



# journal

MAY/JUNE 1970 35 CENTS



*Gifts For You With Conar Test Equipment - See Center Fold*

# CONAR

## TEST EQUIPMENT

MODEL 230

3

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WIRED 230WT \$69.95

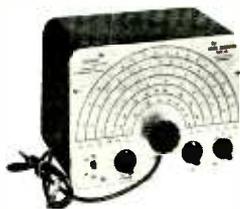
#### NRI STUDENT & ALUMNI PRICE

KIT 230UK \$39.80  
WIRED 230WT \$56.70

MODEL 280

2

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2

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#### NRI STUDENT & ALUMNI PRICE

KIT 311UK \$24.40  
WIRED 311WT \$33.85

USE CONVENIENT ORDER BLANK ON PAGE 25



# journal

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## ON THE COVER

Pictured on the cover is an array of Conar test equipment developed for the professional technician by the design engineers of National Radio Institute. These instruments and other merchandise are featured in the special advertising pages at the center fold of this issue.

Use the handy order blank on Page 25 to order your selections from the Conar Instruments Division of NRI.



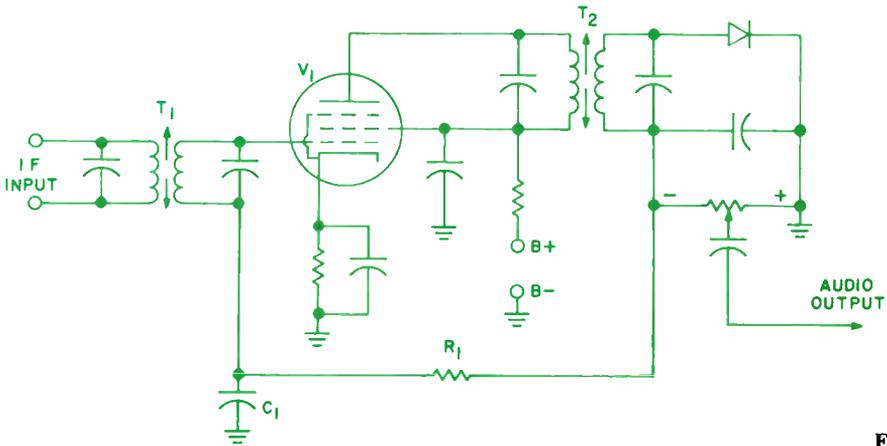


Fig. 3

is produced when the tube is conducting fairly hard.

The other important part of the circuit that must be present is some form of coupling circuit to remove a sample of the signal from the output circuit of the amplifier. In its simplest form, this is simply a parallel connection across the load fed by the amplifier output. Any signal fed to the load is also fed to the agc circuit. The sample signal is applied to a circuit that processes the signal so that it may be used as a control voltage.

Fig. 2 shows the i-f amplifier and detector circuit that might be used in a broadcast receiver. Note that the resistor in the detector circuit is used as a volume control. Also, note that a dc voltage is developed across this control. The amount of voltage depends on the strength of the signal. Since the detector diode allows current to flow in only one direction, from its cathode to its anode, the voltage across the control will be negative at the left side, and positive at the grounded side. This means that a negative voltage (with respect to ground) is available at the left end of the control.

Fig. 3 shows how this voltage can be put to work. Resistor  $R_1$  and capacitor

$C_1$  together act as a filter to prevent any rf or af voltages from being fed back to the controlled stage. They also establish the agc time-constant, which is a measure of how fast the agc circuit can respond to changes in signal strength. Now let's see just how this circuit is used.

The i-f input signal is applied to the primary winding of i-f transformer  $T_1$ . The signal is coupled to the secondary of this transformer, and fed to the grid of  $V_1$ . This tube must be one that can have its gain controlled, remember. Typically, it would be a remote-cutoff pentode, such as the 6BA6. The signal is amplified and fed to the i-f output transformer,  $T_2$ . The secondary of  $T_2$  is a part of the detector circuit. Remember that current flow in the diode will be in the direction opposite the arrow, so the current flow through the circuit will develop a voltage across the volume control that is negative on the left, and positive on the right. Since the right side of the control is grounded, a negative voltage is available at the left side.  $C_1$  and  $R_1$  filter this voltage into a pure dc. This voltage is then used to regulate the gain of the i-f amplifier.

Assume that a signal is being passed

through this circuit, and that suddenly the signal strength increases. When this happens, the voltage developed across the volume control also increases, and this means that the negative bias voltage applied to the i-f amplifier will increase. Of course, when the bias voltage increases, the gain of the amplifier stage decreases. The circuit is designed so that the decrease in gain is just enough to bring the amplitude of the signal applied to the detector back to its original level.

Remember that this whole process happens in a twinkling of an eye, so the output amplitude appears constant at all times. The action is reversed when the signal strength decreases. This is the basic idea behind all agc circuits, regardless of how complex a particular circuit may be.

### DELAYED AGC

Now that we have gained an understanding of the fundamentals of agc action, let's look at a few variations. One term that causes some confusion is "delayed agc". Many people have the impression that the "delay" is a time delay, somehow related to the agc time-constant. This is not so. Delayed agc is a special type of agc circuit that is completely inoperative until the signal

strength reaches a certain predetermined level. The delay is used to allow maximum gain to be developed by the controlled stages whenever a weak signal is being received.

Now, this may seem unnecessary, as the agc voltage developed by a weak signal is a very small voltage, but even a small agc control voltage will somewhat reduce the receiver's gain. A receiver is expected to furnish a usable signal even when the signal strength is very low, so this measure is used to improve the operation of the receiver, even though the improvement may be very slight. Such a system is often used in sensitive communications receivers where weak signals must be frequently detected.

There are many ways of going about providing the delay, but the approach shown in Fig. 4 is probably the simplest. Notice that two similar diode circuits are used: one as a detector, and a second circuit as the agc detector. The only difference between these circuits is the positive bias voltage applied to the cathode of the agc detector diode. The voltage is supplied by the B+ circuit through the voltage divider consisting of resistors  $R_1$  and  $R_2$ . The voltage at the junction of these two resistors reverse-biases  $D_2$  and determines just how much delay there will be, as the agc detector diode cannot conduct until the positive half-cycles of the signal are more positive than the positive bias applied to the cathode.

In other words, the diode will not conduct until its anode is more positive than its cathode. When the diode is conducting a voltage is developed across resistor  $R_3$  which depends on the signal strength. This voltage is then used in the same way as the agc control voltage in the basic circuit described above.

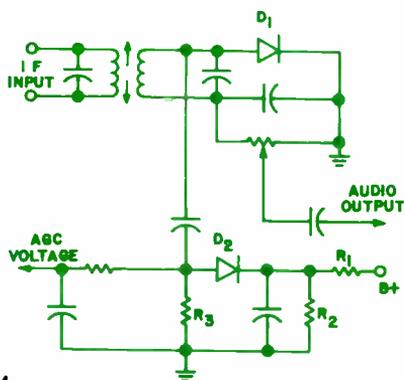


Fig. 4

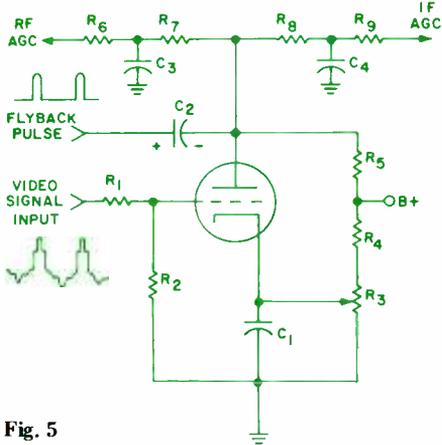


Fig. 5

### KEYED AGC

Simple agc can be used in a television receiver, but the results are not very good. The basic problem is that the video signal has a constantly changing amplitude. The signal amplitude varies with picture brightness. Maximum transmitter power occurs during very dark portions of the picture. The darkest portion of the picture is the sync pulse, which is transmitted during blanking time. The sync pulse has a constant amplitude as it is transmitted by the station. Variations in signal strength will be noticed by variations in the amplitude of the received sync pulse. Some means is needed to make the agc circuit respond to variations in sync pulse amplitude only; the varying video signal must be ignored by the agc circuit. This job is done in a modern television receiver by the keyed agc circuit. This circuit operates only while the sync pulse is being transmitted. The control voltage produced during this time is then used in the same way as the agc voltage in the simple system described earlier.

Fig. 5 shows a typical keyed agc system. The agc control voltage is de-

veloped at the plate of the tube. This voltage will be developed only when the tube is allowed to conduct. The tube will conduct only when a positive voltage is present at the plate at the same time that the grid is not too negative with respect to the cathode. The positive pulse is applied to the plate by the horizontal output transformer. One pulse is generated during each horizontal retrace time. Remember that the sync pulse also occurs during retrace time. This means that the two pulses will be present at the same time.

The flyback pulse at the plate is of a fixed amplitude, but the amplitude of the sync pulse applied to the grid depends on the strength of the received signal. The cathode voltage is adjusted by  $R_3$  (the agc control) to the point where the grid is just positive enough with respect to the cathode to permit the tube to conduct when the sync pulse is present, provided that a positive voltage is present at the plate at the same time.

Now, you may be wondering how a negative voltage is to be developed at the plate if a positive pulse is applied here. The key to the operation of this circuit is capacitor  $C_2$ . When the horizontal pulse is present, and the tube is conducting, plate current will cause a buildup of an

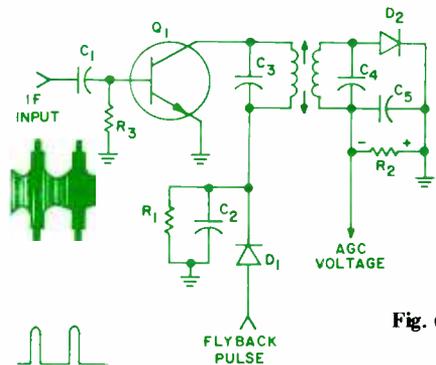


Fig. 6

excess of electrons on the right-hand plate of the capacitor, and pull electrons from the left-hand plate. The capacitor will then be charged as shown in the diagram. As soon as the horizontal pulse disappears, the capacitor must begin to discharge through the resistors connected to ground.  $C_2$  must be large enough so that the charge does not change greatly during the time between horizontal pulses. The amount of negative voltage developed at the plate of the tube depends on how hard the tube conducts.

Since the flyback pulse amplitude is fixed by design, only the amplitude of the video signal applied to the grid affects the voltage developed at the plate. When the video signal is very weak, the tube conducts very little, and the plate voltage actually becomes slightly positive because of the connection to B+ through  $R_5$ . This positive voltage placed on the agc line produces maximum gain in the controlled stages, just what is wanted when the signal is weak.

Fig. 6 shows another simple keyed agc system. As you can see, this circuit is from a transistorized TV receiver. A transistor agc circuit could be designed to operate exactly the same as the vacuum tube circuit of Fig. 5, but this particular circuit is a bit different. The transistor in the diagram is actually an i-f amplifier, and its input is obtained from the last regular i-f amplifier in the receiver. The i-f amplifier shown here is used only for agc; its output is not used to supply the video signal. Notice that no dc voltages are applied to the transistor amplifier stage. Instead, a positive pulse from the flyback transformer is used to supply collector voltage. The values of  $R_1$  and  $C_2$  are chosen so that  $C_1$  discharges very rapidly. This means that the amplifier will work only while the flyback pulse is present. Since the sync pulse is the only part of the modulation signal that coincides with the flyback pulse, only this part of the i-f signal will be amplified. The output is applied to a detector circuit to convert the signal into a dc voltage. This voltage will be in proportion to the sync pulse amplitude, and therefore to signal strength.

### FORWARD VS. REVERSE AGC

When we spoke of controlling the gain of a vacuum tube amplifier stage, we said that increasing the negative voltage applied to the grid of the tube will reduce the stage gain. What about a transistor amplifier? Here there are two possible modes of operation, forward and reverse. In either type, gain is maximum when the collector current is some moderate value. In the reverse agc stage, gain is reduced by reducing the forward bias applied to the base-emitter junction. This causes a reduction in collector current, which in

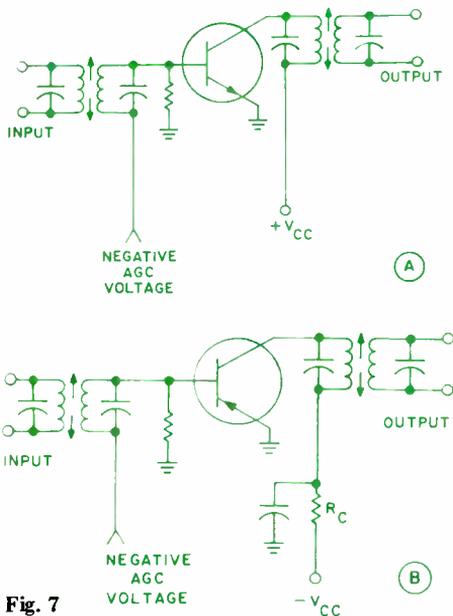


Fig. 7

turn causes a reduction in stage gain. This is very similar to the way in which the gain of a vacuum tube is controlled. A typical reverse agc stage is shown in Fig. 7A.

Fig. 7B shows a similar stage using forward agc. In this type of circuit, gain is reduced by increasing the base bias so that the collector current is increased. Notice the resistor in series with the collector circuit. This resistor has a fairly large resistance, selected by the designer to reduce the collector voltage when the collector current increases. This reduction in collector-to-emitter *voltage* then causes the gain to be lowered. This circuit could be used with an NPN transistor if the polarity of the agc voltage (and supply voltage, of course) were reversed. There are advantages to both types of operation, and you will see both frequently in servicing work. Often, a receiver will use both types of agc action: forward agc in one or more stages, and reverse agc in others (reverse agc is almost always used in rf amplifiers). Be careful when you replace transistors in gain-controlled stages; almost any transistor will work well in a reverse agc circuit, but only certain types will give good results in forward agc circuits. This is because the

transistor must handle more current in the forward agc circuit. If you cannot obtain an exact duplicate from the manufacturer, make sure that the replacement you choose will be able to handle the fairly large power used by this type of circuit.

These circuits are representative of what you may expect to find in servicing TV receivers, but they are by no means the only ones you will ever encounter.

## SELF-TEST QUESTIONS

Test yourself to see what you have learned. Answer the five TRUE-FALSE questions below. Answers are on page 21.

1. AGC and AVC are really very similar.
2. The gain of a transistor is controlled by reverse agc in the same way as the gain of a vacuum tube stage is controlled.
3. Capacitor  $C_1$  in Fig. 3 is used to provide delayed agc.
4. Capacitor  $C_2$  in Fig. 6 is usually a large-value electrolytic.
5. If capacitor  $C_2$  in Fig. 5 becomes open, the agc voltage will become positive.

## Make the most of your scope — use it

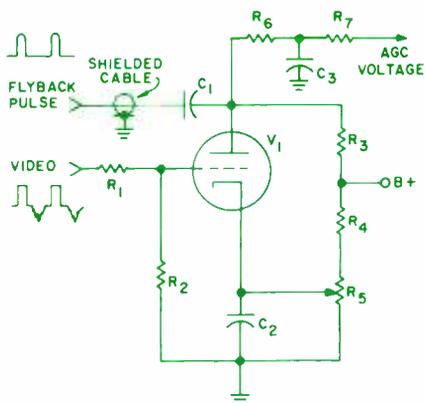
Do you let your oscilloscope sit in a remote corner of your shop most of the time? You know, this instrument is a most helpful one, but it can help you only when it is close at hand. The first step in making the most of your scope is using it constantly. *Don't* be satisfied with making voltage measurements with your vtvm in a malfunctioning stage; look at the circuit waveforms with your scope. Even if you don't immediately see the cause of the trouble, you will at least know that part of the circuit is working properly. Here's a good example of this that I ran into a few days ago.

Now, my friend Lowell is no dummy, but he is one of those experienced technicians who remain unconvinced of the true value of the oscilloscope as a service instrument. He owns a scope, but he uses it only once in a while, and then only when he believes that the set he's repairing is a real dog.

Lowell was slaving over a portable color set when I walked into his shop. This portable, which shall remain nameless, was overloading badly, and the agc control did not seem to

have much effect on this symptom. However, clamping the agc line with a bias box restored normal operation. This indicated that the trouble was in the agc circuit.

A simplified schematic diagram of the agc circuit used in this set is shown below. As you can see, this is a keyed agc system, typical of the circuits used in most TV receivers. This type of agc circuit depends on a pulse from the horizontal output transformer for its operation. The pulse is used to charge capacitor  $C_1$  through the tube. This charging action builds up a negative voltage at the side of the capacitor connected to the plate of  $V_1$ , and this negative voltage then becomes the agc control voltage. The amount of negative voltage developed depends on how hard the tube conducts, which, in turn, is determined by the amplitude of the pulse applied to the plate. This pulse amplitude is fixed by the design of the set. The conduction of the tube also depends on the bias applied between grid and cathode. The cathode voltage is set with  $R_5$ , the agc control, and the grid voltage depends on the strength of the video signal.



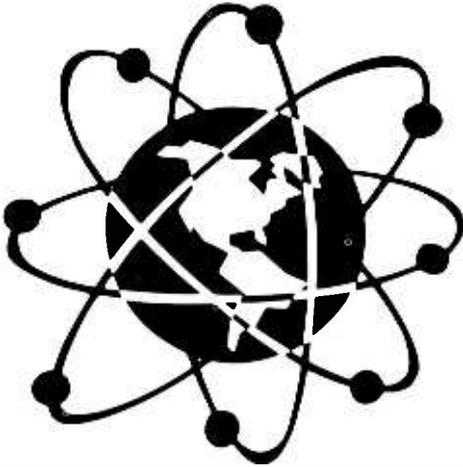
Now, in this set, the agc voltage was positive. This is not too unusual, since the voltage should become positive if the agc tube is not conducting, because of the connection to  $B^+$  through  $R_3$ . However, the agc voltage could not be made negative by adjusting the agc control, so the set overloaded. Remember, overloading occurs when the received signal is too strong, or when the receiver gain is too high. A positive agc voltage causes the receiver to develop a tremendous amount of gain. But what fooled Lowell was that he could vary the agc voltage from about +2 volts to about +20 volts. This showed that the agc circuit was working, somewhat.

Here's where my friend made his big mistake. He used the ac function of his vtvm to indicate the presence of the flyback pulse at the plate of  $V_1$ . Since the waveform is not a sine wave, it is not possible to make a meaningful measurement of the peak-to-peak amplitude with the vtvm. A scope must be used for this measurement. As it turned out, the trouble was that the shielded cable connecting the flyback transformer to the agc circuit was open. Enough of a pulse was coupled into the circuit to allow the circuit to work somewhat, but not properly. Replacing the cable cured the problem.

Lowell could have saved himself a lot of time and trouble by using his scope earlier. How often has this happened to you? There's a really simple way to avoid this type of situation: make the most of your oscilloscope ... use it at the first sign of trouble.

by JOE DEXTER

# HAM NEWS



*By Ted Beach, K4MKX*

I'm afraid that I will have to begin this column with some apologies. First of all, in the rush of getting out last issue's column, I inadvertently left out seven people whose calls should have been listed. Then to top it all off, I never got around to sending out acknowledgments to those whose calls we did publish! There is no real excuse for this oversight, other than the fact that I am my own "secretary" and as such hate to keep lists and records and such things. At any rate, my apologies to you all, and I will certainly try to do better in the future.

While I'm on the subject of the calls listed in the column, you fellows could really help me out. To save me digging through the Call Book and our student records, PLEASE give your call, address, class of license and your student number when you write. This saves me from guessing as to what class license you have, and from putting your call in the wrong list. Fellows, please help my "secretary!"

Many of the cards and letters received since the last issue have expressed interest in the NRI CW net. Well, as the Radiogram shows, Paul has had some response, but has had some problems himself meeting the 10 p.m. sked and now proposes 10:30 p.m. EST, 7100 to 7110 kHz as being better for getting some midwest contacts. Those of you who are interested should check in with the net or write Paul for more information. His address is in the Radiogram. (See the next page).



# THE AMERICAN RADIO RELAY LEAGUE RADIOGRAM



NUMBER <b>15</b>	PRECEDENCE <b>ROUTINE</b>	HX	STATION OF ORIGIN <b>K1PNB</b>	CHECK	PLACE OF ORIGIN <b>TOWNSEND MASS 01469</b>	TIME FILED <b>2300Z</b>	DATE <b>FEB 14</b>
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<p><b>To</b> TED REACH K4MKX          NATIONAL RADIO INSTITUTE          3939 WISCONSIN AVE          WASHINGTON D. C. 20016</p> <p>PLANNING TO MEET WEEKLY WITH NRI CW NET ON <b>7100</b> TO <b>7110</b>KC DEPENDING ON QRM AT TEN THIRTY PM EST (<b>0330Z</b>) ON SATURDAY EVENINGS X WHEN WE HAVE HEARD FROM ALL THOSE INTERESTED IN CW WE WILL KNOW DAY OR DAYS AND BEST TIME X SENT MESSAGES TO WA3DWF WA9YUJ WA8EEJ WA9PJD &amp; WA2HXX</p> <p style="text-align: right;"><b>VY 73</b>      PAUL E F MOREY K1PNB RM E MASS</p>	<p>THIS RADIO MESSAGE WAS RECEIVED AT</p> <p>AMATEUR STATION <b>K1PNB</b>      PHONE _____</p> <p>OWNER <b>PAUL MOREY</b></p> <p>STREET ADDRESS <b>304 MAIN ST</b></p> <p>CITY AND STATE <b>TOWNSEND MASS 01469</b></p>
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<p><b>REC'D</b></p> <p>FROM _____ DATE _____ TIME _____</p> <p><small>THIS MESSAGE WAS HANDLED FREE OF CHARGE BY A LICENSED AMATEUR RADIO OPERATOR WHOSE ADDRESS IS SHOWN IN THE BOX AT RIGHT ABOVE AS SUCH MESSAGES ARE HANDLED SOLELY FOR THE PLEASURE OF OPERATING NO COMPENSATION DIRECT OR INDIRECT PAID OR PROMISED CAN BE ACCEPTED BY A STATION OWNER FOR THE SAME REASON NEITHER EVENTUAL DELIVERY NOR ACCURACY OF COPY CAN BE GUARANTEED ANY REPLY MAY BE FILED WITH THE STATION DELIVERING THIS MESSAGE TO YOU FURTHER INFORMATION ON AMATEUR RADIO MAY BE OBTAINED FROM A.R.L. HEADQUARTERS 220 MAIN STREET NEWINGTON CONN 06111</small></p>	<p><b>SENT</b></p> <p>TO _____ DATE _____ TIME _____</p> <p><small>THE AMERICAN RADIO RELAY LEAGUE INC IS THE NATIONAL MEMBERSHIP SOCIETY OF LICENSED RADIO AMATEURS AND THE PUBLISHERS OF QST MAGAZINE ONE OF ITS FUNCTIONS IS PROMOTION OF PUBLIC SERVICE COMMUNICATIONS AMONG AMATEUR OPERATORS TO THAT END THE LEAGUE HAS ORGANIZED AN AMATEUR RADIO PUBLIC SERVICE CORPS (ARPC) COMSISTING OF THE AMATEUR RADIO EMERGENCY CORPS (AREC) FOR WORK DURING EMERGENCIES AND THE NATIONAL TRAFFIC SYSTEM (NTS) FOR DAILY NATION-WIDE MESSAGE HANDLING THE TWO DIVISIONS SUPPLEMENT EACH OTHER IN DAILY OPERATION MORE INFORMATION IS AVAILABLE FROM A.R.L. HEADQUARTERS LINDEN U.S.A</small></p>
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I still have nothing to report on the 20 meter SSB net. I guess that either there was not enough interest or perhaps not enough of you could make it. If anyone knows more than I do about this, please let us in on what's going on.

Here is the current crop of NRI amateurs who are enrolled in or are graduates of the NRI Course for Amateur Licenses:

- |        |         |   |                   |
|--------|---------|---|-------------------|
| Bob    | *WN8CLW | N | Helena, OH        |
| Ivan   | *WN6DRY | N | San Jose, CA      |
| Stan   | WN1LDZ  | N | South Windham, ME |
| Gordon | WN2MGD  | N | Madison, NJ       |
| E.P.   | WN2MTY  | N | Fairfield, NJ     |
| Gus    | WA3JTG  | A | Bloomsburg, PA    |
| Jim    | WN3MIE  | N | Pittsburgh, PA    |
| Russ   | WN3MYN  | N | Yardley, PA       |
| Alex   | WB4AWZ  | G | Albany, GA        |
| Jim    | WN4NKQ  | N | Nashville, TN     |
| John   | WN4PRF  | N | Eva, TN           |
| Phil   | WN5AKO  | N | Rockdale, TX      |
| Sam    | WN5WRF  | N | Pilottown, LA     |
| Roger  | WN6MZX  | N | Chula Vista, CA   |

Jim	WN6REC	N	Fremont, CA
Wallace	W7VVG	A	Page, AZ
Dawn	WN8ECV	N	Benton Harbor, MI
Duane	WA8EEJ	A	Caro, MI
Ralph	WN8EPK	N	Mt. Blanchard, OH
Joe	WN8ERU	N	Kalamazoo, MI
Eben	WN8FQJ	N	Logan, WV
Norb	WA8JIX	G	Cincinnati, OH
Jim	W9AKR	T	Chicago, IL
Jerry	WN9BFU	N	Elkhart, IN
Bob	WN9CYT	N	Mooresville, IN
Les	K9FIF	G	Nelson, WI
Ralph	WA9GIU	A	Brookfield, WI
Bob	WA9UXK	T	McHenry, IL
Harold	WNØAKQ	N	Sturgeon Lake, MN
Clarry	WNØWIZ	N	St. Peter, MN

\*omitted from last issue of Journal.

By the time you read this, WN1LDZ will probably have traded in his “N”. Stan says his goal is April for the next test. He runs a 50-watt Harvey Wells on 80 and 40 and the Conar 400 on 15. A Heath HR20 rounds out his shack. Stan says his course has been a *real* help to him so far.

Gus, WA3JTG, traded in his “N” back in October. How come we’re just hearing from you now??

WN8ECV is our second YML studying amateur radio. Dawn works all bands with a Heath HW16 when her two-year-old son Matt will let her. She says it is a real problem finding the time to study. I know what you mean, Dawn!

WA8EEJ is a very enthusiastic graduate of our Ham Course. Duane’s progress goes something like this: enrolled January, Novice license June, graduated September, Advance class December. None of this two-year Novice stuff for Duane! Nice going and congratulations.

Another NRI enthusiast is WN8EPK. Ralph got his license in July and has worked 31 states, 25 confirmed, two provinces and Brazil for a total of 73 confirmed contacts. Not bad. He is presently building (or should that be planting?) an antenna farm to consist of a triband quad and a Hy Gain 80-40 trap doublet. These will replace 80 and 40 meter home brew dipoles.

Joe, WN8ERU, says that the course has been a lot of work but the rewards (operating) are well worth the effort. We agree.

K9FIF has had a General license for seven years and figured it was about time to start thinking about upgrading. April is when Les plans to make the plunge for his next license.

Ralph, WA9GIU, is presently an Advance class licensee and his goal is the Extra. The code has been his hangup, but he thinks he has that whipped now. I wish I could say the same for my code.

January 1, 1970 was the day Ralph, WNØAKQ, got his ticket, having enrolled in April. He says he is looking forward to many enjoyable hours on the air.

And that about sums up the doings of our Ham Course people for this time. Now let's see who's among our other students and graduates:

Frank	*W6IQU	G	Los Gatos, CA
Lewis	*WA6BVT	G	El Cajon, CA
John	*WN3NHE	N	Washington, DC
Elmer	*WAØPLB	A	Duluth, MN
Alvin	*WB9ACF/Ø	C	Minot, ND
Don	WA1ARJ	A	Haverhill, MA
Steve	W1CUE	C	Concord, NH
Erwin	W1IFI	A	Plymouth, MA
John	WN1LKC	N	New Bedford, MA
Herb	W2EZD	G	Clark Mills, NY
Dennis	WN2GAE	N	Jamestown, NY
Roger	WN2LYV	N	Edison, NJ
Howard	WA2UHS	C	Plattsburgh, NY
Pete	WB2YEM	A	N. Tonawanda, NY
Al	WB2ZYQ	G	Levittown, NY
Melvin	WA3DWF	C	Accident, MD
Al	WA3FQU	G	Newark, DE
Jan	WA4JIG	A	Crossville, TN
Charles	WB4KIP	G	Decatur, GA
Steve	WBLJZ	A	Maitland, FL
Bob	WN4PQV/1	N	Middletown, CT
Chester	WA5CMC	C	Wichita Falls, TX
Jim	W5EZY	E	San Antonio, TX
Einar	W5FPB	A	Albuquerque, NM
Hal	WA5VWM	A	Tulsa, OK
Dick	WA6ERQ	G	Rubidoux, CA
George	WB6KUU	T	San Francisco, CA
Larry	K6MPI	C	Palmdale, CA
Ray	WA7AHW	A	Portland, OR
Loren	WA7KLL	A	Phoenix, AZ
Ron	W8HGS	A	Milan, MI
Cesare	K8NEE	A	Girard, OH

Ken	WA8UXH	T	Hinckley, OH
Larry	WB9ADJ	?	Fort Wayne, IN
John	WAØDCB	C	Dubuque, IA
Gene	WAØEMH	C	Centralia, OH
Les	VE1LL	A	Moncton, NB
Carl	VE3FZZ		Ottawa
Dick	HL9VF		Korea
John	KL7OK	A	West Africa

\*omitted from last issue of Journal.

Don, WA1ARJ, is taking our Communications course and is looking forward to getting his Extra real soon. At present he is using an EICO 753 transceiver and a Windom antenna.

Another transceiver/Windom operator is W1CUE. Steve uses a Swan 260 and is a graduate of the NRI Servicing course.

Erwin, W1IFI, says he is interested in our 40 meter net and hopes we get our club station soon. Be sure to let Paul, K1PNB, know of your interest, Erwin, and thanks -- we also hope to make a club station a reality soon.

WN1LKC has an all Conar rig and likes cw. John says he would like it very much if we would include the Novice in on the cw net. Let Paul know, John, and I'm sure someone will listen for you up in "Novice Land"!

WN2GAE is a graduate of the FCC course and has his First phone to show for it. Dennis is an ex-Army radio operator and hopes to go for his General class license soon. I can vouch that the First phone test is harder than the General exam, Dennis; maybe it's that code that's holding you up?

Joining the ranks of those who want to know how come no 80 meter net is WN2LYV. Roger runs a DX60 and SX101-A to a long wire on 80 and would like to hear some NRI Hams. How about it?

A letter addressed to me at my home QTH was received from Melvin, WA3DWF. He enclosed a copy of a letter he had sent to Paul telling of his interest in the NRI net. Melvin is a high school librarian in, of all places, Accident, Maryland. Now I've heard everything.

WN4PQV/1 is a transplanted Floridian attending school up "no'th". Bob says he *prefers* Connecticut to Florida and plans to set up residence there. As a long-time resident and native Floridian, I find this hard to take!

Chester, WA5CMC, sent us a photo of himself at the operating position of WA5CMC.

Unfortunately it is a little too dark for reproduction, but we really would be pleased to print any interesting pix you guys and gals might send us of yourselves, shacks, etc. Chester really has an array in his shack -- home brew and commercial, SSB and RTTY -- you name it, he has it! Wow!

W5EZY, like Paul Morey, is an avid traffic man and is RM for the South Texas ARRL Section. Jim runs an HW100 and an inverted vee on 80 and 40, phone and cw.

Ron, W8HGS, must be a real rag chewer. He works AM on all bands, 160 through 2, and sideband on 75 through 10. His equipment includes an HT37, 75A4, HW22, DX100, SX101-III, HQ150 and several home brew linears and AM finals -- quite an impressive collection, Ron.

K8NEE is a 1953 graduate of our Servicing course. Cesare runs a Radio-TV service business and still finds time to get on 10, 15 and 20 occasionally.

WA8UXH works 6 and 2 as a Technician and is working on his code so that he can graduate to General. Ken is also working for a First phone, which I'm sure he'll get real soon.

WB9ADJ says that he is the only operator of WA9PJD, the club station at Purdue University. Larry says he too is interested in the cw net but wants to see date, time and frequency in print in the Journal. Take a look at Paul's Radiogram, Larry, and drop him a line -- then get on the air Saturday night.

Well, I guess Dick, HL9VF, now makes our "best DX" list. The question now becomes how far away can you get? Pretty soon, if we go any farther west for DX we'll be getting close to home again! Oh, well. . .

John, KL7OK, seems to have a very interesting job. Notice that with the Alaska call, we listed West Africa on his QTH. John is an installer and tester of UHF/VHF/ microwave multiplex and high speed data equipment in Warri, Nigeria. That is really going some.

Since we first reported, WB2LAO has gotten his Advance class license. Norm said he couldn't stand to give up his favorite operating frequencies. Congratulations, Norm.

And there we are for another two months. There is only so much room in each column to give you all the news of NRI Hams, and we only wish we could report fully on everyone who writes us. Anyway, thanks for the cards, and we'll BCNU

Vy 73 - Ted - K4MKX

# Moonlighting: *Is It For You?*

That part-time job can add  
experience as well as cash

*by Louis E. Frenzel, Jr.*



There is no doubt about it. The electronics industry continues to be one of the fastest growing and highest paying fields around. And all signs seem to indicate that the future of electronics is just as good, if not better, than it is now. Electronics provides many of you with stable, high-income jobs. But despite the lucrative nature of the electronics industry, inflation and higher taxes continue to increase our cost of living and keep us busy trying to meet the basic needs of our families. And even though the basic needs are met, you want to enjoy some of the luxuries of life, too. The question is, how? Well, there are a number of possibilities, but I'd like to discuss one of them that is perhaps better than most. It's something you may be interested in trying. It may not be the complete answer, but it will be interesting and financially rewarding. At the same time it can broaden your electronics capabilities and improve your future chances for success in this field. What is it? It's called moonlighting, and it may be just what you are looking for.

## MOONLIGHTING, WHAT'S THAT?

Moonlighting is the slang term applied to a part-time job that one works at after his normal full-time work is complete. Many of you probably already know all about moonlighting and have done it yourself at one time or another. A lot of people have taken part-time, after-hours jobs in order to meet some financial obligation that they could not handle with their regular paychecks. This is one definite reason for moonlighting. However, there are other reasons why you may want to work at a part-time job.

Before we consider the benefits of moonlighting in detail, let's look for a moment at another possible way you might get more money. The most obvious solution to the problem of providing yourself with higher pay is to find yourself a better, higher paying full-time job. If you have had the right amount of education and experience you may be able to go out right now and change jobs for the better. This will no doubt result in a salary increase and could possibly put you in an even better position for future promotions and still higher pay. If you are in such a position, then you should most definitely consider a new job, particularly if your present job does not offer you the pay, the opportunity or the challenge that a new, higher paying job could.

On the other hand, you may like your present job and it may suit your capabilities and desires and, therefore, provide you with everything you need. Even though it doesn't pay as much as you would like, it may offer good security and a promising future. In this case, you would most certainly not like to change jobs. For that reason, moonlighting may be the answer to a temporary need for extra income.

If you are currently working in electronics and have a certain basic background of education and experience, then most likely you can find part-time jobs in electronics to supplement your present income. Moonlighting is one way you can turn your experience and education into instant cash. There are many companies that offer part-time employment in the various electronics fields. There is no reason why you should not take advantage of your electronics training and experience to supplement your present income.

While it may be relatively easy to get any type of a part-time job, the idea is to make this part-time job work for you in your regular line of work. You may be able to go out right now and find a job as a gas station attendant, a store clerk or any other position requiring evening and weekend work. However, if this work is not in your field of interest, it will not provide you with anything but a small increase in income. If you are going to moonlight, why not put your experience and education in electronics to work to obtain a higher paying part-time job and at the same time have that job provide you with additional experience and education in your field of interest that could help you on your full-time job or in the future?

Let's summarize the benefits of a moonlighting job in electronics:

(1) If you are experienced in the field of electronics, then the part-time job that you obtain will most likely be substantially better than any other part-time job out of your field of interest. Because you have had some experience and training in your field, you can command a much better, higher paying part-time job.

(2) Your part-time job is going to supply you with additional experience in your interest area. The more experience you have in electronics, the more competent you will become and the better full-time job you can command. It pays to get as much experience as possible, for it can only lead to improvements in salary and position later on.

(3) Your part-time job will give you a different slant on the electronics industry. You will be working for a different employer whose methods and business may be quite a bit different from those you encounter on your full-time job. This tends to broaden your outlook of electronics and provides you with some additional ideas that can make you better on your full-time job. You will gain more knowledge and thus become more diversified.

(4) Moonlighting is a good way for a newcomer to the electronics field to get started. If you have had no experience in electronics, it is sometimes difficult to find a good job. But once you find initial employment, then you are on your way in the electronics field. You can supplement this initial experience with part-time work to get where you want to go much faster. Moonlighting provides you with a means of getting nearly double the experience in the same amount of time. It will no doubt permit you to move ahead much faster than you would otherwise.

### WHERE ARE THE JOBS?

Trying to come up with a good comprehensive list of prospective part-time jobs in electronics is not easy. Even though there are many such jobs available, it is not easy to compile a list of specific jobs since the number and type of jobs varies widely from one area of the country to another. However, we can give you some ideas on how you might

(contd. on page 17)

# FREE

## PREMIUM GIFTS WITH YOUR PURCHASE IN CONAR'S SPRINGTIME SHOPPING SALE

# PLAY THE NUMBERS GAME!

HERE'S HOW . . . One (or more) of the premium gifts shown on this page is yours free of extra cost when you purchase any of the CONAR instruments or merchandise featured in this issue.

Each premium gift below is numbered. Each item for sale features a number in a circle. Simply match the numbers to see which gift you receive free with your purchase. The higher the number, the more valuable the gift.

When you order your merchandise, be sure to cut out and enclose the appropriate coupon (or coupons) below so that you will receive your free gift.

This special offer ends at midnight on June 30, 1970, so don't delay. Send in your order right away.

# 4

## PREMIUM GIFT COUPON



### XCELITE NUTDRIVER SET

Ten color-coded, pocket size drivers, plus a "torque amplifier handle" that fits over driver handles. Packed in sturdy, see-through plastic case. A \$8.25 value.

# 3

## PREMIUM GIFT COUPON

### KNICKNACK CABINET

Small parts cabinet with all-metal frame and fifteen see-through drawers. Index tabs and drawer dividers included. A \$4.98 list price value.



# 2

## PREMIUM GIFT COUPON



### MINI WIRE STRIPPER

Multi-purpose handy pocket tool. Pocket clip opens to cut wire. Strips insulation without nicking. Handy insulated small screwdriver. Only 5½" long. A \$2.50 value.

# 1

## PREMIUM GIFT COUPON

### CLIP-ON NEON TESTER



Test voltage in any circuit. Indicator shows when circuit is hot. AC or DC 90 to 500 volts. Clip on shirt or coat pocket.

# Adventures In Electronics Kit

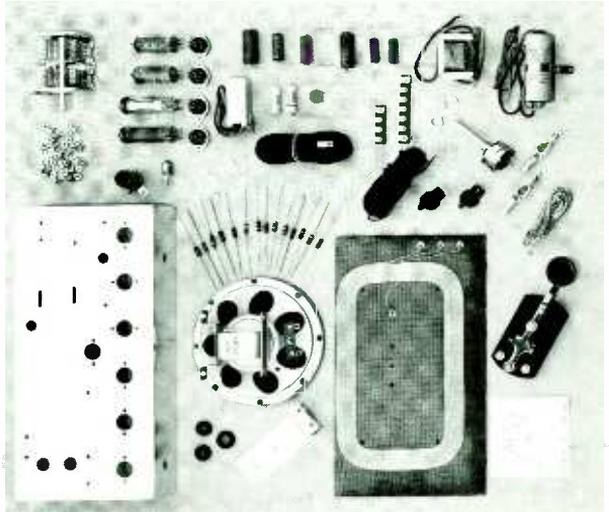
FROM CONAR . . .

*The Perfect Gift  
for Some Lucky  
Boy (or his Dad)!*

- ★ More Than 100 Parts
- ★ Ten Experiments

**\$18<sup>95</sup>**

Stock #26UKSIP  
Weight 6 lbs.  
Parcel Post



**2**

Ten *fascinating* and *safe* educational projects. This kit is used by teachers in many school classrooms to introduce students to electronics—help them toward satisfying and profitable careers. Here's proof positive of its sound educational value and thorough training.

Kit contains over 100 top-quality parts—name brands you'll recognize. This is not the “*plastic-cardboard-battery*” type experimenter's kit usually found on store shelves. **IF PURCHASED SEPARATELY, THE PARTS USED IN THE ADVENTURES IN ELECTRONICS KIT WOULD RUN WELL OVER \$30.00.**

You learn about electronics and *have fun* doing it. Each project graphically demonstrates a number of electronics principles. You're shown “why” and “how” these principles work. You need *no previous electronic training or experience*. Just follow the simple, concise instructions and large diagrams in the 48-page project manual. The manual includes a glossary of common electronics terms for quick and easy reference.

**The projects cover a seemingly endless variety of activities:**

- You build a Radio Receiver which performs exact-

ly like a manufactured set—picks up local broadcasts and distant stations.

- **You learn about Testing Radio Sets.** In this project you build a signal tracer and use it to find the exact point in a circuit where the signal stops. The signal tracer is a test instrument used by professional electronics technicians.

- **Then you become a Radio Announcer.** You set up a broadcast station, and with the speaker as your “mike,” transmit your voice through your radio or a neighbor's set.

- **Now you assemble a “Secret Listener.”** The speaker becomes a concealed microphone. Put it in one room and hear any conversations through a receiver without being present. Use it as an electronic “baby sitter.” Mother can place the “Listener” near baby's crib and hear cries while she's in another room.

- **You'll experiment with sound.** In one project you build an Audio Oscillator and produce a wide range of sounds. Another experiment teaches how sound is magnified. After putting together an Audio Amplifier, you amplify sounds from a phonograph pick-up.

**ALL THE TOOLS YOU NEED  
ARE INCLUDED **FREE****

SOLDERING IRON • SCREWDRIVER • PLIERS



**USE CONVENIENT ORDER BLANK ON PAGE 25**

# CONAR Cathode Conductance Tube Tester

③



Catalog Price **\$49.95**  
NRI Student and Alumni Price

KIT 223 UK **\$44.80**

**\$5 DOWN, \$5 PER MONTH**

Catalog Price **\$75.95**  
NRI Student and Alumni Price

WIRED 223 WT **\$68.25**

**\$7 DOWN, \$7 PER MONTH**

**Express Collect**

Completely new, modestly-priced Tube Tester Kit, designed by men with unequalled experience in training technicians -- understanding their equipment needs and servicing problems. No unnecessary frills added to the Model 223's specs. Only those features most essential to a technician's work are built in.

Every technician -- full or part time -- needs the Model 223 for his bench. Helps you make better job estimates and pays for itself quickly in extra profits. Perfect for experimenters and hobbyists, too.

Tests all series string and up-to-date tubes as well as the standard base types -- 4, 5, 6, 7-pin large octal, local, 7, 9 and 10-pin miniatures, 5 pin nuvistor, novar and Compactron. Checks 17 individual filament voltages from .75 to 110 volts. Tests multi-section tubes, gas rectifiers and remote control gaseous types. Has open-close "eye" tests for cathode ray indicator tubes, and visible filament continuity check to show up on filaments regardless of pin position.

12 level element selector-distribution system enables you to select the individual elements of the tube you're checking and simplifies cathode leakage tests and inter-element short tests. Most important this feature provides you with flexibility AND gives you insurance against obsolescence as new tubes reach the market.

Designed around the approved Electronic Industry Association's Emission Circuit, the Model

223 uses a precise, accurate, double-jeweled meter movement. It's balanced and factory calibrated within 2% accuracy. Large, easy to read -- with clear plastic case and two 2-color scales.

Test sequence set up to reveal quickly open filaments and shorts. The time-saving feature rejects an "open" or "shorted" tube and lets you proceed with more detailed checks right away. For maximum safety to you and the instrument, the test circuit transformer is isolated from the power line. Triple-window, high-speed, gear-operated roll chart is illuminated, easy to read, even in darkened areas. Lists over 2,000 tube types.

Durable, black, leather-fabric case makes the Model 223 attractive as well as functional. Hinged lid is removable. When the lid is on, a snap lock holds it securely.

Level switches and other controls conveniently grouped to eliminate wasted motion. This minor but thoughtful feature is typical of the care put into the Model 223.

The instruction manual for the Model 223 is written with the same high standard that went into the circuit design -- with HUGE picture diagrams to guide you every step of the way.

Building the Model 223 is easy. Using it is even easier. The operating simplicity makes it a pleasure to use. Just 10 lbs. -- it's a pleasure to tote along on service calls, too.

**PICTURE TUBE ADAPTORS: 70°-90°, Stock 3AD; 110°, Stock 5AD -- \$3 Each**

**USE CONVENIENT ORDER BLANK ON PAGE 25**

4

# CONAR 5" Wide Band Oscilloscope



**KIT** CATALOG PRICE \$99.90  
**250 UK** NRI STUDENT AND ALUMNI PRICE **\$82.90**

**WIRED** CATALOG PRICE \$139.50  
**250 WT** NRI STUDENT AND ALUMNI PRICE **\$129.75**

### OPTIONAL ACCESSORY

Set of four heavy duty probes designed specifically for use with Model 250. Set includes: Signal Tracing Low Capacity; Resistor Isolated; and Direct Testing Probes; Roll-up Carrying Case. Complete instructions in Model 250 manual.



Stock #250PB. 2 lbs. Parcel Post **\$17.70**

## ADVANCED DESIGN • NEWEST CIRCUITRY • EXCLUSIVE FEATURES

Advanced design, newest circuitry, exclusive features—a truly professional oscilloscope for laboratory or service shop. The Model 250 is ideally suited for color and monochrome TV, AM-FM and transistor radios, hi-fi and stereo amplifiers, plus numerous industrial electronic applications.

Note these CONAR Model 250 features:

- Uses 2400 volts on the cathode ray tube—50% more than most scopes. Trace remains clear, distinct, bright, with increase in sweep frequency or vertical-horizontal expansion. Forget about darkening room to observe traces on your Model 250 screen!
- Vertical gain control is calibrated for direct reading of peak-to-peak voltages. Simply multiply vertical gain control setting by attenuator setting by trace height for quick, accurate peak-to-peak readings. No need to remember special formulas or "feed-in" calibrating signals.
- New improved scope circuitry gives excellent linearity at low frequencies without limiting the production of frequency sweep signals.
- Two stage retrace blanking amplifier gives 100% retrace blanking at all frequencies produced by the scope sweep generator. Retrace lines will not confuse the display at high sweep frequencies.

- 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. Eliminates need for a separate flyback tester costing from \$40 to \$70.
- Sweep range—10 cps to 500 kc—five times the range of most other scopes, using special linearity circuit.

The Model 250 can be assembled in less than 15 hours—even by an inexperienced kit builder. Uses only top grade components. Most components are over-rated, giving you an extra margin of dependability plus years of trouble-free service. And—there's no trouble finding replacement parts if ever needed. (Of course, we stock a complete inventory of parts, too.)

Step-by-step assembly instructions include big 17" x 22" picture diagrams plus 12 full pages of comprehensive operating instructions with more than 30 illustrations showing waveforms and connecting points.

### SPECIFICATIONS

**VERTICAL SENSITIVITY:** .023 VRMS. **VERTICAL FREQ. RESPONSE:** Flat 13 cps to 2.5 mc, Down .05 db at 11 cps, Down 1.5 db at 3.58 mc (color burst), Down 3.5 db at 4.5 mc. **HORIZONTAL SENSITIVITY:** 1.0 VRMS. **HORIZONTAL FREQ. RESPONSE:** Flat 20 cps to 90 kc, Down .8 db at 12 cps, Down 3 db at 250 kc. **RISE TIME:** .05 ms. **SWEEP FREQUENCY:** 10 cps to 500 kc. **TUBES:** 11 (equivalent of 19 using dual types). **PUSH-PULL ON-OFF** does not upset other adjustments. **CONTROLS:** Intensity, Focus, On-Off, Astigmatism, Horiz. Centering, Vert. Centering, Horiz. Gain, Vert. Gain, Sweep Selector, Vert. Attenuator, Fine Frequency, Sync Selector, Sync. **CABINET:** Heavy gauge steel, baked-on rich blue finish, rubber feet, chrome handle. **PANEL:** Satin finish aluminum (not painted) with red lettering. **BINDING POSTS:** 5-way type to accommodate all connectors. **DIMENSIONS:** 9 3/4" x 13 3/4" x 15 1/2". **POWER SUPPLY:** 110-120 volts, 60 cycle AC, fused circuit. **ACTUAL WEIGHT:** 21 lbs.

USE CONVENIENT ORDER BLANK ON PAGE 25

# CONAR

## Audio Color

*An Exciting New Concept in Music*

For music lovers and electronics enthusiasts alike, this transistorized marvel attaches quickly to hi-fi sets, stereos, tape recorders and *even most* radios. Simply connect alligator-clip leads to your speaker terminals, and you're ready to enjoy a color spectacle.

While you listen to your favorite melody, beautiful hues of red, orange, yellow, blue, green and violet move across the Audio Color screen in a breathtaking variety of patterns. A frosted screen eliminates glare without filtering the colors.

But Audio Color *does more* than paint the music. It also reproduces the tempo. With each *torrid* beat of the bongos . . . with each *clash* of the cymbals, the colors grow brighter. If the tempo mounts slowly, the colors brighten gradually. A *sharp rise* in volume is matched by a *sudden flash* of colors, bass on the right—treble on the left.

Order the Audio Color in kit form and build it yourself in a few short hours. For those who can't wait to see it, we have a few already assembled.



3

**KIT** CATALOG PRICE \$44.95  
**103 UK** NRI STUDENT AND ALUMNI PRICE **\$39.85**

**WIRED** CATALOG PRICE \$54.95  
**103 WT** NRI STUDENT AND ALUMNI PRICE **\$49.45**

## SOLDERING TOOLS AND AIDS

*The Revolutionary New*

### ENDECO

**Desoldering  
Resoldering  
Tool**

**One-hand  
operation**



Endeco . . . the first successful desoldering/resoldering iron . . . not only removes soldered components, but also resolders printed circuit boards faster and better than regular resoldering irons. It requires only one hand to operate, leaving the other hand free. Its hollow tip fits over the connection; vacuums all solder for easy removal of the component; leaves terminals and mounting holes clean. Then, it resolders with 360° tip coverage and capillary action of the solder around the component lead for a perfect connection. Pays for itself quickly in time saved.

1

Stock #1300TO  
Wt. 11 oz.  
Parcel Post

**\$11<sup>45</sup>**

### SOLDAPULLT

**Deluxe  
Model**



**Standard  
Model**

SOLDAPULLT is the best resoldering tool we've seen yet. This tool incorporates easy handling, swift vacuum action and a self cleaning feature. Soldapullt is loaded by pushing plunger knob down until it latches. Molten solder is drawn into its cylinder instantaneously with a high impulsive vacuum by release of the spring loaded piston.

**\$5<sup>95</sup>**

Stock #14TO  
**Standard**  
8 oz. Parcel Post

1

**\$9<sup>95</sup>**

Stock #13TO  
**Deluxe**  
10 oz. Parcel Post

**USE CONVENIENT ORDER BLANK ON PAGE 25**

4

Completely  
New from  
CONAR

MODEL 680

INTEGRATED  
CIRCUIT



# COLOR GENERATOR

<b>KIT</b>	CATALOG PRICE \$89.50
<b>680 UK</b>	<b>NRI STUDENT AND ALUMNI PRICE \$79.45</b>
<b>WIRED</b>	CATALOG PRICE \$121.50
<b>680 WT</b>	<b>NRI STUDENT AND ALUMNI PRICE \$109.00</b>

Only the 680 Has All These Features At Any Price!

- EXCLUSIVE Digital Integrated Circuits
- EXCLUSIVE 4 Crystal Controlled Oscillators
- EXCLUSIVE AC or Battery Operation Standard
- 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

SPECIFICATIONS

**OUTPUT:**  
R. F. only—low impedance  
Approximately 50,000 microvolts into 300 ohm tuner  
100% modulated carrier—composite video  
Crystal controlled oscillators:  
189 kc timing oscillator  
3,553.795 kc offset color subcarrier oscillator  
4,500 kc sound carrier oscillator  
55.25 mc or 61.25 mc rf carrier oscillator

**MODULATION:**  
Single dot  
Single cross  
Single vertical line  
Single horizontal line  
Full dot pattern  
Full crosshatch pattern  
Full vertical line pattern  
Full horizontal line pattern  
Keyed rainbow color pattern

**POWER REQUIREMENTS**  
120 vac—1.0 watt or:  
4 "D" cells—6.0 vdc at 130 ma.

**REGULATED POWER SUPPLY:**  
Silicon diode bridge rectifier  
Zener diode stabilized transistor regulator

**SEMICONDUCTOR COMPLEMENT:**  
16 type 914 integrated circuits  
3 type 2N2369 NPN silicon transistors  
1 type 2N555 PNP power transistor  
1 type 1N74A Zener diode  
4 silicon rectifier diodes  
1 modulator diode

**GUN KILLER SWITCHES:**  
Permanently wired cable  
Separate red, blue and green switches  
Colored switches for rapid location

**CONSTRUCTION:**  
Aluminum cabinet, chassis and panel for light weight  
Printed circuit board, 6" x 9"

**SIZE:**  
10" x 3" x 9" (WxHxD)

**WEIGHT:**  
Less than 5 pounds with batteries  
Less than 4 pounds without batteries

## Tomorrow's Engineering Today

You can pay much more, but you can't buy more exclusive and up-to-date features than CONAR engineers have built into the new Model 680 Color Generator. CONAR is first with digital integrated circuits, 4 crystal-controlled oscillators and AC and battery operation built in (even the batteries are supplied). Compact and portable, the 680 weighs less than 5 lbs. Peak accuracy and stability are assured by cool all solid state circuitry, regulated power supply and stability control. The 680 incorporates a wide range of test patterns, including single and multiple vertical bar, horizontal bar and crosshatch patterns—all with horizontal lines only one raster line thick, as well as a standard 10-bar color pattern. The most modern and versatile color generator on the market, the 680 incorporates 26 semi-conductors: 16 type 914 integrated circuits, 3 2N2369 transistors, 1 2N555 transistor, 5 silicon diodes and 1 zener diode. Oscillators include 189kc. timing generator, 3.56 mc. offset color subcarrier, 4.5 mc. sound carrier and 55.25 mc. or 61.25 mc rf carrier (channel 2 or 3 as ordered). Until now, no commercially available color generator has offered so many quality features in a single instrument. The 680 features nine video patterns to speed convergence adjustments, simple timing circuit alignment, all printed circuit construction, plus your choice of kit or wired models, and represents the finest in operating quality. You get TV station quality composite video signals, including "back porch" color burst. All this, plus CONAR's low prices, make the 680 the absolute tops in dollar-for-dollar value.

Please Specify Channel 2 or 3

USE CONVENIENT ORDER BLANK ON PAGE 25

# NEW ELECTRONIC SLIDE RULE



1

800AC

\$5<sup>95</sup>

Plus 20c Postage

**Professional Quality.** Anyone in electronics can save time with this precision instrument. Ideal for electronic engineers, 2-way radiomen, TV technicians. Circular computer,  $4\frac{7}{8}$ " diameter. Precision calculation of surge impedance, resonance frequencies, inductive reactance, capacitive reactance, wave-length frequency, decibels. Includes ten scales. Made of special plastic which will not shrink or expand under most adverse conditions. Scale graduations are deeply imprinted and will not wear off. Light weight, pocket-sized. Leather-grain plastic case. Individually boxed with instructions.



1

\$10.90

Stock 765TO  
3 lbs., Parcel Post Insured

## COLORAMA TV Lamp-Clock

**A new concept in time-telling**

Correct time at a glance with this modern tv-lamp-clock. Hours, minutes, and seconds on rotating dials keeps correct time constantly in view. Attractive walnut case with contrasting persimmon face. Independent soft light can be used as night or nursery light. Self-starting electric motor uses 110V. 4" high, 7" wide,  $3\frac{3}{8}$ " deep. One year guarantee.



## TELEPHONE AMPLIFIER

\$14<sup>95</sup>

Stock #4AM  
5 lbs., P.P. Ins.

**Makes Your Phone Twice As Useful!**  
You'll work smarter—not harder—when you simplify telephone work with the Fanon hand-free phone amplifier. Four-transistor unit is smartly designed, powered by one 9V battery with a life of nearly 500 hours. It's completely portable. There's no need for a line cord. You can talk into any phone while you use both hands for taking notes, type, search files or carry on whatever other work you're doing. Pays for itself in time saved.



1

USE CONVENIENT ORDER BLANK ON PAGE 25

4



## THE FAMOUS GTX HUNTMASTER

Jetco Metal And Mineral Detector  
DESIGNED FOR THE PROFESSIONAL AND AMATEUR ALIKE!

- ★ 14 Transistors of Power
- ★ Lightweight and Balanced
- ★ Waterproof Search Coils
- ★ Detects Through Wood, Dirt, Rock, Sand, Mud and Water
- ★ 3 Year Guarantee
- ★ Precision Pin-Point Tuning
- ★ Comes With 2 Search Coils

**THE GTX HUNTMASTER WILL DETECT: A PENNY . . . AT 5 TO 7 INCHES • A SILVER DOLLAR . . . 8 TO 12 INCHES • A BAG OR JAR OF COINS . . . 18 TO 30 INCHES • LARGER OBJECTS DEEPER . . .**

The GTX Huntmaster is the perfect companion for exploring old homesites, ghost towns, caves and beaches. Its durable corrosion resistant construction makes it excellent for use near salt water. Detects gold, silver, copper, iron and all other metals and detectable minerals. The amazing GTX HUNTMASTER features maximum penetrating power combined with small coin sensitivity that cannot be surpassed, regardless of cost.

The GTX Huntmaster has view-meter which increases its efficiency by detecting objects on the fringe of the normal detecting area. View-meter allows the GTX to be used silently.

The GTX Huntmaster comes complete—ready to use with both 6" and 12" waterproof coils.

You will not find a better detector at a comparable price.

DETECTS  
ALL DETECTABLE  
METALS AND MINERALS

COMPLETE  
ONLY

**\$129<sup>50</sup>**

Stock #1 Wt.  
6 lbs. Parcel  
Post Ins.

## THE JETCO GTS



Pictured above are the components of the GTS Kit Model Detector. A printed circuit board (not shown) is also included. There is nothing else to buy. In about four hours you will have built a power packed detector worth nearly twice the price. You save because you build it yourself.

## THE NEW KIT MODEL DETECTOR

Assembles in about four hours—no knowledge of Electronics required for easy assembly.

**\$59<sup>95</sup>**

6" Coil #8UK  
12" Coil #9UK  
5 lbs. Par. Post. Ins.

Dual Search Coils

Model #69<sup>95</sup>  
#10UK  
6 lbs. Par. Post. Ins.

- Power Packed, Highly Sensitive Detector
- Fully Transistorized
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- Your Choice of 6" or 12" Waterproof Search Coils
- Lightweight — 3 Pounds
- All Parts Guaranteed 3 Years
- Detects All Metals & Detectable Minerals
- Works Through Mud, Rock, Concrete, Soil, Wood and Water

3

USE CONVENIENT ORDER BLANK ON PAGE 25

approach the subject. Let's take a few typical examples to show you what we have in mind. Perhaps you may be able to do something with these specific examples. If not, hopefully you will be inspired to do a little digging on your own and possibly come up with something even better.

If you work in the consumer electronics business, where you service TV's, radios, hi-fi's, and other equipment, the prospects for part-time employment are generally excellent in big cities as well as small towns. TV service shops, for example, are generally in constant need of good personnel to perform service work. Much of this work is performed in the evenings and on weekends. This may involve bench troubleshooting or making outside calls to customer's homes. In any case it wouldn't hurt to check out all of the TV service shops in your area for possible evening or weekend employment.

If you have an FCC second or first class radiotelephone license, then the chances are that you may be able to land a job as a transmitter or studio engineer at a radio or TV station. Many radio and TV stations are on the air around the clock and find it difficult to obtain the help they need. With the proper license you can make application with the radio and TV stations in your area asking about part-time evening and weekend employment in this area. While they may not have anything for you immediately, their demands vary and you may eventually obtain such a position.

Don't overlook the possibility of some mobile radio service facilities that provide evening or weekend work. If you have at least a second class FCC license your chances of getting such a job may be excellent. Check the yellow pages of your telephone directory for companies that do this type of work.

Many cities, particularly in industrial areas, have electronic manufacturers. Some of these manufacturers may operate several work shifts. You may be able to land an excellent part-time job on an evening shift in one of these companies. Such jobs will most often involve production and test work in electronics where electronic equipment is being assembled and checked out before being shipped to the purchaser.

As mentioned earlier, it is to your benefit to find a job in electronics that will increase your experience in your field of interest. You may be able to use this experience in your present full-time job or to make use of it later in obtaining a better, higher paying position. However, the situation in your area may be such that part-time jobs like you want are just not available. If moonlighting is still your goal, then you may be able to find something that is related, but not directly, to your field of interest. One of these areas is sales. If there is an electronic wholesale parts distributor in your area, you may be able to obtain work in counter sales or inventory control. If you are familiar with electronic components you can work quite effectively in these areas. Many electronic wholesalers work evenings and weekends.

Another possibility is sales work in the area of consumer electronic equipment. Many department stores sell radios, TV's, hi-fi's and related electronic equipment. If you are familiar with this area, you could most certainly sell this equipment quite completely. If you can't find anything on the technical side of electronics, then you may wish to consider the sales field, which can be quite lucrative.

There is one other possibility that you may wish to consider. This is perhaps one of the best moonlighting means there is, but one of the most difficult to get into and be successful with. I am speaking of your own part-time business. Most people would prefer to work for themselves on a part-time basis. This is a very desirable possibility and one

that you may wish to give serious consideration to. You may be able to start a successful business servicing radios, TV's and other consumer electronic equipment and do it in the evenings and on weekends in your house. You may be able to fix up a spare room or your basement for a service shop of some sort, then provide yourself with the appropriate test equipment to do the job. Through some form of advertising you can spread the word about your new business and capabilities and you are on your way. If you handle this properly this can be a most lucrative and certainly the most satisfying way to moonlight.

### MOONLIGHTING - SOME AFTERTHOUGHTS

There is no doubt about the fact that moonlighting can be very beneficial to you. It will provide you with the extra income that you need and some experience that can be very helpful to you on your present job or in the future. However, moonlighting has some disadvantages as well. You should know what these are before you dive in and take advantage of its benefits. Here are a few key points that you should keep in mind about moonlighting.

(1) Don't make a career out of moonlighting. You will not want to do it forever. If you are considering a part-time job, then consider it for a specific purpose. For example, you may need some additional income to pay off some financial obligation or to buy some luxury item that you can't afford on your normal paycheck. Then again, the additional experience to be gained may be your goal. In any case, set yourself some goal and moonlight for this purpose and no more. Once you have accomplished your goal, then your moonlighting can end.

(2) Setting a goal and then achieving it through moonlighting is all well and good. There is one disadvantage. It is very easy to get "hooked" on the extra income even to the point that quitting your part-time job could put you into a financial bind. Once you begin to work at your part-time job for any length of time, you begin to depend more and more on that income and when you decide to quit, you will most certainly feel the financial strain. This may or may not be a disadvantage to you, but you should be aware that this problem can exist.

(3) Working at a part-time job is not easy. If you spend a full eight-hour day on your regular job and then work extra hours at night and on weekends, you could possibly overwork yourself. It could tire you excessively and give you little free time for yourself, your family, or any other activity that you wish to pursue. Keep this in mind when taking on a part-time job. Try to find one that doesn't take all of your evenings and weekends. Save a little time for yourself and for other things. Don't forget, however, that your moonlighting may be only temporary. You may be able to withstand the strain and inconvenience of the extra work and lack of free time if you know that you are going to accomplish a worthwhile goal.

(4) If you should suddenly get a raise or a better full-time job that can provide you with a better income and the extra benefits you are seeking, your part-time job may not be necessary.

(5) There is one very important point you should keep in mind when considering a part-time job. Your boss may not approve of your part-time activities and this could seriously affect your full-time job. Many employers feel that if their employees work part-time, they cannot give full attention and effort to their regular full-time jobs. Many frown upon it to the extent that you could be dismissed for carrying on outside work.

Then again your employer may be quite liberal in this respect, as many are, and may even encourage your extra efforts. Different companies have different policies, so be sure to check before you take on your part-time work. You certainly don't want to jeopardize your capabilities to earn a living at your main job. If you handle this discreetly, however, you should not encounter any serious problems.

As you can see, moonlighting has its advantages and disadvantages. Take them all into consideration when you are thinking about possible moonlighting work. If you think of it as a temporary means of gaining some benefit, either financially or in experience, then you most probably have the proper attitude toward it and will no doubt be successful. Happy moonlighting. 

## How to repair an electronics instrument?

1. *Approach the ailing instrument in a confident manner. This will give the instrument the (often mistaken) idea that you know something. This will also impress anyone who happens to be looking, and if the instrument should suddenly start working, you will be credited with its repair. If this step fails to work, proceed to step two.*
2. *Wave the handbook at the instrument. This will make the instrument assume that you are at least somewhat familiar with the sources of knowledge. Should this step fail to work, proceed to step three.*
3. *In a forcible manner, recite Ohm's Law to the instrument. (Before taking this step, refer to some reliable handbook and be sure of your knowledge of Ohm's Law.) This will prove to the instrument beyond the shadow of a doubt that you do know something. This is a drastic step and should be attempted only after the first two steps fail.*
4. *Jar the instrument slightly. This may require anything from a three to six foot drop, preferably on a concrete floor. However, you must be careful with this step because, while jarring is an approved method of repair, we must not mar the floor. Again, this is a drastic step, and if it fails there is nothing to do but to proceed to step five.*
5. *Add a tube. This will prove to the instrument that you are familiar with instrument design. Also this step will give the instrument an added load to carry and will thereby increase your advantage. Should these five steps fail to work, you must proceed to the most drastic step of all. This step is seldom needed and must be used only as a final resort.*
6. **THINK.**

Source unknown. Submitted by Louis Blaine Skelton  
341 N. 2nd W.  
Tooele, Utah 84074

...HELP WANTED...	...HELP WANTED...
<p>Do you have your FCC license and a desire to work in the vehicular radio field?</p> <p>If so, contact:</p> <p>William J. Cling, Jr. International Mobile Telephone Systems 10442 Burbank Boulevard North Hollywood, CA 91601</p>	<p><b>SEARS</b> has many career opportunities for experienced TV technicians or recent graduates of electronics schools. Top benefits, locations throughout the U.S.</p> <p><b>CONTACT:</b></p> <p>The Service Manager of your nearest SEARS SERVICE CENTER or the Personnel Manager of your nearest SEARS retail store.</p>
<p><b>POSITIONS AVAILABLE DEALING WITH HEAVY DUTY INDUSTRIAL EQUIPMENT, 2-WAY RADIOS, CLOSED CIRCUIT TV AND PAGING SYSTEMS. REQUIRES AT LEAST 2ND CLASS FCC LICENSE.</b></p> <p><b>CONTACT: MR. GLENN WHITE</b> DISTRICT SERVICE MANAGER 19-A BRADSTON STREET BOSTON, MA 02118 617-445-4545</p>	<p><b>MONTGOMERY WARD</b> has openings for TV technicians or grads of electronics schools. Openings available in Wash., Md., and Va. areas.</p> <p><b>CALL OR WRITE:</b></p> <p>Pat F. Cosentini Service Manager 7100 Old Landover Rd. Landover, Md. 20785 301-322-3344</p>
<p><b>WANTED . . . . .</b></p> <p><i>Experienced or well-trained two-way radio technicians. Ideal positions open for responsible men. FCC second class license required.</i></p> <p><b>CONTACT . . . . .</b></p> <p><i>Manager, Communications Department Lafayette Radio Electronics 2025 Arden Way Sacramento, Calif. 95825</i></p>	<p><b>FULL AND PART TIME OPPORTUNITIES AVAILABLE IN AM RADIO BROADCAST ENGINEERING FOR HOLDER OF FIRST CLASS RADIO-TELEPHONE LICENSE. LICENSE AND TRAINING NEEDED.</b></p> <p><b>CONTACT: Robert F. Burns, Chief Engineer</b> Radio Station WOKW P.O.Box 6 Whitman, Mass, 02382</p>

**WANT TO MAKE UP FOR LOST TIME?**

**RCA HAS TRAINING PROGRAMS FOR THE INEXPERIENCED BEGINNER IN BASIC TV SERVICE AS WELL AS FOR THE EXPERIENCED TECH IN THE LATEST SOLID STATE CIRCUITRY.**

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**Contact: J.C. Pumphrey  
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4210 Howard Ave.  
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Positions now available in the Graphic Communications Field. Technicians needed to install and maintain such equipment as Electronic handwriters and Facsimile units. Top starting salary and excellent benefits.

Contact. Telautograph Corp., 1921 North Harlem Ave., Suite 108, Chicago, IL 60636  
(312-622-7111)

**ANSWERS TO TRUE-FALSE QUESTIONS ON PAGE 7.**

1. True. Automatic volume control (avc) is a simple type of agc used in radios.
2. True. In a reverse agc transistor stage, gain is reduced by reducing the collector current. In a vacuum tube stage, gain is reduced by reducing the plate current.
3. False.  $C_1$  in Fig. 3 establishes the agc time-constant, but delayed agc means that the agc circuit is not effective until the signal is fairly strong. The "delay" is not a time delay.
4. False. This capacitance must be very small, so that  $Q_1$  can amplify the i-f signal only while the flyback pulse is present.
5. True. If this capacitor is open, no flyback pulse will arrive at the plate of the tube. No negative voltage will be produced, so the agc voltage will become positive because of the connection to B+ through  $R_5$ .

# LET'S HEAR IT FOR THE GALS!

*Let's hear it for radio-TV repair -- women!*

*Well, why not? There's no reason why a woman can't solder in a component as well as a man, and my husband has to admit that my smaller hands can reach those impossible-to-get-at places a lot easier than his can.*

*This is the way it happened for me: My husband, Leonard, enrolled in the NRI Radio-TV course. That's where it all started. He kept asking my opinion on certain things in his lesson text; he knew I didn't know a thing about it, but it just seemed to be easier and more enjoyable for him when he discussed it with someone.*

**before he finished his first book  
we were taking turns reading . .**



*Well, before he was through his first book we were taking turns reading aloud to each other. It was more fun! Every discovery was doubly enjoyable because we shared it. And everything he did, I did, too, right down to working on the kits. He would let me help sort out the parts and solder a few joints now and then.*

*After each kit was completed we did the practical experiments. Now that's really fun! The thrill of seeing an experiment turn out exactly the way it's supposed to is just great. It's really hard to believe at first, when you see a meter reading come out right on a vtvm you built yourself -- well, almost.*

*And the thrill of hearing your favorite radio station come in loud and clear on the radio you built is surpassed only by the excitement of seeing the first program on your do-it-yourself television set. I couldn't believe my eyes. Even though I knew we had done everything step by step exactly as the book said, I still couldn't believe it would actually work.*

*I stood on the other side of the room with my fingers in my ears while Leonard plugged the set in, but to my surprise nothing exploded.*

*And with a little adjustment, such as with any new television set, it came in beautifully. Needless to say, our relatives and friends were amazed. I'm afraid for awhile there we were really showoffs, but we thoroughly enjoyed it.*

*Now, you may say, "I don't have the time, what with the kids and the housework." (Well, I have to admit I don't get as much housework done as I used to.) But maybe if your husband likes having you study with him enough he may help you with the dishes. (Leonard likes it, but not that much!)*



*Seriously, men, there's another advantage to having the little woman take a course with you. Who wouldn't like to have a built-in, first-rate troubleshooter in his TV shop? When you're out on a call she can hold the fort. And gals, how else can you work on that "outside interest" and still spend the day with your husband?*

*So if your husband isn't planning to take a radio-TV course, why not think about enrolling on your own?*



*If you do, you are in for a little work, and a lot of thrills and surprises. Maybe he'll even study along with you, and then you can hire him for your shop! Radio-TV servicing has been a field "for men only" long enough. Don't you think it's time to change it?*      **by MARCELLE SPLAWN**

# NRI HONORS PROGRAM AWARDS

*For outstanding grades throughout their NRI course of study, the following January and February graduates received Certificates of Distinction with their Electronics Diplomas.*

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J12

### CREDIT APPLICATION

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

Enclosed is a deposit of \$..... on the merchandise I have listed on the reverse side. I hereby apply for credit under the Conar Easy Payment Plan. The statements below are true and are made for the purpose of receiving credit.

Date ..... 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 ..... (Name) ..... (Address) ..... Highest Credit .....

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



## **In Memoriam**

*It is with deep regret we report the death of Theodore E. "Ted" Rose, retired Director of NRI's Graduate Service Department and former Executive Secretary of the NRI Alumni Association.*

*Ted served as a member of the NRI staff for 40 years prior to his retirement in February this year. As a member of the executive team, he was a capable, cheerful employee dedicated to the welfare of NRI students and alumnus. Many of you who have attended local Alumni meetings will remember Ted's numerous goodwill visits to NRIAA Chapters. He did much to build a fine world-wide reputation of NRI men by helping with problems of employment, building successful businesses, and joining together fraternally and professionally through the NRIAA.*

*We know you join with us in extending sincere condolences to the family and many friends of Mr. Rose.*



## *Alumni News*

Sam Stinebaugh ..... President  
 Br. Bernard Frey ..... Vice-Pres.  
 William Sames ..... Vice-Pres.  
 Graham Boyd ..... Vice-Pres.  
 Samuel Antman ..... Vice-Pres.  
 T. F. Nolan, Jr. .... Exec. Sec.

# Lively Winter Sessions Reported By Chapters

### **DETROIT CHAPTER EXPERIMENTS WITH CONAR COLOR TV**

At the February meeting of the **DETROIT CHAPTER** Dave Harding brought in his Conar Color TV, assisted by Charles Cope and William Tupy. Earl Oliver, who has had quite a bit of experience with color TV, helped troubleshoot the set and showed the various adjustments which must be made. At the next meeting the set will be aligned.

John Nagy announced that he can obtain

transistor books for the chapter at considerable savings.

At an earlier meeting, Earl Oliver, David Harding and William Tupy demonstrated the use of the voltmeter in servicing. The chapter is lucky to have the talents and experience of these gentlemen available.

### **FLINT, SAN FRANCISCO CHAIRMEN EXCHANGE VIEWS AT MEETING**

Chairman Andrew Jobbagy of the **FLINT (SAGINAW VALLEY) CHAPTER** kept



**A steak dinner marked Andy Jobaggy's 40th year in NRIAA.**

his commitment as Goodwill Ambassador on a recent visit to San Francisco, meeting with Chapter Chairman Isaiah Randolph. They exchanged views on programs and the benefits of membership in the NRIAA. Andy invited Mr. Randolph or any of the members to visit the Flint Chapter whenever they can.

A dinner at the Bonanza Steak House honoring Mr. Jobbagy was held in place of the February meeting. The occasion celebrated his 40th year as a member of the NRIAA. The dinner was so successful that the members decided to repeat it

next year when the new chairman is elected. George Maker was toastmaster, and promises to do it again on the next occasion. Maybe it'll be a minstrel show!

The March meeting had five entertaining speakers, Gilbert Harris, Steve Avetta, Andrew Jobbagy, Robert Polli, and Art Clapp. Lots of talent there!

### **LOS ANGELES CHAPTER ELECTS NEW SECRETARY-TREASURER**

Gerry Daugherty has accepted the job of Secretary-Treasurer of the LOS

**ANGELES CHAPTER.** The February meeting was held in the showroom of Boyd's TV Shop. It was well attended. It was decided that the regular meeting day would be changed to the third Friday of each month.

An informal discussion of technical problems was participated in by members. The Motorola Solid-State Color TV sets, handled by member Graham Boyd at his shop, provide very good topics for discussion. Any problems that come up in the normal servicing category are apt to be material for these meetings, giving members a chance to see the problems that can occur and how they can be corrected, with the latest information available.

### **PITTSBURGH CHAPTER MOVES TO NEW MEETING PLACE**

The **PITTSBURGH CHAPTER** has found a new home at the United Presbyterian Church in Verona, Pa., at the corner of Second and South Avenue. Meetings will be on the first Thursday of each month at 8:15 p.m.

The February meeting had two speakers, Clement McKelvey and Tom Schnader, who discussed various service problems. At the March meeting, Bell Telephone provided the program, which consisted of 16 mm color and sound film on the production of wire from raw ore to the finished cable. Cable, microwave, radio and open line networks were discussed. Tony Jox supplied the projector, which enabled the chapter to have the program.

### **BAD WEATHER FAILS TO DETER NEW YORK'S BUSY SESSIONS**

Stereo multiplex circuits was the subject

of Pete Carter's talk at the January meeting of the **NEW YORK CHAPTER**. He covered methods of isolating troubles to a specific section with the aid of blackboard diagrams. At the same meeting, Carl Gronquist, a recent NRI Communications Graduate, gave an absorbing account of the course.

The February meeting had many technical demonstrations. Pete Carter again was a speaker, reporting on a vertical transformer, and along with Joe Bradley, the theory of FM stereos. Then Pete spoke on 8-track auto tape machines. Frank Lucas demonstrated a video detector diode problem, and Jim Eaddy what can happen when a horizontal multi-vibrator repair is improperly made.

The March meeting featured Jim Eaddy, who gave a demonstration on high voltage in color sets with the help of an RCA set brought in by Tom Vevo.

### **NORTH JERSEY CHAPTER HOLDS TROUBLESHOOTING SESSION**

Although bad weather canceled one meeting of the **NORTH JERSEY CHAPTER**, the January meeting was held, with a practical troubleshooting session held on TV sets and AM radio. All the members joined in, using a vtm and an oscilloscope. A number of nonworking sets were brought in for the demonstrations, and they were all in working order at the meeting's end. Various members reported on recent servicing problems, and their solutions.

### **SAN ANTONIO CHAPTER SHOWS RAPID GROWTH**

John D. Goolsbee became a member of

the SAN ANTONIO CHAPTER at its February meeting. Welcome aboard, John!

The chapter had a very interesting speaker, Bill Archer of the Admiral Corp. headquarters in San Antonio. He spoke on his experiences as District Service Manager, why he supported the part-time serviceman and his observation of the California TV license law in operation. He gave his estimate of equitable service charges, and discussed the Admiral line. He gave an excellent talk much appreciated by members, including this interesting statement: "Any TV serviceman worth his salt started on his kitchen table, on his own!" That's worth keeping in mind, although the chapter meetings may serve as a pretty good substitute.

The March meeting was the official visit of Executive Secretary Tom Nolan. Tom gave a talk on Color TV Alignment, using a special electronic mockup which included a tuner, picture i-f, and color sections of the color TV. He demonstrated sweep alignment, using the unit along with a sweep and marker generator and a small scope. Tom assured the audience that the knowledge gained by alignment of the mockup would enable anyone "to align any color TV receiver on the market." After Tom's talk, Boy Scouts helped serve the refreshments.

"One of the greatest pleasures of the visit," Tom reported back at National Headquarters, "was meeting again with National President Sam Stinebaugh."

The following evening Tom and his wife, Janet, were entertained by several chapter members and their wives at the home of Bob Bonge, Chapter Chairman. Each

family brought a different dish, and "the food was out of this world," Tom said. (Editor's note: Tom and Janet enjoyed the visit so much that they are already looking forward to next year's!)

The chapter has set its membership goal at 50. It is already well under way, and with the kind of programs it's having it shouldn't be difficult.

### SPRINGFIELD CHAPTER WORKS ON COLOR TV PROBLEMS

Bro. Bernard Frey brought in a Conar Color TV set he had assembled to the SPRINGFIELD CHAPTER meeting. A vertical roll problem was found, corrected, and explained to members. Bro. Frey introduced an alignment problem in the color circuits. Using NRI lesson texts, he aligned the circuits, showing results on both the scope and vtvm. The club appreciated the chance to see and work on the final stages of the set.

Also at the meeting, a harness kit was used to enable removal of the club's color TV set to a table position for accessibility of viewing. Problems of parts failures and misalignment will be introduced for members at future sessions, so they can locate and correct the problems, using equipment and methods specified by the manufacturer.



### NEED HELP? NEED A JOB?

Use the free Job Ops columns in each issue of the NRI Journal

## DIRECTORY OF CHAPTERS

**CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER** meets 8 p.m. 2nd Tuesday of each month at Bob Erford's Radio-TV Service Shop, Chambersburg, Pa. Chairman: Gerald Strite, RR1, Chambersburg, Pa.

**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., Wednesday of each month at Andrew Jobbagy's shop, G-5507 S. Saginaw Rd., Flint, Mich. Chairman: Andrew Jobbagy.

**LOS ANGELES CHAPTER** meets 8 p.m., third Friday of each month at Graham D. Boyd's TV Shop, 1223 N. Vermont Ave., Los Angeles, Calif., NO-2-3759.

**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 264 E. 10th St., 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.

**PITTSBURGH CHAPTER** meets 8 p.m., 1st Thursday of each month in the basement of the U.P. Church of Verona, Pa., corner of South Ave. & 2nd St. Chairman: Tom Schnader, RFD 3, Irwin, 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, 60 Santa Fe Ave., 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., 2nd Saturday of each month at the shop of Norman Charest, 74 Redfern Dr., Springfield. Chairman: Al Dorman, 6 Forest Lane, Simsbury, Conn.

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

# CONAR

## TEST EQUIPMENT

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**\$18<sup>50</sup>**

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The attractive 2 1/4" clear plastic meter measures output voltage and current in three ranges.

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