adding one or two small, portable hand-carried units would make this setup even more versatile.

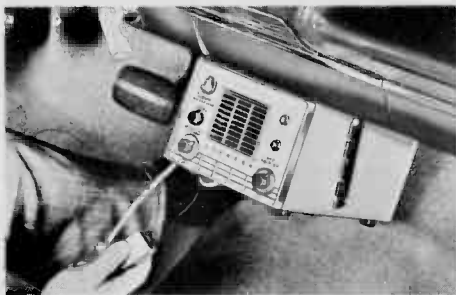
As for business applications, Citizen's Radio could very well make business easier and more profitable. For those NRI graduates or students who own a full-time Radio-TV service business, you may be passing up a good thing if you haven't looked into the possibilities of using Citizen's Radio to aid your business. A good number of service businesses are using two-way Citizen's Radio to route outside service calls. One unit is at the shop and other units are in the service vehicles. Rather than have the service truck return to the shop after one or even several calls, it can be routed by radio. This saves considerable time and money.

Many boat owners are now using Citizen's Radio to provide them with two-way com-

munications. In most cases, communications here is not just a convenience but almost a necessity, especially for safety purposes. Many sportsmen use Citizen's band radio on hunting or camping trips. Doctors use this service to save time on house calls. As you can see, there are many applications for Citizen's Radio. How many more can you think of? Do you think you could benefit by the use of Citizen's Radio? It certainly wouldn't hurt to analyze your situation closely to see.

## CITIZEN'S RADIO LICENSES

When the FCC first introduced the Citizen's Radio Service, there were only three classes of licenses. These are still available today. The first, class A, allows operation in the 450 to 470-mc band using telephone and a maximum of 60 watts of power. Class B uses the same frequency range as class A but is allowed only 5 watts of power. A class C license is for remote control of such devices as model boats and planes or garage-door openers. The 27-mc band is used here. The first two classes of citizen's license



A mobile installation.

never became too popular. The frequencies used made the price of the equipment too high for the average person, and it had a limited communicating range. The class C license did become quite popular, however, and it still is. This license for remote control purposes only, can be obtained by any U. S. citizen 12 years or older.

Some years ago several manufacturers tried to make the class B Citizen's Radio Service popular by coming out with some relatively inexpensive units. Even though this effort did help to popularize the Citizen's Radio Service to some extent, it did not become really big. It did set the scene for the introduction of the class D license in September of 1958. At that time the FCC gave the entire 11-meter amateur band to Citizen's Radio. From then until now, the popularity of Citizen's Radio has certainly grown. The frequency of operation authorized by the class D license is

probably the big reason for the recent excitement over Citizen's Radio. The 27-mc band allows simple, inexpensive equipment and a substantial and reliable communicating range is realized.

Since class D Citizen's Radio is by far the most popular and the one you are most likely to become involved with, the rest of the information in this article pertains to class D operation.

## HOW TO GET THE CITIZEN'S LICENSE

The Citizen's license is relatively easy to obtain. You must be qualified, but the qualifications are easily met. As long as you are a U. S. citizen 18 years or older and have a valid reason for wanting a Citizen's license, you will have no trouble in obtaining one. Just write to the FCC (Washington 25, D. C.) and ask for an application for Citizen's Radio license (Form 505). These application forms can also be obtained in person at any FCC field office. Just fill out the form carefully, have it notarized and send it to the FCC in

Washington. Because of the great number of applications for this license being received, the FCC may be slow in processing your application. The actual time before you receive your license will depend upon the load at the FCC, but a month is about the average waiting time. Just remember that during this time you cannot operate. No operation can legally take place until the license is in your possession. The Citizen's license is an equipment license only; no operator's license is necessary.

One last word about getting your license is in order. The FCC wants all Citizen's band users to be informed of the rules and regulations regarding this service. Before your application for a license can be notarized, you must certify that you have read and are familiar with Part 19 of the FCC Rules and Regulations. This is part of Volume VI of the Rules and Regulations. This publication

is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The cost of Volume VI is \$1.25. Part 19 cannot be obtained by itself.

## EQUIPMENT

After you have decided that Citizen's Radio is for you, and after you have put in your application for a license, you will be looking for the equipment to use. Of course, you will need at least two receiver-transmitter units and antenna systems. (Actually, two complete "two-way" units are not necessary if one-way communication will fill your needs. The FCC says that one-way communications on the Citizen's band is allowable. This means only one transmitter and one receiver.)

Since there are over 50 different Citizen's band units available for class D operation, you may have a difficult time deciding which units to buy. Single units are available in the \$40 to over \$200 range. These units normally contain both a receiver and a transmitter. The receiver is either a superregenerative or superheterodyne type. The transmitter is an oscillator-amplifier type, usually a dual-section tube. All units use the 3rd overtone type of crystal in the oscillator section. The amplifier normally runs 5 watts (or less) plate power input. The modulation used is standard AM, and this is accomplished by an audio section which also functions as the receiver audio. Antennas are usually 9-foot whips for mobile, and vertical ground planes and half-wave dipoles for fixed stations. Rotary beams are also available. There are also a few "walkie-talkie" type units for those who want truly portable operation. A quick glance at any of the recent electronics magazines will give you an idea of the great variety of units available.

If you are technically minded and handy with a soldering iron, you might want to build your own unit. Just be sure that the unit you build is stable and conforms to the FCC regulations. The unit must be crystal-controlled on one of the Citizen's band channels with an accuracy of .005%. The unit must be amplitude modulated not more than 100% and have a final plate power input of no more than 5 watts. Actually, you won't save any money by building your own. You'll probably end up spending slightly more than the price of a good lower-priced commercial unit. Besides, the commercial unit is probably more reliable and definitely looks better.

NRI has recently added three citizens band transceivers to its stock and these units are available through the NRI Supply Division. (See ad on page 18 of this issue).

## CONCLUSION

There are several things which you should know about Citizen's Radio before you decide to use it. First, since no operator's license is necessary to operate the equipment, no technical knowledge is required of the user. Because of this, the equipment must meet certain rigid specifications. The transmitter must be crystal-controlled and it must maintain its frequency within .005% of the assigned frequency. The transmitter must use amplitude modulation of not more than 100%. The plate power input of the final stage should not exceed 5 watts. In addition to all of this, you must hold at least a second-class radiotelephone license before you can repair, service, or tune these units. It is allowable for the operator to tune the unit, if the transmitter is not connected to an antenna. A fairly recent FCC ruling says that the transmitter may be tuned while in operation if it meets certain FCC requirements. This ruling applies to commercially built units or kits which have a pre-wired, pre-tested and pre-tuned oscillator or frequency-determining assembly. This would not apply to home-built, non-commercial units.

Since the frequency tolerance is quite close, be careful to use only the crystal recommended by the manufacturer of the equipment you are using. His unit was designed for a particular type of crystal and using different crystals has been known to cause off-frequency operation. Of course, this is a violation of the FCC rules and regulations. If they find out about it you will certainly hear from them.

When the class D Citizen's band was first introduced, it was assumed that it could be used just like an amateur radio band. Immediately many people began using the band to rag chew, work DX and for other similar "ham" activities. This Citizen's band is not a "ham" band and it cannot be used as one. The FCC rules and regulations state this specifically. If you want to take part in amateur-radio activities, get a "ham" license. Keep in mind the basic purpose of the Citizen's band: to provide personal, short distance communications for citizens and businesses. Do not use it in any other way.

There are 12 reasons for failure. One of them is the avowed intention of performing no more work than one is paid to perform. The other eleven reasons are immaterial where this particular one exists.

# You asked for it...

# Now we've got 'em!

Here's the best possible answer to the numerous letters we get asking for help in planning a hi-fi, stereo, amateur radio, or citizen's band set-up.

The NRI Supply Division is proud to announce availability of NRI TESTED-RECOMMENDED-APPROVED equipment for hobbyist and enthusiast. In an era when all advertising seems to holler "WE'RE THE BEST", we give every NRI man the opportunity to profit from the experience of our own technicians and engineers.

Let's face it, nowadays anyone who even begins thinking about hi-fi, and stereo equipment in particular, is going to get just plain CONFUSED! If a market was ever literally "flooded", this is it. How does someone who's not an engineer decide between 100 different amplifiers, 200 different speakers, accessories, gadgets -- all with attractive specifications?

NRI "experts" have a distinct advantage over the average buyer. They have the facilities and ability to interpret design first -- "specs" second. As impartial judges, these men REFUSE to be sold a bill of goods. You'll find the end result on these pages. Here's the equipment we like best -- selected for quality and performance -- plus a SOUND dollar investment.

Check -- then compare -- these 5 important buying advantages:

1. Benefit from the judgment of experienced men who read a product's advertised specifications -- after they've written their own!
2. In addition to the manufacturer's guarantee, NRI stands behind every item sold. We personally guarantee your COMPLETE SATISFACTION.
3. Free and comprehensive Consultation Service when and if you need it.
4. Prompt shipment on all orders with personalized attention.
5. Convenient monthly terms if you wish -- just write us for details.

Use handy order blank on page 21. Sorry - no trade-ins.

## SHORT WAVE RECEIVERS



Hallicrafters S-107. Outstanding value in a general-coverage receiver. Five ranges cover 540 kc to 1630 kc AM, 2.5 to 31 mc and 48 to 54.5 mc shortwave. Features separate electrical bandspread with 0-100 logging scale.

Extra large slide rule dial for easy reading; built-in noise limiter, phono input jack. Uses antennas of 50 to 300 ohms impedance - balanced or unbalanced. Has tip jacks for headphones, built-in 5" PM speaker. Gray steel cabinet; 7 tubes plus rectifier. 7" x 13-3/8" x 8-7/8". For 105-125V 50-60 cycle AC. Shipping weight 18-1/2 lbs.

\$94.95

Hallicrafters S-38E. A low cost receiver suitable for novice hams and short-wave listeners. Covers 540 kc to 32 mc in 4 ranges. Gives sensitive coverage of short-wave and AM broadcasts. Features include separate electrical band spread; built-in 5" PM speaker; tip jacks for headphones; large slide rule dial; receive/standby switch; switch on rear panel for speaker or headphones. Gray steel cabinet with silver trim. 12-7/8" x 7" x 9-1/4." For 105-125V DC or 50-60 cycle AC. Shipping weight 14 lbs. \$59.95







Hallicrafters S-108. Excellent value in a better receiver. Features include: bandspread dial calibrated for 80, 40, 20, 15, 11 and 10 meters; RF amplifier; 2 i-f amplifiers; BFO with variable pitch control; automatic noise limiter; 3 position tone control; built-in 5" PM speaker; 4 tuning ranges -- standard broadcast plus 3 shortwave bands. Has temperature-compensated oscillator; slide rule dial; standby/receiver switch; automatic volume control; panel jack for headphones.

Steel cabinet finished with silver trim. Seven tubes plus rectifier. Size: 8-7/8" x 18-1/2" x 10". For 105-125V 50-60 cycle AC. Shipping weight 36 lbs.

\$129.95

National NC-109 Receiver. A top-rated receiver for SSB, AM, or CW. Separate product detector and "Microtome" crystal filter for 5 degrees selectivity. Phasing notch over 60 db deep. 540 kc to 40 mc in 4 bands. Controls: Main tuning, bandspread tuning, antenna trimmer, band selector switch, RF gain, AC off-on and AF gain, standby, mode selector, tone, BFO pitch, selectivity, phasing. 10" x 16-13/16" x 10-7/8". 110-120V 50-60 cycle AC. Shipping weight 35 lbs. (Less speaker - order NTS-3)

\$169.95



National NTS-3 Speaker. Matches NC-109 Receiver. 8-5/8" x 5-5/8" x 4-5/8".

\$19.95



National NC-60 "Special" Receiver. A modern, low-cost, compact receiver. Good for beginners in ham radio or SWL. Excellent sensitivity with full electrical bandspread. Coverage from 540 kc to 31 mc. Slide rule dial with marine, aircraft, amateur and foreign short wave freq. marked. Phone jack; built-in speaker. Selectivity: 5 kc at 6 db down. AM/CW switch; standby-receive switch. 7-5/8" x 13-1/2" x 8-5/8". 110-120V AC or DC. Shipping weight 15 lbs.

\$59.95



## CITIZEN'S BAND EQUIPMENT



Gonset G-12 Multi-Channel 2-Way Citizens Band Radio. A complete two-way radio station! License is easy to obtain -- simply fill out single FCC form -- no exam or special skill required.

Four quartz crystal controlled channels provide fullest operational versatility - permit instant switch to other channels if voice traffic is especially heavy or if interference is present on channel in use. Positive, simple in operation -- no fussy tuning. Has front panel switch for selection of channels, press-to-talk switch on microphone and transmitter tuning indicator. Built-in speaker permits calls to be heard some distance from set. Specifications: Frequency 26.96 to 27.23 mc; RF power input 5 watts; audio output 2.5 watts into 8.2 ohms; Size 4-1/2" x 7" x 10". Actual weight 11 lbs.

Furnished with strong universal mounting bracket for desk, auto, truck, boat, etc. Price includes microphone and crystals for one channel. When ordering, specify Model 3316 for 12 V DC and 117 V AC. Model 3329 for 6V DC and 117V AC. Shipping wt. 13 lbs. \$149.95

Johnson "Messenger" Model 242-128. Compact transceiver for top Citizens Band performance. Panel switch selects any of 5 channels. Squelch keeps receiver quiet between messages. Has chrome plated front panel, gray wrinkle finish cabinet. Shipped complete with crystals for 1 channel, push-to-talk mike and power cords. 5-5/8" x 7" x 11". For 12 V DC or 110-120 V AC, 50-60 cycle. Shipping weight 16 lbs.

\$139.75



Johnson "Messenger" Model 242-127. Same as above but for 6 V DC or 110-120V AC, 50-60 cycle.

\$139.75

## HI FI AND STEREO EQUIPMENT

To meet your needs NRI has chosen two complete stereo systems in different price ranges. The individual components in both systems have been carefully selected to provide you with the best available for the money; more important, the components have been chosen to harmoniously "work together" to provide superior reproduction.

You can purchase any single component for the price shown. Note however, that you will save money by buying the complete system.

The following components were carefully chosen to provide a truly professional high fidelity stereo system. Bought separately these brand-name components would cost you \$403.20. (Shipping weight 109 lbs.) NRI De-

Luxe Stereo System exclusive price: \$374.95.

This system includes the following components as described below: Bogen-Presto B61 turntable with base; Empire 108 Stereo Cartridge; Pilot Model 240 Stereo Amplifier; Two Electro-Voice Leyton Speaker Systems.

Bogen-Presto B61 Turntable.

Top-performing Swiss-made turntable-arm combination. Tone arm equipped with ball-bearing vertical and horizontal suspension, plug-in type head and visual stylus force adjustment. Turntable offers continuously variable speed control from 29 to 86 rpm plus click stops at 16, 33-1/3, 45, and 78 rpm. Heavy 4-pole motor drives massive 7-3/4 lb machined zinc alloy cast turntable covered

with heavy rubber mat. Automatic cueing; exclusive lever switch arrangement permits lowering the tone-arm anywhere on the record or raising it automatically. Wow and Flutter less than 0.2%; Rumble 51 db below average recording level. Includes walnut base. Shipping weight 28 lbs.

\$65.20



distortion less than 1%; phono sensitivity 3 mv; hum and noise -80 db. Shipping weight 23 lbs.

\$134.50



Electro-Voice Leyton 2-Way Speaker System.

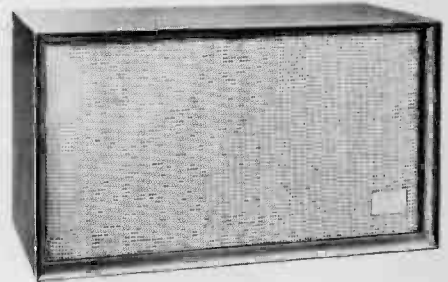
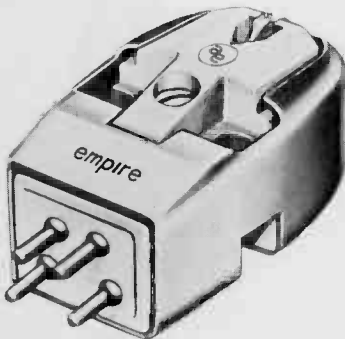
An expertly designed, space-saving 2-way system -- only 14" high, 25" wide, and 12" deep. Completely wired, beautifully finished on all four sides - ready to enjoy. The Leyton features rigid 3/4" wood construction employing a special 12-inch high compliance low-frequency driver and a matched 8-inch mid-high frequency unit. A control permits adjustment of the high frequencies to exactly match your room acoustics and taste. Smooth, wide-range response from 40-13 kc; handles 35 watts, 70 watts peak; 8 ohm impedance. Shipping weight 29 lbs. each.

Empire 108 Stereo Cartridge.

Acknowledged by the experts as "hard to beat at any price." Frequency response 15 cps-30 kc  $\pm 2$  db; compliance  $6 \times 10^{-5}$  cm/dyne; output 8.0 mv per channel; channel separation over 25 db; only 1-1/2 to 5 grams tracking force required.

\$34.50

(each) \$84.50



Pilot Model 240 Stereo Amplifier.

A wealth of features - beautiful black and brass styling. Offers 30 watts monophonic or 15 watts per channel stereo: "Stereo-Plus" curtain of sound allows simple addition of a third speaker for 3-speaker stereo sound or remote use. "Trolok" tone control system allows individual or simultaneous adjustment of base and treble in each channel. Automatic shut-off, "Simplematic" balance, and many other features. Response:  $\pm 1$  db, 20-20 kc;

NRI engineers looked long and hard to find a group of components that would provide true high fidelity stereo sound at a minimum cost. Again we are able to offer this custom system at a reduced price. Normally you would pay \$228.50 if you bought the components separately. NRI Custom Stereo System exclusive price: \$212.50. (Shipping weight 77 lbs.)

The NRI Custom System includes the following components: Garrard Model 210 record changer and base; Shure M7D stereo car-

tridge; Harmon-Kardon Model A-220 Stereo Amplifier; two Electro-Voice LS-8 loudspeakers; two custom designed speaker enclosures.

Garrard Model 210 Record Changer.

A compact, 4-speed automatic and manual changer that intermixes all record sizes. Die-cast aluminum tone arm features instantly accessible stylus pressure control. Garrard's 4-pole shaded "induction surge" motor with dynamically balanced rotor gives the 210 constant speed with no hum or vibration. Comes fully wired and with base. Shipping weight 17 lbs.

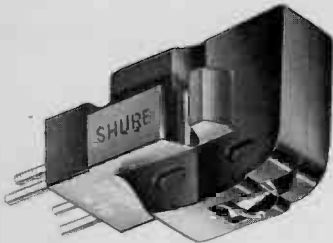
\$49.45



Shure Model M7D Custom Stereo-Dynetic Cartridge.

A high quality moving-magnet type stereo cartridge at a moderate price. Response 20 to 15kc; output 5 millivolts per channel; compliance  $3.5 \times 10^{-8}$  cm/dyne; tracking force 4 to 7 grams.

\$24.00



Harmon-Kardon A-220 Stereo Amplifier.

The "Lute" features a dual preamplifier and two 10 watt power amplifiers on a stylish copper and black chassis. Illuminated push-button on-off switch, full range balance control and many other features. Power output;

10 watts per channel at less than 2% harmonic distortion; response  $\pm 1$  db 20-20,000 cps at listening level; tone control range  $\pm 12$  db at 50 cps and 10 kc. Shipping weight 14 lbs.

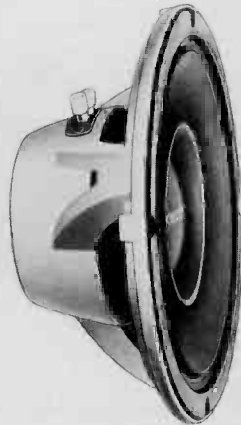
\$79.95



Electro-Voice LS-8 Loudspeaker.

This 8 inch full range "WOLVERINE" model is loaded with high quality features: heavy duty die-cast frame; dual-cone construction for improved high frequency output and dispersion; voice coils are edge wound of ribbon conductor to improve efficiency 18% over round-wire coils; glass coil form; long throw design voice coil. The LS-8 has a response from 55 to 13 kc with a free cone resonance of 55 cps. Power handling capacity 20 watts, total flux 70,700 maxwells, impedance 8 ohms. Shipping weight 5 lbs each.

(each) \$18.00



Custom Speaker Enclosure.

This enclosure is rigidly constructed of 5/8 inch high density particle board beautifully finished in stainproof walnut wood grain formica. The grill cloth is of neutral shade to blend with any room decor. The speaker mounting board is pre-cut to simplify mounting an 8 inch speaker. In addition, another hole is provided and covered so that you can step-

up the system at a later date by adding another 8 inch speaker or a tweeter. The cabinet is reflexed for improved bass response. Shipping weight 20 lbs each.

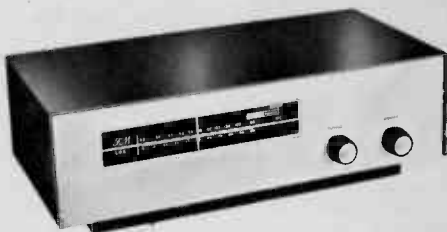
(each) \$19.95



Harmon-Kardon Model F-10 FM Tuner.

This sensitive FM tuner features an Armstrong circuit with limiter and a new broadband Foster-Seeley discriminator. Attractive styling with copper control panel. Sensitivity 2.5 microvolt for 20 db of quieting, selectivity 200 kc bandwidth, 6 db down; image rejection 40 db. Shipping weight 10 lbs.

\$69.95



Note: The extended low frequency response of the Electro-Voice Leyton speakers requires that the record player have an extremely low rumble content not met by the economical Garrard 210. If you desire a record changer with System No. 1 we recommend either the Garrard Model 88 or Type A. Write to us for a price quote using either of these changers in system No. 1.

not included in the price of either system. If you wish to include it simply add its price (\$69.95) to the price of the system you choose.

If you wish to interchange some of the system components -- for example, use the turntable instead of the record changer in System No. 2 -- write to us for a special price. Just list the components you choose -- remember, though, this special reduced price applies only to a complete system.

The Harmon-Kardon Model F10 FM tuner is

----- ORDER BLANK -----

National Radio Institute Supply Division  
3939 Wisconsin Ave.  
Washington 16, D. C.

292 KT

I enclose \$ \_\_\_\_\_ . Please rush me via Express Collect the items I have indicated.

<u>Description</u>	<u>Model Number</u>	<u>Price</u>
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_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total amount enclosed \$ \_\_\_\_\_

Name . . . . .

Address . . . . .

City . . . . . Zone . . . . . State . . . . .

(If you live in Washington, D. C., please add 2% Sales Tax.)

## GRADUATE GLIMPSSES

Read what NRI Graduates say and do



Communications  
Engineer  
With Kentucky,  
W. Va. Gas Co.

"I guess you wonder at times if graduates do progress with the art. I think I have. Am now Communications Engineer for Kentucky, West Virginia Gas Co. My job is to install and maintain all two-way radio and microwave equipment. At this time, we have 25 mobile units, 4 base stations plus 2 terminal and repeater stations.

The microwave carries telephone, telemetering, supervisory control on two pipe lines and one compressor station. One station is controlled by wire line and one by repeater radio.

This is briefly what I have been and am doing. The NRI course is thorough in its method of instruction."

Mr. Richard P. Conley  
Falcon, Ky.



Rated  
an  
Expert

"After my graduation, I worked part-time in Radio-TV servicing for a year and a half. I now have my own shop and am making a good living. The earnings have gone up to \$150 to \$200 per week. I'm glad I took your course -- it has everything. They rate me here as an expert when the rest give up!"

Mr. William Apley  
Route 1, Box 3  
Miller, S. Dak.



Hobby  
Becomes  
Profitable  
Pastime

"NRI must have a particularly effective method of instruction because although I studied radio and radar during the war in classroom style, it never got across to me the way it has now. I have a flourishing part-time business which developed out of a small repair service I began in order to get practical experience. This is having a very beneficial effect on my income.

But what I appreciate as much is the new interest it has given to life; something far more fascinating and absorbing than an ordinary hobby. For this I cannot thank you enough."

Mr. J. Douglas-Young  
212 S. Stanton Ave.  
Anaheim, Calif.



Price of  
Course  
Reasonable

"As yet I have experienced no difficulty in servicing Radio and TV receivers. All the training I have had has been from NRI. One does not have to be a college graduate to learn the servicing field from you. Your Radio-TV course is all anyone could ask for and the price is most reasonable. A TV school here in Rockford charges \$360.00 for a six week course with no instruments included."

Mr. Eddy Clell  
1426 Elm St.  
Rockford, Ill.

If the five-hour work day ever arrives, some employees will undoubtedly complain it makes an awfully long morning.



Passed  
Civil Service  
Exam



Remington  
Rand  
Engineer

"The NRI course helped me pass a Civil Service examination for Electronic mechanic. I strongly recommend your courses to all who ask me about it. It's the best I know of to help a person get ahead in the Electronics field."

Mr. John Lasiw  
RFD 1, Box 364  
Morehead City, N.C.

"I am presently employed by Remington-Rand Univac as a field service engineer. No doubt NRI training helped get my Electronics career off the ground. The text books have been invaluable to me."

Mr. Fred A. Hewitt  
8635 5th Ave. So.  
Bloomington, Minn.

## Satellite Relay System Plans Announced

American Telephone and Telegraph Company has announced plans to put the first station of a satellite relay system into space within a year.

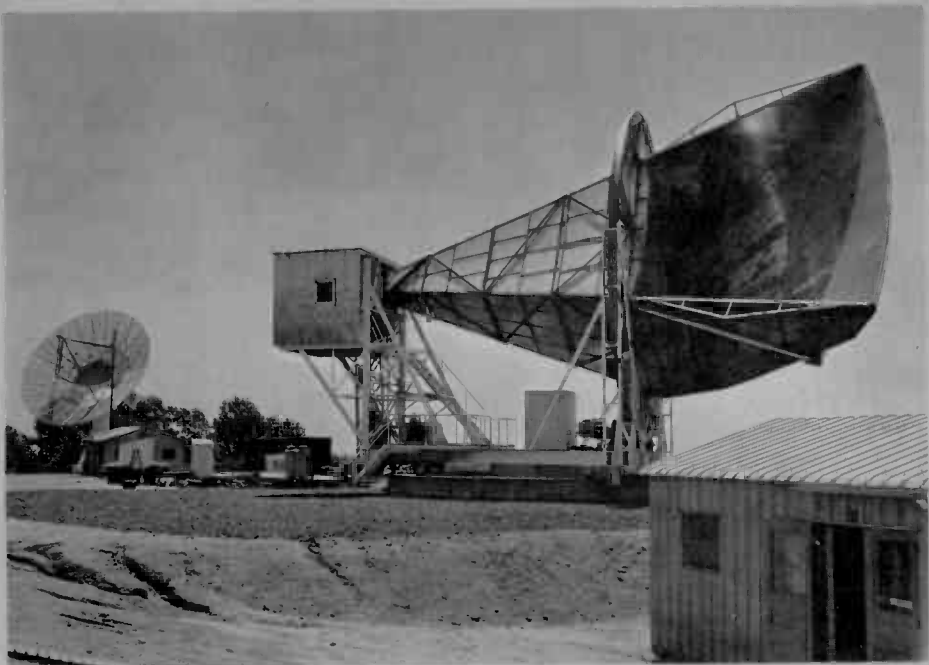
The station would provide for the experimental transmission of telephone calls, television, data transmission and other types of

communication between the United States, the United Kingdom and continental Europe.

The company is now prepared to contract for the launching of the necessary satellites and to proceed with the construction of transmission and receiving stations on the ground. The project would be financed and the facili-



TRAVELING-WAVE TUBE, shown here in the hands of a telephone technician, is the amplifying device planned for use aboard Bell System's proposed satellite relay station next year. The high-frequency micro-wave tube can amplify radio signals as much as 10,000 times.



Bell Telephone Laboratories "telephone terminal to outer space" at Crawford Hill in Holmdel, N.J. In the foreground is a horn-reflector antenna developed by Bell Laboratories as part of its satellite communication receiving system. The transmitter, a 60-foot dish is shown in the rear. Antennae are aimed at satellite in accordance with predicted orbit information provided by the National Aeronautics and Space Administration.

ties operated by AT and T, in coordination with telephone administrations abroad. This is similar to the practice for many years in handling overseas communications by cable and radio.

In the development of this project, the company expects to work closely with the National Aeronautics and Space Administration.

In addition to requesting approval of the satellite experiment, AT and T also asked the FCC for rule changes which would allow the company to proceed, following satisfactory tests, with the initial stages of commercial service.

"We are planning a system that would make use of solar-powered satellites orbiting at an altitude of about 2200 miles," Henry T. Killingsworth, AT and T vice president in charge of Long Lines, said.

"Electronic amplifiers aboard the space stations would catch signals from earth, immediately boost and relay them on to ground stations in the United States, the United Kingdom and western Europe."

The proposed spheres would be four feet in

diameter and weigh about 175 pounds. About 60 per cent of the surface would be covered by glass-coated solar cells. A metal skin and two slotted antennae would comprise the rest of the surface.

"We expect this initial system will be capable of transmitting up to about 35 minutes some three or four times a day -- coordinated with the satellite passes over the earth station areas," Mr. Killingsworth said. "The satellites would act as microwave towers in the sky, performing the same boosting and transmitting functions as the microwave towers of our radio relay systems here on the ground."

The new project is a further step in the Bell Telephone System's fundamental space communications research program. It would employ "active" satellites, containing electronic devices to receive, amplify and send signals back to earth. An earlier phase of this program was Bell System work on "Project Echo," which employs a "passive" or reflecting satellite launched by the National Aeronautics and Space Administration.

It is expected satellite communications will



help answer a rapidly growing demand for circuits between the United States and other countries. Overseas calls this year will total some four million, double the number handled five years ago. AT and T estimates the number may be around 100 million 20 years from now.

To provide for such service, AT and T, in addition to its satellite plans, also is planning new ocean telephone cables with greater capacity than those already in use.

During the current "Echo" experiment, two-way voice communication has been established between Bell Telephone Laboratories' Holmdel installation and the Jet Propulsion Laboratories in Goldstone, Calif., using microwave frequencies reflected from the satellite. Tests also have been made with stations in the United Kingdom and France.

Data from this experiment confirmed the views that broadband communication between continents, capable of transmitting large numbers of telephone calls and television, is

now practicable by using microwave relay stations in space.

The proposed step into space would permit transmission of one TV program in either direction, or two-way transmission of telephone signals. Data transmission or other services could be substituted for these.

Recent newspaper ad: "Found - roll of five-dollar bills. Will owner please form a line at door of 1622 Central Ave."

#### HISTORICAL NOTE

Of course Robin Hood robbed the rich. The poor didn't have any money.

## TEXAS STUDENT GAINS EXPERIENCE—AND GOODWILL!

Serving his community while learning radio repair is NRI student Louis E. Ridley of Dallas, Texas. Ridley, who began his Radio-TV course in September, 1960, has been donating one day's work per week to Goodwill Industries of Dallas where he repairs radios donated to the rehabilitation agency.

The idea of donating his services came to Ridley when he bought a two-dollar radio in the Goodwill store's "as is" department and repaired it with a cash outlay of only 40 cents. It occurred to him that he could gain valuable experience in radio repair, and aid the work of the agency, by repairing the donated radios which could then be sold at higher prices.

He approached Mrs. Avis Miller, operations manager of Goodwill, who not only welcomed his suggestion but comments that his help has been very valuable. Ridley checks and classifies radios as to value and repair needed. He has stockpiled used parts and plans to improve some test equipment. Prior to his work at Goodwill, the agency had farmed out radio repair to a vocational school because of the prohibitive expense of hiring a radio repairman-instructor.

Goodwill is a non-profit rehabilitation agency which operates sheltered workshops for the employment and training of handicapped men and women. There are 126 Goodwill Industries located in major cities of the United States.



LOUIS E. RIDLEY

# NRI ALUMNI NEWS



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

## Chapter Chatter

DETROIT CHAPTER reports its officers for 1961 as follows: James Kelly, Chairman; Adam Rieder, Vice-Chairman; George Langois, Recording Secretary; Ed Atkinson, Assistant Secretary; Earl Oliver, Treasurer; Prince Bray, Librarian; John Stanish and Asa Belton, Financial Committee; Charles Mills, Sergeant at Arms; and Stanley Szafran, Chapter Photographer. Charles Mills was also made permanent Chairman of the nominating committee. Our congratulations to these officers!

Jim Kelly, Leo Blevins and John Nagy have been giving a good many excellent demonstrations on transistors. The Chapter has been planning a TV color demonstration by RCA, which should prove very interesting.

Oscar Smith and Chester Wodzinski are the most recent members to be admitted to the chapter. A warm welcome to these new members!

FLINT (SAGINAW VALLEY) CHAPTER, as pointed out in the last two issues of the NRI News, has been featuring a series of lectures by Professor William DeJenko of the University of Flint on the latest Radio-TV Servicing methods. The fifth lecture in this series was on tuners. A sweep generator was used to illustrate alignment procedures.

In the sixth lecture of the series Professor DeJenko dealt with age troubles, in the seventh with video i-f alignment with different types of signal generators.

The members think highly of these lectures and feel that they have derived a great deal of valuable and practical benefit from them.

HAGERSTOWN (CUMBERLAND VALLEY) CHAPTER elected its officers to serve the Chapter for the current year, as follows: Harold J. Rosenberger, Chairman; Harry W. Straub, Vice-Chairman; Robert E. Moats, Secretary; J. Howard Sheeler, Corresponding Secretary; Robert J. Saum, Treasurer; and George H. Fulks and S. Austin Hess,

Program Committee, George H. Fulks to serve as Chairman of this committee. Our congratulations to these new officers!

At this same meeting George Fulks used his oscilloscope and a TV receiver to demonstrate kinks he had learned about servicing the sync section. Refreshments were served to the members during the discussion period which followed.

The Chapter usually suspends meetings for the summer. But members have been enjoying the meetings so much lately that there have been suggestions to continue them through the summer, also the possibility that meetings be held more than once a month.

LOS ANGELES CHAPTER'S Chairman Eugene DeCaussin read an article by Chapter member William G. Edwards appearing in the magazine "TV Reporter." The article dealt with the advertising practices followed by TV repairmen and their scale of charges for house calls.

William Edwards demonstrated a novel use of a magnifying glass. He showed how one can be used to magnify the parts of a schematic diagram on a picture screen. The particular magnifying glass that he used is manufactured by Mattel Toys Inc., and sells for about \$20.

Chairman DeCaussin showed two more of his very interesting travel films, one on the Pacific Islands and the other on Ceylon. Some old-time movies which he also showed were very amusing.

This meeting was enlivened by the presence of three members' wives. To add to the occasion Mrs. DeCaussin contributed a pound cake and Mrs. Tevis brought some cookies. Secretary Allen topped off the refreshments with the coffee he donated.

The newest member to join the Chapter is Robert Hawkins. Welcome to the Chapter, Bob! MINNEAPOLIS-ST. PAUL (TWIN CITY) CHAPTER'S Walter Berbee, former Chair-

man and operator of a full-time Radio-TV sales and service shop for some years, gave a talk and demonstration on signal tracing with an oscilloscope. The members always enjoy demonstration of test equipment and they particularly liked this one.

At the next meeting Harold Linquist discussed Ohm's Law at some length. Because it is so fundamental and so important to practical Radio-TV servicing, almost every technician can benefit from a periodic review of this subject.

For the benefit of those members who may not be aware of it, the Chapter would like it known that any member can rent its party-size coffee urn for a fee of one pound of good coffee for each rental. So many members have taken advantage of this arrangement that the Chapter is now several pounds ahead on its supply of coffee.

NEW ORLEANS CHAPTER quite sometime ago decided to devote the major part of its meetings to TV theory and troubleshooting. Time has shown that this was the right decision, for the program has been popular among the members from the start and still is. The Chapter calls this part of its meetings the "TV Clinic." It is conducted by Gaston Galjour, a Radio-TV service technician of wide experience and proven ability.

NEW YORK CITY CHAPTER is another one of the Chapters whose attendance at meetings suffered back in December and January. Due to the very severe weather only the hardier members showed up. But the meetings were lively, nevertheless.

Dave Spitzer and Jim Eaddy have been team-



Phil Powell, field service engineer for Delco-Rado, delivering a talk on transistors at a Philadelphia-Camden Chapter meeting.



David Linz, representative for Globe citizen's band equipment, addressing members of the Philadelphia-Camden Chapter.

ing up and holding troubleshooting sessions on the Chapter's set. They introduce various defects and then leave it up to the members to try to reason what the cause of the trouble could be.

Dave Spitzer also described the construction and use of an appliance checker. Members were invited to make a copy of a large diagram he had prepared for this appliance checker.

Jim Eaddy is continuing with his popular and highly informative talks on transistors and transistor circuits.

The committee always has something interesting planned well ahead of time for each meeting. The Chapter has many fine speakers who are well informed.

PHILADELPHIA-CAMDEN CHAPTER members spent one of the most memorable evenings in the history of the Chapter. They were guests of the General Electric Company at the GE Building in Philadelphia, for what GE called "National Radio Institute Alumni Night -- An evening of Electronic Tuition, Interesting Demonstrations, and Enjoyable Fellowship." The arrangements were made through the courtesy of Mr. George Reid, General Manager, Eastern Sales Division of GE, and Mr. George Walker, General Manager, Special Products Division. Ted Rose, Executive Secretary of the NRI Alumni Association, and J. B. Straughn, Chief, Consultation Service and Assistant Director of the NRI Instruction Department, were present at the meeting. Ninety members of the Chapter attended. Ted Rose spoke briefly about the lat-

est NRI course in Industrial Electronics, then administered the oath of office to Jules Cohen as National President of the Alumni Association. Jules Cohen is also Secretary of the Philadelphia-Camden Chapter.

The host for the General Electric Company, Mr. Walker, then took over the meeting and with the aid of a film strip projector and a GE Television dynamic demonstrator, went through the 1961 GE TV chassis and automatic tuning. At the conclusion of the talk and demonstrations, twenty-two door prizes, donated by GE, were given out. The ninety-five guests present were then treated to a buffet supper that was truly sumptuous. All kinds of cold cuts and cheeses, drinks (both hard and soft) and all kinds of snacks guaranteed that no one would leave hungry. It was unanimously agreed by all the members who expressed an opinion about it that it was the best meeting they ever attended. The General Electric Company can rest assured that this gesture has left a warm feeling among the members and a closer relationship between GE and the Philadelphia-Camden Chapter.

Harvey Morris continues with his invaluable aid to the Chapter, his latest contribution being a question-and-answer forum and the members were very enthusiastic about this meeting. The members feel that if there is anyone who can answer your problem if it's TV trouble, Harvey is the man.

The Chapter attracts as many new members as ever even though it is already so large. The newest members are Frank Yukanis, Harry Fine, Elmer Young, Joseph Berry and Frank



Westinghouse technician Art Roucher conducting a demonstration at a meeting of the Philadelphia-Camden Chapter.

Webb. It's a pleasure to welcome you to the Chapter, gentlemen!

Members have voted in favor of a banquet to be held next fall. The tentative date is October 4.

This is a belated report of the officers elected to serve the Chapter for 1961. They are: Herb Emrich, Chairman; Harvey Morris, Vice-Chairman; Jules Cohen, Recording Secretary; Joe Burke, Fin. Secretary; Charles Fehn, Treasurer; Charles Wells, Librarian; and Ray Stout, Sgt. at Arms. All these officers are carry-overs from last year. Congratulations to them upon their re-election and to George Dolnick, who was elected Ass't. Librarian.

PITTSBURGH CHAPTER members are well pleased with the discussions and demonstrations being conducted by their new Chairman, Howard Tate. At one meeting Chairman Tate dealt with employing an oscilloscope for troubleshooting a TV receiver.

At another meeting he discussed sweep circuit troubles and illustrated his talk with a commercial sweep circuit troubleshooting instrument.

The members thought so highly of these talks and discussions that they asked for more at future meetings.

SAN FRANCISCO CHAPTER, in installing its new officers for the current year, used the occasion to celebrate its second anniversary. There were plenty of delicious refreshments -- pies and cakes furnished by wives of the members -- and two exceptionally beautiful travel films in color were shown by Sidney Mahler. The technical part of this meeting was an excellent talk by Secretary Art Ragsdale on how the failure of agc voltage can cancel out the picture in a TV receiver.

Two more equally fine talks were given by Anderson Royal, Chairman of the Program Committee, on audio amplifiers and by Chairman Ed Persau on how to convert Radios to inter-coms.

The Chapter has been pleased to admit two new members to membership, Marcario Celiz and Bartolome Flojo. Congratulations to these new members!

Andy Royal has been busy planning the construction of a 5-tube Radio on a large "bread board." All members of the Chapter will participate in the construction of this receiver.

All members of the Chapter should make special note of this: Since the first of the year the Chapter has been holding its meetings at

its new meeting place, 147 Albion Street, San Francisco.

SOUTHEASTERN MASSACHUSETTS CHAPTER former Chairman John Alves spoke on the increase in transistor service work to be done and stated that he felt this work could be done profitably by servicemen who were thoroughly familiar with it. Guest speaker Charles Boytano led an interesting discussion on the technical applications of transistors.

At the next meeting John Alves held the lime-light not only as the featured speaker with another blackboard talk on transistors but was also presented with a gift by his fellow members for the use of his recreation room as the Chapter's meeting-place.

The newest member welcomed into the Chapter is Edward Ahlbrecht. Glad to number you among the members, Ed!

The Chapter's officers for 1961 are: Edward Bednarz, Chairman; Manuel Sousa, Vice-Chairman; Harvey Cole, Secretary; John Kosior, Treasurer; James Donnelly and Stanley Tobol, Finance Committee. Our congratulations to these officers!

SPRINGFIELD (MASS.) CHAPTER was among those whose activities were the most seriously affected by the severe weather and bad road conditions back in midwinter. So few members showed up for one meeting that the meeting could not be held; another meeting was cancelled altogether. But now that spring is here once again, attendance is expected to return to normal.

The members enjoyed a film "Seconds For Survival" supplied by the New England Telephone and Telegraph Company. Chairman Norman Charest thanked Howard Smith for the use of his projector and for running the film. The remainder of this meeting was devoted to the continuation of a class on horizontal vibrators. In the absence of Secretary John Park, Chairman Norman Charest conducted his class.

John Park brought in an NRI Television receiver (constructed as part of his training in his NRI Practical Television Servicing course) to the following meeting, together with a scope and meter. With John acting as narrator, all the test questions of the 10th manual of the course were discussed and all the members present participated in the lively discussion. Despite the difficult conditions created by the steel-frame building, the NRI receiver performed well.

The members have become used to expecting

the Chairman to bring in the usual number of dog receivers to shop meetings. Where he gets them heaven only knows -- it seems that every set has more troubles than the Congo -- but the members always manage to get them going. What could be better training than this?

To reduce expenses, the Chapter is considering the possibility of weeding out inactive and non-paying members and taking their names off the mailing list. All members -- especially those who have not been attending the meetings regularly -- please take notice.

### Directory of Local Chapters

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

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

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

FLINT (SAGINAW VALLEY) CHAPTER meets 8:00 P.M., 2nd Thursday of each month, St. Agnes School Annex, 518 W. Pierson Rd., Flint. Chairman: George Rashead, 338 E. Marengo Ave., Flint, Mich.

HAGERSTOWN (CUMBERLAND VALLEY) CHAPTER meets 7:30 P.M., 2nd Thursday of each month, "The Nook" Restaurant (rear), Hagerstown, Md. Chairman: Harold J. Rosenberger, R.D. 1, Waynesboro, Pa.

LOS ANGELES CHAPTER meets 8:00 P.M., 2nd and last Saturday of each month, 4415 Santa Monica Blvd., L. A. Chairman: Eugene DeCaussin, 5870 Franklin Ave., Apt. 203, Hollywood, Calif.

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

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

NEW ORLEANS CHAPTER meets 8:00 P.M., 2nd Tuesday of each month, home of Louis Grossman, 2229 Napoleon Ave., New Orleans.

Chairman: Herman Blackford, 5301 Tchoupitoulas St., New Orleans, La.

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

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

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

Caryl Dr., Pittsburgh, Pennsylvania.

SAN FRANCISCO CHAPTER meets 8:00 P.M., 1st Wednesday of each month, 147 Albion St., San Francisco. Chairman: E. J. Persau, 1526 Wayland St., San Francisco, Calif.

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

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

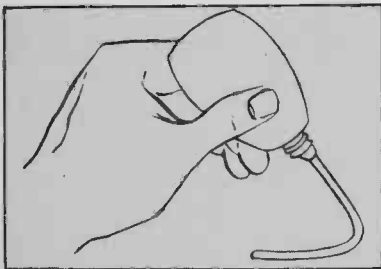
# Stan Cor's Corner

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CHICAGO STANDARD  
TRANSFORMER CORP.  
Mr. Bennett Cook, Adv. Mgr.

## SERVICE SHOP SHORT CUTS

### Oil Syringe

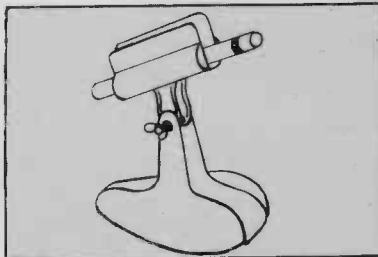
You can make a handy service syringe by inserting a length of small diameter insulating spaghetti into a plastic squeeze bottle. The far reaching nozzle lets you use



this tool as an oil can to apply oil to phono and tape recorder belts. You can also use it to apply cleaner to noisy controls. As you use this handy device, countless of other applications will occur to you.

### A Large Third Hand

A large paper clamp fastened with a bolt to the metal base from an old desk lamp or electric fan often makes a handy bench tool. It can be used to hold a service light or a soldering iron and it can also be used as



a device for holding parts while they are being soldered or tested. By loosening the wing nut, it can be angled to several different working positions. Its flexibility makes it a welcome addition to any service bench.

# National Radio Institute

3239 WISCONSIN AVENUE, N.W., WASHINGTON 16, D.C. ESTABLISHED 1914



March 20, 1961

Dear Students and Graduates:

As most of you know (from the last issue of NRI News), I celebrated my 80th birthday on February 3rd.

The process of growing older has, in my case, been a pleasant one. The job of helping others to help themselves has been a never-ending source of happiness and satisfaction to me. So I'm always glad to see another birthday roll around.

To say that I was deeply moved and somewhat overwhelmed by the special gift so many of you sent me would be an understatement. I only wish I could personally thank each man who took the time to send the name of a friend who would make a good NRI student. Mere words seem inadequate to express my appreciation, gentlemen.

Thank you -- one and all -- for your kindness and good wishes. May 1961 prove to be your greatest year of personal achievement.

Sincerely

Founder

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