FEEDBACK

The OFFICIAL Newsletter of the
Georgian Bay Amateur Radio Club Inc.

Sponsoring
VE3OSR FM REPEATER 146.940- BARROW BAY
VE3OST FM REPEATER 145.290- OWEN SOUND
VE3GBT FM REPEATER 146.895- MARKDALE
VE3IJD PACKET BBS 145.630 KEADY

September 1996

REGULAR EVENTS

GBARC MEETINGS: 4th Tuesday of each month at the Billy Bishop Airport 7:30 P.M.

BREAKFAST MEETINGS: 2nd and last Saturday of each month at the Rockford Esso , 9:30 A.M.

GBARC INFORMATION: Information regarding membership should be directed to VE3NEM Tom Merner RR#4 Owen Sound, N4K5N6 371-0655

FEEDBACK: Submissions or letters to the editor should be directed to VE3TSA Tom St.Amand, 1232 3rd Ave . East, Owen Sound N4K2L5

MINUTES OF THE MEETING OF JUNE 25, 1996:

The meeting was opened by President Bob with twenty two members present. Acceptance of the minutes of the May 28th. meeting was moved by Jack VE3DTS and seconded by Bill VE3HMZ and passed. Bob VE3XOX reported on the hobbymarket results. The hobbymarket held on June 1st. had approximately 275 admissions with about sixty tables. Tom VE3NEM is drafting a final accounting for the clubs involved but Bob reports that about four hundred dollars was made by the club. The charity auction raised about eight hundred dollars for the three charities involved. Steve VE3XKM reported on the field day held this year at John VA3JRF's home in Tara. This years field day was operated as three alpha with three hf stations and two vhf stations.

Brad VE3RHJ informed the club members that there are seven people registered for the advanced course in Markdale. Brad will accept further registrations prior to the class opening. Course manuals have been ordered and an advanced study guide disk has been donated for the course. Brad and committee members will be meeting with the Wiarton airport owners to discuss a possible emergency station set-up at this location. There was discussion as to the club's interest in this offer. The committee will report back on the results of this meeting.

Gene VE3IJD gave the membership an update on the packet bbs system. He reported that the 19,200 link between his location and Bob's location is working fine. The two new 19,200 modems to complete the high speed link into Barrie have been ordered. Tom VE3TSA presented the two meter tuner that he had completed. The building plans for this tuner appear in the May issue of feedback.

Bob VE3XOX will be looking into the Owen Sound Fall Fair in September. He will report back on the scheduling of operators for this event. Gene VE3IJD moved that the club be authorized to spend one hundred dollars for the fall fair. Seconded by Jack KA1QU and passed. Norm VE3NBJ will be contacting the organizers of the Terry Fox run to discuss our involvement in this event to provide communications assistance.

Adjournment of the general meeting was moved by Henry VE3UWD and seconded by Nick VE3MWU and passed. The 50/50 draw was won by Jim McLaren VA3CJM.... *Minutes by Norm ve3nbj*

Presidents Message.....From: ve3xox

Hello again gang...Hope every one had a great summer....Well every one has heard of rambling rose...Well here is rambling Bob... September came in like summer, with temps in the high seventies and low eighties...Has been nice... Well, we have seen some changes over the last couple months with the packet and repeater population in the area... In the packet end of things, I see a new face in the crowd with Tom VA3TAB in Mount Forest...Welcome Tom.... Gene and myself have been playing with the high speed link between ve3ijd-7 and ve3xox-10 this summer and have it more or less flying with colors. The boys down at Allan Park have had to move the complete station there and the station was off line for a few days...

Our repeaters have had a big change with the loss of two repeaters in the the area...I went north and pulled the VE3OSR 146.940 repeater off line at Barrow Bay due to the intermod problems we had that was locking up the system....The same night as I pulled the 94 machine off line, the VE3OST 145.290 Repeater in Owen Sound blew up in a cloud of smoke ... With some of the dollars that we made at the hobby market the club then purchased a control automated technology 500 controller that I had on 146.730 VE3XTX repeater and a GE EXEC 2 repeater that was crystalled up for 146.940 This was installed on a two bay antenna just south of Owen Sound on a one hundred foot tower...A special thanks goes out to grey bruce communications (Jim VE3CRV and Don VE3IDS) for suppling a tower site on such a short notice of need....Ken VA3KMS and myself had put together a 440 repeater (442.350+) a while back on the same site..The repeater has not been used a whole lot, so Ken and I spoke about giving the 440 repeater to the club for the linking requirements needed to link the three club repeaters together...With the new club controller we will be able to run the 94 and the 440 repeater at the same time, and off the same controller with the capability of turning on the link or off the link...

Well, its looking great for the Wiarton Kepple Airport...For those who have not been in touch over the last few months, the airport in Wiarton which was owned and operated by the federal government was purchased by the Wiarton and Kepple township groups for a dollar and the new airport commission has approached the Georgian Bay Amateur Radio Club with the idea of setting up a club location at the new air port...At this time they are in the process of attempting to supply us with one of the 90 foot towers on the site....This is where the 145.290 Repeater would hang her hat... This would also (if every thing goes well) give us a location for a club station for special events and contesting...With our own office, this would give us a place to start to collect radio equipment for our very own club station...

The airport has already got things in gear , when the local wiarton scout group aproached the airport about holding jamboree on the air this year..The air port told them they would be happy to have the scouts on the 800 acre airport for JOTA and to help them out , give GBARC a call...I spoke with the scout master and told him that we the GBARC group would be able to help out...October 19 and 20th is the big days for JOTA...Lets show the scouts a great time and what amateur radio is about...I told them it was great of them to call and asked them how many boys were in their troup...The reply was that they have 13 boys in the group...I said that maybe some day it could be a big regional meet some time and he thought that would be great....As things went on, he asked about asking the Southampton troup up...I replied "great!". There is a a regional scout meeting in the next week or so and the invitaion from the Wiarton scout troup is going out to the regional scout troups...

Guys this might be a big one...Lets look good...Lets help these boys learn about the best hobby in the world...A hobby that can teach, history, geography, language, culture, electronics, and so much much more... By the time you get this, we will have had our Owen Sound Terry Fox run, and that it went over with a big success... Any way...I will close with a big hello and a see you soon...

See you at the September Club meeting at the Owen Sound Airport...

73 Bob VE3XOX

ATTENTION RADIO OPERATORS:
TAMPER WITH RADIO EQUIPMENT AND RISK JAIL SENTENCE

VANCOUVER, August 19, 1996 -- The Courts are sending a strong message to radio operators who tamper with equipment to broadcast on emergency frequencies: do so and risk a jail sentence.

That's what happened to Michael Courtney Johns when he was convicted of having amateur type radio equipment in his possession that was programmed to transmit on police frequencies. A provincial court judge sentenced him to two months in jail.

"Transmitting on emergency frequencies can mean the difference between life and death, not only for emergency personnel, but also for the civilians they are called on to rescue and protect" said Ian Spence, Lower Mainland District Director of Industry Canada. "A jail sentence in this case reflects the gravity of the offence and the potential danger of the activity."

The two-month jail sentence comes after a number of similar offences involving Johns. In 1994, his radio operator's certificate was suspended and then upgraded to a full revocation in 1995 when an investigation by Industry Canada found him to be possessing and operating radio equipment while under suspension.

Industry Canada is responsible for managing Canada's radio spectrum by planning for the utilization of frequency bands, assigning frequencies, issuing radio station licences and technical certificates for broadcast stations, and through monitoring and inspection to ensure that all users are operating within the terms of their authorization without interfering with other radio users.

A few notes from the editor

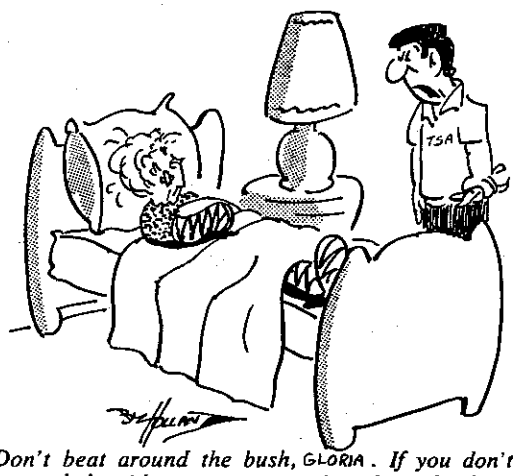
Hello to everyone, I hope you all had a nice summer, the weather certainly improved from what we had in June. I have 2 revisions to the club membership list and they are as follows. (these are address changes) VE3TTV 1855 3rd Ave West, N4K4R7 and VE3HMZ 785 21st St A East, N4K6T2.

Just a reminder that club dues can be paid at any time for the 96/97 year and are $20.00 if paid before Dec 31st.

73 and we'll see you at the September meeting .....editor

2 metre Net Schedule ... from VE3IOD

ve3iod-	sept5	nov28	feb 20	may15
ve3tsa-	sept12	dec5	feb27	may22
va3kms-	sept19	dec12	mar6	may29
ve3wud-	sept26	dec19	mar13	june5
va3jrf-	oct3	dec26	mar20	june12
ve3pck-	oct10	jan2	mar27	june19
ve3rhj-	oct17	jan9	apr3	june26
ve3xox-	oct24	jan16	apr10	
ve3ijd-	oct31	jan23	apr17	
ve3xkm-	nov7	jan30	apr24	
va3cjm-	nov14	14feb	may1	
ve3nbj-	nov21	feb13	may8	



"Don't beat around the bush, GLORIA. If you don't want to help with my antenna again today, why don't you just come right out and say so?"

Grounding Techniques for Radio Installations

by Gary Coffman KE4ZV

There are three main reasons to ground radio equipment.

1. Safety grounding to protect operators from accidental electrical shock.
2. RF grounding to prevent spurious and harmonic radiation and to enhance antenna efficency.
3. Lightning protection.

Each of these require different grounding technique. A careful analysis of the ground methods used is required to determine if all three objectives are met.

Safety grounding is in many ways the easiest criteria to meet. Simply bonding all equipment cabinets to the power company ground with conductors of low resistance and adequate current carrying capacity to blow the circuit breakers will meet safety requirements.

Effective RF grounding is often much harder to achieve. The ground path must not offer any significant impedance at the frequencies of interest. Since the frequencies of interest are often octaves apart, this is challenging. The frequencies of interest are the fundamental frequency of the transmitter, the harmonic frequencies of the transmitter, and any spurious frequencies the transmitter may generate. The latter is usually the toughest.

Grounding for lightning protection is difficult due both to the magnitudes of the voltages and currents involved and to the fact that the lightning waveform is a step function and has considerable RF energy.

Probably the WORST problem one faces in designing an effective grounding system is the prevention of GROUND LOOPS. Ground loops will cause unintended currents to flow in circuitry, often with disasterous effects. Either damage or degraded operation will inevitably be the result of a ground loop.

The best method of securing a good ground for a radio installation is to use a GROUND WINDOW. The ground window technique requires that every cable that enters or leaves the radio room pass through one small area where all ground connections are made.

The power company ground must be bonded to the ground window and surge suppressors such as those marketed by Lightning Protection Associates should be installed in series with the hot wires. Note that simple shunt protectors will not be sufficient to protect the equipment in the event of a direct lightning strike. Series protectors are designed to open the circuit under severe overload.

All coaxial cables must have their shields attached to the ground window and have their inner conductors clamped with an arc cartridge designed to fail shorted. In addition the inner conductor should be fused in a manner that will open the line when the arc cartridge fails.

Telephone cables must enter through the ground window and have their leads clamped with MOVs and arc cartridges that are designed to fail shorted. In addition all leads must be fused in a manner that will open the line when the arc cartridge fails.

Each piece of equipment in the radio room must be attached to the ground window by a wide heavy strap installed so as to be as short and straight as possible. Neatness definitely does not count here. Don't "dress" the ground cable, make it short and direct. Do not "daisy chain" grounds. Make sure that the only path from one piece of equipment to another is via the ground window. This means that interconnecting shielded cables should go from the equipment out to the ground window, have the shield bonded to the ground window, then return to the next piece of equipment. This is the only sure way to prevent circulating ground currents. .....*continued on next page*

Grounding Techniques for Radio Installations

by Gary Coffman KE4ZV

Now that every piece of equipment in the radio room is at the same potential as the ground window, the ground window must be brought to true earth ground. This is fairly easy for DC and low frequency AC, just make sure the cable is heavy enough to have the smallest possible voltage drop across it. For RF, inductance and resonance effects must be considered as well as skin effect. A wide flat copper strap that is routed as straight as possible to earth ground is preferred. For maximum lightning protection, the ground strap must never travel upward because the space charge will resist the current flow. Sharp bends will act as single turn inductances and should be avoided. Since a single ground cable will exhibit resonance at certain frequencies due to it's length, several ground cables should be used with each a different length. The lengths should be chosen such that a cable that is near a quarter wavelength at a given frequency will be paralleled by a cable that is near a half wavelength. In practice, several cables varying from the shortest possible length to twice the shortest length should be paralleled so that at least one will present a low impedance at any frequency. Do not coil the longer cables, instead fan them at the center point.

The method used to route cables down the tower will affect the degree of lightning protection achieved. If possible use a plumber's delight type of antenna that is dc grounded to the tower. Route the coax down the inside of the tower, and ground the shield of the coax to the tower at 6 points. This last will short out the single turn transformer formed by the tower and the shield of the cable. Unless this transformer is shorted, currents flowing in the tower to ground will induce currents in the shield of the coax.

The true ground must be more than a single stake driven into the earth. If the tower is ground mounted, use the base of the tower as the center of the ground field, otherwise drive an eight foot ground rod to form the center point of the ground field. Run radials out from the center of the ground field to a buried loop connecting a series of ground rods separated from each other by no less than eight feet. A minimum of eight rods should be used. If possible, the radials should continue outward for one quarter wavelength at the lowest frequency of operation. If your tower is not ground mounted, bring it's base ground back to the ground window using multiple lengths of cable as discussed above. Do not run a ground cable directly from the isolated tower to the true ground or a ground loop will surely be created that can allow damaging circulating currents to develop.

This all sounds like a lot of work and expense, but field experience has proven that a system like the one described will withstand direct lightning hits without loss of equipment, air time, or lives.

MOVE OF RAC HEADQUARTERS

Radio Amateurs of/du Canada is re-locating its administrative offices to Ottawa in October 1996.

From Monday, October 7, through Friday, October 18, the administrative office will be "dormant" while the telephone services and computer systems are transferred from the Kingston location to the new Ottawa facilities. The physical move will also be ongoing during that same period. Clubs requiring study materials for fall classes are "strongly" encouraged to get orders into the Kingston office early, to avoid shipping delays.

Please note the new address, NOT BEFORE October 15, 1996:

Radio Amateurs of/du Canada Administrative Office
720 Belfast Road, Suite 217
Ottawa,ON K1G 0Z5
The new telephone (613) 244-4367, after October 18.
The new fax number (613) 244-4369, after October 18.

73 de VA3RAC Steve VE3GRS

UPSs get smart..... from VE3IJD

As most systems managers know, UPS systems are intended to improve the quality of mains power to provide uninterrupted operation of mission-critical equipment.

To accomplish this, a UPS takes in standard mains power and provides two enhancements: power quality improvement and redundant (back up) power source. Power quality defects which may be improved by the UPS include surges, noise, or sags.

A UPS system provides redundant power by supplying the load with a primary power source and then providing a back up power source in case the primary source fails. In addition, it is widely believed that there are only two types of UPS systems, namely the standby type UPS and on-line type UPS.

However, many misunderstandings about UPS systems are cleared up when the different types of UPS topologies are properly identified. The main difference between the standby type UPS and the on-line type UPS is which power path is chosen to be the primary power path.

For standby UPS operation, the transfer switch is set to choose the filtered AC input as the primary power source, and switches to the battery/inverter as the backup source in case of the primary source failure (AC). For on-line operation, the transfer switch is set to choose the battery/inverter as the primary source, and switches to the input AC as the backup source in the case of a primary source failure (battery/inverter).

Historically, on-line systems have offered better sag protection yet have substantially decreased reliability. Meanwhile, standbys were smaller, less expensive, and dramatically more reliable. A recent development is the line-interactive UPS pioneered by APC Smart-UPS. This approach combines the best advantages of a classical on-line (extended brownout protection) with the best characteristic of a standby (reliability).

In the line interactive, hybrid design, the battery-to-ac power converter (inverter) is always connected to the output of th UPS. In addition the inverter provides filtering and regulation during normal operation even though it is not supplying output power.

The bottom-line benefit is superior performance without any sacrifice of reliability. With superior reaction, regulation for brownout conditions, redundancy which eliminates the potential of single point failure and effectively provides for two independent power paths, and 98 per cent efficiency, the line interactive design means better performance than on-line designs and better reliability than standby designs.

It is important to know these differences before purchasing a UPS to get the power protection needed for loads expected. However it is worth noting that buying any UPS strictly based on its topology is a mistake no systems manager should make, as overall quality makes much more of a difference in the actual performance of a UPS than does its topology.

An Uninterruptible Power Supply (UPS) has commonly been referred to as a battery in a box - a large piece of hardware designed to protect against power outages. But this is no longer the case. Today, UPS are "smarter" than previous models and are becoming an integrated network component capable of performing unattended automatic safe shutdown, enterprise-wide protection via SNMP, in addition to having the ability to monitor room temperature, and even informing users if a fire or unauthorised access alarm is triggered.

Just as UPSs have changed in the past few years so too have the needs of the network manager. First and foremost, while data loss is still to be avoided, downtime is now as important. When large financial institutions measure downtime in millions of pounds per minute, it is critical that all links on the network function flawlessly. Moreover, the current downsizing trend in corporate environments, from mainframes and distributed power to the adoption of server rooms requires that UPSs not only prevent downtime of mission-critical applications but also create more reliable paths of power. ..... continued on next page

UPSs get smart ..... continued

No longer do companies consider points of power, rather, paths of power. So the goal is not to just preserve data but to operate unaffected through a power outage. And this is accomplished by protecting the whole network, and the datacenter including bridges, routers and hubs. Only 53 per cent of midrange systems are protected by UPSs, versus 74 per cent of Lans.

Over the past few years, the demand for UPSs was ultimately created by network managers who wanted to be sure their Lans were protected. But that same demand for midrange systems has lagged behind. Again, the need to protect mission-critical applications whether it be an AS 400 or three workstations remains the same, 100 per cent uptime.

However, one of the biggest objections to midrange UPS products has been price. And when price is mentioned regarding midrange UPSs, systems managers are generally not talking about initial purchase price. They are instead talking about lifecycle costs - how much will the UPS cost to operate, to service, to replace batteries, and more.

Today, the UPS market is evolving from one of power protection to one of power management. The UPS is not only an outside peripheral protecting the computers data but has become an intelligent integral part of the network that it is supposed to protect; in a effect a power management tool. It communicates with the host computer, interactively, exchanging power information. In many instances, this information is available to a network manager in real time, resulting in immediate corrective action.

As a result of the systems manager's need for continuous operation at an economical price, American Power Conversion has introduced an innovative new approach to packaging midrange UPS protection. The new Matrix UPS is a modular approach to UPS protection that provides 100 per cent uptime, hot swappable components, low lifecycle costs and more. Sized for multiple server and midrange system protection, the new line interactive units are available in both 3000 and 5,000 volt-amp models, enough to protect multiple minicomputers and up to 30 file servers.

A basic Matrix unit is made up of three components. An isolation module with a mean time to failure of approximately 99 years, an electronics module with a MTTR of about 12 years, and external SmartCell battery packs with a lifetime of about six years.

Unlike conventional mid-sized UPSs, in which the load is at the mercy of the battery, Matrix moves the weak link to the isolation unit, effectively increasing expected MTTF to 99 years. And the modularity of Matrix allows the unit to be safely swapped-out or repaired on-site by an untrained employee without interrupting power to the loads.

In many existing mid-sized UPSs, a small internal failure can bring down the whole UPS, which then brings down all of the loads. Matrix solves this problem by isolating the failures to their 'block', which can be quickly diagnosed and easily swapped-out while the system remains up and running.

Because 100 per cent uptime is crucial for mission-critical applications, Matrix incorporates hot swappable components that reduces Mean Time to Repair (MTTR) from a matter of days or weeks to a matter of minutes. In addition, because downsizing means more and more unattended systems, Matrix allows full SNMP and local control via APC's SNMP adapter, delivering warnings regarding power events and UPS status to any NMS whether Matrix is located 10m or 2000 miles away. Downsizing also means attention to the bottom line, so Matrix delivers lifecycle costs half that of competitive brands.

What's next? As networks continue to expand and evolve, environmental control and further control of the physical layer of the network will become increasingly important. Though this level of security will be of paramount important, interestingly enough as the networks get larger systems managers will have less and less time and manpower to monitor power conditioning equipment.

Therefore, observers should expect the smart UPSs to become even smarter, fault tolerant UPSs to become even more fault tolerant, and sophisticated UPS software to become even more sophisticated. Contributed by Thierry Nicolet, APC Marketing Communications Manager *Submitted from the Internet,,, Gene, VE3IJD*

440-MHz Folded Dipole Repeater Antenna

Charles L. Kelsey WB2EDV
15 Blanchard St.
Mayville NY 14757

An antenna immune to almost all weather conditions, virtually static-free, and practically maintenance-free.

Commercial price tags and the unavailability in the 440-MHz range helped to prompt the home-brew construction of this 4-bay folded dipole antenna. The only array that could be located for amateur use was a dual 8-bay version that cost around $500.

The folded dipole is one of the most widely used antennas in the VHF/UHF public safety and commercial spectrum. One of the reasons for this is that the antenna is almost immune to lightning damage; another is that it virtually eliminates the static build-up problems common to other antennas.

Unlike many "dc-grounded" antennas, this one ensures that both the center conductor and the shield are at true dc ground potential for each radiating element. Other antennas that may show a dc ground with an ohmmeter may use phasing coils or other matching devices between radiating sections. Inductance is introduced and the static-reducing effectiveness is diminished. Gamma-fed elements are at ground, but the center conductor is not.

Each element in this array is uniquely designed to be 50 Ohms at the operating frequency. This makes it easier to modify the array to a one-, two-, four-, or eight-element configuration. I selected the four-element one because it gives considerable gain while still exerting good vertical beamwidth for use in hilly areas. Higher-gain antennas can actually perform more poorly for mobiles and portables at close range in some instances. Gain for the 4-bay array is approximately 6 dBd omnidirectional or 9 dBd for unidirectional radiation patterns. Vertical beamwidth is 15° for the half-power points. Power levels of up to 250 Watts can be used depending on the style of phasing harness used.

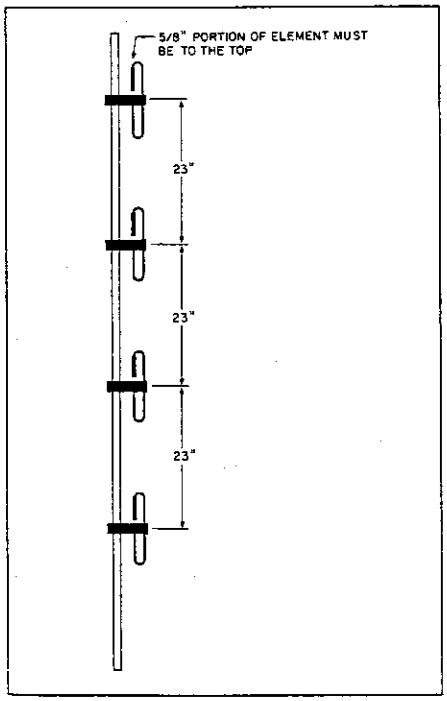


Fig. 1. Side-view diagram of the dipole mast and elements.

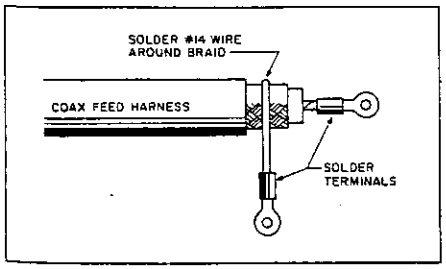


Fig. 2. Feedline attachments to the elements.

Construction

Construction of the antenna elements is much easier if you have access to a machine shop, and the necessary materials can usually be purchased there. A 3/8" and 5/8" solid aluminum rod was used for the radiating material and a 1" x 1/4" solid aluminum flat bar stock was used for the element support arm. Heavy duty materials not only provide strength, but insures that the aluminum parts will not warp from the heat when they are Heliarced together. The assembly was welded to eliminate noise generation from loose parts. Alloy aluminum (6061-T6) was selected because it machines well. Prior to welding, all parts should be completely cleaned with steel wool soap pads and water. Be sure to advise the person who is doing the welding what the alloy is.

Attachment points for the feed harness are made by drilling and tapping holes to accept 6–32 machine screws. The use of stainless steel screws and lockwashers is definitely recommended.

The element support arm should be drilled

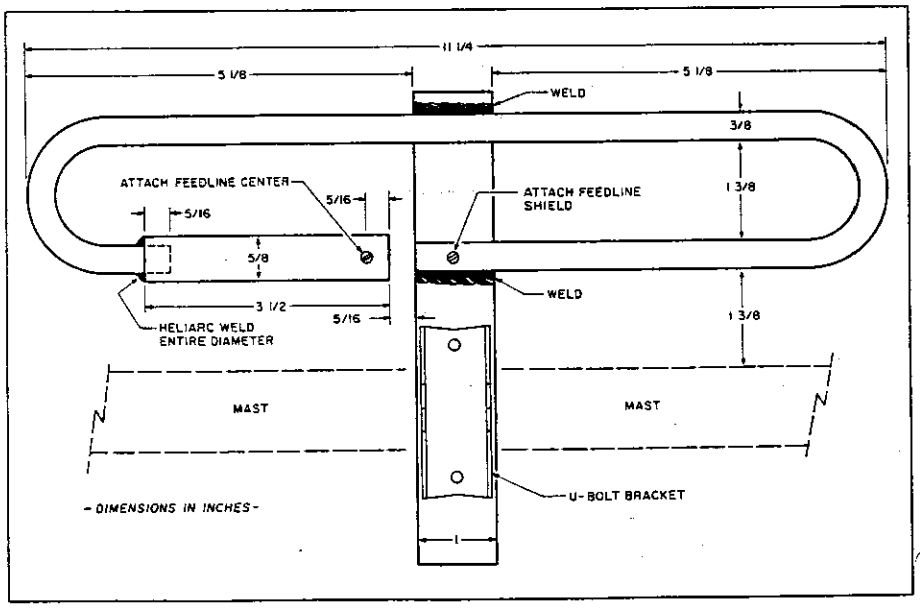


Fig. 3. Diagram of an element.

to accept an appropriate U-bolt and associated toothed bracket so that spacing is maintained (see Figure 1). This can be a little tricky because various diameter masts and U-bolts will change the spacing. Do not complete this step until the element is welded together. It is not known how critical this dimension is.

For the easiest element fabrication, the 5/8" section should be drilled in one end to accept the 3/8" material. The fit should be snug and the hole should be about 5/16" deep. This allows the 5/8" piece to slip into the open part of the element.

The builder has some options on the style of phasing harness to use. The original antenna utilized a 4-way power splitter which was put together using test equipment not normally available to most hams. Construction is not included in this article. KLM offers a similar unit which should work as well. A phasing harness can also be made with odd quarter wavelengths of 75-Ohm coax. This method is described in the *ARRL Handbook*, and in others as well. Remember that all elements must be equal lengths of 50-Ohm cable if a 4-way power divider is used. Excess cable can be attached to the mast. The divider is best positioned at the middle of the array to minimize cable lengths. It is best to use an RG-8 "flooded-braid" to help keep water from migrating up the shield. A flooding compound is put in the braid by the manufacturer to accomplish this. In any case, the ends of the cable must be weatherproofed, particularly where they attach to the elements.

Crimp-on ring terminals should be used to attach feed-line to each element. Prepare the end of the cable in the same fashion you would to attach a PL-259 connector. Use a piece of 14-guage copper wire to encircle the braid, and solder it all the way around the coax braid. Install a ring terminal to the end of the wire and put another terminal on the center conducter. Solder all terminals and position them so as to put the least amount of strain on the assembly. Weatherproof with *good* grade black vinyl electrical tape such as the Scotch 33 Plus. Stretch the tape slightly while applying, making sure to release all the tension during the last four or five windings down the cable. Additional heat-shrink tubings would not hurt, either. If you choose to use nylon cable ties to attach the feedlines to the mast, make sure that they are rated for outdoor use. Otherwise, use black vinyl tape over the each tie so that it will not deteriorate from ultraviolet light.

The array should be mounted on a mast, this then becomes part of the antenna. Masting must extend above and below the top and bottom parts of the elements by at least a few inches, at least six inches on the top if the antenna is to be top-mounted. I suggest galvanized pipe for top-mounting. If the antenna is mounted on the side of a tower, a piece of electrical conduit can be used and bent with offsets at each end to allow for top and bottom attachment to the tower leg. Spacing between mast and tower is 1/4 wavelength.

Spacing between the elements is 23" center-to-center. When attaching the element to the mast, the mast should be on the same side of the support arm as the element rod material. Make sure that all the elements have the 5/8" diameter part at the top. In tower side-mounting, the elements align one over the other, and face away from the tower. Top-mounted installations for omnidirectional coverage should have the elements arranged around the mast in 90° increments. I don't recommend this configuration.

Comments

Vswr across the band should be 1.5:1 or less. The bandwidth is at least 20 MHz wide.

In constructing the elements you should use the exact dimensions shown in Figure 3, since any deviation may produce an undesired effect. Most of the engineering in this project was trial and error rather than design.

The prototype was placed in service in the summer of 1986 and has performed beyond expectations, and the winter weather conditions at the site are harsh, often with seventy mile/hr winds and snowdrifts of up to 15 feet. Still, I expect several maintenance-free years out of it.

Thanks go to the following people who provided construction assistance: Phil Hiller WA2EQX for masting and installation; Jon Henning WA2BTW for the power divider and for providing test results; and Dan Wood and Dave Nelson for prepping and welding the antenna. ■

"No matter what the project he's working on is supposed to be—it ends up being a light dimmer."

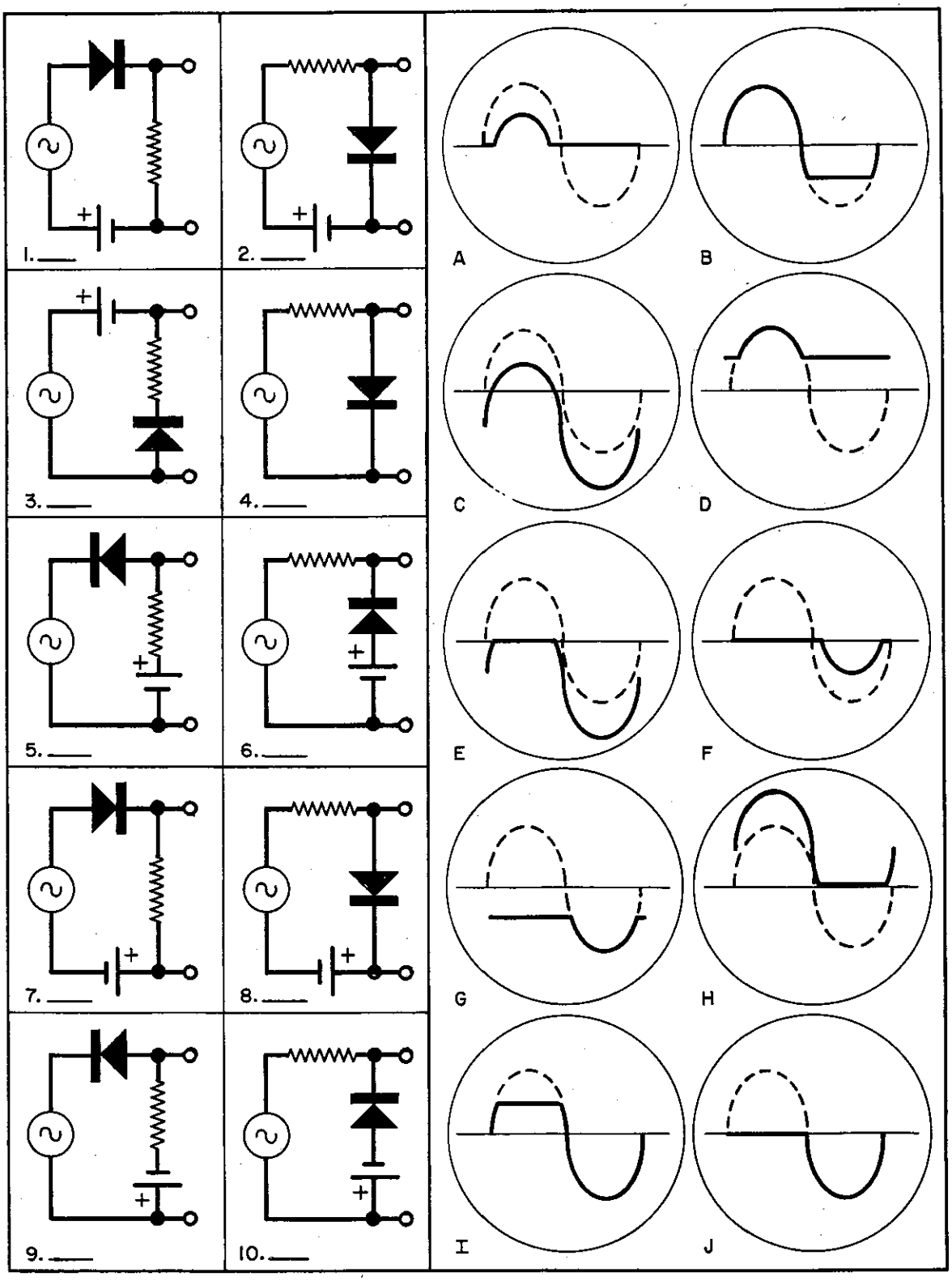
CLIPPER CIRCUIT QUIZ

BY ROBERT P. BALIN

A SIMPLE circuit consisting of a diode, resistor, and battery can be used as a clipper or limiter, or to shift the zero reference level of a waveform. Just what a particular arrangement will do is predictable if you observe the polarity of the net circuit voltage, diode biasing, and each voltage drop.

See if you can match the output waveforms (A-J) with the circuits (1-10) below. In each case, the input is a sine wave with a peak voltage twice the cell's voltage. The resistor is large compared to the forward resistance of the diode yet small compared to its reverse resistance. The dotted lines represent the undistorted output waveform.

Hint: Assume a cell voltage of three volts and see what happens as the input sine wave goes to +6 and −6 volts in 1-volt steps.



Answers: 1-H, 3-C, 5-I, 7-A, 9-G, 2-F, 4-J, 6-D, 8-E, 10-B