

- Introducing the CONAR Model 201 Component Substitution Box
- More Adventures in TV Servicing
- NRI Fetes One-Millionth Student



journal
September/October 1974

New—From **CONAR**

The Model 201 Component Substitution Box



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- SAVE EFFORT
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Now . . . you can quickly and easily verify the condition of a suspected defective part—by substitution. Read the article in this issue of the Journal for a complete description of this new and useful CONAR kit. Then order yours now!



journal

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EDITOR AND PUBLISHER

William F. Dunn

TECHNICAL EDITOR

Ted Beach

MANAGING EDITOR

Tom Beadling

EDITORIAL ASSISTANT

Mildred Duncan

STAFF ARTISTS

Bill Massey

Arthur Susser

Ernie Blaine

In this issue, CONAR introduces its brand-new Component Substitution Box, NRI welcomes its one-millionth student, and long-time Journal author J.B. Straughn adds another chapter to his series of TV servicing adventures.

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introducing the CONAR MODEL 201 Component Substitution Box

by Jim Lytle

As every service technician knows, one of the most fundamental approaches to troubleshooting is parts substitution—the temporary replacement of a component suspected of being defective with one known to be good. Depending upon his skill and experience, a technician can devote 30 percent or more of the time he spends troubleshooting in locating and substituting suspected components. Consider, for example, that in many shops, a technician deciding to check a suspected part by substitution must (1) walk over to the parts area, (2) locate the component he needs, (3) walk back to the service bench, and (4) tack-solder the new component in the circuit. If his original suspicions were correct, the symptoms of the malfunction disappear with the new part in place. He then (5) permanently connects and solders the new part into the circuit. Quite often though, the technician must repeat steps 1 through 4 one or more times (hopefully, only after making additional observations with his test equipment) before the actual defective component is found.

As every electronics hobbyist knows, you don't always have to use the exact same semiconductors the authors do in those electronics magazine construction articles. You can usually save a few dollars by using some similar device(s) you usually have in your "junkbox." The trouble is, it often takes considerable juggling of the component values in the circuit around the junkbox semiconductors before your completed project performs as the author's did. Then you find out what happens to the foil on those homemade circuit boards after you've changed the same component several times.

With the needs of both the service technician and the electronics hobbyist in mind, Conar Instruments now introduces the Model 201 Component Substitution Box. With this new Conar instrument, you can connect any one of over fifty values of

CARBON RESISTORS 10% 1 watt	CAPACITORS 10% 500 volt min.
15, 22, 33, 47, 68, 100, 150, 220, 330, 470, 680, 1K, 1.5K, 2.2K, 3.3K, 4.7K, 6.8K, 10K, 15K, 22K, 33K, 47K, 68K, 100K, 150K, 220K, 330K, 470K, 680K, 1M, 2.2M, 3.3M, 4.7M.	0.00047, 0.001, 0.0015, 0.0022, 0.0033, 0.0047, 0.0068, 0.01, 0.015, 0.022, 0.033, 0.047, 0.068, 0.1, 0.15, 1000 @ 75 V.
MISCELLANEOUS	
Diode rated 2 amps at 1000 volts, an "open" position on each of the three component selector switches, a "short" position on the switch selector.	

FIGURE 1. SPECIFICATIONS FOR THE MODEL 201.

the most commonly used electronic components across one end of a pair of clip leads (see Figure 1). You can then connect the other end of the clip-lead pair into a circuit to bridge a component suspected of being defective or to find the optimum value for a component in a homemade project of your own design.

With the Model 201 on his bench, the service technician will usually need to make only one trip to the parts bins. There will never be any need for repetition of steps 1 through 3 and probably never any need at all for step 4. A service technician doesn't need to be told that time saved in troubleshooting means more servicing \$\$\$.



FIGURE 2. THE MODEL 201 COMPONENT SUBSTITUTION BOX.

Unlike the service technician, the hobbyist isn't too interested in saving time. On the contrary, he pursues his hobby as a pleasant means of spending time. What the Model 201 can do for him is take some of the drudgery out of getting from the schematic diagram to the working prototype stage of his projects, thereby making the time he spends all the more pleasant.

The Model 201 is shown in Figure 2. To operate the instrument you simply plug the two test leads into the two banana jacks provided. With appropriate switch selections, you can now electrically connect any one of the components inside the box to the test leads. This makes the components available for substitution in a circuit under test, or for temporarily replacing a component suspected of being defective.

The components within the box are divided into three groupings: low resistance values (15 ohms to 6.8 kilohms), high resistance values (10 kilohms to 4.7 megohms), and capacitors. A 2-ampere 1000-piv diode is included in the capacitor grouping.

To select a particular component, you must first determine in which of the three groups it is located. You then make this group selection using the bottom center switch on the front panel. The exact component may then be selected using the switch associated with the group selected.

One important consideration to bear in mind when using the Model 201 is the electrical rating of the components. All the resistors are rated at 1 watt continuous and will be damaged if required to dissipate more than this for extended periods. All the capacitors, with the exception of the electrolytic, are rated at least 500 volts. The 1000- μ f electrolytic capacitor is rated at 75 volts and to keep you mindful of this, its voltage rating is printed on the front panel next to its value.

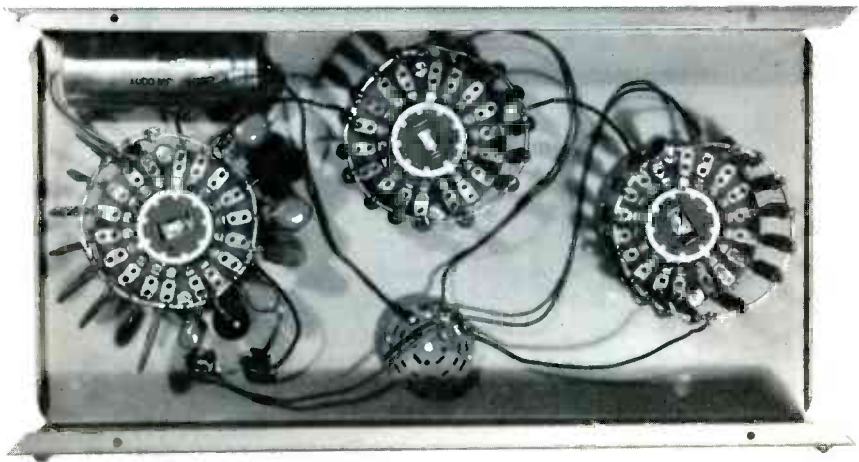


FIGURE 3. INTERIOR VIEW OF THE MODEL 201.

Conar offers the Model 201 in kit form only. All the components mount directly on the switches as shown in Figure 3, so the assembly is quite simple. I assembled the instrument pictured in this article in a single evening with time out to watch a movie on TV.

Get your Model 201 by filling out the order blank in this issue of the Journal. You can save \$5 if you order yours right away. The special introductory price of \$24.95 will be in effect for all orders received before November 1, 1974. After that date, the regular price of the Model 201 will be \$29.95.

GERNSBACK WINNERS CHOSEN

NRI is proud to announce the winner of the 1974 Hugo Gernsback Award. The Award has been presented to Sister Mary Benita Carey of Brooklyn, New York.

Since 1971, NRI has cooperated with RADIO-ELECTRONICS Magazine in making this annual scholarship award of \$125 to a deserving student currently enrolled in NRI. The award is applied toward furthering the selected student's education in electronics. NRI is one of eight home-study electronics schools chosen to perpetuate the scholarship, established by RADIO-ELECTRONICS in memoriam to Hugo Gernsback, its founder and a notable pioneer in electronics.

Sister Mary Benita was born in Brooklyn, New York. Her parents died before she was 17, and she lived some years with her two younger sisters.

In 1950, Sister Mary Benita entered the Community of the Parish Visitors of Mary Immaculate. It is a congregation of Contemplative Missionary Sisters, who visit homes in parishes and give religious instruction and counsel. The Sisters work with families, individuals, and groups.

At present she is engaged in the Bedford-Stuyvesant section of Brooklyn and helps to supervise the summer program for underprivileged children.

She is now motivated to learn more about electronics. She considers it more than a hobby and has hopes to act as a patch for the IMRA.

The second-place winner is Allen T. Poland, Jr., of Keyser, West Virginia. Mr. Allen is employed with Westvaco Corporation as a power-house operator. He was presented with an RCA Service Special VOM.



Photo by H. Earl Eakin.
Sister Mary Benita Carey

NRI HONORS MILLIONTH STUDENT

Another one of many milestones in the history of NRI since its founding in 1914 (60 years ago) occurred on July 12, 1974. It was on this day that NRI honored its one millionth student, Mr. C. David Waggnner, of Street, Maryland. Mr. Waggnner enrolled in NRI's Color TV and Audio Servicing course on May 17, 1974.

Although Mr. Waggnner was honored as NRI's one millionth student, we feel he is a representative of all NRI students and graduates. Because without you, this event could have never taken place. We are very proud of all of you and hope you join with us in our feeling of pride on this occasion.

Mr. Waggnner and his wife Rosemary arrived at NRI on the morning of July 12. After a greeting from Mr. John F. Thompson, President of NRI, Mr. Waggnner was introduced to other members of the staff, with whom he will come in contact during his association with NRI. Mr. and Mrs. Waggnner were then given a complete tour of the NRI building and its operation by Mr. Harry Bennett, Vice President and Director of Student Services. After luncheon Mr. and Mrs. Waggnner were taken on a tour of our Beltsville, Maryland building.

In memory of this occasion, Mr. Waggnner was presented with an Honorary Award Certificate attesting to the following:

*McGraw-Hill Continuing Education Center
NRI Honorary Award to
C. David Waggnner*

who enrolled on May 17, 1974 for a course in Color Television and Audio Servicing and thereby became the one-millionth student to have enrolled with NRI. This event, without parallel in professional technical education, has only been possible through the National Radio Institute's leadership in vocational training since 1914... and by the continued support of students of whom the recipient of this award is representative.

This day was indeed a memorable one for all of us at NRI, and we know in the years to come, even after Mr. Waggnner joins our illustrious group of NRI alumni, he too will remember the day he enrolled with NRI.

We at NRI salute C. David Waggnner as our one millionth student. We salute you—our students and graduates—thank you for your continued faith and trust in NRI.

MORE ADVENTURES IN TV SERVICING

J.B. Straughn

SERVICING FRONT-END TUNERS

Servicemen do not usually make any repairs on TV tuners other than the installation of replacement tubes and in some few cases replacement transistors. They may clean the switch contacts in turret-type tuners. This is NOT done by squirting cleaning fluid through holes in the shielding because these holes are seldom near the switch contacts. To properly clean the contacts, the slip-off shield should be removed and the cleaning fluid used to saturate a "Q-Tip," which is then used to wipe each contact. When purchasing cleaning fluid, buy only that kind which states on the label, "Will Not Damage Plastics." On wafer-type switches, the fluid may be sprayed on while rotating the tuner knob vigorously throughout its range, because you can't easily get at the actual contacts.

Should you not be able to find the trouble or correct it, if indeed it can be located, you must call on someone with the proper skills, tools, and experience, and this means a company specializing in tuner repairs. To remove the tuner, the knobs must be taken off carefully. Sometimes working a stout cord or string between the knob and cabinet will enable you to exert a steady pull and so remove a stuck knob. Try not to break a knob because they are expensive and hard to come by. In most cases, when available, they must be ordered from the distributor of that particular receiver.

After removing the knobs, the tuner must be removed from the cabinet. A study of the mounting arrangement will show how. Sam's manuals generally tell how to remove the chassis and tuners and should be referred to when available.

To digress a moment, there are some Admiral portables about five or six years old now coming in for repairs that deserve special mention. They have a metal plate screwed to the underside of the cabinet top and held by four screws to the top of the cabinet. The heads of these four screws are concealed under the flat metal brackets which hold the carrying handle. These screws go into the plastic you can see hanging down from the top of the cabinet. Many servicemen, including myself,

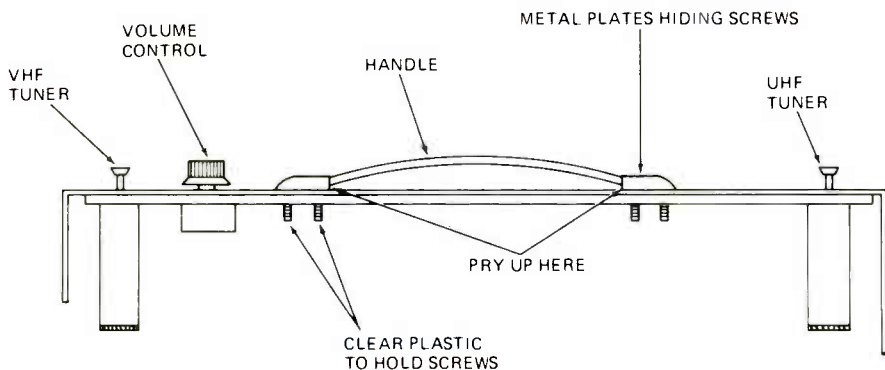


FIGURE 1. HOW TO REMOVE PLATE HOLDING TUNER AND VOLUME CONTROL ON-OFF SWITCH IN SOME ADMIRAL RECEIVERS.

have been puzzled as to their removal. Since the volume control and on-off switch is also mounted on this plate, it must be removed at times. I finally had the bright idea of prying off the handle clips. Figure 1 shows the setup. A screwdriver inserted at the point shown will pry these clips loose and then the screws can be removed—so easy when you figure it out. Everything will go back together again.

When you get the tuners out of the cabinet you must prepare to disconnect the leads to the tuners. The cable from the uhf tuner must be unplugged from the vhf tuner. If the connector has been soldered at the vhf tuner, grasp it with a pair of pliers and rotate. This will break the solder seal and the plug may be removed from its jack. Then the shielded cable from the i-f output of the vhf tuner must be disconnected from the tuner. Sometimes there is a plug like the one for uhf but sometimes the lead and its shield are soldered in place, without a plug. Unsoldering is called for. *However, before doing any unsoldering, draw a picture diagram showing the points of connection of all wires and identify each wire in some way.* I usually cut the leads instead of unsoldering, leaving just enough on the tuner to show the original wire color. In *every case*, however, a drawing is made because the little pieces of lead might be removed at the repair station and then you would be in a real sweat to properly reconnect the leads. Put the drawing in a small box along with the control knobs, screws, etc., and store the box in the receiver cabinet.

Put the tuner or tuners in a shipping box with crushed paper. Include a check or money order covering repair, along with your name and address, the make and model number of the receiver, the nature of the complaint, the channels received in your locality, and state whether the tubes have been tested. Only tuners should be returned, because mounting brackets are not appreciated at the repair stations. However, include all shields. I send my tuners by parcel post, insured for \$100. It may not be necessary but it makes me feel better and the Post Office more careful.

There are a number of tuner repair stations scattered over the country and I have dealt with most. Geographical location is not so important for speedy service. At present I deal with the United Tuner Repair Company, PO Box 42235, Atlanta, Georgia 30311. They charge \$9.95 for a complete rebuilding job on either a vhf or

uhf tuner. Tubes or transistors are extra if needed. They will do a combination uhf-vhf job for \$15.50. A check or money order with the shipment will save several dollars in UPS (United Parcel Service) and COD charges, but they will ship via UPS COD if prepayment is not made.

I mention COD and not sending mounting brackets because I had a pretty bad experience once when I got a wholesaler to send off a vhf-uhf tuner to a repair company for me. The tuners came back okay but the wholesaler refused to pay the COD charges, on the grounds that his credit rating entitled him to monthly billing! There was nothing for UPS to do but return the tuners to the shipper, where they got lost. There I was with a set and no tuners for it. I finally got new tuners, but I had left the mounting brackets on the originals. So, I had tuners but no way of mounting them. The distributor couldn't help, so I had to get some metal and with the aid of a friendly machine shop whacked myself out a mounting bracket. What with one thing and another it was a couple of months before my customer got his set back. This cured me for all time of getting someone else to send my tuners off for me. It may be of interest to you that for a single tuner I charge \$20 and for both a uhf and vhf my bill is \$35. This, of course, is in addition to any other repairs made on the set. I expect some servicemen charge more, but I feel it adequate in my locality where many of the people have little money.

HOW DO YOU DECIDE THE TUNER IS BAD?

If there is no sound or picture but there is a raster, the trouble may be in the tuner, but could also be located in the video i-f amplifier or in the video amplifier. Therefore, you must be able to localize the defect. The first thing I do is to test the tubes in the tuner, followed by those in the video i-f and video amplifiers. If the tests are okay you can then pull tubes one at a time and check at the top of the socket terminals for plate and screen voltages. If you can get at transistor leads from the top of the circuit board you can measure base, collector and emitter voltages. You could go a step further and get out your scope with its signal tracing probe. A check of the output from the tuner will show if an i-f signal is being delivered. If so, the tuner is working, and you can switch to uhf and again look for an i-f signal at the output of the vhf tuner. Such a signal shows the uhf tuner to be okay. After this you can trace through the video i-f and video amplifiers to see where the signal is lost. All of this takes time and an instrument setup and it would be completely impractical in the customer's home. I have at times removed tuners from big consoles and brought them back and installed them right in the home.

LOCALIZING TROUBLE

When I was at NRI, one of my main interests was in servicing. I used to preach to one and all that to service a piece of electronic equipment the trouble should be localized to a section, then to a stage, and not until then should you start testing for the defective part. With radios of the AM variety this was a simple process—if the set was dead, you just touched the control grid of a tube, starting with the first audio amplifier and working back toward the antenna. Touching the control grid with your finger would cause a slight change in plate current and you would hear a thud or click in the loudspeaker, if everything was okay. Passing from a click point

to one where no click was heard meant you had just passed through the defective stage and you then proceeded to measure voltages and make point-to-point resistance measurements in that stage, which would lead to the defective part. If disturbing the first af amplifier caused no thud, you worked from there to the loudspeaker.

With the advent of FM this system fell into disuse except in the audio system. When transistors came along the circuit disturbance method could no longer be used at all—neither did it work for TV sets, so other methods of localization had to be thought up. For AM radios I developed the Conar signal tracer, which works fine in transistor sets and in any audio equipment. As its tuning range covered the standard radio i-f and broadcast frequencies only, its use was limited in FM receivers and could not be used in TV sets. Nevertheless, it is wonderful in auto sets, stereos, and AM receivers.

The signal generator was better because you could feed a signal into a set at any point and observe the output or lack of output. This method was not too good for localization of dead stages in TV sets and very expensive testers were developed which would permit injection of an actual TV signal into the stages of a TV set. Along with scope signal tracing the problem was solved. This was fine except for the expense and I debated for a long time, whether I should invest in one for a spare-time business. I did not go that route.

It occurred to me that there was a much simpler way to do the job and one that would not strain my pocketbook. In my radio days I had an old receiver rigged so I

Reader Exchange

FOR SALE: Conar signal generator, Model 280, like new, \$20. Conar tube tester (with black-and-white CRT adapters), Model 221, good but scuffed, \$20. Conar VOM (with HV probe), Model 240, working order, \$7.50. EICO res/cap tester, Model 950B, very good condition, \$20. Knight grid-dip meter, Model G30, very good condition, \$15. ATR battery eliminator, Model 610C, like new, \$35. Jackson scope, Model CRO-3, like new, \$100. Or will sell as a package for \$150 plus freight. Contact Don Campbell, RR2, Aplington, Iowa 50604.

FOR SALE: Conar oscilloscope and all accessory probes, good condition, 5-inch wide-band, stock number 250, \$90. Conar color bar generator, good condition, \$70. Conar signal generator, good condition, stock number 280, \$40. Conar TVOM, good condition, \$25. All prices include postage or express charges according to the item of equipment. Contact Raymond D. Berry, 1212 Jim Drive, Irving, Texas 75061.

FOR SALE: Mercury Model 2000 dynamic mutual conductance tube and transistor tester, \$125 plus postage. Used less than five hours total. Like new. Contact B. Peter Mortensen, 977 Church Street, Layton, Utah 84041

JOB WANTED: NRI graduate with First-Class Phone would like employment servicing two-way communications or related gear. Contact Thomas J. Bush, 8520 Atkinson Drive, Tallahassee, Florida 32304.

could take a signal from most any stage and feed it into the suspected stage of an ailing receiver. It simplified matters for me. So, why not do the same thing with a TV? Now, having a spare TV receiver on my work bench (office desk) was out of the question. So I rigged up a transistorized vhf tuner (battery-operated), which developed an actual TV i-f signal and fed its output into selected stages of the receiver under diagnosis. It worked like a charm on dead sets (raster but no sound or picture). I connect an antenna to the substitute tuner (called "SUB-A-TUNER") and its output to the point in the set where its tuner normally feeds the video i-f amplifier. I then tune the SUB to a TV station and if sound and picture come in on the picture tube of the set, I know at once that the set's tuner is defective. The uhf tuner can be checked by feeding its output into the SUB instead of the set tuner. If you can then tune in uhf programs, the set uhf tuner is okay—otherwise it needs fixing.

If there is no response when the SUB is connected to the receiver tuner output, the trouble lies further along the signal line and the output from the SUB is fed into the input of the first i-f amplifier, then the second i-f amplifier, and finally into the input of the third i-f amplifier. In an operating receiver the picture will get progressively weaker (snow) as fewer stages of amplification are included but you will get enough to spot a dead stage. If you get nothing at the last i-f stage you know the trouble is in that stage or in the following circuits and the problem is then one of checking a relatively few items. Now for some servicing experiences.

ADMIRAL PK 1560

This receiver had a defective 33GY7 tube, but after replacement an intermittent showed up. The raster would disappear and any slight jar would cause it to return.

The picture tube anode voltage dropped to zero with the loss of the raster. A check of the drive voltage on the control grid, pin 9 of the 33GY7, which is the horizontal output tube, showed that the signal from the horizontal oscillator failed to reach this point when the intermittent occurred. The printed circuit board was pulled for close examination and I found that someone had spent a great deal of time on this problem. Numerous repairs had been made to sections of the printed circuit board and the coupling capacitor between the horizontal oscillator and output tube had been replaced.

A check with the ac section of my VTVM from the plate of the horizontal oscillator tube to the chassis showed that the oscillator stopped working (no ac voltage) when the intermittent occurred. The dc plate voltage at this point decreased with oscillator failure but the screen voltage remained about the same. A study of the schematic in Figure 2 shows that the dc plate voltage is obtained from the boost; therefore, a decrease in plate voltage is to be expected when the high voltage for the picture tube is lost. On measuring the cathode voltage it was odd to note that the cathode voltage dropped to zero when the oscillator stopped, as ordinarily both the cathode current and cathode voltage should have gone up. A further check showed that the oscillator grid voltage became zero when oscillator failure occurred.

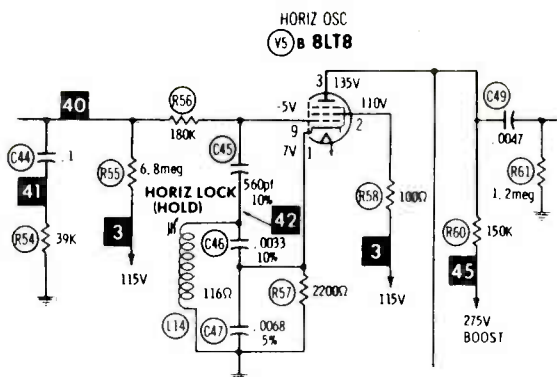


FIGURE 2. HORIZONTAL CIRCUITS IN ADMIRAL PK 1560.

With the set turned off, the resistance from the cathode socket terminal to the chassis measured 2000 ohms, which is normal. The tube remained lit and had plate and screen voltage but where, oh where, had the cathode current gone? The only thing I could think of was an open in the cathode circuit regardless of the normal cathode to chassis to ground measurement of 2000 ohms. It followed that the open had to be an intermittent between the cathode socket terminal lug and the resistor-chassis or had to be inside the socket itself. This was checked by testing for continuity between the bottom pin 1 and the corresponding hole on top of the socket. Sure enough, the circuit tested open when the test probe was wiggled around in socket hole 1! The board was turned printed side up, pin terminal 1 was heated and just enough solder was applied to the bottom of the board so it would run down into the socket. The solder must have flowed down to the break and bridged it because the trouble disappeared. If it had not, it would have been necessary to replace the socket. This was an unusual case but I have run across similar things before, so remember that an open can occur inside a tube socket.

Ordinarily you would suspect an open somewhere in the circuit board but in this case I was warned off by all the work of this sort previously done to locate such trouble and decided to try and localize the defect. This is the best approach anyway, but it is easy to jump to conclusions from previous experience. My bill was \$30 and the customer was happy.

GENERAL ELECTRIC CHASSIS SB

This set belongs to my favorite auto mechanic and he told me the set made a "noise" and the picture disappeared—sound was still present but weak.

A check showed about 500 volts on the picture tube anode instead of the 9900 to 12,200 volts called for in the schematic. Replacement of the weak 1BC2 high-voltage rectifier tube did not increase the anode voltage as I had hoped.

Normal dc voltage was present on the control grid of the 33GY7 so it was being properly driven by the horizontal oscillator tube. I had been having a lot of yoke

trouble recently and because the yoke leads went to a terminal strip staring me in the face, I disconnected these leads (after drawing a reconnection sketch) and checked for a possible short between the vertical and horizontal windings; these checked okay. Also, the windings showed the proper resistance so I gave up on this line and reconnected the yoke leads. A quick check showed that the boost capacitor between the cathode and plate sections of the damper (in the 33GY7) was okay.

About the only thing left was the flyback (horizontal output transformer), so I decided it must be defective. To save money, I ordered a replacement from the distributor. I had forgotten about GE's habit of saving you money by just shipping the coil and leaving off the core. If you ever get one like this, don't remove the tape between the core junctions as it is necessary to set the air gap—the device won't work properly with the tape removed. However, I need not have worried because they sent the wrong transformer; so I sent it back for credit. Mistakes like this can easily happen over the phone.

I got a replacement locally with its own core and went about installing it. There was a problem. The plate lead for the 1BC2 high-voltage rectifier is attached to the coil and in this set passes up through a plastic sheet and into a plastic tube which acts as the housing for the 1BC2 tube. I inserted a hot soldering iron into the connector to remove its lead. There was too much heat and the connector went right through the plastic sheet. The new attached top cap connector was too big to go through this new hole in the plastic sheet and into the tube holder. I stuck a hot soldering iron down into the holder and melted it big enough to pass the top cap connector. However, when I stuck the tube into the holder in an effort to get its top cap to go into the connector, it just pushed the connector through the now big hole in the sheet of plastic. I then slit the holder and removed about 1/4" of material along one side. This enabled me to get a screwdriver blade under the connector so I could force the tube cap home into the connector. After this it was only necessary to put on the socket at the exposed end of the 1BC2 tube and connect the picture-tube anode lead. I finished wiring up the flyback and then fired the set up. I got a good picture but the sound was distorted—it sounded like a rubbing voice coil. On removal of the speaker, I found it to be too far gone to renovate. This can often be done by slitting the voice coil cover and pouring in a little heavy motor oil. It greases the voice coil and lets it slide freely—no distortion! "Oh, well," I thought, "he's my friend," so I bought and installed a new speaker. This necessitated removal of the chassis and when I reassembled it I found to my great disgust that the picture-tube anode voltage had returned to its former defective value and that the raster consisted of a number of broad vertical stripes which did not fill out the screen. Something had happened, but what?

Some thought led me to believe a capacitor in the horizontal sweep circuit had opened up or had become unsoldered. Three capacitors were subject to suspicion. Inserting substitutes one at a time showed a 0.039, 1-kv capacitor to be open—the original had been bent back and forth several times by removal and replacement of the chassis. Permanent installation of the new capacitor completed the job. I made some money on a charge of \$30 but not much. However, my friend put a new (used) transmission in my car for about his cost so I came out okay.

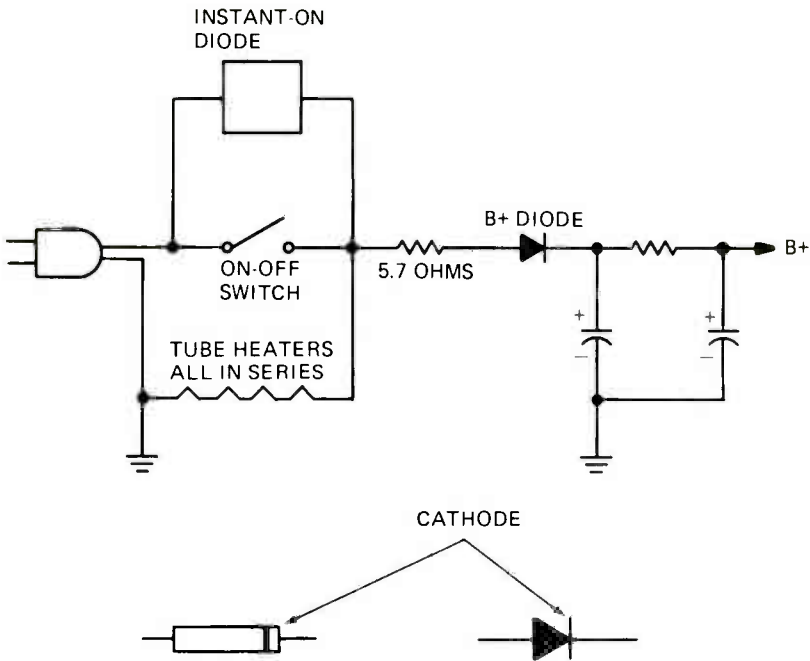


FIGURE 3. CIRCUIT FOR INSTANT-ON TV SET. POINT OF QUESTION IS POLARITY OF INSTANT-ON DIODE.

GENERAL HINT: SETS WITH INSTANT ON

Frequently the “on” diode in such a receiver will break down and since it is across the on-off switch, the set cannot be turned off without unplugging it from the wall socket. For some reason unknown to me the average serviceman will just cut the old diode loose and call the job complete. True, the set can be turned off with its switch but the “instant on” feature is lost and that may be the very reason why the customer bought the receiver in the first place.

The circuit hookup is shown in Figure 3. When the set is turned off the B supply voltage is removed but the filaments are still heated by the current through the diode shunting the on-off switch. When the switch is thrown on, the B supply voltage is applied almost instantly and the set is in “instant” operation.

The only problem when replacing the defective diode is to get the correct diode polarity. Which way does it go in the circuit? Let's look at the schematic.

Readers wishing to get in touch with Mr. Straughn may contact him by writing to Route 1, PO Box 267, Shorter, Alabama 36075.

If the cathode of the replacement diode is the same direction as the B supply diode, current will flow through both diodes when the set is turned off and the switch is defeated. Therefore, the instant-on diode must be reversed from the polarity of the B supply diode for proper operation. In other words the cathode, shown by a band or actual symbol, is connected to the lug of the on-off switch which goes to the ac line cord. Then it will block acceptable polarity current to the B supply diode but will pass heating current to the tube filaments. With the set turned on the "instant" diode is shorted but the B supply diode will rectify a supply of voltage for the input filter capacitor and the set is in operating condition.

Just bear this in mind and you will have no polarity problems when replacing an "instant-on diode" and will please your customers. If you did make a mistake the set just would not turn off, and you could then reverse the diode polarity. As a mind-twister, try to decide why the extra diode is not left off and the filament string connected to the hot side of the switch!

AUDITION MODEL 2515-I

This is a stereo AM-FM radio, record player and eight-track tape deck. I took it in for repair against my better judgement. It was dead and no schematic was available anywhere. A check showed the primary of the power transformer was open, which was obvious since none of the pilot lamps lit up when the set was turned on. This also meant there were two secondaries—one for the pilot lamps and one for dc voltage rectification for the transistors. I hadn't seen one like this and neither had any of the local wholesalers. One secondary was the rule and that's all the replacements they had. Their replacements came in two sizes—a 35-volt center-tapped secondary job and a 25-volt secondary—also with a center tap. Which to use? If I put in the big one I might damage the transistors, but on the other hand, the lower voltage might not be enough.

All this led to a rush of brain activity and I decided that if I connected 6.3 volts ac to the 6.3-volt winding on the old transformer I could measure the true voltage across the other winding. My interested friend, the wholesaler, told me I was crazy and that the 6.3-volt transformer would just burn up. I told him I would buy it if it did, so we rigged a 6.3-volt transformer to deliver voltage to the 6.3-volt winding of the unit with the open primary. I turned the rig on and tried to measure voltage—nothing. However, my friend yelled—he had his hand on the 6.3-volt transformer, which was getting red hot! "So," he says, "you just bought yourself a transformer." I still didn't believe my idea was a dud and checked the supply winding I had hoped for voltage across, with an ohmmeter. The thing was shorted and that was why the test transformer was overloaded.

I said to heck with it and bought the 25-volt center-tap job and left with it and my hot transformer and a few coarse jokes ringing in my ears.

Back at the shop, I installed the 25-volt transformer, turned the set on and waited for music. Nothing, but I heard a sizzling and found the 25-volt transformer was heating up. I checked the two diode rectifiers, which I should have done in the first place, but they were okay. Then I measured the resistance across the transformer

secondary—it was zero, just like the one I had removed. I almost decided to knock off and go fishing, but I disconnected the secondary and rechecked. This time it had normal resistance. An examination of the circuit board showed some solder had crawled over two connections and was shorting the secondary. This was apparently the original trouble and had opened the primary after shorting the secondary. This time when I fired her up I got beautiful FM music, even if it was just boogie woogie. I could only get one mounting screw in place, but I figured that was okay because the customer was not about to operate the set upside down. I put in the formerly hot 6.3-volt transformer, connecting its primary in parallel with that of the 25-volt transformer. I found another mounting screw hole in a convenient place for the 6.3-volt transformer and the monster worked just like new—lights and all! I charged \$35 for the job, which gave me a gross profit of \$30. However considering all the running around I had to do, the letter writing for a nonexistent schematic, and my friend's raucous laughter, the price was not excessive. I later found out that my customer had purchased the set from a department store (with me in mind) because the store couldn't get it fixed!

PHILCO MODEL 50-925

This set is about twenty years old and came in dead. The line cord was defective, so I replaced it and tried the set out. It was quite distorted and noisy on AM, while FM was missing. I tested all the tubes and found a number defective including the 19D8 of which neither I nor the local wholesaler had ever heard. I finally decided it was the same as the 19T8 which was available from a pal's junk box.

Checked the dc voltages and they were low which, considering the age of the copper oxide rectifier and the electrolytic capacitors, was not amazing, I installed a modern silicon diode and the dc voltages increased, but not enough. I couldn't get the original multi-section electrolytic so I put in a couple of separate sections which gave the right capacity and working voltage (note that it's okay to use a higher working voltage but not a lower). This brought the dc voltages up to normal and with the new tubes the AM was so-so. Most of the paper capacitors showed signs of physical leakage so I replaced them. The set now worked fine on AM but FM was terrible—mostly a loud hum along with weak signals. Since everything else had been replaced or checked good, I decided the FM i-f amplifier was out of alignment, perhaps due to the 19T8 having different internal capacities (it is used as the FM discriminator). I had no signal generator but went ahead anyway. If you try this yourself, don't blame me if you get things messed up and *never* try this on a TV video i-f amplifier.

I could get a strong local FM station so I decided the i-f produced by the mixer would serve as a signal source. I read over the factory instructions, which said to adjust all i-f FM trimmers for maximum output. I did and then read over what they had to say about the adjustment of the discriminator secondary. They said to adjust this trimmer for minimum reading on the output meter and forgot to say where the meter was connected. However digging back in my memory I hooked it across the 2- μ f capacitor in this circuit (see Figure 4). I noted that when the set was tuned across the station, this voltage also flopped back and forth like the output of a discriminator should. So I carefully tuned the station in again and tried adjusting

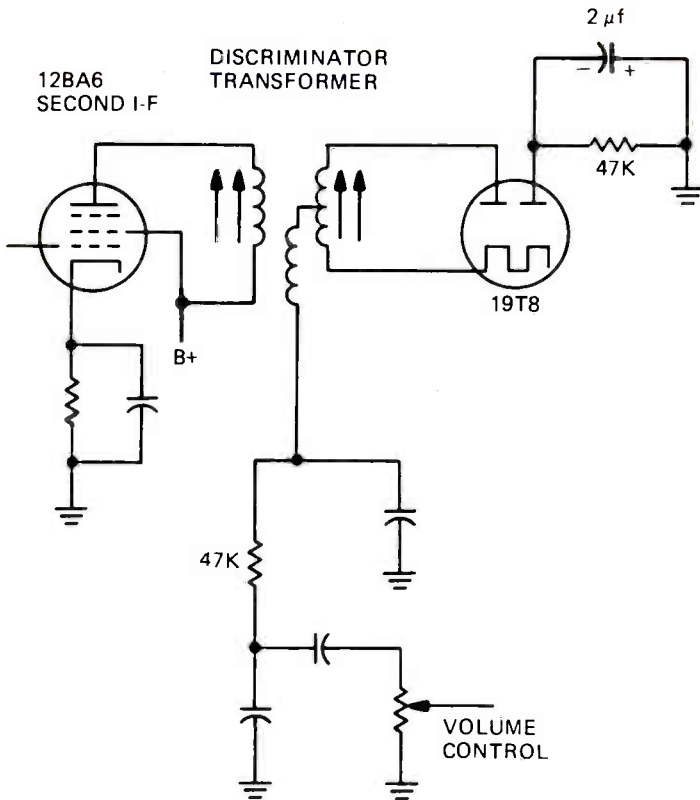


FIGURE 4. FM DETECTOR CIRCUIT IN PHILCO 50-925.

the trimmer. From one extreme to the other the voltage just increased except for a little dip at one point. I adjusted very carefully to this dip and found I got swell FM reception. I let well enough alone at this point as it was the only one where there was no hum—just good sound.

I gave the set back to the customer, who being somewhat of an antique radio buff was quite happy with the high price for restoration of her baby. She then told me she had three more old radios for me to fix including an old Majestic 90 which I happen to know is a TRF (not a superheterodyne) and vintage about 1929, when I first went to work at NRI. I wonder what I have let myself in for this time?

ARVIN MODEL 67K48

A customer brought this in and said the picture jumped and couldn't be watched. I turned it on, wondering what the complaint really was. After about an hour it was still going perfectly and I was about to call the customer and tell her nothing was wrong but decided to feed the cows instead.

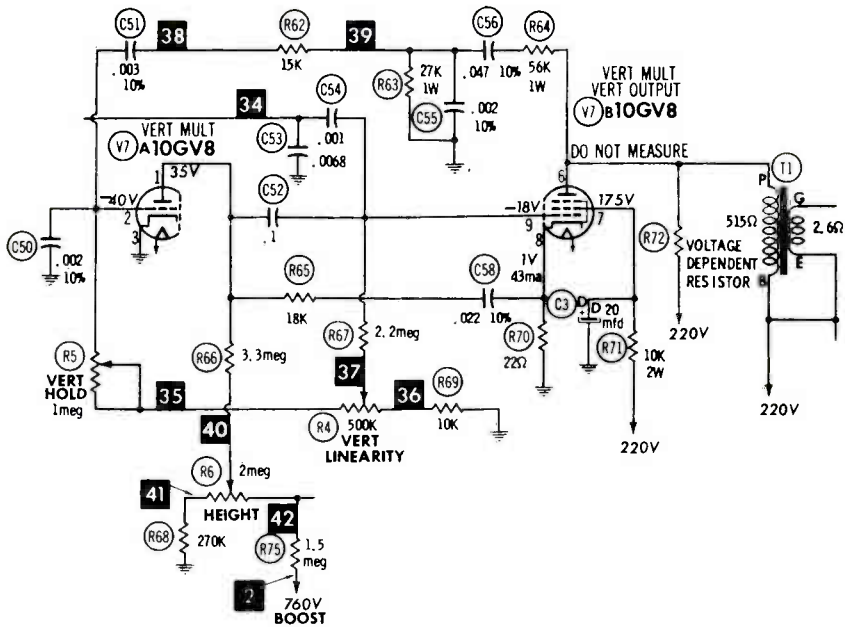


FIGURE 5. VERTICAL SWEEP, ARVIN MODEL 67K48.

When I got back the darn thing was jumping. It acted like it wanted to roll and then changed its mind and jumped back in sync. I tried the vertical hold control because I thought it might just need resetting. Not so, as it was at the extreme of its rotation. Any turn in the opposite direction resulted in the picture rolling up. I couldn't get it to roll down.

I decided that the 10GV8 was bad as it is the vertical output-oscillator tube. This is not a popular tube, so the next time I went to town I got one. It didn't help a bit. Next, I decided that some resistor or capacitor in the oscillator circuit had changed in value, as the RC time constant, decided by their values, determines the frequency of oscillation.

Now this set is built like a battleship and parts are generally hard to get at. The schematic of the vertical section is shown in Figure 5. Note that the boost voltage is used in the vertical sweep system. I located the correct point and measured the boost voltage. I found it to be about 100 volts low. I didn't really think this had anything to do with the matter but decided to check the horizontal output tube and damper. The pins on the output tube were bent a little but I shoved them into the socket on my tube tester. One of the tube pins proceeded to break off and I had to pull it out of my tester socket with a pair of pliers. The damper tested weak so I got another along with a new horizontal output tube—the latter cost me \$5.50! It retails for \$13. Neither tube helped and then I thought the 10GV8 I bought may have been bad. I tried another, no luck.

I looked at the schematic and decided my trouble was that I did not want to pull the chassis, but first I looked again to see what I could replace before pulling the chassis.

I located the plate load and grid resistors, which are in the R/C network and as they checked out of tolerance I replaced them, without any effect. I replaced the coupling capacitor on general principles and the trouble went on.

I decided to pull the chassis and did so. I could now get at all the parts in the feedback network between the output plate and the input grid. I carefully checked all resistors, which were okay. I then disconnected both of the series feedback capacitors, and checked them carefully. I found that while the 0.003- μ f unit had infinite resistance, as it should, it did not hold a charge. This was shown by the fact that when checked with an ohmmeter and put to one side for a few minutes and then rechecked (the same ohmmeter polarity must be used), it showed a momentary charging current. If good, the ohmmeter pointer should not have moved when the second connection was made. Although the other capacitor checked okay, and held a charge (compared to a new capacitor), I replaced both units. I put the chassis back in the cabinet and tried it out. Success at last! I could adjust the vertical hold control and make the raster roll either up or down as it should. I played the set for several hours and it worked perfectly. I let the tubes go at my cost and just about broke even—you can't win them all!

TOP NRI STUDENT SCORES A FIRST

Mickey Eleazer Caldwell, a top student in NRI's Master Course in Color TV Servicing, has become the first black journeyman printer in Deep East Texas. The journeyman's card indicates the achievement of professional status in the art of printing.

Mickey, who has been an NRI student since 1973, operates computerized electronic typesetting equipment for the Longview (Texas) Morning Journal. He has been an employee of the Longview News Company since 1969, where he began as a metal-melter in the composing room.

Mickey, 42, served eight years in the Navy and is a Korean war veteran.

NRI's Master Course in Color TV Servicing provides a wide background in electronic theory as well as practical hands-on experience with electronic equipment.

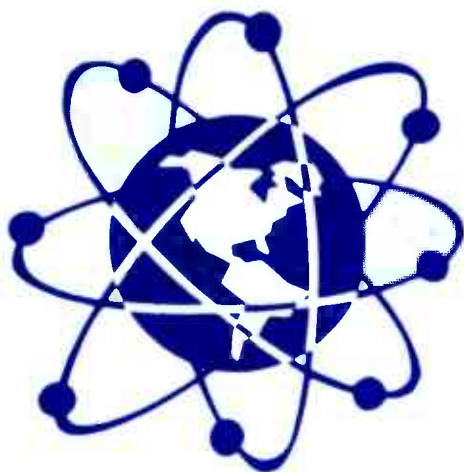


Mickey Eleazer Caldwell

HAM NEWS



By Ted Beach **K4MKX**



As you all may have noticed, a lot of my ham activities revolve around making gadgets. I really do like to make things, and frequently get involved in a project to the extent that I seldom get on the air to do some operating.

The little keyer built into the transistor radio case is a good example of the kind of thing I like to play with. That one, incidentally, I am still using and have interested a newly formed Amateur Club in Arlington VA in using this gadget as a joint club effort to sort of get things going. Of about 45 members, 10 or 12 have expressed an interest in building the keyer. Our first job is to wait for a "sale" of transistor radios so all of the keyers will look exactly alike. I have gotten the circuit board down to a size that will fit almost any radio.

Another project has been the building of a two-meter synthesizer, which I'm sure I mentioned some time ago. That one has been sitting on the bench for a while as I had trouble interfacing it with my GTX2 rig. Since finishing the prototype synthesizer I have bought a very nice GE

pre-progress rig from Phil Deem, WB4EGA, of our staff and this rig should interface much more easily—when I get around to it.

The most recent gadget I've been working on is an automatic dialer for Autopatch. With this unit all I have to do is push a button to get the dial tone through the repeater, then push another button to dial the telephone. I can change the number dialed just by setting up seven rotary switches. A second phase of this project is to pre-program a set of cards that will plug into the machine so that I won't have to even set the seven rotary switches. When I get this going, it will certainly make dialing from the moving car a whole lot simpler and safer than it is now. With a regular touchtone pad you have to stop the car (preferably!), access the dial tone and then dial the number. With a fully automatic system it is just a matter of selecting the correct number card, plugging it into the machine and pushing two buttons. This you could do at turnpike speeds if necessary.

Right now I'm having problems keeping the tone frequencies steady. As you may

know, there are seven separate and distinct audio frequencies used in the tone dialing system, two tones at a time representing the twelve characters on the dial (1,2,3,4,5,6,7,8,9,0, * and #). Each frequency has to be right on the money and exactly the right level or the thing won't work. I built the tone generators from scratch since the commercial circuits do not lend themselves to electronic switching. And, I guess my design leaves a little something to be desired since I've gotten the thing to work successfully only once! Oh well, another challenge!

Incidentally, the same device could be used at home or in the office if the phone is served by a tone dial central office. If you're as lazy as all that, that is.

As I mentioned before (when, I don't remember), I have the low band vertical up on the roof at the home QTH now and have the old Ranger fired up occasionally. The first QSO I had was with a VE7—my first VE7, I might add, and I was quite pleased to work such a distance with 90 watts on 40 meters.

I found soon after I fired up the rig that I could not make the antenna take a load on 20 meters, and that really bugged me. I have four radials on the stick, and the various sections were assembled in strict

accord with the instructions. The only thing that could have been wrong was a bad 20-meter trap—the one at the top of the antenna, naturally. In addition, I have the whole thing stuck up on top of a ten-foot mast!

Oh well, back to the store with my complaint and it just so happened that they had a spare 20-meter trap which they gave me to replace the first one. Now the thing takes power on 20 but the SWR appears to be a bit high. However, I have made some contacts on this band so I guess everything is okay. I am using the Heath vhf SWR bridge so I take its readings with a grain of salt. It is supposed to be good only for 50 MHz and above but I found the indicated SWR to be reasonably low on the low bands when working into a dummy load, so why not use it?

Well, anyway, I am sometimes now on the air in the evenings. I usually hang out on 40 meters between 7050 and 7100, making an occasional swing up into the Novice section when the broadcast interference isn't too bad. The keyer is still working fine, and is still on the original battery (despite being left on overnight several times!). If you should hear a fairly slow CQ down there with perfectly

J.H.	WA1QXS	G	Amesbury, MA
Tom	WN2UWH	N	Blauvelt, NY
Bob	WN3WFA	N	Potomac, MD
Bill	WN3WMJ	N	Clinton, MD
Keith	WA7YVU	G*	Springfield, OR
Larry	WN9KWX	N	Martinsville, IN
Leland	KL7IAC	A	Anchorage, AK
Neil	VP9HT	—	Hamilton Bermuda
Dan	WN7WLX	N	Dutch John, UT
Dick	WB8JIR	A*	Jackson, MI

* Just upgraded — congratulations!

formed characters, it's probably me so give me a shout.

We haven't heard from a whole lot of people since the last time. As usual, the first names listed are students and/or graduates of our Amateur courses, while the last two names are those of students of another NRI course.

Keith, WA7YVU, writes that he got his Technician License back in March and then turned around and got his General in May, only two months later. Gee, I think I would have saved nine bucks and waited two months, Keith!

KL7IAC had his present call assigned back in November of 1973. Prior to this, Leland had held *two* Novice calls, WN7AVZ back in 1964 and WN7THG in 1972. I think he is the third or fourth "two-timer" we've heard from. Leland says that he got the Advanced license thanks to his NRI training. Thank *you* Leland!

VP9HT wrote us about his license on his report for Kit 3R. Neil says his call was issued in June of 1974 and is sort of equivalent to a combination of Novice and General Class. Nice going, Neil.

WN7WLV writes that he has had his call for slightly over a year and plans to go for General or Advanced in September. Dan says he is "kinda slow" about these things since he had even put off writing us for over a year. That's okay, Dan, its that old ticket that counts, and its better to take things real slow and be sure you do it right the first time.

In addition to getting a brand-new Advanced call, WB&JIR, Dick also has a new Second Phone license to decorate his wall. Very good, Dick, and we're sure you will have no trouble boning up for the First Phone either. Dick says he built a Heath HW-7 QRP rig and is having a ball with it. He added a passive 400-Hz audio filter and can really copy the CW now. The finishing touch was a new Vibroplex key which he says is a "real new technique." You should try an electronic keyer, Dick!

Well, that's about it for this time. Do let us hear from you and let us know what you would like to see in your column. Otherwise, we'll probably just ramble on like we have this time! Very 73, and we'll BCNU on 40.

Ted -- K4MKX

Job Ops

JOB OPENINGS: Repairmen wanted who are familiar with general aviation, corporate and ARINC communication and navigation systems. Good starting salaries and excellent future for the right personnel. Contact Robert E. Whittaker, General Manager, Oxford Avionics Inc., 288 Christian Street, Oxford Airport, Oxford, Connecticut 06483.

JOB OPENING: Immediately available. Electronic maintenance on nine keyboards and four photo units, typesetting equipment, the Linofilm system. Day position, no traveling, good benefits, salary open. No degree necessary; we will train on the job. Contact Mr. Harris at General Typographers, 927 H Street, N.W., Washington, D.C. 20001, or telephone 393-6868.

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For outstanding grades throughout their NRI courses of study, the following May/June graduates were given Certificates of Distinction along with their NRI Electronics Diplomas.

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Jerald L. Massey, Macon, GA
Richard L. McDowell, Mount Vernon, IL
Robert E. McFeeley, Staten Island, NY
David R. Medved, Wyandotte, MI
David A. Merrill, Mount Arlington, NJ
Homer C. Mess, Monrovia, CA
Phillip A. Meyer, Palatine, IL
Dennis L. Middleton, Indianapolis, IN
Dewey H. Morris, Brewton, AL
Leonard Mortorff, Gardner, PA
W. Richard Mosig, Jr., Whitehall, PA
William A. Mudd, Richmond, VA
John M. Mullen, Jr., Woodbridge, NJ
Peter J. Munnik, Newton, NJ
James A. Muse, Lake Mary, FL
George Myers, Tampa, FL
Peter A. Nackers, West De Pere, WI
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John P. Oleski, Overland Park, KS
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John D. Oliver, APO San Francisco
Lester T. Olsson, Red Hook, NY
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George H. Pyles, Portsmouth, VA
James W. Rainey, Carl, GA
Ralph H. Ramsay, Dumas, TX
Fred S. Reynolds, Chesapeake, VA
Jack H. Rich, Silver Spring, MD
Woodrow Robinson, Morristown, NJ
Frankie Rogers, Levis, PQ Canada
Eduardo B. Rojo, Quezon City, Republic of Philippines
Stanley, Saganowski, Trenton, NJ
Albert J. Schell, Bowmansville, NY
Matthew Serwacki, Freetown Sieria Leone West Africa
John N. Shelburne, Norwalk, CA
James C. Shelton, Oxon Hill, MD
Jesse H. Shepard, Plattsburgh, NY
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David Shumway, Cleveland Heights, OH
Earl Simmons, Manassas, VA
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Manuel A. Torres, Altus AFB, OK
Sidney V. Tressler, Baltimore, MD
Don L. Tweedy, St Petersburg, FL
William A. Wagoner, Troy, NY
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Robert G. Weiss, Dover, NJ
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Alfred E. Wilson, Vandenberg AFB, CA
Donald R. Winkleman, Ypsilanti, MI
George Wood, Albany, NY
George E. Woodis, St Paul, MN
John D. Youger, Fort Mitchell, KY
A. D. Youngblood, Albuquerque, NM
George E. Ziegert, Springfield, MA

DIRECTORY OF ALUMNI CHAPTERS

CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER meets at 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. 841-4972.

FLINT (SAGINAW VALLEY) CHAPTER meets 7:30 p.m. twice a month every other Wednesday at Andy's Radio and TV Shop, G-5507 S. Saginaw Rd., Flint, Mich. Chairman: Larry McMaster, (517) 463-5059.

NEW YORK CITY CHAPTER meets 8:30 p.m., 1st and 3rd Thursday of each month at 199, Lefferts Ave., Brooklyn, N.Y. Chairman: Steve Kross, 381 Prospect Ave., Brooklyn, N.Y.

NORTH JERSEY CHAPTER meets 8 p.m., 2nd Friday of each month at The Players Club, Washington Square. Chairman: George Stoll, 10 Jefferson Ave., Kearney, N.J.

PHILADELPHIA-CAMDEN CHAPTER meets 8 p.m., 4th Monday of each month in RCA Building, 204-I, Route 38 in Haddonfield Rd., Cherry Hill, New Jersey 08034. Chairman: Joe Szumowski.

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. and 2nd St. Chairman: George McElwain.

SAN ANTONIO (ALAMO) CHAPTER meets 7 p.m., 4th Thursday of each month at Alamo Heights Christian Church Scout House, 350 Primrose St., 6500 block of N. New Braunfels Street (three blocks north of Austin Highway), San Antonio, Texas. Chairman: Norman Bird. All San Antonio area NRI students are always welcome. A free annual chapter membership will be given to all NRI graduates attending within three months of their graduation.

SOUTHEASTERN MASSACHUSETTS CHAPTER meets 8 p.m., last Wednesday of each month at the home of Chairman Daniel DeJesus, 12 Brookview St., Fairhaven, Mass. 02719.

SPRINGFIELD (MASS.) CHAPTER meets 7 p.m., 2nd Saturday of each month at the shop of Chairman Norman Charest, 74 Redfern Dr., Springfield, Mass. 734-2609.

TORONTO CHAPTER meets at McGraw-Hill Bldg., 330 Progress Ave., Scarborough, Ontario, Canada. Chairman Branko Lebar. For information contact Stewart J. Kenmuir (416) 293-1911.



FLINT-SAGINAW VALLEY CHAPTER BUSY AS USUAL

At the May meeting Mr. Larry McMaster brought in a black-and-white set which had been modified for motel use. The background of the picture was bending and all members pitched in to analyze the situation. It turned out to be a bad vertical height control.

Andrew Jobbagy showed a newly calibrated digital meter and compared it with a standard VTVM.

Steve Avetta spoke on defects in TV receivers in which even the manufacturer cannot diagnose the trouble. His talk was very interesting.

At the June meeting the chapter was invited to attend a service clinic sponsored by the Dynascan Corporation. All the latest techniques of troubleshooting utilizing B&K test instruments were shown. This was presented by the Taylor Electronics Company of Flint, Michigan to expand the knowledge and cut the troubleshooting time of servicemen. It was located at the Sheridan Motor Inn on Pearson Road in Flint. Refreshments were served by the Taylor Electronics employees.

NRI AA OFFICERS

James Kelley.....President
William W. David.....Vice President
Albert H. Sharp.....Vice President
W. L. Simmons.....Vice President
Arnold E. Verdow...Vice President
Tom Nolan.....Exec. Secretary

Alumni News

The door prize was won by Dennis Besser and it was a water fountain for outside use. Also, Mr. Andrew Jobbagy received a \$150 gift certificate toward any test instrument, thanks to B&K.

The NRI AA members did not do too badly by carrying home two door prizes out of six. Gentlemen, keep up the good work.

BELL TELEPHONE SPEAKER ENTERTAINS SAN ANTONIO CHAPTER

At the May 1974 meeting of the San Antonio Texas Chapter, Mr. Van Lyons of the Bell Telephone Company spoke on automatic switching.

Mr. Lyons is very knowledgeable in his field and made the subject very interesting for us. The very numbers involved in channeling messages in large quantities staggers the imagination. The chapter wants to thank Mr. Van Lyons for a good presentation.

At the June 1974 meeting a two-part film was shown on the theory of transistors. These films were obtained by our chairman, Mr. Norman Bird, and Mr. Sam Dentler was the projectionist. All

members present gained additional knowledge concerning transistors.

At our next regular meeting transistor theory films part 3 and 4 will be shown.

Later in the season Mr. Close of Motorola will present a program on TV satellites.

NORTH JERSEY CHAPTER TENDS TO BUSINESS

At the June 1974 meeting the North Jersey Chapter presented slides and brochure supplements to a lecture on business management review from the Howard W. Sams Company.

The slides and information were well received and much appreciated.

DETROIT CHAPTER ELECTS NEW OFFICERS

As this June meeting of the Detroit Chapter was the last of the summer season until September, we had our election of officers. The new officers are: Mr. Jim Kelley, Chairman; Mr. Ray Berus, Secretary; Mr. John Nagy, Vice Chairman; Mr. Earl Oliver, Treasurer; Mr. Leo

Blevens and Asa Belton, Financial Secretary; and Mr. Prince Bray, Librarian. Prior to the meeting Mr. Ray Berus and Mr. Asa Belton teamed up to renovate our slide projector which we plan to use more often next year.

John Nagy says that he bought a

used 16-millimeter movie projector and he was now going to get a number of technical films and show them during the year. After a discussion of programs for future meetings we had coffee and sandwiches, donated by Mr. Nagy, Mr. Oliver, and Mr. Blevens.

Another year has gone by and we are now ready to elect officers for 1975.

We will nominate one candidate for president and four for vice president. These nominations must appear at NRI by September 15, 1974. The nominees will be announced in either Tom's Technical Flyer or the next issue of the Journal. In considering who to nominate, members should keep in mind the restriction on the reelection of incumbent and past officers as set forth in Article 6, Section 2 of the constitution quoted below: The President shall not be eligible for reelection until after expiration of at least eight years following his last term of office and further may be a candidate for Vice President only after expiration of at least a year following his term of office as President. Vice Presidents may not serve more than two consecutive terms; when reelected for a second consecutive term they shall not thereafter be candidates for Vice President until after expiration of at least three years following their second term of office.

In past years we have made suggestions as to possible candidates for office. This year, however, we are going to leave it entirely up to you, and if you yourself feel qualified you are welcome to nominate yourself for any of the positions.

At the end of this article you will find a 1975 nomination ballot and you will notice that the polls close September 15, 1974.

Thomas F. Nolan
Executive Secretary
NRI Alumni Association
3939 Wisconsin Avenue
Washington, D.C. 20016

1975 NOMINATION BALLOT (Polls Close September 15)

I am submitting this nomination ballot for my choice of candidates for the coming election. The individuals below are those I would like to see elected officers for 1975.

My choice for President is _____

City _____ State _____

My choices for four Vice Presidents are

1. _____ 3. _____

City _____ State _____ City _____ State _____

2. _____ 4. _____

City _____ State _____ City _____ State _____

Your signature and student number _____

Your address _____

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Adapters for Testing TV Picture Tubes

70°-90° ADAPTER: Lets you test TV picture tubes in a receiver or in a factory carton. Test includes cathode emission check and check for shorts between various tube elements. Stock No.3AD. Price \$3.00. 110° ADAPTER: For testing the latest 110° picture tubes. MUST be used with the 70°-90° Adapter. Stock No.5AD. Price \$3.00. COLOR ADAPTER: Tests 70°-90° color picture tubes. Stock No.9AD. Price \$12.00.

Catalog Price

Kit 224UK \$49.95
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Student and Alumni Price

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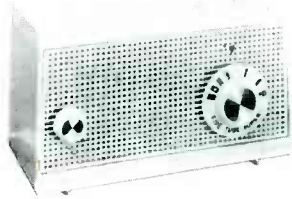


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Small in size but produces "big radio" sound. Easy to assemble using PC board construction. Six-transistor superhet circuit requires no instrument alignment. Crisp, clear AM tuning. Comes complete with two-inch speaker, earphone for private listening, and carrying strap. Nine-volt battery required (not included).

\$9.95

Stock No. UK806



SIX-TRANSISTOR RADIO KIT

The 802 utilizes a reflex circuit to provide high-quality sound. Hi-Q ferrite and rf transformer give noteworthy AM selectivity and sensitivity. Excellent tonal quality provided by matched interstage and output transformers and two-inch speaker. Uses a 9-volt battery (not included).



TWO-TRANSISTOR RADIO KIT

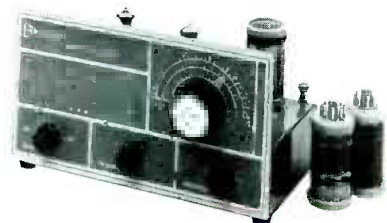
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Tune in amateur radio, marine, foreign stations and AM broadcast band with this multi-band radio. Regenerative circuit and decoupled antenna provide maximum sensitivity and selectivity. Frequency range 820 kHz to 28 MHz. Comes complete with tubes and pre-wound AM band coil. AC operated.

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Stock No. UK511



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Name _____

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1. NAME OF ITEM	2. STOCK #	3. HOW MANY?	4. PRICE EACH	5. TOTAL	WEIGHT

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SELECT YOUR TERMS TO FIT YOUR BUDGET

CONAR FINANCIAL RATES:

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2. Use Select-A-Plan Schedule on the right to find your Finance Charge and your Monthly Payment.
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4. Sign Payment Agreement and fill in Credit Application.

IMPORTANT: When you have made three monthly payments, you can "add-on" purchases with no down payment. If you are under 21, please have the Payment Agreement and credit application filled out and signed by a person over 21. He can make the purchase for you and will be responsible for payment. If you have a CONAR account open or recently paid-in-full, just sign the Payment Agreement.

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Use the Select-A-Plan Schedule to find out what your monthly payment is. Then divide your monthly payment into your "Total of Payments" to find out how many monthly payments you must make. The amount which is left over is your final payment. **FOR EXAMPLE,** if your unpaid balance is \$95, then your monthly payment is \$8.75 (using the Standard Plan). If your "Total of Payments" is \$104, then your monthly payment of \$8.75 divides into that number 11 times with \$7.75 left over. This means you make 11 payments of \$8.75 each, plus a final payment of \$7.75.

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SELECT-A-PLAN SCHEDULE					
PLEASE CHECK ONE <input type="checkbox"/> STANDARD PLAN <input type="checkbox"/> EXTENDED PLAN					
IF UNPAID BALANCE IS	STANDARD PLAN		EXTENDED PLAN		
	Finan. Charge	Monthly Payments	Finan. Charge	Monthly Payments	
20.01-25.00	1.05	3.50			
25.01-30.00	1.50	4.00			
30.01-35.00	2.05	4.50			
35.01-40.00	2.65	4.75			
40.01-50.00	3.00	5.00			
50.01-60.00	4.15	5.50			
60.01-70.00	5.50	6.00	6.40	4.50	
70.01-80.00	7.00	6.50	8.00	5.00	
80.01-90.00	8.00	7.75	10.10	5.00	
90.01-100.00	9.00	8.75	12.60	5.25	
100.01-110.00	12.00	9.75	14.80	5.50	
110.01-120.00	11.00	10.75	16.20	6.00	
120.01-130.00	12.00	11.75	17.60	6.50	
130.01-140.00	13.00	12.75	19.40	7.00	
140.01-150.00	14.00	13.75	21.60	7.50	
150.01-160.00	15.00	14.75	23.20	8.00	
160.01-170.00	16.00	15.75	24.80	8.50	
170.01-180.00	17.00	16.75	26.20	9.00	
180.01-200.00	18.00	17.00	27.90	10.00	
200.01-220.00	20.00	18.50	29.80	11.00	
220.01-240.00	22.00	20.00	32.40	12.00	
240.01-260.00	24.00	22.00	35.20	13.00	
260.01-280.00	26.00	24.00	38.20	14.50	
280.01-300.00	30.00	24.50	41.20	15.50	
300.01-320.00	32.00	25.50	44.20	17.00	
320.01-340.00	35.00	27.00	47.80	18.00	
340.01-370.00	38.00	28.00	52.40	18.50	
370.01-400.00	42.00	29.50	57.20	20.00	
400.01-430.00	46.00	31.50	62.20	21.00	
430.01-460.00	49.50	34.00	69.00	22.00	

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WHERE DO YOU LIVE?

PRINT FULL NAME _____ Age _____

HOME ADDRESS _____ CITY _____ STATE _____ ZIP CODE _____

HOME PHONE _____

() OWN HOME () RENT _____

WIFE'S NAME _____

PREVIOUS ADDRESS _____

HOW LONG AT THIS ADDRESS _____

RENT OR MORTGAGE PAYMENTS \$ _____ PER MO _____

MARITAL STATUS () MARRIED () SINGLE _____

NUMBER OF DEPENDENT CHILDREN _____

HOW LONG? _____

WHERE DO YOU WORK?

YOUR EMPLOYER _____ POSITION _____ MONTHLY INCOME \$ _____

EMPLOYER'S ADDRESS _____

Street _____ City _____ State _____

PREVIOUS EMPLOYER _____

Name _____ Address _____ HOW LONG? _____

WIFE'S EMPLOYER _____

Name _____ Address _____ MONTHLY INCOME \$ _____

WHERE DO YOU TRADE?

BANK ACCOUNT WITH _____ () CHECKING _____

Street _____ City _____ State _____ () SAVINGS _____

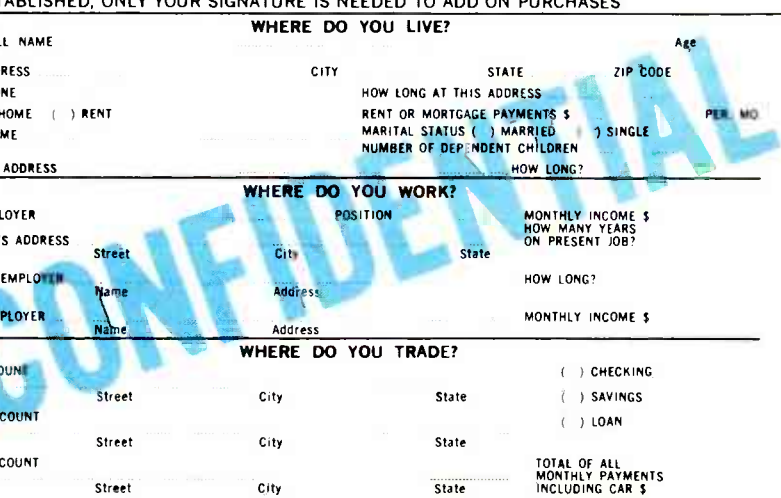
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Street _____ City _____ State _____

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Note: In the last issue of the Journal, it was not made clear that this is an electronic kit. Therefore, we are running the ad again and offering \$5 off the list price.

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**The new electronic clock that gives readout of hour,
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The Digital Concepts electronic digital clock and calendar can indicate the hours, minutes, and seconds . . . or the month and the day . . . or alternate between time and date . . . on an electronic readout . . . in numerals .55" high . . . that is visible from almost any viewing angle, no matter how light or dark the room. There are no moving parts whatever. So the operation is totally silent; the accuracy is superb (to within seconds a month); and life expectancy is an incredible 100,000 hours!

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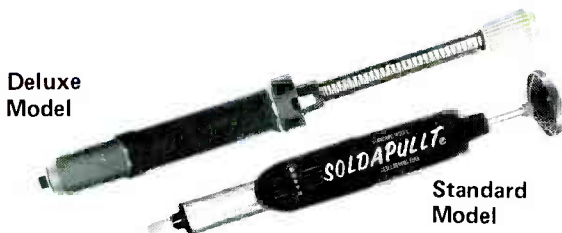
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