Carolina DX Association

DXers

The Pileup

Newsletter of the CDXA

April 1997

AA4R Bill Parris — President
W4WN Cliff Wagoner — Vice-President
K4MQG Gary Dixon — Sec.-Treasurer
K4ZA Don Daso — Editor

THE PRESIDENT'S PAGE

Well, another successful Charlotte Hamfest is behind us. Thanks are due to many who assisted at our CDXA booth, participated in forums, and attended the hospitality evening at Valentino's.

Our booth drew lots of visitors this year. The slide show presentation Jim Long, K4UHL, put together received lots of comments from folks who stopped to view the station setups of the CDXA. Cliff Wagoner, W4WN, managed to keep the PacketCluster display station connected to the network the entire weekend, which was also responsible for drawing folks to our booth. ALL of the extra newsletters and handout materials put together by K4ZA were gone by mid-Sunday morning. Nine all-time-new members joined the CDXA, so we must have put together a good booth! Again, thanks to these members for helping to promote our club.

Bob Southworth, KI4YV, won the GPS in our first-ever CDXA raffle. Thanks to K2SD for purchasing the unit and selling tickets during the weekend.

The Heard Island (VKØIR) Forum was the obvious DX highlight of the weekend. Several of "the deserving" were pleasantly surprised to receive small bagged samples of actual "volcanic dust" from Heard Island during the presentation. The slides and video were very well done, and received a standing ovation from the crowd.

The contest season drew to a close (at least until this fall) with a CDXA spring fling at N4ZC's station in the CQ WPX contest. Using KU4V's callsign, the gang ran up what appears to be a third place finish in the always-competitive multi-multi category. Roger and Don were especially pleased to be within 300,000 points of last year's winner, WZ1R, up in New England. Besides N4ZC, K4ZA, KU4V, KF4HK, and W4WNT, the guys enjoyed help from WA4PXP and KZ2I, who've recently moved to Charlotte. Both were enthusiastic about Roger's station and the contest. "I hope they're already thinking about CQ World Wide!" says Rog.

Other recent club contest activities include: AA4S (with K4ZA) in the 160 phone festivities, and WA4ZXA in the same contest, running up a FB low-power score.

As spring begins in earnest, winter-time thoughts of antenna improvements and tower projects will become reality. There always seems to be work to be done on antennas. As always, plan your project carefully. If you have any questions, or concerns, about anything at all, just give a yell on 147.18. You'll find more-than-willing advisors who can probably provide the answers you need. And, as always, safety should be the watchword of any tower or antenna project.

I hope you will try to join the Shoney's Wednesday lunch group at least once this month. Cliff, W4WN, is planning to show the video of the last South Sandwich DX-pedition one Wednesday this month. If you're there, you can enjoy the show, the food, and some CDXA camaraderie.

As always, good DX!

—AA4R

EDITORIAL

Lately, I've been encountering lots of conversations about the Internet. Some have even included references to ham radio. Namely, that ham radio will die "a natural death" because the Internet makes it obsolete. Old-fashioned, out-dated, out-witted, out-moded, etc., *ad nauseum*. I don't think such reasoning valid. Here's why.

First, an "apples and oranges" comparison seems particularly apt here. Radio is radio—it's wireless, dependent upon several things beyond our control or ability to change. The Internet, despite all its charms and capacity to fascinate, remains related to that old nemesis of an uninterrupted dinner, the telephone.

The real crucial difference, it seems to me, is that the Internet, because of this connection, may someday simply become as commonplace as the telephone—invisible, effortless, and ultimately un-satisfying. Radio, on the other hand, is audible, demanding, and mutable. Radio is romance. The Internet is a science fair idea all fleshed out, bought and paid for by the phone company. Radio is adventure. The Internet is research. Radio is transmission and reception. The Internet is typing school. Radio is magical. The Internet is more like work, or school, or the task at hand.

Yet the culture of "the Net" seems closely allied to our own hobby—legions of followers, some of whom are dedicated and devoted to the idea of playing with wires, circuit boards, ICs, modems, and so forth. They're modern masters of a simple kind of "do it yourself" technology. You can find any number of fascinating crossovers: bulletin boards, web sites, reflectors, newsgroups, and so forth. Yet you can also find many voices of concern over this latest technological marvel.

The question we must ask, of course, is "Where does the Internet leave ham radio?" And we must ask it without reducing the issue to one of Morse code requirements, or knowledge of computer operation versus radio skills, or any other overly-simplistic thinking.

It comes down to a question of pride, I think. Radio, in its earliest days, used Morse, which required study, effort, diligence, a commitment. The technical knowledge and skills needed to communicate were significant. The equipment could be home-made, and often was. Indeed, it usually had to be home-made. No other resources were available. There's little of this attention or dedication associated with computers or the Internet. The ads fairly scream features at you, all offered at amazingly low prices, and the computers come pre-loaded with enough software (thank you, Mr. Gates) to manage a third world country. All you have to do is...start typing. After you've hooked everything up to the telephone, of course.

Yet the sheer numbers, the scope and size of this giant communications "network," should make us stop and think. Might ham radio not appeal to some of them? Might our hobby not benefit if we could somehow demonstrate it? The rhetorical nature of such questions—indeed, the evangelical nature of this language, as well as the process itself—demand our attention.

Today, the Internet is used by a vast variety of hams in talking about our hobby. Some of the pages and sites I've visited on the World Wide Web do a good job of introducing and explaining our hobby. What it is we do, and why, and where the reader can go for further information. I only hope that such readers eventually become listeners—hams themselves.

–K4ZA

You tend to remember your own mistakes, although the process is sometimes painful, & sometimes costly. Learning from the mistakes of others is easier, & usually less traumatic. This treatise on fasteners is meant to inform you about some things we all take for granted during typical antenna & tower projects. It's stuff I've learned both ways—from a Midwestern farming boyhood, up through 34 years of ham radio, into college & beyond, to last week on the Internet. Herewith...

A TREATISE ON FASTENERS

There are bolts, & there are screws. Bolts are held in place by nuts; screws are threaded into one part of the pieces being fastened together. The bolt is held stationary, & tightened by turning down the nut. Screws, of course, are tightened by turning the screw head itself. In other words, the application determines the correct terminology. For reference purposes, take a look at *Figure One*:

Plain talk about threads. The helical screw thread is amazingly versatile—several different types are found in widespread use. The Acme thread, for instance, is a square form thread used on lathes & milling machines to provide straight, directional motion to various sliding rods & cutting heads. A buttress thread is designed to withstand severe stresses parallel to the axis of the thread itself. You can find this thread on hose clamps, for instance. Self-tapping sheet metal screws & wood screws come in a variety of threads—without any sort of standardization. All are specialized to suit different materials as well as assembly methods. One of the first things you notice about bolt threads is that they come in two basic types: fine pitch & coarse pitch. Each has its place in the world of fasteners. But there is no measurable difference in fatigue resistance between coarse & fine threads. (As usual, a World War was required to achieve something akin to standardization among nations regarding screw threads, along with calibers of weapons. Interesting history, if you like that sort of thing. By 1948, the militarily-derived unified fine & unified coarse threaded series, to include a thread angle of 60 degrees, had become that standard.)

Bolt functions. After a few words on threads, let's examine the function of the bolt. Let's start with what a bolt is designed to do. Here, it may help to look at *Figure Two*, if you haven't got a bolt in your pocket to examine while you're reading. First & foremost, bolts are meant to hold parts together. That's all. They are not designed to serve as pivots, rotational axles, fulcrums, or anything else. They should not be used to hold parts in place, either. In other words, bolts should not be used to prevent clamped-together pieces from sliding or moving on or against one another. (For the record, this is what dowels, pilot pins or keys are intended for....) Bolts are meant to be used as clamps. And only clamps. Clamps, of course, must remain tight, under all sorts of loads, vibration, & stresses. A loose bolt's obviously a poor clamp. A loose bolt will fail, & fail quickly. You may ask: "Okay, what keeps a bolted-together joint tight?" First, here are some things which do not keep bolted-together joints tight: lock washers, Loctite, safety wires, cotter pins, or even elastic stop nuts. This is not meant to demean those parts or products. Or even to condemn modern engineering practices. Which might lead you to infer the mechanical world is about to collapse—if you take my statement literally. But what I mean is that in the workaday world, it's simply not practical to clean & torque every single bolt to precise standards. Often, it's not necessary, either. But if bolts are meant to clamp things together, then the bolt will be internally stressed in tension. Tightening a bolt to a specific torque value actually stretches it & loads it in tension to a set level of stress. A properly torqued bolt will have the most resistance to a given load for the greatest amount of fatigue cycles. Understressed bolts will loosen under load, & fail. Overtightened bolts will fail during installation, or prematurely under stress. What's this mean, in practical terms? As you tighten the nut onto the bolt, the bolt itself stretches. Male threads elongate; female threads compress. This creates an interference condition which resists loosening. (Plating, the lack of lubrication, length of the threaded area, all contribute to making this seemingly simple task, in a word, difficult.) Normally, this won't affect your tower or antenna project. If you're an engine builder, you better believe you'll be measuring things like connecting rod bolts for stretch after installation.

Identification. Hams often walk into their friendly hardware or home supply store, buy some fasteners to solve their installation problem, & happily go on hamming. Sometimes, they're disappointed. Either with the strength of the materials, plating (or lack of it) & wear, or something else. Mostly, this is simply a lack of "bolt education," which we're trying to overcome here. Check out *Figure Three*, which is a chart of identifying marks for SAE & airplane industry bolts. Whenever possible, you shouldn't be using anything less than Grade 5 bolts on towers, beams, & rotators. That hardware store stuff isn't heat-treated, & typically, the plating will rust through in a few months of exposure. Stainless steel fasteners (more on stainless later) are recommended for most applications. (A few words on hose clamps, which are also stainless, & come in two types. One is labeled "stainless" but uses a plated screw, which will rust in what seems like a matter of minutes. Search out the type labled "all stainless." And try to use clamps with similar-sized hex head screws. That way, you can carry one drive socket, usually 5/16-inch & do everything. Typically, you can clamp anything from 1/2 to 3/4-inch tubing with this one #6 size clamp.) Enterprising hams, believing they're "using the very best," will search out Grade 8 bolts. These are very strong, indeed, but their heat treating makes them very brittle. Unless specified (for base mounting use, for instance) by the manufacturer, I wouldn't bother with them. Which brings up the idea of buying surplus fasteners. It's not worth it. Unless you know absolutely what you're doing (this includes having a micrometer in your hand), it's not worth it to risk life & limb to save a few cents, literally. Counterfeit fasteners are big off-shore business. If companies like Boeing & NASA can be taken in (& they have), Joe Ham will easily be fooled in the surplus store. Now, those few words on stainless steel...a ferrous alloy. The American Society for Metals (ASM) defines stainless steel as any alloy containing at least 10% chromium, with or without other elements. Alloy 304 is an austenitic stainless alloy (one of the most common of the four types), & the non-magnetic alloy you'll usually find. Alloy 304 has excellent resistance to corrosion. The ASM publishes volumes on metals; it's a vast topic, if you're interested. What most hams don't know (having run down to Home Depot for some stainless hardware) is how to install it. Stainless will "gall" as you tighten it—meaning the threads will bind. Galled threads will stick, & the fastener is then useless. Simple lubrication before assembly will prevent this. I like to use a tube of "LubeGel" which contains teflon. It's small & easily carried in my tool pouch. The gell doesn't get all over everything, like spray lubricants, either. (But a small WD-40 spray can always goes up the tower in my tool pouch. It's so convenient.) Stainless isn't very strong. For critical use, (like the tower itself) stick with Grade 5 hardware.

Rivets, tubing, & corrosion & a wrap-up. Some hams frown on the use of rivets. However, any fastener suitable for aviation & aerospace use (glance out the window the next time you're waiting to take off), can be used on a beam. Pop rivets (the most common variety) are available in various combinations. I recommend the all-aluminum or all-stainless rivet. Invest in a quality rivet tool—as you should with all tools. What makes blind or "pop" rivets work so well in fastening element or boom sections together, for instance, is that they expand to fill the hole. Unlike bolts, which must pass through slightly undersized holes, rivets will expand. I recommend NOT buying rivets from the local hardware store. The blister pack variety are not very strong. Buy Cherry or Avex brand rivets from a fastener supplier. The holes for rivets should be de-burred (hard to do inside an element or boom) to ensure proper seating. More importantly, if you want to realize the full strength of a rivet, the maximum rivet diameter should be 2 to 3 times the work thickness. Tubing, suitable for antenna building, can usually be found in most large cities simply by searching the Yellow Pages. Supplier catalogs can be an education. Tubing is available (in 12-foot lengths) in diameters which increase by .125 (or 1/8-inch), with a wall thickness of .058, providing telescoping fits. Catalogs will list the various alloys available. Usually, you'll be looking for 6061-T6 or "aircraft aluminim" types of alloys. Joining metals, like aluminum, for instance, can be a joy. Its precision nature & ability to be cut or machined "to size" is part of that joy. Joining dissimilar metals can be without joy. All metals have an electolytic potential. Joining them requires you counteract this potential—otherise you've installed a "battery" high in the air, which gradually loses material & strength. Nowadays, the use of "No-Al-Ox" or "Penetrox" lubricants is standard procedure when building beams or tower sections. Not only will such greaselike lubricant prevent corrosion, you can get pieces or sections apart when you have to....

This treatise serves as a short introduction to the mechanics of fasteners. Hopefully, it will cause you to reconsider some of what you may have taken for granted over the years. Hopefully, it will thus save you both time & money. Hopefully, it will have been an education, too!

In future issues of *The Pileup*, further treatises on fasteners....

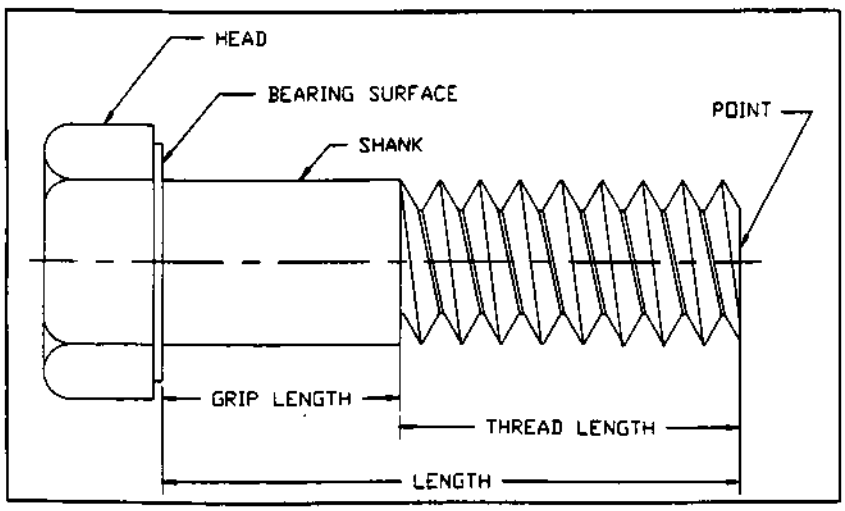
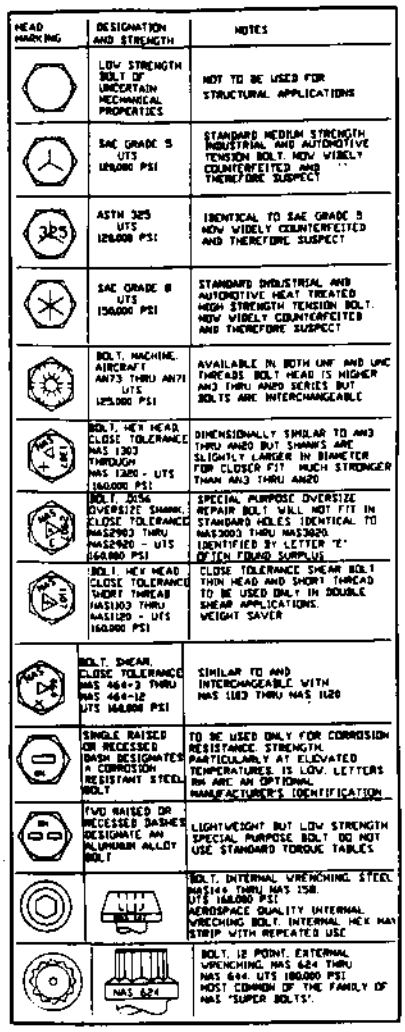
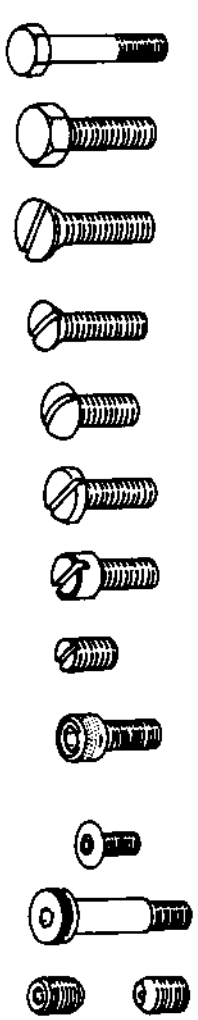


figure one



HEAD MARKING	DESIGNATION AND STRENGTH	NOTES
	LOW STRENGTH BOLT OF UNCERTAIN MECHANICAL PROPERTIES	NOT TO BE USED FOR STRUCTURAL APPLICATIONS
	SAE GRADE 5 UTS 120,000 PSI	STANDARD MEDIUM STRENGTH INDUSTRIAL AND AUTOMOTIVE TENSION BOLT. NOW WIDELY COUNTERFEITED AND THEREFORE SUSPECT
325	ASTM 325 UTS 120,000 PSI	IDENTICAL TO SAE GRADE 5 NOW WIDELY COUNTERFEITED AND THEREFORE SUSPECT
	SAE GRADE 8 UTS 150,000 PSI	STANDARD INDUSTRIAL AND AUTOMOTIVE HEAT TREATED HIGH STRENGTH TENSION BOLT. NOW WIDELY COUNTERFEITED AND THEREFORE SUSPECT
	BOLT, MACHINE, AIRCRAFT AN73 THRU AN81 UTS 125,000 PSI	AVAILABLE IN BOTH UNF AND UNC THREADS. BOLT HEAD IS HIGHER AND THRU AN20 SERIES BUT BOLTS ARE INTERCHANGEABLE
NAS	BOLT, HEX HEAD, CLOSE TOLERANCE NAS 1303 THROUGH NAS 1320 - UTS 160,000 PSI	DIMENSIONALLY SIMILAR TO AN3 THRU AN20 BUT SHANKS ARE SLIGHTLY LARGER IN DIAMETER FOR CLOSER FIT. MUCH STRONGER THAN AN3 THRU AN20
NAS	BOLT, 3056 OVERSIZE SHANK, CLOSE TOLERANCE NAS2903 THRU NAS2920 - UTS 160,000 PSI	SPECIAL PURPOSE OVERSIZE REPAIR BOLT. WILL NOT FIT IN STANDARD HOLES. IDENTICAL TO NAS3003 THRU NAS3020. IDENTIFIED BY LETTER 'E' OFTEN FOUND SURPLUS
NAS	BOLT, HEX HEAD CLOSE TOLERANCE SHORT THREAD NAS1303 THRU NAS1320 - UTS 160,000 PSI	CLOSE TOLERANCE SHEAR BOLT. THIN HEAD AND SHORT THREAD TO BE USED ONLY IN DOUBLE SHEAR APPLICATIONS. WEIGHT SAVER
NAS	BOLT, SHEAR, CLOSE TOLERANCE NAS 464-3 THRU NAS 464-12 UTS 160,000 PSI	SIMILAR TO AND INTERCHANGEABLE WITH NAS 1103 THRU NAS 1120
	SINGLE RAISED OR RECESSED DASH DESIGNATES A CORROSION RESISTANT STEEL BOLT	TO BE USED ONLY FOR CORROSION RESISTANCE STRENGTH, PARTICULARLY AT ELEVATED TEMPERATURES. IS LOW. LETTERS RM ARE AN OPTIONAL MANUFACTURER'S IDENTIFICATION
	TWO RAISED OR RECESSED DASHES DESIGNATE AN ALUMINUM ALLOY BOLT	LIGHTWEIGHT BUT LOW STRENGTH SPECIAL PURPOSE BOLT. DO NOT USE STANDARD TORQUE TABLES
		BOLT, INTERNAL WRENCHING, STEEL NAS144 THRU NAS 158. UTS 160,000 PSI. AEROSPACE QUALITY INTERNAL WRECHING BOLT. INTERNAL HEX MAY STRIP WITH REPEATED USE
	NAS 624	BOLT, 12 POINT, EXTERNAL WRENCHING. NAS 624 THRU NAS 644. UTS 180,000 PSI. MOST COMMON OF THE FAMILY OF NAS "SUPER BOLTS".

figure three



Hex head bolt

Set screw
Hex head cap screw

Flat head screw

Oval head screw

Round head screw

Pan head screw

Cheese head screw

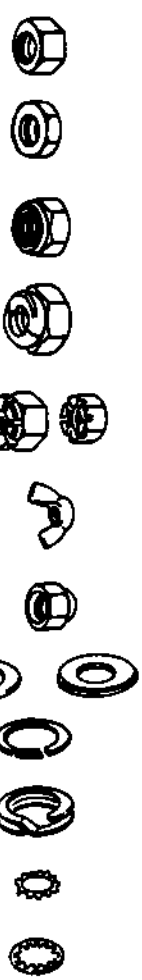
Slotted set screw
Grub screw

Allen bolt
Socket head bolt
Internal wrenching bolt

Button head screw

Socket head shoulder screw

Socket set screw



Hexagon nut

Low hex nut
Shear nut
Jam nut

Nylon ring elastic stop nut

Castellated nut
Slotted hex nut

Wing nut

Acorn nut
Dome nut

Flat washer (plain and chamfered)

Lock washer (split)

Lock washer (double split)

Star washer (external teeth)

Star washer (internal teeth)

figure two

A SIMPLE DX ANTENNA FOR 160 METERS

Horizontal antennas at the 120-foot & lower levels are poor DX antennas on 160 meters. The center of vertical radiation is at 90-degrees, straight up. On top band, 120 feet equates to a ¼-wavelength above ground. A vertical antenna radiating vertically polarized power is needed to give the lower angles of radiation needed for DX work. This article presents a simple antenna which gives that result without requiring a dedicated ground radial system.

Here's what IS needed: 260 feet of insulated wire, a tall tree or support, a matching network, & some coaxial cable to reach that network. Using a ½-wavelength of wire minimizes the need for radials necessary for proper efficiency with ¼-wave radiators, like the inverted-L or ¼-wave vertical. A half-wave antenna has its current loop in the center of the antenna, with the current decreasing to zero at the ends of the antenna. Remember, it's the current that provides the radiating effectiveness of an antenna.

The Lazy-U is aptly named; it looks like the letter "U" lying on its side. The vertical portion should be the middle of the half wave. It should also be as long as possible, so use the highest support you can find. The minimum height should be about 35 feet. I use an 80-foot tulip tree.

As the drawing indicates, we have the vertical portion running from the top of the tree to about five feet above the ground, & two other lengths, one at the top & one at the bottom of the antenna. If the two lengths were stretched out horizontally—one above the other—their radiation will tend to cancel, leaving only omnidirectional vertically polarized radiation from the vertical portion. That arrangement requires a second tree to support the top horizontal portion.

It that's not available, the top portion can be pulled down at an angle, with the limiting angle being the end anchored by a two or three foot stake in the ground. This point will be hot with rf (high voltage on a ½-wave antenna is at the ends), so protect it from any possible contact. There will no longer be total cancellation of the top & bottom wires in this case, & there will be a directional effect with a 3 db improvement in the radiated signal in the direction of the open side of the vertical portion. In this case, the lower wire should be stretched away from the back wire, and supported 5-6 feet above the ground.

Property limitations at my place require my bottom section to be oriented 90-degrees from the top wire. That produces a slight distortion of the horizontal pattern, which isn't noticeable in use. The lower wire can be placed in almost any position with only minor distortion of the pattern. The vertical section should be as long as possible; the rest of the wire is simply to make the total length ½-wavelength.

I use #12 stranded house wire for the antenna. This wire can be purchased inexpensively at your local home improvement warehouse in a variety of colors. (I use green so the antenna blends in with the trees.) I tie an insulator at the top of the vertical portion so as I pull up the wire, it stops at the top limb. The 260-foot length is approximate; the matching network is adjusted for minimum SWR for the given length. A ratio of 1.2:1 should be possible over most of the band. With my network tuned for 1850 KHz, I can operate my TS-850 & linear from 1800 to 1925 with minor re-tuning.

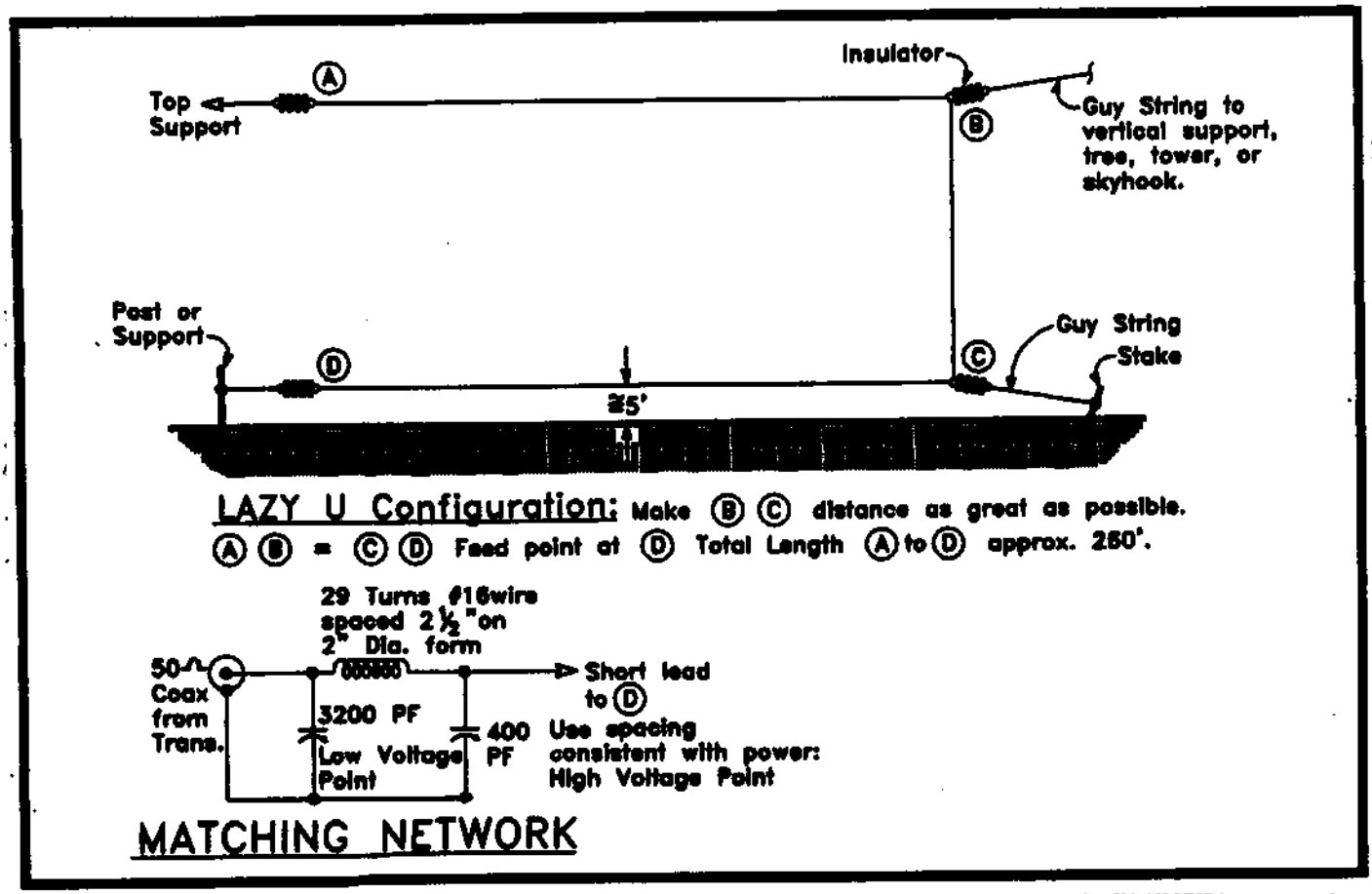
As with most antenna articles, I'll share my success with this one. I've worked 124 countries on 160; I've worked all states with it. It's so easy & so simple to tune up that I take in the matching network each spring (I don't like the band during the noisy summer months.) It's a simple antenna, but it gives outstanding results. I think you might enjoy it, too! If you have any questions, please contact me directly: n4uh@juno.com or via the good old US Mail, using: N4UH, 2701 Rary Road, Cleveland, NC 27013.

—N4UH

The Back Page

A SIMPLE DX ANTENNA FOR 160

Illustration by Mark Barrera Corporate Media Services



PACKETCLUSTER NEWS

CDXA has a database of member roster information on our PacketCluster system. You need to be connected to K4MD, K4PC or N4ZC for it to work. Type SH/ROSTER <callsign>, for instance: SH/ROSTER N4ZC

Please take time to look at your own roster information to make sure it is correct with the command SH/ROSTER <your call>. And if it's not correct or none is listed, type the command UPD/ROSTER <enter> while connected to K4MD, K4PC or N4ZC. Follow the prompts as the computer asks questions. Give it a minute for your node to transmit the data to K4MD and use the command SH/ROSTER <your call> to make sure everything's correct.

If not on packet, send full name, address, telephone number, e-mail address, past callsigns, year first licensed to N4ZC, who will enter the data for you.

And, finally, Joe, K4MD, has been the CDXA guinea pig in getting 9600 baud working on our PacketCluster system. Joe now has both 1200 and 9600 baud working with the same radio on 441.075 MHz. You can connect to Joe using either baud rate on this frequency. The next step will be to get the N4ZC node running at both baud rates on his 441.0 MHz frequency.

–N4ZC