



- How to Install a TV Antenna
- More Adventures in TV Servicing



journal
November/December 1975

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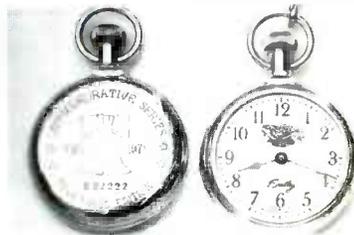


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In this issue, budding Journal author James Crudup gives us a practical step-by-step example of how to install an outdoor rooftop television antenna. And veteran Journal author J. B. Straughn adds still another chapter to his ongoing series of practical television servicing case histories.

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How to Install a TV Antenna



by James Crudup, C.E.T.

Since I comprise a one-man, part-time TV business I am picky about the antenna jobs that I do. I don't take on big or complicated antenna jobs. Also, if I am very busy with sets to repair I will turn down an antenna job. When I turn a job down I recommend the customer contact a buddy of mine who has a shop that does nothing but antenna work. He has the tools and men to handle almost any job.

This particular week things were fairly slow until I went out on what I thought was a routine service call. From the symptoms it looked like antenna trouble. I confirmed my diagnosis when I substituted the outside antenna with a set of rabbit ears. Therefore, the problem was caused by a faulty antenna system. Checking further I found that the antenna had rusted and the lead-in was cracked and brittle.

The customer, Mr. Banks, wanted a new antenna installed. Since it wasn't a very big job and I had very little scheduled for the weekend, I agreed to do the work that following Saturday.

Before I left I planned the job in advance. I decided how the new antenna would be installed, how the lead-in would be run and how much material would be needed. Advanced planning would enable me to do an efficient and professional job. It also allowed me to give Mr. Banks a fairly close estimate.

I arrived at Mr. Banks' house in my station wagon on Saturday about noon as previously arranged. I left my ladder on the station wagon and I carried my tool

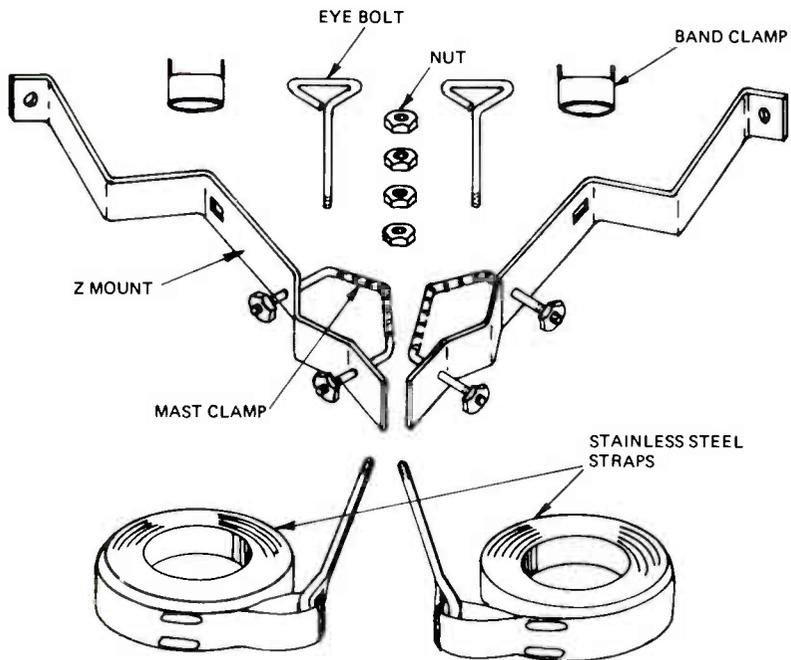
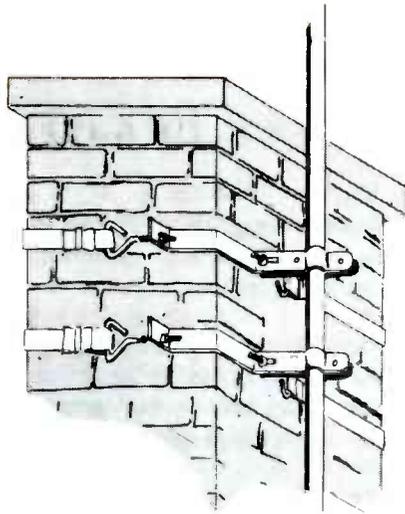


FIGURE 1. A Z-TYPE CHIMNEY MOUNT.

box, the antenna and other material up to the door and knocked. I was cheerfully greeted by Mr. Banks and led upstairs to another ladder already positioned in the hall under the skylight. This was convenient and safer than carrying the material up the ladder outside the house. I used the ladder in the hall to carry the antenna and other material up to the roof. Mr. Banks handed me my tool box and saved me a trip back down the ladder.

I couldn't have picked a lovelier day. The roof was shaded, a slight breeze was blowing and the temperature was about 75°. I placed my materials close to the chimney and unpacked my mounting hardware.

I had planned to use the chimney to mount the antenna and I had chosen the popular Z-mount. This mount is shaped like the letter Z. Figure 1 shows the Z-type chimney mount. It's strong, easy to install and inexpensive. The chimney was about three feet high and close to the edge of the roof. I positioned one strap around the lower portion of the chimney about six inches off the roof. I placed the other strap about six inches from the top of the chimney. I made sure both straps were around the bricks and not the mortar. From previous experience I know the straps will work loose if they are placed around the mortar instead of around the bricks. I checked for kinks and made sure the straps were straight before tightening them securely.

Next, I connected the mast mounting hardware and positioned the mast in the holders. Then I untied the aluminum ground wire and slipped one end between the two mast bolts and the mast. I made sure the mast was perfectly vertical and that it did not touch the roof. Then I tightened the bolts on the mast clamps very firmly. This would ensure a good ground for the mast and prevent the mast from turning in a high wind. Less than three feet of the mast was above the chimney and there was no need to install guy wires.

The next step was to remove the antenna from the box and assemble it. I had chosen an all-channel log-periodic antenna for this job because I had been successful with this type of antenna in this area before. I didn't know how popular this antenna was until I noticed it on many of the other roofs that I could see.

The antenna was easy to assemble. I snapped the elements in place and assembled the antenna in less than five minutes. It was light but strong. I doubt if it weighed much more than five pounds.

I positioned the assembled antenna on the mast about six inches from the top and pointed it in the same general direction as the other antennas in the neighborhood. I did not permanently secure the antenna to the mast because later, when I had a lead-in connected to the set, I might have to reorient the antenna for better reception.

I had chosen 300-ohm twin-lead for this job. I estimated I would need 55 feet for the job. My wholesaler stocks twin-lead in 50, 75, and 100-foot rolls. I purchased a 75-foot roll. I unrolled a short length of twin-lead and cut a four-inch slit down the middle of one end so that it could be connected to the antenna terminals. Then I

passed the end I had cut through the strain relief on the antenna (which forms a small slack loop in the twin-lead) and connected the two leads to the antenna terminals.

I didn't have to strip the twin-lead because the terminals included toothed washers. I put one wire under each toothed washer and tightened down the screw. The teeth of the washers bite through the wire and make a good, strong connection.

Next, I put two snap-on five-inch mast standoffs on the mast to hold the lead-in in place. I twisted the insulators inside the ring of the standoffs to hold the lead-in in place. Then, I installed a screw-in standoff to the metal flashing at the edge of the roof. Next, I passed the twin-lead through the opening in the standoff and dropped the twin-lead over the side of the roof along with the ground wire that I had connected to the mast.

I grabbed my tool box and the remaining material and went down the ladder to the outside where the twin-lead had landed. Leaving my tool box and materials next to the twin-lead and ground wire, I went to my wagon to get the ladder. I positioned the ladder against the house and gathered my material.

I needed a few four-inch standoffs, a few mortar staples and a hammer. I climbed up the ladder and began nailing standoffs into the mortar every four feet and passed the twin-lead through each standoff. I simply nailed the ground wire to the side of the house with mortar staples. After installing five standoffs I was at the point where I had planned to bring the twin-lead into the house. This was about six inches above the basement window. This point was close to the floor joist. I put a half-inch masonry bit in my drill and passed my 20-foot extension cord through the basement window to reach the ac outlet. It was easy drilling through the mortar.

Since I was using twin-lead, I had planned to connect the lead-in to a lightning arrester and ground the antenna mast. In many communities proper lightning protection is required by law, but more important, it protects life and property. I had purchased a universal uhf/vhf lightning arrester with mounting strap and a four-foot copper-plated ground rod. Equipped with the mounting strap, the lightning arrester could be connected around the ground rod.

I went out to my car and brought back the ground rod and a large hammer. Then, about a foot from the house, I drove the ground rod about three feet into the ground. Next, I formed the strap of the lightning arrester, connected it around the ground rod, and tightened the screws to secure the strap. Then I connected the ground wire which grounded the mast to the rod. I passed the ground wire through the clamp that was provided on the rod for that purpose and tightened the screw to secure the ground wire. The lightning arrester is shown connected to the ground rod in Figure 2.

I passed the twin-lead through the slots provided for the twin-lead on the lightning arrester and tightened the two penetrating lock nuts. Instead of bringing the twin-lead directly back to the side of the house, I formed the twin-lead into the

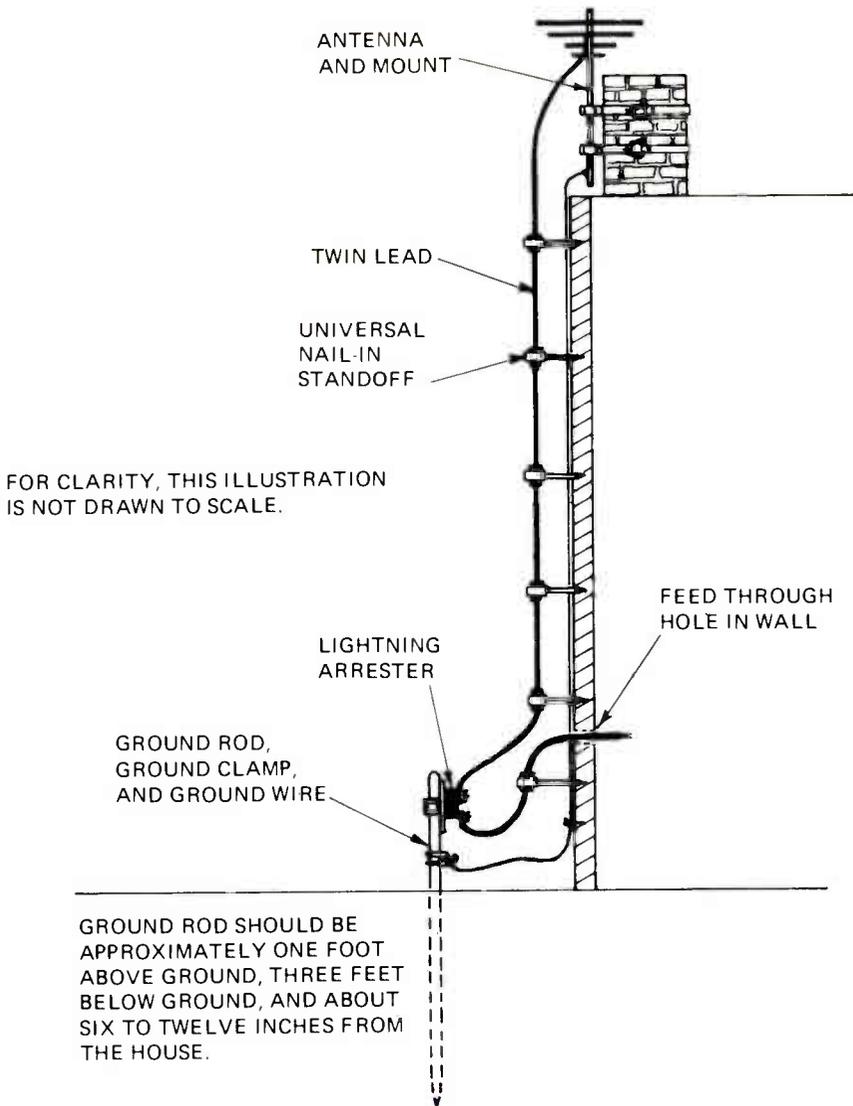


FIGURE 2. THE GROUND ROD AND LIGHTNING ARRESTER.

shape of a “U.” This is commonly referred to as a “drip loop” because it will prevent water from standing on the twin-lead.

Before passing the twin-lead through the hole that I had drilled in the side of the house, I drove another standoff into the mortar near the hole and passed the twin-lead through it. This made a neat and secure run for the twin-lead. Then, I passed the twin-lead through the hole in the wall.

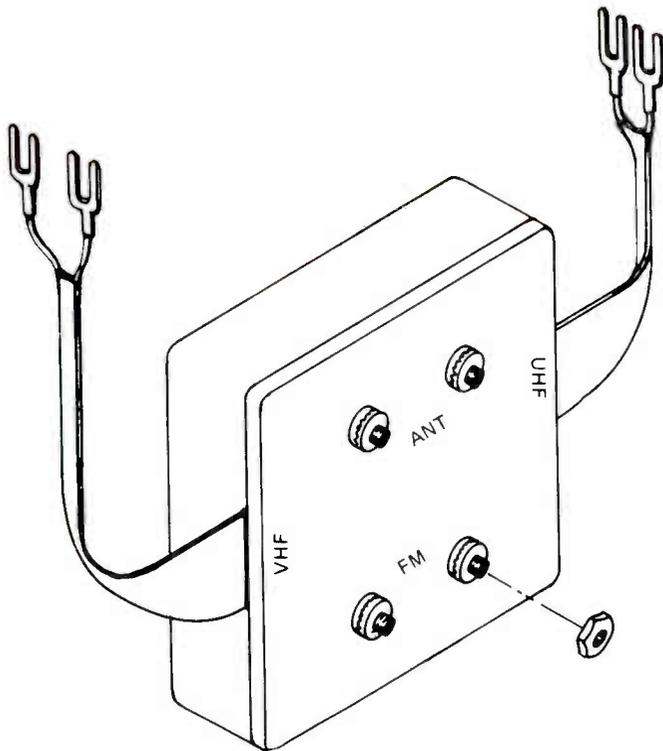


FIGURE 3. A UHF/VHF/FM SIGNAL-SPLITTER.

Inside the house I passed the twin-lead through one standoff that I easily screwed into the wood joist. Because the rear portion of the basement was unfinished, the inside job was easy. Earlier in the week I had received the okay from Mr. Banks to drill a small hole through the floor in the recreation room for the purpose of running the twin-lead. I wanted to make the hole as inconspicuous as possible. The hole would be less noticeable when drilled through the molding than if I had drilled it through the floor.

I went upstairs to the recreation room to drill the hole. Then I went back downstairs and passed the twin-lead through the hole and returned upstairs to pull it through. I found that I had 15 extra feet of twin-lead. I allowed approximately five feet of twin-lead from the hole that I had drilled in the floor to the set and I cut off the extra ten feet. This five-foot length would allow moving the set for cleaning but yet it would not be enough to interfere with the reception. I connected the twin-lead to a signal-splitter. Figure 3 shows the signal-splitter. Finally, I connected the signal-splitter to the antenna terminals on the set. A signal-splitter separates the uhf and vhf signals. The particular splitter that I had purchased also had a tap for FM signals. The all-channel antenna that I had purchased for this job was excellent for three-way reception.

I couldn't help noticing Mr. Banks' expensive-looking stereo receiver. And I also

couldn't help noticing that he did not have an FM antenna connected. I asked him about the FM reception in his area. When he explained that the quality of the reception varied from day to day and that he had trouble with signal fading I was sure I had found a use for the extra ten feet of twin-lead. Since it did not cost extra, he was all for connecting his FM receiver to the antenna. The FM receiver was approximately eight feet away. I tacked the twin-lead to the baseboard with fiber-head tacks. This made a neat run to the receiver. According to Mr. Banks, there was a tremendous improvement in his FM reception with the antenna connected. The customer was happy and so was I.

Finally, I turned the TV on and began tuning in stations. Three of the local stations came in well. Channel 9 came in with a very strong ghost. Two stations from the next town came in fairly well and the uhf reception was excellent. Still, I needed some way to orient the antenna to eliminate or minimize the severe ghost on Channel 9. Since I didn't have a walkie-talkie or field-strength meter, I asked Mr. Banks if he would watch the picture and call out the door when I had moved the antenna enough to eliminate the ghost. I went back on the roof and slowly rotated the antenna. I had rotated the antenna approximately 15° when Mr. Banks shouted that the ghosts were gone. I went back downstairs to check the reception on the other stations. They were still coming in nice and strong with very good color. This meant that Mr. Banks was receiving all of the local vhf stations plus two of the distant vhf stations and five stations in the uhf band. One uhf station was almost 50 miles away. It came in a little snowy but the picture was certainly acceptable. Mr. Banks seemed quite pleased.

I went back on the roof and tightened the antenna to the mast and picked up the trash that I had accumulated.

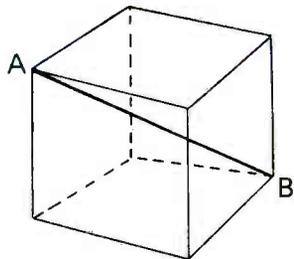
It was almost two o'clock and I was finished. My materials came to less than \$30. When I finished writing out the bill for labor and materials I had made a \$35 profit. Not bad for a couple of hours work. I collected for the job, packed my tools and headed for home. The week didn't turn out to be slow after all.

Mind Bender

1

Knowing how much you guys and gals like to work math problems, we thought we'd throw this simple problem at you. Suppose that you have a cube whose corner-to-corner diagonal distance (AB) is 6.46 inches. What is the length of

each side of the cube? Hint: 6.46 inches is the same as $2\sqrt{3}$ inches. If you really can't figure this out, turn to page 17 for one solution.

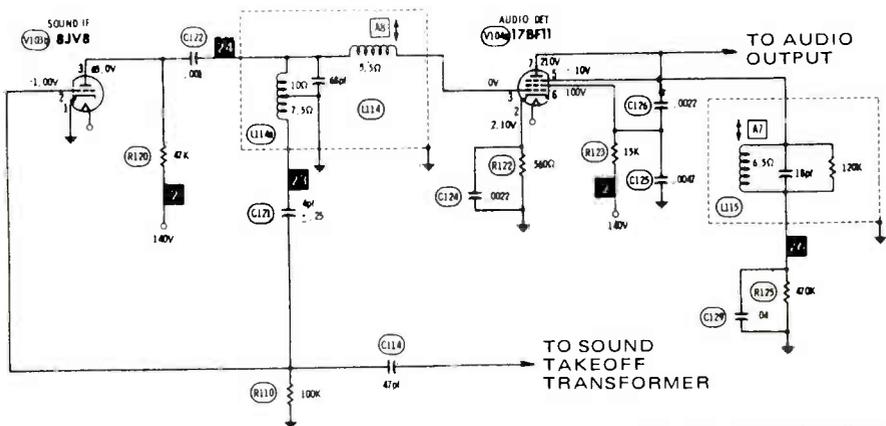


—Richard L. Carlson

When I started checking the individual tubes I found that V201, the 5G57 mixer-oscillator, had an open filament. I got a tube out of my supply and noted that while the box said RCA the tube was made by another company. I had retrieved it from some other set and must have checked it, so I put it in and turned the set on. The tubes lit up but nothing happened in the way of a raster. As a matter of fact, the 381E7 seemed to be overheating and my neon lamp on the end of a fiber tube did not light when held near the base of the 381E7.

I figured the 8FQ7 horizontal oscillator might not be working so I pulled it for a recheck. I noticed that the tube was cold although its filament checked good. This showed the tube filament was being bypassed by some kind of a short. I tried the set out again for a moment and found the next tube in the string, V203, the picture tube, didn't light either. I suspected a cathode-to-heater short further along in the string so I removed the vhf rf tube, V202, but it checked okay. Then I took out the "new" 5G57, which I had just installed. It showed a direct cathode-to-heater short. Now if that tube had been at the end of the heater string as is usually the case, the short probably wouldn't have made any difference. I guess that's why I had saved it. This time I bent the tubes prongs flat and threw the tube in the trash, as once was too much.

With a good tube in the mixer stage the set took off and gave a raster with a beautiful picture. There was a howling hum instead of sound from the loudspeaker. I tried adjusting the quadrature coil L115 (see Figure 2). This enabled me to get sound mixed with a bad hum. I tried adjusting the interstage i-f transformer, L114, and got the howling back again. By messing around a while, I found that L114 had *two* adjustments rather than the one shown in the schematic. After about a half hour of trying alignment, I still couldn't get decent sound without a heavy hum.



Courtesy Howard W. Sams

FIGURE 2. OLYMPIC SOUND SYSTEM. 4 PF IS FOR NEUTRALIZATION.

Next I checked the electrolytics in the power supply by shunting them with others—no dice. I decided I had better check the audio circuits out with an ohmmeter. When I did, I found the grid return, pin 3, of the 17BF11 was open. I removed the shield of L114 from the circuit board and then L114 itself. This was done by putting the soldering iron on the coil tabs one at a time where they came through the circuit board and pushing the tabs through the board with the iron tip. This was necessary so the coil would not be pulled off its base, as it would have been if I had tried to heat the lugs and pull on the end of the coil. After I got the coil out, I looked it over and saw two capacitors, next to the two separate windings. This did not compare at all with the schematic (see Figure 2). Since there was a part number stamped on the coil shield, I checked it against the number given in the manual. It didn't match. In fact, the number was for the sound take-off transformer! The sound take-off transformer had the same number. I figured out that some serviceman had found L114 defective and had in some way unknown to me gotten hold of a replacement sound i-f transformer. So he got a sound "take-off" transformer instead of a sound "interstage" transformer. The lugs fitted but the circuit wound up like that shown and the grid return was open. An examination of the circuit shows that the single 4-pf capacitor, outside the shield can, is for neutralization, since the sound i-f tube is a triode. This accounted for the howl when the core was adjusted—the stage was oscillating.

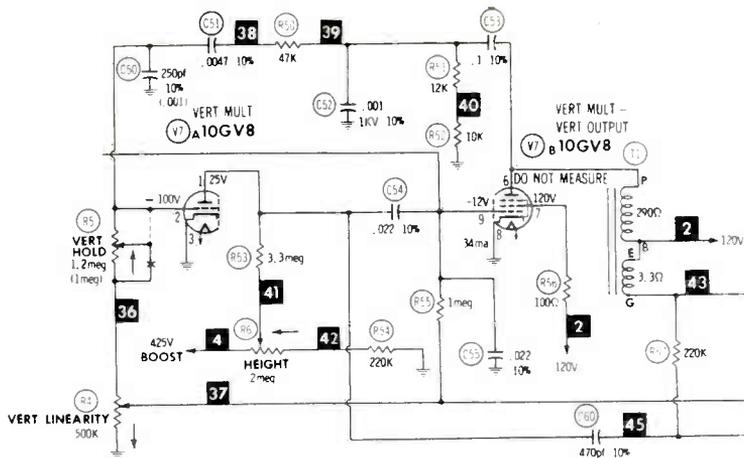
This interstage circuit is rather standard so instead of trying to get a replacement for L114 I took one out of a junk receiver, first making sure the lug and circuit connections were proper for the receiver. With the replacement installed I was able to properly adjust the sound system and the sound came up to normal level without distortion.

This completed the repair for which I made a charge of \$38.50. Whenever you get a job which has been messed up by someone else, time is lost and you are justified in a larger than normal repair bill.

PANASONIC MODEL AN-32

This set came in with the comment that "it needed some adjusting." When I fired it up there was a vertical roll and poor linearity with little vertical size. I couldn't, for some reason, get at the size and linearity controls through the holes provided for this purpose in the rear of the back cover, so I removed the cover. I found that both controls (of the printed-circuit type) had been bent over parallel to the chassis by someone trying to adjust them. I bent them up straight, but was not able to get proper size or linearity with vertical hold. As a matter of fact, the hold control would only move the picture in one direction, whereas it should have been able to make the picture roll up or down, either side of the "stand-still" position. I figured something must be wrong in the vertical circuit, which is shown in Figure 3.

An examination of the set showed that a number of the capacitors in this circuit had been replaced, so I knew that someone else had run into this same problem and had failed to locate the cause. I have run into a lot of trouble in vertical sweep circuits due to leaky capacitors. This, outside of tubes, is the most usual trouble,



Courtesy Howard W. Sams

FIGURE 3. VERTICAL CIRCUIT OF PANASONIC AN-32.

although resistors which have changed in value will cause identical symptoms. I put the set to one side, and the next time I went to town I bought all the capacitors shown in Figure 3 which I did not have in stock. Since these capacitors only cost me \$1.26, I felt that their cost was justified.

I replaced all the capacitors the other serviceman had missed without doing any good. At about this time I decided to forget about the other guy's efforts. I tried another 10GV8 with no improvement. I then began checking resistance values, first the 3.3-megohm triode plate resistor, as high-value resistors are the ones most likely to change in value. I couldn't find any bad resistors, so I went on to check the controls.

When I got to the linearity control I hit the jackpot, because instead of 500 kilohms it measured over 2 megohms. I luckily had another model AN-32 I had been holding while a customer decided whether to have me install a new picture tube. (It's not worthwhile because a replacement costs too much and has to be ordered from the set distributor—in my case, Duluth, Georgia.) I removed the linearity control from the "hold" set (I'll order another if necessary) and installed it in the set under repair. This solved the problem. The charges now came to \$15.

However, the vhf selector and fine tuning knobs were missing, and when I borrowed the ones from the other set they would not fit! The customer or someone had filed the tuner shaft down so it could be easily grasped with a pair of pliers! The fine tuning wouldn't work but the set was okay on local vhf stations and on uhf, when you could find the proper uhf setting. I told him it would cost another \$20 (my cost \$9.85) to send the tuner to Atlanta for a new shaft and overhaul. He decided to stick with plier tuning for the time being. What some people will put up with, when they get used to it!

This set came back a week later with the complaint "dead and no raster," and I was asked if the part I had put in had failed. I told them no, but that the repair should

not be too difficult. On removing the back, I noted that the horizontal output tube did not get as hot as it should, showing that there was no cathode current and probably no plate or screen voltage.

I located the 4.7-ohm surge resistor in series with the low-voltage diode rectifier and found that it checked okay. The diode had been replaced some time in the past by using the lazy man's method. This consists of cutting the old diode loose close to its case and soldering the new diode leads to the ones coming up through the circuit board. This technique is okay, but the leads had just been tacked in place and one had come apart, thus opening up the low-voltage B supply circuit.

I resoldered the loose connection and got normal dc supply voltages. However, when the high voltage came on there was arcing from the picture tube anode lead to the lead going to the plate of the high-voltage rectifier—someone had been inside! I rerouted the anode lead so that this could not reoccur. Since I had not spent over 20 minutes on the repair, I made no charge. This is good advertising.

Haven't you always wished you could get to fix the TV set of some guy who had just ripped you off, like the gas station mechanic who charged you \$5 to walk across the street to remove a lug nut when your lug wrench slips, or the manager of the grocery store who puts bent cans on "sale" priced higher than the unbent ones? My dream just came true on this next job.

I have an International tractor and the starter became intermittent. Sometimes it was necessary to rock the starter before it would engage; when engaged, it might run fast or slow but would start the engine, although smoke came from the starter. I went to the dealer and told him about it. He said it would be very expensive to fix, maybe as much as a new starter (\$72). However, he said, he would let one of his mechanics stop by and look at it on his way home from work. The mechanic did, got the engine to start, and went along home. The trouble continued, but I got a bill for \$27.

I got tired of fooling around and took off the starter. The commutator looked pretty sorry, so the next time I went downtown I took it to a machine shop I knew about. I had them turn down the commutator, rake out between the segments, and install new brushes and new bushings. It is now as good as new at a cost to me of \$26! I wrote to the dealer, but all I received was another bill with 50 cents added as a "carrying charge." Then one day the guy who looked at my starter on his way home from work showed up with his TV to be fixed! Here it is:

PANASONIC MODEL TR-622U

The set had been playing okay one evening but when turned on the next morning was dead. I plugged in the line cord, turned the set on, and peered through the louvers in the back. I could see nothing lit up. I removed the back and found that the set was completely transistorized. However, the picture tube should have shown a lit filament. I figured there was probably a blown fuse or defective on-off switch. I located the fuse and it was blown. Another 1-ampere fuse was installed and I received a nice shock when inserting it in its holder, even though the set was turned

off. I turned the set on but nothing happened. I rechecked the fuse and it had blown. I then unplugged the set and installed another 1-ampere fuse with the set disconnected from the power line. When I inserted the cheater cord I saw the fuse go even though the set was turned off! This confused the issue, since fuses are usually in series with the on-off switch. I installed a 2-ampere fuse and the set played for an instant, but then the fuse blew again. I noted that the power transformer was hot, so I told the customer he would have to leave it.

I called Panasonic in Duluth, Georgia, and ordered a schematic and a new power transformer. The diagram came promptly with a bill for \$2, but no power transformer. After waiting a few days I called again, but got no answer. After a few more days of calling, I decided that the plant must be completely closed down for vacation. I tried the one local wholesaler who keeps a goodly supply of iron-core devices, but there was nothing listed for this set. The schematic called for a 20-volt secondary, so I settled for a 22-volt unit which I figured was close enough.

I installed the transformer with a new 1-ampere fuse, which blew at once. I began having visions of some obscure transistor being shorted and overloading the power transformer. With the aid of the schematic (see Figure 4) I could see why the on-off switch had nothing to do with the fuse. "Instant-on" had been achieved by opening the B supply voltage to the receiver proper, also disconnecting the 2200- μ f input filter capacitor to drop the B supply voltage, which would otherwise rise with the receiver turned off. Note that dc filament current for the picture tube still flows, though at a reduced rate, through heater leads marked H1 and H2.

When I saw that the receiver was disconnected by the on-off switch and that the fuse blew in this condition, I knew the trouble was in the power supply itself. Rather than locate the parts in the transformer primary circuit for a check, I located and opened one of the secondary leads. Then the fuse did not blow, showing that an external short was drawing excess current from the transformer secondary. I wondered now if the old transformer was really bad. I hooked its primary to the power line through a 60-watt light bulb, with no connection to the secondary. The bulb lit up—the old transformer had been overloaded to the point where an internal short had developed.

I started checking across the diodes in the bridge circuit (D71, D72, D73, and D74). I did this without removing the diodes (they were hard to get at) and found that the resistance between the reverse and forward was okay for D73 and D74 but that both D71 and D72 were just about shorted regardless of the polarity of the ohmmeter test probes. Since D71 and D72 were hard to get at, I decided it would be much nicer for the trouble to be in either C701 or C702, which are easy to get at. I removed one lead of each of these capacitors, but a recheck with the ohmmeter showed that the trouble was still present.

I then pulled out D71 and found it to check normal out of the circuit. I pulled D72 (which was the hardest of all to get at) and sure enough, it was shorted. This is a diode with very thin leads, and I wanted to use the type I stock, which has thicker leads. I enlarged the holes in the circuit board by forcing increasingly larger wires through the original holes. With the new diode the set played okay. I later learned

that some of these Panasonic diodes have the nasty habit of intermittently shorting (not opening), so keep this in mind and it may save you a headache.

Now that the set was repaired I no longer felt like ripping off the mechanic (I have a suspicion I burned out the transformer with the 2-ampere fuse) in retaliation for the dealer's starter deal. Instead, I made a deal for him to make some extensive and expensive repairs to my tractor on his way home from work in exchange for the job on his TV set. However, just let me get my hands on the TV set of the banker who got me to sign a note with a variable interest rate ("just a rule of the company"). It was 5 percent and has now slid up to 8½ percent!

The cost to me on this job was fifty cents for fuses, \$4.50 for the transformer, \$1 for the phone call, and \$2.50 for the diagram, a total of \$8—so I came out okay.

ADMIRAL MODEL G3

The customer was very unhappy when he brought this set in, claiming he was about to trade it in on a new set. I guess he was stuck good sometime in the past for repairs. When I got around to it, I found that both the vertical and horizontal were out of sync and that the raster covered only the top half of the screen.

I was about to remove the back but decided to first try making adjustments. I got both the vertical and horizontal in sync without trouble. With this to encourage me, I decided to try adjusting the vertical size and linearity controls through the holes provided in the back cover. When these are adjusted, the vertical hold control must also be adjusted. In about five minutes I had a fine picture with everything normal. I let the set play for about three hours to be sure there was no intermittent—all okay. I concluded that the trouble had been due to the customer's misadjustment of the various controls. I turned the set on before letting it go out and was dismayed to find no vertical or horizontal sync!

I also noted that there was a curved edge on both sides of the raster, showing the presence of 60-cycle hum in the sweep, and that the raster did not cover the screen horizontally. In about 15 minutes all this cleared up and the picture fell into sync. I had run into this before on another set of the same make and model, so I replaced the electrolytics and this cleared up the trouble.

Since the set belonged to a guy who is always good for a large mess of shrimp, when he goes shrimping in the Gulf, I only charged \$15 which, including the uhf loop antenna I put on, just about covered the retail cost of the parts (no labor).

I ran into the same case of defective filter capacitors knocking out all sync in an old black-and-white RCA in which I had just installed a new picture tube. In most sets there is a copper strip of the spring type which grounds the conductive coating on the rear of the picture tube. This is a connection made automatically when the chassis is installed in the cabinet. I noticed a strip of aluminum foil about four inches long and one-half inch wide fall out of the cabinet before the chassis was put in place. I thought nothing much about it so I put it to one side.

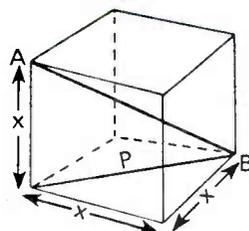
On firing up the set, I was dismayed to see that there was no sync. I thought I had goofed in replacing the filter caps, so I dug the old can out of the trash and was relieved to see corrosion around each lug. This was proof that the capacitors were bad. I also noted parallel horizontal white streaks about a quarter of an inch long on the raster. I was touching the shield on the front-end mixer tube when my other hand came near the back of the picture tube. A spark jumped from me to the conductive coating on the back of the tube.

This was proof that the coating was not grounded, and I realized that the piece of foil was for grounding the aquadag coating on the rear of the tube. When I got this fixed, the sync was perfect and the white streaks had vanished. I could have connected a piece of hookup wire from the chassis to the strap holding the picture tube in place in the cabinet and achieved the same results. The interference resulting from the arcing between the aquadag on the rear of the picture tube and the chassis was enough to knock out the sync.

While defective electrolytics can cause a loss of sync, don't get carried away by these two stories. You shouldn't buy a replacement capacitor unless shunting the various capacitors with a good unit shows the originals to be at fault. A capacitor tester will give the same information—be on the lookout for high power factor. Tubes are far more likely to be a simple cause of this complaint. Any tube from the antenna input through the video amplifier should be suspect. There may also be circuit defects, particularly in the sync separator. In the case of tubes, don't hesitate to try replacements regardless of what the tube tester has to say. Frequently gas in a tube will result in sync clipping, and gas content will not be shown in an emission-type tester.

Solution to Mind Bender No.1 (from page 8): Side x is 2 inches. Visualize or draw a diagonal (P) on the bottom surface of the cube as shown. This is the hypotenuse of a triangle whose other two sides are both x , so from the Pythagorean Theorem,

$$P^2 = x^2 + x^2 = 2x^2$$



The line AB is the hypotenuse of a triangle whose other two sides are x and P . Once again, we have

$$(AB)^2 = x^2 + P^2$$

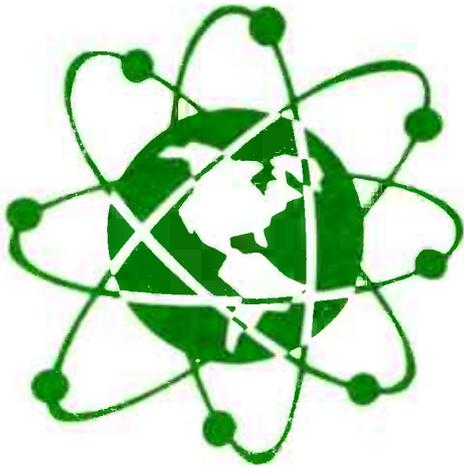
We know $P^2 = 2x^2$, so $(AB)^2 = x^2 + 2x^2 = 3x^2$. Taking the square root of both sides,

$$AB = \sqrt{3}x$$

Substituting $2\sqrt{3}$ for AB ,

$$2\sqrt{3} = \sqrt{3}x$$

$$x = 2$$



HAM NEWS



By Ted Beach K4MKX

Seasons greetings! Once again it hardly seems possible, but another year has passed us by. I hope and trust that it has been a good year for all of you and that our bicentennial year will bring forth all sorts of good things for you.

At this point in time I can scarcely remember from one issue of the Journal to the next what has transpired and what we have talked about. I *think* that I passed on to you that I had bought a portable 2-meter rig (a Wilson) but I can't be sure. Anyway, I did get one and this little jewel is going to be both my portable and mobile station. I am going to build a 25-watt amplifier for permanent installation in the trunk of my VW, and the Wilson will reside in the glove compartment, with all leads—power and antenna—coming into the rear of the glove box. That way, all I have to do is open the door, stick the rig in the box, connect the separate speaker-microphone and antenna and—presto—we're mobile! Whenever I leave the car, the rig goes with me and anyone looking into the car won't be tempted to break in to steal my "CB" rig since nothing will be visible. There has been an awful lot of ripping off of ham

rigs in the metropolitan area, and so why tempt said crooks?

The Wilson came equipped with nickle-cadmium batteries, but I did not buy the charger from Wilson as I was sure I could build one for a lot less than they wanted. I read a couple of articles on charging nicads, and browsed through the General Electric manual to find out the do's and don'ts of working with these beasts. The general consensus seemed to be that you could charge a set of matched cells in series quite safely as long as the charge current is held to no more than 10 percent of the rated discharge rating of the cells. The AA cells used in the Wilson are rated at 500 mah (milliampere-hour) so a 50-ma charge current would be okay and it would be virtually impossible to hurt the cells by overcharging at this rate.

Up 'til now, I have used my Heath power supply (model IP-18) as a constant current supply set for current limit at 50 ma. Fine, but it does tie up the supply for those times in the evening when I need to run a few experiments and need the supply. What we really needed was a dedicated charger so as not to limit the

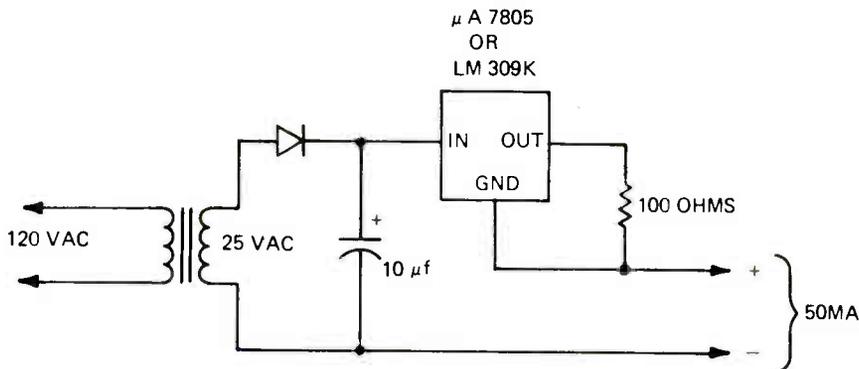


FIGURE 1. CONSTANT CURRENT SUPPLY.

usefulness of the Heath supply.

The circuit of Figure 1 is the result. One of the other hams at the office (Larry, WA3LHG), remembered that the little three-legged voltage regulator IC's could be hooked up as a constant current supply so we dug this circuit up out of the Fairchild manual, and it works like a champ. The output current is determined by the rating of the regulator and the resistor hung across its output. Using a 5-volt regulator the 100-ohm resistor draws $5/100 = 0.05$ ampere. The only requirement is that the transformer deliver enough voltage to accommodate the battery being charged plus the drop of the regulator. In my case, the battery has a voltage of 12.5 volts and the regulator is 5 volts, so I needed about 18 volts input. I chose to use a 15-volt transformer, with a simple half-wave rectifier. The whole thing fits in a tiny box and works like a champ.

I am now in the process of building a second charger that will have switch-selected charging rates of from 50 ma to 750 ma in 50-ma steps so that I could charge almost any kind of nicad. We'll let you know more on this one later.

In a sort of editorial sense, I am going to reprint next a letter I received from a

student of our Amateur License Course as well as my reply to him. I hope all of you will be able to get something from both of these letters.

Dear Mr. Beach:

I am currently a student of NRI's complete amateur radio course. I have some questions to ask if you don't mind.

As a Citizens Band Radio Operator, I would like to know if the amateur bands are as crowded with operators who are inclined to flagrantly and consistently violate the FCC Rules and Regulations as are the CB channels? I purchased my CB License last year and I am really disgusted with it! The multitude of rule violators make it impossible for an honest person to use his CB radio correctly. The majority of operators that I hear do not even abide by the most basic rules such as giving call letters, using channels far in excess of allotted time, using obscene language or language bordering on obscene, etc., etc.

I sincerely hope that amateur radio has not degenerated into the condition that the CB channels are in at this time. But if I find this to be true then I will certainly have no desire to continue my course with NRI as I will

have no desire to achieve an amateur license.

I cannot understand why the FCC is so lax with enforcement of the rules, etc., regarding the CB Radio Service.

Sincerely,

Dear _____,

Thanks very much for your letter. I am in complete agreement with you regarding the activities and abuses so apparent on the Class D Citizens Band. At one time I thought that I would like to have a CB rig in my car just to be able to talk to my wife (who is not interested in getting a Ham license) and in case of emergencies on the highway. Well, before I took that step I thought I'd monitor the band for a while with my station receiver, and believe me, I sure don't like what I hear. I am quite sure that I could never get through to my wife, as she would never turn the thing on if she had to listen to all that garbage. I don't think even a tone squelch would be of any use because of all the heterodynes!

Quite frankly, the FCC does not have the people to properly police these frequencies. Besides, since almost no one uses a call sign, the only violators they would probably catch would be someone like yourself who might make a slip sometime. I truly do not know what the answer is, but it looks as if the FCC may just take the easy out and make working skip legal, allow linear amplifiers, do away with call signs, etc., just so the manufacturers can sell the more expensive equipment "legally." I would hate to see this happen.

Regarding amateur bands, let me say that I have had my license for 18 years and never have I heard such goings on on the Ham bands. Sure, you'll find a few inconsiderate people

who will deliberately interfere and generally make a nuisance of themselves, but they are the exception rather than the rule. Almost every ham I have talked to or met is truly a gentleman or lady and tries to abide by the rules. In addition, we have a sort of self-policing action in that there are Official Observers set up by the ARRL (American Radio Relay League) who monitor all bands all over the country and if they hear a station operating in violation of the rules they notify the person just so he can correct the problem before the FCC latches onto him. This has proven to be quite an effective program, only because the violators respond cheerfully to the suggestions of the OOs.

Thanks for the letter, and be assured all is well on the ham bands.

Very 73,
Ted Beach - K4MKX

Now, let's see who else we have heard from since the last Journal. As always, those listed first are students and graduates of our Amateur License courses while those listed last are those heard from in our other courses.

Bill, WN1VMA, is a graduate and says that he was very pleased to be able to study just for an amateur license without having to pay for a "complete communications" course. Now that he has his ticket, he says he's going to work on the code so he can get that 13 per down pat. That's the way to do it, Bill, get on the air and practice.

Harry, who just got his General ticket, writes: "I can honestly say that without your sincere assistance I would not have even considered taking the test." Joe Schek take note!

WA6INF sent us a nice long letter about

Bill	WN1VMA	N	West Hartford CT
Perry	WN4BDA	N	Albany GA
Ray	WN4BHP	—	Ft. Meyers FL
Harry	WA4GIH*	G	Beverly Hills FL
Herb	WN4MZB	N	Alexandria VA
Ralph	WA6INF*	E	Las Vegas NV
**	WB8OUD*	T	Cincinnati OH
Henry	WN8TOG	N	Bellbrook OH
Gary	WN8WBH		Sandusky OH
John	WN9RPY	N	DesPlaines IL
Bruce	WN3ZPC	N	Trevese PA
Phil	WA4UJJ	C	FPO Seattle WA
Mike	WB5COO	—	Baton Rouge LA
Leland	WA7UJU	T	Ashland OR
John	WA8JGE	A	Newark OH
Doug	WN8UDS	N	Niles OH
Monty	WB8VTH*	G	East Meadow NY
O.M.	K9MRR*	A	Belleville IL
Greg	WB0KTI	T	Stillwater MN
Marijan	VE3HVY		Port Elgin ONT

* Just upgraded—congratulations!

** See text

his progress to the much coveted Extra license which he now possesses. Ralph copied four out of five minutes of the FCC code test perfectly, and says that this ability came after many, many hours of going over the high-speed band on his code record and lots of time put in copying W1AW. Nice going, Ralph, that big "E" makes it all worthwhile. Ralph also suggested that NRI have some QSL cards available for students and graduates at a reasonable price. That sounds like a fine idea, Ralph, and in fact we have been working for some time on the design of just such an NRI QSL card that will probably be sent out (a hundred, I think) along with the diploma providing the graduate sends us his call and QTH. This has *not* been firmed up yet, so please do not write and ask for said QSL's. Everyone enrolled in the Amateur License course will be notified in due course. In addition, I'm sure the cards will be made available to other students and graduates

as well. Watch the Journal for further information.

Once again, there just isn't room to put in the name of the newest Technician on the list. She is Sister Marjorie Kramer, WB8OUD, and her name appears here quite frequently. Congratulations, Sister Marjorie.

WN9RPY got his license back in July, and plans to be on the air very soon using a Heath HW101. Fine business, John, and I'm sure it won't be long before you get to plug that microphone into the rig and get on sideband.

Just as we were going to press, Tom Nolan, the Executive Secretary of your Alumni Association, handed me a letter from graduate Ben Hart. In his letter, Ben related that he had taken both the General and Advanced tests at one sitting back in 1973 and failed the latter miser-

ably. It was then that he decided to enroll in our Amateur Course. Then in August Ben went back once again to sit for the Advanced test. He came out first in a group of eight this time. Although he did not give us his call, Ben ended his letter with the question "Do you suppose the FCC exam is getting easier?" Hi, Hi, Ben—guess it just takes a little study to make it all so easy. Ben's QTH is Lancaster Ohio.

Now, on to the rest of the Rogues in the Gallery.

Bruce, WN3ZPC, got his ticket in May, and is active on 80 meters. He says to look for him at 3720 kHz between 2000 and 2300 Eastern time.

WA4UJJ writes that he is bound for Japan and hopes soon to be operating with the call KA7PK.

Mike, WB5COO, writes that he is in sympathy with me in my efforts to get out the Ham News as he is involved in writing a net newspaper as well as contributing to a club paper. Mike particularly likes to see articles and ideas on building things as well as how to use test gear. In particular, he said that he was shocked to find out how few people he has talked to recently know how to use the old fashioned grid-dip meter and would like to see a few do's and don'ts and how to's sometime in print. We'll keep that in mind Mike, and keep up your own good efforts.

I had a nice "eyeball QSO" with Leland, WA7UJU, when he and his family stopped by NRI for a visit. He and his YML were on a trip mainly to visit their son who is stationed at Ft. Meade MD., but just had to drop in and visit NRI. Nice to see you, Leland.

John, WA8JGE, wrote primarily so that

he could see his name in the Ham News column. Well, here it is John—welcome aboard! His ham activities include 80 through 2 meters although he did not include a rundown on his gear.

We spent about a half hour on the telephone the other day talking to Doug, WN8UDS. He was quite pleased that he had finally gotten his home brew two-band (80 and 40) inverted vee cut to the point that the feed line shows a 1.3 to 1 SWR on *both* bands. That's quite an accomplishment, Doug. He drives that fantastic antenna with a Ranger II and listens with an elderly 75A3.

WB8VTH passed his General very recently and at present is getting his kicks out of operating 2-meter FM. When he returns from a three-year hitch in Spain, Monty says he will build or buy low-band gear to get on the DC bands. Best of luck, OM.

K9MRR is a 1972 graduate of our Communications course and paid NRI a visit back in August. O.M. says that his General ticket was about to expire, so while he was here he stopped in at the FCC and sat for his Advanced license, which he passed quite handily. Sorry we missed you when you made your tour, O.M., but I must have been somewhere else. I would have enjoyed meeting you.

WB0KTI enclosed a newspaper clipping from the *Stillwater Evening Gazette* with his very lengthy letter. The article described (in the usual garbled layman's terms) how Greg and his club installed a repeater with the cooperation of the Stillwater Fire Department. The repeater is WR0All and operates 147.72/147.12 when it's working right. Greg also likes to build and experiment with antennas. He has built his own version of a Cushcraft eleven-element beam out of aluminum tubing and coat hangers. His version of

the Ringo Ranger was made from aluminum tubing and pvc water pipe and shows less than 2.5 to 1 SWR without tuning. Nice going, Greg, and we're sure you'll get the bugs out of WRØAI! now that the bug season is over!

VE3HVV took his license exam and then left for a European vacation and had to wait 'til he got home to find out his new call. Now, Marijan says he will have to get back to studying his TV servicing course or Joe Schek will be after him! At present Marijan is voiceless since he has only a receiver—the transmitter is next, then after some studying, on the air.

Last on our list is Don Hunt, whose name is not in the list above (he didn't include his call or license class!) but who wrote a most amusing tale of why he had not

been studying recently and sending in lessons for grading.

Don likes Heathkits and heard (erroneously I believe) that Heath was discontinuing their SB401 transmitter so he bought one to put together "later" when he could afford the time. Then he opened the box. That was a mistake. Now he had to build it. With it built, he surely had to test it out, so up went some antennas. Then he found out how much fun operating was, and there went the books for a while. Now, says Don, he has reluctantly gotten back to his studies but still finds time to get in a little operating. Really likes that "obsolete" SB401.

That's about it this time gang. See you all next year. Very 73,

Ted — K4MKX

A Reminder

Always be sure to include your student number whenever you contact NRI. This will help to ensure that we can serve you promptly and efficiently.

Perform a death-defying act.

Give Heart Fund.

American Heart Association 

NRI HONORS PROGRAM AWARDS

In the tradition of NRI's pursuit of excellence in training, the following graduates who earned NRI electronics diplomas in July/August also earned unusual recognition under the NRI Honors Program. On the basis of their grades, these graduates distinguished themselves by earning the right to honors listed below and to the appropriate Certificate of Distinction in addition to their regular NRI Diploma. This distinction is made part of their permanent NRI records.

WITH HIGHEST HONORS

Robert L. Anderson, FPO New York
J. S. Bartlett, Washington, DC
Jimmy D. Davis, FPO San Francisco
Richard A. Elberger, Tacoma, WA
George B. Els, Dallas, TX
Leo Iedema, New York, NY
Dallas F. Kruse, Merritt Island, FL
Bill Lovelace, Albany, OR
Robert G. Moquin, Plantsville, CT
Sam Newhouse, New Orleans, LA
William W. Parham, Kingsport, TN
Harjit S. Sidhu, Galena Park, TX
Arthur Venegas, Tracy, CA
Danny L. White, Six Mile Run, PA

WITH HIGH HONORS

Timothy E. Abbey, Jackson, MI
Richard Ashcroft, Winthrop, ME
Henry T. Bauernfeind, Baltimore, MD
Vernon L. Beers, Traverse City, MI
Amedeo Bene, Pompano Beach, FL
Guy M. Blazier, Genoa, IL
Brian S. Blinkoff, Bristol, PA
Robert W. Boyd, Marshall, MO
Thomas D. Calantonio, Gaithersburg, MD
Arthur L. Callahan, Memphis, TN
John M. Clark, Portland, CT
John F. Clarke, Raleigh, NC
Richard Coard, Southampton, NY
John R. Croasdale, Warner Robins, GA
Vernon R. Denson, Virginia Beach, VA
Ronald D. Drinkard, Larned, KS
Ronald L. Ebersole, Conneaut, OH

Carrick T. Edington, Silver Spring, MD
Michael D. Ferretti, State College, PA
Emory H. Firestone, Scottsdale, PA
Thomas C. Flood, Houston, TX
James J. Frankman, Cincinnati, OH
Jeryl B. Grantham, Minot AFB, ND
Ben F. Hart, Lancaster, OH
Ronald L. Holt, Catonsville, MD
Jay W. Howard, Raleigh, NC
Edgar L. Howell, Milton, FL
Mark Jennings, Bellevue, WA
Anthony Kowalchik, Olyphant, PA
William J. Krone, Schenectady, NY
Vernon W. La Favor, Groton, NY
Pak H. Lee, Santa Barbara, CA
Charles C. Leptien, FPO San Francisco
Charles A. Lilley, Lancaster, PA
Ralph A. Mack, Litchfield, CT
Kenneth J. Mathews, Chesterfield, MO
Roberto A. Matos Diaz, Jamaica, NY
Gary S. McCauley, Indianapolis, IN
Robert W. Mindell, Miami, FL
Ervin M. Olheiser, Saint Paul, MN
Thomas F. Price, Huntington Park, CA
Donald L. Reigle, Lockport, IL
Milton C. Spangler, Jr., Huffman, TX
Anthony Taylor, Scottsdale, AZ
Bennett E. Todd, Port Aransas, TX
Arthur M. Wakerlig, Coronado, CA
Harold T. Watson, Colorado Springs, CO
H. Darryl Willson, Fair Oaks, CA
Robert W. Wright, St. Petersburg, FL

WITH HONORS

Percy D. Beck, Northport, AL
George S. Blanchard, Miami, FL
David M. W. Bowers, FPO New York

Patrick H. Brittan, Franklin, LA
Salvatore Campanella, Bronx, NY
Thung, Y. Chin, Saugus, MA
Elmer A. Cline, Marysville, CA
Christopher J. D'Alesio, Sr., Weirton, WV
Terry A. Danielson, San Diego, CA
Douglas J. Dausch, Rochester, NY
John De Kanek, Tucson, AZ
John E. Dillon, Sherman Oaks, CA
Ronald L. Embry, APO New York
Edward J. Folz, Baytown, TX
Allen Foster, Jr., Houston, TX
William E. Fuller, Norfolk, VA
Robert D. Funk, Ogallala, NE
Kenneth D. Fronius, Youngstown, OH
Chester W. Gilman, Springfield, OR
Sangler C. Goldkamp, San Diego, CA
Jack W. Hardy, Romney, WV
Edward C. Hart, Lancaster, PA
James O. Haugen, Minneapolis, MN
Douglas R. Herald, Louisville, KY
Gordon D. Kilday, Anchorage, AK
Donald E. Klemp, Alexandria, VA
James H. Kyes, Minot, ND
Johney G. Long, Staton, TX
Jerry Lyon, Geneva, OH
Timothy F. Mahoney, Flushing, NY

A. Ralph Manners, Sheakleyville, PA
Carl R. Mathis, McMinnville, TN
Otto Metz, North Brunswick, NJ
Charles W. McKnight, Humboldt, TN
A. Alan Morehouse, Cloquet, MN
J. H. Mims, Linthicum, MD
J. C. Muirhead, Medicine Hat, AB, CANADA
John D. Newkirk, Terre Haute, IN
Harry K. Nishiyama, Hilo, HI
Denis Portela, APO New York
Thomas Portz, Milwaukee, WI
Lester A. Prescott, Andrews, AFB MD
Joseph E. Price, Plains, TX
Adolph C. Puntasecca, Jr., APO New York
Joseph M. Ragusa, El Paso, TX
Jack L. Rickett, Orange, VA
William R. Riley, Palmer, MA
David O. Rohrbaugh, Shreveport, LA
Eric L. Schulte, Fort Sill, OK
Robert T. Slater, Oxon Hill, MD
Kenneth R. Szeszulski, Bay City MI
Chancey E. Wells, Ballston Spa, NY
Dale L. Williams, Reading, PA
Frances Whisenhunt, Ashdown, AR
David W. Wood, Moncton NB, CANADA
Eugene N. Young, Columbia, MD
William Yushkevich, West Hartford, CT



DIRECTORY OF ALUMNI CHAPTERS

CHAMBERSBURG (CUMBERLAND VALLEY) CHAPTER meets at 8 p.m., 2nd Tuesday of each month at Gerald Strite's TV-Radio Service Shop, RR2, Chambersburg, Pa. Chairman: Gerald Strite.

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. second Wednesday of each month at Andy's Radio and TV Shop, G-5507 S. Saginaw Rd., Flint, Michigan. 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: Samuel Antman, 1669 45th St., Brooklyn, N.Y.

NORTH JERSEY CHAPTER meets at 8 p.m. on the second Friday of each month at The Players Club, located on Washington Square.

PHILADELPHIA-CAMDEN CHAPTER meets 8 p.m., 4th Monday of each month in RCA Building, 204-1, 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 St. (3 blocks N. of Austin Hwy.), San Antonio. Chairman: Robert Bonge, 222 Amador Lane, San Antonio. 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 at 7:30 p.m. the second Saturday of each month at the shop of Norman Charest, 74 Redfern Dr., Springfield, Mass. 01109. (413) 734-2609.

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



SAN ANTONIO TRIES OUT A NEW METHOD OF LEARNING

At the last meeting the San Antonio chapter tried out an opaque projector to throw schematics on a screen so that all could see them as we worked on a project. Unfortunately, these instruments are hard to find at an affordable price. During a demonstration we heard recorded information on the color section of a Zenith 19EC45, an all-transistor set.

Eight members were present and a young guest, currently an NRI student, who would seem to have quite a future in electronics. His name is Paul Briggs, 2001 Redwood Drive, Kemah, Texas 77565. He told us how he had made a mechanical TV set for his school science fair.

The August meeting featured a recorded tape program with illustrations on the vertical and horizontal circuits of the solid-state Zenith chassis used in the former meeting. Attendance has been good all summer and membership is back up to where it should be.

NRI AA OFFICERS

Richard G. Moore.....	Vice President
Homer Chaney.....	Vice President
Angelo J. Colombo....	Vice President
William D. Harris.....	Vice President
Tom Nolan.....	Exec. Secretary

Alumni News

PITTSBURGH CHAPTER HAS SLIDE SHOW

At the August 1975 meeting Mr. James L. Wheeler, an independent service technician, gave a discussion of RCA's XL-100 signal processing circuitry.

Jim showed a series of slides with the aid of the training manual entitled "RCA Servicing XL-100 Signal Processing Circuitry Field Training Program, Textbook #14," which was given to each member in attendance. Jim had an interesting program.

At the September 4 meeting, Mr. William E. Fisher, Jr. gave a talk on digital frequency counters.

Mr. Fisher gave a very instructive talk, explaining how digital frequency counters work and going into great detail about the circuits and all of the

component parts involved. Mr. Fisher offered to help the members build a digital frequency counter at very little cost.

DETROIT CHAPTER CHECKS OUT CB

At the September 12 meeting, Mr. John Nagy reported receiving a CB license with call letters KVV9771.

Mr. Kelley told how to spot the manufacturer's code and the maker of television sets for Sears, Montgomery Ward, and J. C. Penny.

Mr. Berus gave a report on his recent trip to Washington, D.C. to visit McGraw-Hill, NRI, and the Conar Division. Ray talked about the school and the courtesies shown to him at NRI by Tom Nolan, Executive Secretary of the Alumni Association.

Another year has gone by and we are now ready to elect officers for 1976. We will nominate one candidate for President and four for Vice President. These nominations must appear at NRI by November 30, 1975. 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.

Below you will find a 1976 nomination ballot and you will notice that the polls close November 30, 1975.

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

1976 NOMINATION BALLOT
(Polls Close November 30)

I am submitting this nomination ballot for my choice of candidates for the coming election. The persons below are those whom I would like to see elected officers for 1976.

My choice for President is _____

City _____ State _____

My choices for four Vice Presidents are

1 _____ City _____ State _____

2 _____ City _____ State _____

3 _____ City _____ State _____

4 _____ City _____ State _____

Your signature _____

Your student number _____

Your address _____

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CITIZEN-BAND CONVERTER

Hear traffic and emergency vehicle information on road conditions, accidents, jams, weather, etc., without buying an expensive CB radio.



Your regular car radio can now become a CB radio receiver . . . without disturbing the normal operation of your AM or FM bands.

- No license required.
- Monitor all 23 CB channels.
- No antenna to buy.*
- Simple two-wire installation at dash.
- Operates on any 12-volt negative-ground vehicle.
- Excellent sound and quiet operation.
- Sensitivity control.
- LED pilot light.
- All-metal construction.
- Black and chrome decor.
- Compact size: 1½ inches high by 4 inches wide by 5½ inches deep.
- No battery to buy.
- Monitor the national emergency frequency (Channel 9).

*While not necessary, a CB antenna will provide performance rivaling that of a CB transceiver.

CB owners: Use the Ultralec Converter to monitor your regular call channel while using your CB transceiver to talk on another channel.

Stock No. CB023 **Only \$34.95**

POWER, SWR, AND FIELD-STRENGTH METER

- 10-watt and 100-watt scale
- Direct reading for checking antenna installation
- Field strength reading for checking antenna performance
- Important modulation reading



Only \$34.95 Stock No. AC003

SWR and Field-Strength Meter

- 100-microampere movement
- Coaxial fittings
- Relative field strength readings. Forward and reflective power.



Stock No. AC001

Only \$18.95

Protect your CB Radio . . .

Use the Shur-Lok Radio Lock

(also for tape decks and stereo radios)

Check these features:

- Cannot be pried loose. Special mounting screws and locking nuts prevent removal regardless of force applied.
- Unique mounting bracket design. Cover plate prevents any access to mounting hardware.
- Tempered steel no-pick lock. Finest quality construction prevents picking or cutting.



Only \$14.95

Stock No.AC700

Plus 50 cents postage and handling

CB External Speaker

- Beautiful housing
- Swivel bracket
- Weatherproof
- Dustproof
- Six-foot cord with 3.5-mm mini-plug
- 4-3/4" wide by 4-3/8" high by 3" deep
- Heavy four-inch speaker



Only \$11.95

Stock No.SK004

CB Microphone Connectors

Model CBC-3
Three-Pin Connector  \$1.45 each

Model CBC-4
Four-Pin Connector  \$1.50 each

Model CBC-4Y
Four-Pin Male "Y"  \$1.70 each

Model CBC-4P
Panel-Mount Male Plug
(mates with CBC-4)  \$1.25 each

Model CBC-3P
Panel-Mount Male Plug
(mates with CBC-3)  \$1.25 each

Model P-4D
Four-Pin DIN Plug  \$0.55 each

Model P-6D
Six-Pin DIN Plug  \$0.65 each

Alternator Filter

- For CB Use
- Simple Installation



\$2.40 Stock No. AF-1

Alternator Filter

- Ferromagnetic Type
- 0-50 Megahertz
- CB/Amateur



\$8.00
Stock No. AF-2

Magnetic Microphone Holder

- Powerful Magnet
- CB Mike Holder



Stock No. MH-1

\$0.90

CONAR

DIVISION OF NATIONAL RADIO INSTITUTE
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CHECK ONE: Cash Order
 C.O.D. (20% deposit required)
 Select-A-Plan Order

CHECK ONE: New CONAR Account
 Add-on CONAR Account
 Re-open CONAR Account

PLEASE PRINT

Ship to another address? Give Directions here

Name NRI Student or Graduate No.

Name

Address

Address

City State Zip Code

City State Zip Code

Moved since last order?

Previous Address

City

State

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

IMPORTANT

To speed handling, any correspondence should be on separate paper.

All prices are net F.O.B., Wash., D.C.

Please include postage for weight shown and insurance on Parcel Post orders.

Express Orders should not include shipping charges.

A 20% deposit is required on C.O.D. orders. **SELECT-A-PLAN ORDERS:** Please complete and sign reverse side.

Thank you for your order.

Prices in the CONAR catalog and Select-A-Plan time payment privileges apply only to residents of the United States and Canada.

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7. Parcel Post and Insurance		
8. 10% Cash Down Payment and Parcel Post Costs Required on New CONAR Accounts		
9. Unpaid Balance of Cash Price <small>(Items 6 & 7 less item 8)</small>		
10. Sales Tax <small>(Washington, D.C. Residents Only)</small>		
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12. Finance Charge <small>(See schedule on back)</small>		
13. Total of Payments <small>(Item 11 plus item 12)</small>		
14. Deferred Payment Price <small>(Items 6, 10 and 12)</small>		

Please do not write in this space

RETAIL INSTALLMENT CONTRACT & SECURITY AGREEMENT

CONAR SELECT-A-PLAN

SELECT YOUR TERMS TO FIT YOUR BUDGET

CONAR FINANCIAL RATES:

STANDARD PLAN—The ANNUAL PERCENTAGE RATE is 17.75%

EXTENDED PLAN—The ANNUAL PERCENTAGE RATE is 15.50%

TO SPEED SHIPMENT

1. Complete other side of this sheet.
2. Use Select-A-Plan Schedule on the right to find your Finance Charge and your Monthly Payment.
3. Insert amount of down payment (at least 10% of total order) and other information in Payment Agreement below.
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.

NOTICE TO THE BUYER: (1.) Do not sign this agreement before you read it or if it contains any blank space. (2.) You are entitled to a copy of this signed agreement. (3.) The Finance Charge will be waived if the unpaid balance is paid within 30 days. If paid within 60 days, the Finance Charge will be reduced by 2/3; if paid within 90 days, the Finance Charge will be reduced by 1/3. Accounts extending beyond 30 days will pay up to \$3 in Credit Service Charges before the above reductions are made.

HOW TO DETERMINE THE NUMBER AND AMOUNT OF MONTHLY PAYMENTS TO REPAY THE "TOTAL OF PAYMENTS"

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.

PAYMENT AGREEMENT

Enclosed is a down payment of \$ _____ on the merchandise I have listed on the reverse side. Beginning 30 days from date of shipment, I will pay CONAR \$ _____ each month for _____ months, plus a final monthly payment of \$ _____. Title to and right of possession of the merchandise shall remain in you until all payments have been made. If I do not make the payments as agreed, you may declare the entire balance immediately due and payable. In satisfaction of the balance, you may at your option, take back the merchandise, which I agree to return at your request. I understand that a 1% accounting charge will be added to my unpaid balance if my payments become 60 days or more in arrears. I agree that the above conditions shall apply to any add-on purchases to my Select-A-Plan account. The statements below are true and are made for the purpose of receiving credit.

DATE _____

BUYER SIGN HERE _____

IT'S AS EASY AS A - B - C TO OPEN A CONAR ACCOUNT

PLEASE ALLOW ADEQUATE TIME FOR NORMAL ROUTINE CREDIT CHECK. ONCE YOUR CREDIT IS ESTABLISHED, ONLY YOUR SIGNATURE IS NEEDED TO ADD ON PURCHASES

WHERE DO YOU LIVE?

PRINT FULL NAME _____ Age _____
 HOME ADDRESS _____ CITY _____ STATE _____ ZIP CODE _____
 HOME PHONE _____
 () OWN HOME () RENT
 WIFE'S NAME _____
 HOW LONG AT THIS ADDRESS _____
 RENT OR MORTGAGE PAYMENTS \$ _____ PER. MO.
 MARITAL STATUS () MARRIED () SINGLE
 NUMBER OF DEPENDENT CHILDREN _____
 HOW LONG? _____
 PREVIOUS ADDRESS _____

WHERE DO YOU WORK?

YOUR EMPLOYER _____ POSITION _____ MONTHLY INCOME \$ _____
 EMPLOYER'S ADDRESS _____ Street _____ City _____ State _____ HOW MANY YEARS ON PRESENT JOB? _____
 PREVIOUS EMPLOYER _____ Name _____ Address _____ HOW LONG? _____
 WIFE'S EMPLOYER _____ Name _____ Address _____ MONTHLY INCOME \$ _____

WHERE DO YOU TRADE?

BANK ACCOUNT WITH _____ Street _____ City _____ State _____ () CHECKING
 CREDIT ACCOUNT WITH _____ Street _____ City _____ State _____ () SAVINGS
 CREDIT ACCOUNT WITH _____ Street _____ City _____ State _____ () LOAN
 TOTAL OF ALL MONTHLY PAYMENTS INCLUDING CAR \$ _____

SELECT-A-PLAN SCHEDULE

PLEASE CHECK ONE STANDARD PLAN EXTENDED PLAN

IF UNPAID BALANCE IS	STANDARD PLAN		EXTENDED PLAN	
	Financial Charge	Monthly Payments	Financial 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	5.00		
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
100.01-100.00	9.00	8.75	12.60	5.25
100.01-110.00	10.00	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

ON ORDERS OVER \$400.00 THE FINANCIAL CHARGE ON THE EXTENDED PLAN WILL BE 15% AND PAYMENTS WILL BE IN PROPORTION TO AMOUNTS SHOWN ON ABOVE SCHEDULE

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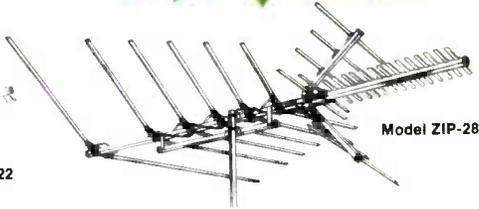
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HIGH GAIN • EXCELLENT COLOR RECEPTION • RUGGED & EASY TO INSTALL

MODEL (STOCK NO.)	RANGE (MILES)		ELEMENT COUNT	LENGTH (INCHES)	SHIPPING WEIGHT	SUGG LIST PRICE	YOUR PRICE
	VHF	UHF					
ZIP-11 (AC-011)	35	20	11	47	4 lbs	12.40	7.44
ZIP-15 (AC-015)	50	30	15	77	5 1/4 lbs	23.50	14.10
ZIP-22 (AC-022)	75	45	22	119	8 lbs	33.50	20.10
ZIP-28 (AC-028)	100	60	28	131	9 lbs	48.55	29.13

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