



journal

March/April 1969

electronics is

NOT for men only

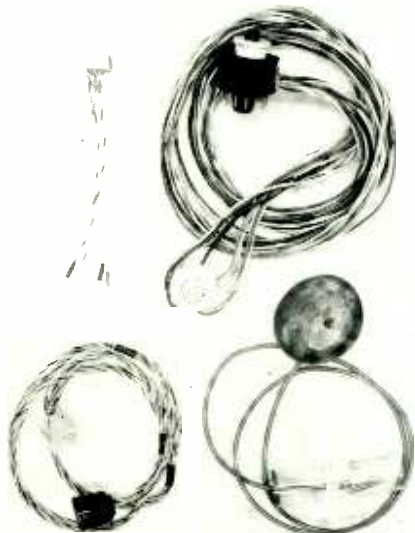
IF YOU OWN A CONAR 600

COLOR TV RECEIVER

NOW YOU CAN USE IT AS A

COLOR TV TEST JIG

WITH THE NEW CONAR
WIRING HARNESS ADAPTOR KIT



- SAVE TIME, EFFORT, MONEY.
- LEAVE THE TV CABINET IN THE CUSTOMER'S HOME; TAKE ONLY THE CHASSIS TO THE SHOP.
- NO NEED TO READJUST CONVERGENCE AND PURITY CONTROLS ON THE SET AFTER YOU REPAIR THE CHASSIS.

Many professional color TV servicemen invest \$150 to \$200 for a color TV test jig. They consider it a wise investment because the test jig quickly saves them enough time, effort, and money to pay for itself.

Now, for a fraction of the cost of a commercially available color TV test jig, you can adapt your Conar model 600 color TV receiver for use as a test jig! The new Conar Wiring Harness Adaptor Kit makes it possible.

Think of what this can mean to you. No more furniture moving. Leave the customer's TV cabinet in his home and take **ONLY** the chassis to your shop. And since the cabinet hasn't been moved, you don't have to readjust the convergence and purity controls for the picture tube. This could save as much as half of the time you would otherwise spend working on the customer's set.

The Adaptor Kit is easy to use. Simply connect the three extension cables between the customer's chassis and your Conar 600, and insert the convergence plug into the chassis. Your Conar 600 is now a color TV test jig which will show on its screen the pictures produced by the customer's chassis. You will be able to see how your work on the chassis affects the picture.

The Adaptor Kit connections will not affect the convergence or purity adjustments on the Conar

600 either, so whenever you choose, simply disconnect the wiring harness and use your receiver to watch your favorite TV programs.

The Adaptor Kit includes a yoke adaptor which allows you to service more than 280 different chassis. Additional yoke adaptors will permit you to service many additional chassis. These adaptors are available from Conar for \$4.95 each plus \$1.50 for a matching convergence plug, if needed. A list of all these adaptors and the chassis they fit is supplied with each Adaptor Kit.

Using your Conar 600 as a test jig will make your color TV servicing easier and faster. In servicing, when you save time you save money. Start saving money now. Order your Conar color TV test jig Adaptor Kit today.

CONAR WIRING HARNESS

ADAPTOR KIT

STOCK #600AD

\$29.95

ADD \$1.00 FOR POSTAGE & HANDLING

USE CONVENIENT ORDER BLANK ON PAGE 25

nri graduate dorothy salka proves daily . . .

NOT ELECTRONICS IS / FOR MEN ONLY

Mrs. Dorothy Salka, Cocoa Beach, Fla., has an unusual job for a woman—she modifies and troubleshoots computer equipment relating to America's space program at Cape Kennedy. She moves in a milieu of men, who treat her as a professional equal.

The work she does is challenging, "very interesting", she says. "There's something new going on all the time. I wouldn't trade my job for any other in the world!"



Her position as a Data Reduction Equipment Technician, working for RCA at Patrick Air Force Base, Fla., may involve any or all of the following as the "daily touch of adventure": using a computer, testing out data-processing equipment, checking electronic circuits.

All of these skills are used to help transform Cape Kennedy's massive mountain of data obtained from satellites into a usable, simplified evaluation of the center's space effort.



Her co-workers in RCA's Data Conversion section at the center are all men. With them she maintains a pleasant state of equivalency, rare for the working woman. Her husband of some 12 years, Joseph Salka, counts this among what he feels are her "much higher than average" accomplishments and successes.

For Mrs. Salka, NRI made the difference between doing-pretty-well and doing-just-fine. Following graduation from Proctor High School in Utica, N.Y., she attended Mohawk Technical Institute there, and then worked for GE, also in Utica, as an Electronics Technician for four years. Later, working for RCA as a Statistical Methods Clerk, she wanted to qualify for a higher position, heard about NRI, and enrolled in its Industrial and Military Electronics Course.



*six months before graduation,
the course began to pay off,
with a promotion and raise*



The course began to pay off six months prior to graduation, when RCA recognized her progress and promoted her to her present position, with an initial salary increase of \$30 per month.

Now that has gone up to more than \$150 in actual salary, with the bonus of increased challenges of her daily work equally as rewarding.

A petite (5' 2"), feminine woman, soft-spoken but as precise as her work must be, Mrs. Salka enjoys keeping house. Since like other women with full-time jobs she has few hours to do it in, she has gotten it down to a science.

"I'd rather do it myself than have someone else do it," she says. But when it comes to cooking, she admits freely that her husband "is far better at it than I am."



Mr. Salka is a communications coordinator for the Federal Electric Division of ITT based at the Kennedy Center, a "vast place". He drives daily the three miles from their home at 911 S. Orlando Ave. in Cocoa Beach, but since their working hours don't quite coincide, she's in a car pool. Both share a "love" for where they live and where they work; "It's right in the middle of all the activity," she says.

The two have common interests in "dabbling in stocks" and in coin collecting, although she says he's much more enthusiastic about the latter than she is. Both, though, like "only the pretty ones -- you know, in mint condition", as well as very old coins.

Mrs. Salka credits NRI's comprehensive coverage of "all types of industrial electronics" with helping her to gain and continue the knowledge she must have to handle her job properly. "The texts are so easy to understand. I like the way they're in layman's terms." She rates NRI's counseling service as "excellent", and encouraging and inspiring to the student. "It's important to the student to feel he's being encouraged."

She also credits NRI training with an additional plus factor, in her case at least. She feels it has helped to improve the Salkas' standard of living,





citing her increased earnings. "You know if you make more (money) you seem to use it to live better." Among other things she has used her additional pay to purchase an organ, which makes for further sharing for the Salkas; i.e., she enjoys playing the organ and he enjoys listening to her play.

Mrs. Salka has "no suggestions" for improving NRI methods of teaching, counseling, etc., except perhaps one: She has heard of the school's projected course in computer technology, and she'd like us to hurry up a bit with it. "I want to take the course," she says, "If I can find the time...."

Want to bet she does?

How to Use Your CONAR 600 Color TV Receiver as a Color Test Jig

Now that you are a professional Color TV Serviceman, why continue to be a furniture mover, too? Those color TV chasses must have a deflection yoke and a convergence yoke plugged in when they are operated on the bench. So away goes the whole set to the shop? This is unnecessary.

A color TV test jig will allow you to service a color TV chassis after it has been removed from the cabinet so you don't have to move the cabinet to the shop. But to do this, the jig must have a color tube, deflection yoke, and a convergence yoke in order to operate. It's no surprise that commercially available color TV test jigs cost about \$200.

Is there a less expensive way to set up a color TV test jig? There is if you own a CONAR Model 600 color TV receiver. NRI color-course students and others who have constructed the Model 600 receiver already have the most important (and most expensive) parts necessary

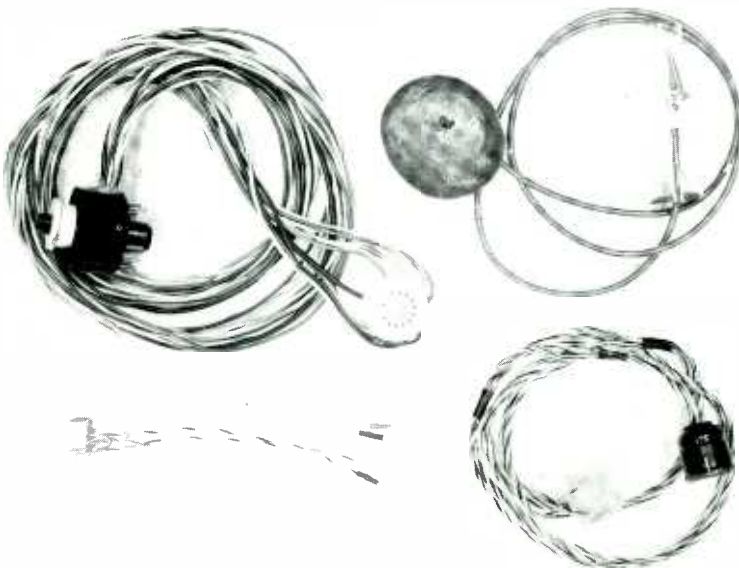


Fig. 1. CONARcolor test jig cables.

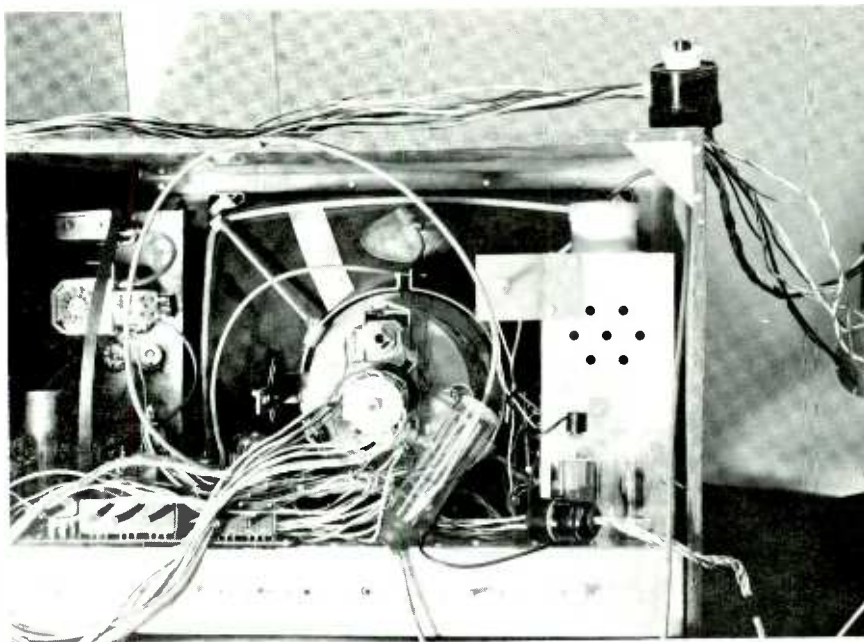


Fig. 2. Color test jig cables connected to CONAR Model 600 color TV.

for setting up a test jig. And now the CONAR Instruments division of NRI offers a Wiring Harness Adaptor Kit which will turn the Model 600 receiver into a test jig without changing its use as a color receiver. Best of all, the adaptor kit costs less than \$30.

The Conversion Kit consists of several cables, plugs, and adaptors which are used to connect the receiver being repaired to your Model 600 receiver. When the two sets are connected, the chassis being repaired will use the CONAR receiver to present the color picture.

To use the Adaptor Kit, unplug your receiver from the ac line. (The receiver will not be energized while being used as a test jig.) You disconnect the deflection yoke plug, the picture tube socket, and the high-voltage anode lead from your receiver.

Now to set up the test jig. The set of cables consists of a picture tube extension and adaptor cable, a yoke extension cable, a yoke adaptor cable, and a high-voltage extension cable. First connect the socket of the picture tube extension/adaptor cable to the picture tube of the CONAR Model 600. Next connect the high-voltage extension cable to

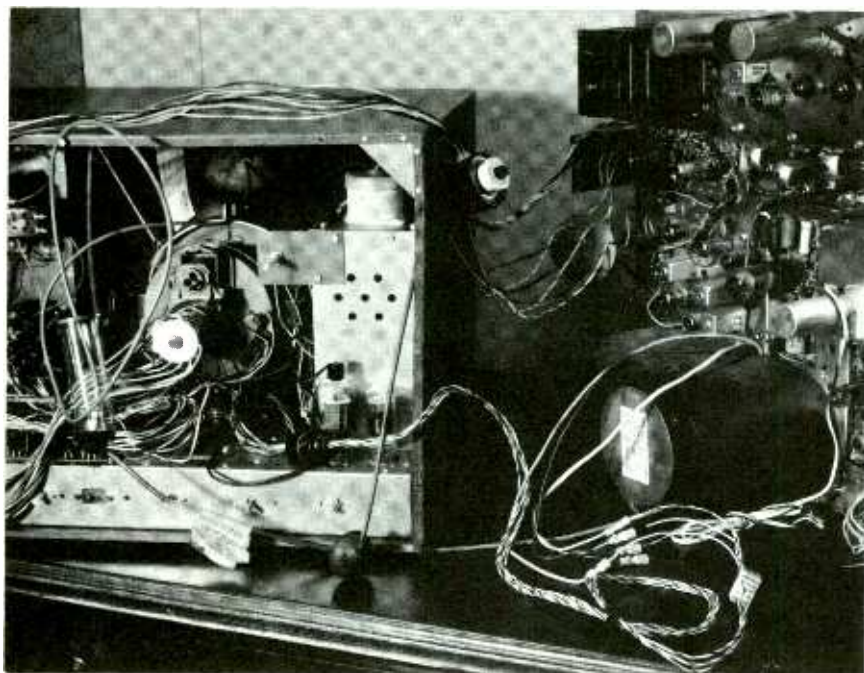


Fig. 3. Rear view of RCA CTC11 chassis connected to Model 600 used as a test jig.

the second anode of your receiver, and finally plug the deflection yoke into the socket of the yoke extension cable.

You should also connect a ground wire from your test receiver chassis to the chassis of the set under test. Now the high-voltage extension should be clipped to the second anode lead of the receiver under test, and the CRT socket of the receiver under test connected to the pins of the picture tube extension/adaptor cable. Finally, you will use the special yoke adaptor cable to connect from the yoke extension cable to the deflection yoke of the receiver under test.

If you happen to run across a chassis which does not conform to the yoke adaptor cable connections, you merely have to buy from CONAR, for a nominal price, the adaptor cable needed. In this way you greatly increase the number of different receivers you can service.

A special plug is also furnished to plug into the chassis convergence yoke socket. This will allow the chassis under test to operate without

the convergence yoke assembly being plugged in. Other convergence plugs are available from CONAR for later model chasses.

Now you can remove the chassis from a defective color receiver without touching the deflection yoke or convergence yoke, and therefore you have not changed any of the delicate adjustments that were so tedious to set. You repair the chassis on your own bench, see a picture on the CONAR Model 600, and see for yourself that the defect has been cured. Then you take the chassis back to the owner, put it back in the cabinet, turn it on and get a good color picture, without touching any of the adjustments on the neck of the picture tube. Sound good?

A list of additional adaptor cables is included with the Wiring Harness Adaptor Kit. If you find a chassis that doesn't fit your adaptors, a note to CONAR will get the proper adaptor in the mail to you in a short time. The adaptors are reasonably priced, and you need not stock additional ones until you have a need for a particular type.

Using the CONAR Model 600 as a test jig will eliminate about 50% of the total time devoted to one repair job. This is true because the customer's color TV cabinet is still in his home, and the adjustments of purity and convergence are still intact. This means quicker service and more return for your effort.

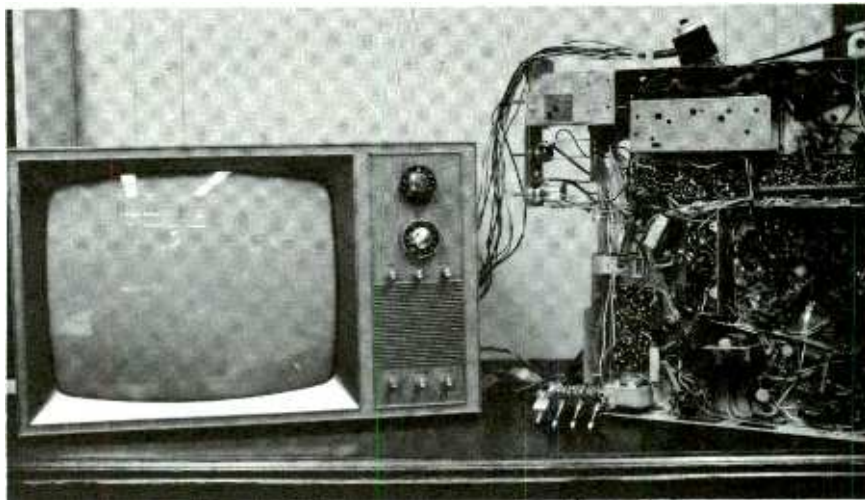


Fig. 4. Front view (normal working position) of RCA CTC11 and Model 600 color TV test jig.

CQ NRI DE G5AMG

Among the many comments received in answer to our previous CQ were a number suggesting an on-the-air get-together of hams who are NRI graduates or students. One who made this suggestion was SSgt. Ron Gaspard, whose Stateside call is WA5UVY, and who is now operating as G5AMG because of his Air Force assignment overseas.

In order to see how much interest there may be in forming an NRI net, or possibly an on-the-air chapter of the NRIAA, Ron has arranged his shift schedule so that he will be available the weekend of March 29 and 30, 1969. He will operate on the following schedule, looking for your calls on 20-meter single-sideband:

DATE	TIME	FREQUENCY	MODE
March 29	2000-2300 GMT	14250 \pm 5 KHz	SSB/VOX
March 30	2000-2330 GMT	14250 \pm 5 KHz	SSB/VOX

So, let's see how many of us can QSO Ron during the time periods shown. He runs 180 watts p.e.p. to a TA-33 Jr. beam up 35 feet, so he should put a pretty good signal into North America unless ionospheric conditions are poor.

Please give Ron your ideas concerning future net schedules and possible organization. We at Headquarters will be guided by your collective wishes. Tom Nolan, Executive Secretary of the NRI Alumni Association, is agreeable to forming an Amateur Chapter with on-the-air meetings if this is what you want. However, we don't want this to be just something dreamed up and implemented by NRI Headquarters -- we would prefer it to be as spontaneous as the original suggestions, with organizational details, schedule times, etc., entirely in your hands.

Those who may not be able to make the schedule with G5AMG, but are nevertheless interested, can drop Ron a line at the following address:

SSgt. Ron Gaspard
2130 Comm. Sq. Box 645
APO New York 09378

If some of you who work cw only want to try something similar on one of the cw bands, please send your proposal to NRI by about March 20, to give us time to print your schedule in the May-June issue of the Journal.

As this issue goes to the publisher, we have now heard from 145 licensed amateurs in 39 states, 3 Canadian Provinces, and England. In addition to the calls printed last issue, we now have:

W1AAQ	WA5FFE	WA8AXF	W N TRV
WA1FOU	W5QVQ	W8CUT*	W N WCJ
W1QDC	W5QVW	W8FIE	K O YAL/5
	WN5UYT	WA8OBU	
WA2LDO		K8QOJ*	KL7FSE
WB2MAP		WA8SLG	
K2QCY	WB6RPL	WA8VYX	VE2SV
	WB6SGH	WA8WFI	
K3ASV	WB6VXP	WA8WQT	VE3ARX
WA3JEC			VE3AWO
WA3KNP	K7BDV	K9FYM	
WN3LDM	WA7CY Y	WA9MOU	VE7ALU
K3NSN	W7FHD*	K9PAV	VE7AOY
	WN7IMX		
WB4DQF	WA7JWW	W O LIJ*	G5AMG
WB4FUJ	W7UZU	K O LUC	
WN4JJG			

*EXTRA CLASS LICENSE

That makes eight of you who are now in the Extra Class. Many of you have said you are on the verge, so please let us know when you join the distinguished group. There are a couple of Headquarters types who are scared off by 20 WPM, but I might get fired if I print their calls.

73,
Russ, W3FSP

WANTED: Man with 1st Class Radiotelephone License for AM-FM Broadcast Station located in Charlestown, West Virginia.

APPLY TO: Bill Ashley
WAVA, Chief Engineer
1204 Rosslyn Building
1901 N. Fort Meyer Drive
Arlington, Va. 22209

Space Hams

by Maurice M. Lewis, Jr.

Reprinted from RCA Electronic Age

Early in this century, fledgling radio amateurs fiddled with receiving sets made of such items as empty oatmeal boxes, curtain rods, and spent rifle shells. Hovering over their makeshift rigs to pluck faint signals from the airwaves, they were in the vanguard of a movement that has seen radio-electronics bloom into a sophisticated science typified by world-wide communications and interplanetary space probes.

Yet, this progress has by no means stunted amateur pioneering. The modern-day counterpart of the radio hams of the early 1900s is the growing coterie of "space hams" in several countries of the world who use rolling pins, inexpensive electric motors, and similar makeshift gear to receive pictures of the earth from TV-equipped TIROS, ESSA, and Nimbus weather satellites orbiting hundreds of miles overhead.

On a single pass of a satellite over the eastern United States, for example, space hams now receive pictures covering areas from northern Greenland to the Yucatan Peninsula in Mexico. Many of these amateur-produced space pictures contain startling detail, showing weather phenomena such as hurricanes and terrestrial features such as the St. Lawrence River, Long Island, and the Florida peninsula.

The originator of this new space-age hobby is Wendell G. Anderson, a veteran

radio amateur and an engineer on the staff of RCA Defense Electronic Products in Moorestown, N. J. Anderson received his first space pictures in the fall of 1964 on what he describes as "relatively crude equipment" hastily assembled in the basement of his split-level home in Moorestown. The photographs were good enough to spur him on to further experimentation.

The basement receiving station was put together primarily from a 30-year-old ham radio set plus the usual store of surplus equipment accumulated by most hams. Also among the components were a common kitchen rolling pin, two electric motors costing \$10 each, a second-hand microscope costing \$15, and an argon electric light bulb. The total outlay was about \$200.

The antenna was fashioned from a piece of wire mesh and a 30-foot length of copper tubing held in place by wooden dowels and fastened to a clothesline pole in Anderson's backyard. Its vertical movements are controlled by commercial TV antenna rotators that allow the antenna to follow the satellites as they speed overhead.

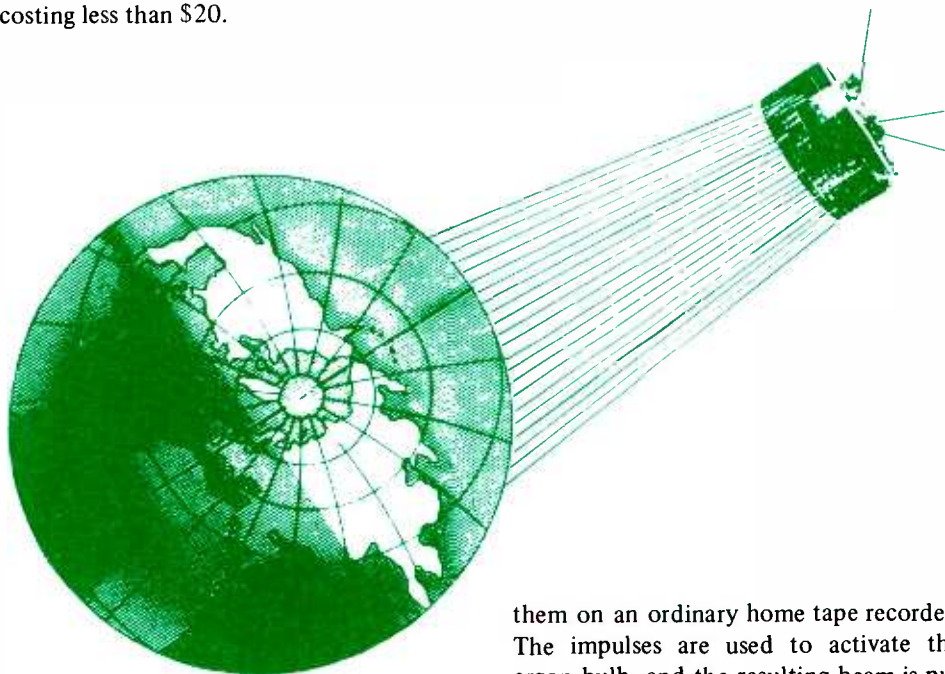
By reporting on his early successes in a magazine for amateur radio operators, Anderson launched an entirely new hobby for hams around the world. He now corresponds regularly with more

than 150 individuals in the United States, Canada, India, Italy, the Netherlands, South Africa, Turkey, and West Germany.

A recent letter from an Italian correspondent contained a satellite view of southern Europe, including the Italian "boot" and the Sicilian "football". The photo was received on makeshift electronic equipment coupled with a camera costing less than \$20.

Anderson estimates that there are now about 50 amateur stations in operation with a similar number under construction. These generally follow his original plan or contain some slight modification, such as replacing old-fashioned tubes with transistors.

To receive a picture from a satellite, Anderson tunes in the signals and records



The range of persons and groups interested in building their own satellite picture receivers runs from hams who have retired from their regular jobs to high-school students. In fact, students at one technical school - the upper Bucks County High School in Bedminster, Pa. - blend academic training with space-age interest by building a receiver each year as part of their electronics course.

them on an ordinary home tape recorder. The impulses are used to activate the argon bulb, and the resulting beam is put through the "wrong end" of the microscope to focus it to a sharp point. The beam is then aimed at unexposed photographic film affixed to the rolling pin, which is rotated by one of the electric motors.

The rolling pin makes one revolution for each of the 800 TV lines that make up the satellite pictures. The exposed film is then processed in Anderson's darkroom. (He is also an amateur photographer.)

Many of the newer space hams bypass the darkroom process by using Polaroid cameras to record the pictures directly from an electronic scope. The recorder is not necessary if the picture is reproduced directly on film or the Polaroid positive as it is received from the satellite. Most hams prefer, however, to tape the signals so that additional pictures can be produced from them.

To practice the hobby, space hams require a good background in electronics plus a certain degree of ingenuity. Some high-school students who have attempted to build sets for their science fairs have found the project beyond their limited know-how.

Pictures can be received only from those satellites equipped with Automatic Picture Taking (APT) equipment, such as the ESSA 6 launched in November, 1967. The APT equipment was especially designed by NASA and the Environmental Science Services Administration of the U. S. Department of Commerce to allow direct transmission to relatively simple receiving equipment.

A second type of weather satellite carries more complex cameras that store pictures for later transmission to highly sophisticated ground stations. These cameras, called advanced vidicon camera systems, provide professional meteorologists with a global view of the world's weather.

Recently, a third type of satellite, the ATS series, has gone into orbit and is beaming pictures from a stationary or

synchronous position 22,000 miles above the earth. By tuning to the ATS frequency, amateurs can receive pictures that show the weather over an entire hemisphere -- a fact that seems sure to stimulate even further interest in a hobby uniquely keyed to the space age.



Wendell Anderson, originator of do-it-yourself space pictures, adjusts the antenna in the backyard of his home.

Multi-Uses for Multimeter

VOMs STILL GO VOOM

by James W. Essex

In my early days of radio, I met a radio engineer who was most emphatic in his claims for the meter he'd just bought because it has a "20,000 ohm/volt movement". As I said, they were early days -- before VTVMs (vacuum-tube voltmeters) were common. I'd just learned about such things as inductance, capacitance, and transformers. But ohms-per-volt? What were they? By the expression on his face, I could tell it meant something to him!

Several VOMs and 20 more years later, my appreciation of this "figure of merit" for a multimeter has grown, and I've learned something of the merits of the meters themselves like the broadcast engineer of long ago.

Consider your own experience with a multimeter. No doubt you, like most, have thought you need a vacuum-tube voltmeter to read avc, agc, etc. You'll likely be surprised to learn that a good VOM (volt-ohmmeter) on the market today can exceed the internal impedance input of average VTVMs on their lower ranges. Yet, there's some feeling today that ascendancy of the VTVM has outmoded the VOM. But there's still much to recommend the continued support of a regular VOM over the VTVM, and it's not all because of price and portability.

James W. Essex, a native of Canada, has had a diverse career in electronics since he enrolled in NRI's Communications Course in 1939. He served with the Royal Canadian Navy as a radar specialist-instructor, has written numerous articles for electronics publications, been a radio chief engineer, active in amateur radio, etc. Since 1960 he has been an instructor at the University of Waterloo in Canada. Holder of several degrees, he is a member of IEEE and consultant in electronics.

Perhaps it's significant that a recent line of top VTVM's features battery packs -- an indirect admission, if you like, that the necessity to "plug in" still leaves much to be desired. In any case, especially if you're just entering electronics, buying a piece of test equipment would be much easier if the

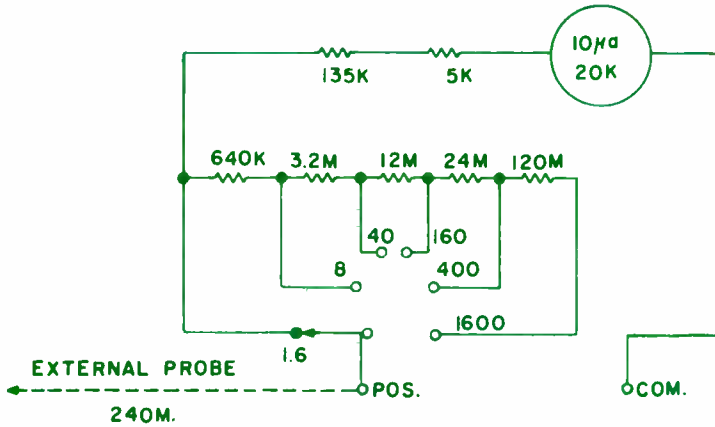
demands upon it weren't so great. Unlike some trades, like water "divining", for example, where all you need is a willow branch and you are in business, an electrical tester requires utility and precision. After all, your ability to stay in business will depend on it. It's not enough -- as with a water search -- to note the bending of a branch indicating water. (Experts are generally agreed you'll find water underground most any place, anyway. This is the best reason I know of that so many believe in that method.)

But in electronics, it's a little different, even if you don't necessarily have to go into high prices to get a workable and useful piece of test equipment. Unlike the bent-branch method, a highly accurate indicator of necessities (volts, current, resistance) can't be had for nothing, but neither do you have to go to the more expensive VTVMs to get high sensitivity with accuracy. Like the water underground, there are volts and current to be found everywhere there is electronic equipment. And how well you can interpret observed results will be a measure of how well you do in this business. But there are many pitfalls.

The photos below are a representative line of three popular VOMs in wide use today. Each has particular merits to meet the buyer's particular needs. I won't go into individual ones here, as your own demands will ultimately decide which you buy. Basically, they represent features common to each: complete portability, easy-to-read scales, and a minimum price for reasonably accurate and reliable readout. Even the "mini" versions so often seen now appear regularly in the most unusual situations. I'm constantly observing equipment in the \$40,000 category being serviced with the aid of a VOM produced from the pocket or briefcase of a technical representative from the factory who swears by the tester -- no matter how inconsequential it seems alongside such giants of electronics. Perhaps the moral here is that for all their complicated and expensive paraphernalia, circuits are still reduced to volts, ohms, and milliamps to diagnose faults.



In essence, a simplified dc voltmeter circuit having a meter movement with fsd (full-scale deflection) of 10 microamps, looks something like this:



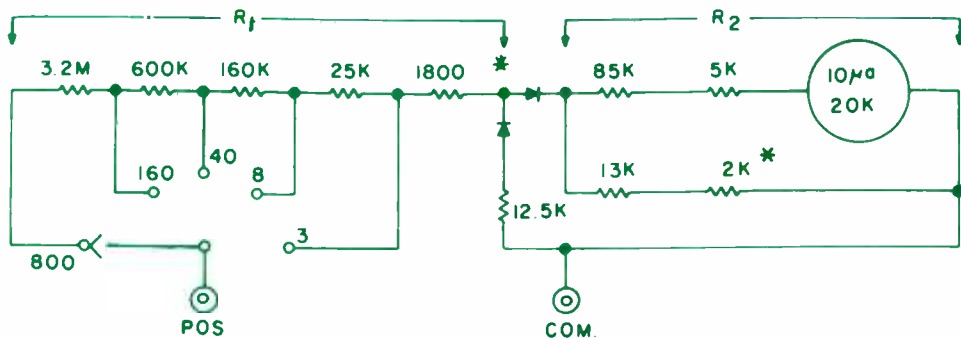
A full-scale voltage can thus be had whenever external voltages (in this case 1.6, 8, 160, 400, 1600, etc.) are applied, driving 10 microamps through the movement. Ten microamps is thus its "sensitivity". For the 1.6V range, for example, we have:



In other words, for full-scale deflection on any particular range, we will have 100,000 times as many ohms for each voltage as in the 8V range. Here we have 800,000 ohms ($640K + 135K + 5K + 20K = 800K$). This holds for additional ranges up to 1600 volts dc. For still higher voltages, an added resistance in the form of a probe raises the volts read to 4,000 volts and higher. When reading ac volts, the requirement of a rectifier together with its own set of calibrated resistors in a series-parallel configuration lowers the ohms/volt rating, although the basic meter movement is the same as in dc. Refer to the Figure on the next page.

This particular meter is rated 5,000 ohms/volt. Or put another way, for every volt needed to achieve fsd, there is 5,000 ohms. Thus, on the 3-volt range, reading ac volts, the total meter resistance including series and shunt values is 15,000 ohms; on the 8V ac range it's $8 \times 5,000$ ohms or 40,000 ohms; and at 800V ac, there are 4 megohms total circuit meter resistance.

An important fact becomes obvious: The unusually high circuit resistance



NOTE: * APPROX VALUES CALIBRATED FOR INDIVIDUAL UNITS:

AT 800 V.A.C. SETTING

<u>R1 TOTALS</u>	3,986,800Ω
<u>R2 TOTALS</u>	13,200Ω
=	<u>4,000,000Ω</u>
	or <u>4 MEGS.</u>

presented by a VOM at its higher scales (though, as is the case on ac, where the ohms/volt is only basically 5,000 ohms) means the "loading" effect on any circuit is negligible when you get to the higher ranges. Thus, loading effect, so often the bane of VOMs when compared with VTVMs, isn't all that bad. With the Bach-Simpson Model 269, in reading dc volts, for example, the total circuit resistance of that meter is $40 \times 100,000$ ohms or 4 megohms!

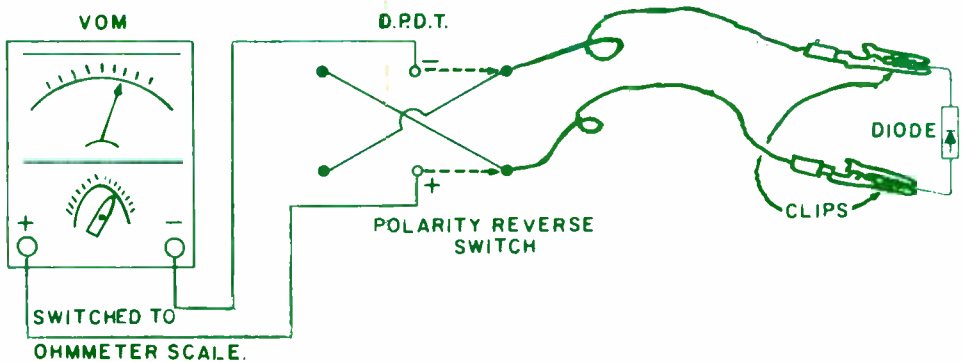
It's even higher at the 160V dc range -- on the order of 16 megohms! There's not much danger of that kind of resistance "loading" a circuit; ac and agc readings can easily be accommodated on the 40V dc scale. By reading as many voltages on scales higher than usual, the loading effect of the 269 is actually less than standard VTVMs.

The freedom from erroneous readings due to line connections inherent with the VTVM is another advantage of the VOM. The following example gave me no end of trouble. Making a resistance check on a TV set left plugged in (but switched off), it showed a resistance of zero ohms across a resistor marked 56K-ohms. What was wrong? The resistor, taken out of the set, read 56K. Inserted again, it read zero ohms. As the horizontal oscillator wasn't working, the zero ohms was suspect. It wasn't until much later that I found the fault was actually due to a bad tube. The zero value was indicated because of the ground return circuit of the VTVM inadvertently "connecting" one side of the resistor to ground. Of course, "pulling" the set completely from the line would have resolved this, but it's a good example

of why line-connected test equipment requires special care.

Whenever you have a piece of test equipment whose case is grounded through a power line, extra care is also needed to avoid shock hazards. Say you have an ac-dc radio or a TV whose ungrounded plug happens to be inserted into the mains so that the normal ground side of the chassis connects to the high side of the hydro line. You'll have 110V ac between your grounded side of the meter and that chassis, whether you realize it or not. One touch of your probe, and you'll have a flash and a blown fuse! If you're unlucky enough to have hands on both, you'll know it the hard way. Isolation transformers are a good idea here. If in doubt, the trusty VOM, connected across the two, will soon tell you if there is unwanted ac lurking there.

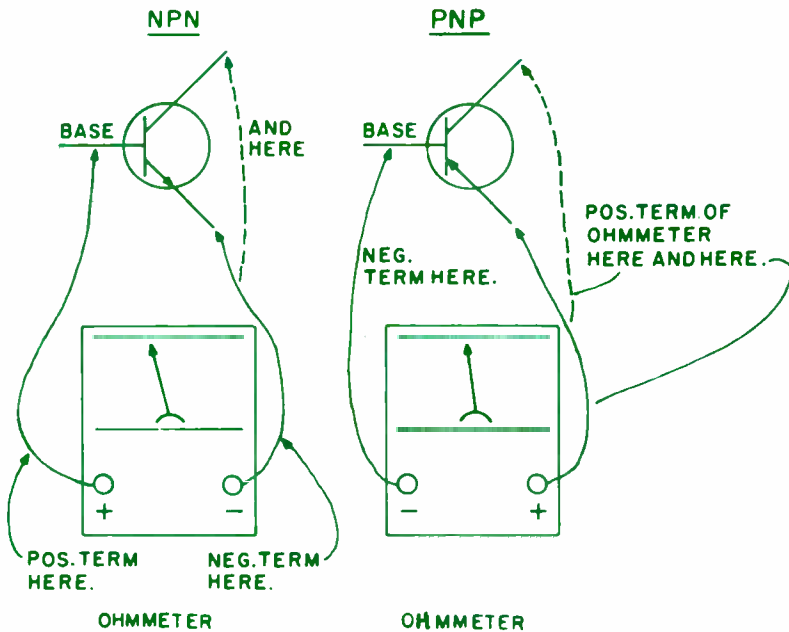
A VOM, by its natural isolation from the line, is safe to use for transistor checks as well, eliminating any danger of a spurious high voltage "blowing" a sensitive transistor during a check for shorts, etc. It is also a quick device for checking diodes for back-to-front ratio, and thereby their condition, also. Because you compare their front-to-back ratio by reversing your ohmmeter leads, observing the current difference between the two, a simple quick-check circuit adaptable to any VOM is as follows:



In checking transistors, the ohmmeter is equally indispensable, readily indicating shorts, opens and even polarity of those doubtful ones. By placing the appropriate probe of your ohmmeter on the matching polarity of the transistor and reading the resistance, you can tell which is "P" and which is "N" of a base besides its general condition and whether it is open or shorted. With an NPN, the positive terminal of your VOM connected to the base gives a reasonable resistance reading when the negative probe is connected to the emitter and collector, in turn. If open, no reading is observed; if shorted, the meter reads zero resistance.

Of course, in some VOMs (as in the Avometer pictured) the ohmmeter leads are not always as indicated. The red lead (or plus) may actually be connected to the negative side of the self-contained battery of the ohmmeter, which means you'll have to reverse your leads. Having determined your "correct" negative and positive lead, the method is straightforward enough.

With the PNP transistor, you place the negative lead of your ohmmeter on the base and read the resistance between the emitter and collector in turn, as before. Be sure the polarity is correct before throwing a transistor out! You can check this by connecting your ohmmeter to a simple dc meter movement and noting if it reads up.



The individual features of VOMs found on the market today are many and varied to suit most particular needs. For example, though the average meter won't read ac current, the Avometer will, allowing ac current consumption values to be easily and readily determined. Of course, they all read dc current in a variety of ranges, from microamps to amps. Some read lower values of resistance with $R \div 100$ scales for ease in determining fractions of an ohm.

With all these features, and obvious advantages, not to mention the fact that the price is still below that of a comparable VTVM, the "old-fashioned" but NEW volt-ohmmeters now on the market are pretty hard to beat.



NEW BOOKS

by *Donald Smith*

How To Use Signal Generators In Radio/TV/Hi-Fi Servicing, by John D. Lenk, John F. Rider Publishing Co., New York, N. Y. 10011. 128 pp, paperbound, \$3.25.

In the preface of the book, Mr. Lenk states "that the Signal Generator is far more useful than most technicians and experimenters realize." After reading this book, I am inclined to agree.

The book contains eight chapters, with Chapter 1 devoted to the operating principles of the rf signal generator, sweep, marker, audio and FM stereo generators. The chapters which follow deal with Operating Procedures, Testing and Calibrating Generators, Testing TV Antenna Systems, Testing an AM Receiver, Testing an FM Receiver, Testing a TV Set and Basic Amplifier Tests.

Mr. Lenk is very thorough in his explanations for using generators. In Chapter 6, "Testing an FM Receiver", he discusses basic FM alignment, talks about the stereo FM receiver and how the left and right signals are obtained, and explains

what equipment is used and why. Then he gets down to step-by-step operations to use in actually doing the alignment of the receiver. Diagrams and waveform drawings are used to help illustrate.

In addition, Mr. Lenk goes on to give the methods for checking image-rejection ratio, measuring FM receiver input impedance, measuring quieting level in an FM receiver and checking AM rejection in the set. Thus in just this one chapter dealing with FM receivers, Mr. Lenk has given information on how to use the generator for finding trouble, making checks of the unit and how to align it.

The chapter on using the signal generator on amplifiers will be of much interest to Hi-Fi fans, as well as technicians who find it their job to repair, run frequency response checks and balance amplifiers. Generators used in the text are those found in most service shops and on the experimenter's workbench, not expensive laboratory types. If you own a signal generator, this book just might demonstrate to you just how valuable that instrument is to you.

NRI HONORS PROGRAM AWARDS

For outstanding grades throughout their NRI course of study, the following November and December graduates received Certificates of Distinction along with their NRI Diplomas.

WITH HONORS

Arthur J. Bennett, N.S. Canada
L.H. Bijl, Netherlands, Antilles
Joseph F. Burba, Greenbelt, Md.
Gerald L. Burchett, Lexington, Ky.
Arthur H. Carpenter, Copperas Cove, Texas
Gerald R. Case, Ontario, Canada
Denis Chintella, Sharon, Pa.
Jose A. Cisneros, Tooele, Utah
John W. Clark, Tacoma, Washington
Jewell Clarke, Jr., Columbus AFB, Miss.
Elmer A. Cline, Sutter, Calif.
Stanton R. Couch, APO San Francisco
Joseph Cournoyer, P.Q., Canada
Howard W. Decker, Shingle Springs, Calif.
Befecada Desta, Addis Ababa, Ethiopia
D.C. Dickinson, James Park, N.B., Canada
L.N. Fairbairn, Granville, W. Australia
Robert J. Gibas, Niagara Falls, N.Y.
Troy L. Givens, Pineville, La.
Elmer C. Guinn, Fairfax, Va.
Garland A. Hass, Spokane, Washington
Joe H. Hitt, Biloxi, Miss.
Ernest B. Hudson, San Antonio, Texas
Gary R. Humphrey, Sandy, Utah
George E. Jarzonbek, Sunnyvale, Calif.
Jon A. Johnson, Sacramento, Calif.
Lloyd A. Johnson, Fargo, N.Dak.
Jesse Jones, Washington, D.C.
Leroy J. Jones, Midland, Texas
Karl R. King, Cheverly, Md.
Paul LaFreniere, Jr., Grand Marais, Minn.
Hubert R. Leaycraft, Wilmington, Calif.
D.P. Lucido, Martinez, Calif.
Douglas Marlatt, Kearney, Nebr.
William T. Martin, Richmond, Va.
Frankie Martinez, Levittown, Puerto Rico
Kuruvilla Mathew, Alkhubar, Saudi Arabia
Carley S. May, Florence, Miss.
Raymond A. Metivier, FPO San Francisco
Randall J. McCauley, Salem, Oreg.
William M. McGaughey, Wenatchee, Wash.
Leo H. McPherson, Vinton, Va.
A.H. Moorhead, Sr., Atlanta, Ga.
Carl Nicholson, Jr., San Francisco, Calif.
John A. Palumbo, Avondale, Ariz.

Gary L. Parr, Gresham, Oreg.
Morton M. Pasco, District Heights, Md.
Gary L. Peters, Gardena, Calif.
Adrien Picard, Tracy, P.Q., Canada
Sherrill Pugh, Pullman, Mich.
Colvin H. Rakestraw, Robards, Ky.
John E. Rask, Rosman, N.C.
Thomas E. Steele, Bancroft, W.Va.
Von K. Stocking, Logan, Utah
Carl J. Stone, Sr., Northfield, Mass.
Matthew P. Strantz, South Bend, Ind.
James C. Stull, Horsham, Pa.
Robert L. Swayzer, Sacramento, Calif.
Richard Van Wagner, Oakhurst, N.J.
Adolph Velatini, Kankakee, Ill.
Carl I. Weilenbeck, Albrook AFB, Canal Zone
Charles I. Wentworth, Anderson, S.C.
David F. Whitten, FPO New York
Jackson D. Wilson, Mt. Sterling, Ky.
Donald E. Yates, Canton, Ohio
Norman E. Yonker, Schenectady, N.Y.

WITH HIGH HONORS

Charles W. Alsnauer, Sharon, Pa.
Carl A. Anfora, Eugene, Oreg.
John P. Aslan, Jr., Hinkley, Ohio
Cecil L. Banning, Hesston, Kans.
Charles G. Bobcowski, Culpeper, Va.
Austin J. Brummett, Moore, Okla.
James E. Caldwell, Lubbock, Texas
Clarence L. Clayton, Baton Rouge, La.
Sam Cohen, Rochester, N.Y.
Stanley R. Corbett, Cincinnati, Ohio
Harvey J. Davis, Central, S.C.
Donald A. Del Ponte, Washinton, Ohio
Leland J. Eastman, Springfield, Vt.
Richard Eaton, Hesperus, Colo.
James O. Eggleston, APO Seattle
Timothy J. Euman, Point Mugu, Calif.
Eugene D. Fairchild, Meridian, Miss.
Gary L. Feathers, FPO San Francisco
Harold K. Fowler, West Monroe, La.
Francis J. Gantt, Washington, D.C.
Joseph K. Gatto, Elmer, N.J.
Richard Gossett, Sault Ste Marie, Mich.
Anthony H. Hacche, Woodland Hills, Calif.

Your training never stops with RCA. First we train you to troubleshoot RCA Color televisions, then we train you in the latest solid state circuitry.

After that, who can tell? If you are not learning anything in your present job, write to:

J.E. Clair
 Employment Manager
 RCA Services Company
 Cherry Hill, New Jersey

Montgomery Ward has openings in Washington, Md. and Va. areas for advanced technicians and technical trainees.

Many company benefits.

Contact: Mr. P.F. Cosentini
 7100 Old Landover Rd.
 Landover, Md.

Technician needed to work with Video Tape Recorders, TV Cameras, Monitors, etc. All used in closed circuit TV systems.

Video Audio Systems Technology
 7501 Democracy Blvd. Suite 122
 Bethesda, Maryland 20034
 301-469-8484

WANTED: Man with second class license, or man willing to work toward that license.

J. & H. Electronics
 611 Wilkes St.
 Alex., Va. 22314
 683-3400

CONAR EASY PAYMENT PLAN

J5

Note: Easy payment contracts cannot be accepted from persons under 21 years of age. If you are under 21, have this sheet filled in by a person of legal age and regularly employed.

Enclosed is a down payment of \$_____ on the equipment I have listed on the reverse side. Beginning 30 days from the date of shipment I will pay you \$_____ each month until the total payment price is paid. You will retain title of this equipment until this amount is fully paid. If I do not make the payments as agreed, you may declare the entire unpaid balance immediately due and payable, or at your option, repossess the equipment. Your acceptance of this will be effected by your shipment to me of the equipment I have listed.

Date _____ Your written signature _____

CREDIT APPLICATION

Print Full Name _____ Age _____

Home Address _____

City & State _____ How long at this address? _____

Previous Address _____

City & State _____ How long at this address? _____

Present Employer _____ Position _____ Monthly Income _____

Business Address _____ How long Employed? _____

If in business for self, what business? _____ How long? _____

Bank Account with _____ Savings Checking

CREDIT REFERENCE (Give 2 Merchants, Firms or Finance Companies with whom you have or have had accounts.)

Credit Acct. with _____ Highest Credit _____
 (Name) (Address)

Credit Acct. with _____ Highest Credit _____
 (Name) (Address)

---HELP WANTED---	---HELP WANTED---	---HELP WANTED---
<p>SEARS HAS MANY CAREER OPPORTUNITIES FOR EXPERIENCED TV TECHNICIANS OR RECENT GRADS OF ELECTRONIC SCHOOLS. TOP BENEFITS - LOCATIONS THROUGHOUT THE U.S. CONTACT:</p> <p>WILLIAM J. LYNOTT DEPARTMENT 731A-E SEARS, ROEBUCK AND CO. P. O. BOX 6742 PHILA., PA. 19132</p>		<p>WANTED!!!!!!! Field Service Technicians Positions now available in the Graphic Communications field. Technicians needed to install and maintain such equipment as Electronic hand writers and Facsimile units.</p> <p>Top starting salary and excellent benefits.</p> <p>contact: Telautograph Corp. 44 W. Madison Oak Park Ill. 60302 848-7266</p>
<p>Wheate's TV is looking for a NRI student or graduate for a Radio-TV servicing trainee. Applicants, preferably from Washington, D. C., must have experience with current electronic equipment.</p>	<p>Wheate's TV 151 Rollins Ave. Rockville, Md. 20852</p>	
<p>Plains Electronics Co., 4419 50th St., Box 6577, Lubbock, Texas, needs Technicians for TV and Two-Way Radios. Salary Commensurate with ability. Must be graduate.</p>		<p>Ray's Radio & TV Service 6413 Old Branch Ave. Camp Springs, Md.</p>
<p>NAYLOR TYPE & MATS is a trade plant that needs maintenance men for electronic typesetting equipment. Will send to school.</p> <p>NAYLOR TYPE & MATS 505 M & M Building Houston, Texas 77002 CA 7-8171</p>		<p>WANTED: TV Bench Man (no outside work). Also; Man with 1st or 2nd Class FCC license for C.B. Transmitters-receivers.</p> <p>Phone: 301-449-5276</p>
<p>Positions available dealing with heavy duty industrial equipment, 2-way radios, closed circuit TV, and PA systems. Requires at least 2nd class FCC license.</p> <p>CONTACT: Mr. W.D. Howard District Service Manager Motorola Communications And Electronics 8 Babson Park Ave. Babson Park, Mass. 617-237-1215</p>		<p>Looking for a permanent position with a future? TV-Stereo service and sales. Excellent retirement. Contact:</p> <p>Jim Renier RENIER's Dubuque, Ia.</p>



Alumni News

Walter Adamiec	President
Franklin Lucas	Vice-Pres.
James J. Kelly	Vice-Pres.
Reynolds Nickless	Vice-Pres.
E. J. Meyer	Vice-Pres.
T. F. Nolan, Jr.	Exec. Sec.

PRESIDENT ADAMIEC ON RECOVERY ROAD AFTER RECENT HEART ATTACK

We are glad to report that Walter Adamiec, National President of NRIAA, is improving from his recent heart attack. In a telephone call to his home, we learned from Mrs. Adamiec that he has gone back to work at Cote Motors in Mattapan, Mass. Walter will have to take it easy for awhile, but he is well along on the recovery road.

Best of luck, Walter, from all of the Alumni members and all of us here at NRI headquarters.

DETROIT CHAPTER STUDIES TRANSISTOR EQUIPMENT

With the use of a transistor demonstration board loaned to the club by Raymond Berus, Jim Kelley, chairman of the DETROIT Chapter, showed how defects in transistor equipment show up with the use of milliammeters and voltmeters. The demonstration board makes tracing a lot easier.

Ray Berus has a Color TV set that he is going to let club members use for color experiments. This will be a great help in teaching color circuitry to the membership.

We hope to hear more in the future regarding the experiments chapter members will make using Ray's receiver.

NEW YORK CHAPTER IS BUSY AS USUAL

NEW YORK CITY Chapter was a little late in getting names of their newly elected officers to us, but here they are:

Chairman	Samuel Antman
Executive Chairman ...	Albert Bimstein
First Vice Chairman	Pete Carter
Second Vice Chairman	Willie Fox
Treasurer	Roy DaSilva

Best of luck to the new officers in the coming year!

In December NRI Executive Secretary Tom Nolan took members on a whirlwind "tour" of transistor color TV, which was well presented and enjoyed by the membership. At the second meeting, a Sam's slide tape lecture, "Transistor Circuit Measurements", was a prelude to a pleasant social hour. Members donated coffee and cake to conclude an enjoyable evening.

The Chapter also welcomed the return of a former member of some years back, Steve Carantonis.

At the following meeting, Willie Fox, new Second Vice Chairman, a member for many years and former NRIAA National Vice President, gave an amusing and informative talk of servicing techniques he has found useful, talking especially about the high voltage and horizontal sections.

Recent talks by Al Bimstein, Charlie Vevo, and Pete Carter have all been very helpful on various troubleshooting techniques for TV. Keep up the good work, fellows; this is what keeps our chapter moving.

NORTH JERSEY CHAPTER HAPPY WITH NEW HOME

It seems that Alumni News made a mistake in the last issue in reporting the address of the new meeting place of the NORTH JERSEY Chapter. The Chapter now meets in the store owned by George Stoll, and the address is the Midland Hardware, 155 Midland Ave., Kearney, N.J.

Also, William Whiteley was mentioned as

being the Chapter's new treasurer. Actually, he has been the treasurer for the past three years until the December elections, when he resigned to spend more time with his repair business. Leroy Frienschner has taken over as treasurer for the new year. Alumni News apologizes for both mistakes.

The Chapter held its first meeting in its new quarters in November, with the speaker Bill Whiteley. The accommodations were found more than adequate for the Chapter's needs, and it expresses its thanks and appreciation to George Stoll for their use, and to Chairman William Colton and his son for having moved the Chapter's equipment to its new home.

Bill's talk was on alignment procedures for a CONAR TV set owned by George Stoll, and which he assembled. No troubles were encountered, and the results were quite successful.

The December meeting was devoted to tough-dog TV sets brought in by George Stoll and Frank Jessich. These provided a busy evening of troubleshooting for members. Bill Whiteley's B & K Analyst was helpful in checking the sets.

THIRTY-FIFTH ANNIVERSARY DUE FOR PHILLY-CAMDEN

This year will mark the 35th anniversary for the PHILADELPHIA-CAMDEN Chapter. Arrangements are being made now for a real wingding.

At the December meeting, Norman Roton gave a good lecture on Color TV. In January, Joseph Szumowski, who is a



Members of Philadelphia-Camden Chapter tour Westinghouse Plant at Metuchen, New Jersey.



Pittsburgh Chapter officers for 1969; from left to right they are: James Wheeler, Tom Schnader, Joe Burnellis, George McElwain, William Sames, William Lundy, and Charles Kelley.

teacher for RCA over in Jersey, gave a talk on integrated circuits and transistors. He used a 16-millimeter sound movie and a blackboard to give the members some good pointers and a detailed explanation of everything.

Winners in the 1969 election of officers were as follows:

Herb Emrich Chairman
 Norman Roton Vice Chairman
 Joe Burke Financial Sec.-Treas.
 Jules Cohen Recording Secretary
 Walter Wiacek Librarian
 Steven Gilbert Sergeant-at-Arms

Members gave John Pirrung a vote of thanks for being president for the past four years.

New members admitted were Victor C. Murphy, Anthony Hilinski, and Tracy F. Fletcher. We're always glad to see new members in the chapter.

PITTSBURGH ELECTS OFFICERS FOR 1969

The following members were elected as officers of the PITTSBURGH Chapter for 1969:

James Wheeler Chairman
 Joe Burnellis Vice-Chairman
 William Sames Treasurer
 George McElwain .. Recording Secretary

Three board members, William Lundy, Charles Kelley, and Tom Schnader, were also elected. The new members of the Chapter's governing body are shown in the photograph above.

SAN FRANCISCO CHAPTER HEARS TALKS BY MEMBERS

Members Pete Salvotti and R. Tomlinson of the SAN FRANCISCO Chapter demonstrated adjustments of vacuum tube voltmeters at its recent meeting. The

demonstrations were thoroughly enjoyed by the membership. At the following meeting, Art Ragsdale continued his demonstrations of square-wave response with input signals from a radio. The Chapter feels lucky to have such knowledgeable members, who can give such informative talks.

After the January meeting, Mrs. Art Ragsdale invited members to the tenth anniversary party of the San Francisco Chapter. Mrs. Ragsdale baked a cake with ten candles for the occasion. The members enjoyed the party very much -- thank you, Mrs. Ragsdale!

SPRINGFIELD CHAPTER TAKES COLOR COURSE

Bro. Bernard Frey, Chairman of the SPRINGFIELD (Mass.) Chapter, announced that members are taking an RCA Service Co. Color TV Course, which consists of film strips and notes, with follow-up workshops using the Chapter's own color set. Members are combining the RCA information with NRI's Color Course in continuing studies at their meetings.

The Chapter has a new member, Walter Knight of 445 Merrimack St., Lowell, Mass. Keep up the good work, fellows, we need those members.

R. E. BONGE ELECTED SAN ANTONIO CHAIRMAN

SAN ANTONIO (Alamo) Chapter has



Some members of the San Antonio Chapter; from left to right, they are: C.W.A. Hoffman, John Chaney, Jr., Albert Wise (guest), Sam Stinebaugh, R.E. Bonge, Albert Sestack, R.R. Church, and Sam Dentler.

named its new officers for 1969. They include the following:

- | | | |
|------------------|-------|---------------|
| R. E. Bonge | | Chairman |
| John Chaney, Jr. | | Vice Chairman |
| Sam Stinebaugh | | Secretary |
| Sam Dentler | | Treasurer |

Appointed to programing and membership committees respectively were Albert Sestack and R. R. Church.

A guest was Robert Wise of Seguin, Texas, an NRI student.

The chapter held a special Christmas party for members and wives in December, with Sam Stinebaugh in charge. Sam, who is taking the NRI Color TV course, brought in his Color TV chassis at the previous meeting for members to see.

DIRECTORY OF CHAPTERS

DETROIT CHAPTER meets 8 p.m., 2nd Friday of each month at St. Andrews Hall, 431 E. Congress St., Detroit. Chairman: James Kelley, 1140 Livernois, Detroit, Mich. VI 1-4972.

FLINT (SAGINAW VALLEY) CHAPTER meets 7:30 p.m., 2nd Wednesday of each month at Andrew Jobbagy's shop, G-5507 S. Saginaw Rd., Flint. Chairman: Arthur Clapp, 705 Bradley Ave., Flint, Mich. 234-7923.

HAGERSTOWN (CUMBERLAND VALLEY) CHAPTER meets 7:30 p.m., 2nd Thursday of each month at George Fulk's Radio-TV Service Shop, Boonsboro, Md. Chairman: Robert McHenry, RR2, Kearneysville, W. Va.

LOS ANGELES CHAPTER meets 8 p.m., 2nd and last Saturday of each month at Chairman Eugene DeCaussin's Radio-TV Shop, 4912 Fountain Ave., L. A., Calif., NO 4-3455.

NEW ORLEANS CHAPTER meets 8 p.m., 2nd Tuesday of each month at Galjour's TV, 809 N. Broad St., New Orleans, La. 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 at St. Marks Community Center, 12 St. Marks Pl., New York City. Chairman: Samuel Antman, 1669 45th St., Brooklyn, N. Y.

NORTH JERSEY CHAPTER meets 8 p.m., last Friday of each month at Midland Hardware, 155 Midland Ave.,

Kearney, N.J. Chairman: William Colton, 191 Prospect Ave., North Arlington, N.J.

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

PITTSBURGH CHAPTER meets 8 p.m., 1st Thursday of each month at 436 Forbes Ave., Pittsburgh. Chairman: James Wheeler, 1436 Riverview Dr., Verona, Pa.

SAN ANTONIO (ALAMO) CHAPTER meets 7 p.m., 4th Friday of each month at Alamo Heights Christian Church Scout House, 350 Primrose St., 6500 block of N. New Braunfels St. (3 blocks north of Austin Hwy.), San Antonio. Chairman: R. E. Bonge, 222 Amador Lane, San Antonio, Texas.

SAN FRANCISCO CHAPTER meets 8 p.m., 2nd Wednesday of each month at the home of J. Arthur Ragsdale, 1526 27th Ave., San Francisco. Chairman: Isaiah Randolph, 523 Ivy St., San Francisco, Calif.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets 8 p.m., last Wednesday of each month at the home of John Alves, 57 Allen Blvd., Swansea, Mass. Chairman: Oliva J. Laprise, 55 Tecumseh St., Fall River, Mass.

SPRINGFIELD (MASS.) CHAPTER meets 7 p.m., last Saturday of each month at the shop of Norman Charest, 74 Redfern Dr., Springfield. Chairman: Br. Bernard Frey, 254 Bridge St., Springfield, Mass.

SPECIAL OFFER FOR THE COLOR TV SERVICEMAN

GET OUR \$22.³⁵

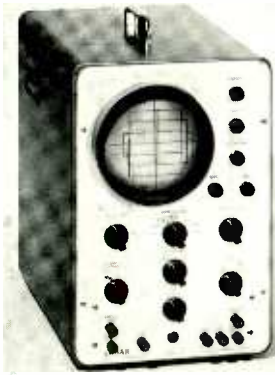
ISOLATION TRANSFORMER **FREE**

WHEN YOU ORDER BOTH:

CONAR 5" WIDE BAND
OSCILLOSCOPE

AND

CONAR COLOR BAR
GENERATOR



CATALOG
PRICE

KIT 250UK \$99.90

WIRED 250WT \$139.50

STUDENT AND
ALUMNI PRICE

KIT 250UK \$82.90

WIRED 250WT \$129.75

Shipped
Express collect



CATALOG PRICE

KIT 680UK \$89.50

WIRED 680WT \$121.50

STUDENT & ALUMNI PRICE

KIT 680UK \$79.50

WIRED 680WT \$109.00

The Conar model 250 features:

- Uses 2400 volts on the cathode ray tube—50% more than most scopes.
- Vertical gain control is calibrated for direct reading of peak-to-peak voltages.
- Two stage retrace blanking amplifier gives 100% retrace blanking at all frequencies produced by the scope sweep generator.
- Accurately measures ripple output of power supplies; checks auto radio vibrators dynamically.
- Intensity and focus controls use special insulated high voltage potentiometers to eliminate leakage and shock hazards.
- Has push-pull outputs balanced by separate phase splitter tubes in both horizontal and vertical amplifiers.
- Built-in flyback checker gives rapid, in-circuit testing of flybacks, transformers, yokes, coils, loopsticks.
- Sweep range—10cps to 500kc—five times the range of most other scopes, using special linearity circuit.

The Conar model 680 integrated circuit color bar generator features:

- Exclusive digital integrated circuits.
- Exclusive 4 crystal controlled oscillators.
- Exclusive AC or battery operation.
- Completely solid state.
- Color amplitude control.
- Color phase adjustment.
- Regulated power supply.
- Stability control.
- TV station sync and blanking pulses.
- Nine patterns.
- Red, blue and green gun killers.
- Compact, lightweight, portable.

ORDER NOW AT YOUR SPECIAL STUDENT & ALUMNI PRICE.

BOTH FOR ONLY: KIT **\$162.40** OR WIRED **\$238.75**

(THIS SPECIAL OFFER EXPIRES APRIL 30, 1969)

USE CONVENIENT ORDER BLANK ON PAGE 25

COLOR TV SERVICEMAN'S SPECIAL OFFER

GET OUR **\$22.35** ISOLATION TRANSFORMER FREE

WHEN YOU ORDER BOTH:

CONAR MODEL 250
WIDE-BAND 5" OSCILLOSCOPE

AND

CONAR MODEL 680
COLOR BAR GENERATOR

An Isolation Transformer is a must for color and black & white TV servicing. It reduces the shock hazard by isolating the equipment from the AC power line. It prevents "hot chassis" when servicing. The transformer works with 115 volts, 50-60 cycles. It comes with cord, plug, and standard AC receptacle. 300 watts, 4 $\frac{5}{8}$ " x 3 $\frac{7}{8}$ " x 5 $\frac{5}{8}$ ". Stock #7TO. 13 lbs.

SEE INSIDE BACK COVER FOR DETAILS

NRI JOURNAL
3939 Wisconsin Avenue
Washington, D. C. 20016

MR WALTER WEISNER
5251 S E OETKIN WAY
MILWAUKIE OREG 97222

CS4-A327-G

Second-class
postage paid
at Washington, D. C.