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- SW-2000 SWR/power meter
- SW-100A SWR/power/volt meter
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CQ The Radio Amateur's Journal

ON THE COVER: The man behind the contesting legend, Hazard "Buzz" Reeves, K2GL. There are a lot of antennas at this Tuxedo Park, New York QTH and a very impressive radio room, plus the "K2GL Team" to account for those high scores. Photo by Larry Mulvehill, WB2ZPI.

APRIL 1985 **VOL. 41, NO. 4**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

After the ice-age temperatures in Chicago, it was a double pleasure to be heading to Miami for the 25th anniversary celebration of the Tropical Hamboree. We arrived for their first warm week in a long time, so everyone was basking in the warmth. The weather was perfect.

There were two exhibits that were especially interesting in that they attracted the younger attendees. The AMSAT display was located in the fleamarket downstairs, which is partly outdoors. They had several *working* stations for anyone to use to make satellite contacts. Obviously they had planned ahead, and through the cooperation of several manufacturers they had obtained various brands of equipment on loan for the setup. They also had their own members' gear on display and the personnel to explain and help with operating it. The picture shown here was taken early on during the show before the crowds descended on the fleamarket. After that, all you would have seen in the pictures were backsides. It's a situation that's hard to resist—working gear that you're actually encouraged and invited to try. It was a good idea that really seemed to work. Making a satellite contact was no longer an abstraction or something someone else was doing; you were actually doing it yourself.

The other exhibit that attracted a lot of young people, and perhaps the only kids that I saw there, was located next to the *CQ* booth. Big Al's Electronic Trading Post is a local Miami dealership in new and used computer equipment. They had two computers running both days, which attracted kids like a Pied Piper. You could see kids literally dragging their parents by the hand to see what was going on. One computer was running a graphics program of space shuttles, and the other was a flight simulator whereby you could "fly" your own plane from here to there. Like the AMSAT booth, this display had something to react to and participate in. The degree of equipment sophistication and special knowledge requirements was not a barrier or hindrance to "trying it out."

Where does one go to "try out" amateur radio? Where do you have to be in the first place to know that such a thing even exists? Those are the problems that need addressing. There are plenty of amateurs who will state emphatically that if anything, there are too many amateurs and we need more amateurs like Custer needed more Indians. Well, if you want to be short-sighted, selfish, and naive, you can ignore the fact that the median age of amateurs is rising and eventually there will be no replacement population. We could "age" ourselves out of existence without government edict, providing they would let us wallow around that long using up precious spectrum.

"Pardon my back." The one open position is about to be occupied by this passing visitor to the AMSAT booth in Miami. The "try it out" approach really worked.

On the other hand, you can recognize that the amateur radio service is important to us now *and* as a resource for the future. What the service eventually evolves into is really not important to the here and now, just as it wasn't important in the '20s and '30s. The fact that it was around long enough to evolve is important. I doubt that the diehards of the '20s would approve of what we have now. What we have achieved is all the justification one needs. The careers, the technology, and the electronics industry itself were all born from an idea and a basic desire to communicate.

Somehow, or by some indirect process, we were made aware of this thing we call amateur radio. Somehow we managed to survive the weeding out process that pitted us against the "old timers" of the day who really didn't want us in their clubs or taking part in *their* activities. Somehow we got our parents to take us to meetings or drive us downtown to sit for a license exam. Somehow some of us equate that with building character and deserving membership in the "I got mine" club. All it really did was leave a lot of very nice people out in the cold. There were and still are too many "somehows" with which to contend.

Well, the first "somehow" with which to contend is how do you make people aware that there is something called amateur radio? You could wait to be asked, but that could take forever. You have to talk about it in the same positive way that one talks about any hobby, sport, or pastime. Think back. Wasn't that what happened when you heard about amateur radio, or do you think you invented it? What was said, and how was it said to trigger your imagination and make you start asking questions?

The key to getting someone else started in amateur radio is probably the same key that got you started. You had to see or hear something. If an amateur has an indoor antenna and no call-letter license plates or imprinted tee-shirt and cap, then there's nothing there to start the process other than what he says. If the same amateur is wearing his imprinted tee-shirt and cap while installing a few mobile antennas on his call-letter emblazoned car and is sporting several HTs hanging from his belt, then you can bet it will pique someone's curiosity. However, most of us do not appear as obvious in public.

How did you handle your neighbor's reaction to your putting up your first antenna? "I like to listen in to the BBC." "It's sort of like CB but different." "It's not me; it must be some CBer in the neighborhood." Typically, we all avoid just what the antenna is, what it is used for, and how we use it. We hope and pray that they don't even notice it. Another big "somehow" is that we somehow avoid talking about amateur radio in this situation, and by so doing we avoid an opportunity to invite them in to help "try it out."

The ARRL mandate of 50,000 new amateurs will not happen directly from anything developed in Newington or even Hicksville. It will happen and can happen from your efforts. This is not to disparage the League nor its ability, but a single organization or group of organizations cannot do it by themselves. We got into this thing called amateur radio one at a time because someone reached out to us one at a time. It is going to take a lot of effort by individuals, clubs, the League, and everyone who wants to see amateur radio grow, prosper, and be there to foster the future generations of amateur radio enthusiasts. 73, Alan, K2EEK

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CIRCLE 6 ON READER SERVICE CARD

Our Readers Say:

Green Keys Don't Compute

Editor, *CQ:*

I am a newcomer to the HF bands, and I want to thank your magazine for all the help it has given me all the years I have been a subscriber. The RTTY special issue (November 1984) arrived last week, and like previous RTTY issues, it was special for me. My main interest is RTTY and I use an old machine, mainly because I like them and because the popular computers (such as the C-64) are about three times the U.S. price here in Australia.

It is nice to be able to have a printout, and just last night I worked a gentleman who proudly told me that I was his first RTTY contact. He requested a printout of the QSO and I was only happy to oblige. But one problem we machine users have when working computers is that computers are fine when talking to other computers, but they have their limitations. Some computer programs don't seem to have any provision for inserting a carriage-return/line-feed at the end of a line. This leads to a pile-up at the end of my line and a frantic dash to the machine. Another problem I have found is that the essential LETTER or FIGURE shifts are not transmitted at the beginning of each line. This is fine if the signal is above S-9, but if conditions are marginal, then frantic button-pushing is required if the next line is not to consist of a cartoonist's idea of profanity.

Terry Robinson, VK3DWZ
Victoria, Australia

Picky, Picky, Picky

Editor, *CQ:*

Surely you jest with us? After seeing your January cover I expected a full-length feature article on the obvious National Electrical Code violations visible in the picture. I also thought you would open the door and let us view the jungle which must exist inside. I also expected a summary of the dangers which exist for anyone luckless enough to have to work at such a tacky site.

What happened???

Art Rideout, WA6IPD
Fallbrook, CA

220—Still Up In The Air

Editor, *CQ:*

After reading Ted Cohen's lamentations about the seemingly impending loss of the 220 MHz band by the Amateur service to commercial land-mobile usage (*Dateline . . . Washington. D.C. column, November 1984 CQ*), I couldn't help but think that it has become a target due to our under-utilization of that band.

One possibility for increasing the use of the 220 MHz band might be to open it to holders of Novice-class licenses. That would let newcomers to the Amateur community participate in voice communications and some community-service activities. Greater participation might help keep Novices from dropping out, which many seem to do. Also, activity on a "local" band would quickly put Novices in contact with other, more experienced hams who could lend advice and encouragement.

I realize that the elder statesmen of the ARRL have fought any expansion of Novice-class privileges in the past, but perhaps, with the threat of loss of all or part of a band, that position might be reconsidered.

Phil Harrison, KA0NAU
Lawrence, KS

Where Is Comoros?

Editor, *CQ:*

I thought that I'd write this note to tell you how much I enjoyed reading the article "A DXpedition (Almost) To The Comoros," by Ian Shepherd, G4LJF in the January issue. I must say that I really admire the courage and fortitude that Ian displayed throughout his entire ordeal! It really takes a lot of courage to be able to tolerate the insects, lousy living quarters, lack of cooperation from the locals, and the total ignorance of all in regard to amateur radio. It really is a shame that more people don't know what amateur radio truly is all about.

I really don't know how Ian was able to "grin and bear it." First the problems with the customs officials, then the rough rides he encountered, the poor communication problem with the government officials at Comoros, etc., etc., etc. It seemed that Murphy was at work overtime with poor Ian.

I really have to tip my hat to Ian, and I must say that I feel that Ian deserves some sort of award for putting Comoros on the air for those who were fortunate to work him at a possible cost of more than just the hassle. I am certainly glad that the end result was not one like the Sprately incident where some amateurs were actually killed.

By the way, Ian, just where the devil is Comoros??? 73 and all the best to Ian for a job definitely well done!

Christopher B. Hays, WB0LPV
Florissant, MO

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C22A	220	Yes	2W	20W	5A	$89
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A CQ Exclusive: Secret plan uncovered to move all General, Advanced, and Extra class amateurs to VLF and below.

Amateur Radio's New Frontier: The Bands Below 30 kHz

**BY PROFESSOR EMIL HEISSELUFT*,
LAUTON INSTITUTE
GROSSMAUL-AN DER DONAU, AUSTRIA**

The world has long known of amateur radio's many contributions to the state of the radio art. Amateurs, after all, were responsible for "opening up" the bands below 200 meters at a time when everyone else thought them worthless. Later, amateurs pioneered the use of single sideband and developed revolutionary new devices such as the parametric amplifier. Today, satellites in the OSCAR series ring the Earth, testifying to our ingenuity and resourcefulness. It is for these and other reasons that our government will soon call on all General, Advanced, and Extra class amateurs to open the bands below 30 kHz. Read about the secret plan to shift our operations below 30 kHz in this exclusive expose by our Austrian correspondent, Professor Emil Heisseluft.

—K2EEK

While the debate over allocations for the Amateur service over the past 10 years has centered on frequencies at HF and above, the Federal Communications Commission has long recognized that a largely untapped region of the spectrum remains unexplored by amateurs. Specifically, the Commission is concerned that amateurs have made virtually no contributions to communications technologies at VLF (very low frequency; 3–30 kHz) and below, and that the lack of such contributions has inhibited the use of these bands. If amateurs were forced to use the VLF, ULF, and other low-frequency bands, it is reasoned, significant advances could be expected in areas such as radio-wave propagation and long-wire antennas. Amateurs, however, have little desire to move below 30 kHz, for rather obvious reasons.

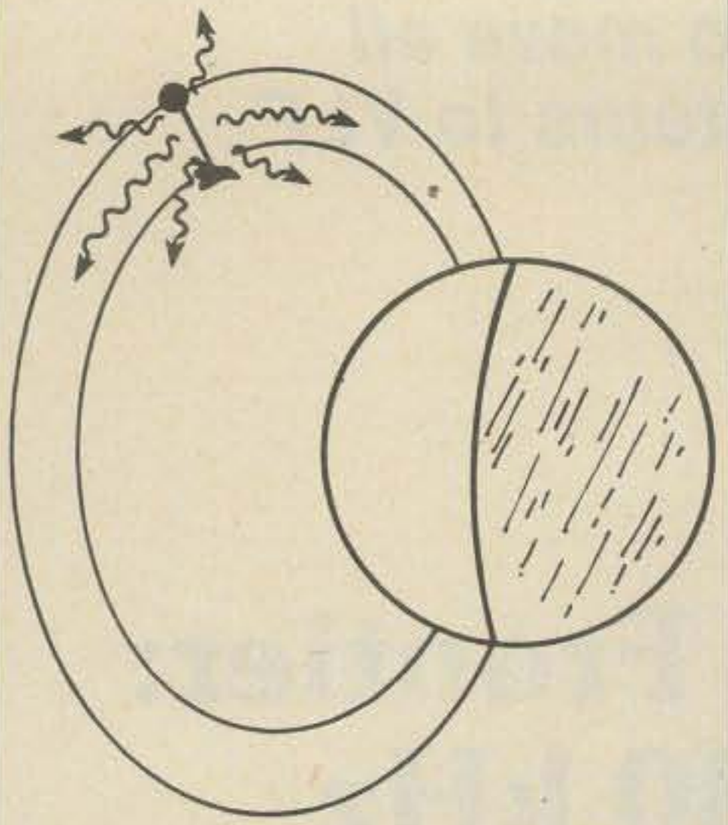
Their protests aside, amateurs may soon have no choice but to move to the VLF band! My associate, the beautiful Sonya Ostermond-Tor (daughter of my old professor, Jerzy Ostermond-Tor, ex-YM4XR [see ref. 1]) recently uncovered a secret plan under consideration within the Commission to require all General, Advanced, and Extra class amateurs to move below 30 kHz by December 31, 1990. The delay in implementing the changeover, dear readers, stems from the need first to investigate the feasibility of using satellite-based long-wire antennas (deployed using so-called "tethered satellites"), and second to retest amateurs shifting to the low bands for their proficiency in the use of the International Morse code—the only type of emission that will be authorized for use at these frequencies. Truly, the Commission's actions represent an undertaking of gigantic proportions, and one that will forever change the face of the Amateur service!

Antenna Problems At VLF and Below

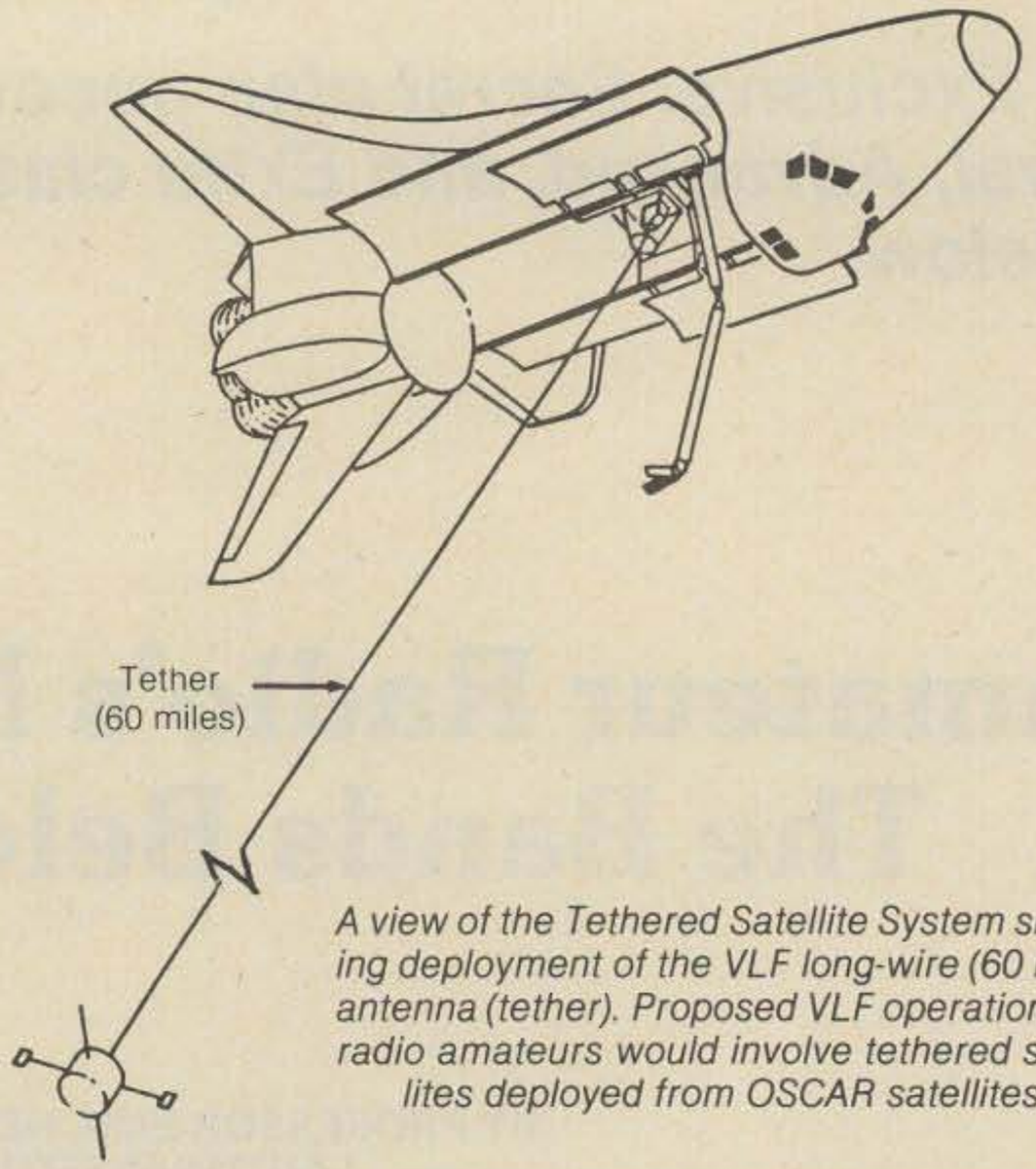
Readers of this esteemed publication and other journals of the communications industry will immediately recognize the problems posed by the need to erect efficient antennas for use at VLF and below. One has only to look at the problems encountered by the U.S. Navy in constructing its ELF stations in Wisconsin and Michigan to gauge the legal and environmental roadblocks that will stand in the amateur's way.

Consider, for example, that 30 kHz is equivalent to a wavelength of 10,000 meters, or almost 6 miles, and you will understand why amateurs will soon be scrambling to buy large lots for the erection of long-wire and vertical antennas. I am told, in fact, that at least two of the largest DX contest clubs in North America have already purchased large tracts of land in northern Michigan on which to erect wire antennas, that several other clubs are scouring the country for land having granitic bedrock close to the surface, and that still other contesters are preparing to erect 1000 foot towers for their VLF "super stations." But even long-wire antennas and tall, base-loaded towers have very low efficiency at the fre-

**Professor Heisseluft is currently performing studies on the Earth-ionosphere waveguide at this residence in Grossmaul-an Der Donau, Austria. Correspondence to the Professor may be directed c/o CQ.*



Schematic view of the use of the Tethered Satellite System to generate VLF and ELF waves by modulating the tether current aboard the Shuttle. (Modified after "The Tethered Satellite System," Utah State University, 1980.)



A view of the Tethered Satellite System showing deployment of the VLF long-wire (60 mile) antenna (tether). Proposed VLF operations by radio amateurs would involve tethered satellites deployed from OSCAR satellites.

quencies we are discussing, with the energy radiated at reasonable power levels almost always below that required for dependable communications.

Recognizing that the erection of good VLF antennas may pose a problem to some amateurs, the government has gone to great lengths to determine whether VLF signals can be injected into the lower ionosphere by other means. In November 1982, for example, Martin Marietta Aerospace was given a contract to perform detailed engineering analyses and selected, advanced-development evaluations of a Tethered Satellite System concept (ref. 2). Based on the results of this work, it is expected that the first tethered satellite will be carried into orbit by the Space Shuttle in the late 1980s, and will be suspended downward from the cargo bay on a tether up to 60 miles long—more than enough to act as a good antenna at VLF and below.

The Tethered Satellite System

The idea of using a tethered satellite for deploying a wire antenna up to 60 miles in length was first proposed by Grossi (ref. 3) for use in making ULF radio transmissions. What Grossi proposed was to reel out a small satellite from a boom mechanism mounted in the Shuttle's cargo bay. The tether, which would be made of conducting material, would then be used as a radiator to launch VLF waves into the ionosphere and magnetosphere. The method by which this is done is quite complex, but basically, time-varying currents are established within the tether through modulation of the active electron emission from the orbiting Shuttle. Some experimentation involving the length of the tether and the frequency of current modulation will be required, of course, but it is expected that the Tethered Satellite System will produce significantly higher VLF power densities than would ever be possible using ground-based transmitters (ref. 4).

If it can be shown that the VLF signals radiated from tethers provide a useful wave source, amateurs would next be encouraged to develop, launch, and deploy an OSCAR satellite containing a tethered satellite and a space-based source of sufficient power to drive the radiator. The OSCAR satellite, however, would also have an EHF (extremely high frequency; 30–300 GHz) capability in that the signals radiated at VLF would, according to current thinking, be transmitted on uplink frequencies in the Amateur-Satellite band at 248–250 GHz.

In sum, then, after December 1990, all General, Advanced, and Extra class amateurs would be limited to transmissions at 248–250 GHz (uplink only), with retrans-

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Frequency Range	144-147.995	440-449.995
Battery Pack (V/mAHr)	8.4/250	8.4/250
Receive Squelched Norm	18 mA	22 mA
RX At Full Volume	130 mA	130 mA
Transmit (Low Power)	220 mA	300 mA
Transmit (High Power)	550 mA	700 mA
Dimensions mm	60 × 170 × 40	60 × 170 × 40
Weight (with Battery)	490 gms	490 gms
TRANSMITTER		
Output Pwr. (Hi, Lo)	1.5W, 0.15W	1.5W, 0.15W
Spurious Transmitted	< −60dBc	< −60dBc
Deviation Limit	5 kHz	5 kHz
Pickup Device	Condenser Mic	Condenser Mic
RECEIVER		
Receiving System	Dbl. Superhet.	Dbl. Superhet.
I.F. Frequencies	10.695 1st 455 kHz 2nd	21.6 1st 455 kHz 2nd
Receive Sensitivity	<0.25 uV @ 12dB	<0.35 uV @12 dB
I.F. Bandwidth	30 kHz @ −60dB	30 kHz @ −60 dB
Operating Temp	−10-+60 C	−10-+60 C

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Rotation Time	61 Sec @ 60 Hz	50 Sec @ 60 Hz
End Stop Type	Mechanical	Mechanical
Rotational Torque	350 in-lbs	340 in-lbs
Stationary Brake Torque	1750 in-lbs	1500 in-lbs
Vertical Load Max	N/A	440 lbs
Maximum Mast Size	1.5-2.5 in. dia.	1.5-2.5 in. dia
Maximum Mounting Size	1.25-1.625 in. dia.	1.5-2.5 in. dia.
Cable Type	6-#22	6-#22 or larger
Dimensions		
Control	4.33" × 6" × 7.5"	4.33" × 6" × 7.5" aprx.
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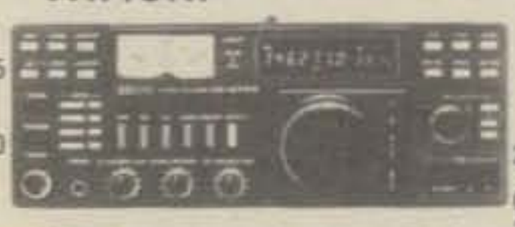

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mission of these signals limited to frequencies of 30 kHz and below. The retransmission would be accomplished using a tethered satellite system, with the conductive tether acting as the VLF antenna. Those amateurs who are able to erect suitable antennas at VLF, however, would also be permitted to transmit at these frequencies.

Retesting For Morse Code Proficiency

While the shift of most amateurs to frequencies above 248 GHz (transmit only) and to below 30 kHz (transmit and receive) is expected to advance the state-of-the-art at both of these frequencies—something the government has been unable to do, up to now, without amateur participation—a return to the use of CW is mandatory. The reason for this is that the nominal 3 kHz bandwidth required for voice communications is simply too great to be used with a carrier frequency of only 30 kHz (or less!). Thus, relatively slow-speed CW—say, at 12 wpm, where the information rate is 5 Hz and the required bandwidth is 10 Hz (ref. 5)—represents the most practical way to communicate at VLF.

Ordinarily, the Commission would have little concern about an amateur's ability to send and receive Morse code at these speeds. After all, General, Advanced, and Extra class licensees must demonstrate a proficiency in the use of the code at 13 wpm or higher when they take their amateur examinations. Further, it is common knowledge that everyone maintains their Morse code proficiency at the required level for the class of license they hold, if for no other reason than they must certify as having such a capability at the time they renew their licenses!

The above notwithstanding, recent, stinging criticism of the Commission regarding the creation of a "no-code" amateur license demonstrated, more than ever before, that amateurs take the Morse code very seriously. Thus, prior to the opening of the new amateur VLF band, the Commission will recertify all General, Advanced, and Extra class amateurs for Morse code proficiency. The effort will begin in January 1987, and in a move that surprised even Washington insiders, only Commission examiners will be used. Anything less, such as the use of volunteer examiners, will not suffice! It might be misinterpreted, says the Commission, as a lack of interest and commitment on its part to the continued viability of the Amateur service and to ensuring that operator capabilities are maintained at the state-of-the-art.

Summary

The secret plan to move all General, Advanced, and Extra class amateur operations to frequencies below 30 kHz is well on its way to being implemented. Within a few years NASA will deploy a spaceborne, long-wire antenna strung between the Shuttle and a tethered satellite. Once the feasibility of using such antennas to inject VLF and ULF signals directly into the ionosphere is demonstrated, similar antennas will be deployed from amateur-developed OSCAR satellites. At that time, the majority of amateurs licensed in the U.S. today—all of whom will have been recertified for Morse code proficiency—will move to the new bands at the low end of the radio frequency spectrum to continue an old amateur tradition of contributing to the advancement of the radio art.

References

1. Heisseluft, E., "D.O.S.E. Awarded to Prof. Ostermond-Tor," *CQ*, April 1969.
2. Martin Marietta to Negotiate on Tethered Satellite Contract, NASA News Release No. 82-169, November 4, 1982.
3. Grossi, M.D., A ULF Dipole Antenna on a Spaceborne Platform of the PPEPL Class, Letter Report to NASA-MSFC, Contract NAS 8-28203, May 11, 1973.
4. The Tethered Satellite System, Final Report from the Facility Requirements Definition Team, Center for Atmospheric and Space Sciences, Utah State University, through Marshall Space Flight Center Contract NAS8-33383.
5. Code Transmission, *The Radio Amateur Handbook*.

CQ

CQ REVIEWS:

The Telex/Hy-Gain Explorer 14 Triband Beam

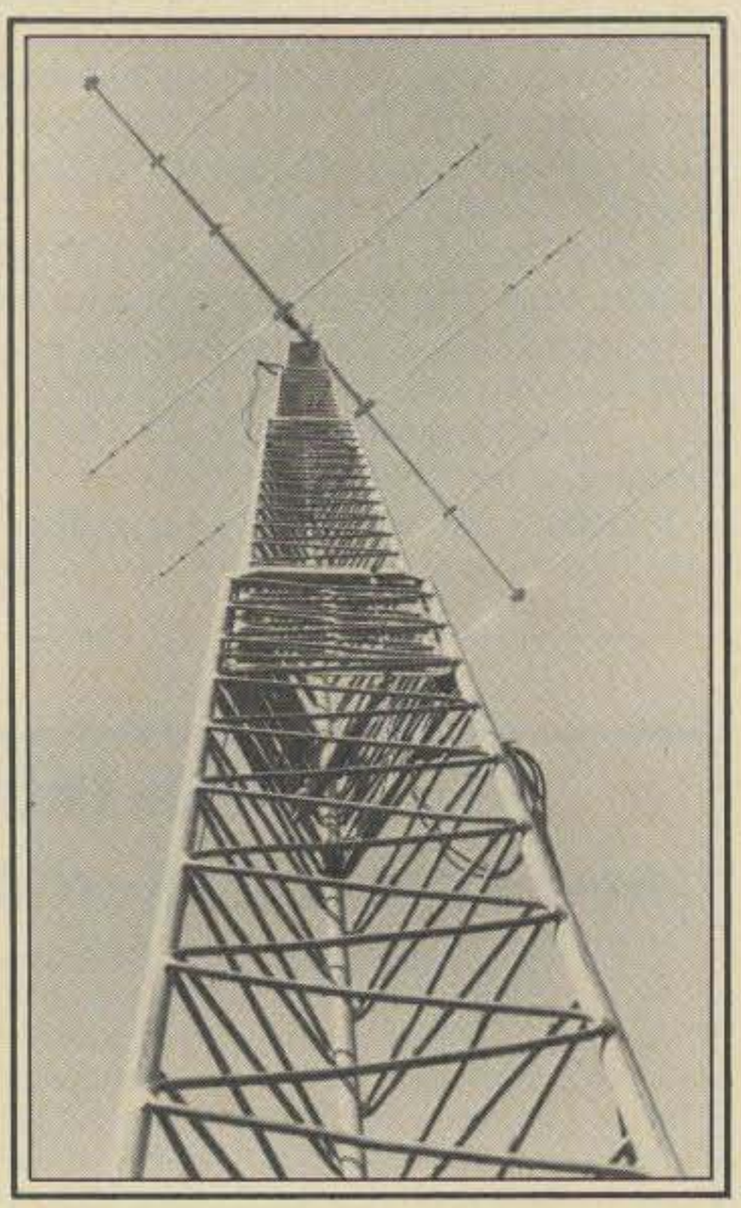
BY JOHN J. SCHULTZ*, W4FA/SV

This review should have been finished some time ago, but household moves from DL to CN to SV lands within a year's time prevented the Hy-Gain Explorer 14 from ever fully emerging from its shipping container. In any case, it has finally done so with its very fine complementary rotator, the Hy-Gain Ham-IV. Both items have been put through their paces for a time now and will be described in some detail in this article.

General

Table I lists the electrical and mechanical specifications for the Explorer 14. Both specifications are quite detailed and worthy of some study. Overall, the Explorer 14 presents itself as a triband 20/15/10 meter beam having very good gain and bandwidth characteristics on all three bands while still maintaining a modest turning radius, wind surface area, and boom length. The longest element length is 31½ feet, while the boom length is about 14 feet.

The photo shows an overall elevated view of the antenna and fig. 1 gives detailed dimensions for all parts of the antenna. Fig. 1 also illustrates the basic electrical design of the antenna. The front director element is of conventional triband design in that it contains two pairs of traps such that the entire element is active on 20 meters and only appropriate lengths on 15 and 10 meters as determined by the 15 and 10 meter traps. The two rear reflector elements are a bit different in that the longest reflector element functions only on 20 and 15 meters with one pair of traps to electrically determine the correct length for 15 meters. The second reflector element is active only on 10 meters and serves on that band as a full length, trapless element. The center driven element is the most interesting feature of the antenna and, according to Hy-Gain, unique enough such



that they have a patent pending on it. But, overall, the Explorer 14 has three elements active on any given band and functions as a classic three-element Yagi-Uda configuration of parasitic elements on any given band.

Returning to the driven element on the Explorer 14, fig. 2 shows its design in more detail. As is shown in fig. 2(A), the driven element consists of three sections all of which are electrically insulated from the boom. The feed element has one pair of traps and the entire element is active on 20 meters. Only the center sections are active on 15 meters as determined by the 15 meter traps. The two sections running parallel to the center section are the heart of what Hy-Gain refers to as its Para-Sleeve system. The so-called front and rear sleeves act an as open sleeve dipole on 10 meters that has been optimized for maximum bandwidth by having one sleeve dimensioned for the lower portion of the band and the other sleeve dimensioned for the high end of the band. Fig. 2(B) shows the details of how the center section of the driven element is fed. A "hair-pin" or Beta matching system which consists of two spaced aluminum tubes, 60 inches in length, is used. The tubes are shorted to the boom at their far end so the feed point is always at a DC ground potential. The balanced 50 ohm feed point is matched to the coaxial transmission line by a standard Hy-Gain BN-86, 1:1 ferrite core balun (included with the antenna).

Assembly

The first thing that one notes when one starts to assemble the Explorer 14 is that it comes complete with a 27-page manual rather than a few simple instruction sheets! It's not that the antenna requires any complex assembly work, but, as will be noted later, the manual is very comprehensive and deals with a lot more than just the simple assembly aspects of the antenna.

The antenna consists of 67 parts ranging from the usual tubing and nuts and bolts down to some Coax-Seal® to be used as a final "finishing touch" once the antenna is installed.

Hy-Gain gives some very good advice in the manual in that one should read through the manual *three* times before starting assembly of the antenna and then choose a large, clear area, if possible, for assembly and allow five hours to do the work. Only a 12 foot tape measure and ordinary hand tools are required for assembly. The reason for reading through the manual several times is to gain some perspective on the assembly and to develop a feel for parts recognition.

The antenna was assembled using a short length of mast tubing placed firmly in the ground so one could work at slightly above waist level (another Hy-Gain suggestion). This procedure is highly recommended over laying all the parts on the driveway and then squatting for a few

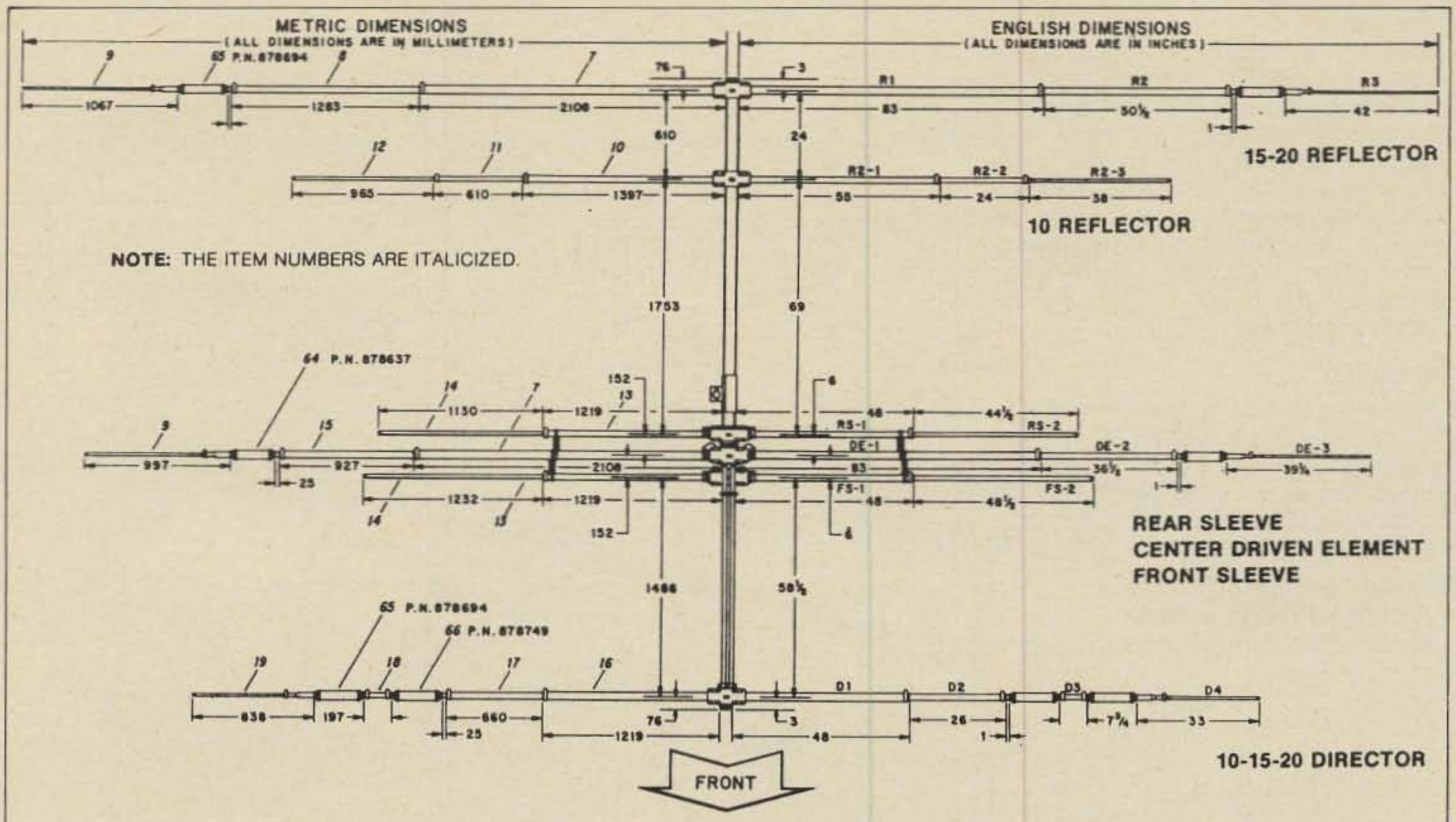
*c/o CQ magazine

Specifications

	Electrical		
Frequencies of operation:	20M	15M	10M
Under 2:1 VSWR (MHz)	14.0 - 14.35	21.0 - 21.45	28.0 - 29.7
Under 1.5:1 VSWR (MHz)	14.170 - 14.330	21.220 - 21.450	28.550 - 29.550
Front-to-Back Ratio (dB):			
Maximum	27	27	21
Average	16	19	16
Minimum	12	14	12
Average Half-Power Beamwidth (deg)	65	66	67
Maximum Gain (dBi) (Average gain for 3 bands = 8.1 dBi)	7.5	8.0	8.8
Maximum Power	Maximum Legal		
Lightning Protection	DC Ground		

Mechanical	
Boom Length	14' 1½" (4.3 m)
Boom Diameter	2 inches (51 mm)
Longest Element	31' 6" (9.6 m)
Longest Driven Element (one-half total length)	20M — .209 wavelength 15M — .242 wavelength 10M — .241 wavelength
Turning Radius	17' 3" (5.3 m)
Accepts Mast	1¼" to 2½" O.D. (31.7 mm to 63.5 mm)
Net Weight	45 lbs. (20.4 kg)
Maximum Wind Survival	100 mph (161 kmph)
Wind Surface Area	7.5 sq. ft. (.69 sq. m)
Wind Load at 80 mph	192 lbs. (87.1)
Hardware	stainless steel
Suitable Rotors	Hy-Gain CD-45II, Ham IV
Shipping Weight	50 lbs. (22.7 kg)

Table I– Electrical and mechanical specifications for the Explorer 14.



Item No.	Designator	Description	Item No.	Designator	Description
7	R1, DE-1	1¼" x 83"	15	DE-2	1⅛" x 42"
8	R2	1⅛" x 55"	16	D1	1¼" x 48"
9	R3, DE-3	7/16" x 37"	17	D2	1⅛" x 31⅞"
10	R2-1	⅜" x 55"	18	D3	1" x 6"
11	R2-2	⅜" x 26"	19	D4	7/16" x 28"
12	R2-3	7/16" x 42¾"	64	15M DE Trap	15M DE Trap
13	RS-1, FS-1	⅝" x 48"	65	15M Trap	15M Trap
14	RS-2, FS-2	7/16" x 53"	66	10M Trap	10M Trap

Fig. 1– These exact dimensions for the Explorer 14 are meant for assembly purposes, but one can see from them how the antenna is dimensioned.

hours. One should be a comfortable as possible while putting the antenna together so one can concentrate on the job at hand and leave the gymnastics for an exercise class. No exact time record was kept on how long it took to assemble the antenna, since that was not the purpose of doing the job. But with some breaks now and then and a lot of double and triple checking just to see that all the dimensions were correct, it took no more than four odd leisurely hours to complete the assembly.

The assembly instructions and illustrations are very well presented. Fig. 3, for instance, shows about the most complicated part of the assembly procedure, namely the Para-Sleeve driven-element connections. The diagram is very detailed and, at first, may seem a bit confusing. But, taken in conjunction with the text ac-

companying it in the Explorer 14 manual, it is very easy to follow and to use. It is just one of seven nicely illustrated assembly diagrams. The manual even contains a takeout, expanded-size diagram of the type shown in fig. 1 besides a regular-size diagram of the same type permanently bound in the manual. The expanded size diagram is very handy for final measurement checks.

In assembling the antenna one also can't help but note the very good quality of the standard hardware which is used. All hardware, except for seven long bolts used in the boom-to-bracket, are made of passivated stainless steel. The seven long bolts are plated with a layer of cadmium and a further protective coating of clear chromate. The internal tooth-type lockwashers used in the antenna are made of a slightly magnetic grade of stainless steel. Element compression clamps are made of T304 passivated stainless steel. All other metallic parts are aluminum (e.g., the boom-to-mast assembly is a two-piece cast aluminum assembly). The insulators used are either of polyethylene or Cycolac. There is no doubt that the materials used can be rated as first-class.

Operation

Mounted at about 40 feet high and over flat, nonwooded terrain, the Explorer 14 presented almost exactly the SWR curves shown in fig. 4, which Hy-Gain

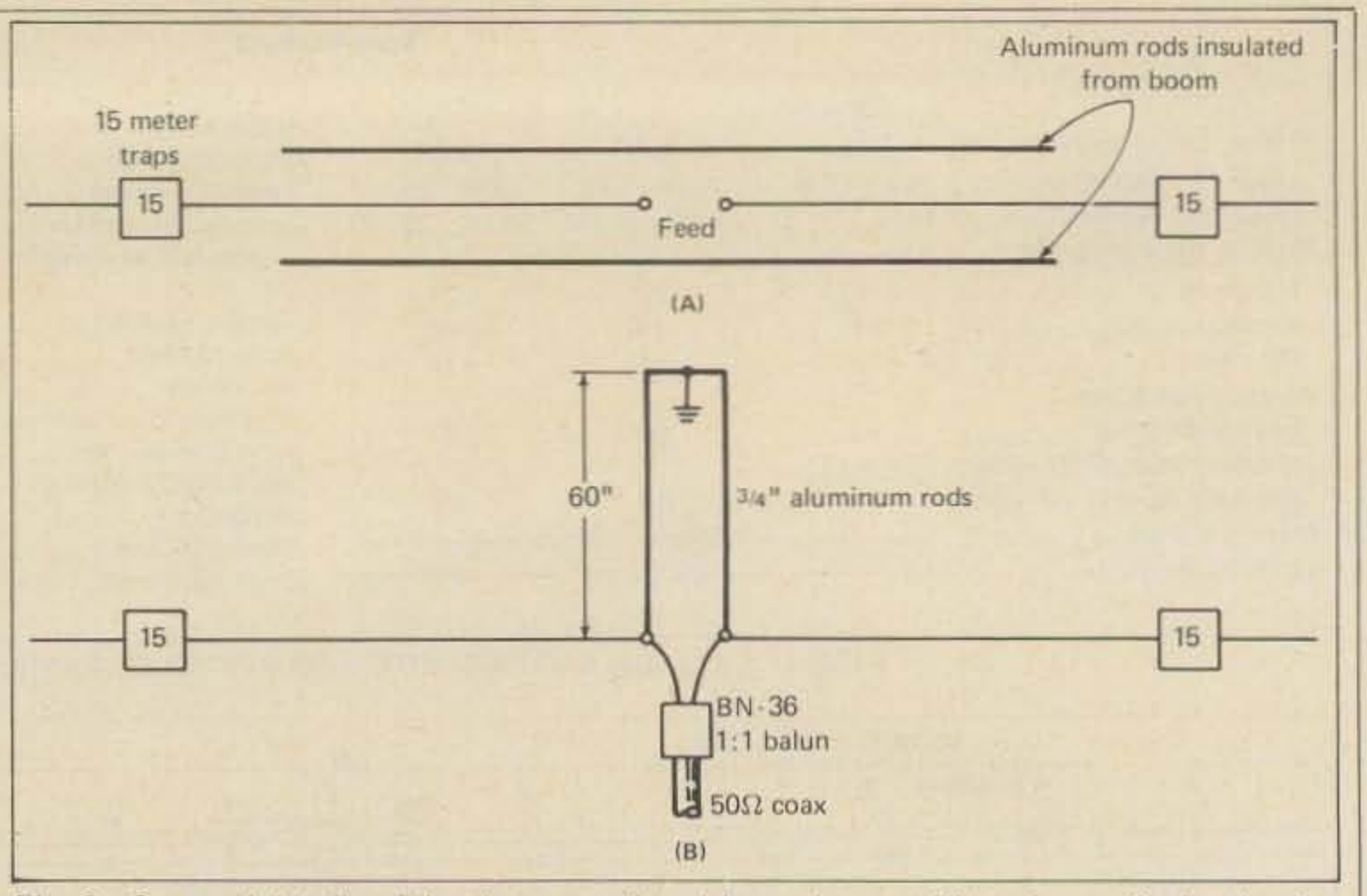
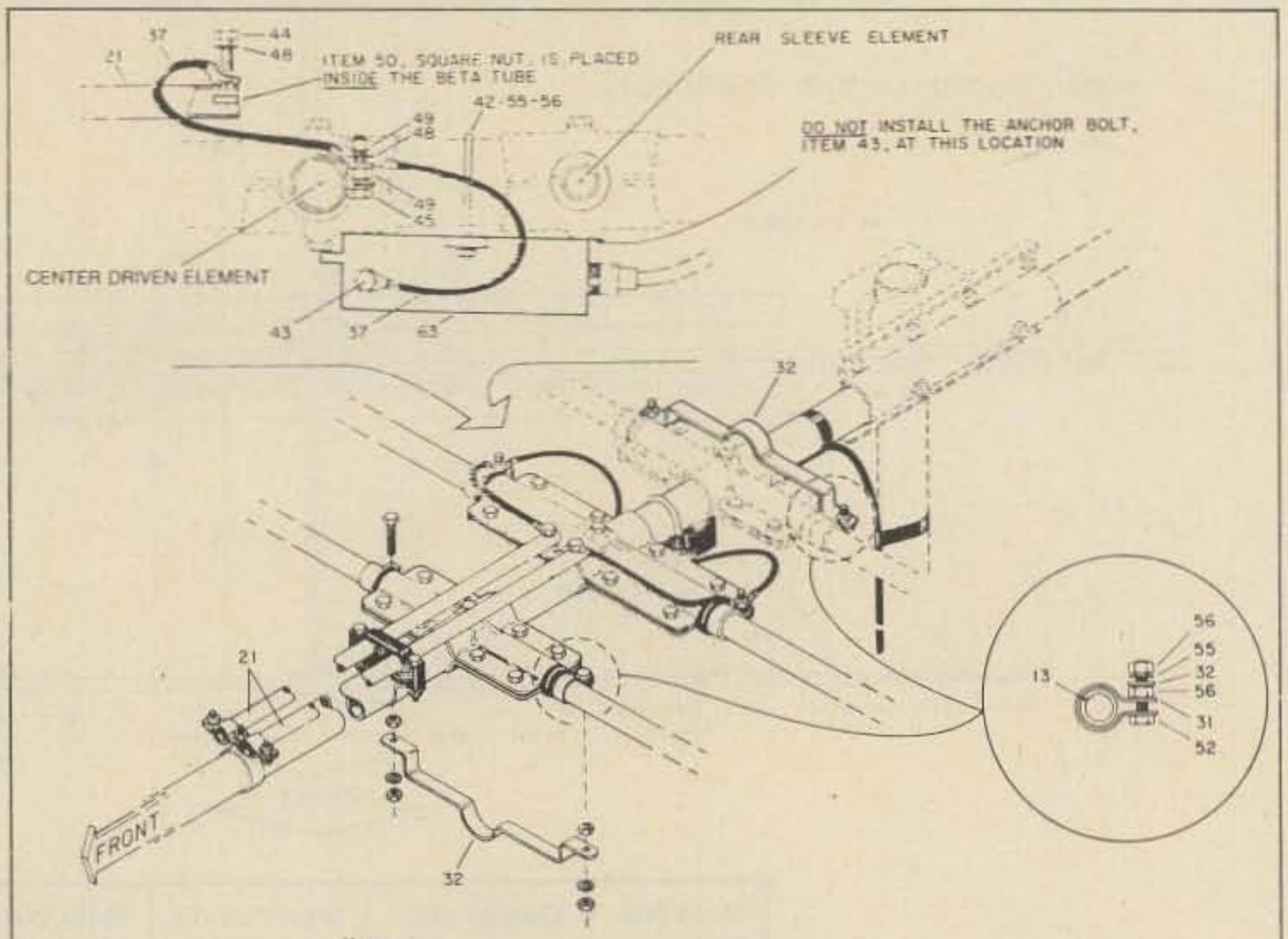
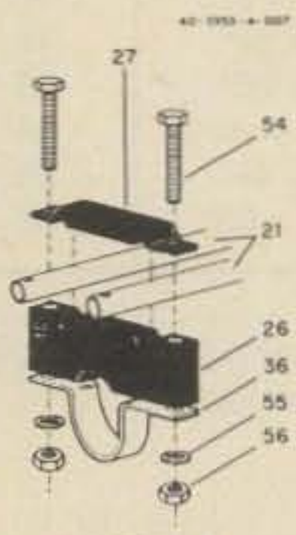


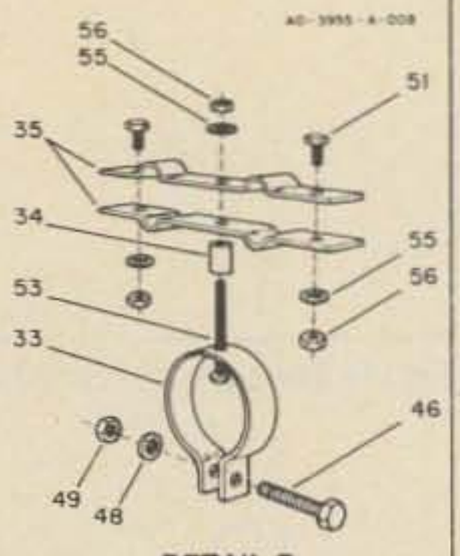
Fig. 2– General details of the three-section driven element (A) and specific feed-point details (B).



Item No.	Description
13	Tube, alum., 5/8" x 48", swaged, RS-1, FS-1
21	Tube, aluminum, 3/4" x 60"
26	Insulator, beta support (bottom)
27	Insulator, beta support (top)
31	Clamp, tubing, 5/8"
32	Strap, boom jumper
33	Strap, boom-to-beta
34	Sleeve, beta shorting
35	Strap, beta shorting, 3/8" radius
36	Clamp, beta support
37	"Pigtail" wire, 7"
42	U-bolt, #10-24 x 2-1/2" x 2-3/4"
43	Bolt, 1/4"-20 x 3/8", hex head, ss
44	Bolt, 1/4"-20 x 3/4", hex head, ss
45	Bolt, 1/4"-20 x 1-1/4", hex head, ss
46	Bolt, 1/4"-20 x 1-1/2", hex head, ss
48	Lockwasher, internal, 1/4", ss
49	Nut, hex, 1/4"-20, ss
50	Nut, square, 1/4"-20, ss
51	Bolt, #10-24 x 5/8", hex head, ss
52	Bolt, #10-24 x 1", hex head, ss
53	Bolt, #10-24 x 1-1/2", hex head, ss
54	Bolt, #10-24 x 2", hex head, ss
55	Lockwasher, internal, #10, ss
56	Nut, #10-24, hex , ss
63	Balun, BN-86



DETAIL A
Beta Support Clamps and Insulator Assembly



DETAIL B
Beta Shorting Clamp Assembly

Fig. 3– An illustration of one of the very complete and detailed assembly diagrams supplied with the Explorer 14.

says will be typical for the antenna when it is mounted from 30 to 100 feet high. The measured SWR, in fact, was slightly better in most cases, often not exceeding 1.5 or 1.75 where 2.0 is shown in fig. 4. The practical result of the SWR performance is that the Explorer 14 will work fine with most solid-state transceivers without an antenna tuner if one is primarily interested in operation in the U.S. SSB band segments on 20, 15, and 10 meters. In fact, the Explorer 14 is very much a phone person's antenna. As can be seen from fig. 4, the front-to-back ratio is optimum in the phone segments of each band. Possibly the antenna dimensions can be slightly reconfigured to favor the CW portions of each band, but no information regarding this is supplied with the antenna.

No facilities were available to confirm the gain of the antenna, but comparison tests with dipoles indicated that the forward gain is at least as specified. No attempt was made to work 100 countries in two days, but on the other hand, the total impression when using the Explorer 14 was that within its size class, it is a triband beam with superior performance characteristics for those interested in SSB operation on 20, 15, and 10 meters. Many contacts that would have been impossible using simpler antennas at the same elevation were easily established using the Explorer 14.

SYMPTOM	POSSIBLE CAUSES
Consistently high VSWR on all bands.	Balun damaged by lightning or excessive power. Shorted coaxial connector. Water inside of balun or transmission line.
High VSWR dependent upon direction of beam.	Resonant guy wires too close to antenna. Metallic structures or wiring too close to antenna.
Intermittent high VSWR not dependent on weather or power level or direction of beam or band selection.	Loose connection on feed system, matching system or transmission line.
High VSWR when raining or with high humidity.	Trap(s) installed with drain holes up instead of down. Water inside of balun or coax cable.
High VSWR with High power, Low VSWR with Low power.	Balun damaged or defective.
Low VSWR, but only near band edge(s).	Loose coaxial connection on transmission line.
High VSWR on only one or two bands.	Trap(s) damaged or defective. Resonant guy wires or nearby metallic structure. Another HF antenna too close. Antenna not assembled correctly.

Table II– The "Troubleshooting" chart from the Explorer 14 manual.

Manual

As was mentioned before, the manual that comes with the Explorer 14 is interesting. Only ten of its pages are directly concerned with assembly of the antenna. The rest of the manual addresses subjects such as installation on different types of towers, operation, maintenance, troubleshooting, service information, etc. It contains a wealth of practical information and gives one the very distinct impression that the manufacturer wants to be sure that the user gets the antenna installed properly and enjoys using it. The troubleshooting chart contained in the manual, as reproduced in Table II, typifies the practical orientation of the manual. It contains practical little hints which should be of interest to anyone who uses a trap-type or balun feed antenna.

The manual even contains an SWR log sheet which the user is urged to complete upon final installation of the antenna. Such a log sheet may seem a bit unnecessary at first, but it is really an extremely valuable asset as the antenna is used over a period of time. There will always be times when one wonders if the antenna is performing properly, whether storm conditions have damaged the antenna, etc. A careful, periodic SWR check will generally indicate whether the antenna system is still in proper condition, and significant changes in SWR will certainly signal problems such as moisture entry into a coaxial transmission line.

The manual is so good that I hesitate to find fault with it. However, its completeness is lacking in one area. The chapter that describes installing the antenna on a tower is clear enough to amateurs who have installed several beams. However, I think the references made to gin poles and pulley arrangements require illustrations if they are to be clear to the amateur installing a beam for the first time.

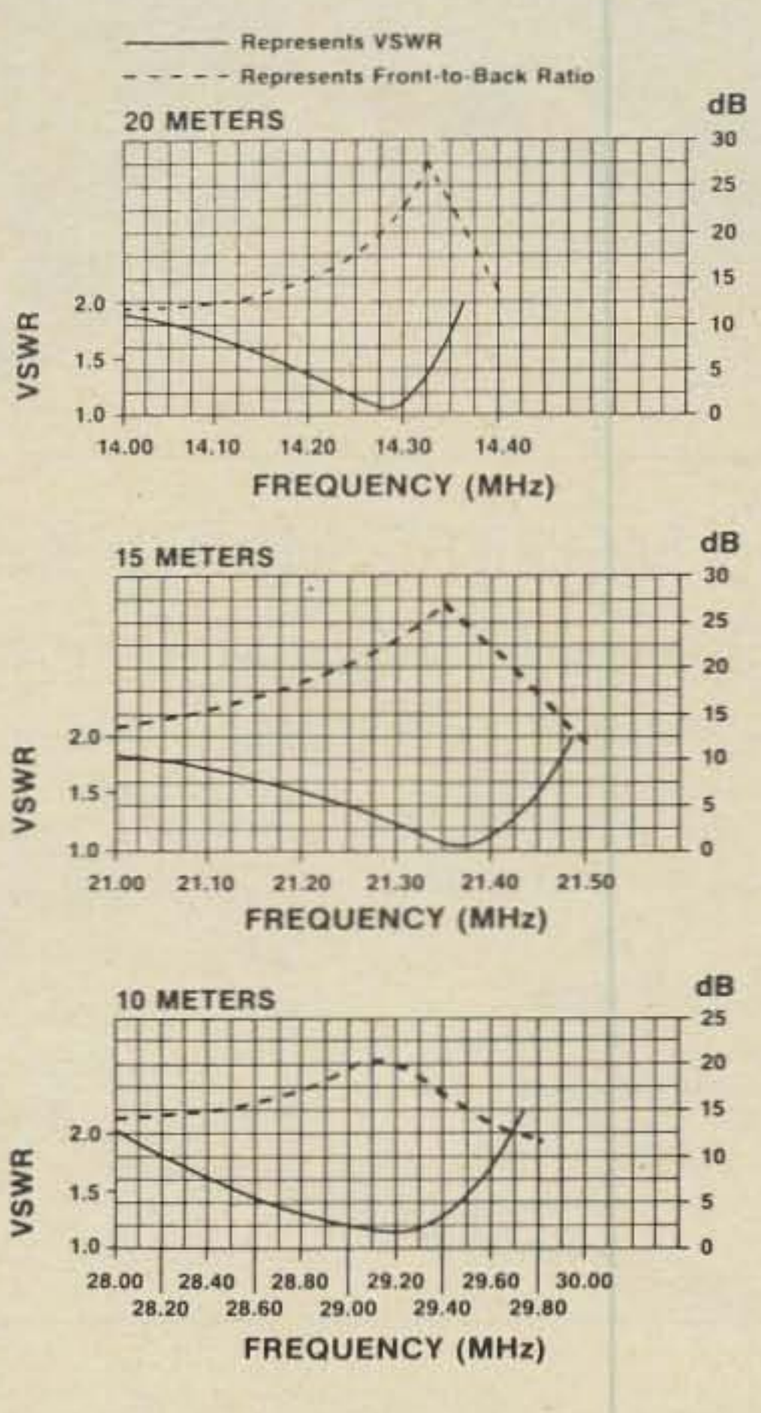


Fig. 4– Typical SWR curves as supplied by Hy-Gain. Actual test results were somewhat better. The front-to-back ratio curves could only be approximately verified.

Summary

Triband 20/15/10 meter beams by their very nature have to be a balance of slight compromises. No beam design can achieve maximum gain, front-to-back ratio, flat SWR, along with minimum beamwidth, minimum physical size, etc., across the entirety of each band in one package. Ad writers may shy away from the word "compromise," but I think it is distinct flattery to consider the Explorer 14 as being a very sensible and balanced "compromise" design. Its electrical characteristics are excellent for its physical size, and the materials used in its construction strongly augur for the expectation that the beam should endure environmental conditions for years of dependable service.

An option is available for the Explorer 14 for those interested in 40 or 30 meter operation in the form of a Model OK-710 kit. In addition to normal triband operation, the installation of this kit will allow the Explorer 14 to operate as a rotatable dipole antenna on *either* 40 or 30 meters.

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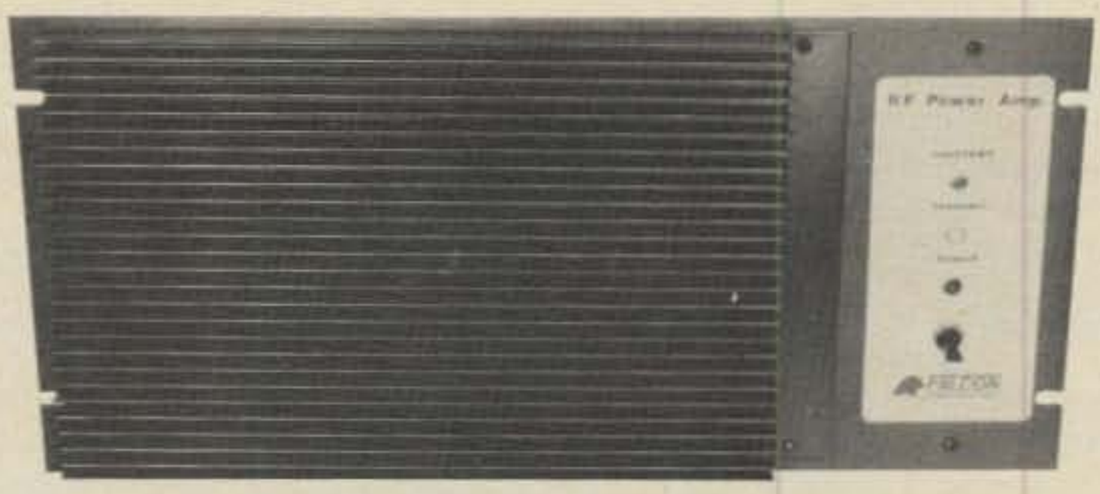

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Polynesian Paradise

A DXpedition to Tonga, Niue, and Samoa

Part II—Conclusion

BY TONY WARD*, VE3IAT

We resume our story this month at a point where the plane is about to leave for Niue. Arm-chair DXpeditioners (that's most of us) can sit back and relax while we enjoy reading about Tony's DXpedition. —K2EEK

Take-off in a turbo prop is a riveting (or deriveting?) experience. Forewarned by other intrepid explorers of the Pacific who had gone before, I was still unprepared for the violence of the event. Once aloft, however, we settled into relative calm for the trip east. Used as I was to the Pacific, it was still a surprise when the island swam into view. An elevated coral atoll about 12 miles across, solitary Niue rises steeply in cliffs from the sea to a bejungled rim elevated about 230 feet. The central region like a saucer represents the raised lagoon, and the broken coral fragments here give rise to soils much better than the cavern-riddled coral of the ancient atoll that encloses it. Jungle rules, with coconut the king, banana below, and taro in the scattered garden patches at the ground. Green dominates. The tiny villages peep warily from beneath the canopy. The concrete houses uniformly echo the beaurocratic edict that erected them to replace the more varied but hurricane-susceptible native forms.

Niue is a New Zealand dependency, and although self-governing, the inhabitants can and increasingly do move to New Zealand for work. Barely 3000 remain, although the cheerful children everywhere show that some spirit remains, and those who stay on are keeping the homefires burning. Depopulation saps development, though. The government struggles to get lime, passion fruit, and other tropical fruit processing off the ground. Elsewhere in the Pacific inhabitants climb for the coconuts. In Niue they wait more cautiously for gravity to make the effort redundant. Yet at least one new enterprise thrives as craftswomen sew imported leather strips into the finest of rugby footballs with nimble, flying fingers. The roads, the airport, and the public buildings betray more concern than elsewhere, and most things do function—slowly perhaps, but they *do* function.

Harry, ZK2AE, on Niue's principal form of transportation.

It wasn't difficult to pick Harry from the waiting throng, and our friendly taxi driver, Doug, more than repayed his modest tariff with a flood of Niuen spent on the poor embryonic customs officer who dared suggest to Ron that his rig would be better off in bond for the duration of our stay. We were off with Harry racing behind on one of the tiny Hondas that are the principal island form of locomotion. The dateline had conveniently recycled Tuesday for us. Harry's shack was well equipped and antennas already festooned the trees. We fell on dinner and then the pile-ups with great appetite.

Harry! What to say. They used to call him Mr. "50 cents," although inflation is adjusting a new generation to Mr. "2 dol-

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Marty, 5W1AT, Phil, 5W1AU, and Ron, 5W1CW, relax over an ale from Marty's famous refrigerator with the tap in the side.

lars." Harry makes things work: clocks, radios, bikes, anything. He fixes things in the good old-fashioned way forced on him by a lack of spare parts and the torturously slow and damnably inefficient freight service common to the islands. In retirement, and trapped on Niue by a government policy that chopped his pension for daring to stay away from New Zealand longer than the rules allow, Harry quite simply can't afford to live elsewhere.

As ZK2AE and the only permanent amateur resident, Harry cheerfully puts up with the pressure of assisting itinerants such as ourselves attracted to Niue's relatively rare DXCC status. "Don't write any nonsense about me being a king on the island," said Harry in a rare moment of introspection. "They are very good at putting you to work around here," he noted, and that's the serving image that suits the truth much better. Police chief John, who rented me a car to see the island and then cheerfully cut the tariff to the bones "for a friend of Harry's," was straightforward. "He is a tremendously valuable member of our community" said he, "and we'll never replace him." The islanders admire him as the only Palangi to adopt Niuen citizenship at the expense of his privileged status as a New Zealander. His house is a near constant bedlam of passing children queing up for the hot water showers or performing minor tasks for chocolate treats. Michener could never have invented him, guant questionmark of a frame with an eternal home-rolled cigarette in his mouth and a smoker's cough that shakes the island in its violence.

Even with Harry as a willing catalyst little could be done to ensure the safe arrival of the FL-2500 and my beam. Ron's beam, sent on before, soon decorated the 15 meter mark on Harry's jungle pole —a termite-troubled timber that we came to feel as second-home so often were we up and down it. Daily I struggled for the latest news as Janet did at home, but the weekly flight from Rarotonga came and went on Wednesday with no joy. Ah, jet lag—that marvelous modern invention whereby one's luggage follows one to a destination three or more days late. I have been unable to trace to source the rumor that a neatly folded pack of spare underwear for Captain James Cook (England's discoverer of so many of these isles) that was shipped to him by his mum in 1768 via some antediluvian airline has come recently to light in a dingey depot in Apia. It *could* be true. We pressed to service a vertical left by Sam and battled on against the daily roar.

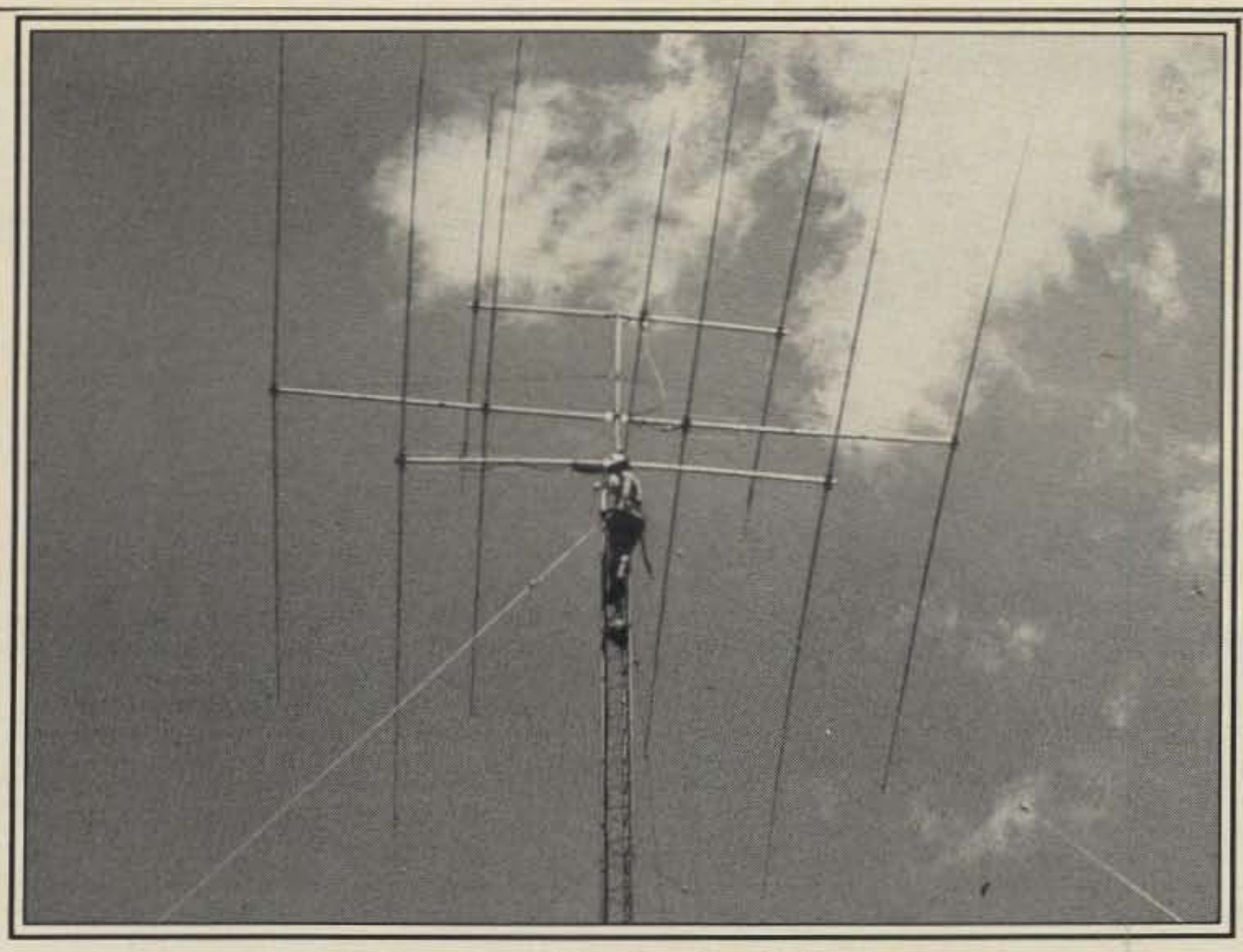
The same plane that took us on to Samoa brought the gear to Niue one week later. I consigned it on to Tonga in another test of faith and fate.

With Harry's help the regime settled down to a steady rhythm. Ron slept at the shack, but I enjoyed the half mile late-night walk back to the house, my passage marked by furious barking from a hundred dogs who woke to guard downtown Alofi from invaders. The surf washed gently on the cliff and palm trees did their tropic thing in the steady southeast trades. Harry's meals were culinary masterpieces of plain but wholesome cooking, and our time flew by on well-oiled wings.

I spent the mornings, exploring Alofi or further afield once the antennas were to our liking. Harry's shack is about ¼ mile inland, and only the beam made it up above the dense canopy. Low-band contacts came hard as the jungle sucked up all but the high-angle skip. Elevated coral riddled with cavities absorbed RF like a sponge. I toyed with sending SWL cards to the nightly K-land owls who haunted 160 meters, but failed to hear my answering code.

We left Alofi eight days after we had come. Harry's shack returned to near normal, our logs loaded with 12,000 callers to ZK2EA and ZK2TW. Samoa is a scant 460 or so miles north of the latitude of Tonga and Niue, but in August the climatic contrast is at its greatest. From pleasant 75 °F days and temperate nights we walked into the true tropics—a sticky ennervating 90 °F, which frequent showers seemed never to relieve. The most developed of the Polynesian lands, its progress has left an occasional legacy of pure bloody-mindedness. The customs man was quite unshakeable. Our gear

Sunset from beautiful downtown Alofi on Niue.



5W1BJ at the 75 foot level on Phil's tower.

was radio equipment and could not be imported. It would be held in bond and we could have it back at the end of our stay! We rang Phil Williams, 5W1AU, our host and friend. Phil, as charge engineer for a Polynesian airline, is not unused to frustration and had developed the handiest knack for a survivor in the islands—that of knowing which butt to kick and how hard to kick it to get results. It took 15 minutes and a cram course in the regulations for our tormentor, and our gear was suddenly available again.

Samoa was the only one of our stops familiar to me. Janet and I had spent two days there en route from VE3 and ZL1 three years ago, but as with our other stops I looked forward to seeing it as a focal point rather than as a stepping stone to other places. The drive from Faleola airport to Apia impresses. The road is sealed, the landscape garden-like and colorful. The true exotic touch contrasts with the rundown versions of western dwellings we had seen elsewhere. A gigantic coconut plantation flanks the lowlands, and Samoa's major island, Upolu, rises in extinct volcanic splendor to over 3000 feet. Savaii is larger but less developed and is a scant 20 miles away. Tourists visit its shores for getaway-type holidays isolated from the latter 20th century. The country lurches somewhat erratically towards true economic independence. A sovereign state cut loose from New Zealand's apron strings in 1962, Samoa still shows evidence of pre-WWI German rule—the continental brew-masters responsible for the excellent local beer, for example, and a ponderous teutonic influence in the colonial architecture of Apia. The other major new endeavor is a thriving tobacco factory, although not all are happy that the new nation's economy can be securely based on cigarettes and booze. A tiny timber trade perhaps lights a truer path, for, as with all the islands, the tropic climate grows trees at a phenomenal rate.

Traffic on the islands well-made roads is heavy. Samoa changed from right- to left-hand drive a while ago and nostalgia for old habits adds a spice to driving there, which is unknown elsewhere in the Pacific. Routeways for people, bikes, pigs, and chickens, as well as cars, the roads are best traveled with great care, preferably in armoured tanks.

Phil's wife, Annie, readily deserves the apellation "delightful." She handled with aplomb our barely warned arrival. We settled to luxurious rest.

While Tonga and Niue are relatively hard to work, the demand for Samoa is better met by three well-equipped resident stations with Phil, Marty, and Peter all active on the bands. We hoped to sightsee more and rest up for the final fling in Tonga, and we handled pile-ups at a more recreational pace. Phil's station lineup would be the envy of any ham anywhere. From Samoa, it is a recipe for instant bedlam on the bands. A Christmas-tree array covers 10 through 20, and with a quick drop and fix the 402 added 40 to the armoury. And with all beams at 75 feet and up, we concentrated on the long and difficult polar paths. The Henry 2K-3 added muscle to the SSB and gave hope to every tiny ground plane and dipole in Europe. Ron hunched over the key for hours at a time, emerging only to mutter "they're all bloody mad" before returning to the fray. While marvelous to behold, the giant pile-ups made the going slower than those provoked by our more modest and familiar setups at other stops.

The heat sapped our strength and the week on Niue demanded rest. We took the time to visit and enjoy. Roger, KB7JX, and, Joanie, his wife, invited us aboard their yacht, and the story of their adventures as ZK1CF in the Northern Cooks vied with Phil's fabulous tales of the South Pacific. Peter's hacienda in the hills contrasted with the glorious disorder of partying at Marty and Dolly's, where the keg beer flows from a tap fitted to the refrigerator wall. The four days flew by and we were off once more for Tonga.

A chance meeting with Dick, VK3VU, and his wife, June, on our first visit to Tonga had made us aware of the "Friendly Islander" motel, presided over by the magnificent Papiloa. When we returned, Dick was just about to turn in his A35RF ticket and head for Victoria once more. We took over his suite. What a place—spotless, 60 feet from the ocean on a north-facing beach! Keliti, pressed into service, quickly had the 40/80 dipoles high upon the coconut trees. With only two days hard work around the four or so government departments involved, my beam was sprung from customs and thrust up from the balcony, and the glorious cacophony commenced anew. Papiloa had provided us on our arrival with a small white card inscribed in Tongan which we were to present in any case of official or other local intransigence. I don't know what it said, but from its effect I assume that a loose translation would be, "You toucha my guest, I masha your face."

I obtained a driving permit and precariously toured the island on a 50cc Honda taking in the sights: the fabled royal tombs, the above-ground burial mounds somewhat startingly decorated with beef bottles along with shells and foliage, the flying foxes—large bats—asleep in their daytime roosts at Kokovai, the glorious coastal sweeps of the western and southern shores, and the ubiquitous coconut plantations. The final night we taxied 22 miles to the "Good Samaritan Inn" where an unlikely French chef served us a fabulous three-course dinner with drinks and a snack for our dozing driver all for less than $10 each.

And suddenly it's all over and we are home again reduced to electronic obscurity once more. The rig sits largely idle in the shack and Janet wears a happy smile. Apart from joining a brief frenetic scramble for Juan de Nova, I've not switched on for, oh, it's nearly a week or so now. The mail floods in at a steady 100-plus per day, and the postmaster knows my first name.

That's the other part of a DXpedition, the part that makes it real to all the people you work and real to you, not just a pigment of your imagination. Was it all worth it? Sure. See you next time! CQ

We've all seen some "mechanical marvels" that seem impossible to make. KA8OBL shares some of the secrets of using standard, commonly available copper and brass stock to build your next antenna.

Homebrewing Antennas With Copper And Brass

BY RUDOLF E. SIX*, KA8OBL

Copper is the easiest material with which to make antennas, especially for the higher frequency bands. Why? It solders, of course. What could be easier than taking a length of copper pipe, drilling the holes, soldering the elements, and *voila*—you are ready to tune up and enjoy the rig. It's not quite that easy, but all the fast talk aside, with a bit of skill and some homemade tools, most brackets and clamps can be eliminated. The antennas I have made are light, are quickly assembled, and have stood up to Michigan winters and spring winds.

In some parts of the country corrosion can be a problem, but aluminum corrodes also. I occasionally take down my antennas and clean them with steel wool. There's nothing nicer than the shine of brass and copper. Note that I don't mention anything about coatings. I never use them. Coatings are hard to get off once you put them on. Coax Seal™ and electrical tape are used on the connectors, and that's all. One word of caution about using Coax Seal™. If you've ever put it on a BNC connector, you know how hard it is to get it off. Tape the connector first and put the Coax Seal™ on last.

First, about the material. Copper pipe is available from hardware stores in different grades and diameters (see Table I). I use M grade for lightness and cost. It is available from chain hardware and lumber stores in 10 foot lengths. For 70 cm antennas a ½ inch copper boom is adequate; for the longer 2 meter antennas, ¾ inch is stronger. I don't see any problem with 10 foot booms if the center is supported.

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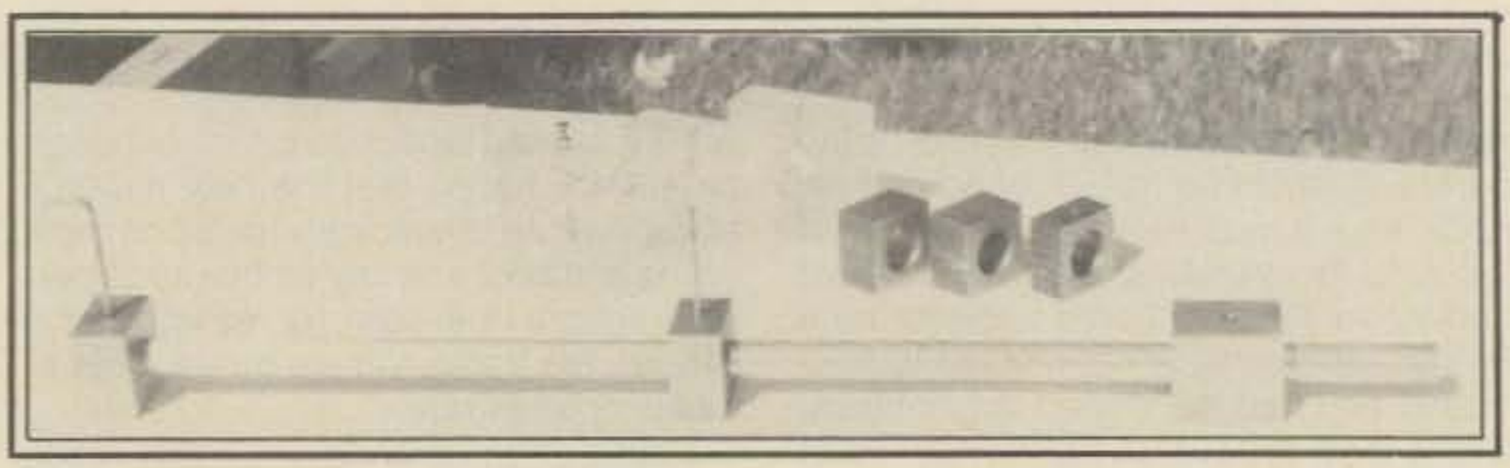

Fig. 1– Three sets of blocks made from steel, aluminum, and plexiglass. A hex key is shown in the left block. The drill used on the center block had its shank ground to a point and is used for the scribe.

Nominal size	O.D.	k	l	m
½	0.625	0.527	0.545	0.569
⅝	0.750	0.652	0.666	0.690
¾	0.875	0.745	0.785	0.811

Table I– Dimensions for different grades of commonly available copper pipe.

Now, how do we get the boom drilled properly? No easy task on a round pipe. I made a set of blocks with a centered hole the dimension of which is the O.D. of the copper pipe. Two blocks have a set screw, and the third has a center hole with a sharp pin. A block with a set screw is attached to each end of the copper pipe; the one with the pin slides freely on the pipe. Assemble this on a flat surface, making sure there is no twist in the boom. A line is scribed on the pipe when pressure is put on the pin sliding down the boom. A quarter turn of the end-blocks and a second line can be scribed 90° from the first. Doing it on all four sides gives four parallel lines for the drill holes of a crossed Yagi. By carefully measuring where the elements go and lightly running a tubing cutter around the pipe, you have marked the pipe exactly for the drill

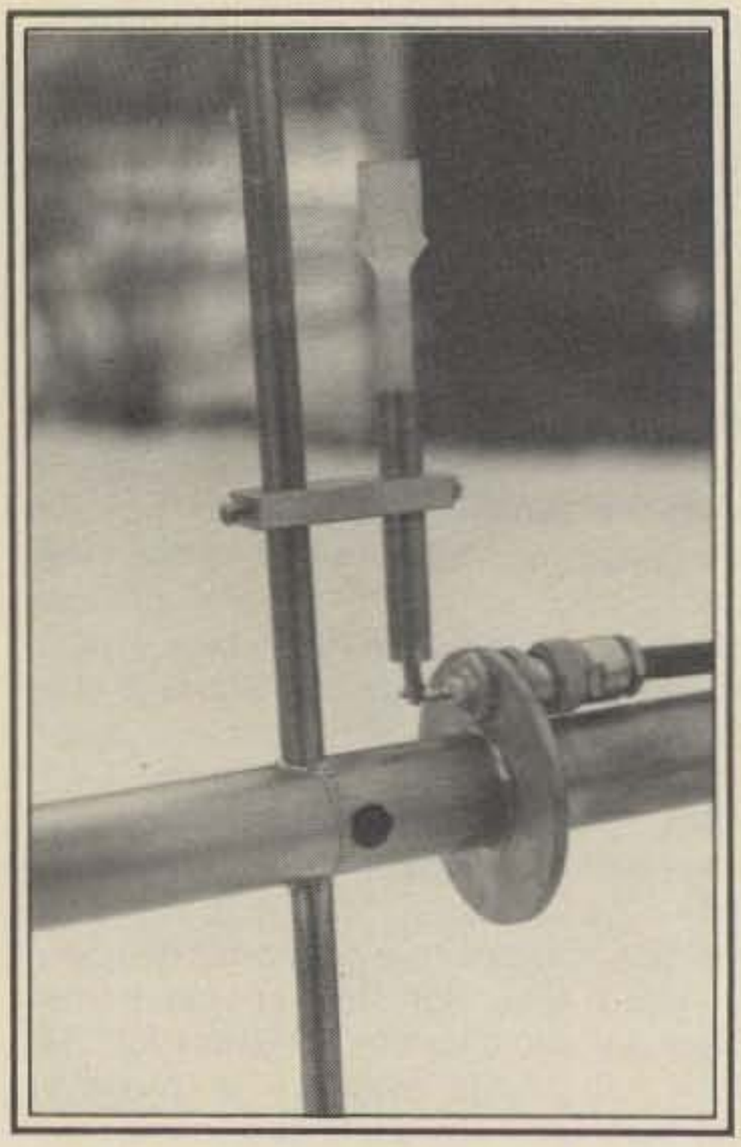

Fig. 2– Simple gamma match for 70 cm. The plexiglass rod was an attempt to change the capacitance with a sliding dielectric. It did not work out.

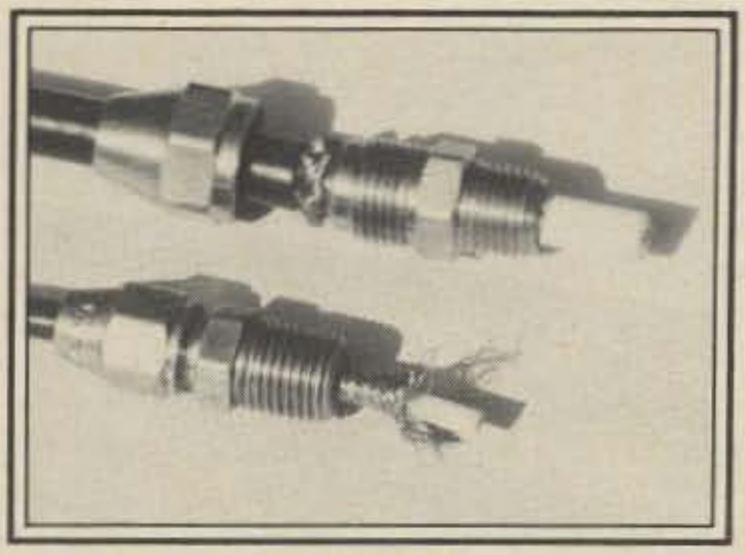

Fig. 3– Flared copper pipe fittings used to terminate cable at the antenna. The top cable shows how the braid is bunched up and serves as a mechanical hold.

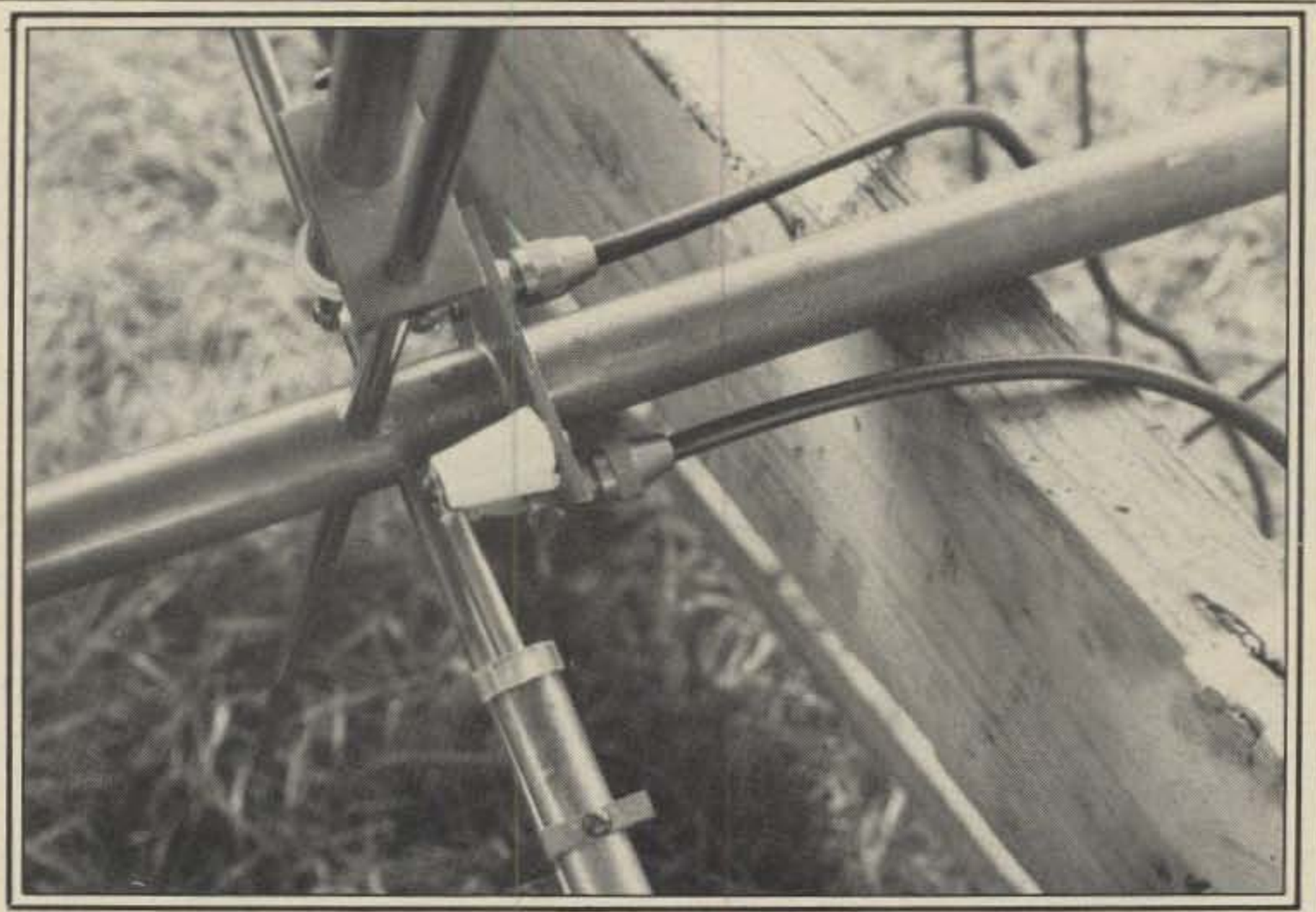

Fig. 4– The fittings can be weather sealed with silicone rubber. Use the kind that does not smell like vinegar.

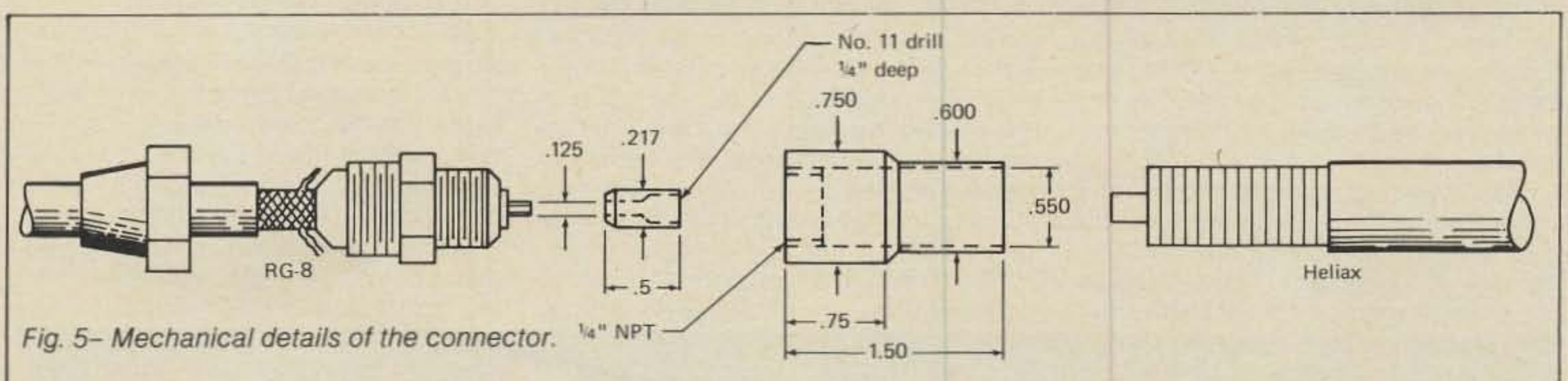

Fig. 5– Mechanical details of the connector.

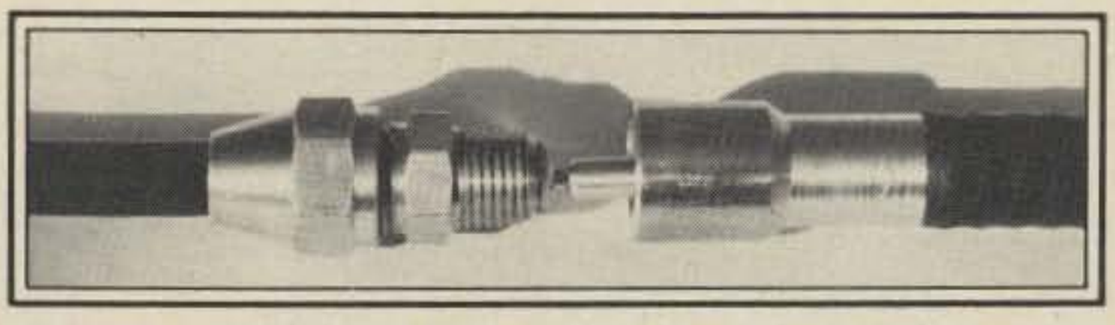

Fig. 6– Assembling the Heliax connector. The sleeve is moved forward on the hardline so coax can be soldered to the center connector.

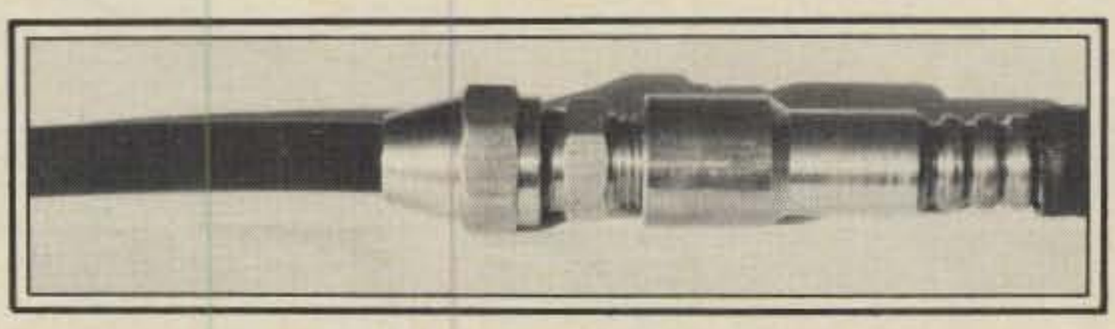

Fig. 7– The assembled connector.

holes. Punch a mark carefully and accurately and drill the first hole with a small drill.

Now back to the blocks. The material can be steel, aliminum, or plexiglass. Fig. 1 shows three sets of blocks made of each of these materials for different pipe sizes. Square bar steel is symmetrical to within a few thousandths and does not require extra work. Of course, a metal lathe is needed, and that's all fine and dandy. "But I don't have a metal lathe," you say. A friend might, and most high schools have a machine shop. Become friendly with a high-school senior taking machine shop (money does the trick), and as the politicians say, "Get full value from your tax dollar." Make three sets for ½, ⅝, ¾ pipe and you're all set.

I made the elements from 3/16 inch rigid copper tubing. Copper tubing is sold by the pound, and a good quantity can be had at reasonable cost. The driven element does require extra pieces. Fig. 2 shows a simple gamma match for 70 cm work. The BNC connector is mounted on a brass ring soldered to the boom. On later antennas the boom hole was made off center to save on weight and was soldered next to the element. This way the gamma match is in the same plane as the element, not behind it. The 3 percent shortening that the antenna manuals recommend for the driven element with a gamma match is all on the gamma-match side of the driven element. The other side remains the resonant length. In other words, the driven element is not centered after being shortened by 3 percent. I found the beam pattern is more in the direction of the boom.

One method I have used for attaching the coax cable to the antenna is flared copper pipe fittings. Amazingly, they fit several different types of coax perfectly. Note in fig. 3 a pipe fitting being used for terminating RG-8 and RG-58. A ¼ inch flare by ⅛ inch pipe thread is used for RG-58, RG-62, etc.—the smaller cables. RG-8 will fit ⅜ by ¼ NPT with some modification. The nut is enlarged to 13/32 inch and the fitting is enlarged to 21/64 inch. Now what are the advantages? They are inexpensive compared to coax fittings (about $1.00 a piece). Second, they are connectors without the drawbacks of a connector. Doubletalk? Nope. There is no break of the coax center lead; it runs through to the matching device on the driven element. The shield is intact also—no loss due to SWR or poor connections. Fig. 3 shows how it is assembled. Fig. 4 shows it in use on a 2 meter crossed Yagi.

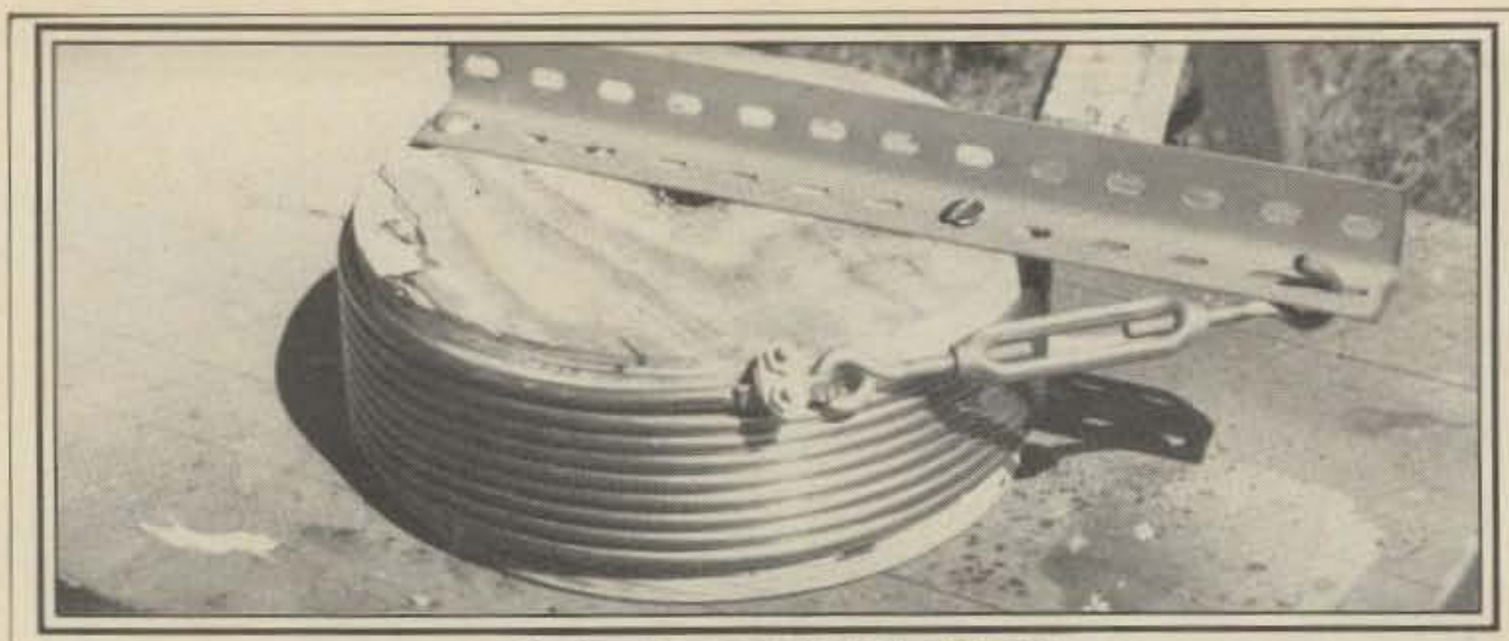

Fig. 8– How to wind a Helix coil.

Here's how to assemble it. Cut the plastic outer cover off, keeping in mind the size of the fitting and the length of center cable required. Cut off approximately ½ inch of the center and twist the braid to a point. Insert the cable through the fitting. Most cable fits very snugly. Leave approximately ¼ inch of the braid showing on the nut side. Carefully push the braid and fitting so the braid bunches up. This braid becomes the mechanical hold, squeezed between the fitting and the nut. Trim off the braid on the other end with a sharp knife, using the fitting face as an anvil to cut.

Many amateurs use hardline such as ½ inch Heliax. Some would like to use it, but their budgets can't cover the cost of the fittings—$20-plus each. I have seen the hardline at hamfests, but not the connectors. Make your own or bribe that high-school kid again. Fig. 5 shows the mechanical details. A ⅜ inch pipe fitting is used with a sleeve and center connector. The dimensions are for 50 ohms and connect RG-8 to Heliax LDF4-50. Cut part of the plastic cover from the Heliax. Solder the center connector to approximately ¼ inch of the Heliax center. Slide the sleeve on Heliax as in fig. 7, and solder the center connector to the coax. Slide the sleeve back and thread it carefully on the pipe fitting as in fig. 6. Solder the Heliax to the sleeve. The sleeve is made thin at that end so that as little heat as possible is needed for the solder. Aim the butane torch at the sleeve and solder as quickly as possible.

The Helix is a complex antenna to build. Frankly, they look impressive but they don't stack up to a Yagi. Some amateurs use coax cable for the Helix coil. After a hot summer the antenna looks more like limp ring bologna. Soft copper pipe works a lot better. If you want to tackle making a Helix, here are a few tips. Buy the copper tubing, but ask that it not be unwound to measure it at the plumbing supply store. Unrolling just makes a mess. Simply measure the diameter and multiply by three times the number of coils. That's close enough to the real length. Cut several circles of ¾ inch plywood with a circumference slightly larger than the length of one turn. Glue the plywood into a cylinder and turn it on a lathe to the correct circumference. Attach a length of L stock as shown in fig. 8. Anchor one end of the coil to the cylinder; put a cable clamp and a turnbuckle on the other end. Tighten the turnbuckle while rapping the plywood with a hammer. The vibration shifts the copper tubing and puts equal pull on the coil. The result is a clean coil with correct diameter. The coil support can be wood, plastic water pipe (strengthened with wood dowel), or fibreglass. Fibreglass is the best. Drop a card to Sky-Pole Manufacturing Inc., 1922 Placentia, Costa Mesa, CA 92627, and ask for a catalog. They sell blemished fibreglass poles at reasonable prices.

With a little ingenuity and patience, you can turn your next antenna into a "shining" example of craftsmanship. CQ

ICOM

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**See IC-740 list above for other options (*)*

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FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
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AG-20 Internal preamplifier*	56.95	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	759.95
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
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Common accessories for 271A/H and 471A/H		
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PS-35 Internal power supply for (H)	160.00	144.95
PS-15 External power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for PS-15/CF-1	6.50	
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	489.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-27A Compact 25w 2m FM w/TTP mic	369.00	329.95
IC-27H Compact 45w 2m FM w/TTP mic	409.00	369.95
IC-37A Compact 25w 220 FM, TTP mic	449.00	299.95
IC-47A Compact 25w 440 FM, TTP mic	469.00	419.95
UT-16/EX-388 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	449.95
ML-12 10w amplifier	339.00	299.95
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IC-505 3/10w 6m port. SSB/CW xcvr	$449.00	399.95
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BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers

Deluxe models	Regular	SALE
IC-02AT for 2m	349.00	299.95
IC-04AT for 440 MHz	379.00	329.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts SALE	359.95
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier SALE	79.95
ML-25 2m 2.3w in 20w out amplifier SALE	179.95
SS-32M Commspec 32-tone encoder	29.95

Shortwave receivers	Regular	SALE
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EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
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CQ REVIEWS:

A Selection of Baluns From Palomar Engineers

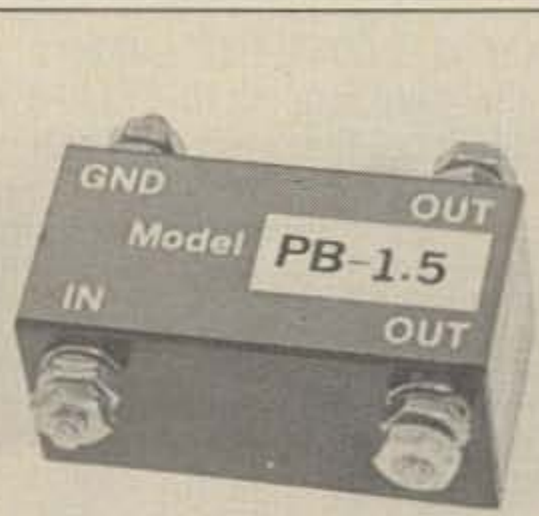
BY JOHN J. SCHULTZ*, W4FA/SV

Palomar Engineers has developed and brought on the market a series of different baluns. Some of the baluns are unique in that they are available in a wide range of impedance transformation ratios not otherwise available, and still other baluns are of interest because of their rugged construction and high power-handling capability. In this article some representative samples of both types of baluns are described.

The PB Series

The PB series of baluns from Palomar are miniature, medium-power-level baluns that come in a uniquely wide range of impedance transformation ratios as shown in Table I. The baluns themselves measure only 1½" × ¾" × ¾" in size (without terminals) and are potted assemblies with two screw terminals on one end for the balanced load and two screw terminals on the other end for the connection of a 50 ohm coaxial line. The potted nature of the assembly seals it against moisture, and the hardware used is stainless steel. The baluns can be used directly outdoors, but mechanical considerations, as described later, might preclude this for some installations. The baluns are rated, at matched load, for 350 watts PEP or 100 watts continuous power (AM, RTTY, etc.). In somewhat plainer language, they are meant basically for use with any 100 watt or so output class HF transceiver (160-10 meters).

Looking at all the impedance transformation ratios available in Table I, one may wonder what applications exist for them. There is, in fact, a very wide range of applications which can roughly divide into two broad classes—matching to an antenna to improve SWR bandwidth, and matching to a wide variety of wire antennas without using an antenna tuner.



The PB-series baluns are housed in very compact enclosures measuring only about 1¾ inches long by ¾ inch square.

The PB 1.5 unit, for instance, matches 50 ohms to 75 ohms balanced. Isn't using such a balun between a ½-wavelength dipole and 50 ohms coaxial line "gilding the lily"? The answer has to be a bit yes and a bit no. Fig. 1 shows the classic curve of radiation resistance for a ½-wavelength dipole versus its height above ground. At low heights there is considerable variation in radiation resistance, but at the heights at which most amateurs are likely to use such an antenna, and considering the effect of imperfect ground, the terminal impedance is likely to be 70–75 ohms resistive. Therefore, the use of 50 ohm coaxial line will produce a 1.4:1 to 1.5:1 SWR. Such a relatively low SWR means the feeder-line loss due to SWR will be insignificant even on 10 meters. Also, most solid-state transceivers are likely to accept a 1.4:1 or 1.5:1 SWR with only a minor reduction in output power. However, if the SWR is such a value at band center, it is likely to rise to 2:1 or more at band edges.

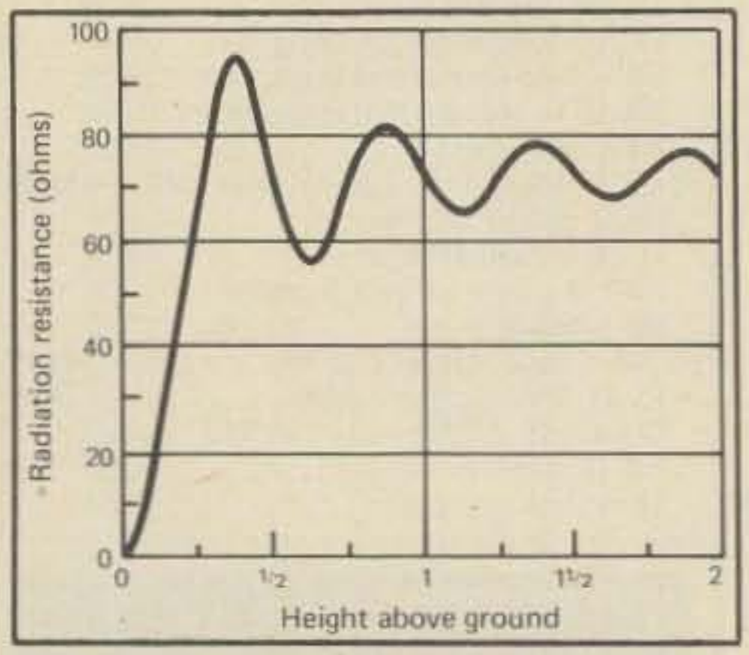


Fig. 1– The classic dipole height above ground, in wavelengths, versus radiation resistance graph.

If one uses an antenna tuner, one can adjust it so a solid-state transceiver still delivers full power output. But if one doesn't use a tuner, the transceiver is

Model	Ratio	Matches 50 ohms to
PB-1	1:1	50 ohms
PB-1.5	1.5:1	75 ohms
PB-2	2:1	100 ohms
PB-3	3:1	150 ohms
PB-4	4:1	200 ohms
PB-5	5:1	250 ohms
PB-6	6:1	300 ohms
PB-7.5	7.5:1	375 ohms
PB-9	9:1	450 ohms
PB-12	12:1	600 ohms
PB-16	16:1	800 ohms

Table I– The PB series of baluns from Palomar Engineers covers a very extensive range of impedance ratios. Each model will match 50 ohms unbalanced to the impedance shown in the right-hand column, balanced or unbalanced.

*c/o CQ magazine

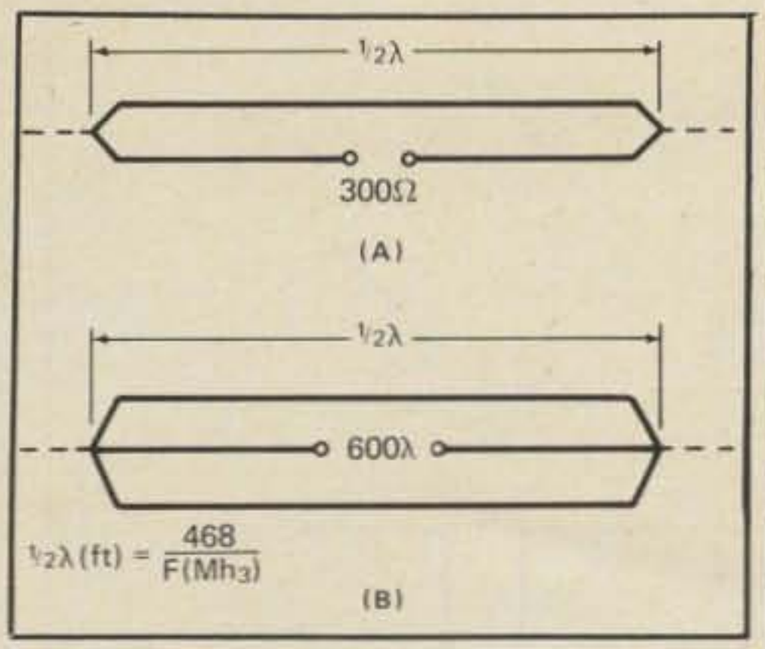


Fig. 2– The old two- and three-wire folded-dipole antenna designs can provide excellent SWR characteristics across an entire band. The dipoles can be constructed from #14 stranded antenna wire with plastic spreaders to keep the wires apart. The spacing between the wires is not critical and can be as little as 2 inches above 14 MHz and as much as 6–8 inches on 80 meters, if desired.

likely to "shut down" to half or less power output at band edges depending on the design of the transceiver's PA, the reactance portion of the antenna, load, etc. On the other hand, if one can get the band center SWR down to almost 1:1 by using a PB 1.5 balun and not use an antenna tuner, the SWR even at the band edges is likely to be such that no significant reduction in output power from a transceiver will occur. The "bottom line," therefore, is that the use of a balun such as the PB 1.5 with a reasonably well elevated dipole will, in many cases, allow a solid-state transceiver to load properly into a dipole across an entire band without using an antenna tuner. One test made with a solid-state transceiver and a 20 meter dipole illustrated the point. Without the PB 1.5, the transceiver delivered about 90 watts output on the mid-band frequency to which the dipole had been dimensioned. At band edges the power output dropped to 30–40 watts, unless an antenna tuner was used. Using the PB 1.5, the power output at the band edges dropped to only 70 watts, which, for all practical purposes, obviated the need for a tuner.

For operators who are primarily interested in single-band operation with a solid-state transceiver and who want instant QSY capability, the use of some other PB series baluns with some form of folded dipole antenna should be of interest. The old-fashioned two- and three-wire folded dipole antennas, as shown in fig. 2, are well known for their broad bandwidth. Some old-timers even claim they have a bit better radiation efficiency than a single-wire dipole. The use of a PB-6 can allow the direct feed of the two-wire dipole of fig. 2(A) with 50 ohm coaxial cable. Or, one can use a relatively light-weight and inexpensive 300 ohm twinlead transmission line to the antenna and locate a PB-6 within the shack to convert to 50 ohms coaxial cable.

The use of a PB-12 will allow the direct feed with coaxial cable of the three-wire folded dipole of fig. 2(B). In this case, the

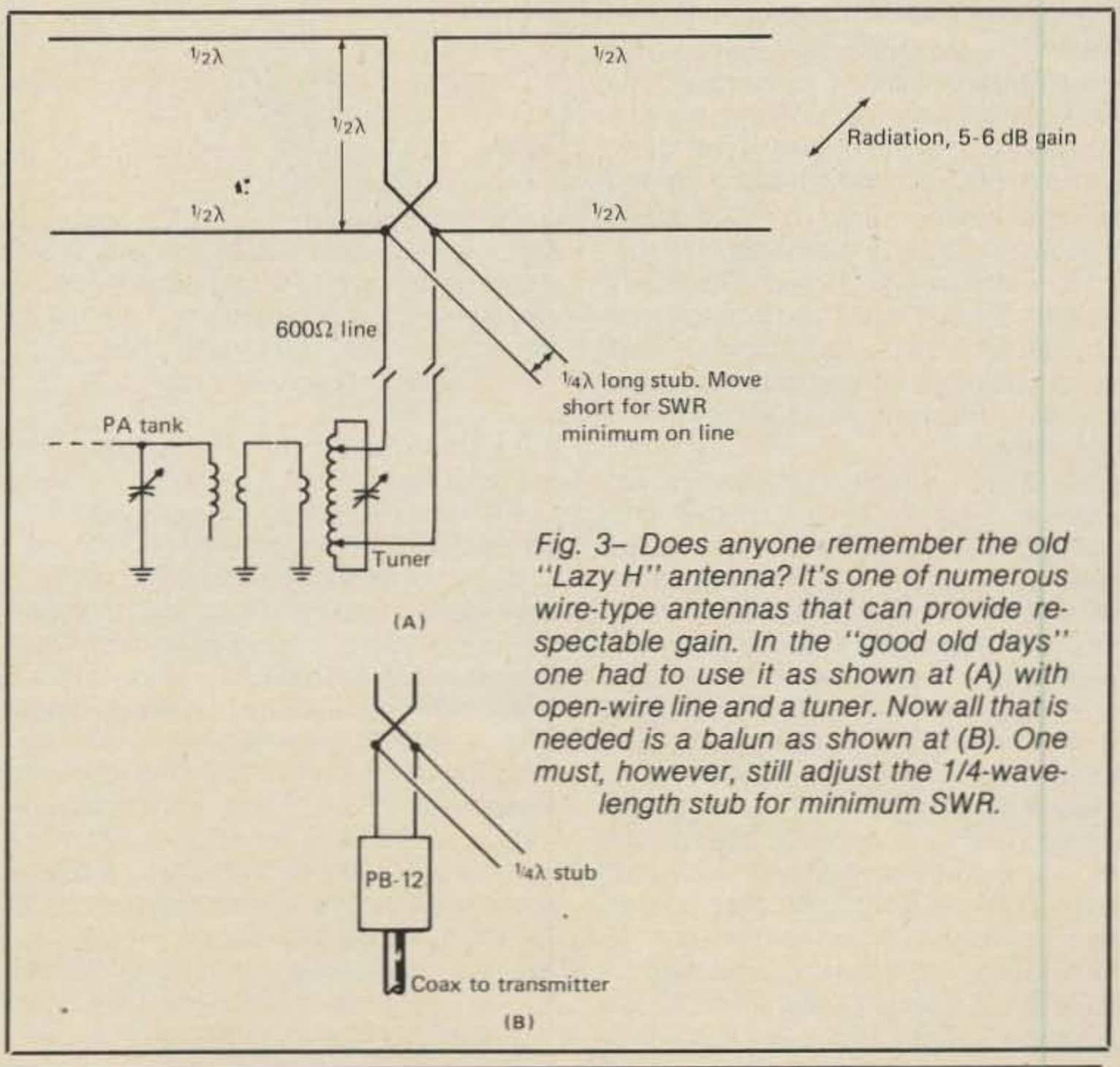


Fig. 3– Does anyone remember the old "Lazy H" antenna? It's one of numerous wire-type antennas that can provide respectable gain. In the "good old days" one had to use it as shown at (A) with open-wire line and a tuner. Now all that is needed is a balun as shown at (B). One must, however, still adjust the 1/4-wavelength stub for minimum SWR.

No -33-34

PB-12 would probably be located at the dipole antenna, since it is hardly worth the effort to construct a 600 ohm open-wire transmission line to the antenna so the PB-12 can be located inside the shack.

Either antenna, once it is properly dimensioned, is capable of producing an essentially flat SWR response across an entire band, except perhaps on 75/80 meters. The three-wire folded dipole has somewhat better bandwidth characteristics than the two-wire folded dipole, but it does pose some construction difficulties on the lower frequency bands because of its length on those bands.

The use of the PB series of baluns opens up the possibility for amateurs to re-explore the use of a wide variety of simple, gain-type wire antennas, many of which have been forgotten since open-wire transmission lines essentially disappeared from the scene some years ago. If one digs back into various old radio handbooks and textbooks, one will find a wide variety of wire antenna forms which achieved gain and directivity at the cost of only wire and space. However, they usually required a balanced open-wire transmission line and an antenna tuner at the transmitter end of the transmission line to convert the transmission-line impedance to some lower value for which the output of a transmitter was designed.

Fig. 3(A) shows a nostalgic example. In this case, a "lazy-H" antenna is illustrated. The simple wire antenna itself provides a respectable 6 dB gain on the band for which it is dimensioned (radiation is bi-directional at right angles to the plane of the antenna). The construction is simple, straight-forward, and inexpensive as far as the antenna itself is concerned. The antenna only becomes awkward to implement because of the original need for an open-wire 600 ohm transmission line and the antenna tuner. Using a PB-12 balun, as shown in fig. 3(B), the whole affair becomes extremely simplified. The PB-12 converts the 600 ohm balanced antenna terminal impedance to 50 ohms unbalanced, and only a coaxial cable run to the antenna is required; no antenna tuner is necessary.

A few more simple examples of wire antennas which can be readily constructed using the PB series of baluns are shown in fig. 4. The full-wave loop of fig. 4(A) provides a bit of gain (2 dB, bidirectional at right angles to the plane of the antenna) and can easily be fed using a PB-2 balun. The extended double-Zepp of fig. 4(B) is basically an elongated dipole having about 3 dB gain broadside to the antenna plane. Again, a PB-2 balun will closely match its terminal impedance. The Windom antenna of fig. 4(C) is a multiband antenna which operates only on even harmonics of its fundamental ½ wavelength (e.g., when dimensioned for 40 meters, it will also resonate on 20 and 10 meters). A PB-12 balun will easily couple a coaxial line to its nominal 600 ohm terminal impedance.

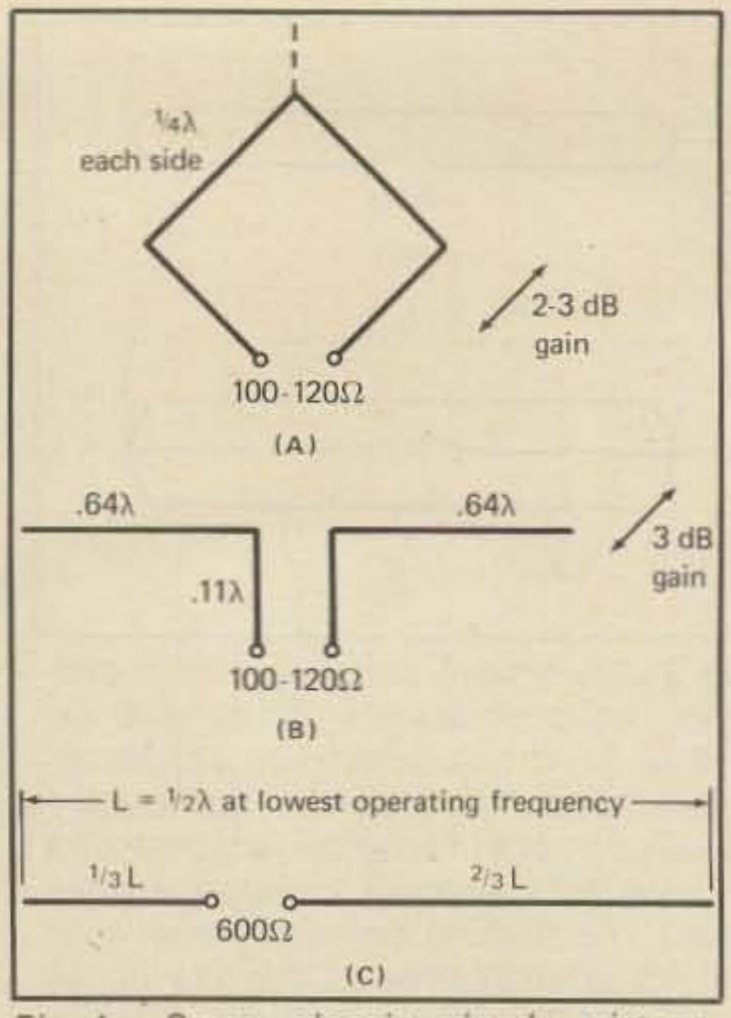


Fig. 4 – Some classic, simple wire antennas which can easily be coupled into from coaxial line by using a balun. (A) and (B) are single-band antennas, while (C) is the classic multiband Windom, which will operate on even harmonic bands of its design band.

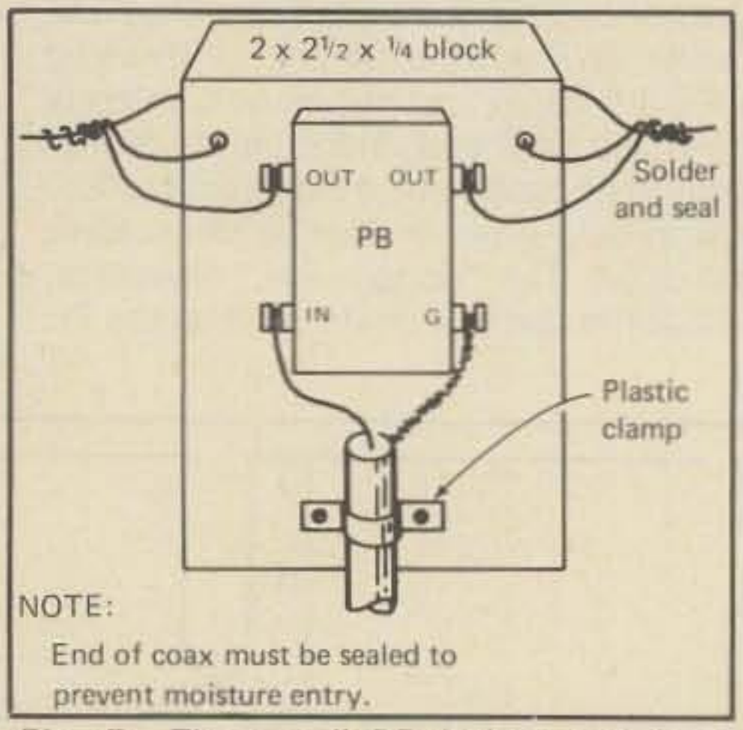


Fig. 5– The small PB baluns are best mounted on a supporting board which can take the pull of the antenna wires and the coaxial cable if they are to be used with long-wire antennas.

As was mentioned, if one explores some old textbooks, one will find dozens of wire-type antennas that can be given a new lease on life by using an appropriate PB-series type of balun to feed them with coaxial cable. An added bonus to the relatively low cost per dB gain of these antennas is that they are usually relatively broadband in nature. Even if the terminal impedance of such an antenna should vary across a band from 500 to 700 from a nominal 600 ohms, by the time a balun transforms the impedance at a 12:1 ratio, for example, the impedance variation at the nominal 50 ohm level is insignificant.

The PB-6 and PB-12 baluns were tried with a variety of wire antennas. They per-

The 1 K balun. It is designed to handle at least 1 KW and to act as the center insulator for a wire antenna.

formed very well, and no sign of heating could be observed when they were used at 100 watts output, key-down for 5–10 minute test periods. No formal insertion loss measurements were made, but an educated estimate is that it could not be more than a small portion of a dB.

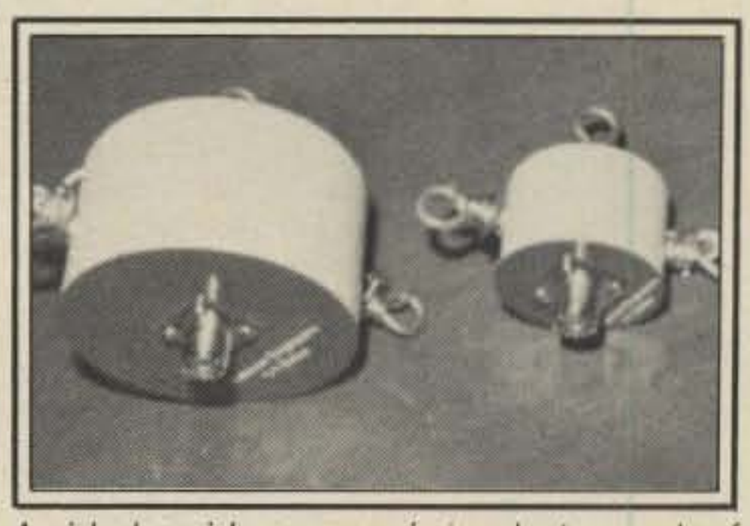
The mechanical construction of the PB series of baluns is rugged enough, but it is probably not a good idea to use them as a center insulator in an antenna except in the case of a very light-weight portable antenna using a light-weight coaxial feedline such as RG-174U. For most installations the PB balun is best mounted on some sort of center insulator support which can handle the pull of the antenna wires and that of the coaxial cable transmission line. Such a center insulator support can be a very simple unit, and ideas can be found in many handbooks. Fig. 5 shows one such support made from a simple 2" × 2½" block of bakelite or similar insulating material. If one were to construct a folded-dipole type of antenna, this type of block insulator would also be ideal, since the continuous wire of the dipole could be fastened to the bottom part of the insulator and jumpered for continuity.

The PB series of baluns can also be wired such that they provide an unbalanced to unbalanced impedance transformation (wiring instructions are supplied with each balun). This possibility probably doesn't have too much application as far as antennas are concerned. However, it could be useful for various matching applications between different pieces of equipment. Matching between a solid-state transceiver and a linear amplifier that has an untuned input but a fairly constant input impedance above 50 ohms on each band particularly comes to mind. A great number of older tube-type linears fall into such a category.

High-Power Baluns

In contrast to the PB baluns, the 1 K and 2 K baluns from Palomar are straightforward, 1:1 ratio baluns specifically designed for rugged, high-power applications. They are completely sealed and meant for outdoor use, simultaneously serving as a balun and antenna center insulator.

The 1 K balun as shown in a photograph consists of a heavy-duty, white PVC pipe cap which is used as a housing for the balun and to which are fastened the eyebolts and a metal bottom plate containing an SO-239 connector. The SO-239 is fastened with regular hardware (instead of simple pop rivets), and the bottom plate is completely sealed where it joins the PVC. The whole appearance is one of very rugged construction. The model 1 K uses a 2½ inch diameter PVC cap, and the overall dimensions with the eyebolts are about 4½ inches wide by 4 inches high.

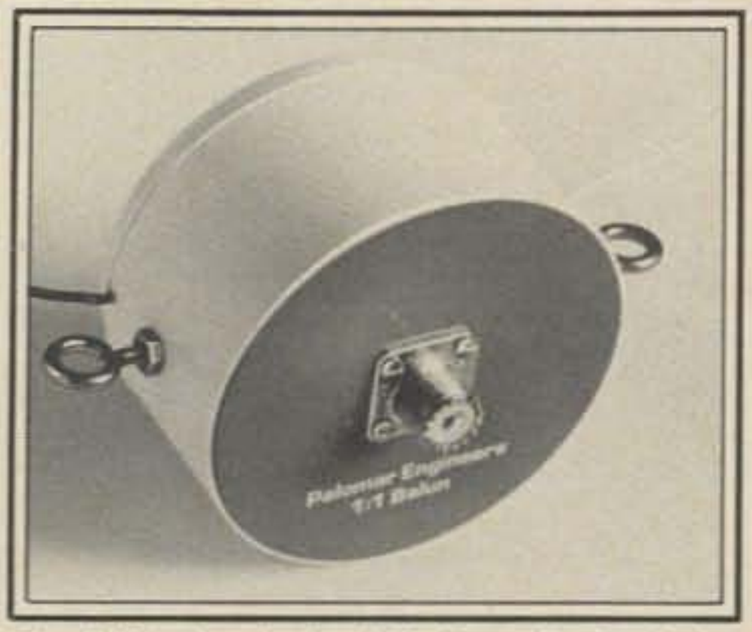


A side-by-side comparison photograph of the 1 K and 2 K baluns to show their relative size.

The photograph of the 2 K balun looks much like the 1 K balun, but in reality there is quite a bit of difference between the units, with the 2 K being the "heavyweight" of the line. The 2 K is constructed in a manner similar to the 1 K, but with much larger dimensioned components. The PVC shell has a 4 inch diameter, and the overall longest dimensions are about 6½ by 5 inches. No scale was handy to weigh the 2 K, but it seems to weigh several pounds. It is rated to handle at least 2 KW at matched load from 1.7 to 30 MHz.

Both baluns were tried in typical dipole antenna configurations. At the approximate 1 KW power level which was available, neither balun showed the slightest sign of heating with SWR's ranging from 1:1.0 to about 1:1.6. Of course, the baluns are not meant to operate at a high SWR. Especially at KW level, no balun is going to survive for very long if the SWR is high and the transmitter power is absorbed in the balun instead of going into the antenna. Using No. 14 antenna wire, the dipole wires were made as taut as possible without any deformation of the balun housings being apparent. Although the baluns use plated hardware, it probably would be useful to use a weather sealer over the wire connections and a sealer on the PL-259 used to connect to the balun once the balun is ready for final usage. There is no reason to doubt that the baluns should last for many years of service. A brief instruction sheet comes with each balun.

The baluns are manufactured by Palomar Engineers, 1924-F West Mission Road, Escondido, CA 92025. The PB series is priced at $22.95 each. The 1 K balun is $39.95 and the 2 K model is $57.95. There is a $4.00 shipping and handling charge for each order. CQ



The 2 K balun is the "big" one in the Palomar line. It measures 4 inches across (not including the eye bolts) and will handle 2 KW plus.

The 160 meter band is growing in popularity at a much faster rate than the size of your property. If you can't wait around for your property to grow, then you might consider KI60's solution and get in on the fun.

The KI6O Top-Linear-Loaded 160 Meter Inverted "L" Antenna

BY DEANE J. YUNGLING*, KI6O

After using one of the top commercial verticals on the 160 meter band for the past two years, I decided that I wanted an antenna with more bandwidth. My vertical, which used a loading coil for 160 meter operation, required the use of an antenna tuner for operation over more than a few kiloHertz of the band. This required constant adjustment of the tuner during contests to keep my Kenwood TS-930S, which has solid-state finals, at full output.

I live on a city-size lot. Immediately behind my house I have a guyed 60 foot tower. A few feet above the top of the tower is a triband Yagi, and 12 feet above the beam is a 40 meter dipole.

I had considered some sort of inverted "L" in the past but had never tried one. The W4TWW coaxial inverted "L" (see August 1984 *CQ*, p. 72, "The W4TWW Coaxial Inverted 'L' Antenna For 160 Meters") seemed interesting. However, I don't have enough room to fit the top portion of the "L" on my lot. I decided that some form of linear loading that would reduce the space required and still work well could be used. The final design exceeded my expectations.

The antenna provides a bandwidth of about 90 kHz with a 2:1 SWR or less. At the design frequency it approaches 1:1.

I adjusted mine to resonate at 1.840 MHz. That way I can work all of the band where most normal and contest activity occurs without needing an antenna tuner. For excursions above 1.885 MHz I can still use the tuner.

There are a number of methods that can be used to support the antenna from

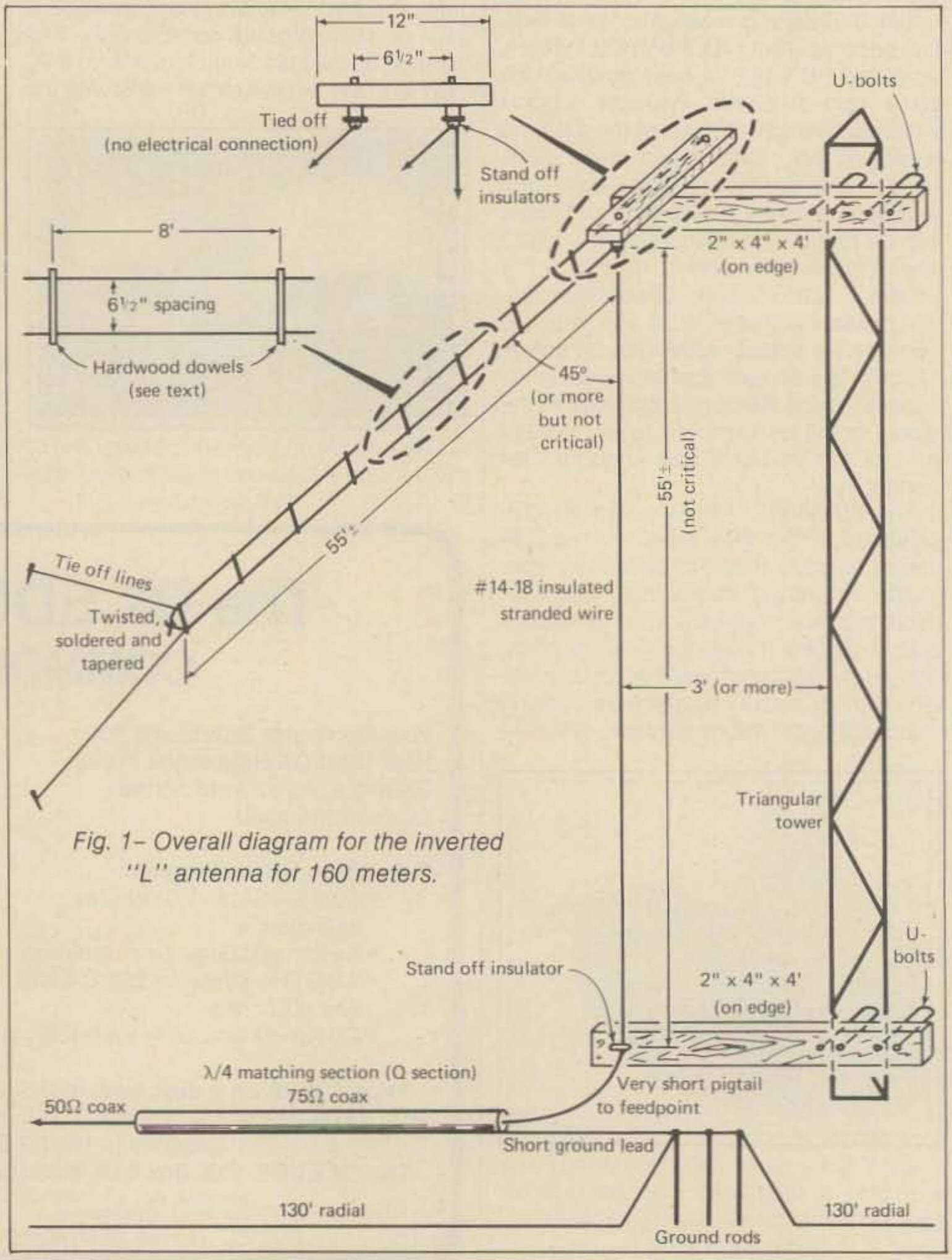


Fig. 1– Overall diagram for the inverted "L" antenna for 160 meters.

*7932 Sunset Ave., Fair Oaks, CA 95628

the tower. The method shown is inexpensive, easy, and works as well as any other. The fir boards, commonly referred to as 2 by 4's, are 4 feet long. They are bolted to two legs of the tower, preferably on the outside, using one "U" bolt for each tower leg. The boards are on "edge" and should extend 3 or 4 inches beyond the rear tower leg. All holes should be drilled and the boards treated with a preservative prior to installation on the tower.

The feedpoint is a stand-off porcelain insulator. The vertical portion of the antenna is about 55 feet long. The wire is #16 stranded, insulated wire (not critical). At the top, the vertical wire, as well as one side of the ladder, attaches to another porcelain stand-off insulator.

The top portion of the antenna is a sloping "ladder" made with the same wire. The spacers (about every 8 or 10 feet) are made of 5/8 or 3/8 inch hardwood dowels which have small holes drilled 1 inch in from each end to hold the wires. The dowels are sprayed with two or three coats of acrylic clear spray for weather protection. The wires are tied firmly to the dowels where they pass through the holes with waxed lacing twine or similar material. The dowels can still be adjusted, with difficulty, after being tied.

The end of the wire is tied off to another stand-off insulator. The ladder is sloped at approximately 45° (not critical). The end of the ladder is tied off to whatever is handy. In my case, it is to the end of my house. The end of the ladder is about 10 feet above my house (which is a single-story ranch-type home). The support lines, which can be of heavy nylon fishing line, should be spread apart at least 10 feet (or more if possible) to keep the ladder from twisting. The ladder is light enough so that it can be tensioned to have very little sag.

Initially the ladder should be a few feet longer than the 55 feet shown to allow for adjustment. The resonant frequency can be checked and a few inches removed at a time from the bottom end of the ladder until the desired frequency is reached. To do so, loosen the support lines and let the ladder swing down. The wire can then be cut in the middle of the bottom end and twisted back together. It can be soldered and then taped to the bottom end dowel when the desired frequency is reached. Remember to keep both sides of the ladder the same length. As a final note, the antenna appears to work best if the ladder, the vertical wire, and the tower are all in line—that is, in the same plane.

As with most vertical antennas, this antenna requires a good ground system. I installed a system of ten 4-foot ground rods at the base of the antenna and two 130-foot radials zig-zagged around my backyard. (The more radials and/or ground rods used the better.)

The feedpoint impedance was determined to be about 20 ohms with an antenna noise bridge. Therefore, some form of matching arrangement was necessary. Because of its simplicity and broad-band characteristics, I elected to use a quarter-wave matching section (Q-section). The required impedance for the matching section to match the 50 ohm transmission line to the 20 ohm load is about 30 ohms. To obtain this impedance I used one quarter-wave section of 75 ohm coax (RG-59 or RG-11) in parallel with one quarter-wave section of 50 ohm coax (RG-58 or RG-8), with the resulting impedance of about 30 ohms. This gave a very close match, as shown by the near 1:1 SWR at resonance.

The method I used to attach the two lines in parallel is shown in fig. 2. It requires two "T" connectors, four "L" (or elbow) connectors, and two barrel connectors. All fittings should be sealed with electrician's tape, Coax Seal™, or some other sealant after assembly. The matching section can then either be coiled up in a convenient location or it can be used for the run to the operating position.

The antenna as described will handle the full legal power limit. As for performance, the antenna has surpassed my expectations. It works considerably better than a vertical on both transmit and receive, has a much wider bandwidth, and picks up less noise than the vertical. As a final note, it seems to exhibit no directional characteristics in spite of its relation and close proximity to the tower CQ

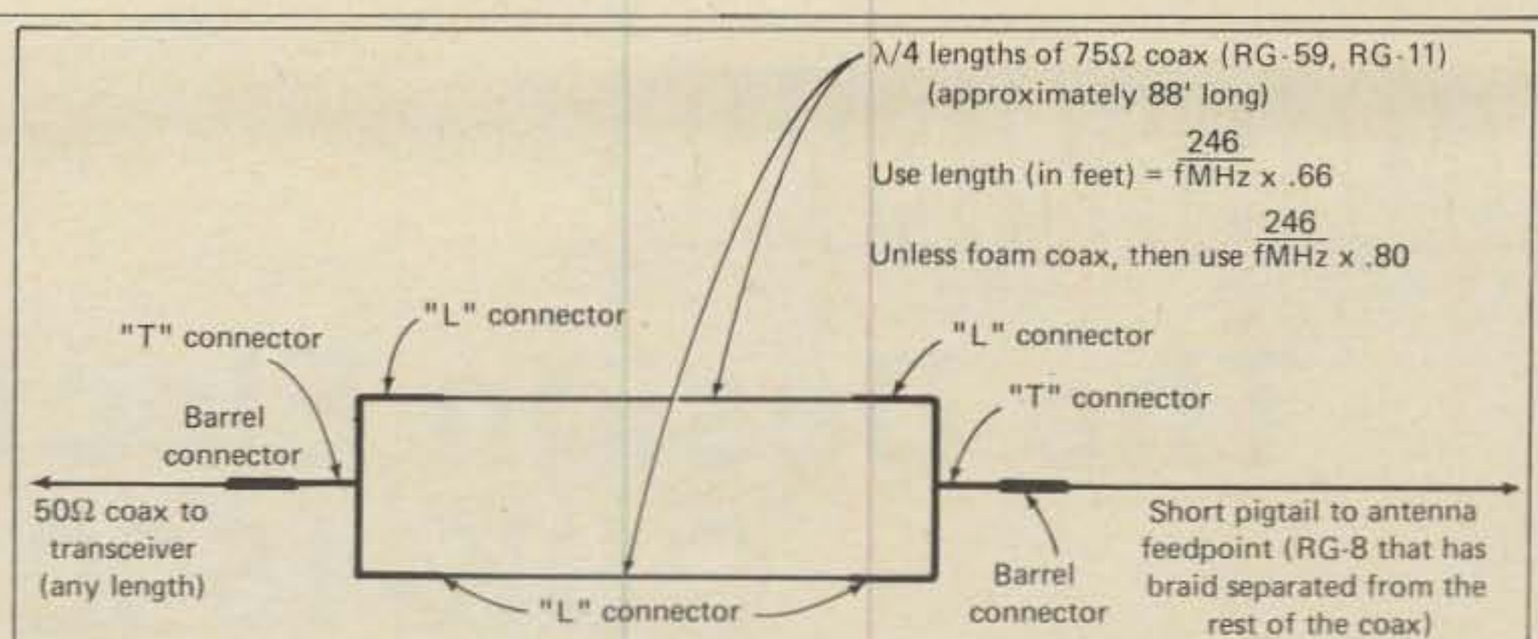


Fig. 2– The matching network.

CQ REVIEWS:

The Design Electronics QSK-1500

BY LEW MCCOY*, W1ICP

Design Electronics of Groveport, Ohio has recently introduced a rather unusual product. It is the QSK-1500, which is an all-solid-state, pin diode, transmit/receive (T/R) switch that is capable of providing high-speed break-in operation for all amateur modes and will handle the amateur legal power limit. The QSK-1500 will turn *any* amplifier into a full QSK (break-in) unit providing the transceiver is a full break-in unit to begin with.

Before discussing the QSK-1500, a word or two about "break-in" operation is appropriate. Originally, the term "break-in" referred primarily to CW operation (which is no longer true), and the actual meaning of the term was for any system that allows the transmitting operator to hear the other station's signal between any kind of pauses, or referring to CW, during the transmitting station's "key-up" periods. This system would allow a transmitting station to be broken in on during these key-up periods, and hence the term "break-in." Also keep in mind that if you are the one transmitting and you have break-in capability, it can save you much time and effort if your receiver is opening up between transmitting periods so that you can hear the station you are calling, such as DX or another contest station.

Before the days of transceivers, when we used separate transmitters and receivers, amateurs used separate antennas, one for receiving and the other for transmitting. In that way they didn't have the problem of switching (either by switches or relays) a single antenna to work break-in. However, to be honest, such a system was not very good because the best antenna was always the transmitting antenna—at least for amateurs with any savvy—and of course such a system was a handicap to good operating success.

Technical Consultant, CQ, 200 Idaho St., Silver City, NM 88061

Here is the QSK-1500 and its companion power supply.

Amateurs experimented with high-speed relays, tube-type T/R switches (I built and described several in my career), and other more esoteric systems. Incidentally, very few phone operators used any type of high-speed break-in, so for years phone was one-way to one-way monologues. With the advent of single-sideband operation, VOX (voice operated transmitters) became popular to the point where now the majority of amateurs operate in this manner—or at least are capable of such operation. Transceiver design improved to such a point that very high-speed CW (using a form of VOX) was possible using full break-in. And I am talking about 50 words per minute and faster. In this day and age high-speed break-in can be a way of life for CW, phone, and many other forms of transmissions, such as AMTOR.

The QSK-1500

All the above is great for a simple transceiver that is designed for fast VOX and break-in, but what about high-speed switching of the power amplifier? A very large percentage of amateurs use the legal power limit in amateur radio. Switching an amplifier at high speed poses many serious problems. Many T/R switches, either in themselves or in their use, are prone to generating TVI or other types of interference. Some require extensive equipment modification, and it appears that nobody likes to modify commercial gear these days. And, of course, some actually can introduce waveform distortion with all the problems that go with that. So what about the QSK-1500?

First off, the QSK-1500 is designed to handle 1500 watts of RF into a 50 ohm load continuously at 40 wpm CW or 800 watts continuous in a key-down locked condition for one hour. There is no waveform distortion at 1500 watts RF output as measured at 55 wpm (see the oscilloscope keying photo and text). Insertion loss on receive can be a problem when using T/R switches. However, the QSK-1500 has a typical loss of 0.2 dB, which for all practical purposes is insignificant. The isolation to the receiver is greater than 50 dB.

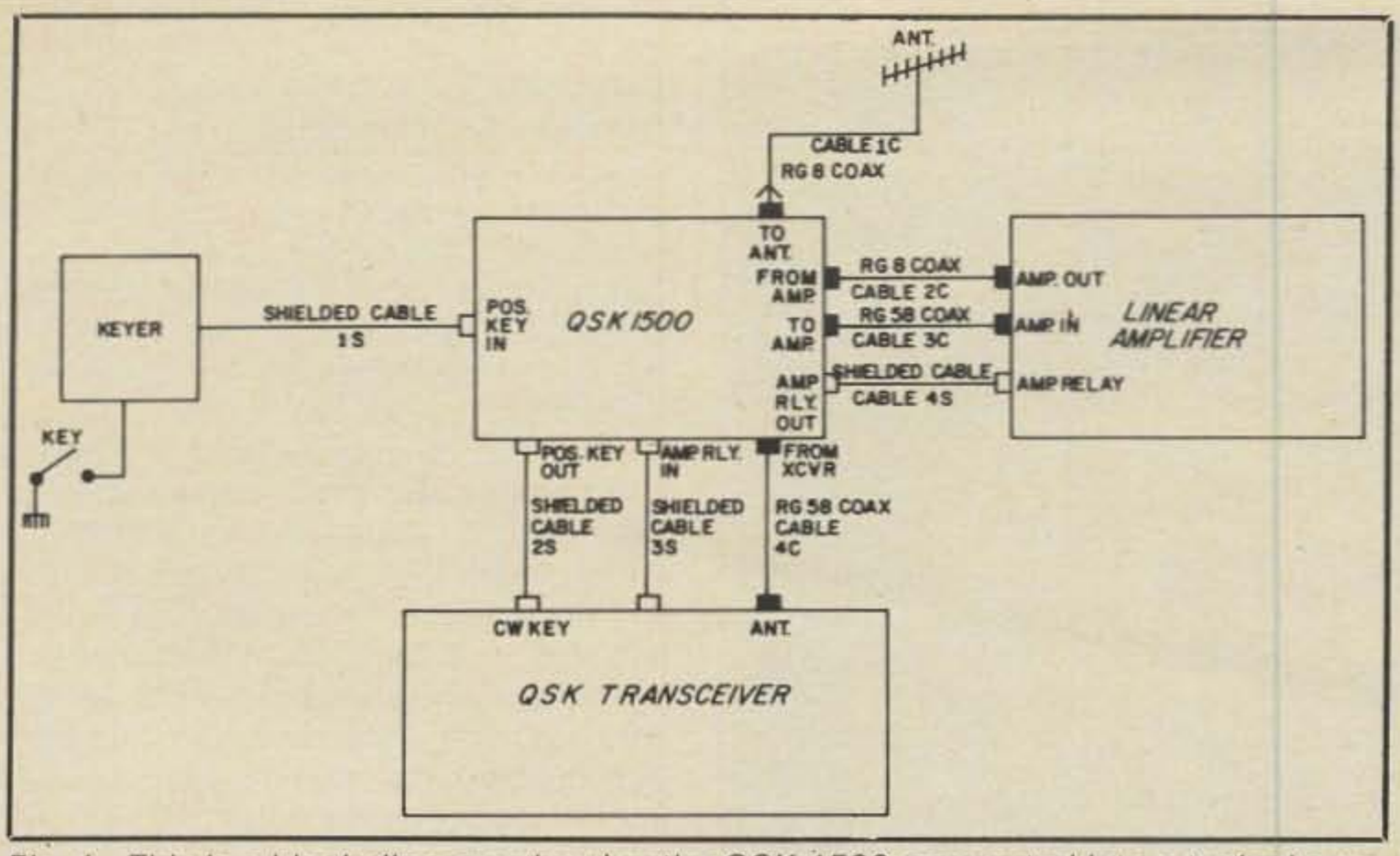


Fig. 1– This is a block diagram showing the QSK-1500 connected into a typical amateur station.

How It Works

Fig. 1 is a diagram showing a typical hookup using the QSK-1500 with a transceiver and amplifier, and fig. 3 is a block diagram showing signal paths. Please refer to figs. 1 and 3 for the following description of how the QSK-1500 works.

Let's follow the receive path of a signal. A signal comes in the antenna, as shown by the non-solid arrow into the output pin diode, which acts as a switch. At this point the signal is blocked from "seeing" any part of the 1500 watt amplifier.

Following the arrows, we see that the signal goes through the output receive line blocker, the receive line protector, input receive line blocker, and then through input pin diode switch. This diode effectively divorces the receive signal from the input circuits of the amplifier.

Now let's look at the transmit path. When you close the key on the transceiver and send that initial keying pulse through the system, three things take place. First, the timing and control unit starts its function. The purpose of this unit is to make sure the correct biasing voltages are applied to the diodes. One of the operations is that the instant the keying signal is received, the relays in the power amplifier are closed via a signal from the timing unit (a circuit using a 556 timing chip), so the relays in the amplifier are locked shut, and they have no further switching function in the operation of the unit. Also, at this first pulse of CW the input pin diode is turned on (biased on) as is the output pin diode. At the same time the input and output receiver line blockers are biased off with approximately 500 volts of reverse bias. The CW signal passes through the input pin diode, through the amplifier, and through the output pin diode to the antenna. When you open up the key, the timing and control circuits reverse the procedure and the receive line opens up. That essentially is how the system works.

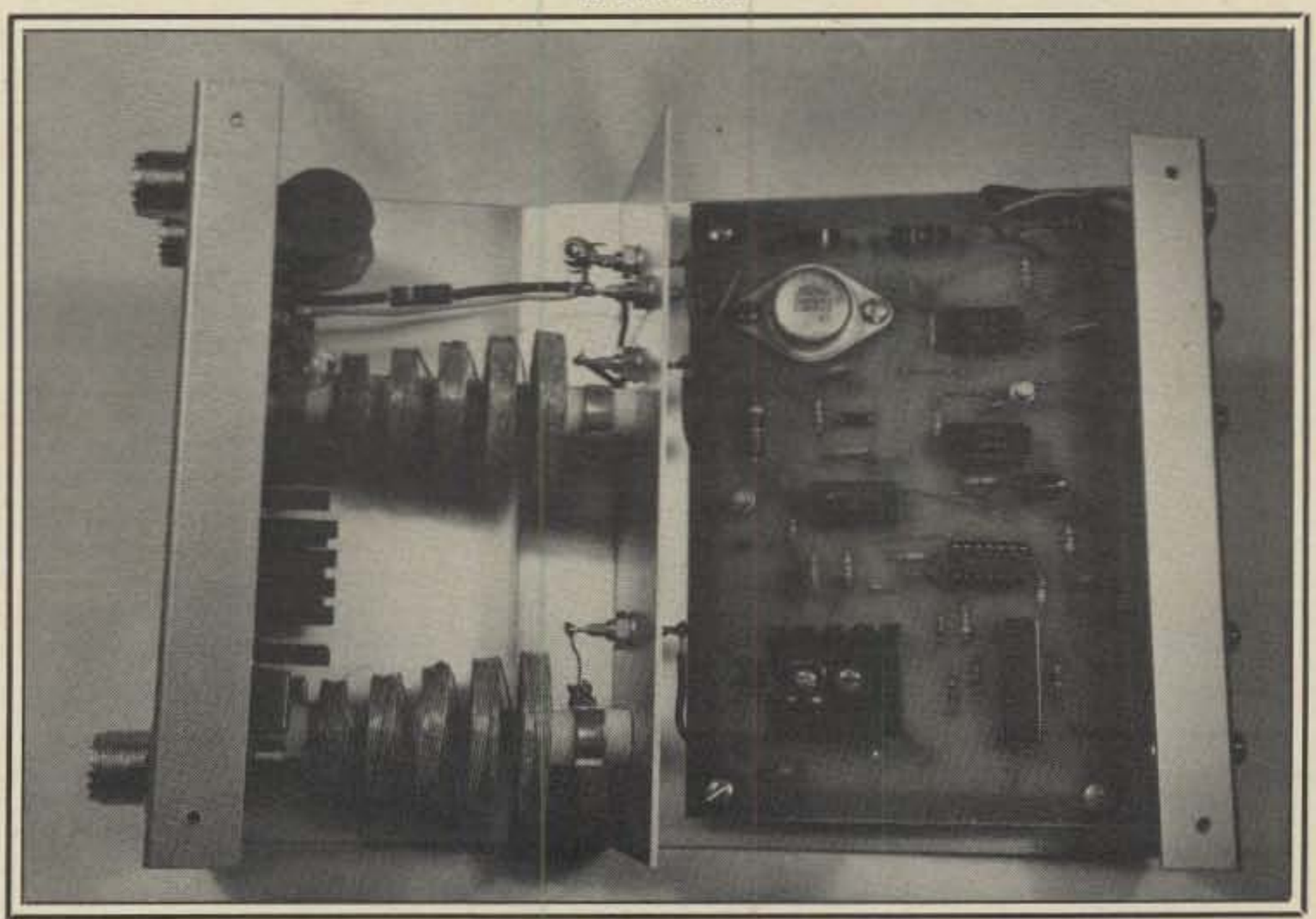
There are additional devices built into this unit for receiver protection in the very unlikely event that one or both of the pin diodes should fail. There is a receiver line protect circuit. This consists of a No. 12 fuse lamp that under normal receive conditions appears as a very low resistance. As high power RF appears on the line, anything above a volt tries to overcome two back-to-back diodes. The diode will trip at 3200 millivolts (3.2 volts), and when that point is reached (about 7 watts of RF), the fuse lamp will blow, completely protecting the receiver. Also, there is 50 dB of nominal separation built into the QSK-1500 between transmit and receive, so if you add that to the 50 dB that exists in all QSK transceivers, you can see there is plenty of isolation between transmit and receive.

How Fast Is Fast?

One of the more serious problems with generating high-speed break-in (and for that matter high-speed CW) is waveform distortion. It takes very good design to eliminate these problems, and this certainly has been accomplished with the QSK-1500. Let's discuss the scope pattern of fig. 2. This photo shows the RF envelope of a 1400 watt signal. The signal was keyed with a string of dots at a speed of 60 wpm. The transmitter used in this case was the TS-930S and Drake L7 amplifier. For those who understand waveform patterns, it is easy to see that the CW waveform is very clean with a smooth envelope rise and fall, indicating a fairly soft make and break. (For those who don't understand scope patterns, the solid square blocks are the string of dots.) The QSK-1500 switching is the line above the solid waveforms, dropping down between the dots and rising again. The interval at the bottom of the dots of the QSK-1500 switching line is 7 milliseconds, and this is the time that the transmitting station receiver would open up. The duration of a single dot (or pulse) is 21, and the length of time between dots that the blocking voltage is applied by the timing circuit is 7.5 milliseconds. If you could visualize a transmitting station sending at this speed, then if you closed your key at your end and sent a signal to him, he would be able to hear your signal even though he was transmitting at this high speed. The break-in capability is outstanding, and note that there is no distortion of any kind on the signal.

We haven't shown a circuit diagram of the unit because the information is pro-

Interior view of the RF control unit. Note the size of the RF chokes. The control board is at the rear.



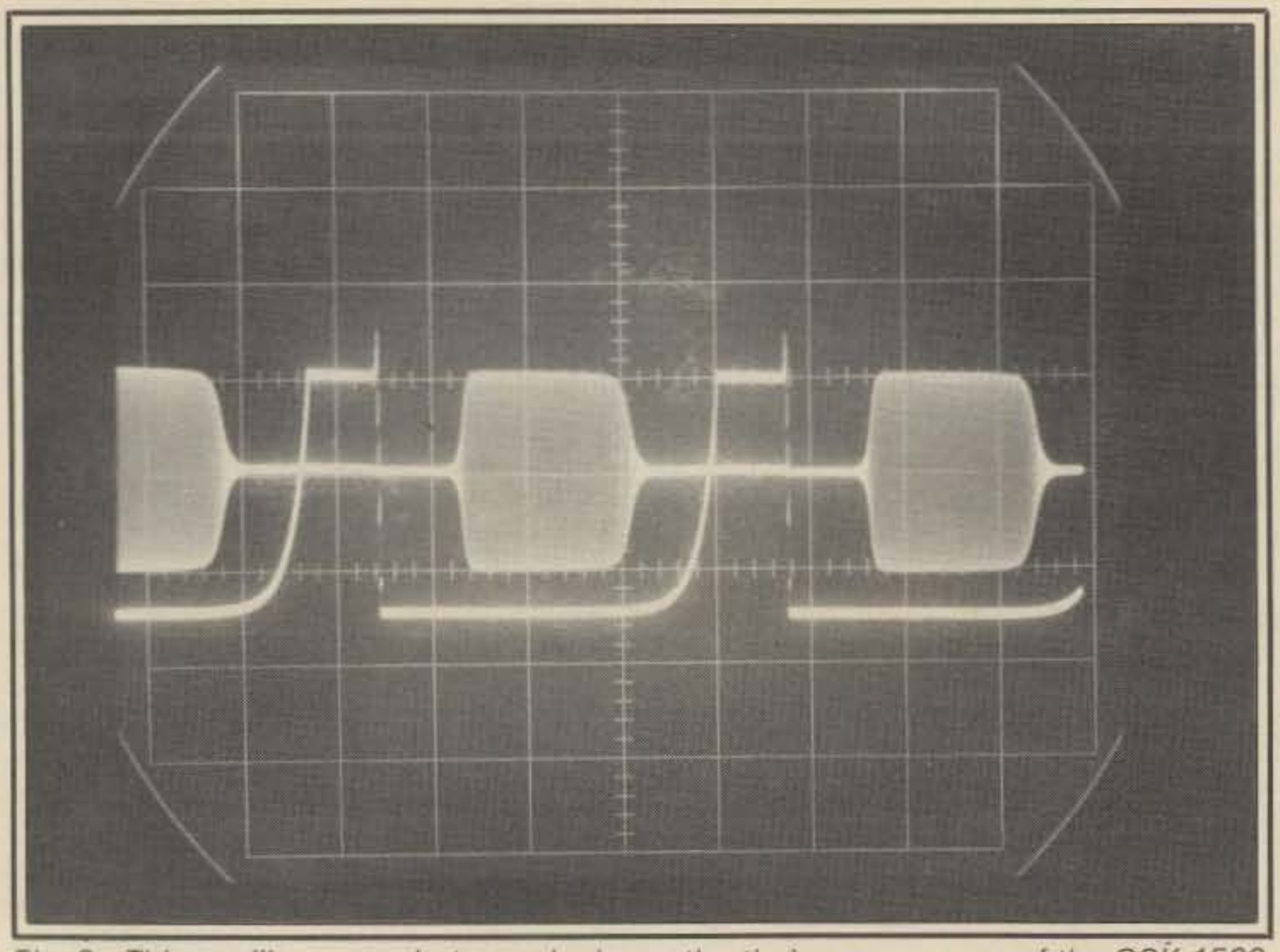


Fig. 2– This oscilloscope photograph shows the timing sequences of the QSK-1500. Please refer to the text for details.

prietary at this time. However, we can talk about some of the functions of the control and timing circuits. The control board is the heart of the QSK-1500 in that it does all the necessary functions. For example, as I mentioned before one problem is that of any T/R switch introducing signal distortion. In the QSL-1500 some ICs are used to maintain the waveform from your transceiver. These are integrated into the timing circuits in conjunction with the switching of the pin diodes. Also on this board is the timing circuit for the power amplifier. In addition, the timing circuits are designed to accurately switch the 500 volt line that controls the actual break-in timing.

A few words about the interesting circuit components are in order here. For example, in the unit there are two capacitors that must carry the full RF power output of the amplifier, or in other words, 5 to 6 amps at the necessary voltage. These capacitors are not exactly easy to come by and can be very expensive. Keep in mind Ohm's law: power equals the current squared times the resistance. In order to run 1500 watts output into a 50 ohm load, you must have between 5 and 6 amperes of current. This is also one of the reasons why your amplifier must operate into a 50 ohm antenna load, or an SWR reasonably close to 1 to 1 (reasonably close means it must be 2 to 1 or less). Another reason for keeping the SWR low is that the pin diodes used, while extremely rugged, can't handle too much heat, which could be generated by higher voltage and currents due to higher SWR.

In addition to these high RF current capacitors, as you can see from the photographs, some really husky RF chokes are needed. In fact, all the components used on the transmitting side must be very rugged—and they are.

What Transceivers Can Be Used?

Not all transceivers will operate high-speed break-in. The following will: all Ten-Tec models; the Kenwood TS-930S; the Drake TR5; the Yaesu FT-1, FT-980, and FT-757; the Signal One CX-11, the ICOM 751, and the Heath 5400.

In the case of the Ten-Tec models, the QSK-1500 will work as is for CW operation. However, for sideband work there is a factory modification available for the Ten-Tecs that permits that mode of operation. Also, for the Yaesu FT-757 there is a built-in keyer in that model. The QSK-1500 requires a separate keyer for its input, because it is designed to key the transceiver.

Observations

In all of my tests I used an ICOM 751 and a home-built amplifier. This operation proved that without a doubt this is by far the best T/R switch I have ever used.

Frankly, I had forgotten how handy full break-in is. At one time in my amateur tenure I was an avid DXer and contester—CW and phone. Because I had to get my feet wet again in testing this unit, I wound up having a lot of fun. However, I have to admit that there sure seems to be a lot of lids chasing DX these days! I had a chance to test the unit in a couple of rare DX pile-ups, and it was something else to hear stations calling the DX while he was transmitting. The QSK-1500 certainly made snaring the DX a lot easier. You tend to cut down considerably on transmitting time when you can always hear

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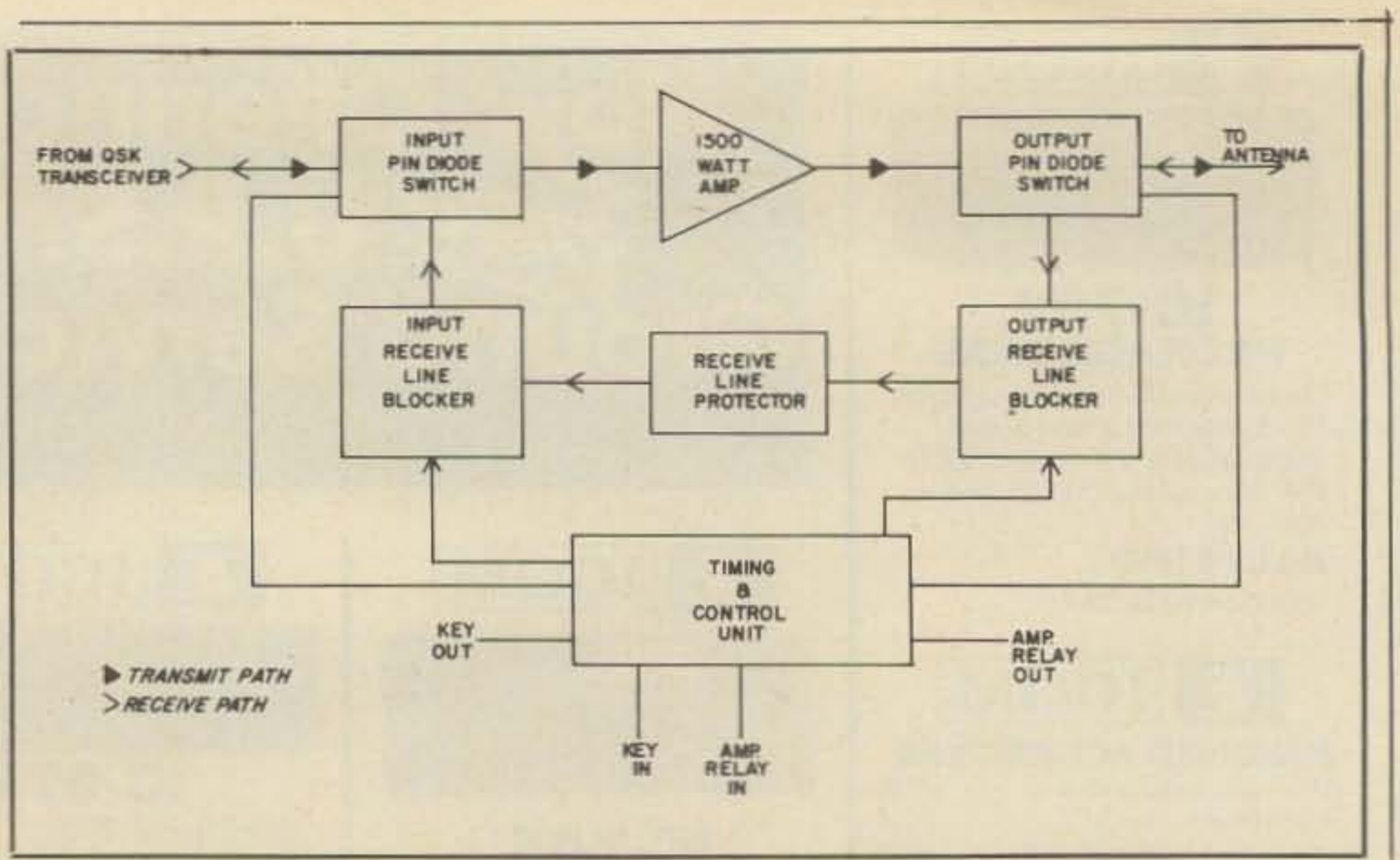


Fig. 3– This is a block diagram showing the signal paths.

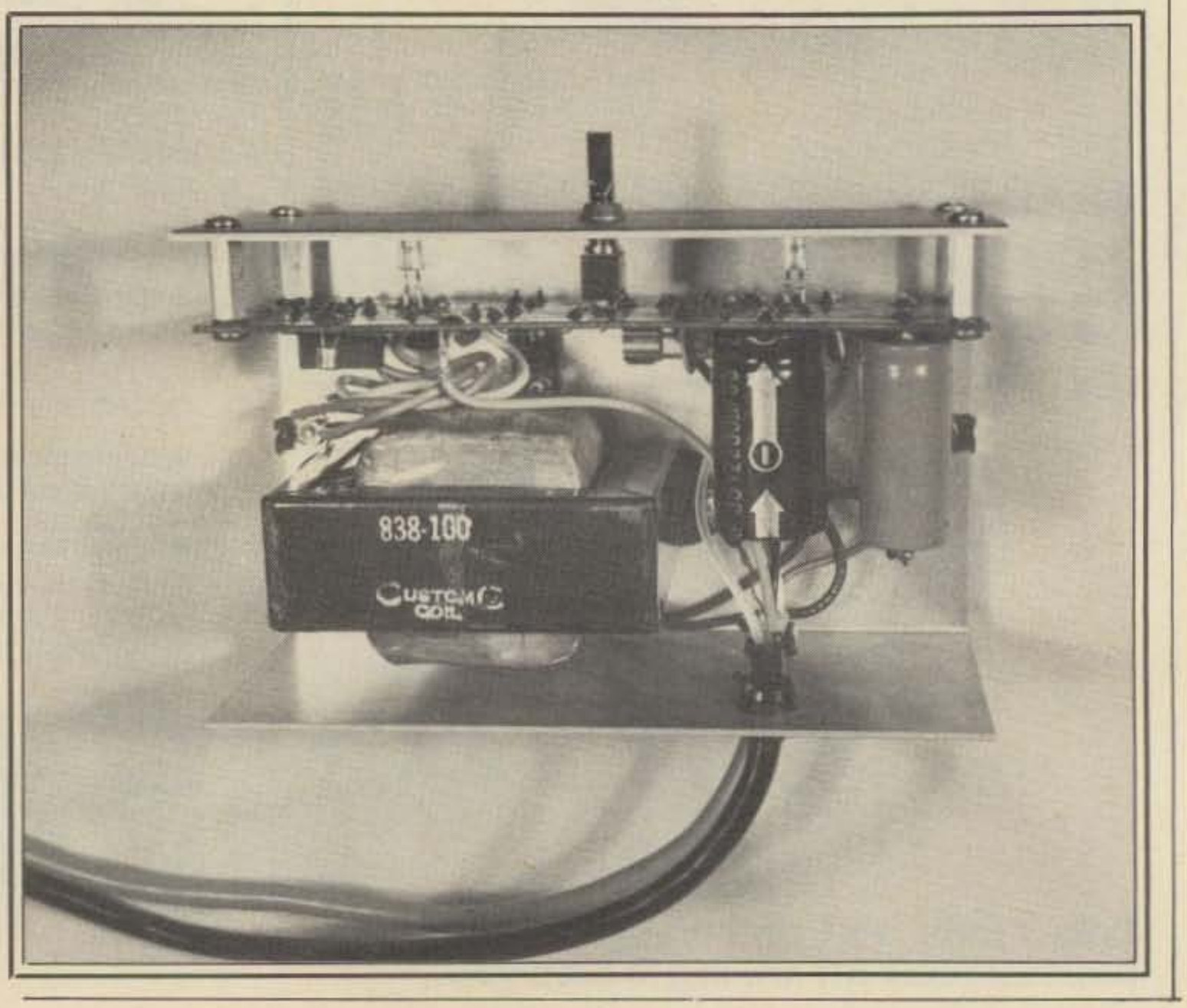
the other station when he is transmitting and an amazing number will respond to a "BK." Needless to say, contest operating really speeded up with full break-in.

One other important point: The QSK-1500 as is now being produced is for use *only* with QSK transceivers. It will *not* make a non-QSK transceiver into a full QSK unit. Also, DEO does not make a unit for separate receiver/transmitter combinations. I discussed this with the factory, and they advised me that such a unit would be far too costly and there wouldn't be enough demand for it.

There are two parts to the QSK-1500: a power supply/control unit and an RF unit. The power supply measures approximately 3″×6″×4″ and the RF unit is 3″×7″×9″. Fig. 3 shows the cabling hook-up of a typical installation.

The price of the QSK-1500 is $299.00 plus $6.00 shipping, and it is manufactured by Design Electronics Ohio, 4925 South Hamilton, Groveport, Ohio 43125. It is available factory direct or from Universal Radio Inc., 1280 Aida Drive, Reynoldsburg, Ohio 43068, telephone 614-866-4267, Att: Ralph Rickett. DO

This is an inside shot of the power supply of the QSK-1500.



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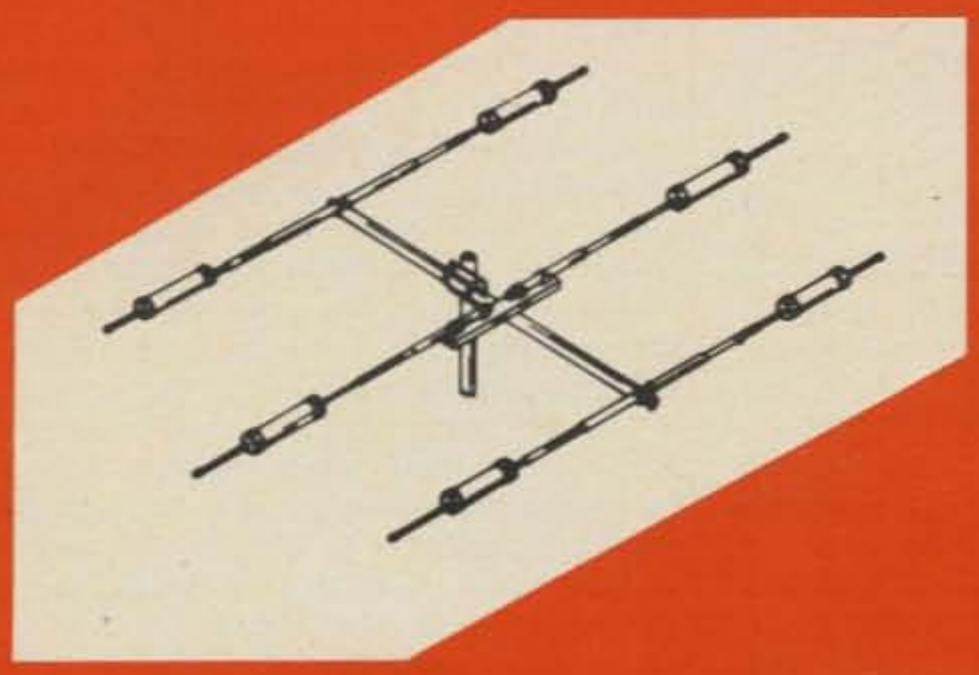

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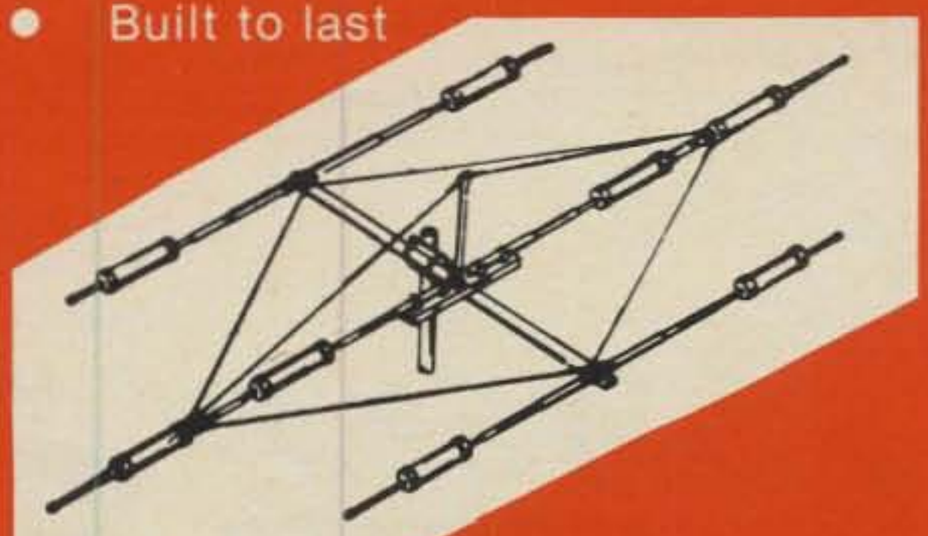

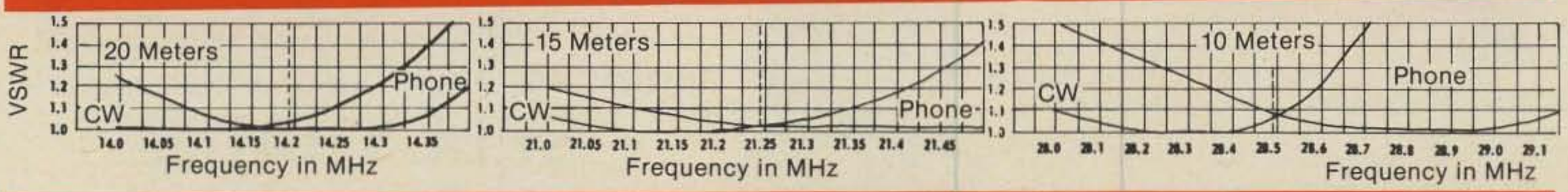

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The Jensen Mechanics Tool Bag

BY ALAN M. DORHOFFER*, K2EEK

As I look out of my office window and see beautiful downtown Hicksville covered in mounds of snow and ice and wistfully contemplate the wind-chill factor, my thoughts tend towards *antenna weather*. I know theoretically that *this* is the best time of all . . . what could be better than the snow, ice, and wind to help you get a job done quickly. Any fool can do it in the summer.

The summer and fall months are only meant to gather up strength and ideas for what you can do in a blizzard. Those months are also a good time to check out your tools, sort hardware, and figure out what you'll need to have with you when the right moment occurs. If you're a "tool-junkie" like me, this is the time to get out all the catalogs and find the one tool missing from your collection that you'll absolutely need high atop your tower, battling the elements.

When your list is complete down to the last widget, it's time to figure out just how you're going to get that stuff up there with you. Some of us have gone the bucket–chain–"s"-hook routine, dumping all the tools and hardware in a bucket and hoisting it up. The odds say that all of the hardware will filter down to the bottom of the bucket and be held there by a solid "wedge" of tools. The odds also say that whatever you want to retrieve from the bucket will necessitate the removal of everything else in that bucket and stuffing every available pocket with the excess. Sometimes this is also known as tradition.

The OD GI Mechanics Tool Bag by Jensen.

Well, tucked away in the Jensen Tool catalog is an interesting alternative to the bucket-pocket combo. Item AA892B030 (sounds military) is listed as a Mechanics Tool Bag. What it is, is a replica (same color and everything) of the GI Mechanics Tool Bags except that this one is made of Cordura® nylon. It has two large pockets on the outside which are divided into three compartments each. It has eight interior pouches in the main section for small parts and hardware and plenty of room left over for an assortment of tools. The OD bag measures 6″ × 7″ × 12″ and closes with an over-sized metal zipper and thong (great for working with gloves on). It can be carried by the two heavy-duty straps seen in the photo. At either end of the zipper there are two loops made of material to which presumably you can attach a carrying strap/sling for keeping the bag in front of you while you work. I tried the carrying strap from a *Lands' End* carry-on suitcase and it worked fine.

The only thing I would suggest to Jensen is that they use metal rings instead of loops and offer an inexpensive carrying strap/sling accessory. One of the product development engineers at Jensen is an amateur and perhaps something can be worked out.

The Mechanics Tool Bag sells for $17.00 plus postage and is available from Jensen, P.O. Box 8016, Phoenix, AZ 85066.

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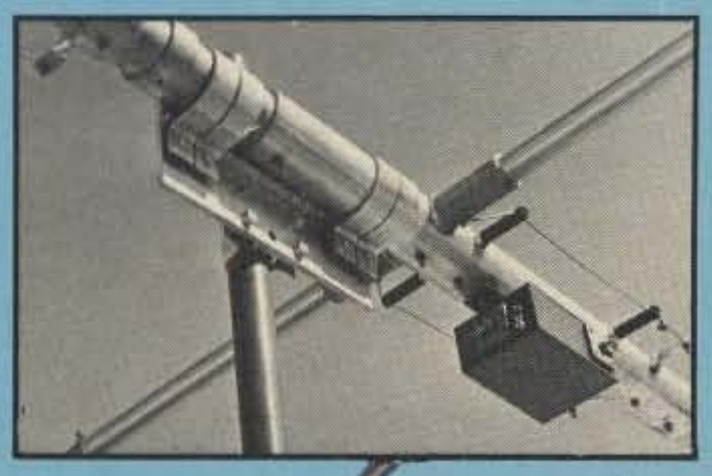

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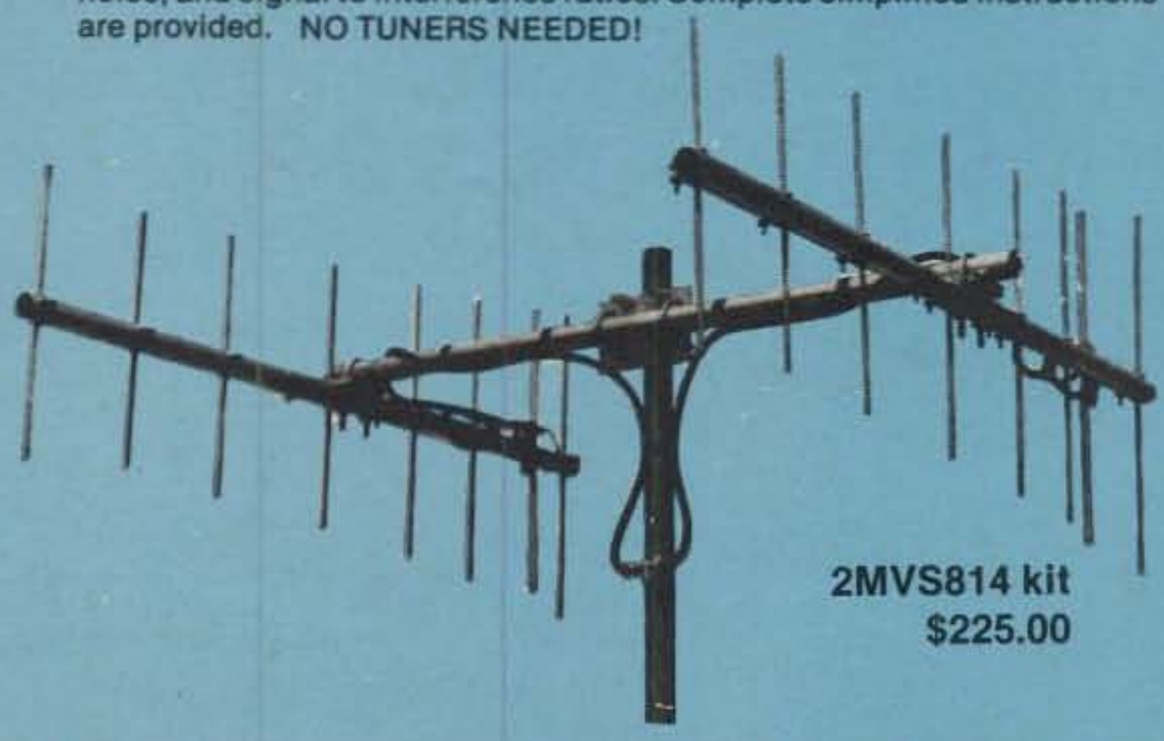

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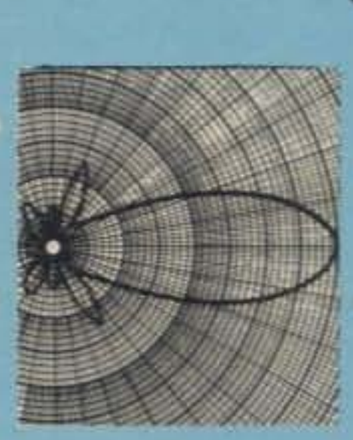

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CIRCLE 139 ON READER SERVICE CARD

No 43-44

The crowds line up in the rain to register for the exams.

Monty, N7CIX, readies the CW receiving stations.

Last summer at the Ft. Tuthill Hamfest in Flagstaff, Arizona, the first Volunteer Examination session for that state was held. This is a report on that exam, and it may be a useful model for your area.

First Volunteer Exam Given In Arizona

BY STEPHEN G. PROTAS*, K7SP

A first occurred on July 21, 1984 at Flagstaff, Arizona, at the Ft. Tuthill Hamfest: The first set of Volunteer Examinations was given in the state. This was done under the auspices of the Boeing Employees Amateur Radio Society, Herschel Eppenstein, N7CAL.

The effort was put together and organized by Steve Protas, K7SP. Major help came from Marlyne Protas, NG7K; Jim McDonald, N7US; and George Anderson, W7ON. Volunteer Examiners who made the effort a great success included Ernie Wendland, W7FGT; Monty Rogers, N7CIX; Eric Schecter, KD7XR; Lee Finkle, KY7M; Howard Chambers, W7DC; John Sullivan, KQ7T; Bud Semon, N7CW; Lou Helser, ND7O; Vince Thompson, K5VT; Ron Freeman, KY7F; Neil Wake, KV7O; Mike Fulcher, KC7V; Hal Bebee, W9RY; Dean Norris, K7NO; Art Winslow, W7NH; and Gary Elliot, K7OX. Additional support came from Mike Zussman, WA7NIY, Carol Wendland, and Pam Rogers. Through the courtesy of Scott Whittaker, KA7RQD, over 3000 information sheets were duplicated. The exam was at the hamfest by A.R.C.A., the Amateur Radio Council of Arizona, and a special thanks goes to Lee Pemberton, WB7BXB, who was the hamfest chairman and provided room and seating arrangements.

As you can tell by the number of people involved, this was no small effort. Things started just 35 days before the exam was given. In that time publicity went out, volunteers were certified, exam materials were obtained, code tapes made, computerized registration set up, evaluation sheets made, release forms set up, headphones and equipment gathered, and organizational meetings held.

Applications for examinations were processed for 152 people in Arizona, New Mexico, Texas, and Washington. Of that, 122 candidates showed up and an additional 25 walk-in candidates were examined, for a total of 147 people examined. Ages ranged from 11 to 77, including 2 disabled amateurs.

Posters were hung at the hamfest and a 2 meter frequency was maintained for exam info. This was handled from outside the exam room to avoid unnecessary chatter and traffic in the exam area. Applicants were registered and given a serial number. Identification was checked, 610 forms were corrected, signatures were checked against I.D. 610 and sign-in sheet, a release form was obtained, and the candidate was routed to the appropriate exam team. The serial number was recorded on the intake registration, 610 VE Team report, exam booklet, answer sheet, and all scrap paper, allowing for full security. All exam materials were returned and serial numbers were matched on completion. Each exam team had a computer printout showing

*3315 West Greenway Rd., Phoenix, AZ 85023

The moment of truth. Last-minute jitters and thoughts just prior to the CW test.

The written exam in progress. Proctors walk the exam floor making sure that everything goes okay.

The CW examiners at work grading papers: Dean Norris, K7NO, and Vinie Thompson, K5VT.

what elements needed to be tested, if prior elements needed to be completed first, and if a candidate needed further routing, as in a multiple class upgrade. Paperwork was carried by Volunteer Examiners and never given to candidates to hand carry. No cheating occurred and no text booklets were lost or compromised. Upon completion, three VEs graded each answer sheet, signed off passed or failed, and initiated a completion certificate. These were then returned to registration, where serial numbers were rechecked. The applicant was given an evaluation sheet, and when it was returned, the candidate was given his results. If the applicant passed, he received his completion certificate and interim identifier, and the temporary license was marked "certified" with a red stamp.

Three separate CW tapes were used at 5 wpm, 13 wpm, and 20 wpm. These were rotated so answers could not get out. The tapes were keyboard generated and recorded using Dolby noise reduction. Thirty sets of headphones were used with individual volume control pots on each.

Written exams were graded by three separate certified volunteer examiners using a punch-sheet grading key, with separate counts obtained from all three examiners per team. There were two CW teams, and separate teams for each written element, Novice through Extra.

How did it go? Fantastic! There were no breakdowns and all went smoothly, especially for a first run and for an exam of this size. I can't help but feel good when I read evaluations and see comments such as very professional, great, super, better than the FCC, best code tapes around, well organized, superb, etc., and those comments came from people who failed as well as those who passed!

Results: 147 people took exams, 90 failed, but 57 passed (39%). This included two people who went from no license to Advanced.

Obviously, we would rather have seen a higher pass rate, but that part was out of our control. It does point out the need for greater preparation on the part of the prospective amateur and a greater effort by the amateur radio clubs in their teaching programs. CQ

UNINTERRUPTED FREQUENCY COVERAGE
100KHz~1.4GHz with RF CONVERTERS for SX-400 SERIES
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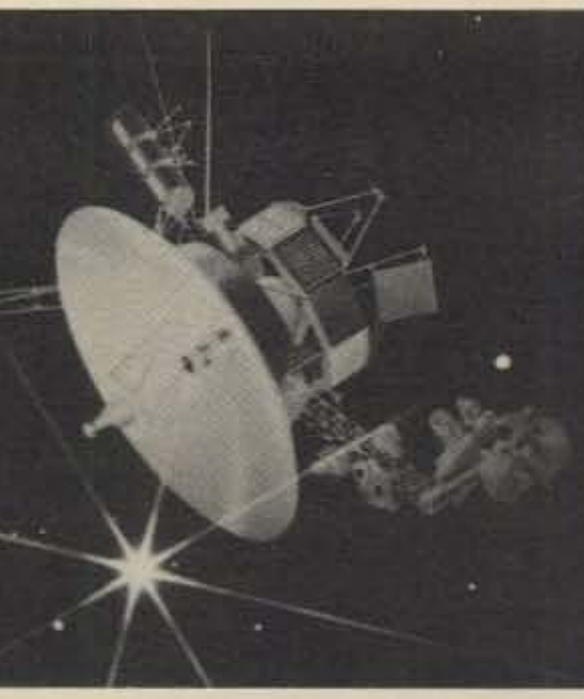
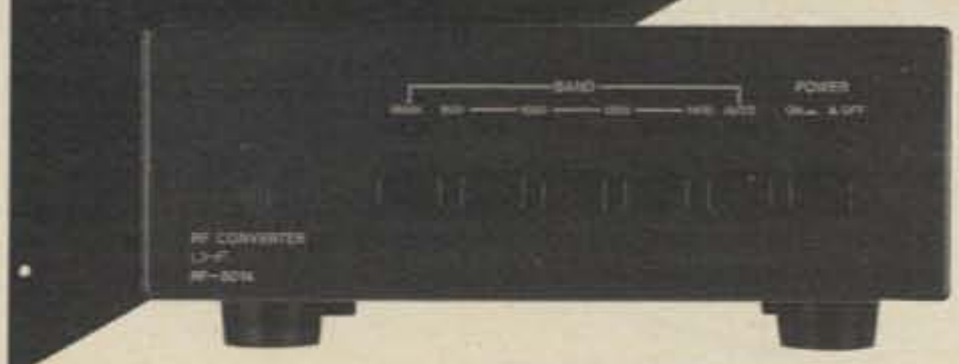
EMERGENCY
MARINE
AIR
SPACE INFORMATION
BUG DETECTOR

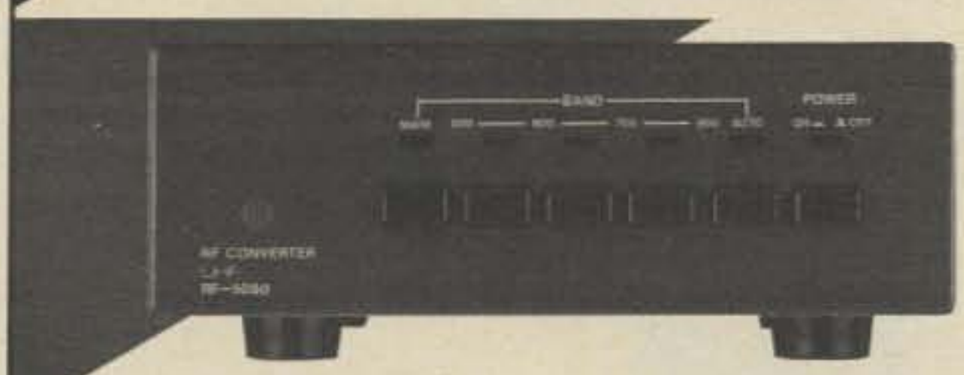




RF-8014 DOWN CONVERTER

800MHz~1.4GHz RF converter for SX-400

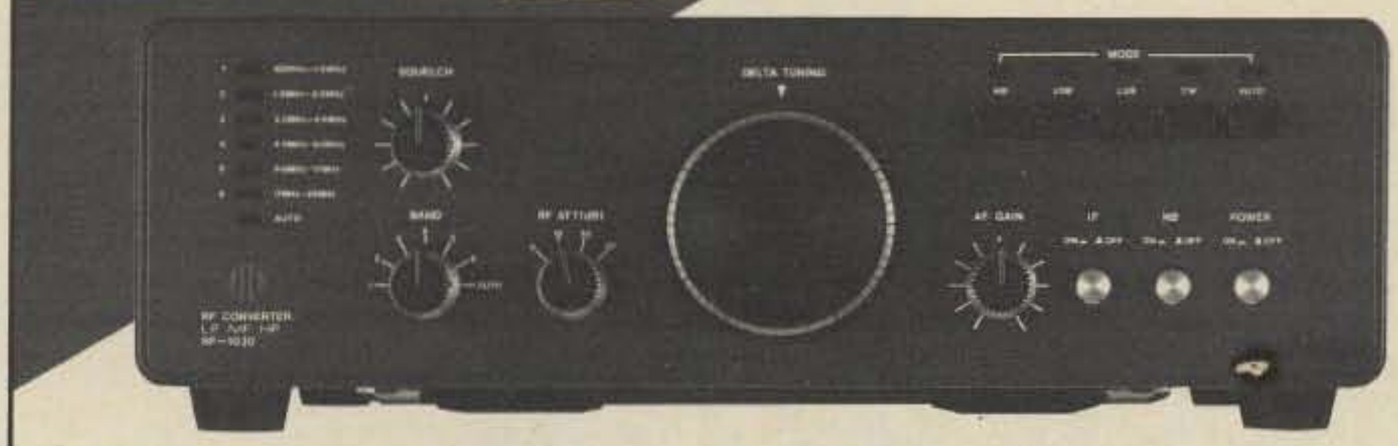
●Bands:•MAIN (to cover 26~520MHz with SX-400)•800MHz~1.0GHz•1.0GHz~1.2GHz •1.2GHz~1.4GHz•AUTO (Automatic control of RF-8014 with an external computer, etc.) ●Frequencies shown in SX-400 display: 500MHz lower between 800MHz~1.0GHz, 700MHz lower between 1~1.2GHz, 900MHz lower between 1.2~1.4GHz. ●Individual Band Switches and LED Indicaters. ●Current Drain: 250mA (approx.) ●Accessories: 1 BNC/M-adapter, 1 Cable with BNC terminals ●Dimensions: W.148×H.51×D.225(mm)



RF-5080 DOWN CONVERTER

500~800MHz RF converter for SX-400

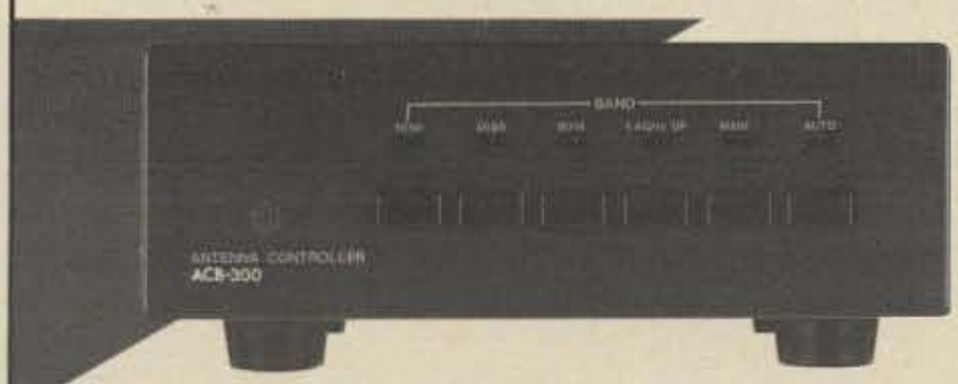
●Bands:•MAIN (to cover 26-520MHz with SX-400)•500~600MHz•600~700MHz•700~800MHz •AUTO (Automatic control of RF-5080 with an external computer, etc.) ●Frequencies shown in SX-400 display: 300MHz lower between 500~600MHz, 400MHz lower between 600~700MHz, 500MHz lower between 700~800MHz. ●Individual Band Switches and LED Indicaters. ●Current Drain: 250mA (approx.) ●Accessories: 1 BNC/M-adapter, 1 Cable with BNC terminals, ●Dimensions: W.148×H.51×D.225(mm)



RF-1030 UP CONVERTER

100KHz~30MHz RF converter for SX-400

●Bands: (1) 100KHz~1MHz, (2) 1~2MHz, (3) 2~4MHz, (4) 4~8MHz, (5) 8~17MHz, (6) 17~30MHz•AUTO (Automatic conrol of 6 bands of RF-1030 with an external computer, etc.) ●Frequencies shown in SX-400 display: 50MHz higher on all bands than the frequencies received. ●Individual Mode Switches and LED Indicaters: AM, USB, LSB, CW, AUTO•CW filter (optional) required for CW reception•AUTO—Automatic Control of modes of RF-1030 with an external computer, etc. ●Band Switch and LED Band Indicaters, Squelch Control, RF Att., AF Gain Control, Delta Tuning, IF ON/OFF Switch, NB (Noise Blanker) Switch. ●Current Drain: 1A (approx.) *Power Supply Unit P-1A (optional) required for RF-1030. ●Accessories: 1 BNC-M-adapter, 2 Cable with BNC terminals ●Dimensions: W.300×H.90×D.233(mm)



ACB-300 ANTENNA CONTROL BOX

Manual and Automatic antenna control system for SX-400 series RF converters

●Individual Band Switches and LED Indicaters: 1030, 5080, 8014, 1.4GHz UP (for reception of 1.4GHz above) AUTO (Automatic control of antennas for RF-1030, RF-5080, RF-8014 and for MAIN scanner) ●Current Drain: 50mA (approx.) ●Accessories: 1 Cable with BNC terminals ●Dimensions: W.148×H.51×D.225(mm)

SX-400

26~520MHz General Coverage Scanner

●Wider Coverage (100KHz~1.4GHz or above) with RF converters (optional). ●Computer controlled memory channel expansion (unlimited), High-Speed reprogramming, Record of Frequencies and Time, and all functions remote controllable with RC-4000 Interface (optional). ●20 memory channels, Momentary recall of any memory channel. ●Continuous normal and limit search without interruptions by birdies. ●Stop Mode Switch for scan or search of modulated signals. ●Quick search of the most important frequency with Priority. ●Selective FM Narrow/Wide Switch for FM/TV listening. ●Variable Delay Control (0~4 Sec.) ●Current Drain: 1A (approx.) ●Dimensions: W.300×H.90×D.233(mm)

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CIRCLE 13 ON READER SERVICE CARD

Did you ever get the feeling that it was going to be one of those days (if not years)? WA4LTO seems to have entered zone 41 in amateur radio's "Twilight Zone."

SQUATTERS RIGHTS

BY JAMES T. PARSONS*, WA4LTO

"**CQ** CQ CQ, this is WA4LTO, WA4LTO K."

"Hey, you get off my frequency!"

"I'm sorry; who was calling me? WA4LTO."

"That don't matter none. You just get out of here, dagnabbit!"

"Sorry, OM, but I asked if the frequency was in use. Am I QRMing a QSO or . . ."

"Ain't nobody using this frequency, and you ain't goin' to either. Now you just get out of here. It's my frequency!"

"Your frequency? You mean you're standing by for a sked?"

"No, dagnabbit! I'm here because it's *my* frequency! I've been here for over 40 years and it's mine!"

"I'm not sure I understand, OM. According to the FCC . . ."

"The dad-blamed FCC ain't got nothing to do with it! This is *my* frequency. The only QSO's that are gonna be here are the ones *I'm* in! Ain't nobody gonna use it but me!"

"Now OM, I really don't think you can keep it all to yourself with . . ."

"The heck I can't! I spend my every waking hour watching over my frequency, making sure no punks like you muscle in and take it away from me. What's mine is mine!"

"Every waking hour? Surely you have to sleep sometime."

"I sleep right here, at the controls of my rig! I eat here; I do everything here so's I can watch over my frequency so's no punks will steal it from me. Now you get off my frequency!"

Harrell Street Apartments, Apt. 42A, Blacksburg, VA 24060

"How often do you use it?"

"Use what?"

"Your frequency. How many QSO's do you have on it?"

"None."

"None? When was your last QSO?"

"Heck if I know. Ain't got no time for QSOs. Too busy chasing punks like you off my frequency!"

"Well, what do you use it for if you're not making contacts?"

"Ain't none of your dad-blamed business what I use it for! It's mine! You just scram, punk!"

"But surely . . ."

"That does it! What's your call?"

"What?"

"I've had enough of your lip, fellah. Now what's your call?"

"My call is WA4LTO, but why . . ."

"I'm writing a letter to the FCC, that's why! I'm telling them all about how you tried to take over my frequency!"

"Well, I don't believe that you identified yourself . . ."

"That don't matter none! Just wait 'til the FCC comes and takes away your rig and your license and maybe sends you to the pokey!"

"I really don't think that they're going to . . ."

"Hey, what did you say your call was?"

"WA4LTO, but . . ."

"You're not in my *Call Book*! Bootlegger!"

"But I've been licensed for over . . ."

"I looked right here in my 1961 *Call Book* and you ain't in here. Bootlegger!"

"1961? OM, I was only three years old in . . ."

"Boy, are you in for it now! To heck with a letter! I'm calling the FCC right this second. They're going to come around with one of their snooping vans and drive right into your shack, and the police are gonna come and lock you up in the paddy wagon, and then the closest you'll get to ham radio will be in the license-plate section of the jailhouse!"

"OM, I don't think . . ."

"Believe you me, they're gonna turn their giant radar dish on you, and when they do, they'll . . . . Hello? Operator? Get me the FCC in Washington, D.C.! This is an emergency!"

"Okay, okay, sorry to bother you! WA4LTO clear!"

"That's right, run! Run away ya dad-blamed bootlegger! They'll catch you yet! By cracky they will! Catch you using my frequency and . . . . Hello? Hello?"

Gee, some people. Oh well, I wonder what's on 2? John was telling me about a new repeater over in Riverdale.

"This is WA4LTO listening on 655."

"Hey! You get off my repeater!"

Not again . . . . CQ

Announcing

• **C.W. Filter Article Correction** - In the February 1985 issue we ran Part I of the article "How To Build A C.W. Filter For The Novice Operator," by Ed Wetherhold. We incorrectly published his callsign as W3NGN; it is W3NQN. There is also a correction for fig. 4, the schematic diagram. The caption should read that all capacitors are in μF. In addition, in the bottom left-hand corner of the diagram, the values of L1, L2, L3, L4, and L5 all should be in mH (*not* μH).

• **Foundation for Amateur Radio Scholarships** -This foundation plans to award 19 scholarships for the academic year 1985–86. Licensed radio amateurs may apply if they plan to pursue a full-time course of study beyond high school and are enrolled or have been accepted in an accredited university, college, or technical school. Most of the scholarships require the applicant to hold a General class license or the equivalent. For more information and an application, send a postcard postmarked before May 31 to FAR Scholarships, 6903 Rhode Island Avenue, College Park, MD 20740.

• **ORAC Aboard the USS Becuna and USS Olympia** -The Olympia Radio Amateur Club will be on the air from the *USS Becuna* and *USS Olympia* on the Delaware, Philadelphia, PA, to celebrate National Submarine Day, April 13 and 14. Transmissions will be heard from 1300Z Saturday to 2000Z Sunday on CW 3590, 7050, 14050, 21090, and 28150; phone 3890, 7240, 14285, 21360, 28600, all ± 10 kHz. Two meter and Novice operation are also planned. Callsign will be that of the operator on duty. For a certificate, send a business-size SASE (foreign 1 IRC) to Olympia Radio Amateur Club, P.O. Box 928, Philadelphia, PA 19105.

• **HOSARC Special Event** - The Hall of Science ARC, Jamaica, NY, will operate on April 14th from 1500–2100 UTC in conjunction with the club's 12th anniversary. WB2JSM will operate CW in the first 25 kHz of the Novice bands of 40, 15, and 10 meters, and in the first 5 kHz of the 30 meter band. WB2ZZO will operate in the first 25 kHz of the General phone bands of 40, 20, 15, and 10 meters. QSL with large SASE (40 cents or 1 IRC) to HOSARC, P.O. Box 131, Jamaica, NY 11415, or to HOSARC's QSL manager Arnold Schiffman, WB2YXB, 81-22 250th St., Bellerose, NY 11426.

• **Arbor Day** - Special event stations will operate from Nebraska City, Nebraska, to celebrate Arbor Day, April 15 at 2400 UTC to April 21 at 0600 UTC. They will operate in the General portion of the phone and CW bands on 80–10 meters. For a certificate of contact, send a business-size SASE and QSL to Nebraska City Radio Club, P.O. Box 8, Nebraska City, NE 68410.

• **Expedition to Canton Uri, Switzerland** - Club station HB9MM/p will be active from the rare Canton Uri (UR) during the H26 contest on the weekend of April 27–28 operating mainly CW. QSL via HB9MM.

• **Operation From the Godspeed** - The *Godspeed*, an English Renaissance sailing ship, is scheduled to sail from London, England, to Jamestown, Virginia, departing on April 30. Amateur radio operators will be on board, and contacts will be made on the 10-week voyage. The rigging of the radio equipment aboard the ship has been coordinated by WA4CHQ. The captain of the ship is KA4FVB. Special QSL cards will be available.

• **The following hamfests, etc., are slated for April:**

Apr. 13–14, **Missouri State ARRL Convention,** Kansas City, Missouri. Contact PHD Amateur Radio Association, P.O. Box 11, Liberty, MO 64068-0011.

Apr. 14, **Southern Alleghenies Hamfest,** Bedford, PA. Contact Joel Cunard, KB3TR, RD 6 Box 104, Bedford, PA 15522 (814-623-9697).

Apr. 14, **NWWVRA Hamfest,** Wood County 4-H Grounds, Parkersburg, WV. Contact Jim Whitlatch, 5007 Elmwood Ave., Parkersburg, WV 26101 (304-422-7157).

Apr. 14, **Raleigh ARS Hamfest,** Raleigh, NC. Contact Rollin Ransom, NF4P, at 919-779-5021, or write to RARS, P.O. Box 17124, Raleigh, NC 27619.

Apr. 14, **NW Oklahoma Eyeball & Swapmeet,** Mooreland, OK. Contact Gordon Richmond, NR5L, Rt. 1 Box 12, Mooreland, OK 73852.

Apr. 14, **Pioneer Valley Radio Assoc. Fleamarket,** West Hartford, CT. Contact Jon Patz, KA1FYL, 34 Whiting Lane, West Hartford, CT 06119 (203-232-8772, evenings).

Apr. 20, **Rochester Area Hamfest,** Rochester, MN. Contact RARC, c/o WBØYEE, 2253 Nordic Ct. NW, Rochester, MN 55901.

Apr. 20, **Springfest '85,** Somersworth, NH. Contact Great Bay Radio Assoc., P.O. Box 911, Dover, NH 03820.

Apr. 20, **Western Slope Amateur Radio & Computer Swapfest,** Grand Junction, CO. Contact Larry Brooks, WBØECV, 3185 Bunting Ave., Grand Junction, CO 81504 (SASE) or phone 303-434-5603.

Apr. 21, **Denison Repeater Assoc. Fleamarket,** Deloit, IA. Contact Jim, KAØHFR, RR #1, Vail, IA (712-677-2404, or 712-676-3499).

Apr. 21, **Madison Swapfest,** Madison, WI. Contact Madison Area Repeater Assoc., P.O. Box 3403, Madison, WI 53704.

Apr. 21, **Athens ARC Hamfest,** Athens, GA. Contact Norman Archibald, KB4IIA, P.O. Box 225, Athens, GA 30603.

Apr. 26, **Dayton-Cincinnati QCWA Chapter 9 Banquet,** Dayton, OH. Contact Bob Dingle, 657 Dell Ridge Drive, Dayton, OH 45429 (513-299-7114).

Apr. 26, **16th Annual BASH,** Convention Center, Dayton, OH. Contact Miami Valley FM Assoc., P.O. Box 263, Dayton, OH 45401.

Apr. 26–28, **Dayton Hamvention,** Dayton, OH. Contact Dayton ARA, Box 44, Dayton, OH 45401.

Apr. 26–28, **Dayton Hamvention's International VHF/UHF Conference,** Dayton, OH. Contact Jim Stitt, WA8ONQ, 311 N. Marshall Road, Middletown, OH 45042.

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MRF 454	18.95	2N3055	00.75
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UG175/176	10/1.60	Type "N" Twist on	
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CIRCLE 140 ON READER SERVICE CARD

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- 1 KW CW, 2 KW P.E.P. SSB
- SO-239 Termination

MODEL	BANDS	LENGTH	PRICE
AS - 160	160, 80, 40, 20 METERS	137 Ft.	$129.00
AXS - 160	160, 30 METERS	96 Ft.	99.00
AS - 80	80, 40, 20 METERS	78 Ft.	99.00
AXS - 80	80, 40, 15 METERS	64 Ft.	99.00
AS - 40	40, 20, 15, 10 METERS	40 Ft.	129.00
AS - 20	20, 15, 10 METERS	23 Ft.	99.00

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CIRCLE 111 ON READER SERVICE CARD

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

This month we make the decision of how to most effectively couple those precious nanovolts[1] received at VHF to our receiving equipment and our hard-earned watts of transmit power to the "ether." While there are a few possible alternatives to coaxial cable, no other type of transmission line offers so many advantages, so few disadvantages, and such universal acceptance by the telecommunications industry. I shall only briefly touch on the "other" transmission line types to point out their drawbacks and then delve into the multitude of coaxial cables available to us.

The only truly useful non-coaxial feedlines for VHF/UHF work are **balanced lines**, the most common kind being the popular "TV twin lead" variety. Much has been written about the low loss and high power-handling capability of balanced feedlines, but it is important to note that their relatively low transmission losses are only possible under the most ideal conditions. Open-wire or "twin lead" feedlines suffer radiation losses,[2] relatively poor RF field containment and electrical properties which are highly dependent on operating environment. Balanced feedlines must be routed carefully to avoid proximity to metals (e.g., antenna masts and towers!) or the accumulation of ice and water, which can severely change their properties. Further, the measurement of transmitted power in balanced feedlines is a problem, for little in the way of commercial, lab-quality power measuring instrumentation is available for these types of lines.

Some amateurs insist on using "open-wire" lines at VHF and build RF balun transformers to help interface the common high-impedance[3] balanced lines to lower-impedance unbalanced (coaxial) RF equipment and antennas. I think this is senseless, in that the balun transformers will usually introduce losses which overcome any savings that the balanced lines might offer. In all, while balanced lines might be useful for the interconnection of high-impedance, balanced antenna arrays (such as collinears), they are best avoided as feedlines for VHF/UHF work.

Coaxial cable has nearly universal acceptance for VHF/UHFers. Coax contains the RF fields entirely within the outer conductor and therefore suffers no radiation losses.[4] Coaxial cable can be installed in close proximity to metal objects and other cables without noticeable interaction. Put simply, coax is just plain easy to use! It may be bound directly to metal antenna booms, masts, and towers; many types can be buried underground for long periods with little or no deleterious effect. Coax offers *flexibility*, both in application and installation, and is widely used throughout the telecommunications industry up to about 3 GHz.

Some of the VHF/UHF station at WB2WIK. The 30 foot long operating bench covers three walls in "wraparound" fashion and supports gear for from 50–1296 MHz.

A brief background may be in order here. Coaxial cable seems to have been around forever, but old-timers know that's not true. In fact, concentric lines were commercially developed in about 1940 by the American Phenolic Company (who became Amphenol), the first to extrude polyethylene dielectric materials. Based on considerable experimentation it was determined that a characteristic impedance of about 30 ohms offers the best power-handling capability (a function of conductor size), while about 70 ohms offers the lowest transmission losses. Thus, 50 ohms characteristic impedance cable, the most popular choice for transmitting/receiving applications, is an excellent compromise for the best possible parameters of importance to amateurs.

The most important factors to amateurs facing the decision of which type coaxial cable to buy will certainly include:

1. Transmission loss
2. Power-handling capability
3. Service life
4. Shielding effectiveness
5. Flexibility
6. Availability of compatible connectors
7. Cost

Although I listed cost as the last consideration, thereby implying it is least important, I know from experience in speaking with thousands of amateurs that many consider a product's low price to be its finest attribute. While I'd surely condone shopping around for available bargains, I'd be remiss if I didn't point out that your transmission line can be the most important part of your station. After all, your transmission line is as much a part of your antenna system as your antenna itself, and it plays as important a role in your overall station gain equation.[5] Remember that a signal lost in your feedline is lost forever and cannot be brought back with a preamp on your receiver!

VHFers have entirely different problems in selecting a suitable coaxial cable than do our HF friends. *Everything* is lossy at VHF and becomes lossier as the operating radio frequency is increased. Loss in coaxial cable can be estimated—if the electrical properties of the cable's components are known—as follows:

$$A = 4.34\ R_t/Z_o + 2.78\ \sqrt{E} \times pF$$

where A is attenuation in dB/100′; R_t is the total line resistance in ohms/1000′; Z_o is the characteristic impedance of the cable; E is the dielectric constant; p is the power factor of the dielectric medium at

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F; and F is the operating frequency in MHz.

The most common coaxial cable dielectrics are solid polyethylene and cellular polyethylene (often called "foam"), which have dielectric constants (E) of about 2.30 and 1.55, respectively. Power factor, or p, is estimated to be .0002 for solid, and .00015 for cellular polyethylene. R_f can be measured or simply looked up in manufacturers' catalogs (e.g., R_f is about 3 ohms/1000' for most RG8/U types), but this is DC resistance and does not include correction for "skin effects" at high radio frequencies. With so many uncertainties, the attenuation formula can derive only an estimate at best. I'd recommend contacting the cable manufacturers for more exact data.

I've taken the liberty of tabulating some of the data I've personally taken on a few of the most popular types of coaxial transmission lines used by VHF enthusiasts, and this is represented in Table I. This table lists only 12 coaxial cable types, roughly in order of descending loss and increasing diameter. Of the types listed, I'd recommend only RG8/U and *larger* cables be used for antenna feedlines. Good "deals" can be found on ⅞ inch and larger diameter flexible and "hardline" cables at amateur fleamarkets, or occasionally via equipment dealers. I personally purchased a few hundred feet of high-quality .875 inch diameter alumifoam corregated 50 ohm line (similar to RG332/U) from Prodelin, just before they relocated from New Jersey to North Carolina, for what I considered to be a "steal." The cable, which normally sells for more than $2.00 per foot, was available to local amateurs for just 45¢/foot in nearly unlimited quantities back in 1982. Prodelin has since become a M/A Com division and moved their operations (and withdrawn this fine offer), but similar deals can be found from time to time. (Incidentally, the mating connectors for this "bargain" cable sold for $48.00 each, but I bought four of them, anyway).

Some of the important characteristics of coaxial cable transmission lines, such as power-handling, flexibility, and service life, are ones which cable manufacturers do not often address in their published data and thus must be determined experimentally or by years of experience. Sometimes even experience will not help, as in the case of a new product such as Belden 9913; this excellent cable has only recently become available to the amateur market (early 1984), and there is much to be learned about it.

In general, a cable's power-handling capability is related to its dielectric withstanding voltage rating, its ohmic resistance (which in turn is based on total conductor area), the thermal rise permissible (a function of insulation type), ambient temperature and barometric pressure, radio frequency of operation, transmitting duty cycle, and VSWR. Whew! Without writing a thesis on cable power ratings, I'll attempt to discuss trends and generalities and recommend that you contact the cable manufacturer(s) for additional details when the need arises.

The cables offering the lowest transmission losses typically have the highest power ratings (or capabilities). However, there can be exceptions to this rule. For example, .190 inch diameter RG141A/U exhibits rather high transmission loss due to its small conductor size, yet it can carry the amateur legal-limit power because its Teflon™ dielectric and jacket insulation has a very high withstanding voltage rating and can operate satisfactorily to about +200°C, a temperature at which standard polyethylene materials melt. In fact, conventional polyethylene-dielectric, vinyl-jacketed RG-type cables are only rated to +80°C operation and therefore cannot tolerate extreme conductor heating without deterioration or destruction. So, where does this bring

Cable Type	Z_0 (ohms)	O.D. (in.)	V.F.	Approx. Attenuation, dB/100' by F_0* 50	144	220	432	1296	Dielectric Type	REC PWR* (W)	Notes
RG58/U	53.3	.195"	66%	3.1	5.7	7.5	11	19	PE	100	1, 2, 3
RG141A/U	50	.190"	69.5%	2.1	4.0	5.2	7.6	16	TFE	1500	1, 4, 5
RG59/U	73	.242"	66%	2.4	4.2	5.4	7.8	14	PE	100	1, 2, 3, 6
RG8/X Type	50	.242"	78%	2.5	4.6	6.0	8.8	16	FPE	200	2, 7, 8
RG8/U, 213/U	52	.405"	66%	1.6	2.7	3.5	5.2	10.7	PE	750	9
RG11/U	75	.405"	66%	1.3	2.5	3.2	5.0	9.5	PE	750	9
8214 Belden	50	.405"	78%	1.2	2.3	3.0	5.0	9.5	FPE	750	9, 10, 11
FM8 Times	50	.405"	80%	1.2	2.1	2.5	3.5	6.5	FPE	1000	10, 11
9913 Belden	50	.405"	84%	.64	1.3	1.8	2.8	5.4	Air/PE	1500	9, 11, 12
RG331/U	50	.500"	78%	.60	1.1	1.5	2.4	4.0	FPE	1500	9, 13, 14
RG17/U, 218/U	52	.870"	66%	.50	1.0	1.3	2.3	4.4	PE	1500	14
RG332/U	50	.875"	78%	.35	.65	.80	1.3	2.5	FPE	1500	13, 14

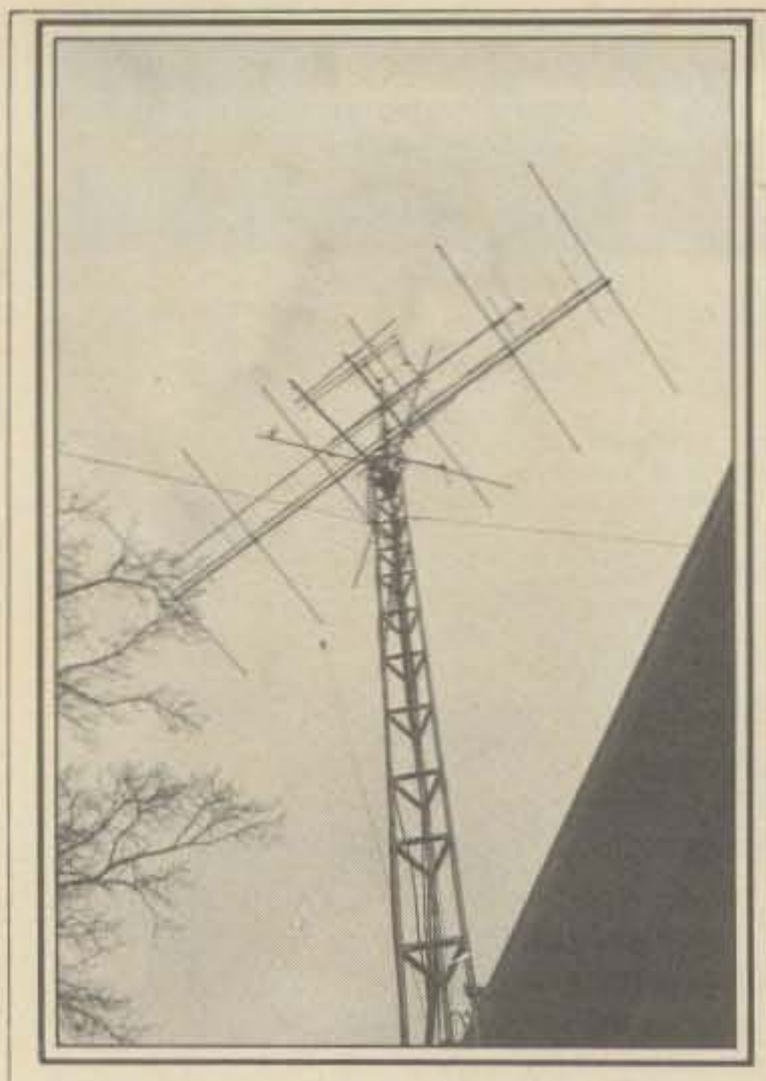
Key to Dielectric Types: PE = solid polyethylene; FPE = cellular (foam) polyethylene; TFE = Teflon™

* Attenuation figures are based on actual measurements made by author and may not agree with manufacturers' published data; consider these typical, not guaranteed. REC PWR is recommended maximum power @ 144 MHz, assuming T_A = 25°C and VSWR = 1.5:1; derate at higher frequencies, temperatures, or VSWR.

Notes:

1. Not recommended for transmission line use above 50 MHz.
2. Recommended for low-power mobile/portable installations where overall length does not exceed 50 feet.
3. Recommended for low-power (and receiving) jumper cables and interconnects.
4. Recommended for baluns.
5. Withstands very high power and ambient temperature (200°C).
6. Recommended for low-power matching sections, "Q" sections, etc.
7. Recommended for medium-power mobile/portable installations; very flexible.
8. Handles 750 W @ 50 MHz, 300 W @ 144 MHz under ideal conditions.
9. Good general-purpose transmission line for use through 220 MHz, or 432 MHz when used in short lengths.
10. Cellular polyethylene dielectric cable with larger than normal center conductor diameter allows lower transmission losses than are possible with conventional RG8/U.
11. 2.74 mm diameter center conductor will not fit standard constant-impedance connectors (type N) without modification of cable or connector. Will fit "UHF" series connectors (PL-259) without modification.
12. Primarily air dielectric (spiral of solid polyethylene to hold center conductor in place) allows use of very large center conductor diameter, resulting in much lower loss than RG8/U types. Recommended for transmission line applications through 1296 MHz.
13. Solid aluminum outer conductor; cable cannot be flexed repeatedly and is not suitable for routing around rotator.
14. Requires special, dedicated connectors; standard RG8/U series connectors are not suitable (UG21/U type).

Table I– Popular coaxial transmission lines for VHF/UHF amateur use.



One of two towers at WB2WIK. This one supports a total of 148 elements for 50, 144, 220, and 1296 MHz. Not shown is tower #2, which supports 39 elements for 144 and 432.

us? Well, it can be said that *for a given insulation type,* the larger diameter the cable and the lower its ohmic resistance, the more power it can handle.

Cable manufacturers are reluctant to rate power handling for transmission lines because so many variables affect this parameter. Based on my personal experience, I've given some recommended maximum power limits for the popular lines listed in Table I. Possibly these figures can be safely exceeded, but at the levels shown these cables become warm, and I hate to think what happens when this heat adds to the surface temperature of the cable used outdoors on a sunny summer's day. Coaxial cable *must be derated* when ambient temperature, altitude above sea level, or VSWR is increased.

Regarding flexibility, as a general rule stranded conductors are more flexible than solid ones, and it is therefore wise to select cables having stranded conductors for applications requiring frequent flexing, such as "rotator loops." But the cables offering the best shielding (i.e., maximum RF field containment) are usually the *least* flexible because they have solid or nearly solid outer conductors. There must be some compromising in this area if both shielding effectiveness and physical flexibility are important to you. In selecting a cable for outdoor use, remember that the insulators become less flexible at lower temperatures, especially below 0°C, and can become the restrictive element in overall suppleness.

How important is shielding? This is a very subjective question and depends upon the application. The common MIL-C-17 cables (called "mil spec," exemplified by RG213/U, RG218/U, etc.) offer an appropriate amount of shielding for nearly any amateur application[6] except, perhaps, duplex repeater work. High-quality mil-spec types, and many non-mil types which are more affordable, frequently have 95% or better braid (shield) coverage. Extra-shielded cables such as RG223/U (the dual-shielded version of RG58/U) or RG214/U (the dual-shielded version of RG8/U) usually have two silver-coated copper braid shields and offer nearly 100% shield coverage. These double-shielded cables exhibit much better shielding than do their single-shielded counterparts, but they do *not* offer lower transmission losses! Thus, there is usually no good reason to use dual (or more) shielded cables in any but the most stringent applications, such as full-duplex (repeater) operation with a single antenna.

Service life is related not only to operation within the cable's rated electrical and mechanical limits, but also to its jacket material composition. While the mil-spec cables have *non-contaminating* PVC jackets, meaning their PVC plasticizer will not migrate and create contamination of the dielectric material, many commercial cables (including RG "types") use polyethylene or standard PVC jacket material which can—and will—lead to early deterioration and shortened service life. It is important to select cables which offer at least the service life you desire. In some cases, this may be many years. When in doubt about the type jacket material a particular cable has, call the manufacturer for guidance. If the cable is labeled "MIL-C-17" or "MIL SPEC," it should have a non-contaminating jacket. In the case of semi-solid ("hardline") cables or those which have a 100% laminated shield (such as the "Duoband II" shield used on Belden 9913), migration of the jacket plasticizer is unimportant because the dielectric is protected by a solid metal covering.

How much deterioration does a coaxial cable suffer from the contaminating effects of vinyl plasticizer migration? Based on one article written by an expert in this field[7] RG8/U, which exhibits about 3 dB loss per hundred feet at 144 MHz when new, can deteriorate to double this loss, or 6 dB/100 feet after "extended service." This article did not clearly define "extended service," but it implies that the period of time required for this kind of deterioration, especially at frequencies above 1 GHz, may be as short as *one year.*

Terrific "deals" can be found, as mentioned earlier, on high-quality surplus coaxial cable suitable for VHF/UHF amateur use. Some of the popular low-loss surplus types include RG17/U, ½ inch, ¾ inch, and ⅞ inch "hardline" and "Heliax"™, etc. If these cables were treated properly, they can offer very low loss even after many years of storage. But the "deal" may not seem so attractive when it comes time to buy connectors. Unless surplus connectors are available from the same source as the cable, you may have to purchase new connectors for your "bargain" feedline at several times the cost of the cable itself. I'd recommend looking into available connectors and sources *before* spending any hard-earned cash on transmission lines which may be incompatible with any procurable fittings. Of course, some amateurs who have access to a well-equipped metal-working machine shop may choose to fabricate their own coaxial connectors, and if proper care is exercised in their construction, home-brew fittings may work well through at least 432 MHz.

This is the station of Russ McKay, WA2CBU, of Pittsford, NY. Russ is active on 6 and 2 meters with 1 kilowatt of power and hopes to install a larger, stacked array for 144 MHz in the near future.

Flash!

Late-Breaking News of Interest To VHF/UHFers: A Special Feature of CQ Magazine's VHF Column.

Fifty MHz DXers will have a rare opportunity to work a new country this April when a team of 11 amateurs equipped with 50 MHz SSB/ CW gear will visit Navassa Island in the Caribbean. American amateurs K2SG and N2EDF, along with G3RFS, KC7UU/5N8, 6Y5NR, 6Y5HN, 6Y5CA, 6Y5IC, 6Y5KC, 6Y5EE, and HK3AYM, intend to set up operation on Navassa beginning about 1800Z on April 2 and will operate until sometime April 9. They will be equipped with an IC-551 and a 5-element beam; this equipment was donated by WB2CZB, K2MUB, and N3AHI. WB2WIK was trying at this writing to also get the group a Mirage A1015, 150 W amplifier. Navassa Island, a famous DXpeditioners' site, is a tiny piece of U.S.-owned land at about 18°N, 75°W, roughly 35 miles west of Haiti's west shore. Fifty MHz enthusiasts throughout the southeastern U.S., the Caribbean, and Central America shhould have an excellent chance to work the expedition, which will be using a 6Y5/ KP1 call that was not determined at this writing. Listen on 50.110 MHz, beamed for the Caribbean, and good luck!

******

WB2OTK/4, who has resided for the past year or so in Greenville, SC, has been ordered by FCC Engineer in Charge (Atlanta) Angelo R. Ditty to cease all operations on 144 MHz due to numerous TVI complaints from Rich's neighbors. Thus unusual mandate was issued on January 31, 1985, after Rich was visited by WA3OPR, an FCC engineer from the Atlanta office, on January 24. WB2OTK is well-known for his big signal on 144 MHz and is also active on 432 MHz, making nightly contacts to 400+ miles via normal tropo. Rich runs an 8877 amplifier on 2 meters, but says that his local TVI problem exists even when he operates at very low power; in fact, ARRL Technical Coordinator Ed Grooms, NE4G, visited Rich on February 6 and determined that he could interfere with Rich's neighbor's television set, which was cable-connected to the local utility service, using just an ICOM IC-2AT handie-talkie. Mr. Grooms' opinion is that WB2OTK's problem is one of fundamental overload and basic negligence on the part of the cable company (West-Pel Cable Co., SC) to provide a well-shielded signal of sufficient amplitude to override interference. WB2OTK was cited for violation of FCC Part 97.73(d), "interference with other radio stations." He intends to fight this and has already requested assistance from the League and their legal counsel, Chris Imlay.

******

Pete Putman, KT2B, advises that the 3N201 transistor, available from Motorola, is an excellent replacement for both the 3N204 RF amp and the 40822 RF mixer in the popular Microwave Modules series of VHF/UHF transverters. For those who have apparently "dead" receiver sections in their Modules—usually caused by severe RF overload of the transmit section—simply replacing these devices, especially the RF mixer (40822), will often fix the problem. Hans Peters, VE3CRU, had many useful service tips for KT2B when Pete was attempting to repair his damaged Module, and we'd like to express thanks to both Hans and Pete for this information.

A personal anecdote relating to the connector problem discussed above: I bought several hundred feet of Belden 9913 low-loss 100% shielded coax for various applications and was very pleasantly surprised to find its transmission losses to be—by actual measurement—nearly as low as ½ inch alumifoam CATV (75 ohm) "hardline." Unfortunately, while a standard "UHF" (PL-259) male fitting attaches very nicely to the 9913 cable, the line's center conductor must be filed down considerably (from 9½ ga to 13 ga, a 26.3% reduction in diameter) to allow it to fit the center pin of a standard military type N (UG-21/U) connector, the only kind I ever use above 144 MHz. What a pain! Now there is one company who sells a special type N male connector which fits the 9913 perfectly,[8] but they sell this connector for $15.29 each, meaning one must spend $30.58 to buy fittings for the $45.00 length (100 feet) of cable. There's a moral here somewhere . . . .

Companies manufacturing or distributing coaxial cables for amateur VHF/UHF work include:

Alpha Wire Corp., 711 Lidgerwood Ave., Elizabeth, NJ 07207.

Amphenol Products, 2122 York Rd., Oak Brook, IL 60521.

Andrew Corp., 10500 W. 153 St., Orland Park, IL 60462.

Belden Electric Wire & Cable, POB 1980, Richmond, IN 47374.

Cablewave Systems Inc., 60 Dodge Ave., N. Haven, CT 06473.

Celwave, Rt. 79, Marlboro, NJ 07746.

Chester Cable Corp., Oakland Ave., Chester, NY 10918.

Decibel Products Inc., 3184 Quebec St., Dallas, TX 75247.

ITT Suprenant Div., 172 Sterling St., Canton, MA 01510.

JSC Wire & Cable, Burgess Pl., Wayne, NJ 07470.

M/A Com, POB 1729, Hickory, NC 28603.

Phalo Corp., 2 Friberg Pky., Westboro, MA 01581.

Saxton Wire & Cable, 215 N. Rt. 303, Congers, NY 10920.

Standard Wire & Cable, 2345 Alaska Ave., El Segundo, CA 90245.

Times Fiber Communications Inc., POB 384, Wallingford, CT 06492.

Uniform Tube, Microdelay Div., Collegeville, PA 19426.

Don't forget to check *CQ*'s advertisers first as a prime source of cable.

Well, I hope I've offered enough information to be of guidance to the beginner—and maybe even a few old-timers—on VHF/UHF. If you've followed this column since its beginning, you should be on the air by now! Next month we'll discuss VHF station accessories and operating tips and, if there's room, print some of the feedback we've received from readers.

If you haven't written us yet, please do. I'd love to hear from you. Let us know about your local activities, accomplishments, etc. Send good, clear (preferably black and white) photographs and we'll run as many as we can in the column. Also, feel free to voice criticisms of our new column. After all, we're pretty new at this and appreciate any input. Till then, C U on VHF!

73, Steve, WB2WIK

Footnotes

1. Nanovolts, or nV, are units of miniscule e.m.f. (1 nV = 1×10^{-9} V, or .001 uV).

2. These losses are related to the ratio of wire spacing to wavelength and can become quite poor at UHF.

3. Commercially available, low-loss balanced lines are typically 300, 450, or 600 ohms characteristic impedance.

4. This assumes the load is matched to the line impedance, an easy situation at VHF.

5. See the January column, which demonstrates how to calculate overall station gain using the formula: G = −(RX) + (TX) + (2 × ANT) + (2 × ANT HEI) − (2 × FEED) − (S/N) dB.

6. About 90 dB at 144 MHz; dual-shielded cables may be more than 120 dB at 144 MHz.

7. Thomas J. Siekierka, in *Belden Innovators* magazine, Vol. IV, No. 1, November 1983, in an article entitled "Specifying Coaxial Cable."

8. Trompeter Electronics, Chatsworth, CA 91311, P/N 1005-1107-1.

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Received too late for the the March Calendar was an announcement from the Costa Lugo Radio Club of Spain. Their contest was scheduled on the same weekend (March 30–31) as our World-Wide WPX SSB Contest.

The exchange is on SSB between club members and all other stations. I doubt any publicity we could have given them would have been of much value. Their chances of being heard in all that activity generated by our WPX SSB Contest, the second largest phone contest world wide, will be too big a handicap to overcome.

Anyway, if you did contact any of the Costa Lugo stations who were using their age in the exchange (YL's zero zero), you can send your logs to Radio Club Costa Lugo, P.O. Box 69, FOZ – LUGO, Spain.

Next time consult our Spanish correspondent, Angel Padin, EA1QF, for a more appropriate date and get your announcement to us in time.

No information from the "King of Spain" contest that is usually held the last weekend in April. Come to think of it, we didn't hear from them last year either. Even EA1QF didn't have anything on it. Maybe His Majesty's representatives have given up this activity.

Nearer to home, I doubt if the Massachusetts group has abandoned their QSO party, a fixture in the month of April, but no word from them either.

We finally did hear from the Tennessee Council of Radio Amateur Clubs, but much too late to make the March issue. If you worked any of the Tennessee Party boys on the weekend of March 23–24, you can check last year's rules in the March '84 issue of *CQ*. There have been no changes in the scoring format, so you can use that as a guide to score your log and send it in before May 1st to Jack Byrd, KF4VL, P.O. Box 65, Pleasant View, TN 37146.

We have not heard from the PZK for some time. I hoped to have some information, but no luck. Before the "blackout" of amateur radio in Poland, their contest activity was the first weekend of April for CW and the third weekend for SSB. Now that they are back on the air, it might be advisable to check those two weekends.

As a final reminder, your logs for the recent WPX SSB Contest must be mailed by May 10th. This year they go directly to *CQ* Magazine, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

Mar.	**30–31**	**CQ WW WPX SSB Contest**
Mar.	30–31	HF Costa Lugo Contest
Apr.	6–7	GARTG SSTV Contest
Apr.	13&14	GARTG RTTY Contest
Apr.	13–14	Connecticut QSO Party
Apr.	17–18	DX-YL to NA-YL CW Contest
Apr.	17–18	DX-YL to NA-YL SSB Contest
Apr.	20–21	VIGO World Fishing Contest
Apr.	20–21	ARCI QRP SSB Contest
Apr.	27–28	Swiss Helvetia Contest
May	4–5	County Hunters SSB Contest
May	4–5	G-QRP Club SSB Activity
May	4–5	Florida QSO Party
May	18–19	ARI International Contest
May	18–19	Michigan QSO Party
May	**25–29**	**CQ WW WPX CW Contest**
May	28–29	CLARA AC/DC "Mystery"

Say, have you seen Ron? Ron? Ron who? Ron Moorefield, W8ILC. He's supposed to be in this caravan, showing you fellows the way. Oh! That Ron. (Last summer the Olympic Torch Relay caravan started in New York City and passed through Stamford, CT on the first day. I got to talk with our local torch bearer at the end of his 2 mile relay, but not the above conversation. Hi! I never did catch up with Ron in all the cheering and confusion.)

Deadline for the July issue is April 15th, and May 15th for the August issue. Have you checked the expiration date of your license lately?

73 for this time, Frank, W1WY

GARTG SSTV Contest

1200Z Sat. to 1200Z Sun., April 6–7

This is the sixth world-wide SSTV contest sponsored by the German Amateur Radio Teleprinter Group. Use all bands, 3.5–28 MHz, in that portion of the bands used for SSTV. The same station can be worked once on each band. A six-hour nonoperating period must be taken during the contest.

Exchange: Call sign, RST, and message number starting with 001. GARTG stations will include their membership number of 5 figures. Exchange must be made exclusively in the SSTV mode.

Scoring: One point for contacts on 20, 40, and 80 meters; 2 points on 15; and 5 points on 10 meters. In addition 50 bonus points for each contact with a GARTG member.

Multiplier: Each country of the WAE and ARRL country list. The following will be considered separate country multipliers: KH6, KL7, and each call area of W/K, VE/VO, JA, PY, and VK.

Final Score: Total QSO points × country mult. × continents + bonus points (worked on each band).

There is an SWL section with scoring same as above. The full report, sent and received, by the station logged must be shown.

Awards: A year's subscription to "RTTY" official organ of the GARTG will be sent to the three top scorers in each group (transmitter and SWL).

Use a separate log for each band and a summary sheet showing the scoring, etc. Logs must be received no later than two months after the end of the contest by Wolfgang Punjer, DL8VX, P.O. Box 90 11 30, D-2100 Hamburg 90, Fed. Rep. of Germany.

Connecticut QSO Party

1100Z Sat. to 1100Z Sun., April 13–14
Rest Period 0500Z to 1000Z Sunday

This year the Candlewood ARA decided on an April weekend for their annual party. The same station may be worked on each band each mode for QSO points and mobiles in each county change. DX stations count for QSO points, but for only one multiplier.

Exchange: RS(T), QSO number, and QTH. County for CT stations; ARRL section for others.

Scoring: One point per contact, 2 points if it's with a Novice, 3 points for Oscar, and 5 points if you work W1QI, the club station.

CT stations multiply total QSO points by ARRL sections plus one DX station worked for their final score. Others use CT counties worked for their multiplier (maximum of 8).

Frequencies: CW—40 kHz up from bottom of each band. SSB—3927, 7250, 14295, 21370, 28540. Novice—3725, 7125, 21125, 28125.

Awards: None indicated, but probably the usual certificates will be distributed to the winners in each section.

Mailing deadline for all entries is May 5th to Candlewood ARA, Att: R. Dillon,

1984 Contest Results
North America

All Asian Phone

7 MHz		21 MHz	
WA6VNR	**24,603**	**KS9U**	**486**
N6AW	19,690	**WA3DMH**	**378**
NP4P	**48**	TI2LO	30
14 MHz		**28 MHz**	
W6OK	**7,440**	**K7SS**	**1**
KE5IV	**6,524**		
W5ZR	6,300	**All Band**	
KA2BBZ	**2,870**	**K6HNZ**	**302,500**
KE5CK	2,772	**N5JB**	**31,944**
AA6T	2,170	KB5FU	27,057
N4MM	**1,632**	K3ZO	15,272
K1KI	**1,512**	K4RZ	3,825
KO7G	**1,464**	WD8IXE	3,744
WA7CGR	1,311	LU3YL/W4	2,170
W4WIJ	1,125	**VE4RP**	**1,653**
WB4UBD	888		
KJ7I	198	**Multi-Opr.**	
KA7FEF	126	**K9MWM/8**	**151,894**
WB5YKD	104	**KM7U**	**390**
AA6EE	70	**VE7EPN**	**28,938**
VE7AV	**4,368**	**4U1UN**	**2,988**
VE3CUI	330		
VE2AE/3	304	**Helvetia "26"**	
HI8GB	**1,025**	**W4OEL**	**6,669**
		KA2DYB	**3,813**
YLRL Anniv. Party		K2SX	2,940
CW		NC2V	2,592
K4AOH	**Gold Cup**	**W8DA**	**1,380**
WD8MEV	**Certificate**	K2NU	1,080
KH8E	**Certificate**	**WA8UHQ**	**585**
SSB		**W1CNU**	**270**
DJ0EK	Gold Cup	W1OPJ	48
WD4NKP	Certificate	**VO1AW**	**7,812**
K4AOH	Certificate		
CW/SSB			
K4AOH	Corcoran Cup		
CT1YH	Hager DX Cup		

There were 22 CW and 52 SSB entries.

Certificate winners boldface.

N2EFA, P.O. Box 143, Bethel, CT 06801. (Include a large SASE for a copy of the results.)

GARTG RTTY Contest

VHF: 1200Z to 1600Z Sat., Apr. 13
40 & 80 M: 0700Z to 1100Z Sun., Apr. 14

This is the second in a series of five short contest periods scheduled by the GARTG for 1985. They are local activities for GARTG members, but other areas are invited to participate.

Classes: A—200 watts or more input. B—200 watts or less input. C—SWL. D—VHF.

Exchange: RST, QSO no., name, and QTH.

Scoring: Contacts on 40 and 80 are worth 1 point. VHF contacts on 2 meters 1 point. On 70 cm 2 points. On 23 cm 3 points per kilometer worked. Final score total of QSO points.

Each contest is a separate activity and should be scored and reported separately. Results will be published in the GARTG news bulletin and the "RTTY" club magazine.

Logs must be mailed no later than 20 days from the end of each contest and go to: Wolfgang Punjer, DL8VX, P.O. Box 90 11 30, D-2100 Hamburg 90, Fed. Rep. of Germany.

DX-YL to N.A.-YL Contest

CW: April 10–11 SSB: April 17–18
1800Z Wednesday to 1800Z Thursday

This is strictly a YL affair in which DX YL's will be contacting YL's on the North American continent. (KH6 and KL7 are considered DX.)

All bands may be used. However, cross-band, Nets, repeaters, or contacts with OM's do not count. The same station may be worked on each band and mode for QSO credit. Phone and CW are separate contests and require separate logs.

Exchange: QSO no., RS(T), and state, province, or country.

Scoring: One point per contact. Your multiplier is determined by the number of states, VE provinces, and DX countries worked. Counted once only, not once on each band.

Left to right are W8ILC, Olympic organizer, WB8HSU, another organizer, and K2DLK. (AT & T provided the communication links for the Olympic Torch Relay caravan last summer, which covered 15,000 kilometers in 82 days. Ron, W8ILC, a representative of AT & T, was directly involved in coordinating the amateur radio portion of the program. Overall there were 37 odd vehicles in the caravan, and some 250 amateurs along the way who had a hand in manning the equipment on 2 meters and 440 repeater links. Ron later told me that his biggest thrills were the flag-waving and cheering crowds along the way, and the fact that he got to run the last two miles with the group going into the Coliseum. "I didn't think the 'ole boy had it in him"—Hi!)

There is a power multiplier of 1.25 for stations using 150 watts or less on CW, 300 watts PEP on SSB.

Final score: Total QSO points times (states + provinces + DX countries) × power multiplier if any.

There is a penalty for each duplicate contact removed from the log by the Contest Committee of three additional and equal contacts.

Frequencies: CW—3555, 7055, 14055, 21095, 28095. SSB—3955, 7255, 14265, 21365, 28595 (plus or minus 15 kHz).

Awards: Four Cups will be awarded to the 1st place winners, DX and N.A., on both phone and CW. And two Plaques to the highest combined CW/phone scores, for DX and N.A. Certificates to the 2nd and 3rd place DX and N.A. winners.

Submit separate logs for each contest, include a summary sheet showing the scoring, transmitter power, and other essential information. The usual signed declaration is also requested.

Entries must be postmarked no later than May 6th and received no later than May 29th.

This year they go to: Marty Silver, NY4H, 3118 Eton Road, Raleigh, NC 27608.

VIGO World Fishing Contest

1000Z Sat. to 1500Z Sun., Apr. 20–21

Don't be mislead by the title of this contest. You don't have to add a rod and reel to your equipment to participate. This event was organized to call your attention to the World Fishing Exhibition in Vigo, Spain on September 17–22.

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Top of the Line HF Transceiver

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- MUCH, MUCH MORE

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- 100W Output
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- Narrow SSB/CW Filter Option

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- Automatic Offset
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- 25W Output
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- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

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TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
- Memory and Band Scan
- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List $529.95
CALL FOR SPECIAL SALE PRICES

TR-2600A New High Tech Compact 2m HT

- LCD Readout
- 10 Memories w/Lithium Backup
- Band And Memory Scan
- Built-in 16 Key Tone Pad
- Extended 140.000-148.995 Frequency Coverage

List $329.95
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TW-4000A Dual Bander 2m and 70cm FM in One Compact Package!

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- 10 Memories w/Scan and Back-up
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R-600—R-100S—R-2000 Receivers in Stock!
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List $229.95 (2m) $239.95 (70cm)
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- 40 Memories
- Memory & Band Scan
- 25W Output
- Built-in 120 VAC Power Supply
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TS-711A List $699.95 TS-811A List $899.95
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BP5 Battery Pack	$49.50
BC35 Base Charger	$69.00
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DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
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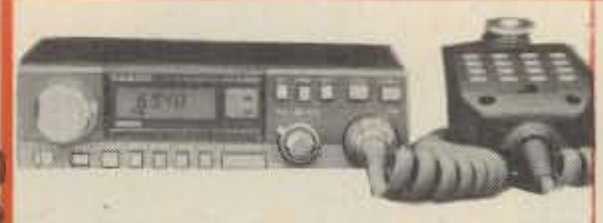

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$249

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
A1015	6M	Yes	10W	150W	20A	$249
B23	2M	No	2W	30W	5A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
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RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MODEL RS-50A

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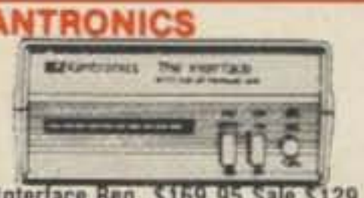

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Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
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ATR-15 1500W Antenna Tuner	$259

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ST222 $279
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LS202 $229

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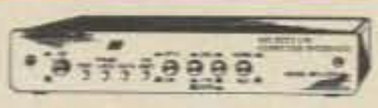

MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
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TR711A 2m Base 25W	$CALL
TR9500 70cm All Mode	$CALL
TR811A 70cm Base 25W	$CALL

ICOM

IC290H 2m All Mode 25W	$469
IC271A 2m Base 25W	$599
IC271H 2m Base 100W	$789
IC490A 70cm All Mode 10W	$579
IC471A 70cm Base 25W	$689
IC471H 70cm Base 75W	$949

YAESU

FT290R 2m All Mode 2W	$349
FT726R Triband All Mode	$779
726/70 70cm module	$269
726/SU Duplex Module	$95
FT790R 70cm All Mode 1W	$349

TEN-TEC

2510 Satellite Station	$439

ROTORS

Ken Pro KR500 Elev Rotor	$189
Ken Pro KR400 Azim Rotor	$149
Alliance HD73 Azim Rotor	$99
Hy-Gain Ham 4 Azim Rotor	$219

AMPLIFIERS

MIRAGE

B108 2m 80W out/10W in	$159
B1016 2m 160W out/10W in	$249
B3016 2m 160W out/30W in	$199
D24 70cm 40W out/2W in	$179
D1010N 70cm 100W out/10W in	$289

THL CORP.

HL110V 2m 100W out/3-10W in	$219
HL160/25 2m 160W out 25W in	$269
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HL45U 70cm 45W out/10W in	$179
HL90U 70cm 90W out/10W in	$319

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A144-20T 2m 20el cir pol	$75
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PS4 70cm Circularity Switch	$69
AOP1 2m/70cm Oscar Pack	$149

KLM

2m-14c 14el 2m w/cir switch	$89
2m-22C 22el 2m w/cir switch	$119
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Ten-Tec 2510 Satellite Station	List $489
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Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
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THL HRA-2 2m Mast Mount Preamp	List $159
Cushcraft AOP-1 Antenna Package	List $219
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $1853
PACKAGE PRICE—ONLY $1499 DELIVERED!
SAVE OVER $375!!

PACKAGE #3

Kenwood TR9130 or Icom IC290H	List $549
Kenwood TR9500 or Icom IC490A	List $649
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

TOTAL LIST PRICE $2428
PACKAGE PRICE—ONLY $1999 DELIVERED!
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PACKAGE #4

Yaesu FT726R VHF/UHF Duplex Xcvr	List $899
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SU/726 Sat Duplex Unit	List $109
Mirage D1010N 70cm 100W Amplifier	List $347
THL HRA-2 2m Mast Mount Preamp	List $159
KLM 2M-14C 14el 2m Satellite Ant	List $112
KLM 435-18C 70cm Satellite Ant	List $145
Ken-Pro KR500 Elevation Rotor	List $189
Alliance HD73 Azimuth Rotor	List $219
South River 10ft Roof Tripod	List $59

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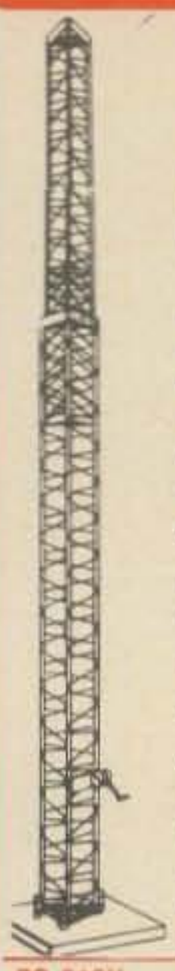

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- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
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HG52SS	52 ft.	9 sq. ft.	$1099
HG54HD	54 ft.	16 sq. ft.	$1699
HG70HD	70 ft.	16 sq. ft.	$2699

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- America's Best Tower Buy—Compare Save $
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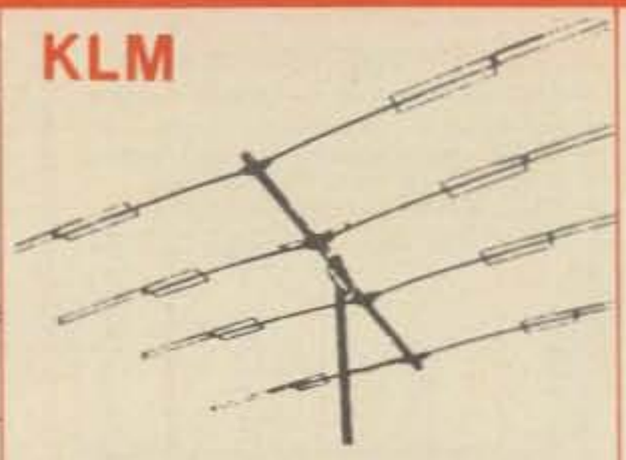
Model	Height	Ant. Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

KLM



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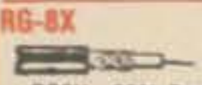

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RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

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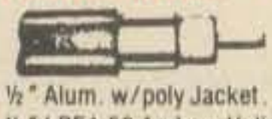

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15-3CD	$119	15-4CD	$129
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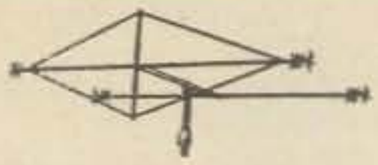

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2m-14C 14-el 2-mtr Satellite Antenna	$89
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2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
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45G $112.50 55G $134.50

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FK2548	48 ft	15.4 sq ft	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399
25G Foldover Double Guy Kit			$219
45G Foldover Double Guy Kit			$249

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

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Activity will e on SSB only, 3.5–28 MHz, single and multi-operator (single-transmitter).

Exchange: RS and CQ zone number.

Points: Contacts between stations in different continents are worth 3 points, in different countries but same continent 1 point. The same country can be worked for a country multiplier but no QSO points.

Multiplier: One for each different country (DXCC) contacted. The same station can be worked on each band for QSO points, but counted once only as a multiplier. A contact with station EH1WFE counts as a extra multiplier.

Final Score: Total QSO points times the sum of your country multiplier (plus EH1WFE).

Awards: The overall single operator winner will be awarded an all-expense-paid trip to Vigo for the duration of the Fishing Exhibition in September. (Including, of course, the red-carpet treatment.) The rest of you will have to be satisfied with certificates to winners in each country (minimum of 10 hours operation or at least 100 QSOs). The winning multi-operator station receives a trophy, and certificates to each operator.

Use a separate sheet for each band. Indicate the multiplier only the first time it is worked, and send a dupe sheet for bands with 200 or more contacts. A summary sheet and the usual signed declaration are also requested.

A penalty of three additional contacts will be subtracted for each duplicate contact removed by the Committee. Disqualification regulations will be strictly enforced. It is suggested you apply for official log forms by sending a large envelope and IRCs to address below.

Mailing deadline for entries is May 31st to World Fishing Contest Committee, P.O. Box 833, Vigo, Spain.

ARCI QRP Spring SSB Contest

1200Z Sat. to 2400Z Sun., Apr. 20–21

The QRP Amateur Radio Club International usually has their CW activity on this weekend, but maybe they alternate each year.

Participation is open to members and non-members. Operating time is limited to 24 hours out of the 36-hour contest period. The same station may be worked on each band and each mode for QSO and multiplier credit.

Exchange: RS and state, province, or country. Members will include their QRP number; non-members their power.

Scoring: Contacts with a member 5 points. With a non-member in the same continent 2 points, but 4 points if on a different continent.

There is a power multiplier as follows:
8 to 10 watts output— × 2.
6 to 8 watts output— × 4.
4 to 6 watts output— × 6.
2 to 4 watts output— × 8.
Less than 2 watts output— × 10.
Over 10 watts output—check log.

There is a bonus multiplier of × 2 for stations using solar or wind power (with or without storage). And × 1.5 if using battery power (100% in both cases).

Final Score: Total QSO points × (states + provinces + countries) worked on each band × power multiplier × bonus multiplier if any.

Frequencies: 1810, 3985, 7285, 14285, 21385, 28885.

Awards: Certificates to the highest scorers in each state, province, and country with two or more entries. Scores will be credited for the annual "Triple Crown" QRP award. Also a special Milliwatt certificate from Adrian Weiss, W0RSP, to stations using less than 2 watts.

Use a separate log sheet for each band and a summary sheet showing the scoring and other essential information. Scoring sheets are available from KA5NLY. Include a large SASE with your request (also if you desire results).

Logs must be received by May 21st and go to: QRP ARCI Contest Chairman, Eugene Smith, KA5NLY, P.O. Box 55010, Little Rock, AR 72225.

Swiss Helvetia Contest

1300Z Sat. to 1300Z Sun., Apr. 27–28

The Swiss usually try to activate some of the rare Cantons, so this offers a good opportunity to build up your totals for the attractive Helvetia Award. Confirmation of all 26 Cantons is required. Only contacts made after January 1, 1979 are valid.

All bands may be used, 1.8–28 MHz, phone or CW (but not the new WARC bands). The same station may be worked on each band for QSO and multiplier credit, but only on one mode, either phone or CW.

Exchange: RS(T) plus a three-figure QSO number. Swiss stations will also include two letters identifying their Canton. Abbreviations of the Cantons are as follows: AG, AI, AR, BE, BL, BS, FR, GE, GL, GR, JU, LU, NE, NW, OW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each HB contact is worth 3 points. The sum of Cantons worked on each band is your multiplier (a possible total of 26 on each band).

Final Score: Total QSO points multiplied by the sum of Cantons worked on each band.

Awards: Certificates to the top scorers in each country and each USA and Canadian call area.

Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicate contacts and include a summary sheet showing the scoring and your name and address in block letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, Walter Schmutz, Gantrischweg 1, CH-3114 Oberwichtrach, Switzerland.

Applications in the form of QSL cards for the Helvetia Award go to: Max Bindschedler, HB9MX, Strahleggweg 28, CH-8400 Winterthur, Switzerland.

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CIRCLE 48 ON READER SERVICE CARD

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

30 Meters and WARC Bands Revisited

Approximately 2½ years have passed since our first WARC-acquired band was opened for use by U.S. amateurs, and the overall returns to-date have been extremely gratifying. Thirty meters has proven to be the ideal HF area for personally developing and evaluating various types of antennas and equipment, and the DX situation is more "enjoyable QSO" rather than mere "report exchange" oriented. The band is fantastic! This 10.1 MHz spectrum has also become popular among financially restricted youngsters and limited budget retirees—an attractive combination for perpetuating our quality amateur standards. The common denominator in each of the above areas is obviously 30 meters' "power equalizing effect" resulting from a 200 watt limit, and the band's unique location in the HF spectrum.

Since everyone uses barefoot gear, noticeable emphasis is placed on effective home-constructed antennas. Additionally, QRP rigs, direct conversion receivers, and modified older equipment is usually capable of good performance on 30 meters. Although some of those items might also be used on 40 or 20 meters, the power ratio of a few watts in a 1500 watt world isn't very encouraging odds. Older rigs and basic-design receivers also tend to "drop off" in performance around 12 or 13 MHz. Personally, I've "spare time" worked over 20 countries on 30 meters while using a pocket-size 2 watt transceiver. You could probably do better.

What other attractions does our only low-power band offer? A relaxed and friendly atmosphere with propagation that's a "cross" between 40 and 20 meters, a band that's relatively open during many daylight and evening hours, a recluse from hectic contest activities on other bands, and a dandy way to enjoy a good electronic keyer or classic bug (watch for more inspiration on bugs in next month's column. We're planning a special tour of the K5RW key collection/museum).

**Eastwood Village No. 1201 So., Rt. 1, Box 499, Birmingham, AL 35210*

Watching 30 Grow

Amateurs in all areas of the world are enthusiastic over our new 30 meter band. South African amateurs are group-constructing direct-conversion QRP transceivers from club-available kits. Australian and Pacific area amateurs are joining 30 meters in increasing numbers. Even OSCAR 10 operators are being heard on 10.1 MHz when the satellite isn't in range of their QTH. From the European side, Anthony Quest, G4UZN, reports that substantial 30 meter activity encouraged him to create a "WARC bands club" complete with quarterly newsletter (air mailed) and attractive membership certificate. The yearly fee is $10 U.S., and everyone is invited to join. His address is 445 Street Lane, Leeds, LS17, 6HQ, England. Tony also reports hearing many U.S. stations working one another in the informal "DX window" of 10.100 to 10.104 MHz with each asking "Where's the DX?" One way propagation? Doubtful. He's probably experiencing the "listen later" antics of 40 meter operators trying 30. You've heard the ritual: You call CQ on a clear frequency, then three seconds later another right-on-frequency operator calls CQ. You answer him, and the exchanged reports are 599. May such trends never invade 30 meters!

As this column is being written, the full 30 meter spectrum (10.100 to 10.150 MHz) has just been opened to U.S. amateurs. Some teletype and buzz saws continue frequenting 10.130 MHz, but they make convenient band markers and propagation beacons. The FCC has also filed a Notice of Proposed Rule Making (PR 84-960) which advocates raising 30 meter's power limit to 1500 watts. Since that expansion would ruin the true beauty of this unique band, I filed a formal reply requesting our low 30 meter power limit

Fig. 1– The coaxial double bazooka antenna as originally designed for 20 meter operation, and presented in K9EID's Ham Radio Handbook. *Text explains easy method of scaling for 30 meters. Skywire doesn't require external balun and works like a champ.*

be retained. Surely we'll be allowed to continue proving our abilities to design our own setups and communicate worldwide using minimum power levels. Will we succeed? The closing date for PR 84-960 replies was December 15, 1984, with resultant action due by late spring 1985. Time will tell.

Equipment Ideas

While recently manufactured amateur transceivers include easily enabled WARC band coverage, a number of individuals have elected to "go their own route" in this area by using separate transmitters or converted CW setups for 30 meter operation. This approach has opened several interesting avenues of pursuit: using "classic" rigs such as the Johnson Ranger or Navigator (remember the unique sound of time sequence keying?), constructing ever-popular "one tubers," or adapting QRP setups detailed in various handbooks and magazine articles. Several amateurs have reported these ventures as being their first true "hands on" experience with circuits, and that kind of incentive is commendable in any light.

Converting tuned circuits in basic or older amateur gear for 30 meter operation can usually be simplified to shifting 40 meter tank coil taps between 20 meters and their original (40 meter) positions, or adding extra capacitors in parallel with 20 meter capacitors. In fact, the wide tuning range of many older transmitters often covers 30 meters without modifications. Rather than retuning VFOs for new band coverage, try installing a freshly purchased crystal for 10.108 or 10.120 MHz and "warping" them with a tuning capacitor—the modern "VXO concept." Many older receivers cover the full HF spectrum. However, ham-band-only receivers can be 30 meter converted by coil-tapping or capacitor-padding their 40 or 20 meter RF input circuits and changing heterodyne oscillator crystals. The general concept of "beating" incoming RF and local oscillator signals to produce a particular IF difference was exemplified in last month's column ("Understanding Modern Amateur Gear"). Just adapt those ideas to your own rig.

There are a variety of "specialty areas" one can pursue in 30 meter activities: mobile operations with a good programmable memory keyer, resurrecting vintage gear such as units described by W6SAI in past issues of *CQ*, or maybe constructing your own microsize DX rig. Have you thought of building a 30 meter transmitter in a ballpoint or felt-pen case? Radio Shack sells RF coils and cigarette-lighter-type 12 volt batteries that are quite small. Add an oscillator-slaved direct-conversion receiver in another pen case, and the "set" makes a complete rig. Maybe a Golden thirties-style setup using number 10 or 46 tubes and a matching receiver with genuine blue envelope valves would pique your interest. The classic model Champion bug is still manufactured by Vibroplex, and it would really complement that setup. Need some more ideas to kindle your thoughts? Check our brief list of "imagination expanders" shown below.

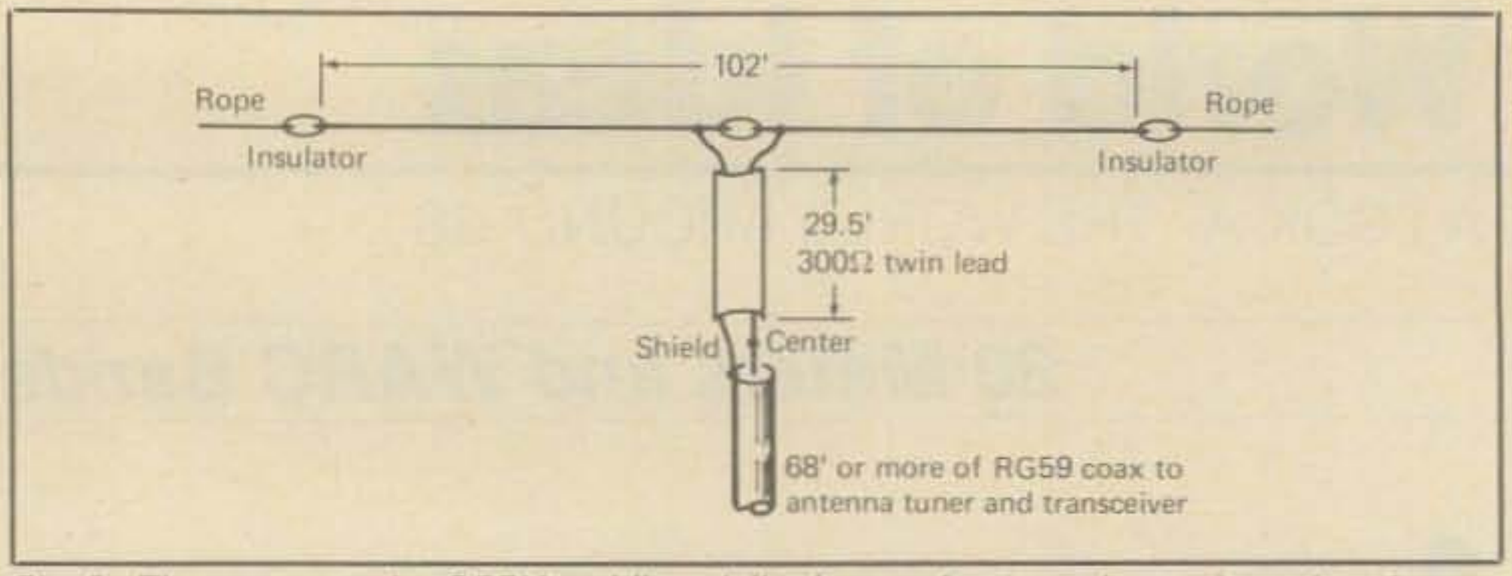

Fig. 2– The ever-popular G5RV multiband dipole—an inexpensive and good performer for 80, 40, 30, 20, 15, and 10 meters. Any antenna tuner which will match coax inputs is recommended.

- "A 50 Watt 1934 Style Transmitter," W6SAI, November 1971 *CQ*.
- "A 2-Tube DX Receiver," W6SAI, June 1972 *CQ*.
- "A 210 TNT Transmitter for 80 Meters," W6SAI, January 1973 *CQ* (circuit also in 1930's *ARRL Handbook*, with coils for 40 and 20 meters).
- "A One Tube 10 Watt Transmitter," W6XM, June 1983 *CQ*.
- "The Viking 4 Watt 20 Meter Transceiver," W0RSP, August 1980 *CQ*.
- "A 2 Chip CW Transmitter," W0XI, October 1981 *CQ*.
- "The QRP-30 Transceiver," K4TWJ, June 1983 *CQ*.
- "WARC-Enabling Modern Rigs," K4TWJ, February 1983 *CQ*.
- Additional Ideas Sources: *QRP Handbook* by W0RSP, *Solid State Design for the Radio Amateur* by ARRL, *Weekend Projects for the Radio Amateur* by ARRL. Also check archives sections of your local libraries.

A Wire Antenna Haven

Remember those bargain-priced rolls of insulated hookup wire, coax, and twin lead that seem to appear in nearly every hamfest fleamarket? The gauge may be thin for kilowatt rigs, but it's great raw material for 30 meter antennas. What kind of array to build? That depends on your available room and ingenuity in shooting fishing lines over tree limbs. Full-wave loops, Bruce arrays, and two-element wire beams always radiate a respectable signal. Phased verticals made with wire elements or various types of longwires are another possibility. Some interesting designs for wire antennas are also presented in older handbooks (or in my upcoming *Wire Antenna Handbook*. It should be published within the next few months.). So you're saying many published designs were before the days of WARC bands? I'll explain an easy way to modify any (single band) antenna's dimensions for 30 meter operation, then leave the area open to your creativity.

Antenna formulas are interesting in the respect that any two known variables can be used to find an unknown third variable. This is done by rearranging their parameters into a "circle formula" and substituting a "times" sign for their "equal" marks. The formula F(MHz = 234 ÷ ¼ wavelength (feet), for example, is rewritten in fig. 1 as 234 ÷ F(MHz) × ¼ wavelength (feet). As an example of its use, let's plug in some figures we all recognize: 234 ÷ 14.0 MHz = 16.714 feet (used for finding length of ¼-wave antenna). Also, 234 ÷ 16.714 feet = 14.0 MHz (useful for finding the resonant frequency of "5 percent longer" reflectors, "4 percent shorter" directors, velocity factor-cut transmission lines, etc.). Likewise, 14.0 MHz × 16.714 feet = 233.996 (useful for finding a "common parameter" for scaling various book and magazine-presented antenna lengths to other frequencies. Nearly every electronic formula can be "fanagled" similarly.

Let's assume you're planning a "Coaxial Double Bazooka Antenna" such as described in K9EID's *Ham Radio Handbook*, and need to convert its dimensions for 30 meters (see fig. 1). F(14.175) × L(31.24 ft.) = common parameter (442.8). Recalculating for 30 meters: 442.8 ÷ F(10.120) = 43.75 feet overall length. Likewise, F(14.175) × L(23.19) = common parameter 328.71. Recalculating that mid-section for 30 meters gives 328.71 ÷ F(10.120) = 32.48 feet. We'll let you calculate the end sections. They should tally to 5.63 feet each. If you build this outstanding antenna, incidentally, Bob emphasizes the coax is older type RG58 with solid center conductor and tough semiclear dielectric. Other types have different velocity factors which require recalculating lengths.

Shifting toward inexpensive multiband antenna designs, the ever-popular G5RV trapless doublet is shown in fig 2. This antenna is also included in K9EID's handbook, and several amateurs report that it works very well on 30 meters—plus 80, 40, 20, 15, and 10 meters. Remember to

use heavy twin lead for the phasing section if you run high power on other bands. A balun isn't necessary, but an antenna matchbox may be required for loading modern rigs into the 2:5 or 3:1 SWR at some frequencies. The antenna radiates very well regardless of SWR, mainly because every part becomes active: phasing section, coax, etc.

The 24 and 18 MHz Bands

Although present sunspot activity continues toward its predicted 1986 minimum, our other two WARC-acquired bands of 12 and 17 meters are beginning to reveal amateur operations from several world areas. There are strong rumors that 12 meters will be open to U.S. amateurs by the time this column appears in print, so monitor W1AW's bulletins or listen closely between 24.880 and 24.980 MHz during late afternoon hours and check what's happening. North/south propagation has been noticed on 12 meters, with Venezuela and Argentina putting fair signals into both the U.S. and Europe. Australians and Europeans are occasionally heard also, mainly when nearby 10 meters is open. Most of the DX on 12 meters runs less than 300 watts, and there's noticeable concern that 1500 watt U.S. limits may obliterate the band's special attractions. Twelve meters will be a "full activity" type band open to General and higher class licensees. A frequency/mode/license breakdown is included in Table I.

What kinds of antennas seem like attractive starters for joining 12 meter action? ZL special wire beams or phased vertical arrays should give a good account of themselves. You can use our previously discussed ideas for frequency scaling their dimensions. Older CB or 10 meter beams can also be (center) loading-coil adapted to 12 meters. An antenna noise bridge and general-coverage receiver should make frequency tuning a snap. As an example, let's say you want to tune the antenna for resonance at 24.900 MHz. Trim the driven element's coils until the noise-bridge-connected receiver indicates minimum noise around 24.900 MHz. A reflector element should be 5 percent longer, which can be calculated as follows: 468 ÷ F(24.900) = 18.79 feet (driven element). Next, .05 × 18.79 feet = .94 feet. Adding, 18.79 + .94 = 19.73 feet. Returning to the formula, 468 ÷ 19.73 feet = 23.720 MHz, the reflector's point of resonance, and minimum receiver (bridge) noise. There will probably be some element interaction, so double check/retune elements as necessary.

Although the 17 meter band promises to be a winner, occupancy by U.S. amateurs before 1989 isn't looking likely. Gad! We should be well on the "uphill side" of sunspot cycle 22 by then, and DX probably will be booming. As of late 1984, listening between 18.068 and 18.080 MHz revealed YUs, DLs, Gs, Is, LUs, VKs, plus "special DX" such as VU, TR8, and OY. The BBC frequented 18.080 MHz, while general jammers and buzz saws occasionally infested the band's upper end. Take a listen to 17 meters during afternoon hours of weekends. It's quite interesting. It's a pity we can't join the low-end action.

Band	Frequency	Modes	Licenses	PWR Limits
30	10.100–10.150	CW	General Class or higher	200 watts (see text)
17	18.068–18.168		Undetermined at this time	
12	24.880–24.980	CW, RTTY	General Class or higher	1500 watts (preliminary figure)
12	24.930–24.980	CW, SSB	General Class or higher	1500 watts (preliminary figure)

Table I– Breakdown of WARC bands according to frequencies and modes. Twelve meters may be available to U.S. amateurs by the time this article appears in print. Seventeen meter availability to U.S. amateurs isn't expected anytime soon.

Conclusion

As a means of bringing information together in this WARC-band update, let's review some sunspot-cycle notes. You can compare them with what you've heard during the past, what you hear now, and get a general idea of what's ahead. Cycle 21 began last sunspot minimum during June 1976 with a count of 12. It peaked during December 1979 with a count of 165. September 1984's count was 44, and June 1985's count is predicted as 31. Cycle 21 should bottom (end) around December 1986 to June 1987 with an estimated count of 10 to 14. The previous information was excerpted from W3ASK's Propagation column in December 1984 *CQ*. George Jacobs has been forecasting for many years, and his predictions are quite dependable.

Considering the full HF WARC band situation, I believe that 30 meters is our most promising band. Seventeen meters, however, should give it stiff competition during the 1990s, when we'll probably be using remote-controlled stations and our country will be experiencing renewed interest in quality education and higher technology. U.S. youngsters will then fully realize amateur radio's vast appeal.

73, Dave, K4TWJ

Looking to get some more mileage out of an old CB antenna? Look no further, for N1BEP shows us how to convert one for use on 2 meters.

How To Convert A CB Antenna To 2 Meters

BY GEORGE W. ALLEN*, N1BEP

As I change interest from one aspect of radio to another, I frequently find that I have an excess of equipment for one application and a need for equipment elsewhere. As with a lot of us, I have a lot of old CB gear, some of which has been converted to 10 meters. With poorer propagation on 10, I have been more active on VHF and have a need for equipment there, particularly antennas for the house and cars to access repeaters. While sorting through some of the very valuable excess baggage in the junkbox, I found a good VHF antenna application for my numerous baseloaded CB vehicle antennas.

A half-wave dipole on 2 meters has the advantage of better radiation and less of a requirement for a good RF ground system than a quarter-wave vertical. The CB hardware turned out to be ideal for the half-wave conversion. In addition, CB hardware is certainly strong enough for an application like this. The loading coil is protected with a sleeve of insulating plastic, as shown in the photograph. This sleeve provides part of the mechanical strength of the assembly, and should be removed and preserved intact for replacement when the conversion is completed. It is removed in the model shown by siding it down over the base mounting ferrule.

Construction

The schematic for the baseloaded quarter-wave CB antenna is shown in fig. 1(A). Fig. 1(B) illustrates the 2 meter adaptation made from it. The loading coil consisted of two turns spaced about ¼ inch to the tap for the 50 ohm input, and about 16 turns closewound for the base load of the whip. In order to make the

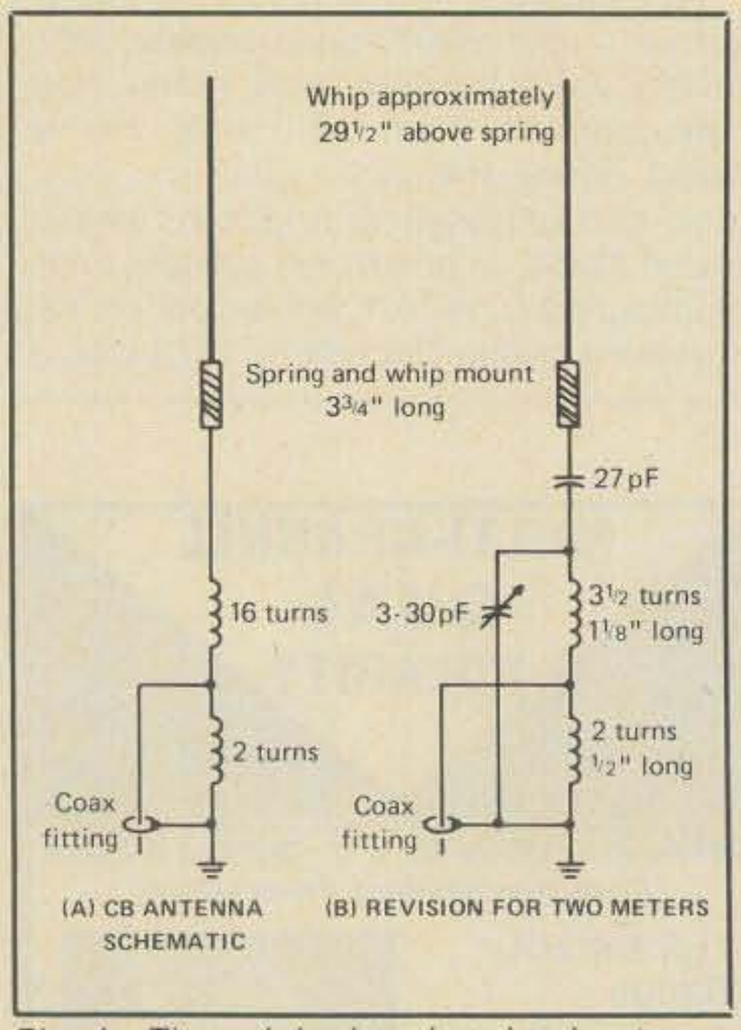

Fig. 1– The original and revised antenna wiring.

change, the lower two turns and the tap remain as before. Turns are removed from the series baseloading coil to make it parallel resonant on 2 meters, as can be seen in the photograph. It will be necessary to modify the coil form as shown in fig. 2 and the photograph in order to accommodate the series capacitor C1. A flat is filed in the coil form just below the top of the form so that the small capacitor will nest there and not interfere with the outside cover when it is replaced. A small hole is drilled through the form at 1¾ inches to secure the last turn of the revised coil. A larger hole, large enough to accommodate the tuning capacitor, is then drilled through the form in the space between the tap and the top coil. In the model a 5/16 inch diameter hole was adequate to accept a miniature printed circuit trimmer capacitor. All parts and soldered connections are recessed enough so that the outer sleeve can be replaced. A clearance hole is drilled in the outer sleeve so that the trimmer capacitor C2 may be adjusted after final assembly.

Adjustment

There are four possible electrical adjustments to the assembly. The inductance of the coil with the trimmer capacitor C2 must resonate at 2 meters, and this should be possible with the values shown. It may be necessary to spread or compress the spacing of the turns of the coil to center the frequency on 2 meters. At final tune-up the resonance is quite sharp, so that a final adjustment is made with the antenna mounted in position. The value of coupling capacitor C1 is not very critical. Any reasonably close value can be used, since the tolerance can be compensated for by coil or whip tuning. The last adjustment to be made is the length of the whip. This is also quite critical, and for initial adjustment a piece of number 12 AWG antenna wire as substituted for the stainless steel whip. It was made longer than required and cut to length as the tuning progressed. Finally, the stainless steel whip was cut to the same length for the final assembly.

Tune-up was done in the shack by using a piece of aluminum foil about 18 inches square for a ground plane. An SWR meter was used, and the tuned circuit first resonated for a minimum SWR at about 146 MHz. The SWR was then checked at 144 and 148 MHz. If the SWR was lower at 144, the temporary antenna was shortened about ½ inch at a time to reach the desired frequency. If minimum SWR occurs at the high end of the band, then lengthen the antenna systematically

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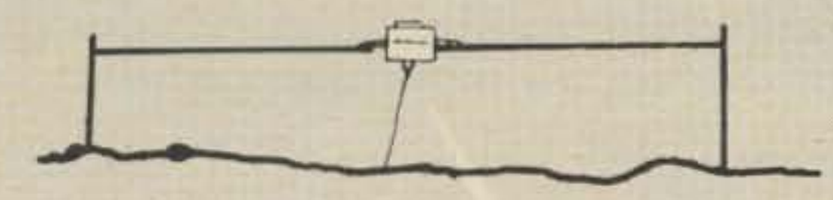

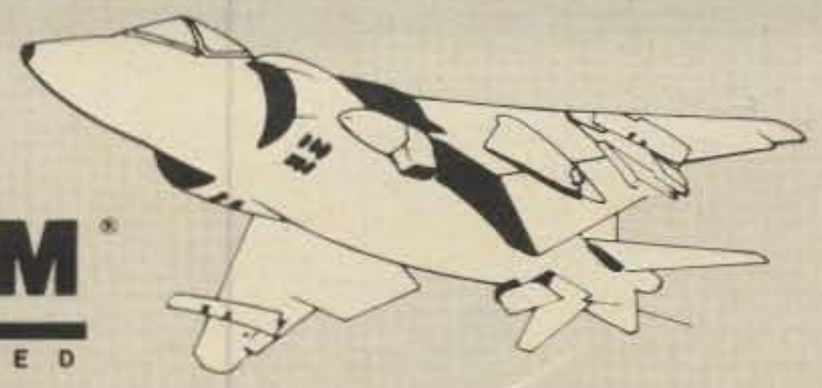

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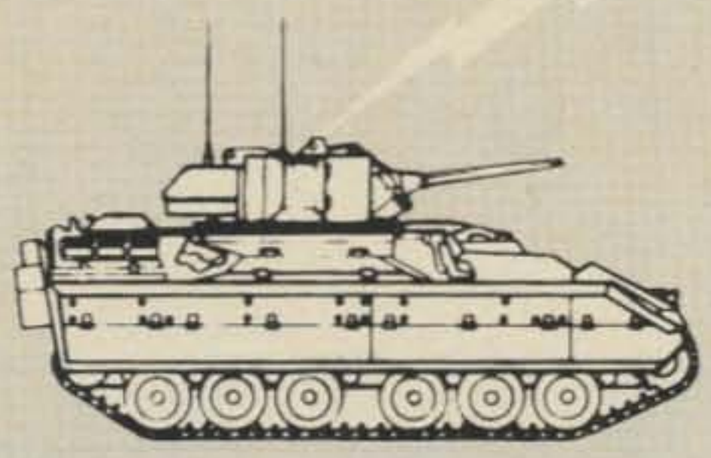

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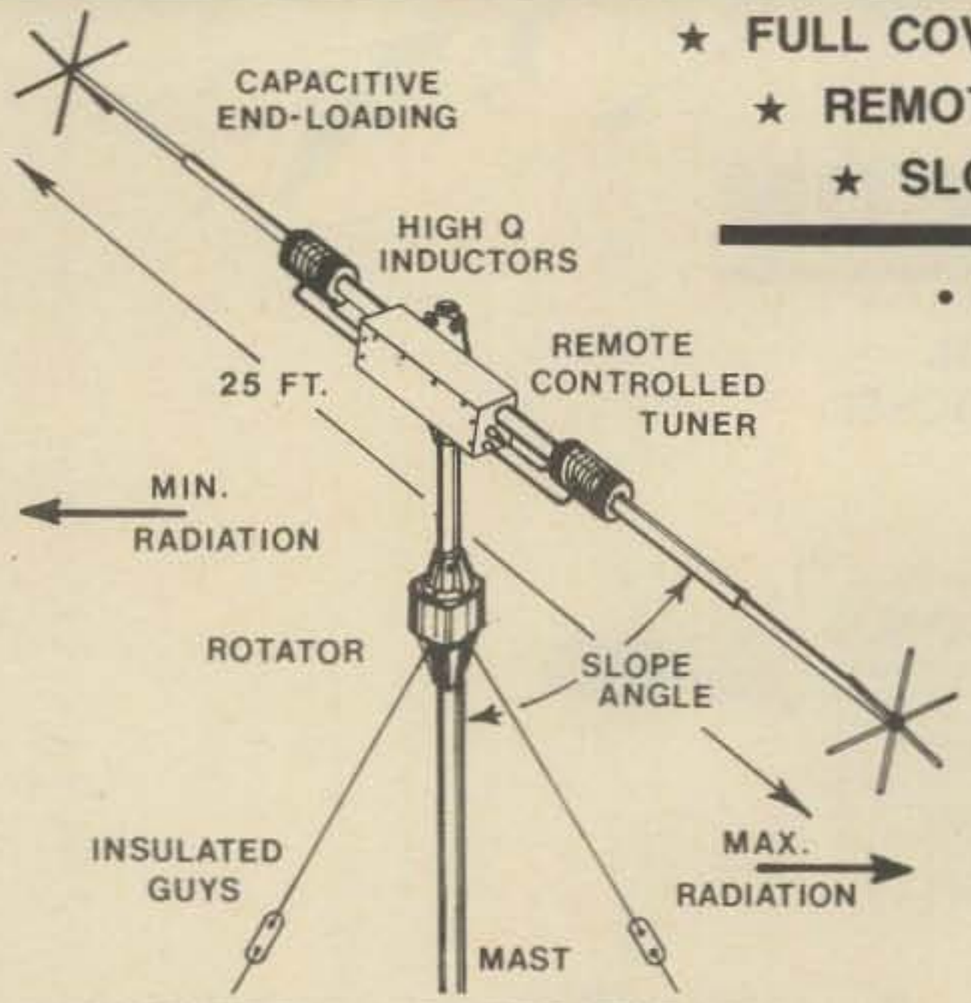

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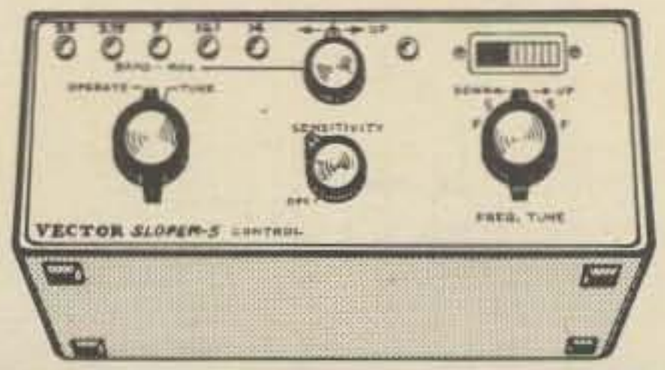

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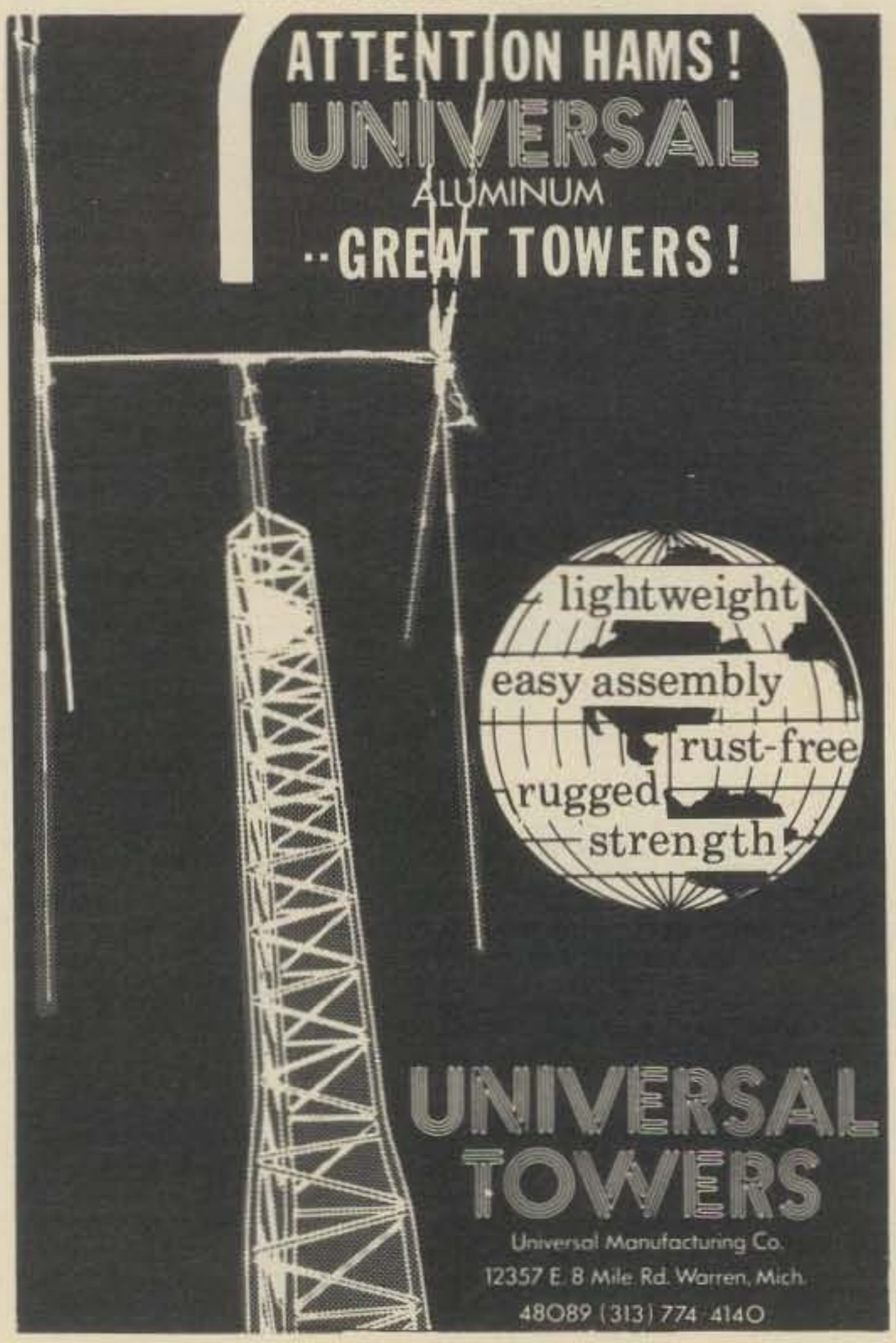

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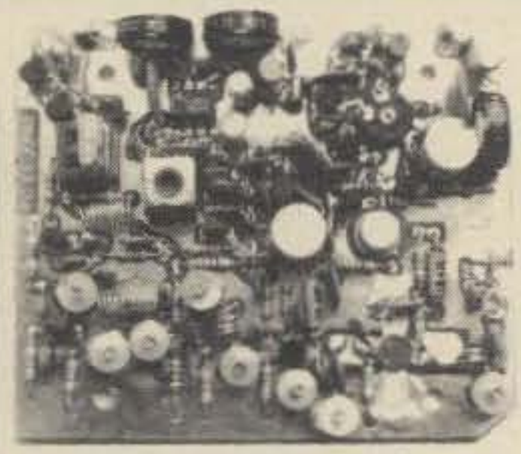

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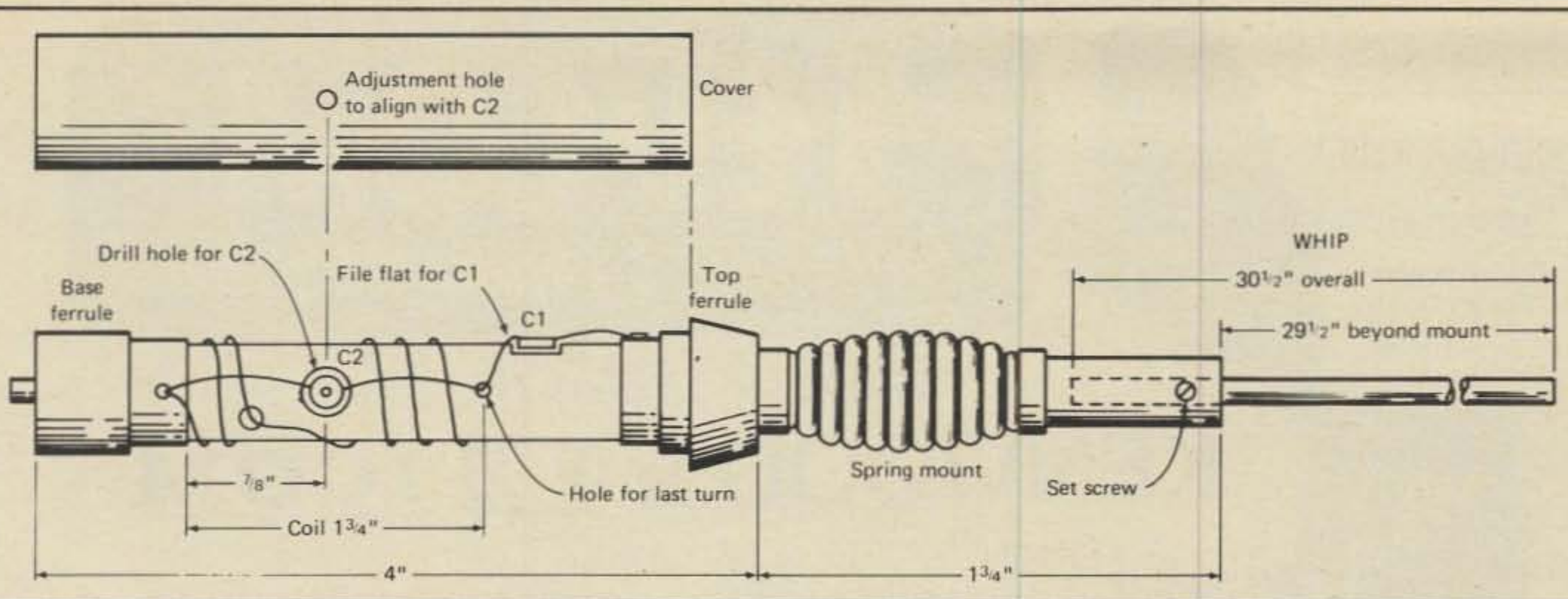
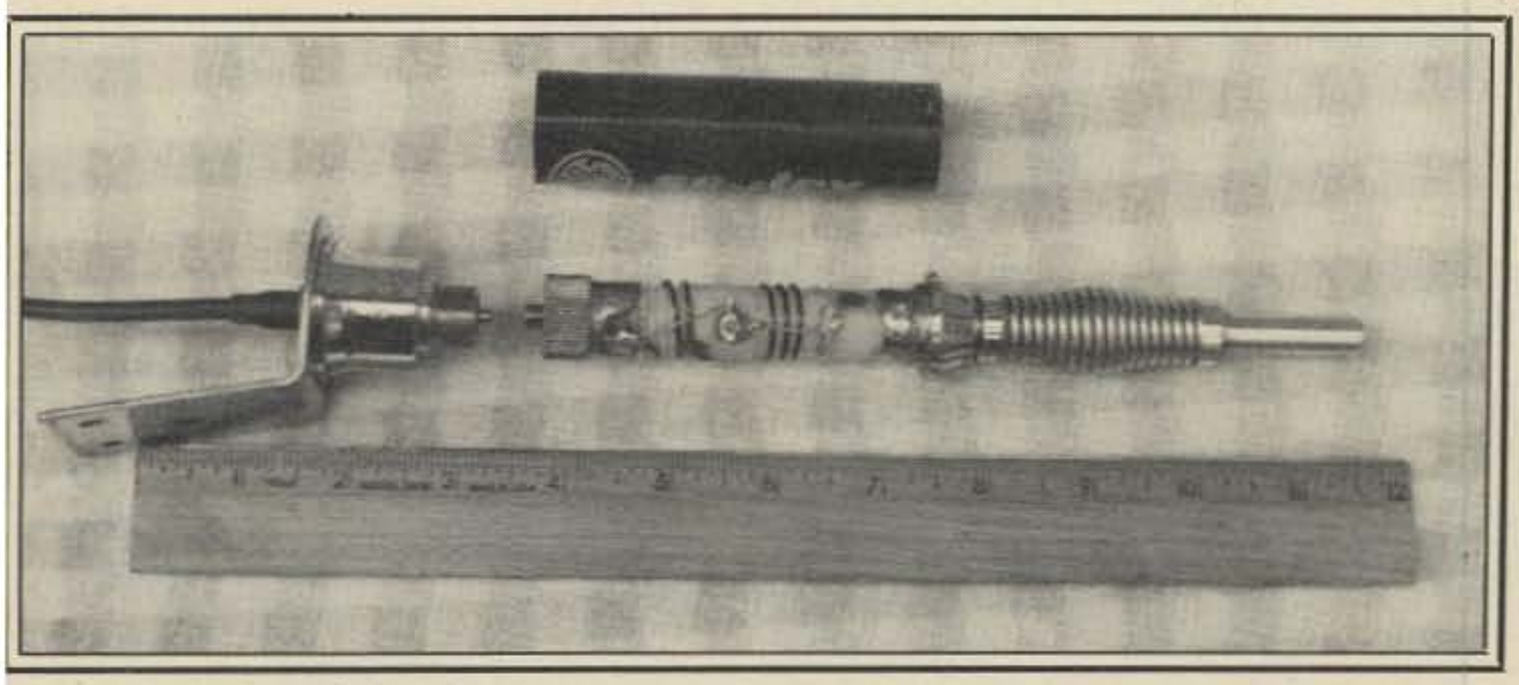


Fig. 2– Mechanical dimensions and modifications of the whip base assembly for the 2 meter conversion.



Exploded view of the whip base assembly showing the modifications to the coil.

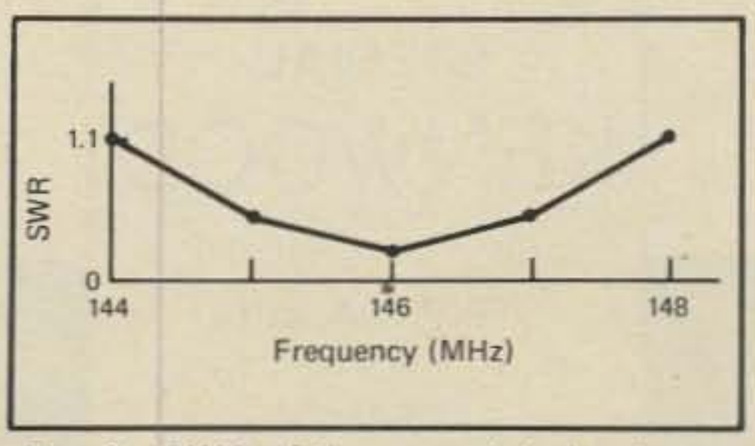
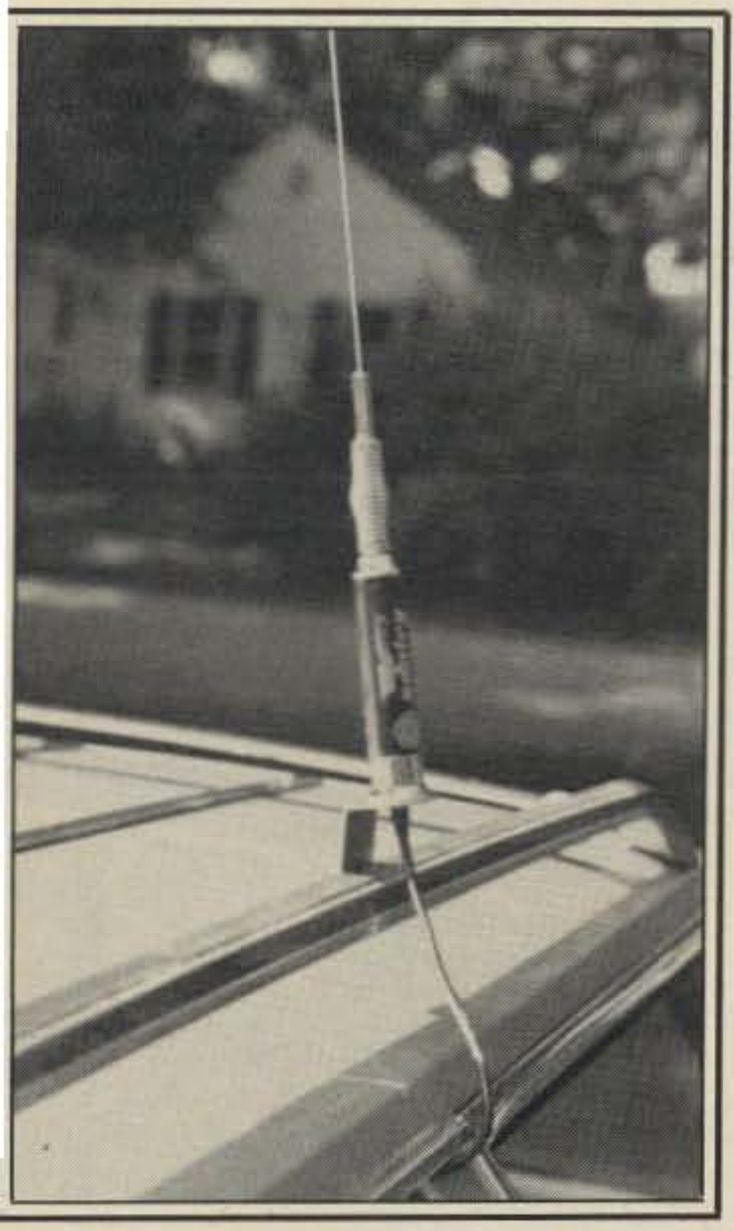


Fig. 3– SWR of the completed antenna. Tuning is quite broad and SWR is better when mounted on the car than when measured in the shack.

until the desired resonant point is reached. The SWR versus frequency curve for the model is shown in fig. 3. When the antenna is finally assembled, small adjustments in length are made by loosening the set screw holding the whip until the best SWR is obtained.

Conclusion

A base-loaded CB mobile whip can be converted to 2 meters to make a strong, efficient antenna for mobile use or for "out the window" use at home. A minimal RF ground is required, unlike a quarter-wave antenna. As an added bonus, the antenna does not advertise the 2 meter equipment in the car, which should reduce the exposure to theft. The project should easily be completed in a weekend.



The antenna mounted on the luggage rack of the family wagon. SWR as shown is very low, indicating a good match.

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Antennas

a monthly feature by
KARL T. THURBER, JR., W8FX

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

From the Notebook

This month it's a wide range of antenna notes and jottings from columnist W8FX, including a reexamination of several inexpensive and popular multiband antennas. Stay with us. —*K2EEK*

In last month's column we examined a very useful and professionally constructed software package. This was AJ3K's "Annie," designed for use with the Apple and Commodore 64 computers. Following our look at this antenna design and development package, we noted "H*A*R*K," a small but interesting group of SWLs, hams, and experimenters. We also reiterated the merits of the G5RV multiband dipole, and took note of some new hamshack software for the Apple.

This time we'll open the ol' notebook for discussion of a number of pertinent antenna-based topics. We'll review the merits of another cheap and easy multiband antenna, the centerfed Zepp; compare and contrast three popular types of HF verticals; and again open the reader mailbag. We'll also review our software notes on several hamshack products that you should find interesting.

Let's open the notebook by becoming reacquainted with an old friend, the classic centerfed Zepp.

The Centerfed Zepp

One of the first questions that comes to mind when contemplating operations on one of the new WARC-79 generated amateur bands is that of antenna selection. For many operators, the choice involves selecting an appropriate multiband antenna that will cover, with satisfactory results, *all* of the HF ham bands from 160 to 10 meters, WARC bands included. Few amateurs are in any position to erect a separate antenna for each band on which operation is desired.

Many different types of multiband antennas can be constructed that will allow coverage of these bands. One of the most popular, and certainly the simplest to construct, is the end-fed singlewire, sometimes called a "random-length longwire." This type of antenna has good potential for "getting out" with minimum hassle, but at the risk of poor loading and tuning conditions on several bands, as well as "RF in the shack" and TVI by-

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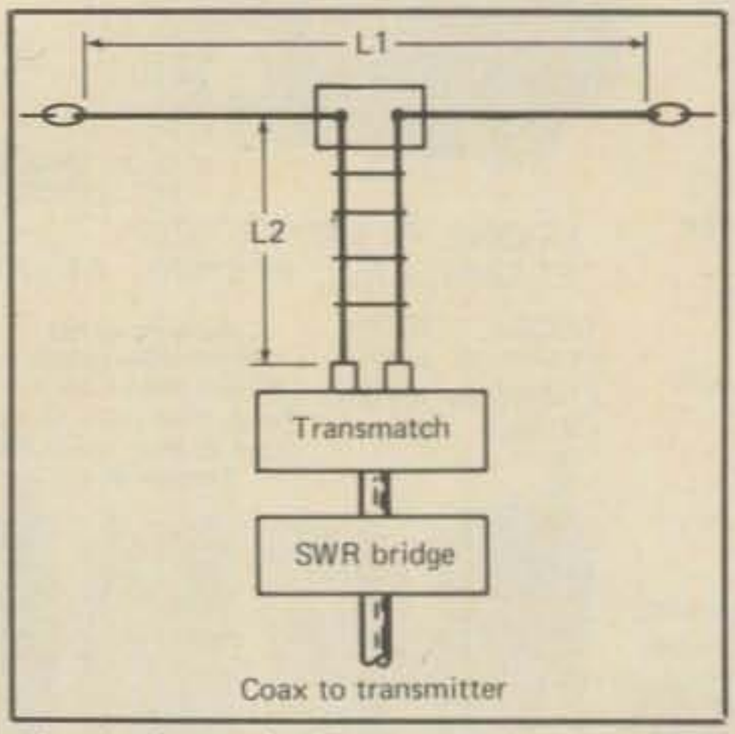


Fig. 1– Centerfed Zepp—a classic. A centerfed wire can be used as a multiband antenna if used in conjunction with a suitable transmatch. While flattop length (L1) is not critical, generally a halfwave at the lowest frequency is used, for best results. The feedline length is also not critical, but L2 lengths of 43 or 77 feet with a 136 foot flattop, or 43 or 66 feet with a 66 foot flattop, are popular (see text). Feedline may be any type of balanced line, but use of low-loss 450 to 600 ohm openwire line is best. Twinlead may be used, with increased loss and weather effects to be expected.

products. Such problems, characteristic of the singlewire, are intensified with the advent of the newer, odd-frequency bands, where it's too much to expect to rely on the old technique of very carefully adjusting antenna and/or ground lead lengths, which often cured the more serious problems. Trying to get all bands to behave with such an arrangement is a very tricky proposition.

Last month we discussed the G5RV. This time we'll highlight an antenna that is closely related to it, the classic centerfed Zepp—a truly old-fashioned approach to multiband operation that is far from out-of-date in 1985.

The centerfed Zepp is merely a dipole of any convenient length, fed in the center with a non-critical length of parallel feeder, normally openwire line. The antenna requires the use of an antenna tuner/transmatch at the transmitter end to couple the system to the typically coax-fed transceiver. While flattop length is not critical, generally a half-wave at the low-

Band	1/4 λ	1/2λ	5/8 λ
160	123.0′	246.0′	307.5′
80	64.5′	129.0′	161.3′
40	32.7′	65.4′	81.8′
30	23.1′	46.2′	57.8′
20	16.5′	33.0′	41.3′
15	11.1′	22.2′	27.8′
10	8.3′	16.6′	20.8′

Table I– Popular vertical antenna dimensions. Vertical element lengths on the lower bands (160 and 80 meters) become impractical for most installations, but are presented for comparison here. Note that the half-wavelength and 5/8-wavelength verticals require the use of a base matching network. The vertical works best with a good RF ground, thus it's recommended to use a ground radial system consisting of a minimum of 8 buried radials, each at least 0.3 wavelength. A good ground is most important in the case of the 1/4-wavelength monobander.

est frequency to be used is employed for best results. Again, the feedline length is not critical, but feeder lengths of about 43 or 77 feet (with a 136 foot flattop), or 43 or 66 feet (with a 66 foot flattop), seem to give less trouble with parallel line currents than do others—at least, on the popular 160, 80, 40, 20, 15, 10 meter bands.

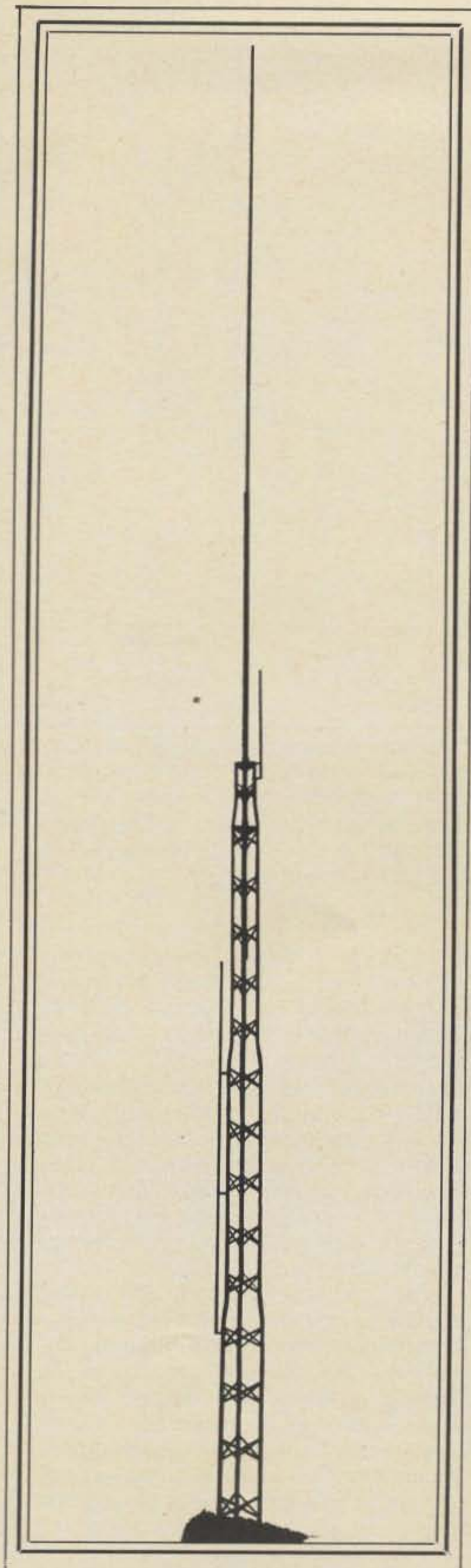
The feedline may be any type of balanced line, reflecting the inherently balanced nature of the centerfed Zepp. It's best to use low-loss 450 to 600 ohm openwire line, though various types of 300 to 600 ohm ladder lines or transmitting-type twinlead may also be used, with greater loss and influence by weather the consequence of making the substitution.

Try a centerfed Zepp, along the lines of fig. 1, for an inexpensive and effective multiband antenna, and consider suggesting its construction to that new Novice who comes to you for advice on his or her first antenna! Neither of you is likely to be disappointed.

HF Verticals: A Threesome

Sometimes, for lack of horizontal space, or for considerations of angle of radiation, the vertical represents the best antenna choice, especially for the DXer. We'll highlight three simple and inexpensive vertical antenna ideas here.

1. The Monobander. The HF monoband vertical is a simple antenna, and most of



The HF verticals described in the text are all of the "cheap and dirty" variety. At the other extreme is a vertical such as the Hy-Gain 18HT Hy-Tower, a multiband vertical with automatic band selection of 10–80 meters by means of a unique stub decoupling system. Fed with 52 ohm coax directly, the antenna may also be used on 160 meters with a base loading coil. Two of the 50 foot antennas may be used in a phased array. (Photo/artwork courtesy Hy-Gain)

us have a great deal more vertical space in which to erect our antenna than we do horizontal space. Keep in mind that the vertical need not be made of rigid tubing or rod, but can also be made of wire and dropped from a high tree limb or other support. The key elements in vertical antenna success are, first, the use of a good ground system (particularly with the quarterwave type); and second, a fairly unobstructed area around the base of the antenna, if ground mounted.

Most of us think in terms of quarterwave verticals on HF, but somewhat longer versions can yield a considerable low-angle radiation improvement, important in DX-chasing. One-half (½) and five-eighths (⅝) wavelength designs are very popular, so consider them if you don't mind "building upwards" toward the sky. Bear in mind, however, that while the quarterwave vertical may offer a fairly good match to 50 ohm coax, the use of the longer length versions requires that a base matching network be used.

Fig. 2 shows approximate dimensions for the three verticals discussed above. (For ground mounting, I recommend at least eight ground radials, each a minimum of 0.3 wavelength.

2. Multiband Verticals. Trap multiband verticals have stolen most of the action

here, but it's quite possible to construct your own "cheap and dirty" multibander. One is a close cousin of the paralleled dipole, where dipoles are simply connected in parallel, then fed in common by a single low-impedance transmission line. This can also be done for verticals, where the vertical element for the lowest frequency band is made of aluminum tubing, with the vertical elements for the other bands being constructed of wire and being "stood off" from the tubing using an insulating material. All of the verticals are connected together at the base, and a common set of radials is used. While there is some interaction between the verticals, the ones that are not resonant at the operating frequency will have but a small effect on the feedpoint impedance of the actual "active" element.

Another, even simpler arrangement involves breaking up the length of a top-supported, wire vertical antenna into segments, using egg insulators, at appropriate quarter-wavelength points for the higher bands. Wire pigtails and alligator or crocodile clips may be used to bridge across the insulators at the proper points. Assuming that the antenna is in an accessible location (a must!), a three-segment vertical can handily enable three-band operation—possibly additional bands if odd-harmonic relationships (such as 40/15 meters) are taken advantage of. Food for thought!

Fig. 3 illustrates both of these vertical antenna ideas.

3. The No-Vertical Vertical. In a pinch, even if you don't have a true vertical antenna as such, you may be able to effectively use your horizontal dipole as a vertical. This can often be done by simply tying together the center and braid conductors of the coax, at the transmitter end, and feeding the antenna through an antenna tuner/transmatch as a singlewire. Of course, the antenna should be treated as a random length of wire, and worked against a good ground system.

Results when using the no-vertical vertical are "predictably unpredictable," and the fact that the feedline is now an integral part of the antenna may produce some strange effects. Nevertheless, you may be in for a pleasant surprise. The mixed polarization (horizontal flattop and mostly vertical feedline) effects may give your signal a needed boost over certain paths.

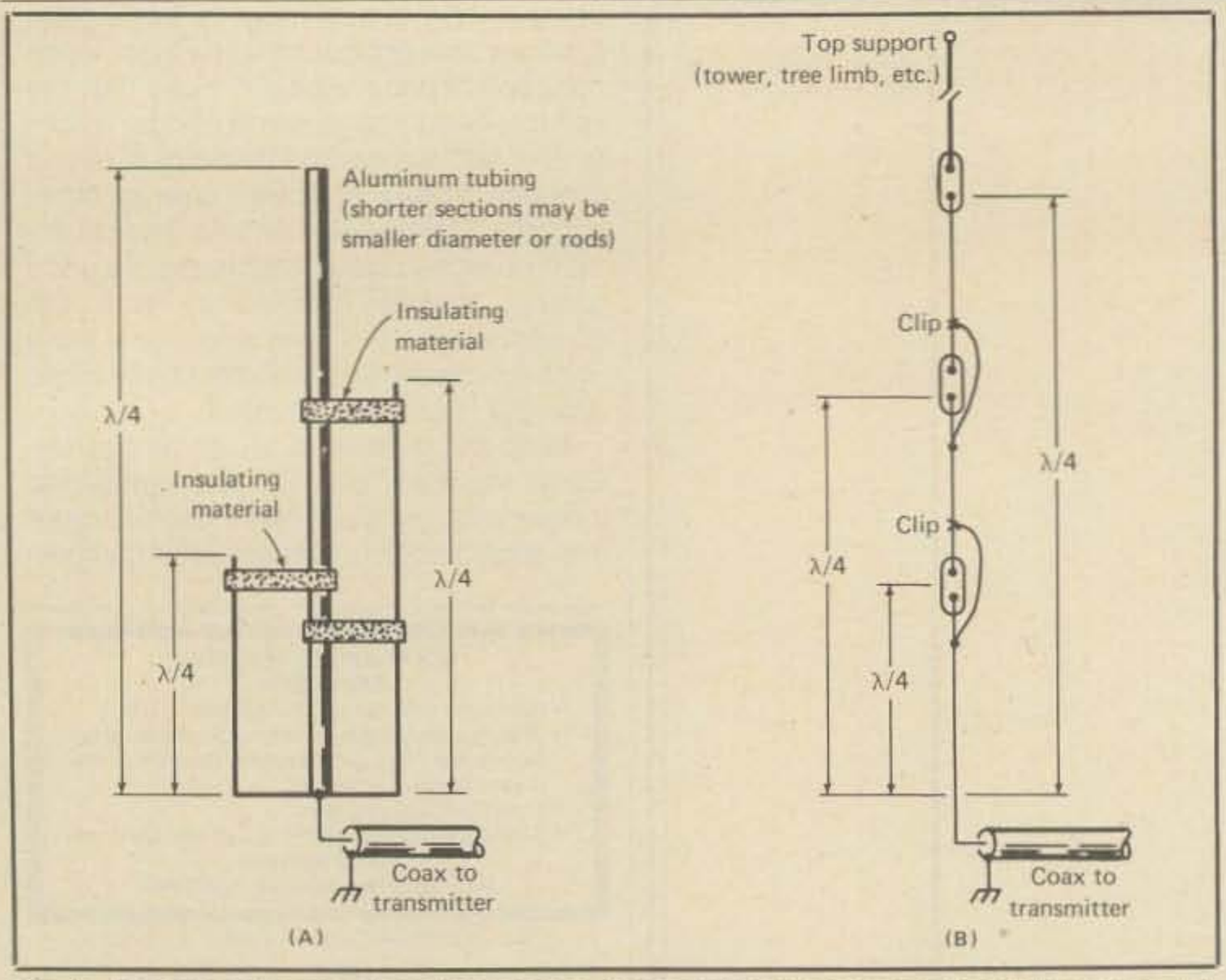


Fig. 2– Two ideas for multiband operation. Shown above are examples of the two multiband vertical antennas described in the text. Shown at (A) is the paralleled vertical, where vertical elements are simply fed in parallel. In (B) a top-supported wire vertical makes use of clips to bridge across the insulators at the proper points. While triband examples are shown, the concept may be expanded to cover more, or even all, of the HF bands, if you're willing to do some experimenting!

AM Returns

While the overall trend in amateur radio is clearly toward hi-tech areas, there is a certain nostalgia extant for the "old modes" of operation. The last 4–5 years have seen no lessening of nostalgic interest, and even a small but steady growth of amateurs using AM on the amateur bands. Some scratch-built equipment is seen, but most of the equipment is 1950s vintage stuff that's being dragged out of the closet and restored. Still other operators are discovering the AM capability built into some of the "all mode" transceivers imported into the country.

The AM Press Exchange is right up your alley if you're an AMer. The monthly magazine looks at ham radio from the AM perspective, and is distributed to AM enthusiasts throughout North America. As the name implies, it is also an AM equipment exchange which offers free advertising for those who wish to buy, sell, or trade AM gear, parts for homebrewing, and vintage radio collectibles.

At this point you may wonder if your rig works on AM. If it does, you may wish to check out these frequencies: 160 meters, 1880–1900 kHz; 75 meters, 3860–3890 kHz; 40 meters, 7160 and 7285–7295 kHz; 20 meters, 14286 kHz; 15 meters, 21440 kHz; and 10 meters, 29000–29200 kHz. These frequencies are as tabulated by the *Exchange*.

For more information, contact *The AM Press Exchange*, Route 1, Box 281, Woodlawn, TN 37191.

Reader Input

We've room to share just one reader note this time—a short letter (along with a color photo of his multiple DX Yagis and Delta Loop) from Pierre Petry, HB9AMO. He let us know that he appreciates *CQ* and the Antennas column. Here are some excerpts from Pierre's letter.

"I am a reader of *CQ* and I carefully read your monthly features about antennas each month. Last month I bought a Commodore 64 [*good Lord, they've infested Switzerland, too—ed.*], and have tried to run some programs on it picked up from *CQ* magazine. Congratulations about your work on the magazine, and especially for publishing programs for computers . . . I know it is difficult to make everybody happy but you do a good job in the journal. I hope to work you in the future on the air to talk about computer programs.—73, Pierre, HB9AMO."

Your columnist certainly appreciates the overly kind words from Geneva. Surprisingly, we don't receive a large number of "nastygrams" chiding us for squeezing into the Antennas column items of interest to the ham computerist. Apparently, the range of antenna, computer, and ham radio interests is sufficiently compatible for us to blend these themes in the same column space.

Software Notes

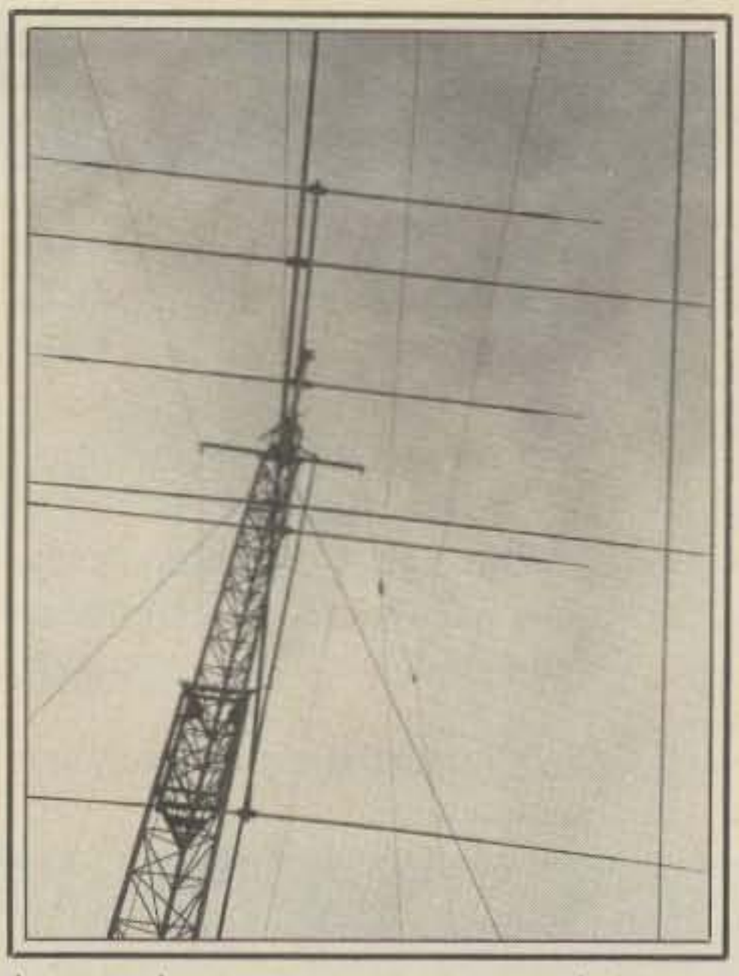
This month we'd like to mention a number of new programs which we have come across. No reviews this month; we'd just like to share some news, ideas, and sources with you.

For the TI-99/4A computer is a line of amateur and technical software distributed by John S. Davis, WB4KOH. Included in John's bag of tricks are several electrical engineering and electronics testing programs, including those for T-network

(tank circuit) design and VHF/UHF propagation. Other programs offered include several business utilities, Morse Code practice, printer aids, and programmer's utilities. Write KOH Software, P.O. Box 18517, Charlotte, NC 28218.

A well-stocked supplier of C-64 programs is RAK Electronics, P.O. Box 1585, Orange Park, FL 32067. Several new programs are offered for the Commodore 64, including a disk-based, 110-Baud ASCII bulletin board system known as "Mailbox 64." In addition, a new C-64 program, "Antenna Reducer," is offered to allow the user to design a reduced size antenna in the frequency range of 0.5 to 15 MHz. After inputting the desired frequency, the user can select an antenna design of from 30 to 100% of full size, in 10% increments. After doing this, he then selects the loading coil diameter of from 1.5 to 3 inches using from 4 to 10 turns per inch. The program then calculates the antenna measurements and graphically displays the end-product design. This latter program is available on either cassette or disk.

RAK also supports the Texas Instruments 99/4A computer. A new contest logging program is available on disk which allows the operator to maintain a computer record of his contest log which provides up to 1000 call entries and sorting for duplicate entries. Formatting is compatible with the format of the ARRL Sweepstakes Contest. A printer routine is included in the package.



Impressive antenna arrays of Pierre, HB9AMO, in Geneva. Easily seen here are a 4-el. monobander for 20 at 60 feet, a 3-el. 10/15 meter Yagi at 70 feet, and also a 30/40/80 meter Delta Loop.

Another Florida-based outfit, the PM-100 Software Group, has produced a set of Morse Code training products: (1) a set of six menu-driven code training programs on disk, for the IBM-PC and workalike computers such as the COMPAQ and CORONA; and (2) a set of three 60-minute audiocassette training tapes. The computer and audiocassette programs feature a training method in which each code segment works with the same set of five characters sent in random order. In this method, one section of the alphabet and numbers is repeated to provide strong reinforcement, rather than to carry the whole alphabet and series of numbers at one time.

The set of computer programs is $19.95, and the same price holds for the audiocassette tape set. For more information on the system, contact the PM-100 Software Group, c/o Clearwater Computer Center, Inc., 3447 U.S. Highway 19 N., Clearwater, FL 33519.

Last year we mentioned the "user supported software" concept of R. F. Tolli, KB4CSA, Route 6, Box 233, Tallahassee, FL 32304. Apparently, the response from the column was almost overwhelming, and he asks that we mention that he is not truly a "software supplier," but rather a disabled but enthusiastic hobbyist with lots of time but few of the green stamps needed to reply to a mailbox full of inquiries. Thus, KB4CSA asks that an SASE be enclosed for obtaining descriptions of the programs which he offers.

This is certainly fair enough under KB4CSA's concept of "user supported software." Under it he has written a number of fairly substantial C-64 and Vic-20 amateur radio and general-purpose utility programs. He makes these programs available for $5.00 apiece to cover his time, and the costs of the medium (disk or tape) and shipping. Some of the programs available from this source include Vic-20 and C-64 Morse Code instructional programs; a contest log mini-database with a dupe-check feature; and a handy disk-handling utility, known as "Libe Filer," which can be used to sort, organize, and print out your disk directories, in order to keep track of your disk collection.

In a refreshing note, KB4CSA advises that all of his programs are written in BASIC and are not copy-protected. In fact, on the intro-screen of each program he encourages the user to pass around the programs to hams and others who might find them useful, remitting back to him, as the author, whatever amount is fair for making the software available in this fashion.

An MSO package for both the Vic-20 and C-64 is offered by Vid-Com Communication, 3131 Foothill Blvd. #H, La Crescenta, CA 91214. Known as the "Vic MSO" or "64 MSO," respectively, either version constitutes a software package that turns the computer into a very capable message handling system. The MSO allows messages to be stored, read, and deleted by external users using RTTY. The text files which are generated may also be written, read, and deleted by the

local keyboard operator in the SYSOP or "system operator" mode. Each text file created is listed in the system's directory by file name, along with the date and time of creation. The MSO also features a direct communication mode, which provides the SYSOP a method to break from the MSO mode in order to directly communicate with a user or any other RTTY station.

The Vid-Com MSO system fully controls the station transmit-receive function with automatic ID, time, date, and time-out features. All popular data codes and rates are supported, and these are user selectable. The program is designed to be used with any TTL terminal unit, and cabling is provided for the popular interfaces. If a disk drive is available, the system will store all messages on disk for later retrieval.

In the past we've mentioned the TI99/4A and Timex-Sinclair software offered by Alabama-based Ken Carpenter, KC4UG. While Ken is still strongly supporting these computers, he's now also into the C-64 and has a comparable line of software for that computer system (hooray, Ken!). Ken's starting off slowly with two C-64 logging programs, one for hams and the other for SWLs. Both are fully menu-driven and, according to Ken, are so "friendly" that reference to a user's manual is not required to enjoy the programs. Ken also has available a utility program package which features a set of world time clocks, MUF forecaster, and special auto-run routine which allows you to cause your programs to automatically run when "booted up."

By my count Ken has at least eight useful ham programs on cassette for the TI99/4A (16K and standard TI BASIC), as well as several programs for the various flavors of Timex-Sinclairs (1000, 1500, 2068, and ZX81). He also distributes a novel "Morse Code Translator" program for use on the TS-1000 and ZX-81 computers. Another set of offerings includes the series of "VIP" RTTY and CW receive/transmit programs and hardware for the various Timex-Sinclairs. For details, contact Kentronics, P.O. Box 586, Vernon, AL 35592.

In the July 1984 column we highlighted the very professionally executed Microcomputer Business Applications (MBA) line of cassette-based general-purpose and contest logging programs for the Commodore 64 and Vic-20 computers. This mention brought us an activity update from MBA's proprietor, Jim Wysocki, W9FI.

"I wanted to thank you for mentioning my software in *Run (a Commodore-specific computer journal published by CW Communications—ed.)* and *CQ* magazines. I have had quite a few inquiries from curious hams about it."

"Because of all of this, two developments have occurred. The first is a price reduction. The Log Book and The Contest Logger are now $19.95 postpaid in the U.S.A., and the Dupe Checker is $9.95 postpaid. The second is that in response to popular demand, I have developed Commodore disk I/O versions of this software. The difference between loading programs, saving and reading data on the diskette vs. a cassette is like the performance difference between a Ferrari and a VW bug. These programs really rip along now . . . by the way, there will be no price difference for cassette or diskette versions of the programs."

". . . Right now, I'm developing software for the IBM-PC, but none of it is ham radio oriented. There doesn't seem to be enough of an installed base of IBM-PCs among hams to create a reasonable demand in the marketplace. Perhaps the continuing price reductions and the availability of used machines will change all of this. Time will tell."

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- Completed 610 form with copy of license
- Indicate preferred sitting time: Sat. 9 a.m., Sat. 1 p.m., Sun. 9 a.m.

Mail registration to: FCC Exams, 203 Bellewood St.
Dayton, OH 45406

All other inquiries write Box 44, Dayton, OH 45401 or phone (513) 433-7720.

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Crumtronics
P.O. Box 6187
Ft. Wayne, IN 46896

C-64/VIC
Hamlog
P.O. Box 308
Englewood, OH 45322

C-64
Bill Giel, KD10
524 Valley Avenue
Yonkers, NY 10703

Apple/C-64
Sonnet Software
4397 Luna Course
Liverpool, NY 13088

Apple
Smith Software Systems
3767 Cold Spring Creamery Road
Doylestown, PA 18901

TS1000/2X81
Thompson Software
P.O. Box 1266
Lombard, IL 60146

C-64
Pop Soft Australia
POB U-1911
6001 Perth
Australia

IBM PC
PM-100 Software Group
c/o Clearwater Computer Center, Inc.
3447 U.S. Highway 19 North
Clearwater, FL 33519

C-64/VIC-20
Vid-Com Communication
3131 Foothill Blvd. #H
La Crescenta, CA 91214

TI99/4A
KOH Software
P.O. Box 18517
Charlotte, NC 28218

Radio Shack Color Computer
dataLOG
P.O. Box 10531
Jacksonville, FL 32247

Various
BVE Engineering
2200 Business Way, Suite 207
Riverside, CA 92501

C-64
R & B Software
P.O. Box 81341
San Diego, CA 92138

C-64
CaGen Software
4821 Rosecroft St.
Virginia Beach, VA 23464

Atari
Bill Potorti
912 Plumas St.
Reno, NV 89509

Radio Shack Color Computer
William Borchers, K1WB
460 Hale St.
Suffield, CT 06078

Table II– Amateur software sources update.

Hopefully, we haven't offended VW-lover readers in the *CQ* audience. Seriously, Jim, more ham software should, in fact, be developed for the IBM-PC and other high-end personal computers, especially now that most of the problems with the PCjr (including a too-high initial price) have been fixed. In the meantime, we would like readers to let us know what they are doing with their IBMs and IBM-compatible machines, Epsons, NCRs, Apples, TI Professionals, and the like.

I'd better mention MBA's address before departing the subject. It's 4045 W. Mercer, Phoenix, AZ 85029.

In Table II we've updated our Software Sources list with several new sources of computer software of interest to the amateur radio enthusiast. This listing updates those found in the October 1983, January 1984, and August 1984 issues. Contact each source listed directly for product information.

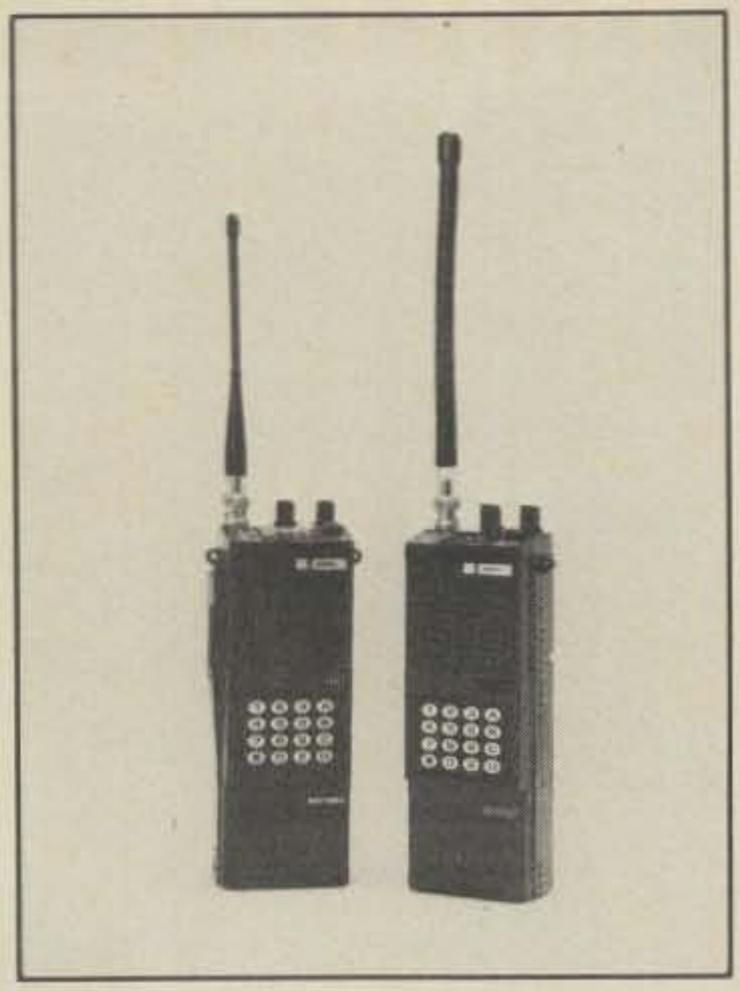
Wrapping It

This month we've opened the notebook with an examination of several popular antennas: the centerfed Zepp, and three popular verticals. We've looked inside the mailbag, too, having lightly scanned several new software offerings and the firms behind them. Next month, we'll continue with more updates to the notebook. See you then. 73, Karl, W8FX

CQ SHOWCASE

Santec ST-200ET and ST-400ET Hand-Held Radios

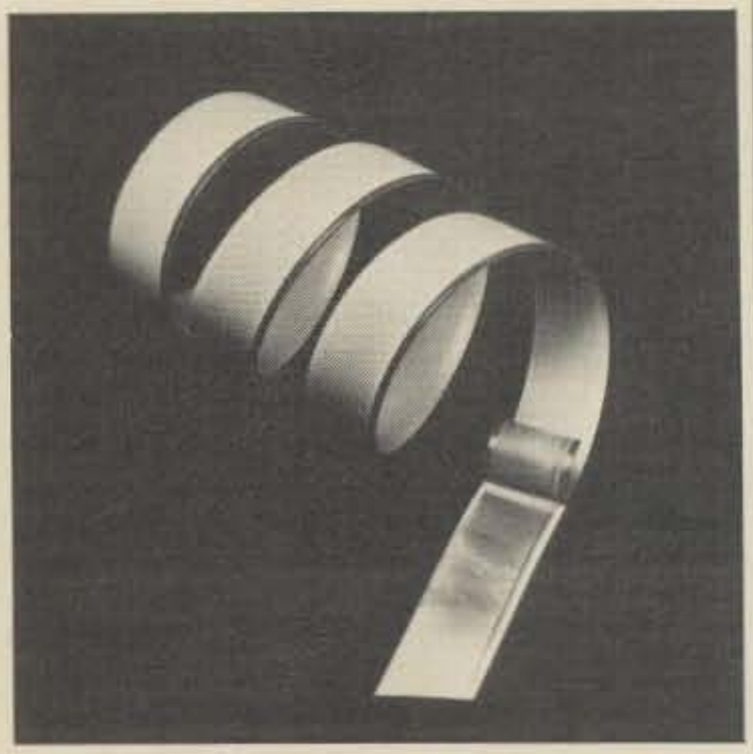
Santec has announced two new hand-held radios, the ST-200ET and the ST-400ET. Both use the familiar thumbwheel switches to change frequency and are accessory compatible with some other brands of HT's. The 2 meter model, ST-200ET, has a suggested retail of $199.95 and the 432 version, ST-400ET, $249.95. Both are backed by Encomm's two-year extended service plan and are serviced by the Encomm service facilities in Plano, Texas.



For more information, contact Encomm, Inc., 2000 Avenue G, Suite 800, Plano, TX 75074, or circle number 101 on the reader service card.

Belden Peelable Ground-Plane Cable

Belden Electronic Wire and Cable has added a peelable cable to its 9GP10XX series of ground-plane cable. The peelable cable eliminates the need for special equipment to separate the mesh from the insulation. This controlled impedance cable aids in reducing crosstalk and is commonly used as an interface cable on personal computers and peripheral equipment. There are six stranded sizes with 20 to 60 conductors per cable. The series will terminate with any standard mass terminable IDC connector. Temperature rating of the cable is 105°C.



Belden peelable ground-plane cable is packaged 100 feet in a box. In quantities of 1,000 feet, a 20 conductor cable would be priced at $97.23 per 100 feet. Other sizes may be manufactured to meet special requirements. For more information, contact Belden Electronic Wire and Cable, 2000 S. Batavia Ave., Geneva, IL 60134, or circle number 102 on the reader service card.

MFJ Electronic Keyer

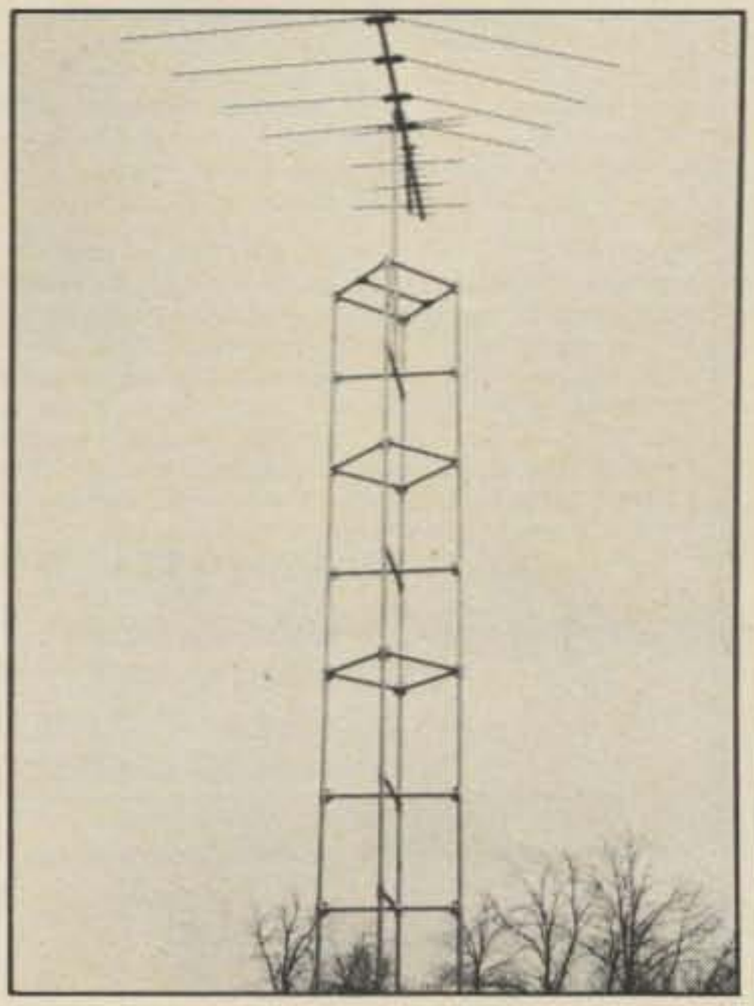
The MFJ-407 electronic keyer sends iambic, automatic, semi-automatic, and manual. Squeeze, single lever, or straight key can be used to send a signal. It features iambic operation with squeeze key, dot-dash insertion, and semi-automatic "bug" operation that provides automatic dots and manual dashes. The keyer also features dot-dash memory, self-completing dots and dashes, jam-proof spacing, and instant start keying. Front-panel controls include linear speed, weight, tone and volume controls, as well as on/off, tune, and semi-automatic switches.

The unit is RF proof, has a built-in speaker, and uses a 9 volt battery or AC adapter. It measures 7"×2"×6" and sells for $69.95 plus $4.00 shipping. For

more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or circle number 105 on the reader service card.

FrameMaker Clamps

FrameMaker clamps can be used with ¾ inch electrical conduit to build a tower. The tools needed are a hacksaw (or tube cutter) to cut the conduit and a couple of wrenches. Conduit sections are placed into the openings of the clamps, and the plated nuts and bolts are tightened, locking the clamp jaws securely around the conduit. Several kinds of FrameMaker clamps are made: 4-way fixed and adjustable, 3-way 'T', 2-way adjustable, and parallel. No locking collars or set screws are needed to prevent slippage. A tower made with FrameMaker clamps can be taken down, and the clamps and conduit can be used to build other projects.



A free project idea brochure is available from the manufacturer. For more information, contact Bullseye Products, 28506 Hayes, Roseville, MI 48066, or circle number 106 on the reader service card.

CaGen Software Contest Log Program

CaGen's universal Contest Log program is designed for the Commodore 64 with disk drive and optional printer. The program is a rapid action, machine language program that eliminates duplicate contest QSO's and prints permanent contest logs and dupe sheets. It allows dupe checks by callsign alone or by callsign, band, and mode. A single disk file will log and check up to 2500 contacts. A fully loaded log of contacts can be dupe checked using call, band, and mode in 2.6 seconds. The Contest Log program will not allow a duplicate contact to be entered. Date, time, band, mode, and QSO number are automatically entered as each contact is made.

The program is priced at $25. For more information, contact CaGen Software, 4821 Rosecroft Street, Virginia Beach, VA 23464, or circle number 103 on the reader service card.

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FOX TANGO FILTERS contain eight specially treated and aged discrete crystals, unlike ceramic or monolithic corner-cutting designs. An implant or transplant with a time-tested FT filter or cascading kit will give your rig *new life.* Our best advertisements are thousands of satisfied users — *check out our claims over the air* — you'll learn that FOX TANGO is **best!** Our filters cost less and are guaranteed longer — ONE YEAR — order with confidence. Why risk disappointment with some unknown or unproven brand?

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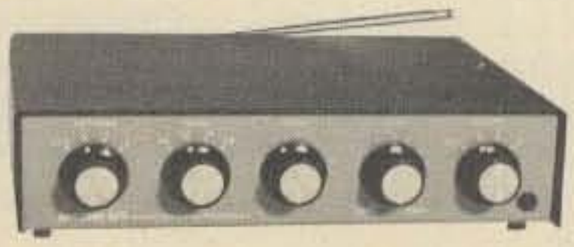

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CIRCLE 58 ON READER SERVICE CARD

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month as told by Jim is:

James A. Whittaker, WBØTVL
All Counties #441, 11-5-83

"I was raised in England, and like most of my contemporaries I left school at age 14. There was no graduation and no diploma, but on my way home from the last day of school I got my first full-time job. For about a 60-hour week I was paid 10 shillings, then worth about $2.00 American.

"Hired as a delivery boy to make deliveries on a bicycle equipped with a large basket over the front wheel, I was also required to clean and polish everything in sight. Particular attention was given to a brass and marble balance scale on which the bulk commodities were weighed against brass weights. Butter came to the store in bulk, and two wooden paddles were used to form it into blocks for wrapping. Orders were packaged in brown paper and tied with string. In those days there were none of the familiar brown paper sacks which are furnished by the stores today.

"At age 17, after several more dead-end jobs, it was off to join the Army. We had brass buttons and badges, tunics that fastened up to the throat, and pipe-stem trousers with cloth wrappings from ankle to knee. For arms we had a 1914 Lee-Enfield rifle and a 16 inch bayonet.

"Housed in two-story stone barracks built in the 1870s, we lived in a world controlled by the bugle, which blew from early morning until light outs. There were calls to wake us up, calls to announce meals, parades, sick call, mail call, lights out, etc., including an officers' mess call at 8 p.m., which brought out the officers in their waist-length scarlet jackets and dark dress slacks. We learned the calls by remembering words which had been irreverently fitted to the tunes over the years. The officers' mess call told us, "An officer's wife gets pudding and pie; a soldier's wife gets skilly." Skilly is a watery porridge, and the words probably reflect the wide difference which once existed between commissioned officers and those of other ranks. Actually, in my day junior officers could not afford to get married on their Army pay even if they could get permission to do so.

"After six months of marching, counter-marching, fixing, and unfixing bayonets, I was able to transfer to the Signal

333 South Lincoln Ave., Mundelein, IL 60060

Jim, WBØTVL, operating W6RO aboard the R.M.S. Queen Mary. *The* R.M.S Mary *is permanently docked at Pier J., Signal Hill, California. The reconstructed wireless room, operated by the Associated Amateurs of Long Beach, is the only continuing public demonstration of amateur radio in the United States.*

Jim, WBØTVL, and XYL, Audrey.

Corps. The Signals taught me to use the flag, lamp, line instruments, heliograph, and in between, something we called wireless. Our leisurely training was suddenly interrupted by the outbreak of WW II. Training completed, I was considered too young to go overseas with the first postings and was sent instead to London, where I helped man radio sets in various locations which were supposed to be used should other means of communications be knocked out. They never were. In mid-1941, after repeated requests for active service, I was finally shipped overseas and did not get back to England until October 1945.

"After one day's leave for each month spent overseas, I was sent back to the London area, where I met my XYL, Audrey, who was soon to take over for all the Sgt. Majors I had known over the years. Audrey, also in the Army, and I were married six weeks after we met, and my Army career ended almost as it had begun. I was selected, if that is the right word, to march in a London Victory Parade and was sent off to march, counter march, and drill for a month in preparation.

Special Honor Roll
All Counties

#489 Buster A. Boatman, Jr., NØCKC, 12-8-84
#490 Don Skaife, W7ULA, 12-17-84

"Postwar conditions were not too encouraging in England. People had expected that peace would bring an end to all the shortages and frustrations of wartime living. Instead, rationing was still necessary, housing was in short supply, and prospects for early improvement were nowhere evident.

"While overseas I had become close friends with a United States Marine, Lloyd Willey, who was living in Vista, California. Lloyd urged me to come to the States and offered to sponsor us. After obtaining the necessary visa, Audrey, our 13-month-old son, Lloyd, and I sailed on the Queen Mary for New York. A three-day train trip took us to Montana and the beautiful Flathead Valley where Lloyd Willey was living at the time. In a few days I was driving a truck and trying to remember that all the traffic I met was not on the wrong side of the road.

"It was while driving a truck that I heard about a school offering night classes to teach people enough telegraphy to take a job as a railroad telegrapher. I was surprised to learn that the Morse Code used on the railroad was quite a bit different from the International Code with which I was familiar. The school was out for money, so they took me on, and a month later the railroad gave me a job as telegrapher.

"The railroad division where I went to work was 500 miles long, and I found I was expected to work at any one of the 70 stations along the line. I was paid travel time to and from each job, but living expenses were on me and times were hard. Audrey was left in Kalispell, Montana to raise our son and a daughter who came along later. Homesick, a long way from home, unable to drive, and with few friends, Audrey had a much more trying time than did I.

"In due time son Lloyd followed friend Lloyd into the United States Marine Corps.

"Times did get better and after transfers to Spokane, Washington and St. Paul, Minnesota I learned that the company sponsored a club radio station. About this time a local high school ran a Novice class, so I decided to try my hand at amateur radio. Cecil Vincent, now WØUM, was the club station manager, and Cecil

was always talking about the County Hunters Nets. The bait, in my case, was a chance to complete WAS by working a Delaware station, but it did not take long for me to be fully hooked. Shortly afterward I was able to make several mobile trips, and with the help of fine net controls such as Karl, WA6MAR, and Bud, N7SU, I soon got the hang of things.

"At first I tried taping all my contacts and transcribing them at night in the motel rooms. The trouble was that I kept forgetting to turn off the recorder, and it took all night to write up my log. Fortunately for me, Audrey, probably in self defense, began to take an interest in the proceedings. She now does all the logging on mobile trips and even checks the cards when they come from the Bureau.

"Our first County Hunters' convention was in St. Louis. There and at subsequent conventions and mini-conventions we have met many wonderful people, some of whom we are lucky enough to claim as close friends. Since I retired from the railroad, most of our travel has been in connection with County Hunter's conventions and mini-conventions. In 1982 we traveled 7,500 miles, in 1983 we traveled over 10,000 miles, and we traveled lots more in 1984, with the Manchester Mini convention still to go as of this writing.

"A big 'thank you' to all those nice people who help make county hunting so enjoyable and to all those who helped me collect All Counties #441.—73, Jim, WB0TVL."

Awards Issued

Buster Boatman, N0CKC, claimed USA-CA 3000 #520, Mixed, 12-8-84 on his way to All Counties #489.

USA-CA 500 certificates were issued to the following:

Mario Bottino, I1KUE, #1991, 12-4-84, All SSB.

Thomas M. Hannen, KC8YM, #1992, 12-11-84, All SSB.

Norman H. Friedman, NK7B (ex-KA7PAC), #1993, 12-13-84, Mixed.

John M. Kapinos, WDX1AM (SWL), #1994, 12-13-84, Mixed.

Ben B. Hutton, KT1H, #1995, 12-17-84, Mixed.

Frank A. "Bob" Swanlund, W0WYX, #1996, 12-31-84, Mixed.

Allen J. Herbert, N5TV, #1997, 12-31-84, All Amateur Extra Class Stations.

Awards Available

General Rules for the ARI (Associazione Radiotecnica Italiana) Awards. The following general rules apply to all awards issued by the Associazione Radiotecnica Italiana (ARI), and they should be read together with the conditions that govern each certificate.

1. All information requests must be sent to the ARI Awards Manager, c/o ARI, Via D. Scarlatti 31, 20124 Milano, Italy, and must be accompanied by one IRC.

2. ARI awards will be issued to any amateur who will submit to the Manager:

a. A letter dated and signed, with name, address, and call of the applicant. The applicant must certify that all administrative rules in his own country have been respected in the true spirit of amateur radio in effecting the QSO's upon which the application is based.

b. The complete list of QSL's, with call sign, date, frequency, reports, time, and type of emission (CW, AM, SSB, RTTY).

c. QSL cards for checking.

d. 10 IRC's or $3 US for foreign applicants. The "Guglielmo Marconi Award" is free (only mail fee).

e. QSL cards must be submitted without corrections, erasures, or additions, and must be clearly legible. If the type of transmission is not shown, two figures (RS) count as phone (AM, not SSB) and three (RST) as CW.

3. To get an award in a specific class, the cards must show the corresponding data in a clear manner.

4. In application of the decisions of Region I of the IARU, all foreign applicants may send a check list of the cards (without QSL's) duly certified by a member of the headquarters of their national amateur radio society. The ARI Manager reserves the right to check, on request, one or more QSL's.

5. ARI headquarter decisions are final.

6. Any card falsification will result in disqualification.

7. Send the applications to the following address: ARI Award Manager, c/o ARI, Via D. Scarlatti 31, 20124 Milano, Italy.

For Italian Applicants Only

Solo per gli OM italiani: Onde evitare l'invio delle QSL bastera far avere una lista dettagliata delle stesse debitamente vistata da un Presidente o Segretartio di Sezione, o Gruppo, ARI. Il costo dei diplomi e di 300 lire (anche in francobolli) oppure 5 IRC. Il CdM/VHF costa 10 IRC. Il Diploma Guglielmo Marconi e gratis (solo spese postil). N.B. Questa procedura riguarda solo 1 diploma rilasciati dall'A.R.I.

Certificato Del Mediterraneo (CDM).

Certificato Del Mediterraneo (CDM)—an ARI award. The CDM is issued to those amateurs who can show confirmation of a two-way contact after June 1st 1952 with: (A) A fixed amateur station in at least 22 countries of the list (please notice that

Certificato Del Mediterraneo—SWL.

peninsular Italy is *not* included in the list); (B) At least 30 amateur stations of peninsular Italy (total of 52 QSL's).

The same station may be worked once only. The CDM is issued in two classes: Phone and CW (AM, SSB, CW, RTTY); and Phone only (AM, SSB). The minimum reports considered are RST 338 and RS 33.

List of Countries: Spain, Balearic Islands, Spanish Morocco, French Morocco, France, Algeria, Corsica, Trieste (before Dec. 31, 1957), Sardinia, Sicily, Lebanon, Egypt, Greece, Dodecanese Islands, Crete, Turkey, Syria, Yugoslavia, Albania, Malta, Gibralter, Cyprus, Monaco, Tunisia, Israel, Libya. (See General Rules for ARI Awards.)

Worked All Italian Provinces Award.

Worked All Italian Provinces (WAIP)—an ARI award. The WAIP is issued to those amateurs who can show confirmation of a two-way contact after January 1st 1949 with: (A) A fixed amateur station in at least 60 provinces of the Italian Republic, for foreign amateurs; (B) A fixed amateur station in at least 75 provinces of the Italian Republic, for Italian amateurs.

The same station may be worked twice or more, if in different provinces. The minimum reports considered are RST 338 and RS 33.

List of Italian Provinces: Agrigento, Alessandria, Ancona, Aosta, Arezzo, Ascoli Piceno, Asti, Avellino, Bari, Belluno, Benevento, Bergamo, Bologna, Bolzano, Brescia, Brindisi, Cagliari, Caltanissetta, Campobasso, Caserta, Catania, Catanzaro, Chieti, Como, Cosenza, Cremona, Cuneo, Enna, Ferrara, Firenze, Foggia, Foril, Frosinone, Genova, Gorizia, Grosseto, Imperia, Isernia, L'Aquila, La Spezia, Latina, Lecce, Livorno, Lucca, Marcerata, Mantova, Massa, Matera, Messina, Milano, Modena, Napoli, Novara, and Nuoro.

Italian Islands Award.

Italian Islands Award (IIA)—an ARI award. Work Italian islands: IA1 Liguri Group, IA5 Tuscan Arch., IB0 Ponziano Arch., IC8 Napoli Arch., ID9 Eolie Arch., IF9 Ustica, IF9 Egadi Arch., IG9 Pelagie Arch. (AF 33), IH9 Pantelleria (AF 33), II7 Cheradi Arch., IL7 Tremiti Arch., IM0 Maddalena Arch., and the Sardinian Islands—IS0 Sardinia, IT9 Sicily.

Points required are as follows: DX 10 points, EU 20, I 40. Modes: SSB, CW, RTTY, Mixed. In general each island counts 1 point, but some of them count 2, 3, 4, or 5 points. Send 1 IRC to ARI for information. Start: January 1, 1970. Different QSO with the same island will be considered only if different mode or band is used. Each island counts 1 or more points, although in the same Archipelago. Honor Roll: 60 points. Cost for this award is $8.00 US or 30 IRC's. (See general rules for ARI awards.)

Notes

Thanks to Angel, EA1QF, for so much fine information on EU awards. Angel is the Contest and Awards correspondent for *CQ Radio Amateur*, the Spanish-language *CQ*, which is published in Barcelona.

A Reminder: After April 1, 1985 double logging, or the so-called "team contacts," will not be acceptable for purposes of the USA-CA Awards.

I hope all is well where you are.

73, Dorothy, WB9RCY

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

Bouvet, Bouvet will come some day
And DXers all will brightly say:
"Let's CQs ring from my beam on high,
And please, 3Y, please hear my cry.

It is spring and April is again everywhere. It is a time of hope and promise, we were thinking, until one of the Locals came trudging up around the curve of the hill. "Isn't this about the most miserable time you've ever seen?" he demanded. Immediately we started sliding from the clouds that glowed with promise towards the depths of despair and confusion. "Miserable?" we had to question.

"It's this sunspot cycle," the Local was quick to advise us. "When I first got started a couple of years back, I didn't realize that I had come on to the DX action during the so-called good times. I really thought that 10 meters would be open forever, because that was just the way things always were. Then I found out that amateur radio is a cyclical thing and that a lot of bad years are coming. Why didn't someone tell me about these things?"

There are always some things that we take for granted such as the sun always rising over the ridge to the east, the August full moon turning the bay to a sheet of silver, the winds out of the south just before a winter storm, the tardy information that a needed one was on last week calling CQ and no one answered his pleas. And always the sunspots go up and the sunspots go down, and so do band conditions.

"But that's the way it has always been," we protested. It was not enough.

"Look," this Local told us, "when I first showed up at the club meetings all I heard was how good things were, how easy it was to work DX, and how things could only get better. I even heard them talking about Hawaii on 2 meters from southern California. Everyone was working everything. Someone even pointed out how 5-Band WAZ was being done in a couple of years. No one ever told me that just when I got organized I would find everything headed for the pits. Even though I did just manage to get DXCC last year, I doubt if I will ever work enough zones to get even the basic WAZ. Why didn't someone tell me all of this? No wonder the number of licensed amateurs is headed down. They are finding out about the sunspot cycle!"

77 Coleman Dr., San Rafael, CA 94901

Last year the Sheboygan County DX Association held a dinner in honor of Father Moran, 9N1MM. From left to right are Greg Schultz, KV9V, club president; Father Moran; Chris Bauer, W9RF, vice president; and Mike Filipiak, KO9Q, secretary/treasurer. Father Moran was presented with a plaque for his outstanding contribution to amateur radio and worldwide DX.

Son of a gun! Here it had been a nice morning in April, and then this one had shown up with his cloud of miseries. We were aware that the FCC license total had plateaued and that some organizations were seeing a decline in membership. But this has happened before and in other places as well. In 1965 the number of licensees had been about 260K, and now it is over 400K, but has hardly increased at all during the 1980s. If one bases his enjoyment of DXing on cold statistics, however, one is in some real trouble. Check the number of new countries worked by those with the 300 DXCC country sticker and you will really have something to worry about. But we could not let our evangelical spirit be squelched. "Statistics don't mean a thing," we protested, "and why don't you just tell us what's bothering you?"

"It's the sunspot cycle," the Local said. "Tell me how I am going to work DX when everything is down. Some DXers have been telling me rather bluntly that a smart DXer knows how to identify the good days and avoid wasting time when the bands are dead. Tell me how you can do this, can't you?"

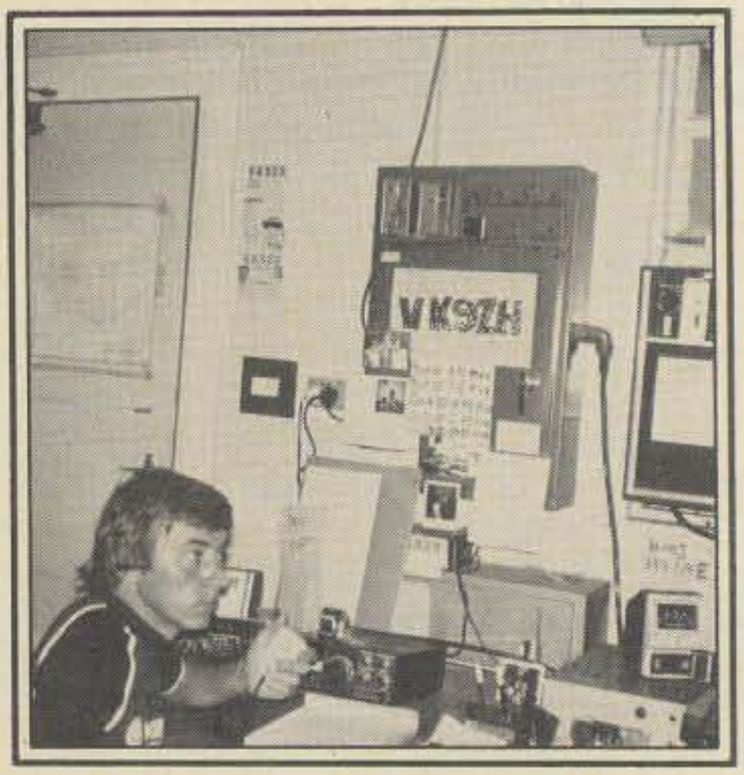
Of course we could! Most DXers eventually learn that being a good listener is almost as good as a backyard of hundred foot towers crowned by stacked monobanders—almost. But it has not been long since we were listening to Dave Palmer, W6PHF, talk as he tuned for WWV at 18 minutes after the hour. Dave was checking the propagation and telling what his game plan was at the bottom of the cycle.

"I did a lot of checking through my logs during the last couple of months," Dave said, "and I couldn't find any time when I worked skip and the Alpha index was above ten. So I listen to WWV, and if the Alpha index is below ten and the K-index two or lower, I figure I'll be able to work some DX. When the figures go up, the DX goes out. That's when I look for something besides DX to do."

We explained all of this to the Local who was hardly impressed. "What's so new about that?" he demanded. "I can remember reading all of that in the handbook. It's all there!"

We were ready to admit that it was. "But are you using the information?" we asked. Reluctantly the Local had to admit that recently it had slipped his mind completely. "When the bands were good and 10 meters was open all night long, who needed all that WWV stuff?" was his explanation. His was not the first example of one ignoring such vital information in a totally insensitive manner. When the bands are blooming, many just want to enjoy the sweet smell of DX. But when the cycle fades and the good times are a slipping memory, it is then that the worry comes.

"Are the good times gone forever?" they ask. The legend of the Maunder Minimum is heard again and the 70-year period without sunspots is ominously noted.



Here is a photo of a DXer whom we consider one of the top operators in the world —Franz Langner, DJ9ZB. The photo was taken when he was operating on the recent VK9ZH Mellish Reef effort. Listen carefully and you may catch him from Clipperton this month. Don't let the youthful appearance deceive you; Franz is one of the few in the DX Hall of Fame.

The WPX Program

Mixed

1142 ..... KX7J

S.S.B.

1701 ..... JE7FSB 1702 ..... LU8DPM

C.W.

2307 ..... K5MC

Endorsements

Mixed: 450 W9JBR. 500 W9JBR. 550 JA4BAP, I2EAY, W9JBR. 600 W9JBR. 650 W9JBR. 800 K7CU. 850 K7CU. 950 K2POF. 1050 K2QF. 1100 K2QF. 1150 K2QF. 1300 N6JM. 1500 IN3ANE.

S.S.B.: 500 KU9C. 550 K2POF. 600 K7CU. 650 K3IXD. 700 K3IXD. 900 WAØDCQ. 1200 W2CC. 1750 WØYDB. 2050 K2POA.

C.W.: 350 JA2KVD, G3VQO, KY9P. 400 JA2KVD. 450 I2EAY. 500 KA8EBG. 550 DL1HBT. 600 W9PWM, KA7AIG, KZ9Q. 850 AG5C, K2QF. 900 K2QF. 950 IT9VDQ. 1550 VE7CNE.

VPX: 750 OE1-0140. 800 JA1-23967.

10 meters: SM5DAC, KX1A, K3IXD.
15 meters: W9PWM, KX1A, K3IXD.
20 meters: KX1A.
40 meters: K8LJG, K7CU.
160 meters: DK5AD, CP8HD.

Asia: OK3CFF.
So. America: VO1AW.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

That and other horrors from the Middle Ages are whispered again in the dark of night, and even if you cautiously note that what goes up comes down—and what goes down comes back up again—eventually, it is not enough. But this was not what the Local was ready to hear.

"If all of this is true," he came right back at us, "how come in the astronomy magazine I was reading down at the library it says Dr. Koeckelenbergh over in the Sunspot Index Center in Brussels is listing a lot of days with zero sunspots. And there are a lot of such days, not just one or two. What about that?"

It did seem that we were again back trying to explain something in which we had long firmly believed. We were not yet ready to acknowledge that our faith might be a peculiar thing found only in ourselves. We were right back trying something else.

"Back in the last cycle," we said, renewing the effort, "when many said that DXing as we had known it might never be seen again, there was one group that refused to accept the words of the prophets of gloom. They said that they believed and that they would work to bring back the sunspots to the Deserving DXers. They would do it with their innovative and interpretive dance routines. They would evoke the spirit of DX. They would raise again the sunspot count!

"They called themselves the Palos Verdes Sundancers," we continued, "and they were positive in believing that they would bring back the good days of DX with their dance routines, their *arabesques*, their *attitude allongee*, their *fouette en tournant*, and even their *grand jete*, to name a few. Some even said that they would try the *cabriole* if is was needed to bring back 10 meters. Certainly you have heard about the Palos Verdes Sundancers. Yes?"

The Local was staring at us. His look of disbelief was a bit hard to bear. "You expect me to believe that?" he demanded, looking hard at us. "You expect me to believe that because of this the bands came back? You have to be kidding!"

We tried hard not to let the Local know how much he was hurting us with his skepticism. All one has to do is check through the amateur magazines from the early 1970s when Cycle 20 was skidding downhill, and you will learn, possibly to your surprise, that many were most staunch in predicting that DXing as we had known it might be gone forever, that an era was closing to become an elusive and fading dream, remembered only by some old codgers who would be found sitting around and trying to outdo each other in telling tales of what they had worked when 10 meters was alive. That was freely predicted, and if you wish, you can find it in the old magazine files. But we still had this disbelieving Local on our hands and he wanted answers.

"Look," we said, "when the cycle is headed down, there will be some good days mixed in with a lot of bad days. If you try to worry about it, you'll probably go nuts. Just listen to WWV and get the Alpha index number. The lower the better. When it is low and the K-index is two or lower, you'll probably find skip conditions and some DX. When the Alpha is high—and though it can go well over a hundred, just think that anything over ten is high—you can expect poor band conditions and forget DXing. The band conditions will not be favorable."

We were beginning to think that perhaps we had steered this Local around to some right thinking. "You know something," he said, "it's been a couple of years since I read all that WWV stuff in the handbook. Actually, in the last couple of years it didn't mean much with the way band conditions were. But maybe I'd better check out things again." We thought that we had pulled ahead a bit, but the Local was back with another question.

"I think I can understand that for daily conditions I should always check WWV," he told us, "but how about those Sundancers? You were just kidding me, weren't you?"

He was not the first to be cautious in believing, and while many will not question the effect of solar activity on propagation conditions, they have a hard time believing that the Palos Verdes Sundancers were effective with their dance routines. We leaned close to the Local, our voices low, the tone conspiratorial. "You know about that big DXer in southern California who has the big open house at his antenna farm every June?" we asked,

Maurice Cote, K1HDO, relaxes with the 5A1TK QSL that took 15 years to corner. A line-by-line scanning of the 'G's' listed in the DX Callbook and letters of query to anyone with the last name of his contact brought results. QSLing can be easy if you have the right route.

and the Local nodded his head. "I have always intended to make one of those gatherings," he told us. We pressed on.

"And of course you know that the QTH of this Big Gun DXer is south of the Los Angeles airport atop the Palos Verdes Hills, don't you?" The Local's eyes were blank with surprise and astonishment.

"You mean . . .?" he asked. Of course!" we replied. Heck! We thought that everyone knew it by now.

It wasn't long before the Local was on his way. "I think I have to pack and get ready for the Fresno International DX meeting," he told us, and we understood. Every true-blue DXer is looking to head for Fresno to meet all the other true-blue DXers when April is close at hand. But we also suspected that the Local would tarry long enough to check the WWV section in the handbook to update his thinking.

As for the *cabriole* and *fouette en tournant*, if it worked last time, why shouldn't it work now? But gracefully! Always do it gracefully!

Persistence

The search for a needed but long overdue QSL can be a cold and often hopeless task. But, as it does sometime happen, the tracer of lost QSLs finds the lost one. K1HDO did it with a QSL for a contact with 5A1TK back in 1969. How did he do it? It wasn't easy.

Maurice Cote, K1HDO, worked Dave Keeler at 5A1TK in May 1969. Back then he did not get a QSL, and you know how things have gone with 5As in recent years. Pushing the 300 DXCC mark, the longer he thought about it, the more desperate he became. Finally he started looking very hard.

There were indications that 5A1TK might have been out of the United Kingdom, but a query to the RSGB did not turn up anything. Then K1HDO took the foreign callbook, checked all the G, GI, GM, and GW's, anything with a 'G' at the front of the suffix, and came up with three G-licensees named Keeler. A letter to the whole bunch brought results, and one was the long sought 5A1TK. Son of a gun!

Anyhow, somewhere along the line here you will see Moe holding up the elusive QSL.

The WAZ Program

10 Meter Phone

293 ..... KM6B 294 ..... K2VV

15 Meter Phone

210 ..... JI1QPU 211 ..... JM1MGP

20 Meter Phone

520 ..... OE5BGL

40 Meter Phone

29 ..... DF9ZP 30 ..... DF7NM

80 Meter CW

4 ..... W3AP

All Band WAZ

S.S.B.

2922 ..... SM0GKF 2925 ..... KC7GO
2923 ..... W1RBU 2926 ..... DF2OZ
2924 ..... VY1CC

C.W. and Phone

5842 ..... OK1ZP 5844 ..... F6BLP
5843 ..... YU2WV 5845 ..... KM1R

All Phone (SSB and AM)

588 ..... W6QWJ

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (37 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

All this underlines what has been said before: DXer need endurance, and lots of it!

Bouvet

The eternal hope that Bouvet will show for the Deserving will probably have to be carried forward to the next summer down that way, or early 1986. A recent note from Einar Enderud, LA1EE, and Harald Hoel, LA5UF, in downtown Oslo, says that while a lot of the planning fell into place, the search for transportation fell a bit short. None of the Norwegian Antarctic Service vessels were scheduled to stop or be near Bouvet this year, and other transportation just is not plentiful. With Bouvet it looks like it will be another year before you can start cranking up your hopes again.

Some South African types are also thinking Bouvet. ZS6BK in some reports has been mentioned as angling for transportation aboard the South African vessels out servicing the weather equipment on the sub-Antarctic islands in the south Atlantic. Some say he would even go for being dropped off on Bouvet and picked up on the return trip. If nothing else, there is a lot of study being given to putting Bouvet on the air. Eventually something will come. It usually does, but it is the waiting that irks.

Clipperton

Something may show from Clipperton this spring. It may be heard in the first half of April. This was the target area being mentioned a couple of months back when this was written. It may be the time to watch, especially if you need this rare one. The last effort was in the spring of 1978, and a lot of Deserving DXers have come along since then.

Last year the group planning action had everything lined up but ran into problems with transportation. They were so determined to go that they even went to Mexico to be ready to depart on short notice should a vessel be found. Everything that looked promising just did not prove out, and the effort was eventually and reluctantly postponed. The early planning was looking for some activity around the third or fourth of the month. The last time out permission had to come through the authorities at Papeete, but now it has come directly from France, the change having been made in the last year. The *Royal Polaris* was being mentioned as the vehicle lined up for transportation. W6SZN, W6OAT, W6RGG, N6GJ, KK6X, N7NG, K3NA, WA7NIN, F6GXB, F9LX, DJ9ZB, TI2CF, XE1ZZA, JG3LZG, FO8HL, and FO8GW are the possible operators. The group is reporting as having departed Mexico on March 30th, and they hope to open up about April 3rd.

Cyprus

The question of country status for the British military bases in Cyprus was due to be decided in late January at the ARRL Board meeting. Early January it looked as though the whole thing was going to slide through.

It was reported that the ARRL DXAC recommended almost unanimously for country status, the Awards Committee being the next step after the DXAC and the Board's blessing being expected for the final approval.

It seems probable that QSLs going back to the signing of the treaty for the British bases in 1960 will count for DXCC. There has been some speculation that to keep things simple cards would not be accepted until after the recent Honor Roll deadline at the end of March. If you are panting with a valid QSL already in your hand, check the late postings.

Space Shuttle

The *Westlink Report* in January had an extensive report on the possibilities of another amateur operating from a space shuttle during 1985. They covered a wide area in the article, going directly to the amateurs involved in the shuttle program and to NASA spokemen for information.

Early in the year there were two Spacelab missions planned with amateurs scheduled for each one. Possible operators include Dr. Owen Garriott, W5LFL, who was the first amateur to operate from the shuttle; Dr. Tony England, W0ORE; and John Bartoe, W4NYZ. The gear will be a hand-held 2 meter transceiver if W5LFL goes, the same gear used last time out. If either England or Bartoe goes, a battery-powered hand-held 2 meter transceiver will also be used, but with the squelch modified. With W5LFL it worked too well and hampered the receiving of signals, the squelch working automatically and not controlled by Dr. Garriott.

It is also possible that in some missions an external antenna will be available rather than the window-mounted antenna used in the first effort.

There is another change planned, this on the 2 meter uplink and the 10 meter FM downlink. This is complicated, too much to try to include here, and there will be extensive information available prior to the mission. There will, however, be provisions for slow scan ATV for logging and other purposes.

There was no date set early this year for these missions, though by the time you read this something may be a bit more solid. *Westlink* does keep close watch on these matters and has some good sources of information available. If you are waiting for more action from amateurs in space, it may not be a long wait. Keeping an eye on *Westlink Reports* will have you ready.

4U1VIC

This proposed new country, the UN International Center/4U1VIC, was due again to come before the ARRL Board of Directors in late January. The second time around comes after a restudy was requested, the DXAC looking unfavorably on the idea the first time around. Headquarters staff prepared a briefing paper on the matter and distributed it to the DXAC members to help them get their thinking aligned. You might have already heard it on the air or even worked the station in Vienna, 4U1VIC often jumping in on some of the DX tests.

Some Various DX Notes

Back in the last *CQ* WW DX Test, the 3A Contest Group made 3165 QSOs when operating GJ0AAA from Jersey. The operators were G3SXW, G3TXF, and G3WVG. QSLs go to G3TXF.

KB6HHE is Merja Ikalainen, the XYL of OH2XB, who is currently in the Santa Barbara area doing some work. Merja got interested

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5 Band WAZ

Standings as of January 1, 1985

All 200 zones worked:

1. ON4UN	30. N4WJ	59. OK1MP
2. K4MQG	31. G3MCS	60. W1NW
3. SM4CAN	32. SM5AQD	61. OE1ZJ
4. AA6AA	33. W0MLY	62. HB9AHL
5. W8AH	34. I0RIZ	63. HB9AMO
6. W6KUT	35. ON5NT	64. LA6OT
7. EA8AK	36. OH6JW	65. UR2QD
8. LA7JO	37. OK1AWZ	66. UK2RDX
9. EA3SF	38. IV3PRK	67. ZS5LB
10. OH1XX	39. DJ6RX	68. F6DZU
11. EA8OZ	40. OH3YI	69. DL4YAH
12. W0SD	41. I4RYC	70. LA7ZO
13. K0ZZ	42. ZL1BIL	71. W9ZR
14. ON6OS	43. I4EAT	72. W1NG
15. OK3TCA	44. ZL1BQD	73. VK9NS
16. K6SSS	45. TG9NX	74. N4KG
17. ZL3GQ	46. XE1J	75. YU7DX
18. OK3CGP	47. F5VU	76. DL8MAG
19. SM0AJU	48. W3AP	77. OK3DG
20. OZ3PZ	49. YO3AC	78. ZL1BOQ
21. I3MAU	50. K3TW	79. EA9IE
22. I2ZGC	51. XE1OX	80. DL7HZ
23. 4Z4DX	52. VE7IG	81. DJ9RQ
24. N4KE	53. OK1ADM	82. EA5SP
25. K5UR	54. CT1FL	83. EA2IA
26. K9AJ	55. WA1AER	84. SP3BQD
27. SM3EVR	56. N4RR	85. LZ1NG
28. LA5YJ	57. UW0MF	86. N4JF
29. DL3RK	58. W4DR	

The top 12 contenders for 5 Band WAZ:

1. DK5AD, 199	7. LA9GV, 198
2. JA3EMU, 199	8. W6GO, 198
3. N4WW, 199	9. K4CEB, 198
4. EA8XS, 199	10. OK1MG, 198
5. K9YRA, 199	11. W2YY, 198
6. W8VUZ, 198	12. SM5AKT, 198

296 Stations have attained the 150 zone level

CQ DX Awards Program

S.S.B.

1386	WF4G	1388	G4HRV
1387	W3SOH		

C.W.

624	DJ3SU	626	JG1RYQ
625	G3RDU		

S.S.B. Endorsements

310	DJ9ZB/314	300	W8PCA/306
310	W0SFU/313	300	YU2TW/301
310	K9LKA/313	300	I8KCI/300
300	WA4JTI/308	200	KR9F/201
300	9H4G/307		

C.W. Endorsements

275	YU2TW/288	28 MHz	JG1RYQ
150	KR9F/158	QRPp	ON4QX

Total number of active countries is 315. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

after arriving in California and attended some local classes to get her American license.

Rich Smith, N6KT, who has put PJ2FR on the air during the last three *CQ* WW Phone Tests, has found cards waiting for him in Curacao every time he returns for another effort. Rich notes that while many may think the Netherland Antilles rather common DX, he is constantly surprised to find the queries that come every time he operates. If you worked Rich during the 1983/1984 *CQ* WW Phone or the 1983 *CQ* WPX Tests, send your card directly to him at 3281 Loma Alta Drive, Santa Clara, CA 95051 (SASE or IRC/SAE).

With things changing in Cyprus, Glynn B. Burhouse, ZC4CZ, who is with the 9th Signal Regiment in Cyprus, points to G4MGQ/G8MWS as his QSL Manager. ZC4CZ promises 100% QSLing if you go that route. Glynn notes that he currently is mainly working CW but expects to be on the air with RTTY before long. If you are looking for him, his address is Glynn B. Burhouse, ZC4CA, CWAO, 9th Signal Regiment, BFPO 58, London. Actually, the note with this information came via a roundabout way, but should still be valid.

John Thompson, W1BIH, was on for the ARRL Phone Test not too long ago and says that cards for W1BIH/PJ2 or for P42J go to W1KDD, Marvin Nettleton, 122 Apter Drive, Torrington, CT 06790. This is a new address and is also good for any of W1BIH's PJ2 operations in 1982, 1983, and 1984, having the logs on hand.

Steve Szecsi, HA9PP, has a problem. He is the QSL Manager for HG9R and HA9KOB, but his call is not shown in the callbooks. Steve is ex-HA5PA and his current address is Istvan Szecsi, H-3501 Miskolc, P.O. Box 129, Hungary. HA9KOB appears to be a club station, and all this action is in the Budapest area.

There are some new operators, including a YL, on MacQuarrie. The calls being heard are VK0GC, Graeme who QSLs via VK9NS; VK0YL, Denise, who goes via VK3AH; VK0CK, who QSLs via VK5LP; and VK0AH, Dave, who QSLs to VK2DEJ. There may be heard some other routes for VK0AK, but VK2DEJ, John Saunders, 8 Toni Crescent, Ryde, NSW 2112, Australia, says that he is the QSL Manager for VK0AK.

Chuck Jones, currently active in Morocco signing CN8ES, notes that the only way to get a CN8ES QSL is to go via WA3NCP (SASE or IRC/SAE). Chuck has operated from a number of DX stops over the years—9L1CA from 1977–1980, and prior to that 6W8FP or 6W8A from 1974 to 1977. WA3NCP has the logs for these operations, and should you still thirst for one of these QSLs, you now have the route to QSL fulfillment.

In the Western Washington DX Club's *Totem Tabloid,* Ken Kinyon, W7TS, has been working on some computer programs for predicting the grayline propagation. Ken is interested in hearing from others working on such programs, as well as comments or examples of practical use. The MINIMUF article on such programs and the prediction of MUF is part of the calculations. If you wonder about such things or are working on them yourself, drop a line to Ken (include an SASE for information that he has prepared).

Ray Myers, W6MLZ, passed away last December just after returning home from a meeting of the Old-Old Timers group. Long active in amateur circles in southern California, W6MLZ wrote a ham column for the *Herald-Examiner* in the 1950s, was with Sir Hubert Wilkins in his North Pole expedition in the

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00, with no fees required for up-dates.

MIXED

3086	YU7DX	1730	YU7BPQ	1250	N4NX	1070	YU2CQ	853	AI8S
2715	F9RM	1726	YU1DZ	1240	N6AW	1018	G4FAM	837	VE2FOU
2680	YU1HA	1707	N2AC	1231	N6JM	1017	K2QF	829	VE5ADA
2488	YU2DX	1699	SM7TV	1226	W7CB	1008	WD9IIC	828	K2POF
2398	K6JG	1689	I2PHN	1219	YU7KV	1003	N3ED	827	PY1DFF
2382	W2NC	1677	I8YRK	1207	NN4Q	999	W6OUL	824	VE2PD
2305	K2VV	1660	YU7AW	1200	KL7AF	999	KS7T	801	YU1OHF
2277	K6XP	1648	W8CNL	1194	JH1VRQ	999	G3ZRH	754	IØAOF
2237	VE3GCO	1603	I6SF	1187	EA9IE	994	YU2CBK	745	KX1A
2109	N4MM	1577	K9BG	1174	W8RSW	992	W8ILC	742	JH8NYK
2082	W9DWQ	1517	WØSFU	1164	CT1LN	982	N4IB	741	DF6EX
2065	W4BQY	1501	KF2O	1163	WA8YTM	971	N8BJQ	707	OE1KJW
1951	YU7BCD	1491	WA1JMP	1150	N5TV	955	N3RL	701	K8HF
1875	N4UU	1467	K6ZDL	1146	YU7AJD	933	N2AIF	698	NE6I
1855	N6JV	1464	EA2IA	1140	I2MQP	922	W6YMH	662	K9LJN
1840	N9AF	1444	IN3ANE	1131	W1NG	913	AI6Z	657	ND6U
1838	N4NO	1401	K6DT	1126	YU4YA	910	YU1SZ	630	WI4K
1815	PAØSNG	1338	SM6DHU	1125	LA7JO	905	WØJIE	622	KN1I
1810	K5UR	1311	W9NUF	1116	WB8ZRL	860	WD4RAF	619	JA6GWU
1790	YU2TW	1291	K8LJG	1095	KA3A	858	K7CU	600	N3KR
1748	N6CW								

S.S.B.

2632	F9RM	1533	K5UR	1112	W2NC	932	AC2J	747	N3RL
2227	IØZV	1524	W9DWO	1108	ZP5RS	908	WB6GFJ	736	K3IXD
2054	K6JG	1498	WD8MGQ	1105	WA4OIB	902	KC8YM	721	IN3AHO
2028	IØAMU	1495	I6ZJC	1064	G4CHP	900	K8LJG	712	PY4VX
2026	K6XP	1396	W4BQY	1048	I8KCI	895	WA2FKF	707	WB6SRK
2016	ZL3NS	1396	YU7AW	1029	EA2IA	869	XE1XF	699	EA7AZJ
1994	K2POA	1383	N4UU	1028	JH1VRQ	859	W1NG	693	ON6IT
1968	K2VV	1365	N4NO	1013	N4NX	846	W3GXK	690	WO4L
1895	N4MM	1348	VE1YX	1008	I1HAG	845	WAØDCQ	680	CT4UW
1706	WØYDB	1341	WA4QMQ	1003	N2AC	811	VE2PD	667	JH5FOO
1684	CT1UA	1341	N2SS	996	YU7DX	810	IØSGF	663	KBØC
1678	HB9AAA	1248	KF2O	994	KL7AF	798	N4IB	661	K8ZZU
1653	I2PHN	1208	WB2NYM	992	W9NUF	795	PY4OD	650	W6YMH
1646	I8YRK	1203	I6NOA	980	W3ARK	792	Z21GJ	649	IK5ACO
1646	I8KDB	1191	WF4V	958	WB8ZRL	787	WØULU	617	WI4K
1634	IØMBX	1176	CT4NH	956	NN4Q	787	W2XQ	610	VO1AW
1621	OZ5EV	1167	CT1FL	950	N5TV	759	CT1BY	600	KK5P
1588	PAØSNG	1136	PY3BXW	946	I1POR	748	N3ED	600	W7KWI
1578	YU7BCD								

C.W.

2833	YU7DX	1596	W4BQY	1292	YU7AW	921	K8LJG	741	EA1JO
2144	W2NC	1573	YU7BCD	1278	4X4FU	897	KL7AF	732	JA5SIX
2010	W8RSW	1555	G2GM	1227	YU3NP	871	IT9VDQ	723	YU2CQ
1850	DL1QT	1544	N4UU	1162	K6ZDL	862	AK9Z	708	YK1AO
1841	K2VV	1513	N2AC	1148	EA2IA	828	W1NG	700	VE2FOU
1817	W8KPL	1500	VE7CNE	1107	JA1KRU	827	NN4Q	687	G4FAM
1812	WA2HZR	1469	VK4SS	1092	W4WJ	813	JH1VRQ	655	SM5DAC
1794	N6JV	1452	N4MM	1087	N4YB	800	N5TV	652	OE1KJW
1774	K6JG	1442	YU7SF	1032	I1YRL	781	N3ED	633	W2XQ
1700	K6XP	1423	K5UR	1032	JE1JKL	767	WD9IIC	616	VE1ACK
1670	W9DWQ	1372	I6SF	1000	KF2O	755	N4NX	601	F6HKD
1643	W3ARK	1345	VO1AW	990	PY4OD	750	AI6Z	600	W6YMH
1638	ON4QX	1305	LZ1XL	929	W9NUF	748	AK2H	600	N3RL
1605	N4NO	1294	K9QVB	927	KA7T	748	N2AIF		

1920s, was an ARRL Director, and was head of security for Lockheed California.

One can feel the weight of the years when an amateur long prominent in the past is recalled, and you find that you can remember and identify someone, possibly a DXer, but others you ask give you the standard blank look. If you want to feel old, ask a wandering DXer if he can identify Danny Weil, Ted Thorpe or Chuck Swain, Ernst Krenkel, Joe Hiller, John Cummings, to name a few. You might be surprised, all this presuming that you as a true-blue DXer can snap up each name on the list, giving the call and accomplishment of each. You might even remember who had the original call W1AW.

The CEØAA effort on San Felix last October made more than 31,000 QSOs, everything from 6 to 160, SSB and CW. The only authorized and true-blue route for a QSL for CEØAA is via the Radio Club de Chile, Box 700, Santiago, Chile. CEØAA is the club's station, and the club has been working DX for some 63 years, actually coming into existence in July 1922. Drop a line here if you need their telephone number, perhaps for a slow QSL or maybe just to say "gracias!"

In February the Dutch Department of Post completed a new antenna installation intended for the propagation of their English-language broadcasts of Radio Netherlands. But before putting it on line, they turned it over to some amateurs to use with the call PA6FLD. If you caught them around February 16–17th, there is a special QSL available. The new installation is at Flevoland.

JWØEQ should be on Svalbard until this fall. Often Chris is found down on the low edge of 75 about 3505 kHz from 0900Z. There were reports that some JAs may be trying for Peter I island around the start of January, but nothing could be determined on this one. The *DX Report,* published in Canada but mailed in the States, notes that with some Soviet offshore or special in-country operations showing up with QSL Managers and direct QTHs given, if you go via Box 88 to the QSL Manager, put the SAE and IRCs inside an envelope with your card and put the call of the QSL Manager on the outside, this being enclosed in an envelope addressed to Box 88. If you go direct, just address it and put everything—the IRCs, your card, and the SAE—inside the envelope and send it on its way. *DX Report* cautions about including currency.

Don Riebhoff, K7ZZ, whom many will remember for the days when Southeast Asia and the XV5s, XUs, and HSs were on the air every day, is headed for another tour in Lisbon and plans to put CT4AT back on the air. He is even thinking of stuffing an 80 meter beam in his backpack, preparing to ride out the bottom of the cycle.

This is the time of year when the clubs start showing up with new faces in the old offices, usually young and fresh and caught unaware. In the Carolina DX Association Ted Goldthorpe, WA4VCC, is the president for 1985 and Robert Denton, KF4NO, the vice-president. Gary Bader will take time from DXing to handle the multiple jobs of secretary-treasurer. Gary is KD4RH, while Murphy Ratteree, W4WMQ, will bring DX erudition to the club bulletin. Jack Lennox, WB4GCP, takes over as net manager.

FH4AA has been found on 40 meters usually after 0300Z. Ordinarily down in the CW bands, the station is being heard frequently. 5R8AL has been reported around 7050 kHz after 0230Z, sometimes also found on 15 around 21335 kHz after 1800Z. If he is not there, check 20 around 14185 kHz.

The Canadian CRRL will have their convention in London, Ontario the last weekend in September (the 27–29th). If you are interested drop a line to CRRL '85, Box 73, Hyde Park, Ontario NØM 1ZØ. This year they are looking to improve the DX portion of the program.

FB8XAD was due to depart Kerguelon before the turn into this year. One station was still being reported as active from FB8 on a reassignment and should have shown a month or so back as FB8XAC if everything went as planned. FT8XB is due to arrive on the island this month. *QRZ DX,* the big Texas DX Bulletin, says that VK9XW is on from Christmas Island on Saturdays, 233OZ at 14245 kHz. The station also was reported looking for North America on 75 meters at around 1100Z.

It's time to head for the Fresno International DX Convention at the Center Plaza Holiday Inn on Ventura Avenue. The DXers returning triumphant from Clipperton are expected; KC7UU will recount his African travels.

With the always speedy delivery of your copy of *CQ,* there is time to remind you that the *CQ* WW WPX SSB test will be the last weekend in March. Be Prepared! The *CQ* WPX CW Test will come in May. But during this month, if history keeps on track, you should find the Connecticut QSO Party, the Holiday in Dixie QSO Party, the DX-YL CW and SSB Tests, the Massachusetts QSO Party, the Swiss Helvetia "26" Test, and the County Hunters SSB Test —something for every need every weekend.

Reluctantly, the column is written three months in advance of publication. Allow plenty of leverage when you report on planned operations. We need the extra time. And again we note that we like pictures of DXers—the brighter the better. Big smiles! Big DXCC totals! Really big-guns! We like foreign or domestic types. All DXers are brothers. And we prefer faces to towers and shacks, but we will take anything. We're humble.

73, Cass, WA6AUD

DX Ten Years Back

In April 1975 FR7AI was planning a mid-summer effort from Glorioso. VS5MC aimed for Spratly, but problems in transportation as well as the deteriorating political climate in the South China Sea scrubbed the effort. Erik, 3C1AGD/SM0AGD, was on from Fernando Poo for 24 hours; he could only get a 24-hour operating permit. The ARRL Board pointed the way and fees for the DXCC award, $10 for the award, $2 for endorsements, and $20 for the 5BDXCC Award were to come on line June 1st; the fees were given a second look later on and disappeared. The FCC came out with new Bicentennial callsign prefix authorizations, AA, etc., prefixes coming into use in 1976. PY7YS was planning for Fernando de N., and CN8DX was on from Morocco on a number of bands. The sunspot activity was nothing much to chortle about, as actually it was rather low; Cycle 20 was dying. Some changes were expected in the Pacific with changes in administration in the Gilbert and Ellice Islands—even some speculation on changes in the Northern Line Islands. The Fresno International DX Convention had 289 turn out, and Ellen White, W1YL, handled the DX Forum.

QSL Information

Bill Carter, KM5R (902 Pinecrest Dr., Richardson, TX 75080), stands up to say he is ready to take on the QSL chores for a DX station. R.E. Miles, K9IL, emphasizes that he is the QSL Manager for VK9YR and VK9YJ (1979 only), and QSLs for others hit a dead end at his QTH. LU8DPM is the QSL Manager for CE1FGT, CE3FIP, CE5SG, CE6EDZ, CE6CGU, CE7DOM, CE8ABF, ZP5LHY, ZP5LOY, ZP5JCA, ZP5JCY, and ZP0JCY. If your YV0AA QSL has not arrived, you might try YV5DFI. All the following comes with help from WA5VGI, KM5R, KA6A, W9LNQ, and N9ALC.

CE3DQR to W3HNK
CN8ES to WA3NCP
CO2HQ to XE1XF
DL7AM/C56 to DARC
KF6ME/DU2 to KF6ME
EL2CD to KE9A
K3VW/FS7 to K3VW
FW0BX to ZL1AMO
FY0GA to NU6X
GJ0AAA (WW CW '84) to G3TXF
HH2VP to W1FJ
HI0A (WW '84 only) to HI8LC
HK0BKX to WB4QFH
J73RM to VE3DFD
JY4MP to WA4HNL
KP2AJ to WB1GZW
OX3XR to OZ3PZ
PJ2FR to N6KT
K1KI/PJ4 to K1AR
PZ5ES to N8DE
PY0FG/PY0F to PY2AJK
TI1C (WW SSB '84) to K6VNX
T52JL to OH2JL
UA0FL to WA7GVM
V3ZZ to KE5KK
V9ADC to WA2HZR
VP2VCW to N6CW
VP2VFL to N6CW
VP2MW to G3RRS
VK9YR to K9IL
VK9YJ to K9IL
VK0AK to VK2DEJ
VQ9YR to KA4SPA
WA2HZR/VQ9 to WA2HZR
XE2MX to K6VNX
XE2SI (WW '84/CW & SSB) to K6VNX
XE1VIC to KV8U
YS1UL to WA0JYJ
ZC4CZ to G4MGQ
ZD8SB to G4KIV
ZF2FK to K9QVB
ZP5JCY to LU8DPM
KC7UU/5N8 to K6EDV
5X5GK (new mgr) to JA1HGY
3D6AL to 3D6AT
6W0A to WA3NCP
6W0FP to WA3NCP
6W1HF to W0ZUZ
6W1ZF to DL1HH
6Y3M to N3DAY/KT3M
9L1CA to WA3NCP
9L1FC to WA0CAE
CE0AA to Box 700, Santiago, Chile
EI6EX to Box 462, Dublin 9, Eire
EL2P to Box 1929, Monrovia, Liberia
FH4AA to J. Respau, B.P. 4, Mamaoutzou, Mayotte, F-97600, France
HA9KOB/HG9R to Istvan Szecsi, HA9PP, H-3501 Miskolc, Box 129, Hungary
HP1XZB to Box 1112, Balboa, Panama
H44IA to Box 219, Honiara, Solomon Islands
PA0JLS/PJ2 to PJ2 Bureau
W1BIH/PJ2 to W1KDD, 122 Apter Dr., Torrington, CT 06790
P42J to W1KDD, 122 Apter Dr., Torrington, CT 06790
PY7SAR/PY0F to POB 4411, Recife, Brazil
S83W to P.O. Box 814, Umtata, Republic of Transkei
YS1TG to P.O.B. 1476, San Salvador, El Salvador
ZS6BBH to 59 King Street, Irene 1675, Republic of South Africa
ZZ2CW to Box 676, 74000 Goiania-Go, Brasil
5N2AM0 to POB 7355, Kano, Nigeria
9Q5MA to Don Berger, K1VSK, 108 Great Road, North Smithfield, RI 02895

No-99-100

Novice

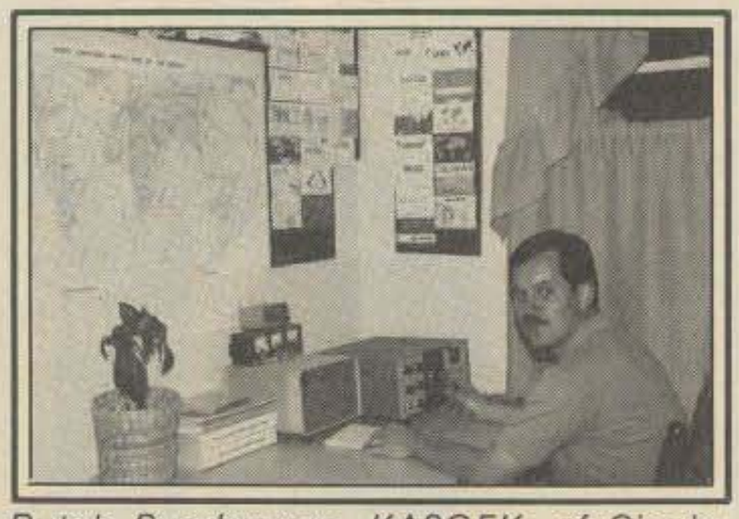
a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Volunteer Examinations—Part I of II

The Federal Communications Commission (FCC) no longer conducts amateur radio operator licensing examinations. This task is now performed by two groups of amateur radio Volunteer Examiners (VE's). The first group consists of General, Advanced, and Extra class amateurs who prepare, administer, and grade Novice-class (only) amateur radio operator licensing examinations. The second group consists of Advanced and Extra class amateurs who administer and grade Technician, General, Advanced, and Extra class amateur radio operator licensing examinations as members of Volunteer Examiner Teams (VET's) functioning under the direction and supervision of Volunteer Examiner Coordinators (VEC's) approved by the FCC. Each VEC must agree to serve an entire region; as an example, Michigan, Ohio, and West Virginia comprise the eighth region.

Factors related to both of these groups of VE's are detailed in this article because some readers are aspiring Novices, whereas most readers of this column are already licensed and their interest lies in upgrading to higher class licenses which provide increased operating privileges. VEC-related organizations that offer amateur radio operator testing opportunities may offer Novice through Extra class examinations (such as our club does), but the Novice (only) portion is not part of the VEC program. The Novice written test is often included as a part of overall tests administered to Technician through Extra class license applicants who do not hold Novice licenses.



Butch Sunderman, KA8QFK, of Cincinnati, Ohio credits John Eberhard, W8RSN, and Mike Finney, K8RLQ, with getting him into amateur radio. Butch obtained his Novice license in June 1982. He has contacted amateurs in 38 states and 50 countries. Most of his operation is on the 15 and 40 meter bands. His station includes a Heath HW-101 transceiver and a Hy-Gain vertical antenna.

Novice Examinations

Novice licensing examinations have been conducted almost exclusively by amateurs since the Novice license became available in July 1951. The major difference between the present Novice testing program and the previous program is that the FCC no longer supplies specific exams to be returned to them for grading. The Volunteer Examiner (VE) selects a set of 20 questions to be used in the Novice written examination. The VE is permitted to use any examination format, which means that tests can be essay, fill-in-the-blank, multiple-choice, single-answer, or true-false format. The applicant must answer at least 15 questions correctly to pass the Novice written test. However, the VE must use the exact wording of the FCC-approved element-two Novice questions listed in PR bulletin 1035A. Each Novice written test must contain the specific number of questions indicated herein for the listed subjects:

A. Rules and Regulations—7
B. Operating Procedures—1
C. Radio Wave Propagation—1
D. Amateur Radio Practice—3
E. Electrical Principles—3
F. Circuit Components—1
G. Practical Circuits—1
H. Signals and Emissions—1
I. Antennas and Feedlines—2

I prefer to use multiple-choice Novice written exams. Each question (stem) is asked as clearly as possible, avoiding words that might be difficult to understand. Each correct answer is stated without trickery or any attempt to teach. Each wrong answer (detractor) is incorrect with no possibility that it can be determined to be correct by anyone who knows the subject reasonably well. Good examinations contain questions that are easily understood and just require applicants to know single facts to obtain correct answers. Questions within questions, questions based on correct answers to other questions in the exam, and questions requiring answers of "all of the above" or "none of the above" are improper because they require knowledge of more than one fact to arrive at each correct answer.

The prospective Novice should be prepared to pass the code (element 1A, 5 wpm) and written (element 2) portion of the Novice examination before she/he locates a Volunteer Examiner (VE) and schedules a mutually satisfactory test site and time.

It should not be difficult to locate a VE in most parts of America. Local electronic store employees can usually provide locations and meeting dates of amateur radio clubs. A visit to a local club should produce a contact with a VE, permitting a Novice examination to be arranged. If you experience unusual difficulty in locating a VE, I advise you to write a letter to ARRL/VEC, 225 Main Street, Newington, CT 06111. Ask for the name and address of a group conducting ARRL/VEC Technician through Extra class exams in your area. Any VE team is likely to include amateurs who would be willing to conduct Novice tests. It should help if you tell the ARRL/VEC the postal zip codes (at least the first three numbers) of your town/city, plus zip codes of nearby towns and cities.

The VE will conduct the 5 wpm code receiving test after you have properly identified yourself and filled in an FCC Form 610. The code receiving test can require the applicant to copy one minute (25 units) correctly out of a five minute (125 unit) test run, or to answer at least 7 of 10 questions (about the text of the tape) correctly. If the applicant passes the code receiving test, most VE's will then administer the 5 wpm sending test. Article 32 (Section 1, Amateur Service) Item 2735 states, "Any person seeking a license to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear texts in Morse Code signals." This requirement applies worldwide in regard to using amateur frequencies below 30 MHz. I administer a code

2814 Empire Ave., Burbank, CA 91504

Russ Mason, N6JVG, of Culver City, California earned his Novice license during November of 1983 after attending Murphy's Radio School, and he upgraded to Technician one month later. Russ has had more than 200 contacts on 15, 40, and 80 meters. He has contacted amateurs in 40 states and 12 countries, and he particularly enjoys working foreign (DX) amateurs. His station includes a Yaesu 757-BX transceiver, HQ-1 miniquad for 10/15/20 meters, a 40 meter dipole, an 80 meter inverted Vee, a Yaesu antenna tuner, and a Bencher iambic keyer. Russ is a 35-year-old photographer who works for a Los Angeles advertising agency. He lives in an apartment. Russ is a member of the South Coast Radio Amateur Network.

sending test to each Novice license applicant, who is required to send one minute (25 units) of consecutive correct text to pass the 5 minute 5 wpm sending test. In addition to meeting the international requirements for amateur radio code receiving and sending tests, the sending test gives me an opportunity to offer advice and help after the test has been completed. One does not acquire good sending technique by reading a book; it must be demonstrated to the newcomer by a competent operator. Except for people with physical or medical handicaps, everyone can send faster than they can receive; however, they may not be understandable to anyone, including themselves.

If the code test is passed, the VE administers the written (element 2) test that she/he prepared from the questions in FCC PR Bulletin 1035A. If any potential VE does not have time to prepare a Novice written exam, she/he is welcome to request one by sending a note to me and including a self-addressed stamped envelope (SASE). I have both multiple-choice and essay-type Novice tests on hand. I have several of each type, and I make new ones from time to time. Similarly, I will send a copy of FCC Form 610 (Application for Amateur Radio Station and/or Operator License) to anyone who requests one and provides the usual SASE with such a request. The June 1984 version of FCC Form 610 is much easier for VE's to use than the previous versions of this form. Potential Novices and VE's are welcome to direct Novice examination program questons to me. Just make sure an SASE is enclosed with your letter.

As is true for all tests, the testing location should be comfortable, convenient, well lit, and free from distractions, When the exam has been completed, it is good to thank your examiner for her/his time and effort, regardless of whether you passed or failed the exam. The VE is not allowed to discuss examination questions and/or answers, so the applicant should not attempt to initiate such a discussion. The VE corrects the written test and tells the applicant whether or not she/he passed it before the applicant leaves. Most VE's tell an applicant his test grade, but it is not required that they do so. I do not offer the grade, but I do provide it if an applicant requests it.

The VE should double-check the applicant's Form 610 before the applicant leaves the test site. Make sure the applicant's signature matches the name printed or typed in item five. Mailing address (item seven) and station location (item eight) information should both be filled in, even if they are the same. If the applicant checks the "NO" answer in item 13, indicating she/he has not failed and amateur examination element within the last 30 days, make certain they do not fill in item 14 or 15, which asks questions about the failed exam. Pay particular attention to item six, because it is a common error to state the current year (1985) instead of the year one was born. The Novice exam VE fills in the heavied up (outlined) block at the top of the front page of the Form 610 to show test results and whether or not a license should be issued by the FCC. The VE then fills in the section at the top of the back page of the Form 610 and mails it to the FCC, P.O. Box 1020, Gettysburg, PA 17325. The applicant should provide the stamped envelope the VE uses to mail the completed Form 610 to the FCC. The VE is required to retain the applicant's test at least one year past the test session date.

This concludes the first part of this two-part article about volunteer examinations. Next month's column provides complete information about Technician through Extra class testing conducted by VE's. Each part is useful by itself, but both parts should be read to achieve maximum benefit from this article.

Novice Net

A low-power (QRP) Novice net meets at 1400 UTC on 7110 kHz. The net control station (NCS) for this group is Robert D. Perry, KA2RWL, of Buffalo, New York. In local times this net starts at 9 a.m. EST, 8 a.m. CST, 7 a.m. MST, and 6 a.m. PST.

South Pacific Map

I recently obtained an excellent map of the South Pacific. It shows the location, capital, and political status of American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Hawaii, Kiribati, Nauru, New Caledonia, Niue, Papua New Guinea, Pitcairn Islands, Solomon Islands, Tokelau, Tonga, Tuvalu, Trust Territories of the Pacific Islands (Belau/Palau, Federated States of Micronesia, Marshall Islands, and Northern Mariana Islands), Vanuatu, Wallis and Futuna, and Western Samoa. Small island groups are shown within the previous larger groups. These include the following Island groups: Austral, Chesterfield, Gambier, Gilbert, Marquesas, New Georgia, Phoenix, and Society Islands.

The name of this map is the New Pacific Map, 1984 edition. It is published by the State of Hawaii. It was jointly produced by the State of Hawaii and the Pacific Basin Development Council. The overall dimensions of this map are 31 by 23 inches, and the image area is 27.75 by 19.75 inches.

If you want to obtain a single free copy of this map, request it from the State of Hawaii Information Office, Department of Planning and Economic Development, P.O. Box 2359, Honolulu, Hawaii 96804. *(Geographer Lee S. Motteler provided information regarding this map.)*

Amateur Radio Rules And Regulations

Every amateur should have a copy of the amateur radio service rules and regulations on hand in her/his station. This is Part 97 of the Federal Communications Commission Rules and Regulations. Part 97 is available from the Superintendent of Documents, U.S. Government Printing Office. However, the issue presently available has not been updated to reflect recent rule changes. The American Radio Relay League has published a 166-page book (The FCC Rule Book) which includes an up-to-date FCC Part 97, plus plain-language explanations of these regulations.

Six pages of front matter, including a table of contents, are followed by seven pages of introductory material. In alphabetical sequence, chapter one includes changes on the horizon, FCC and Congress, FCC organization and authority, how amateur radio fits in the Private Radio Bureau, and unregulation.

The second chapter devotes 19 pages to simple explanations of how Part 97 applies to amateur radio. In alphabetical sequence, it covers appendices of Part 97, Communications Act of 1934, international/domestic laws, subparts A through I of Part 97, where the rules come from, and why amateur radio exists.

The third chapter covers licensing and examinations in 24 pages. In alphabetical sequence, the subjects explained in this chapter are antenna structures, call signs, club stations, definitions, eligibility, examination credit, FCC exams, FCC license modifications, FCC study guide, finding an exam opportunity, forms, license classes/privileges/exams, license terms, license renewals and modifications, Novice exams, protecting FCC monitor stations, syllabus for each FCC exam, Technician and higher class exams, U.S. radio districts, volunteer examiners, plus volunteer examiner coordinators and VEC phase-in period.

The fourth chapter explains technical standards in 24 pages. In alphabetical sequence, it covers amplifiers and type acceptance, band-edge operation, bandwidth limitations, digital codes, emissions, ham bands, international frequency allocations, Morse code, power limitations, spurious emissions, plus TV and facsimile.

Chapter five covers standard operating procedures in 13 pages. In alphabetical sequence, the subjects in this chapter are communication points, control operator, high-seas operation, logs, operating away from home, radio frequency interference, reciprocal operation in the U.S.A., station identification, unlicensed guests, and where amateur radio license should be kept.

Chapter six describes special operating procedures in 15 pages. In alphabetical sequence, its subjects are auxiliary station operations; band plans; beacon operation; crossband/duplex operations; emergency communications; net operation; one-way communications; Radio Amateur Civil Emergency Service; radio control of models/vehicles; repeater frequencies, identification, operation; and satellite service rules.

Chapter seven covers miscellaneous items of interest to amateurs. The subjects covered in these 12 pages include autopatching, broadcasting, business communications, citations, direct/indirect payment, malicious interference, operating privileges, phone patching, prohibited practices, retransmitting radio signals, and third-party traffic.

A complete reprint of FCC Part 97 is presented on the 36 pages following chapter seven and preceding the eight-page index. Subparts A through I are followed by the five appendices to Part 97. These subparts are general (A), amateur operator and station licenses (B), technical standards (C), operating requirements and procedures (D), prohibited practices and administrative sanctions (E), Radio Amateur Civil Emergency Service (F), reciprocal operation in the U.S.A. (G), amateur satellite service (H), and volunteer examiner coordinators (I).

This $3.00 book should be available at most electronic distributors of amateur radio items. If you experience trouble obtaining a copy locally, you can order one from the ARRL, 225 Main Street, Newington, CT 06111. If you order from the ARRL, remember to enclose $1.00 shipping costs. I advise you to obtain a copy of this useful publication. Richard K. Palm, K1CE, and his ARRL associates have produced an extremely helpful book with the aid of John Johnston, W3BE, and his FCC staff personnel.

73, Bill, W6DDB

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activites and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription or renewal is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs who frequently work the American Novice bands are also urged to submit photographs. I have never received pictures from Novices in Connecticut, Hawaii, Louisiana, or Vermont.

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CIRCLE 66 ON READER SERVICE CARD

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

Simpatch Use Raises Serious Questions Regarding Purpose of Amateur Radio

In October 1984 the Executive Committee of the ARRL reported to that organization's Board on its study of simplex autopatches ("simpatches"). In essence, the report approved the continued use of these devices by amateurs. The Committee did recommend, however, that a number of actions be taken related to the use of simplex patches, including the resumption of efforts to establish proof-of-license requirements for the purchase of transmitting equipment.

The Committee's action came as a surprise to some officials in Washington. And as their thoughts on the subject have crystalized, the questions they are asking portend serious debate on the future of amateur radio. At the heart of the matter, apparently, is the concern that the use of simplex autopatches represents a significant departure from the traditional uses of amateur radio. After all, the simplex autopatch is intended to link a licensed operator, via the telephone lines, to a person who may or may not hold an amateur license. In discussing the matter, one official, who requested that he not be named, asked: "Is this the direction amateurs want to take their service?" Similar questions are being voiced regarding the unattended operation of a digital station.

What concerns official Washington is that the Amateur service is moving more and more into areas served by other Commission licensees. This "convergence," as it's called, manifests itself in a number of ways, with rebroadcasting, simplex autopatch, and the upcoming operation of PACSAT cited as examples. The concern in Washington is that eventually, operators in a number of other services may argue that they—not amateurs—should be providing some of the communications provided by amateurs, and that they, therefore, should have access to our frequencies.

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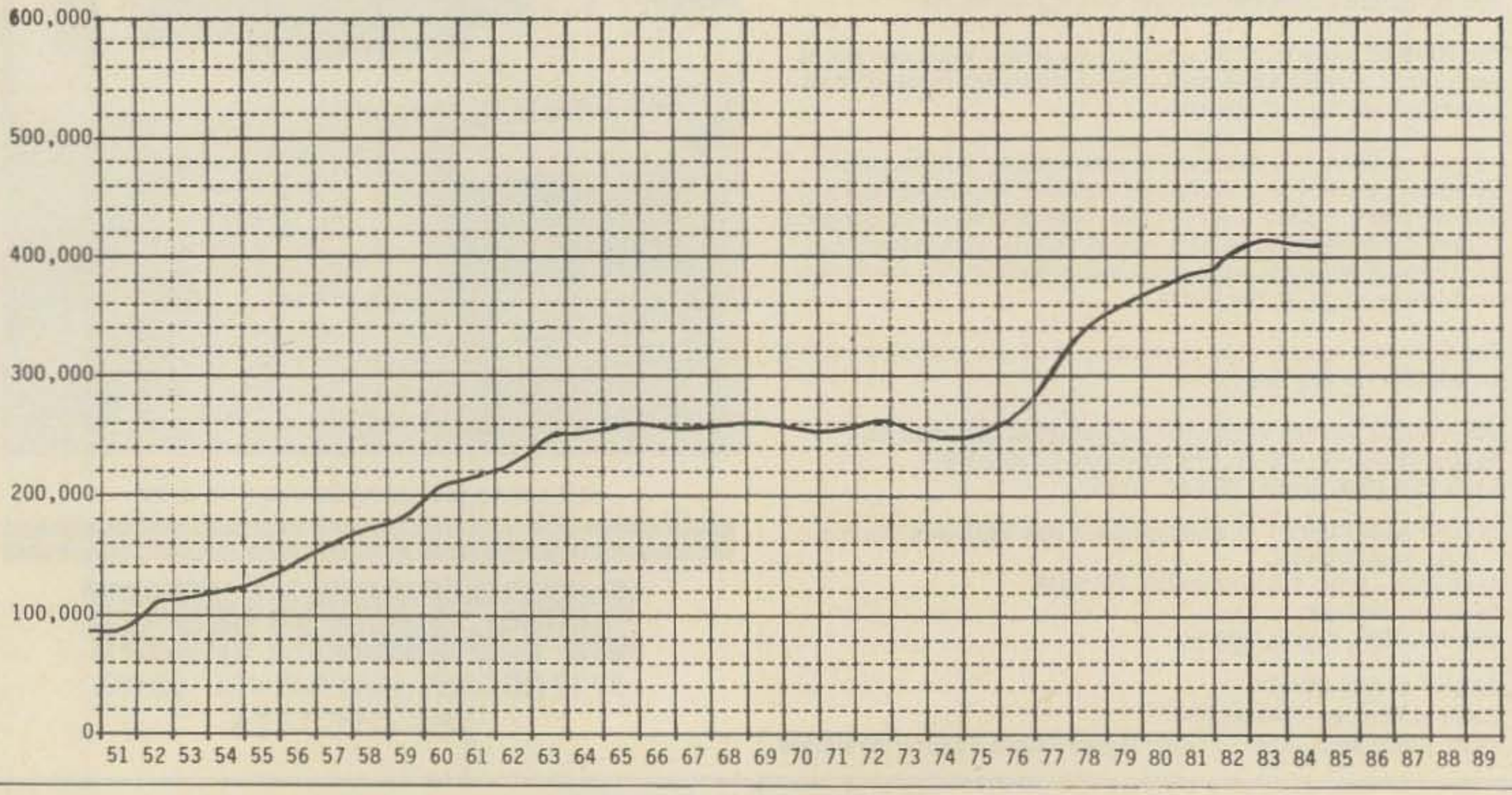
Growth in the Amateur Service . . . Where Will It Come From?

In its October 1984 meeting, the ARRL Board of Directors set a very ambitious goal: to increase the number of licensed amateurs in the U.S. by 50,000 per year for the next five years. A review of the amateur population numbers over the past 35 years, however, suggests that the goal might be unreachable.

As seen here, the number of amateur operators in the U.S. currently stands at slightly over 400,000, up significantly from the 100,000 operators licensed at the end of 1951. More important, however, is the fact that even with growing interest in the Novice class license during

Fig 1– Number of amateur radio operators licensed by the FCC at the end of each year. As of December 28, 1984 the count was 412,156 for the year. The high mark—May 31, 1983 with 414,973. (Data courtesy John Johnston, FCC)



the 1950s, and with the influx of CB operators into the Amateur service during the mid-1970s, growth in the amateur population never exceeds 40,000 per year (1977).

Given our growth history, the questions now being asked around Washington include:

•What is it, given the many activities that compete for a person's time these days, that will draw people, especially the young, to our hobby?

•How will we motivate at least 50,000 people each year to acquire an amateur license?

•What actions must be taken by the Federal Communications Commission, the ARRL, and the amateur community at-large to fully support the sought-after growth?

At this time, no one has the answers to these questions. But one thing is very clear . . . we have our work cut out for us!

Goldwater Introduces Several Resolutions and Bills Into New Congress

With the start of a new Congressional session, Sen. Barry Goldwater, K7UGA, on 3 January 1985, introduced several resolutions and a bill into the Senate which are of interest to operators in the Amateur service. They are:

•S. Res. 35: Relating to Restrictions on Home Satellite Antennas; and

•S. Res. 36: Relating to Restrictions on Amateur Radio Antennas.

In his remarks the senator indicated that he was introducing these resolutions because of discriminatory and unreasonable local restrictions on home satellite and amateur radio antennas. With respect to the latter, Goldwater, in a balanced approach to the problem, urged the Commission ". . . to insure that the Federal interest in effective reliable licensed amateur radio station operation is not impeded by unreasonable local regulation of amateur antenna systems, which regulations are not necessary to a clearly articulated and affirmatively expressed compelling governmental interest related to the health and safety of the community."

In calling on the Federal Communications Commission to delineate the limit of local jurisdiction over antenna regulation, the senator also issued a not-so-veiled warning on the subject of federal preemption in the matter of amateur radio antennas. Said Goldwater, ". . . it is expected that the Federal Communications Commission will grant administrative relief in accordance with this resolution. If that is not the case, it may be desirable to consider mandatory legislation on the subject."

•S.66: A bill to amend the Communication Act of 1934 to eliminate willful or malicious interference with communications. Enactment of this bill would provide a statutory basis for the Commission to investigate incidents of interference and to seek prosecution by the U.S. Attorney based upon violation of both the Criminal Code and the Communications act. This bill does not contain the equipment seizure provisions of a similar bill introduced into the last Congress.

RFI Complaints on the Increase

Jeffrey Young, Field Operations Bureau, FCC, reports that during the first quarter of FY85 (October, November, and December 1984), RFI complaints to the Commission totaled 18,634. This is an increase of 7% from the 17,391 complaints filed during the same period last year, and suggests that RFI problems are again on the increase.

Of the 18,634 RFI cases reported, 13,217 involved television receivers. Thus, over 70% of all RFI cases still involve a TV receiver as the victim device, something the FCC has been empowered to address since late 1983!

Amateurs were cited in 1,324 of the RFI complaints filed in the first quarter, with alleged TVI accounting for 992 complaints. Amateur-to-amateur interference was reported in 305 cases, about the same number reported in the year-earlier period. This apparent breakdown

in the self-policing aspect of our service still concerns the Commission.

Finally, CBers were cited in 8,907 RFI complaints during the first quarter. Almost 85% of these complaints (7,595 cases) involved a TV receiver as the victim device.

Amateurs Outraged Regarding Power Line Interference

Amateurs must tolerate a significant amount of interference and noise in their day-to-day operations. Some of it is simply the result of using bands populated by thousands of other amateurs, while Mother Nature is also a contributor. In both cases the use of more selective receivers, directional antennas, and advanced communications techniques can mitigate the problem.

When it comes to power-line noise, however, the amateur is frequently at the mercy of the local power company. And therein lies a problem, since the management of many electric utilities puts power-line interference at the bottom of the list for funding and attention. Judging from the mail received by your Washington editor, this has amateurs outraged.

To be sure, some utilities have developed effective ways to deal with the problem, including the use of trained personnel and research programs to ensure that they "don't put up tomorrow's problem today" when new lines are strung. But more often than not, repair crews answering service calls don't have the equipment needed to locate the source of the noise, much less silence it.

In all fairness to the electric utilities of this country, locating and silencing power-line noise is an art, not a science. Everything from electric blankets to fish-tank thermostats can saturate a neighborhood with electrical noise that can extend well up into the VHF spectrum, while loose hardware, broken insulators, and damaged transformers can produce enough noise to put an amateur off the air.

If power-line noise is limiting your operations, there are a number of things you can do to bring about a solution to the problem. First, educate yourself! One excellent source of information is the *Interference Handbook* by William R. Nelson, WA6FQG, a former investigator of radio frequency interference (RFI) problems with Southern California Edison Company. (The book is available from Radio Publications, Inc., Box 149, Wilton, CT 06897.)

Using the information in this handbook, work with representatives from your local utility to locate the source of the noise. Often, you will be able to locate the source yourself using a portable shortwave receiver tuned to the highest frequency possible. **In no case, however, should you attempt to fix the problem!** It's not only illegal, but you could be injured or even killed in the process. Keep records of the dates and times when the noise is observed, of its characteristics, and of suspected sources (i.e., specific utility poles). It also doesn't hurt to send the president of the utility a letter, describing the problem and offering your assistance to silence it.

If, despite your best efforts, the utility fails to respond in a timely fashion, file a complaint with the FCC, Field Operations Bureau, Washington, DC 20554. Cite examples of how the noise is affecting your operations and your public service/emergency communications. Send a copy of the letter to the utility involved. On many occasions, the recognition that power line noise is interfering with federally sanctioned communications, and that the Commission has been notified of this fact, is enough to bring action.

The treatment of power-line noise on a case-by-case basis, however successful such actions might be, is only a temporary solution to the problem. In the long run, the power industry must develop and implement construction standards that will minimize interference to RF devices from their distribution network. The industry must also recognize that they have an obligation to train their personnel in the resolution of RFI problems. Nothing less will suffice to eliminate sources of noise that today can affect virtually anyone using a radio or television receiver in their home or office.

FCC Moves on Power-Line Interference Problem

Recognizing that power-line interference is a matter of concern to all radio services, the Commission, according to Richard Smith, Chief, Field Operations Bureau, FCC, has begun a program to address this issue with the nation's electrical utilities. In particular, the bureau's field offices, says Smith, have already held seminars on power-line interference in Tampa, FL, and Baltimore, MD, for the purpose of raising the electrical power industry's awareness on the interference problem. Two additional seminars are scheduled for early 1985, which will see J. Jerry Freeman, Engineer-in-Charge of the Commission's Norfolk, VA, Field Office, address representatives from power utilities in Virginia and North Carolina.

Telephone RFI Rears Its Ugly Head

Reports are beginning to reach the ARRL RFI Task Group regarding "alleged" interference to some of the newer electronic telephones on the market today. The problem, which in some cases involves devices produced by internationally recognized corporations, apparently results from the telephones' susceptibility to strong RF signals from nearby transmitters (as opposed to any characteristic of the radio signal itself). While telephones have yet to be classed as "electronic home-entertainment equipment," RFI problems encountered with these devices is surely a situation that should be addressed by the Commission. Accordingly, amateurs and others who experience RFI problems with their telephones are encouraged to file complaints with the Commission. Be sure to send a copy of the complaint to the ARRL RFI Task Group, *c/o* League Headquarters in Newington, CT.

Final Touches Put On NPRM For Repeater Coordination

As we go to press, the Commission is putting the final touches on its Notice of Proposed Rule Making (NPRM) in the matter of repeater coordination. The NPRM has been under development since the latter part of 1984. Though little information on the Notice is available, sources in Washington indicate that it will include many of the points raised by Peter O'Dell, KB1N, in his petition for rulemaking on the subject.

In his petition O'Dell suggested that "the Commission, taking whatever steps it deems appropriate, appoint one national organization to develop a consistent, fair program of spectrum management for amateur repeater stations operating above 29.5 MHz." Matters to be addressed included, but were not limited to, repeater coverage, use of channels in congested areas, national band plans, and the resolution of conflicts. As part of O'Dell's plan, the Commission would only issue a license for repeater operation after this national "super coordinator" had approved the repeater's application for coordination. (It should be noted that at the time of his filing, O'Dell clearly indicated to the Commission that he was not officially affiliated with a major amateur radio organization or frequency coordinating body.)

Air Force Opens New OTH Radar Center

As noted in *C³I News*, a Bethesda, MD, newsletter for the communications/electronic industry, the Air Force, in December 1984, dedicated a new over-the-horizon—backscatter (OTH-B) air-defense radar system in Bangor, ME. When completed, the radar will be capable of detecting aircraft at distances of up to 1800 miles from the east coast of the United States.

Construction of the new facility follows on the heels of the Air Force's successful experiments with a smaller version of the HF OTH-B radar system tested in Maine from June 1980 to June 1981. These experiments demonstrated the feasibility of using backscattered HF signals traveling ionospheric paths to detect, locate, and tract approaching aircraft.

According to *C³I News*, the OTH-B radar system's first of three transmit antennas is located in Moscow, ME. Three receive antennas will be used, with the first

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Three other OTH-B radar systems are also scheduled to be built; they will be located on the west coast, in the central U.S., and in Alaska.

Faculty Shortage Could Harm Engineering Schools

According to a report from the American Electronics Association (AEA), a shortage of engineering faculty in our nation's schools could adversely affect the quality of electrical and computer engineering graduates. Specifically, faculty vacancy rates, which were at 8.5 percent for all engineering fields in 1983, reached 9.7 and 16.1 percent, respectively, for electrical and computer engineering that same year. The effect of these shortages is already being felt, as qualified high school graduates are being turned away from the engineering schools of their choice.

The report also cites that fact that with student enrollment up 100 percent in the last 10 years, engineering faculty has increased only 10 percent. Consequently, professors are not only overworked and have to rely more on teaching assistants, but they have less time for research.

One solution to the problem is for the electronics industry to support engineering education. To this end, Patricia Hill Hubbard, AEA vice president of engineering and technical education, told the IEEE that "companies in the electronics industries are beginning to realize they must give time and financial support if they expect universities to produce quality engineers."

For more information on the report, "AEA Status Report on Engineering and Technical Education," contact the Association at 2670 Hanover St., P.O. Box 10045, Palo Alto, CA 94303.

Mystery Satellites Identified

For some time amateurs have complained that a "mystery satellite" has been interfering with EME experiments in the 13 cm band. Recently, however, Richard Flagg of the Kettering Group (a small satellite-interest group having members worldwide), together with several amateurs (including W4HHK and WB5LUA), observed that the mystery satellite is not one, but two, new Russian early warning satellites.

According to their findings, which were published in "Amateur Satellite Report," AMSAT's newsletter for the amateur space program, the satellites are Cosmos 1547 and 1604. Their operation at 13 cm is consistent with the Primary allocation of this band to the Radiolocation service; amateurs, on the other hand, have only a Secondary allocation. Thus, there is little amateurs can do to have the "intruders" removed.

All is not lost, however. Robert Atkins, KA1GT, observed that the identification of these satellites and their predictability of passage suggest that "they could be used by amateurs as beacons and alignment tools for both active electronics and mechanical hardware such as dish mounts, feed horns, and the like."

To obtain copies of "Amateur Satellite Report," write to Satellite Report, 221 Long Swamp Road, Wolcott, CT 06716.

FCC Publishes Standards For Filing

If you intend to file comments with the FCC on any proceeding before the Commission, it might be a good idea to follow the published standards for such filings. To obtain a copy of these standards, write to Federal Communications Commission, Attn: Office of the Secretary, 1919 M St., NW, Washington, DC 20554. In filing comments, consider the following:

Your experience: Convey your experience, judgments, and insights.

The facts: Explain who you are and what your interest is in the inquiry or rulemaking proceeding.

Specific arguments, pro or con: Explain clearly and precisely why you do or do not favor the action proposed.

Filing date: Submit your comments to the Office of the Secretary, FCC, before or on the filing date. Remember, if you want your comments to be received as a formal filing, you must submit an original and five copies.

League's VHF/UHF Advisory Committee Calls For Comments

The ARRL Executive Committee recently asked the VHF/UHF Advisory Committee (VUAC) to develop a "band plan" for the 13 cm amateur band. This band now consists of the segments 2300-2310 MHz and 2390-2450 MHz. Given the many types of operation found at these frequencies—including amateur television (ATV) exchanges, Earth-Moon-Earth (EME) experiments, and amateur satellite operations—it is vital that current and future spectrum utilization requirements be identified at an early date.

Amateurs wishing to contribute to the VUAC's study are urged to send their comments and suggestions to the attention of Mark Wilson, AA2Z, in care of the League's headquarters in Newington, CT. Wilson also seeks comments on operating procedures favored for EME and meteor scatter (MS) exchange.

NABER Announces New Handbook On Certification Exam

The National Association of Business and Educational Radio (NABER) has announced the availability of its new handbook to assist technicians in preparing for the Association's Two-Way Radio Technician Certification Examination. The handbook features a number of items, including a sample test, detailed outlines of each exam section, recommended study references, suggestions for preparing for the exam, and test-taking strategies. Copies of the handbook may be ordered by sending $9.95 (plus $1.50 for postage and handling) to NABER, 1330 New Hampshire Ave. NW., P.O. Box 19164, Washington, DC 20036.

A free brochure on NABER certification programs may also be obtained by writing to the address above.

International Satellite Users' Conference Announced

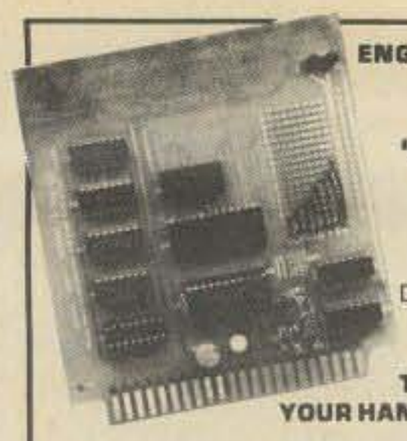
The second International Satellite Direct Broadcast Services Users' Conference will be held April 15–19, 1985, at the Holiday Inn near the Baltimore-Washington International Airport. The purpose of this conference is to provide a forum for an exchange of information between the user community and the designers, operators, and managers of direct broadcast satellite systems. Present and future satellite direct readout systems and operations will be discussed, as will government and private sector data uses. About 40 exhibits of environmental satellite receiving and processing equipment will be on display. Special "Satellite Application Sessions" for amateurs are scheduled for Wednesday, April 17.

For more information contact Mr. Robert W. Popham, NOAA Co-Chairman, ISDBSUC, NOAA/NESDIS, Washington, DC 20233; telephone (301) 763-7289.

Spread Spectrum Beacons Take To the Air

According to Hal Feinstein, WB3KDU, AMRAD's spread-spectrum coordinator, two different frequency-hopping beacons are now operating in the Washington, DC area. The first station, N4EZV, operates with 100 ms dwell and hops randomly on channels spaced at 25 kHz intervals in the band 144.9 to 147.8 MHz. The second station, K4RS, commences operation on the 5-minute mark at 147.81 MHz (input frequency for the AMRAD repeater), identifies in CW, and then hops using one of two modes. Amateurs wishing to participate in the spread-spectrum experiments now being conducted by the Amateur Radio Research and Development Corporation under their Special Temporary Authorization are encouraged to contact the Corporation at P.O. Drawer 6148, McLean, VA 22106-6148.

Your Washington Editor thanks Mr. David Siddall, K3ZJ; Mr. Ray Kowalski, FCC (Washington); and Ms. Colleen McNeely, FCC (Norfolk, VA) for their contributions to this month's column.



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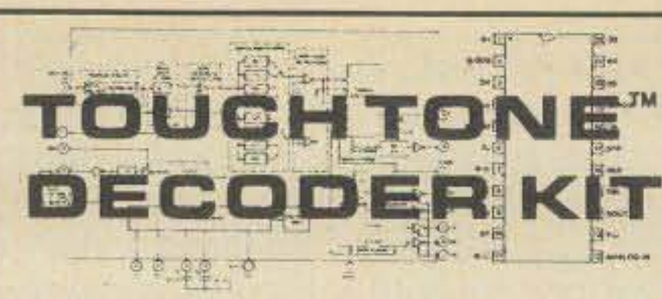

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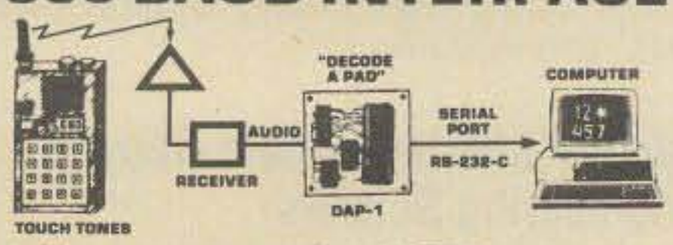

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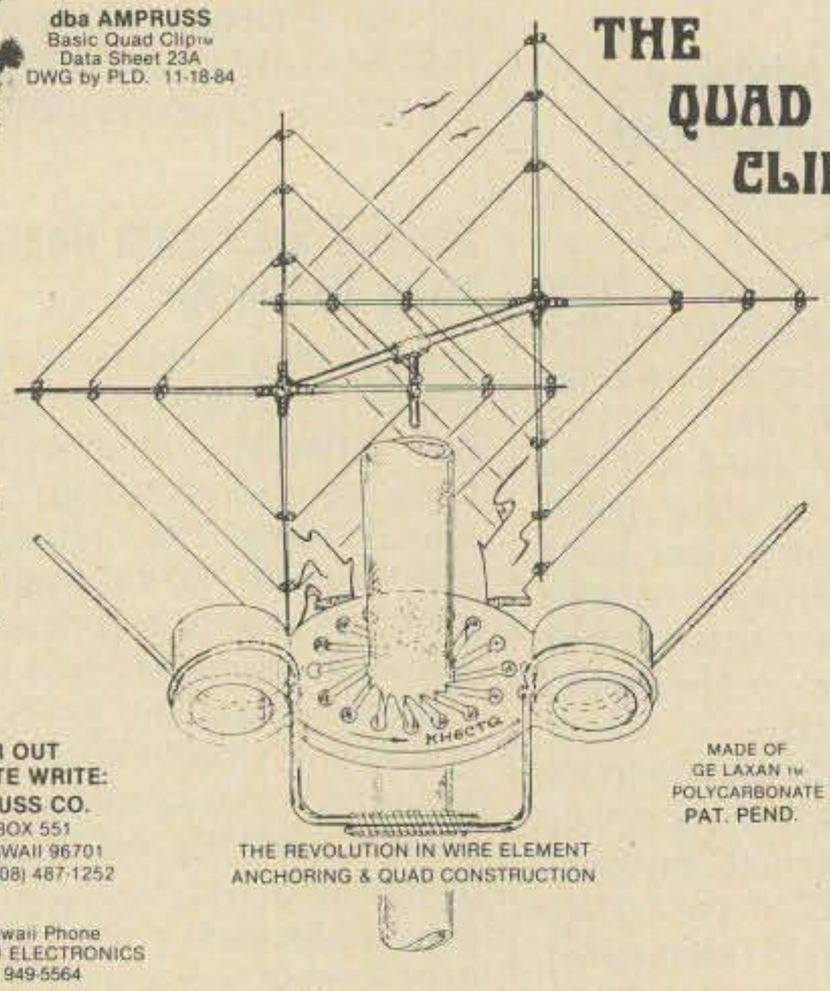

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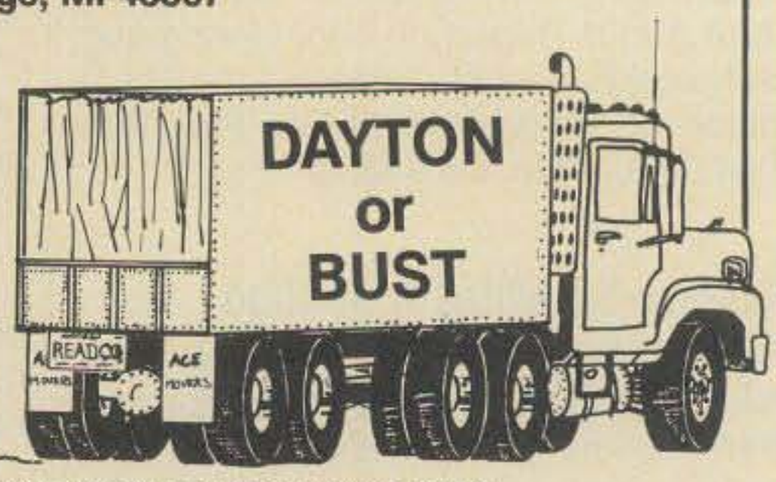

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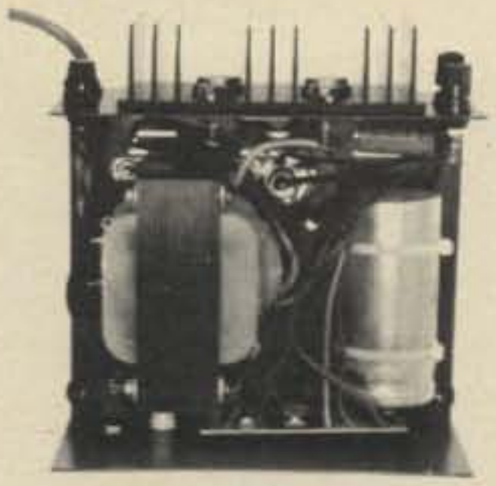

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RM-50A	37	50	5¼ × 19 × 12½	50
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RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

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MODEL RS-7A

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RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

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RS-20M	16	20	5 x 9 x 10½	18
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VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

Math's Notes

a feature by
IRWIN MATH, WA2NDM

A LOOK AT THE TECHNICAL SIDE OF THINGS

Before starting this month's column, I would like to correct an error in the January column. Fig. 6, the schematic diagram for the breakout box, had a missing wire, the common to all LED's. Connect the common junction of all LED's (anodes of the red and cathodes of the green) to pin 7 and the circuit will operate properly.

You will recall that in this same column we discussed RS-232 and TTL and how to convert from one to the other. Now we can use that knowledge to interface the outside world with our computer if we so desire. Since many computers do produce RS-232 signals at their output ports, the simple circuit of fig. 1 can be used to allow these ports to drive whatever you wish. Note the similarity to the circuits of my last column. The reed contacts can further be used to control heavier relays for greater loads or additional circuitry. There is one problem with this circuit, however, and that is the common computer/power-supply ground. For true isolation you must use a circuit such as shown in fig. 2. Here the coupling medium between the computer and the outside world is light in the opto-coupler. You still need the external relay supply, but all the computer "sees" is an LED. Actual voltages and resistor values may vary depending on the opto-coupler, relay, and power supply you wish to use, but the principle is the point here.

When more power is required than the reed relay contacts can handle, the opto-coupler output can be used to drive a higher power transistor as shown in fig. 3, or even an SCR (for AC switching) as shown in fig. 4. This circuit can easily handle watts of power, and if used with the AC line, should be built with extreme care.

In all of the above examples you will have to write the program to produce the proper RS-232 output from the computer. Our technique of doing this is by using the serial printer output (often pin 3). In your software when you want an output you would command the computer to produce a series of X's to the printer port. Then by using a simple integrator such as fig. 5, you would sense this output and trigger the desired load. Another way, for multiple outputs, would be to use a parallel port together with multiple input gates to divide the output in regard to a specific ASCII character. In both these methods some handshaking jumpers may be necessary.

While all of the above information is usable, the purpose of this particular column is to give you ideas of how to interface with a computer. Exact details and circuitry should be determined by the user in the specific individual application. I hope this is of interest to you.

73, Irwin, WA2NDM

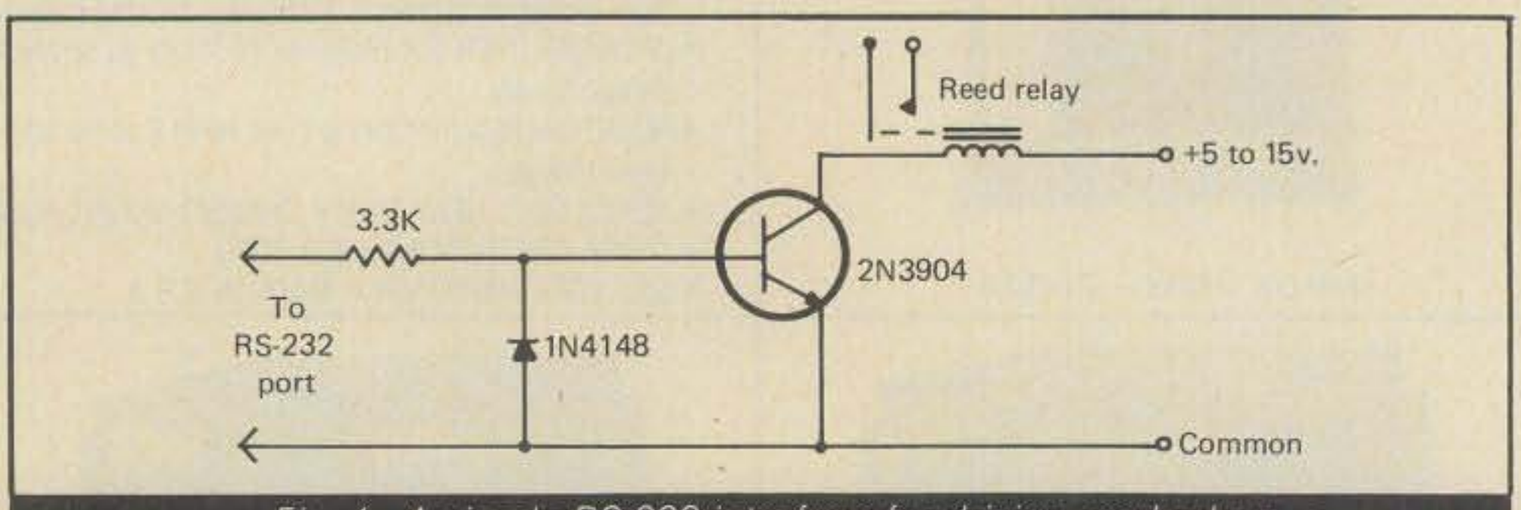

Fig. 1– A simple RS-232 interface for driving reed relays.

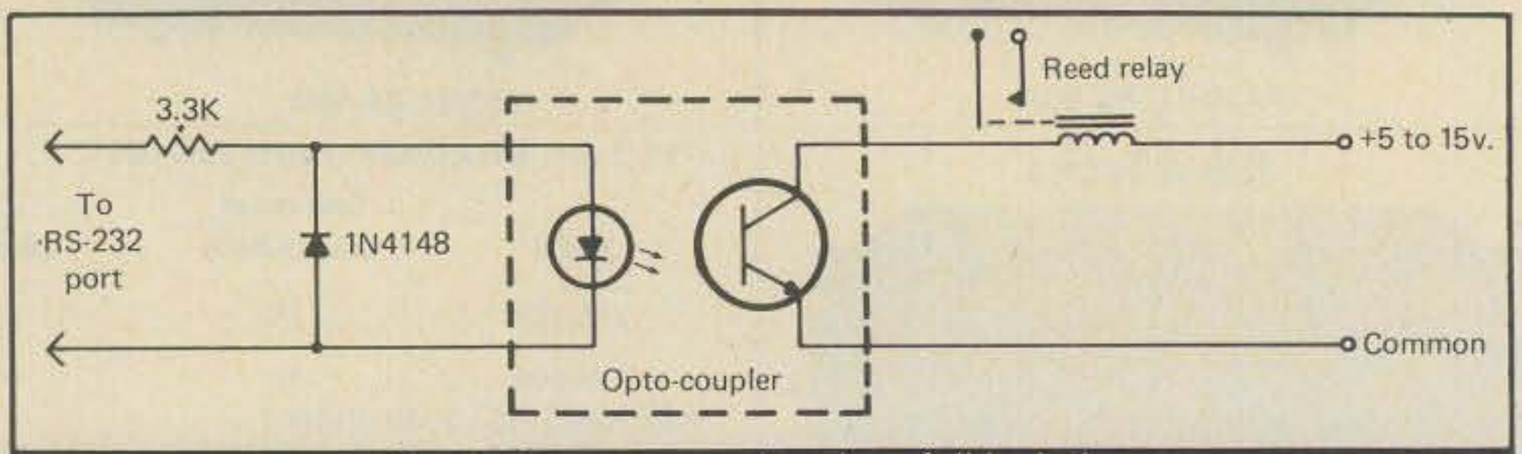

Fig. 2– An opto-coupler gives full isolation.

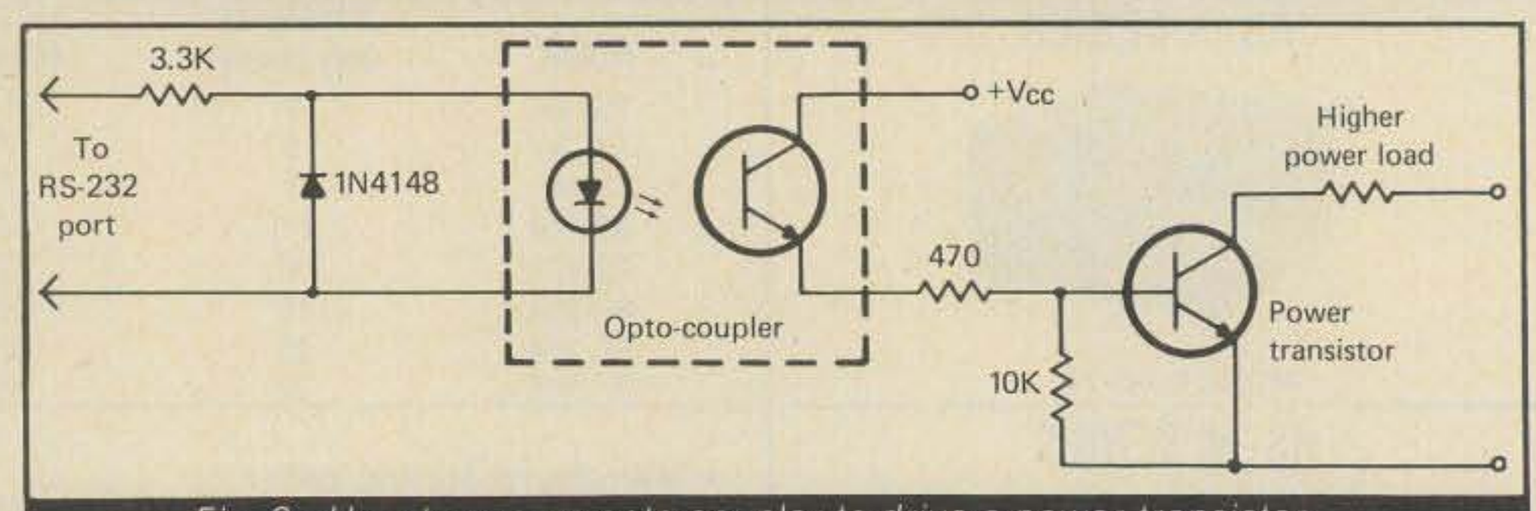

Fig. 3– How to use an opto-coupler to drive a power transistor.

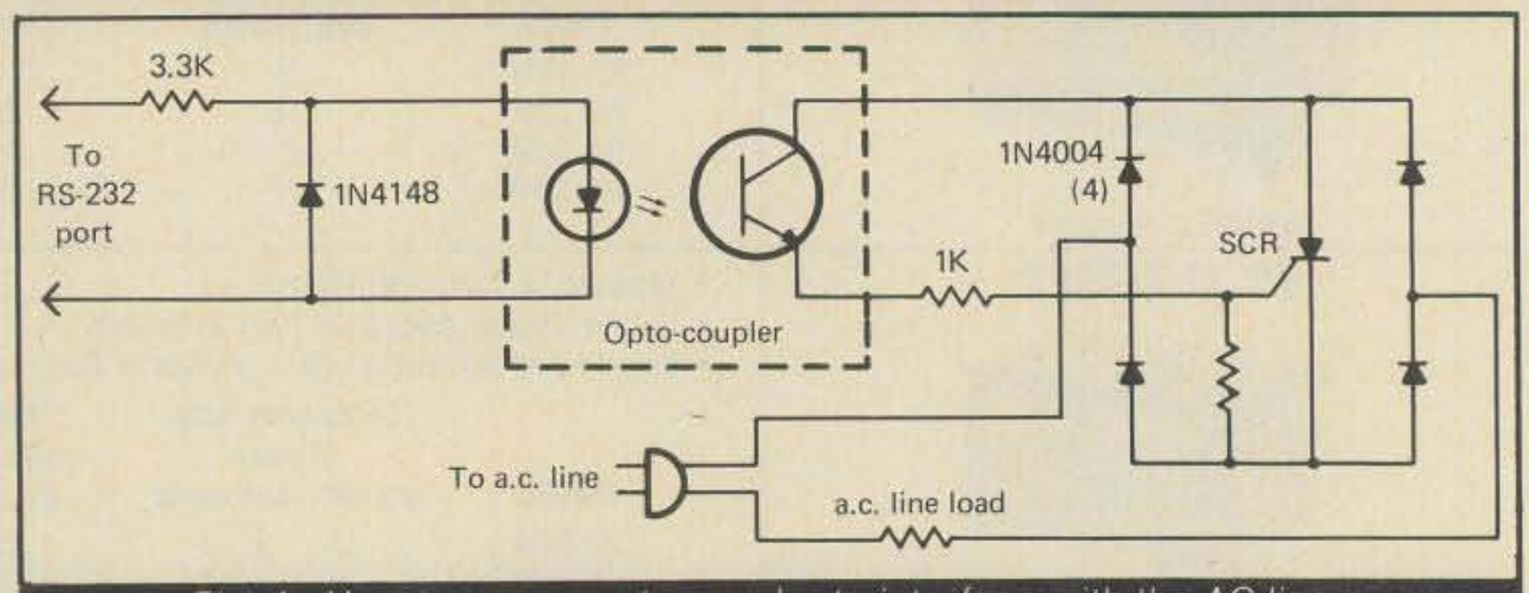

Fig. 4– How to use an opto-coupler to interface with the AC line.

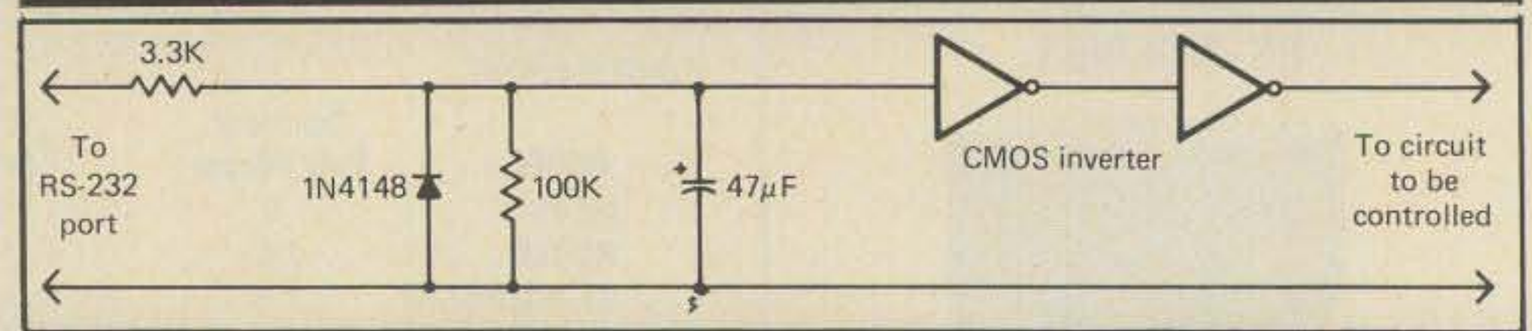

Fig. 5– Using an "integrator" circuit to drive a load from an RS-232 port.

**Math Associates, 2200 Shames Drive, Westbury, NY 11590*

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The present solar cycle continues to decline at a steady rate. The *Royal Observatory of Belgium*, the world's official keeper of sunspot records, reports a mean sunspot number of 18.2 for December 1984. This results in a 12-month smoothed sunspot number of 46 centered on June 1984. The sunspot cycle is measured by the value of smoothed sunspot number. Based on the present behavior of solar activity, a smoothed sunspot number of approximately 30 is forecast for April 1985.

Low Solar Phase

A smoothed sunspot number of *30* generally heralds the beginning of the *low phase* of solar activity. It is during this phase that the intensity of the ionosphere will be weakest, and conditions on many of the HF amateur bands will be at their poorest.

How long will this phase last? Statistically, it should last from the time that the cycle dips below 30, reaches its minimum value, then rises to above 30 again during the new cycle.

Using the last cycle, Cycle 20, as an example, the smoothed sunspot number dropped below 30 during October 1974. The cycle reached its minimum value of 12 during June 1976, and the new cycle climbed to the 30 level by August 1977. In this case the low phase of solar activity lasted for *34* months.

During Cycle 19, the low phase lasted *39* months and during Cycle 18 for *35* months.

Based on past experience, the present low phase of solar activity will probably end during early 1988, when solar activity will again rise above a smoothed sunspot level of 30.

For a more complete explanation of solar cycle characteristics and their influence upon shortwave radio propagation, refer to *The Shortwave Propagation Handbook* by George Jacobs and Theodore J. Cohen, available from *CQ*'s Book Shop.

April DX Propagation

During April *20 meters* should be the optimum band for DX propagation conditions during most of the daylight hours and into the evening hours as well. Considerably fewer openings are expected on *15 meters*, but some fairly good DX should still be possible towards southern areas, especially during the late afternoon hours. Very few *10 meter* DX openings are expected this month, but an occasional one should be possible from all USA time zones to South America and from the western states to the South Pacific. Be sure to check *10 meters* when conditions are expected to be High or Above Normal.

After sunset optimum DX propagation conditions should be shared between *20* and *40* meters. Good openings to many parts of the world are forecast for both bands between sunset and midnight, and on *40 meters* from midnight to sunrise. Some fairly good *80* meter DX openings should also be possible during the hours of darkness and at sunrise, and there is a fairly good chance for an occasional DX opening on *160 meters* during the same time period.

Seasonally favorable propagation conditions over long paths between the northern and southern hemispheres, for example, to Australasia, South America, southern Africa, etc., should continue during April on all HF bands.

Ionospheric absorption should continue to increase in the northern hemisphere during April as the sun rises higher in the northern sky. This should result in somewhat *weaker* DX signal levels during daytime openings, compared to the winter months. Static levels are also expected to increase noticeably during April, as thunderstorms become more numerous. This should result in higher noise levels, particularly on *40, 80,* and *160* meters.

Short-Skip Propagation

For openings between 50 and 250 miles the best band should be *80* meters during the day and *160* meters at night. Between 250 and 750 miles, *40* meters should be best during the day, *80* meters for an hour or two after sunrise and again from sunset to midnight, and *160* meters from midnight to sunrise. For openings between 750 miles and the one-hop, short-skip, limit of 2300 miles, use *20* meters during the day, *40* meters for an hour or so at sunrise and again from sunset to midnight, and *80* meters from midnight to sunrise. Look for *15* meter short-skip openings from about 10 a.m. to sundown, ranging between approximately 1300 and 2300 miles, although at times openings may be as short as 500 miles. There is also the possibility for some *10* meter short-skip openings during the daylight hours over similar distances.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between *10* and *160* meters for the period *April 15 through June 15, 1985.* Beginning this month and continuing through the summer and fall, the times shown in the charts will be local *daylight* time (EDT, CDT, MDT, and PDT).

For more detailed predictions of short-skip openings between distances of 50 and 2300 miles, refer to the Short-Skip Charts, which appeared in last month's column.

A day-to-day forecast of *general* propagation conditions expected during April is given in the *Last Minute Forecast*, which appears at the beginning of this column.

VHF Ionospheric Openings

Chances for VHF ionospheric openings during April look pretty good. *Lyrids*, a major meteor shower, is due April 21–23. It should peak during the afternoon of April 22, when an average of 15 good-sized meteors are expected to enter the earth's atmosphere every hour. This should considerably increase the chances for VHF meteor-scatter-type openings.

Sporadic-*E* propagation normally begins to increase during April, and it should continue to do so through the spring and summer months. This should result in an increased number of short-skip openings

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1985

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 10, 14, 23	A	A	B	C
High Normal: 5, 9, 12-13, 15, 22, 24	A	B	C	C-D
Low Normal: 3-4, 6-8, 11, 16-17, 21, 25-26, 29-30	A-B	B-C	C-D	D-E
Below Normal: 1-2, 18, 20, 27-28	B-C	C-D	D-E	E
Disturbed: 19	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. **Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.**
2. **With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on the 1st and 2nd, good-to-fair (B-C) on the 3rd and 4th, good (B) on the 5th, etc.**

11307 Clara Street, Silver Spring, MD 20902

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce. Boulder, Colorado, 80302.

April 15-June 15, 1985
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Central Europe & North Africa	Nil	14-18 (1)	05-07 (1) 09-10 (2) 10-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	19-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & European USSR	Nil	14-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-16 (3) 16-18 (2) 18-22 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-00 (1)*
Eastern Mediter-ranean & Middle East	Nil	14-17 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
West & Central Africa	14-16 (1)	10-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	13-16 (1) 16-17 (2) 17-19 (4) 19-20 (3) 20-21 (2) 21-23 (1) 07-09 (1)	20-22 (1) 22-02 (2) 02-03 (1) 00-02 (1)*
East Africa	Nil	10-13 (1) 13-16 (2) 16-17 (1)	07-09 (1) 13-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	21-01 (1)* 21-00 (1)*
South Africa	Nil	09-12 (1) 12-14 (2) 14-15 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-21 (1)	21-22 (1) 22-00 (2) 00-02 (1)
Central & South Asia	Nil	17-19 (1)	07-10 (1) 14-16 (1) 19-21 (1)	05-07 (1) 19-21 (1)
Southeast Asia	Nil	Nil	08-10 (1) 14-16 (1) 19-21 (1)	Nil
Far East	Nil	17-20 (1)	08-10 (1) 18-20 (1) 20-22 (2) 22-00 (1)	04-06 (1)
South Pacific & New Zealand	16-19 (1)	09-11 (1) 15-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-00 (2) 00-04 (1)	02-03 (1) 03-06 (2) 06-07 (1) 02-06 (1)*
Australasia	Nil	16-18 (1) 18-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 15-16 (1) 16-18 (2) 18-22 (1) 22-00 (2) 00-02 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Northern & Central South America	12-14 (1) 14-16 (2) 16-18 (1)	10-12 (1) 12-13 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	00-06 (1) 06-07 (2) 07-08 (3) 08-10 (4) 10-11 (3) 11-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-00 (2)	19-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1) 21-02 (1)* 02-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1) 15-17 (2) 17-18 (1)	08-09 (1) 09-11 (2) 11-14 (1) 14-15 (2) 15-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-10 (1) 14-16 (1) 16-17 (2) 17-18 (3) 18-21 (4) 21-22 (3) 22-00 (2) 00-04 (1)	20-21 (1) 21-04 (2) 04-06 (1) 23-05 (1)*
McMurdo Sound, Antarctica	Nil	Nil	07-09 (1) 16-20 (1) 20-23 (2) 23-00 (1)	01-05 (1)

Time Zones: CDT & MDT (24-Hour Time)
CENTRAL USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Central Europe & North Africa	Nil	14-16 (1)	06-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-18 (2) 18-20 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-00 (1)*
Northern Europe & European USSR	Nil	Nil	06-07 (1) 07-09 (2) 09-14 (1) 14-17 (2) 17-23 (1)	20-00 (1)
Eastern Mediter-ranean & Middle East	Nil	Nil	07-09 (1) 13-15 (1) 15-18 (2) 18-19 (1) 22-00 (1)	20-00 (1)
West & Central Africa	Nil	12-14 (1) 14-16 (2) 16-17 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-23 (1)	20-01 (1)
East Africa	Nil	13-15 (1)	07-09 (1) 13-16 (1) 16-19 (2) 19-20 (1)	21-00 (1)
South Africa	Nil	09-11 (1) 11-14 (2) 14-15 (1)	14-16 (1) 16-19 (2) 19-22 (1)	20-22 (1) 22-00 (2) 00-01 (1)
Central & South Asia	Nil	17-20 (1)	07-10 (1) 17-19 (1) 19-21 (2) 21-22 (1)	05-07 (1) 19-21 (1)
Southeast Asia	Nil	Nil	07-10 (1) 19-22 (1)	05-07 (1)
Far East	Nil	18-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-00 (1)	03-07 (1)
South Pacific & New Zealand	15-17 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	16-19 (1) 19-22 (2) 22-00 (3) 00-04 (2) 04-07 (1) 07-09 (3) 09-10 (2) 10-12 (1)	00-02 (1) 02-06 (1) 06-07 (1) 02-06 (1)*

Australia	Nil	16-18 (1) 18-21 (2) 21-22 (1)	07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-22 (2) 22-00 (3) 00-02 (2) 02-07 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Northern & Central South America	11-13 (1) 13-16 (2) 16-18 (1)	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	00-06 (1) 06-08 (2) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-00 (2)	19-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 21-23 (1)* 23-02 (2)* 02-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1) 15-17 (2) 17-18 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-09 (2) 09-10 (1) 14-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-07 (1)	21-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	Nil	15-18 (1)	07-09 (1) 16-18 (1) 18-21 (2) 21-23 (1)	00-06 (1)

Australasia	17-20 (1)	13-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	19-21 (1) 21-23 (2) 23-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Northern & Central South America	11-14 (1) 14-16 (2) 16-17 (1)	09-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	05-06 (2) 06-09 (3) 09-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-00 (2) 00-05 (1)	19-20 (1) 20-21 (2) 21-02 (3) 02-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	13-17 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	05-06 (1) 06-08 (2) 08-09 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	20-22 (1) 22-01 (2) 01-03 (1) 21-01 (1)*
Antarctica	Nil	16-19 (1)	07-08 (1) 16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1)	03-06 (1)

on both the *10* and *6 meter* bands. Most openings will fall between the 750 and 1300 mile range, but some may extend out to 2000 or more miles. During periods of intense sporadic-*E* ionization, openings on *2 meters* may also be possible over distances between about 1200 and 1400 miles. As its name infers, sporadic-*E* openings may occur at any time of the day or night, but there is a tendency for them to peak between 8 a.m. and noon and again between 5 and 9 p.m., local time.

Unusual ionospheric openings on the VHF bands can also occur during April from widespread auroral activity. The best times to check for such openings are during periods of radio storminess on the HF bands. Check the *Last Minute Forecast* at the beginning of this column for those days during April that are expected to be Below Normal or Disturbed.

73, George, W3ASK

Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western Europe & North Africa	Nil	Nil	06-08 (1) 08-10 (2) 10-13 (1) 13-16 (2) 16-19 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	Nil	Nil	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-23 (1)
Eastern Mediterranean & Middle East	Nil	Nil	07-09 (1) 13-15 (1) 18-19 (1) 19-21 (2) 21-22 (1)	20-23 (1)
West & Central Africa	Nil	11-15 (1)	06-08 (1) 12-15 (1) 15-16 (2) 16-17 (3) 17-19 (2) 19-21 (1)	20-23 (1)
East Africa	Nil	12-14 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (1)	20-22 (1)
South Africa	Nil	10-13 (1)	06-08 (1) 13-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	19-22 (1) 20-22 (1)*
Central & South Asia	Nil	19-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	04-07 (1)
Southeast Asia	Nil	19-21 (1)	07-08 (1) 08-10 (2) 10-11 (1) 22-23 (1) 23-00 (2) 00-02 (1)	04-07 (1)
Far East	Nil	20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 19-22 (1) 22-00 (2) 00-02 (1)	02-03 (1) 03-06 (2) 06-08 (1) 03-07 (1)*
South Pacific & New Zealand	14-16 (1) 16-19 (2) 19-20 (1)	11-13 (1) 13-16 (2) 16-21 (3) 21-22 (2) 22-23 (1)	04-08 (1) 08-11 (2) 11-17 (1) 17-20 (2) 20-21 (3) 21-00 (4) 00-01 (3) 01-04 (2)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-02 (1)* 02-05 (2)* 05-06 (1)*

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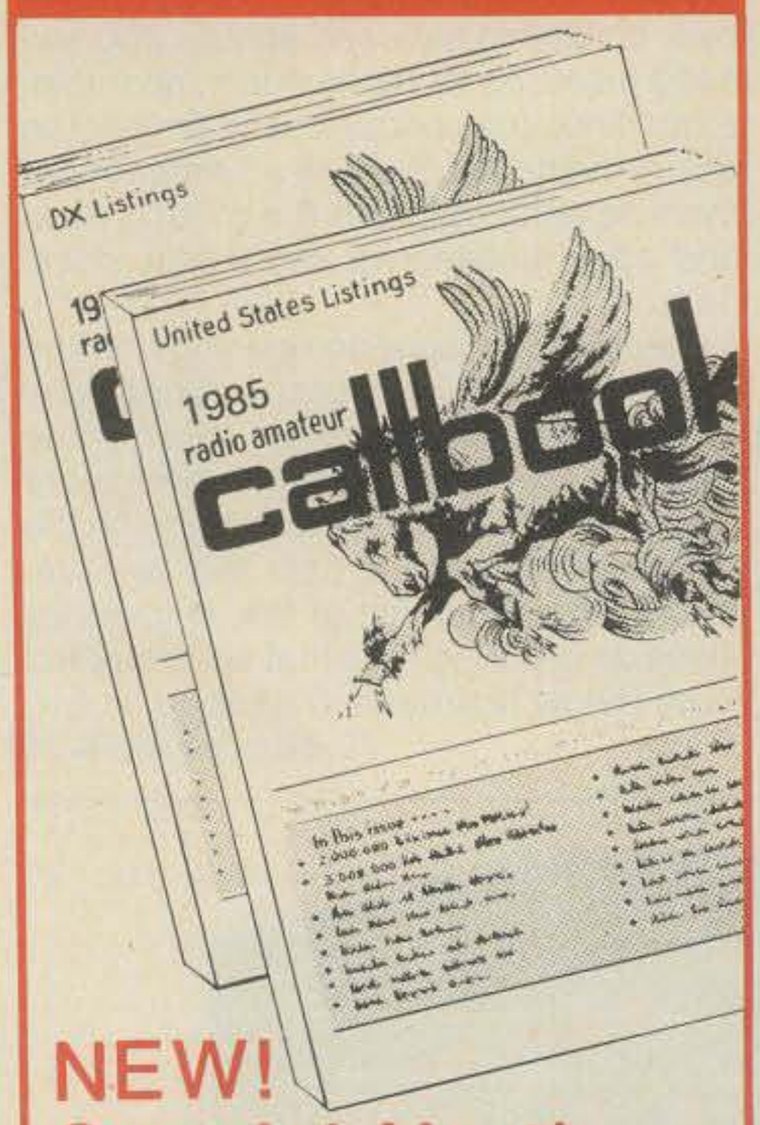

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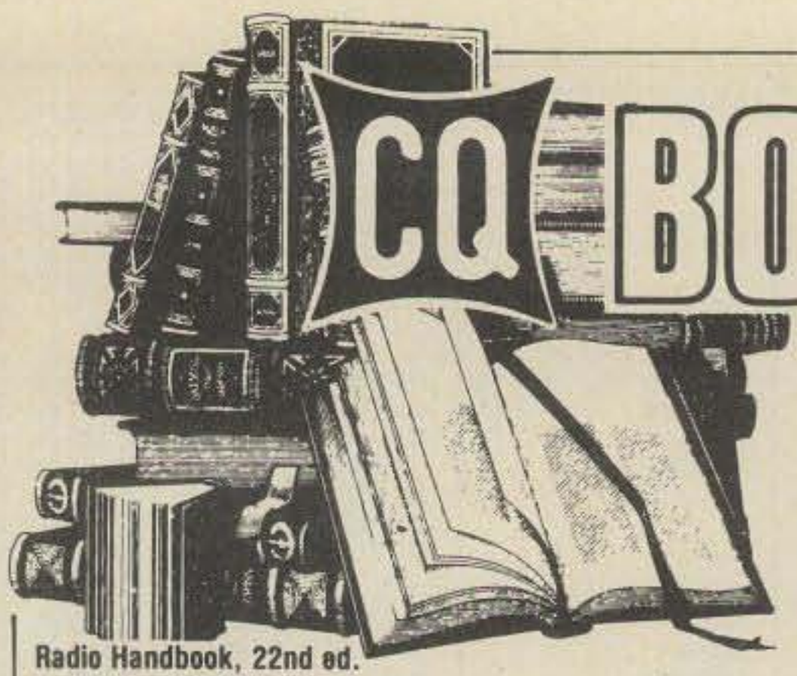

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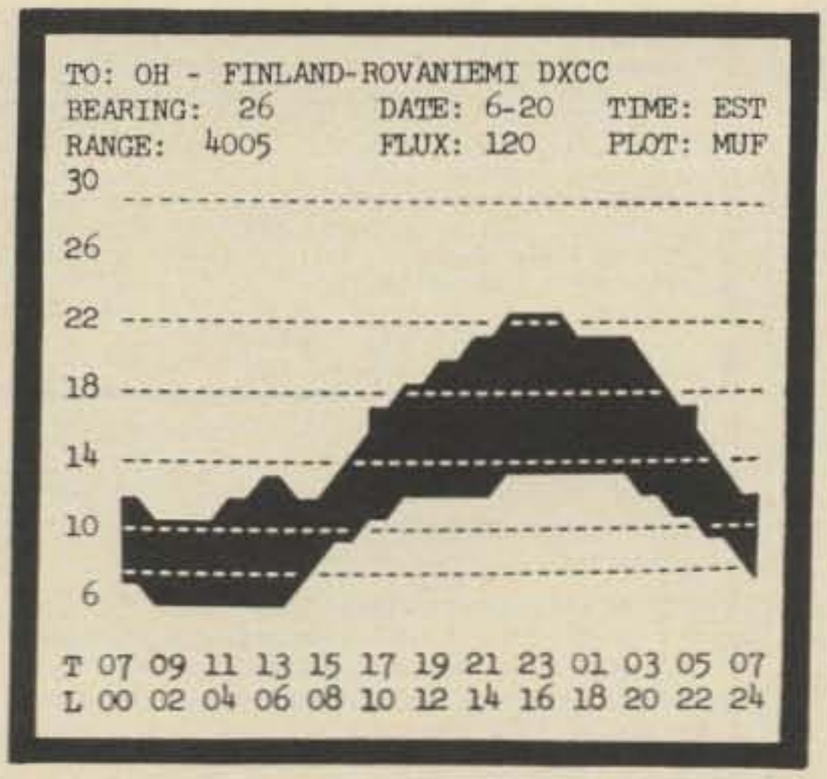

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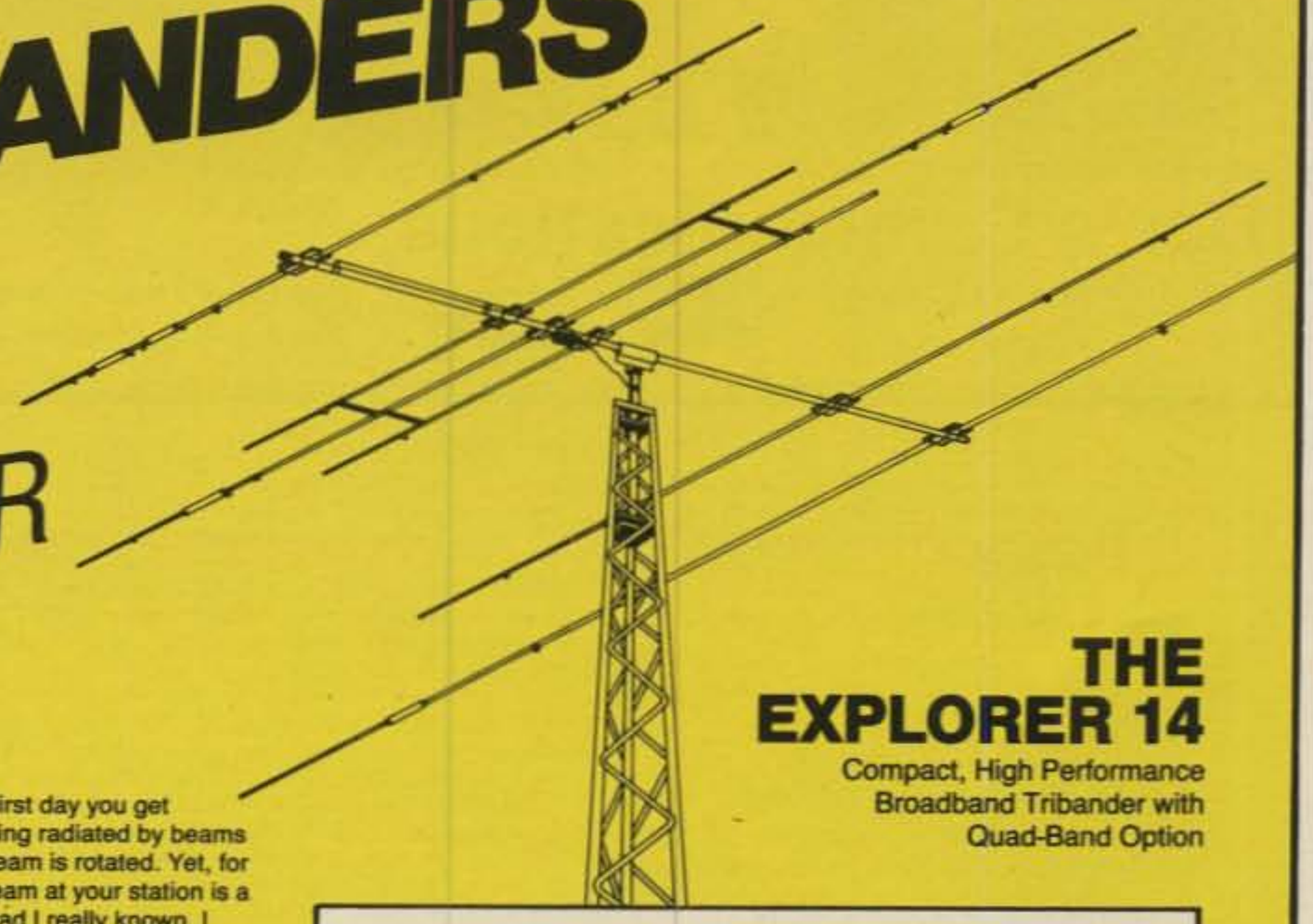

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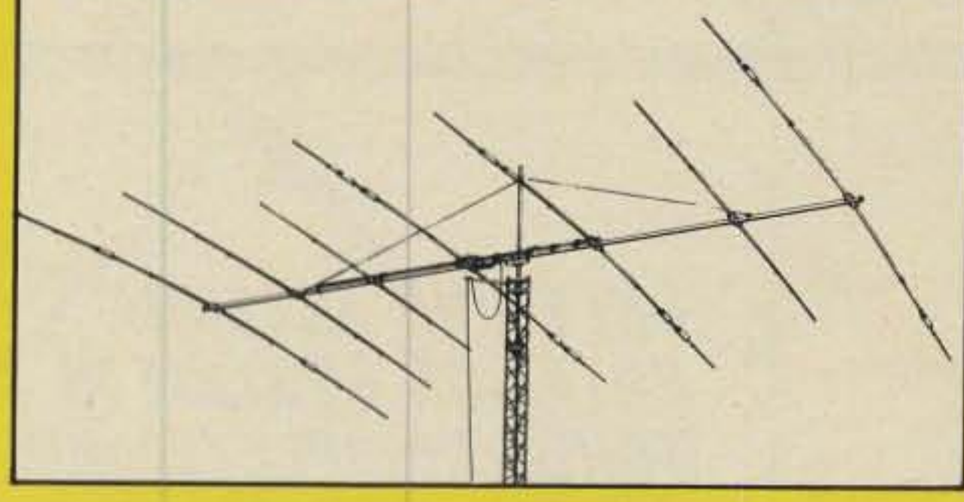

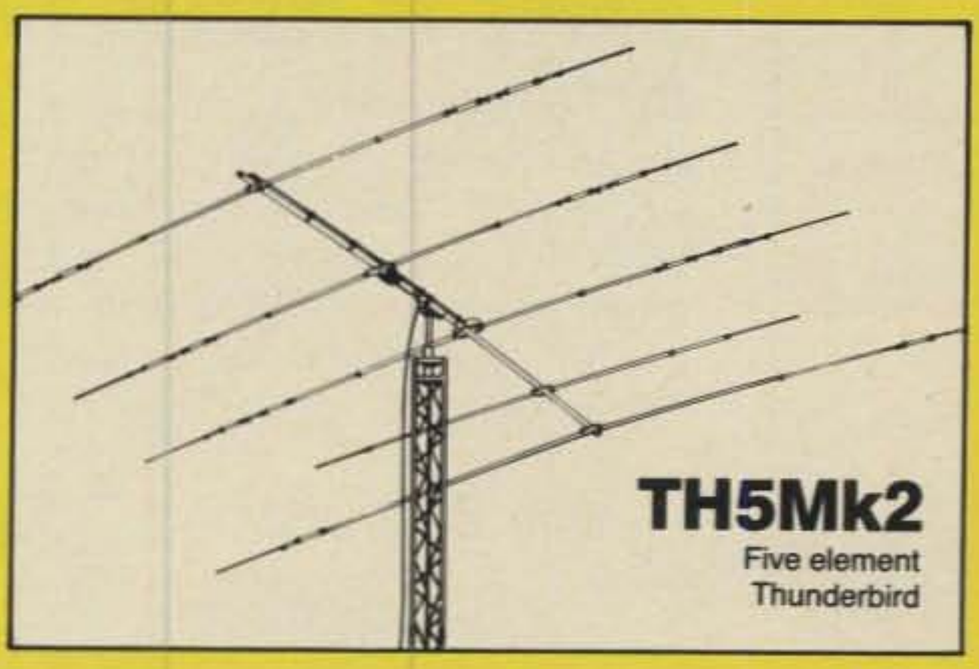

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HEATHKIT HW-2021 two meter walkie-talkie with auto-patch encoder, charger, and carrying case, $80. REGENCY HR-6 six meter mobile FM transceiver, 12VDC, mint, $100. SPARKOMATIC AM/FM/40 channel CB in-dash mobile radio, new in box, original cost $269.95, sell for $100. HALLICRAFTER S-120 four-band worldwide shortwave receiver, $100. New MOTOROLA 4025 AM 40 channel base station; this CB sold for $269.95, now $125. PRESIDENT WASHINGTON 40 channel new AM/SSB base station, in full warranty, original cost $449.95, sell for $250. DEMCO by Command 10 to 1000 watt power-SWR-modulation meter, like new, $75. MACO Model 60 frequency counter (new), $125. REGENCY DX3000 scanner, new 30 channel six band programable AC/DC, list $269.95, sell $185 with warranty. REGENCY RS2 Super-het XK long-range radar detector, in warranty, $85. Paul Duncanson, 6846 Calumet Ave., Hammond, IN 46324 (tele: 219-932-2196).

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, and all others. Six ½" digits in a 5" wide by 1½" high and 9" deep metal cabinet. Send $1.00 for information. GRAND SYSTEMS, Dep't. D, P.O. Box 3377, Blaine, WA 98230. Canadians VE7LB.

HAMFEST: The annual Kankakee Hamfest will be held at the Kankakee County Fairgrounds on May 5. FCC booth, large flea market, and many exhibitors. Take exit 308 off I-57 to Rt. 45 South 1 mile. For further info contact Don Kerouac, 1377 Circle Dr., Kankakee, IL 60901.

COMMODORE-64 5 BAND DXCC LOG includes custom beam headings, distances to DX plus continent, country, zones, QSOed/QSLed on any band, phone or CW, upon country name or call-sign entry. Diskette and instructions $18.99 U.S. ppd. Sondor Software, P.O. Box 416, Sarnia, Ontario, Canada, N7T-7J2.

FREE SHIPPING, Continental USA. MINI-QUAD's $139.95, BUTTERNUT HF6V's $106.50, HF2V's, MOSLEY TA33, $239.95, AMERITRON, NYE, AMP-SUPPLY LA-1000A $379.95. Stamp for flyer. Don, HART EASTERN COMMUNICATIONS, 1444 Darlington Drive, Derby, New York 14047, phone 716-947-4840.

FCC COMMERCIAL GENERAL RADIOTELEPHONE LICENSE CORRESPONDENCE COURSE. 60 individual lessons for $89.50. Payment plan. Results guaranteed! Details free. AMERICAN TECHNICAL INSTITUTE, Box 201, Cedar Mountain, NC 28718.

COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates C.W. on TV speaker. Random code, keyboard input, or prerecorded "CW Tests." Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). N7BCU, Dennis Olver, 22000 S. Tonya Ct., Beavercreek, OR 97004.

ROSS $$$$ USED April SPECIALS: (OVER 300 USED ITEMS IN STOCK) KENWOOD R-820 with four filters $589.00, TS-180S $429.00, VFO-180 $95.00. DRAKE R-7 $769.00. COLLINS 32S-1, 75S-3, 516F2 $569.90. ROBOT 800 $299.00. YAESU FT-301D $339.90, FT-901DM $579.00. ICOM IC-245 $169.00, IC-21A $169.00. If this month's special is not what you are looking for, send SASE, call letters, name & phone # for used list. Over 6,000 NEW ham-related items in stock. MENTION AD. Prices cash, FOB Preston. Closed Monday and Saturday at 2:00. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263, phone (208) 852-0830.

FREE SUBSCRIPTION—THAT'S RIGHT. We will send you a FREE one-year subscription to "THE SWAP LIST" . . . the national publication where you can sell your used equipment FAST. To get your FREE SUBSCRIPTION just send us an ad of 30 words or more selling used Radio, Computer, or Electronic Equipment. Personal ads are 25¢ a word; Business ads are 50¢ a word. Mail to: THE SWAP LIST, BOX 988-C, EVERGREEN, CO 80439.

"SUPER SAVINGS": ICOM ICR-71A $659.50. Kenwood R-2000 $495.50, R-1000 $409.50. Sony 2002 $219.50. Bearcat DX-1000 $489.50. Regency HX-1000 $239.50, MX-5000 $385.50, HX-2000, MX-4000, IN STOCK CALL!! Bearcat BC-300 $359.50, BC-250 $255.50, BC-180, BC-201. Yaesu FRG-8800, RF-3100 $266.50. Panasonics, CB's, Coax, Antennas, MFJ, CW/RTTY decoders. FREE UPS SHIPPING & INSURANCE TO 48 STATES. 25-Page Picture Catalog $1.00 (refundable). GALAXY ELECTRONICS, Box 1202, 67 Eber Ave., Akron, Ohio 44309, phone 216-376-2402 (9–5 pm EST).

CODE PRACTICE PROGRAMS diskette for IBM PC, PC/jr. $10 p.p. Andrew Modla, 5 Derby Place, Newtown, PA 18940.

The 16th ANNUAL B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 26th, 1985, at the Convention Center, Main and Fifth Streets. Parking in adjacent City Garage. Admission is free to all. Sandwiches, snacks, and C.O.D. Bar available. Live entertainment for a super social evening. Don't miss it. Two exciting top awards, and many, many others. For further information, contact the Miami Valley F.M. Association. P.O. Box 263, Dayton, OH 45401.

WANTED: Help and/or instructions on converting BC-348Q to AC. Fred Richards, 865 Main St., Hingham, MA 02043.

HAVE AM CAPABILITY? Join SPAM (Society for Promotion AM). Membership is free. For free info send s.a.s.e. to F.A. Dunlap (SPAM), 14113 Stoneshire, Houston, TX 77060.

Why is New York City called the Big Apple? Send WB2JKJ and the Crew at Junior High School 22 your QSL and not only will we tell you but you might also get our QSL OF THE WEEK AWARD.

BUYING, SELLING, OR TRADING AMATEUR RADIO EQUIPMENT? Woody's Amateur Trader gives you the most for your money. We're fast and economical; 25 cents a word; name, address, call, and phone free. Published 2 times monthly, $9.00 a year, $5.00 six months. Woody's Amateur Trader, P.O. Box 202, Lynden, WA 98264.

Advertiser's Index

We'd like to see your company listed here too. Contact Jack Gutzeit, W2LZX, or Arnie Sposato, KA2TYA, at 516-681-2922 to work out an advertising program tailored to suit your needs.

Presenting two small cases for a lot of mobile power.

You won't find a 45-watt, 2-meter FM mobile rig that's built smaller than the Yaesu FT-270RH.

Nor will you find a dual-band FM mobile that offers the crossband full-duplex capability found in the 25-watt Yaesu FT-2700RH.

It shouldn't be surprising. We've been coming up with a lot of innovative concepts lately.

The FT-270RH measures just 2 x 6 x 7 inches. Conveniently fitting its high-power punch into many small spaces of your car. Places where other 45-watt mobiles just won't fit.

The FT-2700RH is small too. Smaller than other dual-banders. But with one big difference: a "DUP" button. Push it, and you're operating full duplex, 2 meters on one VFO, 440 MHz on the other. Each at 25 watts. So you can simultaneously transmit and receive in true telephone style.

Once installed, you'll find the FT-270RH and the FT-2700RH equally simple to operate. Just turn the rig on, dial up a frequency, select offset or duplex split, and you're on the air.

Each rig gives you 10 memories for storing your favorite frequencies. Dual VFO capability. A clean, uncluttered LCD display for easy readout. Push-button jumps through the band in 1 MHz steps. Band scanning with programmable upper and lower limits. And priority channel operation.

You don't even have to take your eyes off the road to determine your operating frequency and memory channel. An optional voice synthesizer announces them both at the push of a button on the microphone. The FT-2700RH announces both your 2-meter and 440 MHz operating frequencies.

Also, tone encode and encode/decode capability is programmable from the front panel, using an optional plug-in board.

So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

YAESU

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ICOM Dual Bander

IC-3200A

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Dual Bands. The IC-3200A covers both the 2-meter (140.000–150.000MHz) and 70cm (440.000–450.000MHz) bands. The IC-3200A also features fully programmable offsets in 5KHz steps for MARS and CAP repeater operation.

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10 Tunable Memories. To store your favorite frequencies, 10 memories are provided. Each memory will store the receive frequency, transmit offset, offset direction and PL tone. Each memory can be tuned up or down when selected, yet automatically returns to the original frequency when reselected. All memories are backed up with a lithium battery.

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- Frequency dial lock
- Dual VFO's
- Mounting bracket

Optional Accessories. An optional IC-PS30 system power supply, voice synthesizer and IC-SP10 speaker are available.

See the IC-3200A at your local ICOM dealer for the best buy on a full featured dual bander.

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