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Amateur Radio

CQ

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Rules For The First CQ WW VHF WPX Contest

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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in amateur radio

TM-211A DCS... a new turn in 2 meters/70 cm.

TM-211A/411A

The TM-211A 2 meter and the TM-411A 70 cm mobiles combine ultra compact size with the added feature of a 7 position adjustable front panel, allowing you maximum flexibility in both home and automotive installations! These compact transceivers also feature Kenwood's innovative DCS (Digital Code Squelch) circuit, that allows you to program your transceiver to respond only to transmissions from stations whose radios transmit a pre-selected digital code. Both radios deliver 25 big watts of R.F. power on HI and 5 watts (approximately) on LO power. Dual digital VFO's, built-in, highly visible yellow LED display, five memories plus COMM Channel add to this impressive array of features. The TM-211A and TM-411A each boast high performance receive and transmit specifications and an external high quality speaker that provides unsurpassed sound quality. Mounting flexibility is also a feature. Yes, all these features, plus priority watch, memory and programmable band scan, microphone test function, audible "beeper" for operation confirmation, repeater offset switch and reverse switch. The TM-211A and TM-411A offer you the best in 2 meters and 70 cm operations!

Optional accessories:

- CD-10 Call Sign Display
- PS-430 D.C. Power Supply
- KPS-7A Power Supply
- MC-55 Mobile Microphone with Time-Out Timer
- MA-4000 Dual Band Mobile Antenna with Duplexer
- SW-100A/B SWR/Power meters
- PG-3A Noise Filter

More information on these products is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

CD-10/DCS

The optional CD-10 helps maximize your use of Kenwood's revolutionary new signalling concept, DCS (Digital Code Squelch). DCS uses digital code information to open squelch on a receiver that has been programmed to accept the specific code being transmitted. Up to 100,000 different 5-digit codes are possible, allowing each station to have its own "private call" code or to respond to a "group call" or "common call" code. Program your call sign (up to 6 digits) in the ASCII code and it is automatically transmitted when the transmit key is depressed. The CD-10 stores the calling station's call sign in its memory for future reference, and it is also displayed on the L.C.D. readout. The CD-10 can store call sign data of up to 20 stations, allowing you to quickly check for calls if you have been absent from your station, and review your contacts for logging purposes. The DCS/call sign data transmission system uses mark and space frequencies within the normal speech band width (compatible w/most repeaters).

TM-201A/401A

The extremely popular TM-201A 2 meter FM (25 watts, 142.000 to 149.000 MHz) and the TM-401A 70 cm FM (10 watts, 440-450 MHz) ultra compact mobile transceivers are also available.

Specifications and prices are subject to change without notice or obligation.

KENWOOD

pacesetter in amateur radio

TS-930S "DX-traordinary"

TS-930S

We call it "DX-traordinary" because the TS-930S has now become the favorite rig of the serious contester! Its superior capability for full break-in split-frequency operation, the speed and convenience with which its eight memory channels can be accessed, its unsurpassed receiver dynamic range and its remarkable ability to select the desired signal during periods of heavy QRM, utilizing VBT, Slope tuning, IF Notch filtering, and tuneable audio filtering, have all combined to make this the rig that gives you the EXTRA EDGE!

The TS-930S is loaded with all the special features that you always wanted in an HF transceiver. Full coverage of the 160 through 10 meter bands, including the new WARC frequencies, (easily modified for HF MARS), plus a general coverage receiver that can tune any frequency from 150 kHz to 30 MHz. Operation in the SSB, CW, FSK, and AM modes, with selectable full or semi CW break-in. All solid-state, with 250 watts PEP input on SSB, CW, FSK, and 80 watts input on AM. SWR/power meter. Triple final protection circuits plus two cooling fans built-in. 10-Hz step synthesized frequency control. Available with optional automatic antenna tuner built-in, another industry first! Dual digital VFO's. Eight memory channels that store both frequency and band information, with internal battery back-up, (batteries not supplied). Dual mode adjustable noise blankers, especially effective in eliminating "woodpecker" type interference. SSB IF slope tuning, for maximum rejection of interference. CW variable bandwidth, with pitch and sidetone control. IF notch filter. Tuneable audio peaking filter. Unique six digit white fluorescent tube digital display is easy-on-the-eyes during those long contests. RF speech processor, for higher average "talk-power." SSB monitor circuit. 4-step RF attenuator. VOX. 100-kHz marker. AC power supply built-in, 120, 220, or 240 VAC.

TS-930S Optional Accessories:
AT-930 automatic antenna tuner, SP-930 external speaker, with selectable audio filters, YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filter, YK-88A-1 (6 kHz) AM filter, all plug-in type. SO-1 commercial stability TCXO, MC-60A deluxe desk microphone, MC-80 and MC-85 communications microphones, MC-42S mobile hand microphone, TL-922A linear amplifier (not for CW QSK), SM-220 station monitor, PC-1A phone patch, SW-2000 SWR/power meter, 160~6 meter, SW100A SWR/power/volt meter 160-2m HS-4, HS-5, HS-6, and HS-7 headphones.

Isn't it about time you stepped into the winner's circle?

More information on the TS-930S is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.

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- Full break-in (QSK)
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- Separate power supply for easy station layout
- Four status indicators
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CQ The Radio Amateur's Journal

ON THE COVER: Yes, they have switched to safety. On the left is Steve Katz, WB2WIK, and on the right is Peter Putman, KT2B. The two *CQ* VHF Contest Directors are shown making final adjustments on a homebrew 4-1000A amplifier for 50 MHz. Photo by Larry Mulvehill, WB2ZPI.

FEBRUARY 1985 **VOL. 41, NO. 2**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

If you check the table of contents this month, you will notice a large amount of VHF material. This issue was designed to get you in the mood to think about VHF, as we are also featuring the rules for our new VHF contest. Take some time and check out the rules. You'll find that in this premier contest there is literally something for everyone who enters.

For the most part, we hope you'll have fun entering this contest. For some of you, this will be a first exposure to the world of VHF and UHF, and you may be surprised at what you can work. It will also be a way of increasing the amateur population on some of these bands, even if only for a short period of time. Who knows? It might open up new possibilities and challenges for amateur radio.

East meets west at the ICOM America party: Sumio Miyamoto, JA1QCQ, Editor-in-Chief of the Japanese CQ, and our own CQ's Editor, K2EEK.

Travels With CQ

About a week ago I got a chance to get out to the west coast for a quick trip. ICOM America, Inc. planned a party in celebration of their new building, and I was invited to attend. The trip also presented an opportunity to see some other folks in that general area. I started out by flying to San Francisco to see an old friend, Bill Orr, W6SAI. As many of you know, Bill is with EIMAC, a division of Varian. He is also the author of a popular series of antenna books and numerous articles on amateur radio. Bill gave me the guided tour of EIMAC, and I must say that it was quite impressive to watch those power tubes being made. One of the bigger tubes they manufacture is rated at 1.5 million watts. No, I couldn't wrangle a pair of them from Bill for a product review. I had lunch with Bill and Jack McCullough, W6CHE (Jack and Bill Eitel, W6UF, started EIMAC), and then left for my flight up to Seattle.

I arrived in Seattle in time for the evening rush-hour ceremony (just like New York) and drove up to Bellevue (about 20 miles). The next morning I drove to Lynwood (another 15 or 20 miles) to visit with Mike Lamb, N7ML, and George Buxton, N7EZJ, of AEA. They've managed to create a truly unique amateur radio product in their Dr. DX® . After a tour of the facilities, they showed me a great testimonial letter for Dr. DX® from a very satisfied user, K7UGA. Mike and George were also invited to the ICOM party, and so after lunch Mike and I drove back to Bellevue, sidetracking slightly to see his new home. It's in a beautiful location, an amateur's dream, high on a hill with a wonderful view and in a setting not unlike some of our Christmas covers of *CQ*ville. I mention that because two weeks after the Lamb family moved in, another amateur moved in down the hill. When you look out the front windows of the Lamb's house, you can see a large tower with stacked beams and plenty of inverted Vees and guy wires. It looked good to me, but I was unable to check with Mike's wife.

The new ICOM building is a beautiful example of modern design, and everything inside, down to the squeaky clean smell (no smoking allowed in the building), was obviously brand new. I was taken on a tour of the 40,000 square foot building, about half of which is being utilized now; the rest is slated for expanded services. The President of ICOM, Tokuzo Inoue, JA3FA, and his wife, Ritsuko, were there to welcome 200 to 300 guests to the new headquarters of ICOM America, Inc.

The party started with a traditional Japanese saki ceremony. We were entertained by a string quartet (a nice touch) and had our choice of American or Japanese (or both) delicacies to eat (it's a rough life). The guest list was diversified in that ICOM's amateur, marine, and land mobile divisions were represented by people from those fields. I got to meet Sumio Miyamoto, JA1QCQ, the editor-in-chief of the Japanese magazine *CQ*, which some of you may have seen here. It really was a remarkable party (it was a job in itself just to sample all of the foods available) and a very proud moment for all of the folks at ICOM. It certainly was a pleasure to be there and share that moment of their joy and accomplishment.

What's It All About?

One of the big questions today concerns tomorrow. From where are the new amateurs going to come? How do we attract younger people to amateur radio? The consensus seems to be that youth and younger people are tomorrow's hope for amateur radio. How young or what constitutes youth hasn't been that clearly defined. For some that means high school or college; for the more "seasoned" amateur young can be 25 to 35 years old.

As the median age for amateurs increases, the concept of youth changes accordingly. It all depends on youth in relationship to what. Ideally, the correct starting age should be from 7 to 12 years of age. At that age children are more receptive, are not intimidated by exams, and have an insatiable curiosity. They are in school, can read and comprehend (probably more than we give them credit for), and certainly might like the concept of amateur radio.

It's also a reasonable assumption that these potential amateurs as a rule are not encumbered by too many of life's social demands, unless they're especially precocious. Many kids in this age group have been attracted to computers, and in years gone by to CB. Whatever the pastime has been or the attraction seems to be, there are parents who seem able or willing to underwrite the expense. Part of it does go back to the theory of disposable income.

For the least monetary investment and your (insert our, my, or whatever fits) time, we might consider an approach to our own children. Can we sell amateur radio or make it attractive enough to our own children? If so, why aren't we doing more of that? Another hurdle or consideration that we all must think about is the following: if we do get larger and larger numbers of "young" people to join amateur radio, can we as a group accept them. Can we be tolerant of them (as others were of us many years ago)? Can we overcome the private-club philosophy that says, "I don't want kids on my repeater (substitute net, band, frequency, or whatever fits)."

The approach is simple. Amateur radio is fun. You can talk to people all over the world and make lots of new and exciting friends. Amateur radio is not digital theory, Morse code, an unstable ever-changing examination procedure and content, or any organization. *Amateur radio is fun. You can talk to people all over the world and make lots of new and exciting friends.* That's the simple message loud and clear. Try that out on your own kids. You just might be surprised. Everything else that some of us might feel is important will follow. But it will follow only if the goal is strong enough and attractive enough. After all, it worked for us.

73, Alan, K2EEK

So You Want To Try Something New? How 'Bout The AEA Packet Breakthrough!

Because:

You want to recreate the thrill of your first ham contact!
You'd like to learn something new!
You want to send error-free messages on HF/VHF/Satellite in spite of QRM!
Frequency in use? No problem!! Jump right in and transmit!!
No VHF line-of-sight path to Joe? Again, no problem! Digipeat through other stations to Joe!
Joe's not there? Store a message at his station!
RTTY is too slow? "Packet away" at up to 1200 baud or more.

In Packet Radio, your station is a radio, a computer terminal, and a TNC (Terminal Node Controller, hopefully the AEA PKT-1). You type and the TNC sends short bursts (packets) of two-tone modulation called AFSK. The other station decodes them and displays them on his monitor screen. He then sends to you.

There is a lot of activity—local clubs, voice nets, mailboxes/bulletin boards, links between bands, long range (digi)repeaters and chained digipeaters, voice nets, search/rescue and emergency work, newsletters, satellite communications, technical development of new equipment and software, etc. 220 MHz will be very important to packet radio. Help us populate it and "Save the Band"!! We need your help and participation.

AEA Packet Radio
RAM length is 2000
cmd: connect to N7ML via KB7G, K6RFK
cmd: ***CONNECTED TO N7ML
Hi Mike - have you seen the great new AEA PKT-1?
YES JOHN - LOOKS GOOD K
Bye Mike sk
cmd: ***DISCONNECTED
cmd:

Packet radio is:

Standardized—your station can talk to any other packet station.
Popular—fast growth over the last year to about 2000 stations in the U.S.
Multi-frequency—10.147, 14.103, 145.832, Oscar 10, 145.01 (and other local 2M frequencies) are being used now.
Public Service—traffic handling, search and rescue, public events, emergency service.
Multimode—conventional radio, meteor scatter, but no EME/moonbounce yet (will you be first?).
Simple—you control the PKT-1 by typing 5-6 simple one- to four-letter command words on the terminal or computer. Several of them are shown in the above monitor screen simulation, which shows a connect via digipeaters, and an interchange between two stations.

It's easy to get going. You probably already have the radio, and the computer or terminal. You'll need to operate your computer in RS232C mode using "communications terminal" software that is free or cheap. We can usually furnish information on what to use for popular computers. The rest of the software is resident in the PKT-1 (you will need to buy a PKT-1). And you need a MIC connector to connect to the (furnished) radio cable you'll plug into your radio MIC jack. And "BRAAP," you're on the air with "Packet Racket."

You're likely aware of Packet Radio already. If not, read WB4GXD's three excellent tutorial articles in the Sept. and Oct. '83 and Jan. '84 issues of *73*. Clip the coupon below, and we'll send articles, a reading bibliography, product literature on our PKT-1 Packet Controller, answers to commonly asked questions about packet radio, lists of packet clubs in your area, sample packet newsletters from the ARRL and clubs, AEA dealer locations, packet videotape and audio cassette loan info, voice net info on HF/VHF where you can listen and ask questions, a blow-by-blow description of how easy it is to get started, a free AEA Packet Lapel Button, AND WE'LL PUT YOU ON OUR PACKET MAIL LIST to ensure you'll get further mailings!!!

See your favorite AEA dealer, clip and send the coupon, or call John Gates, N7BTI (the AEA Packetman) at (206) 775-7373.

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OK AEA, send packet information to:

Name _____ Date _____
Street _____
City, State _____
Zip _____ Call me at _____

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ICOM 144, 220 and 440MHz

MOBILES

The World's Most Compact Mobiles

ICOM's three ultra compact mobiles...the IC-27A 2-meter, the IC-37A 220MHz and the IC-47A 440MHz... are the smallest mobiles available.

Even in such a small package the 25 watt mobiles contain an internal speaker which makes them fully self-contained and easy to mount.

Size. The ICOM compacts measure only 5½"W x 1½"H x 7"D (IC-37A is 9" deep)... which allows them to be mounted in various "compact" locations. Yet the compacts have large operating knobs which are easy to use in the mobile environment.

More Features. Other IC-27A/37A/47A standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan, and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 external speaker are also available.

32 PL Frequencies. The IC-27A/37A/47A come complete with 32 PL frequencies.

9 Memories. The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

Scanning. The ICOM compacts have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel...and the scanning speed is adjustable.

Stacking Mobile Mounts. The IC-27A/37A/47A can be stacked to provide a three band mobile station. Each band is full featured and will operate even when another band is in use.

The IC-27A/37A/47A provide superb performance in the mobile radio environment. See them at your local ICOM dealer.

CIRCLE 65 ON READER SERVICE CARD

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

IC-02AT

ICOM 2-Meter Handhelds

If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

Frequency Coverage. The IC-02AT covers 140.000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz...both include frequencies for MARS operation.

IC-02AT Features. ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.

Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAh IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

IC-2AT

IC-02AT

CIRCLE 23 ON READER SERVICE CARD

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

Our Readers Say:

TU][Revisited Correction

Editor, *CQ:*

Thank you for the nice spread in the November 1984 RTTY issue for my article "TU][Revisited." I have already received correspondence and telephone calls regarding the circuit, including one from Bob Hart, the author of the original "TU][."

There was only one major error that I have detected in the article, and I am not sure whether I left it out or whether it was lost in the redrafting. There is a ground connection missing from the schematic diagram on the 7805 regulator chip. If the project is constructed using the PC board there is no problem. However, if the circuit is breadboarded, it might cause damage to the computer. Could you please print a correction in a subsequent issue of *CQ*?

Thanks again for printing my article, and keep up the good work.

Lawrence W. Stark, K9ARZ
St. Charles, IL

Does 0000Z Exist?

Editor, *CQ:*

Reference time of starting of *CQ* World-Wide DX Contest, as announced on page 50 of September 1984 issue of *CQ*, I maintain that there is no such time as 0000 (Saturday). Having served 30 years in the military and having used 2400 time since 1927, the day ends at 2400 hours. The *next* minute of time is *0001* of the next day. This would *make it perfectly clear* as to which *day* is involved.

Richard L. Hoyt, W5RIT
Fayetteville, AR 72701

"Let's Take the Bile Out of Maritime Mobile!"

Editor, *CQ:*

One sometimes wonders if maybe the average Maritime Mobile (M/M) operator might have gotten his license as a prize in a bag of candy or a box of Cracker Jack!

In the Pacific area, particularly in Southeast Asia, Maritime Mobile operators frequently find themselves, their vessels, etc., in an emergency situation. It is a common thing for hams from Singapore to Japan to jump in and give communications support, make relays, and even run errands. Many times these emergencies, MAYDAY or SOS incidents, last not just a few hours, but days. It's not uncommon for people to take annual leave in order to "hang in there" and see one of these things through. The list of hams who routinely come up on frequency and work on these ad hoc, impromptu nets would fill a section of any call book.

Once the emergency is over with, the problem is getting these M/M operators to recognize or even acknowledge that the ham fraternity responded to his call for help, advice, or whatever. Ask for or try to QSL one of these Maritime Mobilers after he's no longer in danger or need of assistance, and the stock response seems to be a bland "Sorry, OM," or more likely, silence. I wonder what the Maritime Mobiler's reaction would be if they asked for help and no one answered or someone said, "Sorry, OM"! *It would seem to me that anyone who can afford to tool around in a yacht can also afford a few pennies for a QSL card and the consideration to say thank you once in a while!*

In addition to these ad hoc emergency nets, one should also acknowledge the established, on-going nets that give daily, on-going assitance year in and year out. Two of the more notable of these established nets in the Pacific are the Southeast Asia Net (SEA net) and "Rowdy's" net. Both occur on 14.320 ± at 1200 GMT and 2400 GMT, respectively, on a daily basis.

Both Peter Carbutt, 9V1TL (SEA net), and "Rowdy," TI7RT, have and do continually put in a prodigious amount of time, effort, and organizational know-how maintaining a very professional operation that is always there when help or emergency communications are needed. It's not just a sometimes thing. Peter Carbutt has been involved with the SEA net for something like 14 years, and "Rowdy" has been around for years also. Those of us who have either corresponded with or had an "eye-ball QSO" with these two men have a very definite impression that they are "involved." In my own case, and that of a fellow ham from Okinawa, Peter has more than extended himself that extra little bit. Another ham from Okinawa had a similar reaction when he met "Rowdy" a while back.

I'm not a "net person" by nature, but when I've gotten involved with these Maritime Mobile emergencies, it's an interesting and illuminating lesson on different people's reactions to protracted stress and danger.

Virtue may be its own reward, but a thank you goes a long way—particularly for a Maritime Mobile operator who has just been helped out of a tight spot.

Herbert M. Burnett,
W0KQE/JR6YGL/KA6HB
Okinawa

hy-gain®

TOWER OF STRENGTH

Rugged Hy-Gain antenna crank-up towers are made as no others. All steel construction and galvanizing after welding meets ASTM material standards. Giant welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

	Tower Sections	Height Extended	Height Retracted	Width at Base	Antenna Windload Limit	Weight
HG-52SS	3	52 ft. 15.8 m	21 ft. 6.4 m	16.44 in. 417.6 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	455 lbs. 206 kg
HG-37SS	2	37 ft. 11.3 m	20.5 ft. 6.2 m	13.75 in. 349.3 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	265 lbs. 120 kg
HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
HG-70HD	4	70 ft. 21.3 m	21.5 ft. 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg

Hy-Gain crank-up towers come complete with hinged base, installation steelwork, pre-drilled rotator plate and a manual winch.

Hy-Gain crank-up towers require no guying and conform to EIA, to the Uniform Building Code, and are approved by Los Angeles (license 1095). UBC documents for building permits are available on request (specify tower model) **before** you buy the tower.

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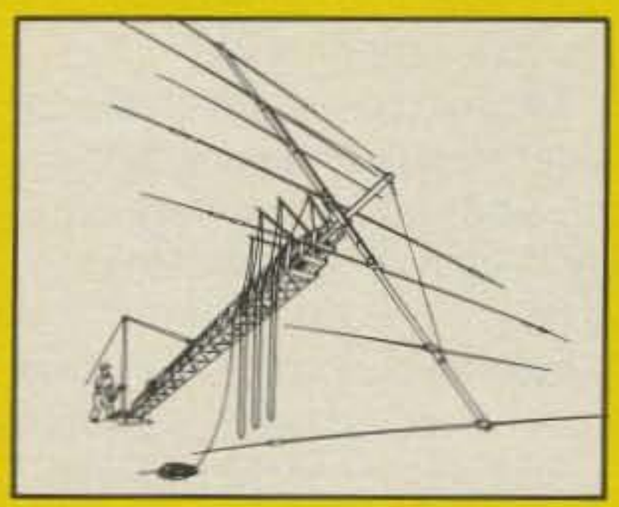

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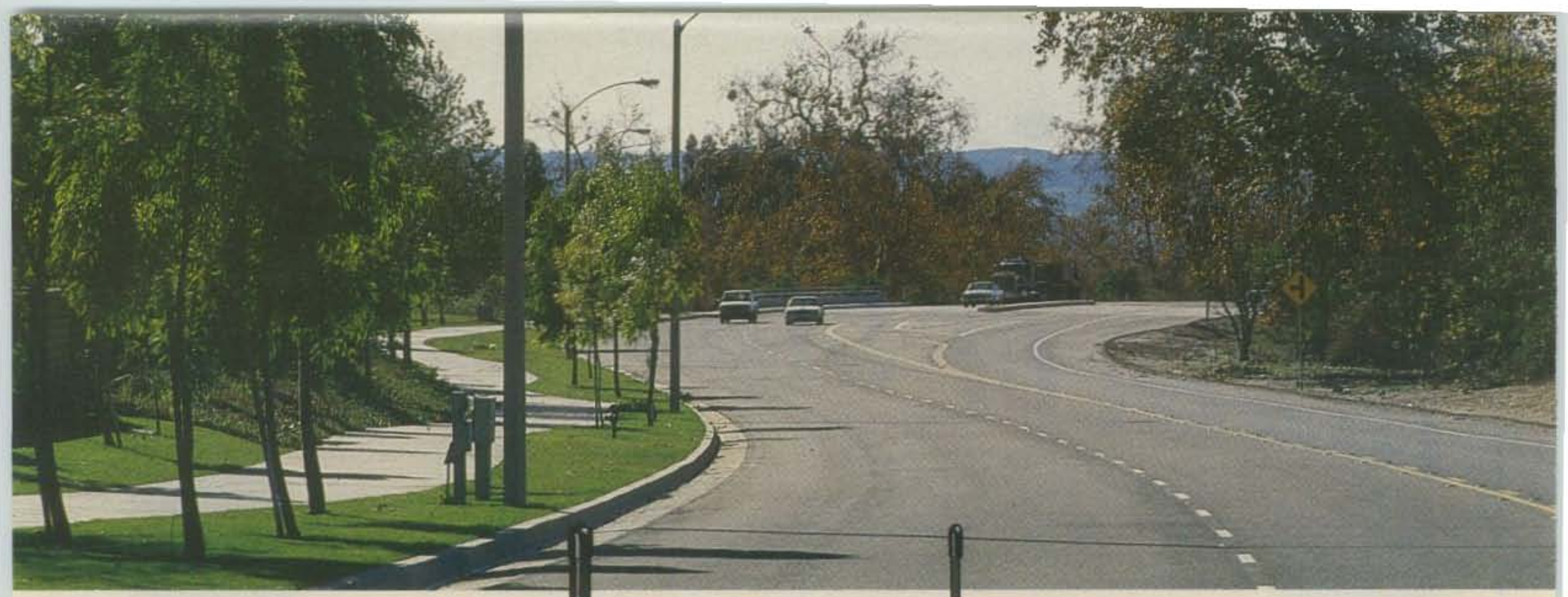

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Don't believe the saying that lightning never strikes twice in the same place. K5NW will attest to the fact that it can happen. Here are some suggestions on how to reduce the chances of serious damage to your home and equipment.

Lightning — It Could Strike You!

BY JOHN HAWKINS*, K5NW

It was an innocuous little thunderstorm, hardly worth noting. The actual date on which it occurred escapes me now, because what I thought at the time was such a terrible thing was soon to be overshadowed. It was about 6:00 a.m. around the first of August. I was on my way to the kitchen to make some coffee before heading to the shack for some early morning DX. BANG! It was a tremendous noise which seemed to reverberate throughout the house forever. I rushed to the shack, where I was met by the ominous smell of ozone and burnt radio parts. A quick check showed that the smell was coming from a 2 meter walkie-talkie and the AC charger in which it was sitting. I later discovered that the Ham II Control Box had also been damaged. The XYL came around in a few minutes and said, "That sounded close." "Yes," I replied, "Closer than you think!"

The damage to the talkie included a blown diode in the antenna changeover circuit, a blown transistor in the receiver front end, and the ground wire from the chassis to the negative charger terminal was *completely gone*. The damage to the charger included a blown voltage regulator IC, a couple of melted contact pins, and burnt plastic around the pins. The charger line plug was welded into the AC outlet. The rotator control box damage was confined to a delayed breaking circuit that I had recently installed. This circuit, which was connected directly to the control cable, had every diode and electrolytic capacitor on it blown out.

As I said, as serious as I thought that was, it was soon forgotten. For those who still believe that lightning never strikes twice in the same place, you are wrong, my friend, you are wrong. On August 14, I came home from work to find first that my automatic garage door would not function. Once I got into the house, I was again greeted by that ominous smell of ozone and burnt radio parts. Since there had been heavy thunderstorms in the area that day, I knew immediately what had happened. This time the damage survey showed that I had not been so lucky. Damage was spread throughout the house, and included the Drake T4XC, Ham II Control Box, remote coax switch, linear amplifier, a second rotator control box, the garage door opener, two television sets, and several light bulbs.

The T4XC antenna change-over relay contacts were pitted and welded together, and the wire from the coax connector was completely desoldered from the relay PWB. The Ham II power switch was all but destroyed, and all the diodes inside were blown out. The remote coax switch power transformer windings were shorted to the core, and all the diodes in that control box were also blown out. The coil in the remote switch itself was also burned out. The feed-through bypasses on the linear amplifier AC line cord had literally exploded. Some of the circuit etch was burned away in an active filter unit where it had arced to the grounded box.

Portions of the circuit etch inside the garage door opener were missing and several CMOS IC's were blown. A solid state audio module was blown out in one TV, and the power supply diodes were blown in another. Almost every AC plug in the shack had been disconnected from the outlets into which they had been plugged, and the snap-on top to a power strip was popped off. There was evidence of arcing from some of the ungrounded equipment to other equipment which was grounded.

Much of the damage, in the shack and elsewhere, appeared to be caused by a large surge of current which entered the various station components by way of the external cables associated with the tower. This current sought ground through the various power supply circuits, blowing any voltage-sensitive components in its path. It ultimately found ground through all power transformer secondaries which were connected to the grounded chassis. When the current passed through these secondaries, it created a high voltage transient in the primaries. Remember, in this case the transformers would be acting in reverse, having voltage step-up ratio on the order of 5 or 6 times that applied. This transient is what burned the coax switch power transformer, the amplifier AC bypasses, and the Ham II power switch.

The transient then continued on through the house wiring to the garage door opener where it caused an overvoltage condition which burned out all the CMOS devices. Much of the circuit etch which connected the AC line to the power transformer was gone. This must have been caused when the voltage transient caused a high current to flow in the fairly low impedance transformer primary. Several 115 volt motor control relays were heavily damaged in the garage door opener.

The current associated with the voltage transient was large enough to induce current into other nearby house wiring sufficient to burn out the light bulbs and to cause the damage in the televisions. Fortunately, the AC circut that serves the shack and the garage does not serve any other part of the house. This was done by design during the construction of the house, and I am convinced that it minimized damage outside the shack.

An outside inspection revealed several interesting things. Part of a wood window screen frame, adjacent to where the cables enter the shack, appeared to have exploded. This probably can be attributed to rapid expansion of the moisture inside the wood. Some of the XYL's potted plants

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"Heavy Duty" is Relative!

In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.

Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.

T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.

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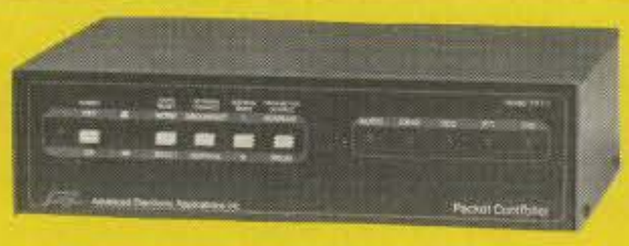

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which were sitting near the ground rods were virtually destroyed. They looked as if they had been blown down by a strong wind. This probably can be attributed to a rapid expansion of the air around the ground wire and ground rods. A portion of the lightning charge must have come down one of the guy wires, because next to one guy wire termination was a hole in the ground about 4 inches in diameter by about 8 inches deep. There were mud splashes on the driveway up to 10 feet away. Incidentally, there is an egg insulator in the guy wire which the lightning charge had to jump across to get to the bottom of the wire.

Another severe strike on an amateur station is documented in the February 1971 issue of *QST*. For comparison, W2FRC's only antenna was an 80 meter dipole supported on both ends by wooden supports. My antennas are supported on a 90 foot tower with 16 feet of mast extension beyond the tower. The tower is grounded by ½ inch diameter by 4 to 5 foot long copper pipes at each leg. The ground rods are bonded to the tower legs with #4 stranded copper wire. The station is grounded to three of the same type ground rods spaced about 4 inches apart and bonded together with #6 copper wire. The same type of wire connects the station ground bus to the ground rods.

W2FRC's dipole was supported on one end by a guyed wooden pole and on the other by a tall oak tree. The antenna itself was #12 solid copper wire fed with 300 ohm ladder line. The only ground for the antenna was the center tap of the antenna tuner tank coil. When the lightning struck, the top 30 feet of the tree was lost, and large portions of the dipole and feed line simply disappeared without a trace. The charge started down the feeders, but apparently jumped to a nearby rain gutter downspout, as the feeders passed close by. It then traveled along the downspout and passed through the wall into the house wiring. The only explanation for this was a sharp bend in the feeders near the downspout, plus the inductance in the tank coil must have provided sufficient impedance to cause the lightning charge to seek a path of lower impedance. A portion of the charge traveled down the guy wires here also, again jumping egg insulators on the way. The guy-wire current jumped to an ungrounded "dog run" wire and then blew a large hole in the garage wall where the dog run terminated. Serious damage to the radio equipment at W2FRC was avoided because the antenna was disconnected from the radios. Some minor damage did occur when the lightning charge entered the radios via the AC lines.

If that wasn't enough, W2FRC had some old antennas in his attic, none of which were grounded either. The lightning apparently traveled along some metal which was part of the roof, eventually passed through the roof on some nails,

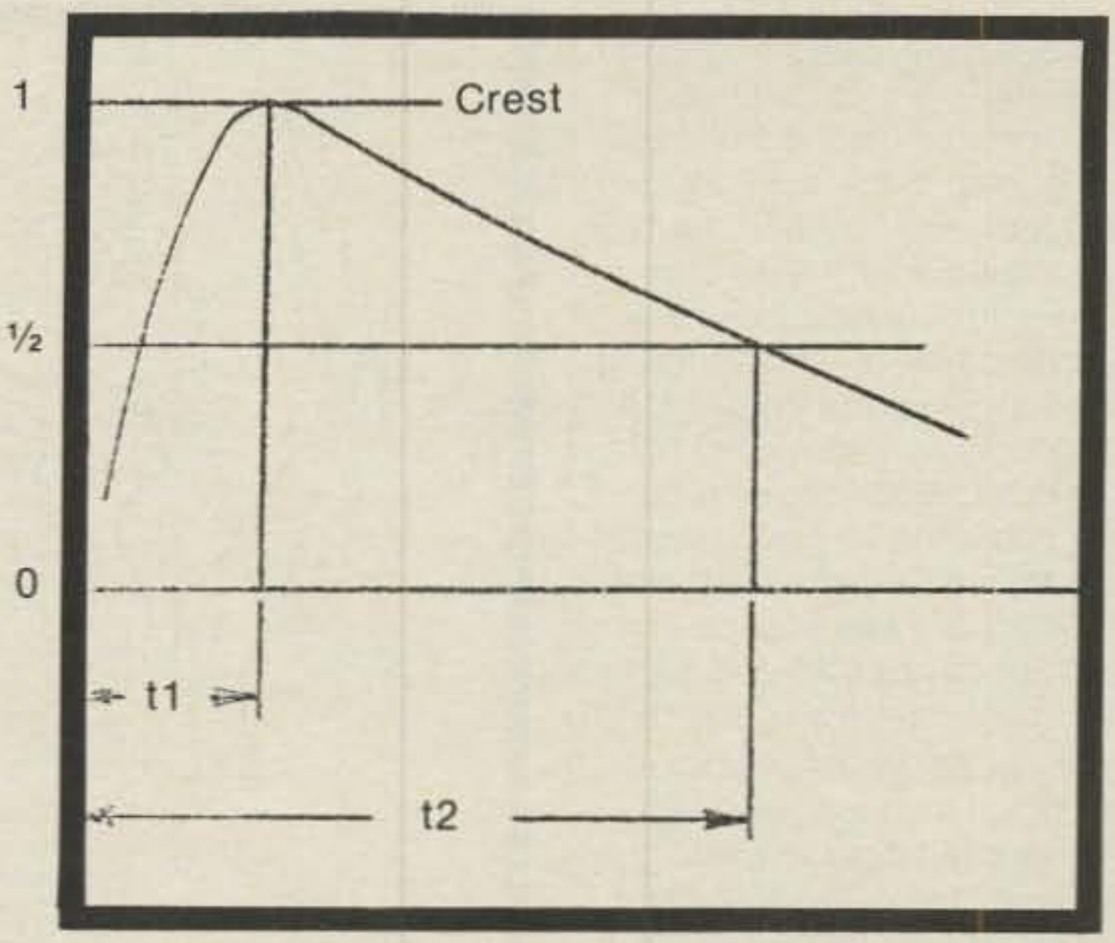

Fig. 1– Definition of the stroke waveshape in terms of its time to crest and return to half crest time.

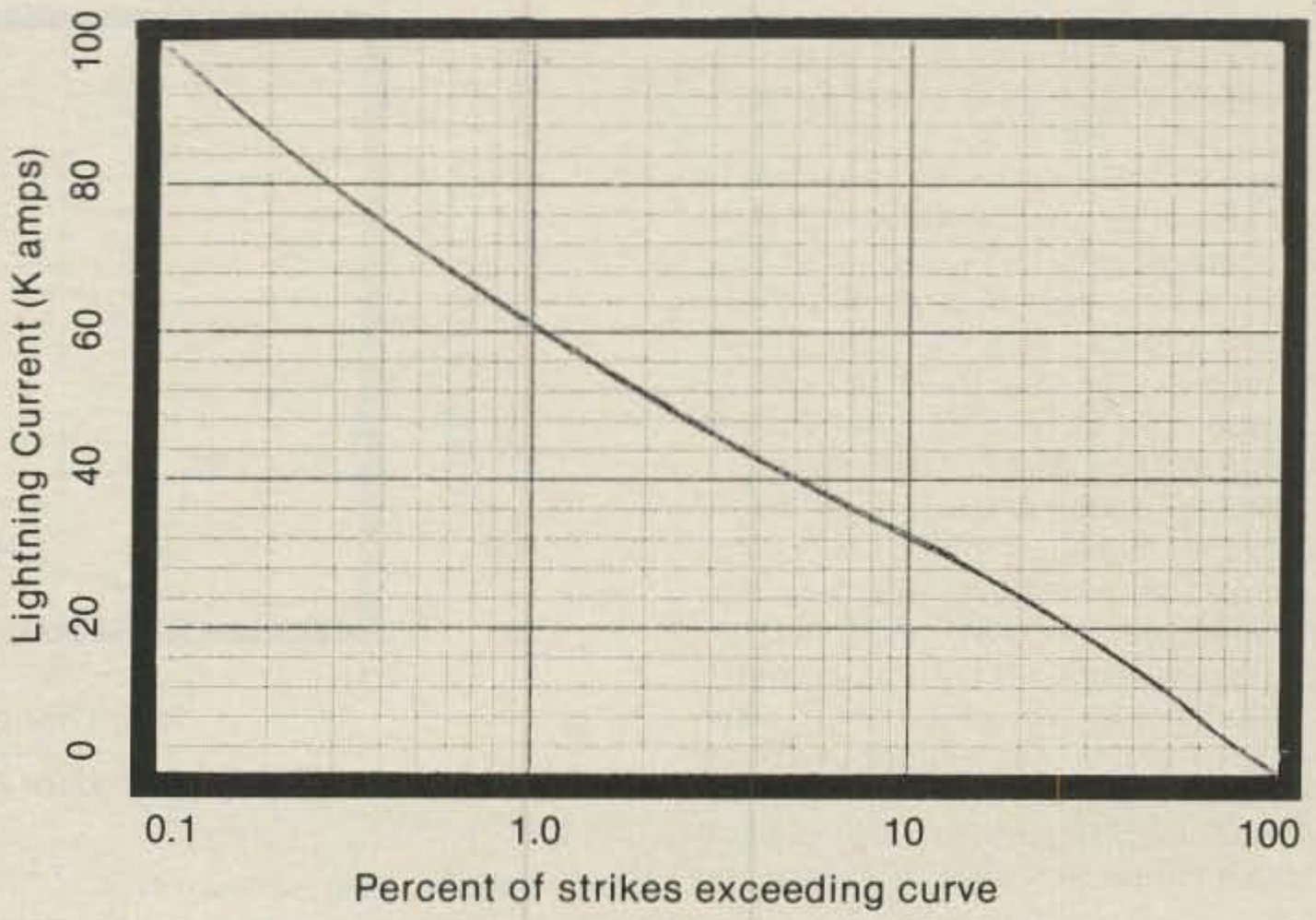

Fig. 2– The percent of lightning strikes exceeding the current value shown on the vertical axis.

and then arced to the attic dipoles. This arcing actually set W2FRC's house on fire. Thanks only to quick action from the local fire department, the house was not seriously damaged. A lightning expert who visited W2FRC said the damage was as extensive as he had seen. He estimated the stroke current to be on the order of 100,000 amperes.

Now, there are some lessons to be learned from all of this, but first let's take a look at some fundamental information about this powerful phenomenon called lightning. Some of the best information I could find on the subject was in Volume IV of the EMC Encyclopedia Series, *Lightning and Lightning Protection* by Hart and Malone.[1] The following information, for the most part, is taken from that source.

Lightning has bombarded the earth for millions of years. It can be both beautiful and awesome. The activity is enormous, and it has been estimated that 100 lightning flashes strike the earth every second. The average power contained in one of these lightning strokes is 10 followed by 13 zeros. Some scientists believe that lightning is the catalyst that triggered life on earth.

The total lightning discharge is called a *flash*, and each flash is made up of 3 to 4 individual *strokes*, each separated by about 40 milliseconds. This brief time lapse between strokes is what causes the lightning, when viewed by the human eye, to flicker. Many people think that lightning

[1]*Published by Don White Consultants, Inc., State Route 625 Box D, Gainesville, VA 22065.*

strikes from the ground up," which is both right and wrong. As the cloud to ground potential builds up prior to a stroke, a stream of electrons leaves the cloud and forms a series of step leaders. Each leader is about 150 feet long and is formed by the ionization of the air by the electrons. As a step leader progresses downward through the atmosphere, meandering from point to point (thus giving rise to the traditional jagged representation of lightning), it begins to be influenced by ground objects when it comes to within about 100 feet of the object. Once this happens, an upward moving positive charge completes the path of ionized air and forms the channel for the final surge of current.

Lightning, as it occurs in nature, has an infinite variety of waveshapes and amplitudes. It is generally accepted that the typical waveshape is that shown in fig. 1. The time-to-crest, t1, will be as long as 6 microseconds no more than 10% of the time, it will be between 3 and 6 microseconds about 50% of the time, and it will be at least 1 microsecond 90% of the time. The time to the half-crest point on the decay side, t2, will be as long as 75 microseconds only 10% of the time, it will be between 30 and 75 microseconds about 50% of the time, and it will exceed 15 microseconds at least 90% of the time. Fig. 2 shows the percent of strokes that are expected to exceed a given value of current. For example, only 1% of the strokes will exceed 60,000 amperes, but 30% of them will exceed 20,000 amperes.

Lightning certainly occurs in every state of the union, but it is more likely to occur in some areas than in others. For many years weather stations around the world have kept *thunderstorm day* statistics. Thunderstorm days are those days on which thunder was heard or lightning was seen. A thunderstorm day is recorded as just that, regardless of the actual number of thunderstorms occurring on that day. Fig. 3 is a map of the U.S. showing the average annual thunderstorm days for the country. As you can see, the west coast has very few thunderstorms, while central Florida is the "hot spot." It is interesting to note, on a world-wide basis, that in one area in the heart of the Amazon jungle, in Brazil, the thunderstorm day count exceeds 200 per year! Uganda is close behind, reporting over 180 per year. Incidentally, both of these areas lie almost atop the equator.

This information in itself does not provide any insight into the number of thunderstorms actually occurring nor their intensity. However, some work has been done by E.T. Pierce, et al (referenced in Hart and Malone), which relates flashes per unit area to monthly thunderstorm days. The monthly thunderstorm day count is far more useful than the annual thunderstorm day count because most areas experience the bulk of their annual thunderstorms during only a few months of the year. A plot of Pierce's empirically

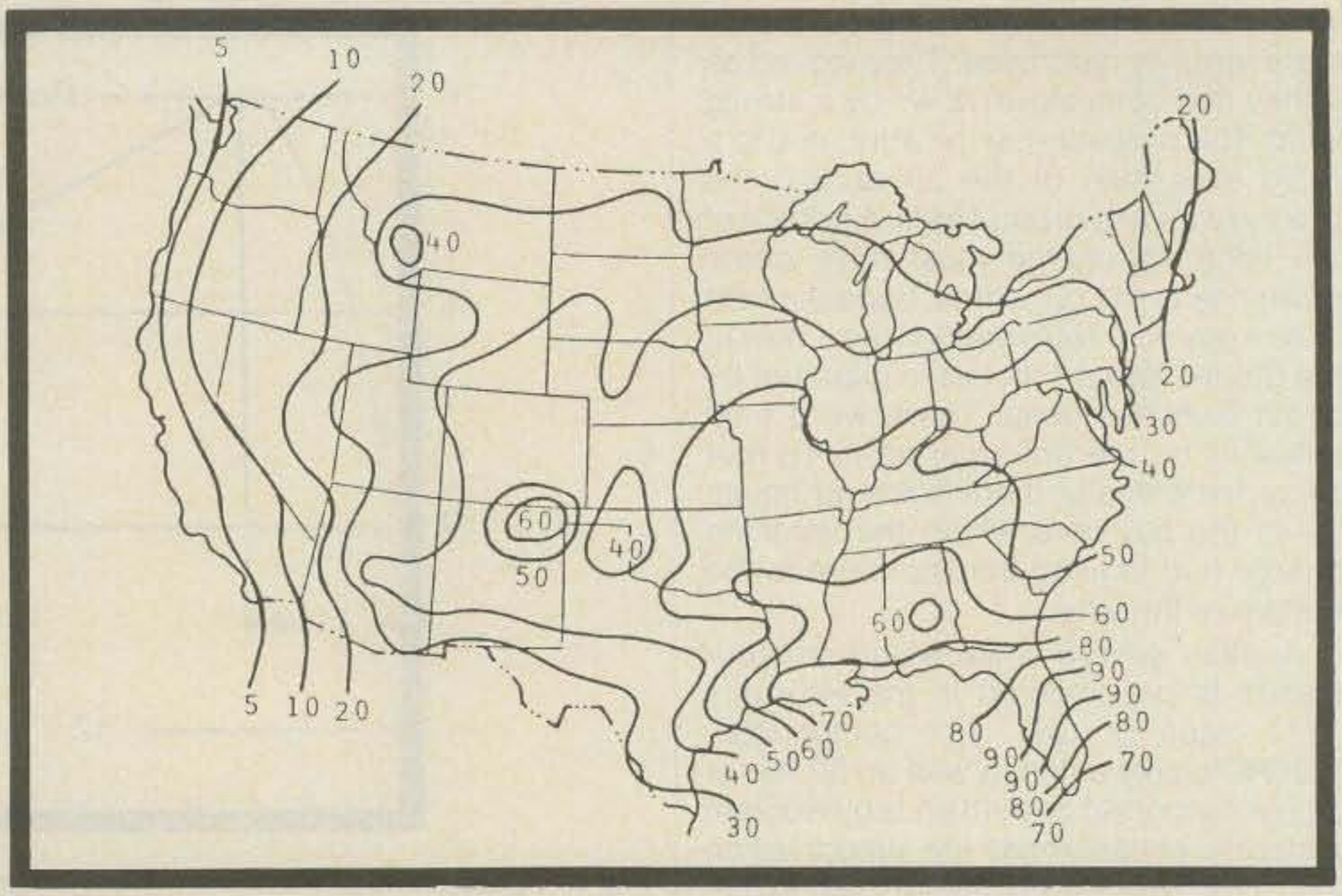

Fig. 3– Distribution of annual thunderstorm days across the U.S.

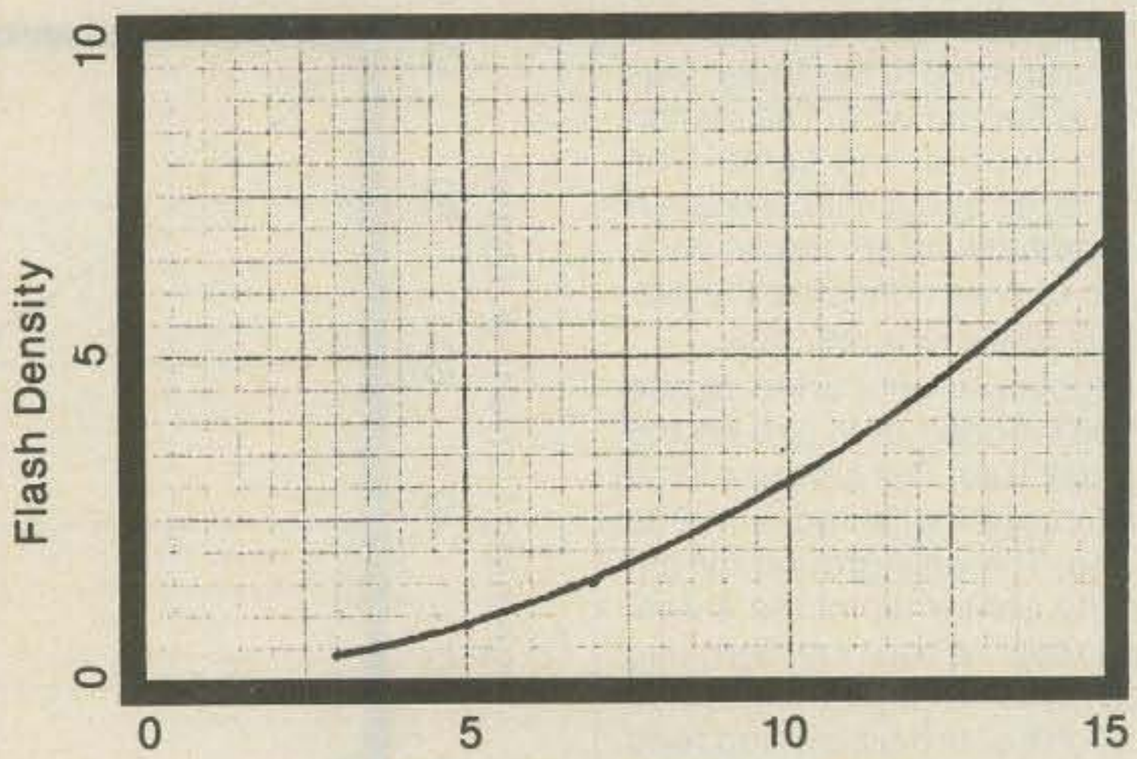

Fig. 4– Flash density per square kilometer per monthly thunderstorm days.

derived relationship is shown in fig. 4. The flash density (flashes per unit area) shown in fig. 4 is the average number of flashes per square kilometer per months in which thunderstorms occur.

Pierce also developed a relationship which estimates the number of lightning strikes that will hit various objects based on their physical shapes. The two shapes of greatest interest to amateurs, of course, are towers and longwires or dipoles. The actual numbers derived by Pierce are dependent upon statistical determinations which are highly subjective. Therefore, the relationship for towers, shown in fig. 5, is presented as a plot of the *relative likelihood* that a tower will be struck as a function of its height. For example, the relative likelihood for a 40 foot tower is about 63, while the relative likelihood for a 70 footer is just under 200. The ratio of the two likelihood numbers indicates that the 70 footer is about 3 times more likely to be struck than is the shorter tower. Estimates derived by Pierce for long horizontal conductors indicate that the likelihood of an 80 meter dipole (horizontal dipole, not an inverted vee) being struck is roughly one-third that of a tower if both are 60 feet high. This relationship varies such that as the heights increase the tower becomes more and more susceptible as compared to the dipole.

Now we have seen what lightning is capable of doing to your ham shack and your house, and we have learned a little about what lightning really is, so let's take a look at what you can do to minimize your chances of experiencing what I have or what W2FRC has.

Air terminals, or lightning rods, are the best known form of lightning shield devices and have been used as such for many years. Your tower is probably the tallest object around (in your immediate neighborhood, at least), so it is without a doubt the dominant air terminal in the area. This is both good and bad. The good part is that the tower affords you and your house a high degree of protection from a direct strike. The bad part is that every

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*EX-242 FM unit	39.00	
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*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	
Options also for IC-745 listed below		
IC-730 8-band 200w PEP xcvr w/mic	$829.00	569.95
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FL-44A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	$1349.00	869.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	$999.00	789.95
PS-35 Internal power supply	160.00	144.95
CFJ-455K5 2.8 kHz wide SSB filter	4.00	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

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

IC-751 9-band xcvr/.1-30 MHz rcvr	$1399.00	1199
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FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	
Options: 720/730/740/745/751	Regular	SALE
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EX-144 Adaptor for CF-1/PS-15	6.50	

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EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
PS-30 Systems p/s w/cord, 6-pin plug	259.95	233.95
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock	99.95	94.95
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IC-2KL w/ps 160-15m solid state amp	1795.00	1299
VHF/UHF base multi-modes	Regular	SALE
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BC-10A Memory back-up	8.50	
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IC-271H 100w 2m FM/SSB/CW xcvr	899.00	759.95
PS-35 Internal power supply	160.00	144.95
PS-15 external power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-25 Mast mtd. GaSFET preamp	84.95	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	989.95
PS-35 Internal power supply	160.00	144.95
PS-15 20A power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 PS-15/CF-1 fan adaptor	6.50	
AG-35 Mast mounted preamp	84.95	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	619.95
PS-25 Internal power supply	99.00	89.95
AG-20/EX-338 2m preamplifier	56.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted 15dB preamp	89.00	
PS-25 Internal power supply	99.00	89.95
Common accessories for 271A/H and 471A/H		
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	359.95
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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BP-10 Internal Nicad battery pack	79.50	
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SP-4 Remote speaker	24.95	

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IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

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BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-60 6-position gang charger, all batts	SALE 359.95
BC-16U Wall charger - BP7/BP8	10.00
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 ⅝-wave telescoping 2m antenna	18.95
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CP-1 Cig. lighter plug/cord - BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
LC-2AT Leather case for standard models	34.95
LC-11 Vinyl case for standard models	17.95
LC-14 Vinyl case for Deluxe models w/BP-7/8	17.95
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

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FL-32 500 Hz CW filter	59.50	
EX-310 Voice synthesizer	39.95	
RC-11 Wireless remote controller	59.95	
CR-64 High stability oscillator xtal	56.00	
R-70 100 Khz-30 Mhz digital receiver	749.00	569.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12v DC option	9.95	
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time it does its job and attracts the lightning away from your TV antenna, everything in your shack gets zapped by the currents induced into your tower cables.

Most commercial installations protect their equipment with devices called lightning arrestors. These devices can be of several types including varistors, spark gaps, or other kinds of semiconductor devices. Some of these devices are beginning to be pitched for protection of ham stations, and I'm sure they are quite effective, but they are expensive and it takes a single arrestor for *each wire* entering the shack. The average station probably has an 8 wire rotator cable, an 8 wire remote coax switch cable, maybe 3 or 4 miscellaneous control wires, and 2 or 3 coaxes, which adds up to a lot of lightning arrestors. If you have a contest station like mine, with 2 or 3 rotators, some relay control lines, a remote coax switch, and 5 or 6 coaxes, the expense is even greater. So, what I propose to present here is an alternative (other than manually disconnecting everything) to that large number of expensive lightning arrestors.

There is one big difference between the lightning strikes which I experienced and the one which W2FRC experienced. At W2FRC the lightning struck his 80 meter dipole directly, and the entire stroke went right into his house. In my case, the strike was to the tower, and the "primary" current went right to ground, just as it should have. The current that entered my house was current that was *induced* into the control lines and the coaxes. I'm sure that had the lightning struck my control cables directly, they, too, would have disappeared just as did W2FRC's dipole. The level of these induced currents is dependent upon several things. Its duration, however, is very short. Recall that the stroke duration is seldom over 75 microseconds long. Multi-pole double-throw toggle switches, rated in the tens of amperes (at low voltage), are readily available from surplus parts houses. These switches are designed to handle their rated current in a switching, or interruptive, mode. That is, they are designed to break a circuit carrying that amount of current. They are quite capable of handling much higher currents when they are used in a *non-interruptive mode*—that is, if they are not switched when the current is present. Thus, I claim that these switches can indeed handle the very short, albeit very large, transient currents produced in the control cables whenever the tower takes a direct strike.

I have installed a number of four-pole double-throw switches in a metal chassis which is itself installed into the window of my shack. The cables from the tower enter this chassis and connect to the common poles of the switches. One side of each switch is then connected to a ground bus, and the other side of each switch is connected to its appropriate station accessory. This is shown schematically in fig. 6. Whenever the switches are in the "down position," the cables are not only disconnected from the station equipment, but are connected directly to ground without ever having actually entered the shack. Of course, whenever the switches are placed in the "up position," the equipment will operate normally. Now, for this method of protection to be effective, the ground path impedance must be kept as low as possible. If the impedance is too high, the voltage may build up to a point that would cause the current to jump across the switches and seek ground through your equipment. The ground system I currently use is three ½ inch diameter by 5 foot long copper pipes separated by about 6 inches and bonded together with #6 copper wire. I base the claim about the switches on the fact that any piece of equipment that provided a lightning a low impedance path to ground was spared damage in both my strikes.

Just to cover all bases, including the possibility of arcing in the switches and creating a fire hazard, I recommend that the switches be enclosed in a metal box just as I have done. This will also protect the switches from the weather. Fig. 7 shows a sketch of the cable entry scheme currently in use here. The switch enclosure is a 5″ × 8″ × 3″ aluminum chassis oriented so the bottom (back) cover can be removed to connect the wires. The cables come into the box at one end and fan out to the switches. The ground bus leaves the box at the other end and goes directly to the ground rods. I used #6 copper wire to make the ground connection.

The window filler panel can be anything you happen to have on hand. I used some ¼ inch plywood that was left over from a wood-working project and which

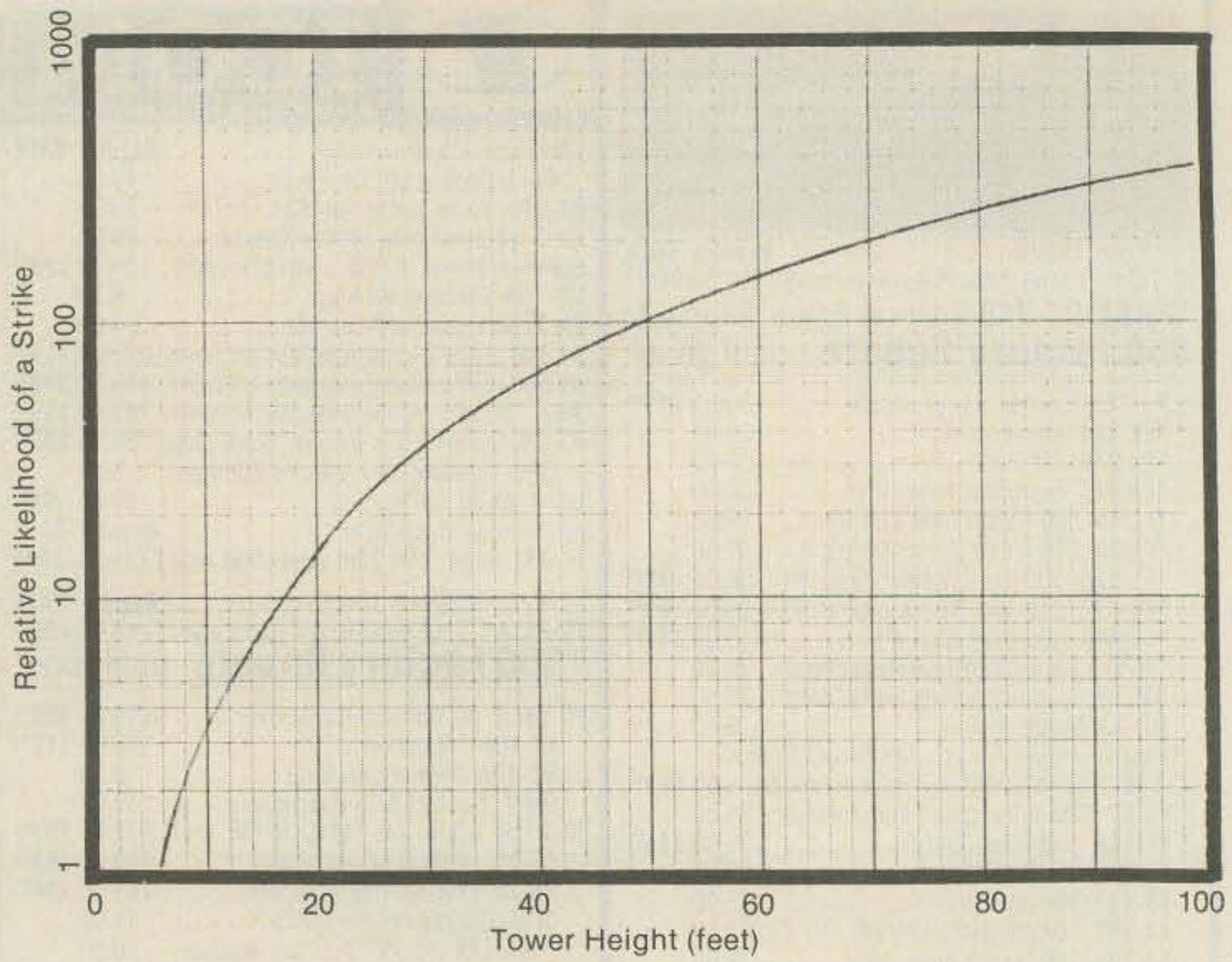


Fig. 5– Relative likelihood that a tower will be struck as a function of tower height.

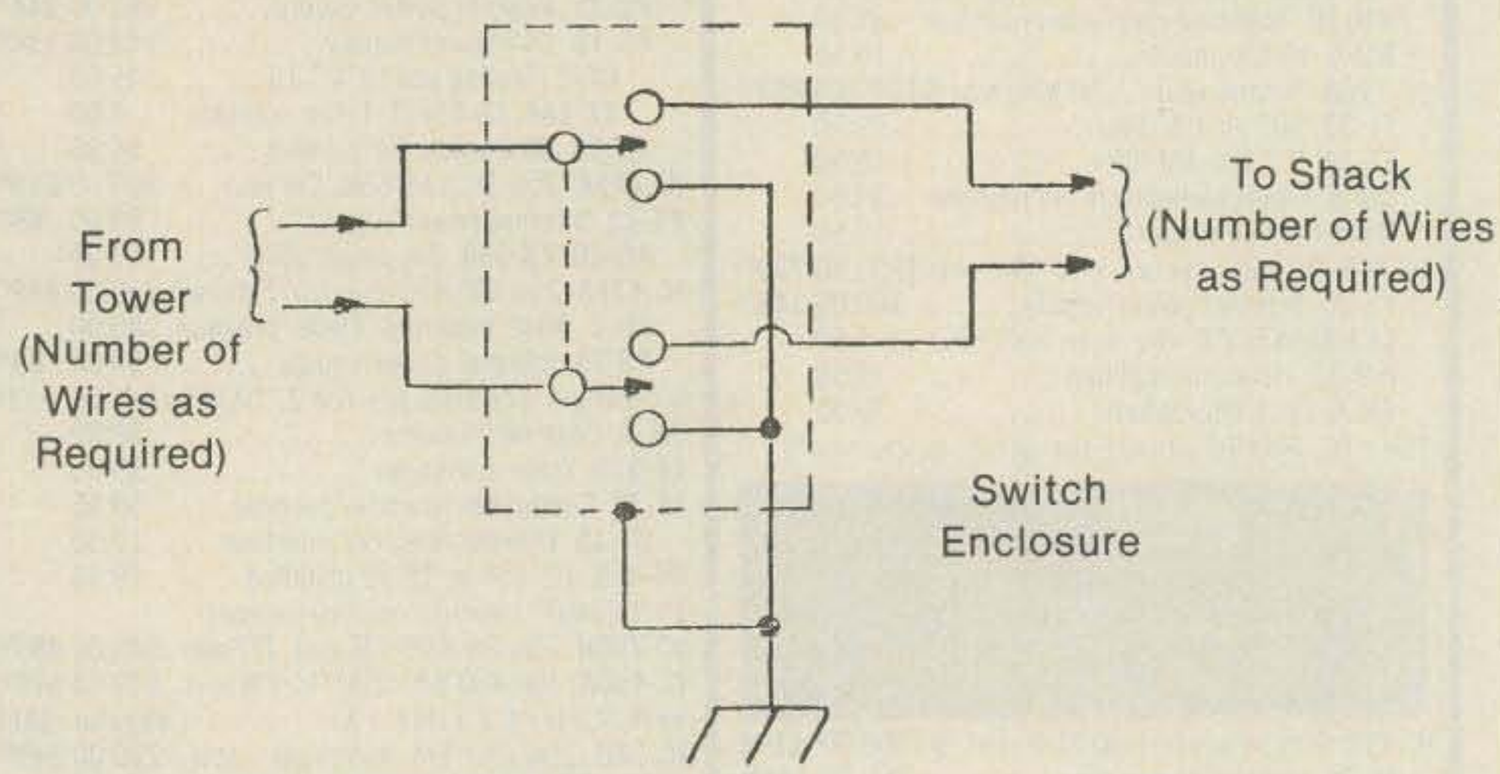


Fig. 6– Tower cable switching scheme.

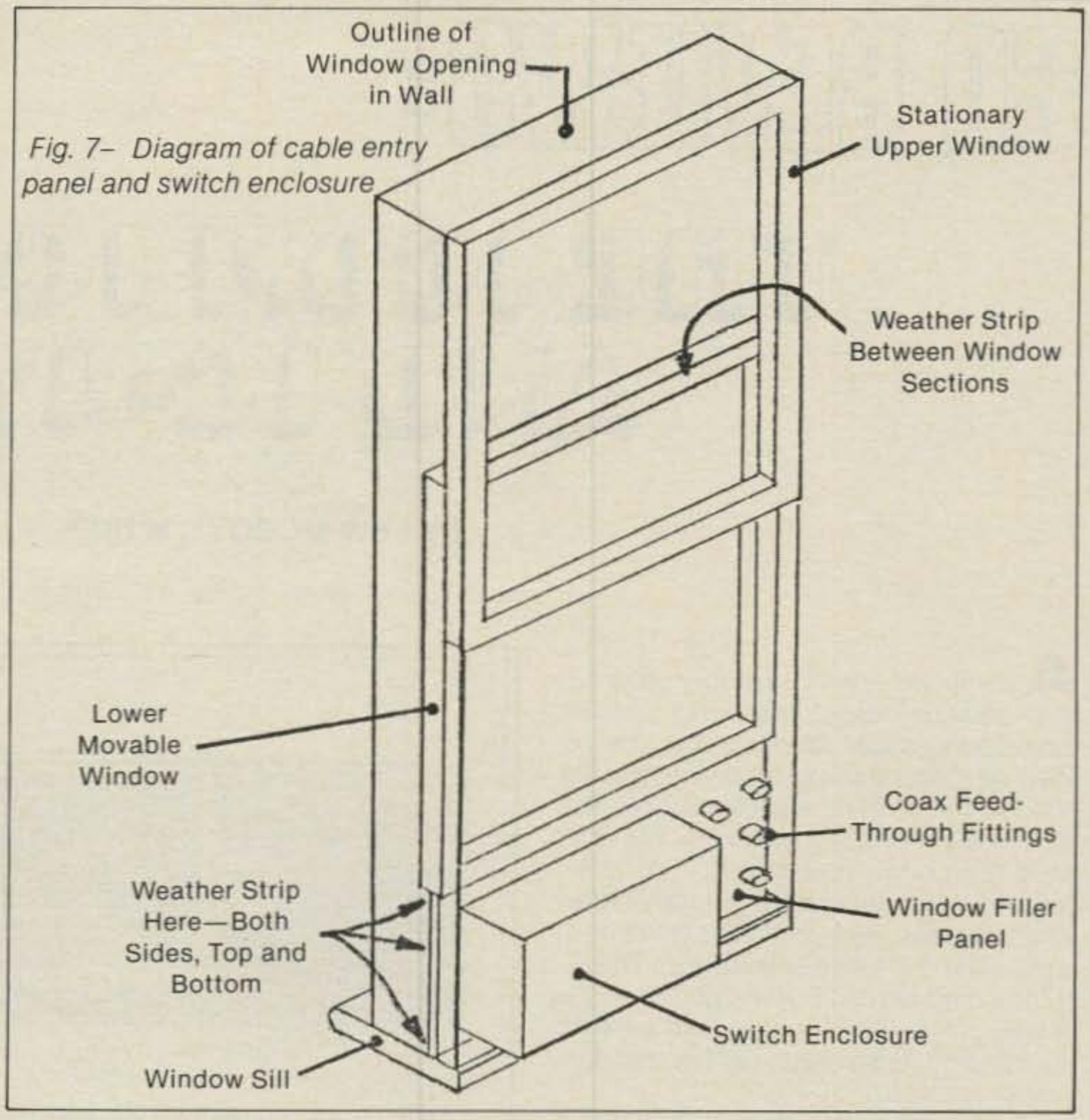
was stained to match the rest of the paneling in the house. You can use your imagination and probably please the most particular XYL. Don't forget to plug all the air leaks with weather stripping. I used the adhesive-backed foam strips.

Coaxes can be grounded in the same way and with a commercial product that you might already have in your shack. All the h.f. coaxes connect directly to a rotary coax switch which grounds the unselected positions. Simply select "dummy load" and all the coaxes are grounded. However, make sure that the switch enclosure is well grounded to the station ground rod(s). *Do not rely on the coax shields to ground the switch by way of the transmitter chassis!* A similar arrangement can be made for any v.h.f. coaxes, but since you probably have only one or two, it will be just as easy for you to unscrew them from the entry-panel feedthrough fittings.

Remember that lightning can enter your house via the telephone line, power line, television cable, or whatever else you have connected to your house, and since the lightning eventually will get to the AC lines regardless of how it gets into your house, it is still a good idea to unplug everything. Like the cables coming into the shack from the tower, a well-equipped station will have lots of cords to unplug. I use a power strip to power all the small station accessories, which allows me to unplug all of these at once by unplugging the power strip. Because of the current load, the receiver and transmitter (or transceiver) should be connected directly to the wall outlet.

Now I have some final comments and observations. When listening to the local RACES Skywarn Nets, I often hear people say that they are using their "indoor" or "attic" mounted antennas. I know that they think this will protect them from lightning. However, I contend that unless they have a well-grounded lightning shield (grounded tower), the inside antenna is just as dangerous as a roof-mounted antenna. Be careful—you may not be as safe as you think! Many of my friends have routed their coaxes and rotator cables through their attics and down their walls. I realize that this is very neat looking and often appeases the XYL, but should these cables happen to take a strike, there are many things in the attic and walls of a house that the lightning could arc across to as it comes down the cables. A fire in the attic or walls of a house can go undetected for a long time and could end up in a tragic situation. Finally, I simply cannot offer an iron-clad guarantee that by following my suggestions your station will be totally immune to lightning damage. However, I do believe that if you follow these suggestions, you will definitely reduce the chances of serious damage to your equipment and of having a fire. Remember, lightning is unpredictable and it is dangerous, so take my advice and *switch to safety!*

Fig. 7– Diagram of cable entry panel and switch enclosure



CQ REVIEWS:

THE ICOM IC-27H AND IC-47A

BY LEW MCCOY*, W1ICP

A completely new line of very compact VHF and UHF transceivers has been introduced by ICOM America, Inc. This review will cover three of these models: the IC-27A, the IC-27H, and the IC-47A. The IC-27A and H models cover the 144–148 MHz (European version 144–146 MHz) frequency range, and the primary difference between the two models is the power level (and the size of the case). The IC-27A is capable of 25 watts output, while the IC-27H is the 45 watt output version. All the models have a 5 watt output low-power position.

The IC-47A is the 25 watt output unit that covers 440–450 MHz (European model 430–440 MHz, Australian version also 430–440 MHz). The IC-27A and IC-47A are identical in size, measuring 1½"H × 5½"W × 9"D (38mm × 140 mm × 226 mm). These dimensions provide an extremely compact transceiver that is literally loaded with outstanding features. The higher power model, the IC-27H, is the same height and width, but is 2 inches longer.

With the continued and increasing use of microprocessor chips it is almost impossible to keep pace with all the new features in equipment these days. The use of such chips is certainly evident in these new transceivers. For myself, I keep wondering what the manufacturers are going to do to top themselves as each new model makes its appearance. However, they seem to keep doing it. I was one of those people who said I thought the use of small gear and smaller control knobs would not be for me with my large fingers, but how wrong I was! For example, these units have 15 different controls on a panel that only measures 1½" × 5½"—and that is tiny! However, I find no problem at all using these controls. In fact, I can use the units and adjust them without even looking at the front of them. More about that in a moment.

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

Front view of the IC-27H.

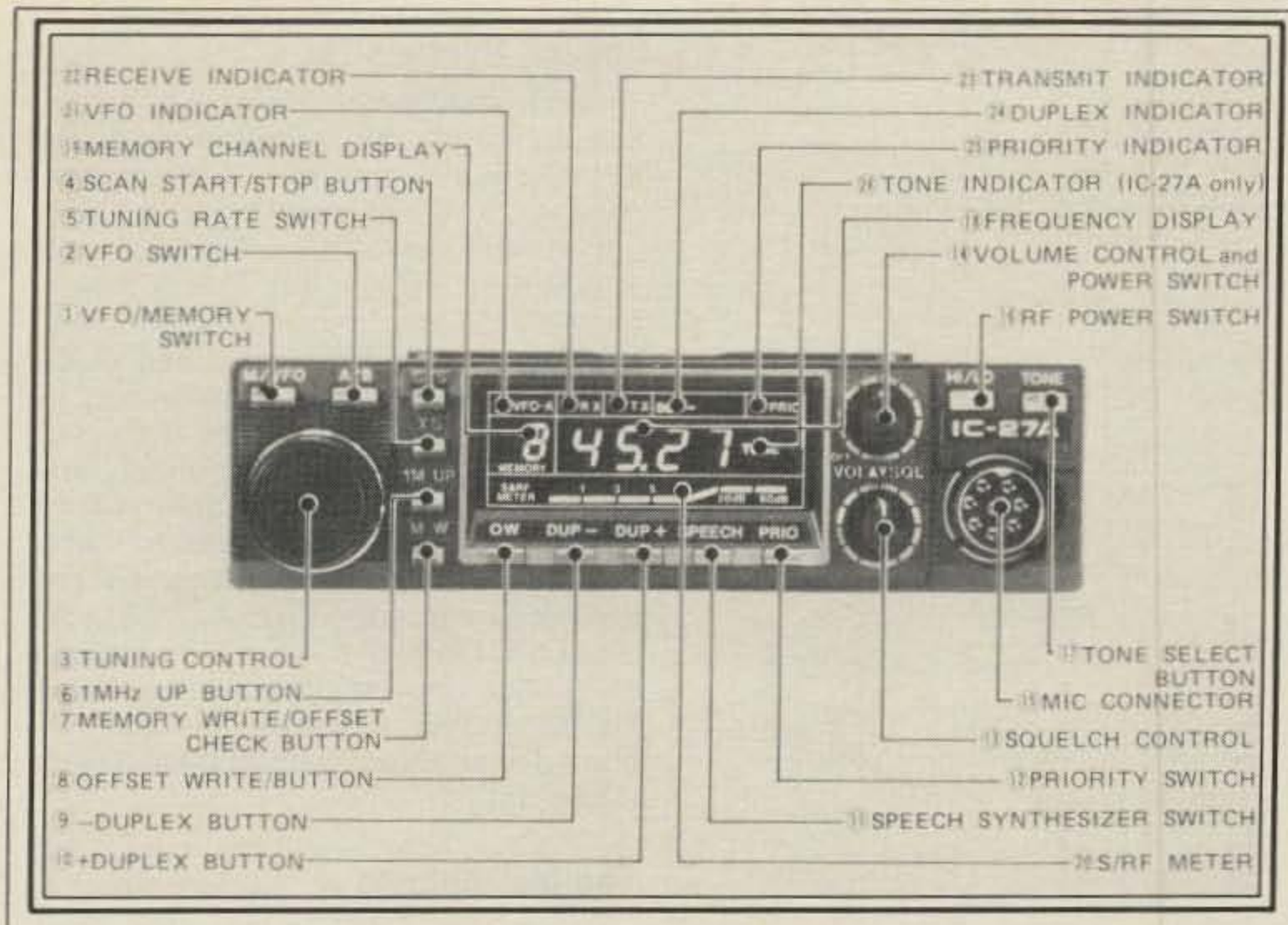
Here is the front view of the IC-47A.

Some Features

First there are nine programmable memory channels in the transceivers. These can be either simplex or repeater channels with the appropriate offsets. When programmed, the memories are backed up with a lithium battery so that when you turn the power off, the programming remains. In addition, these units have a built-in subaudible tone encoder that provides 32 different tones. These tones are stored into memory along with the channel frequencies. (I happen to be a member of the Cactus Intertie System, a large group of remote base and repeater stations which are all tone-accessed, so you can see how important this feature is to me.)

Scanning Features

As more amateurs become familiar with these newer radios, they also ask more questions about scanning features. The ICOM transceivers, whether low-band or VHF, take no back seat on this score. The IC-27 series and the IC-47A are fully equipped for scanning. First you have **Memory Scan** available whereby the nine programmed channels can be scanned continuously by just pushing the **VFO/Memory** switch to memory and then the **Scan/Start/Stop** switch.



The front-panel controls of the IC-27A. All the models are almost identical.

Next you have a programmed scan available which will scan between two desired channels or frequencies. These two channels or frequencies are programmed into channel 0 and 1. You realize, of course, that you can set the low end of the band, 144 MHz for example, and the high end, 148 MHz, and scan the entire band. The scanning steps will depend on where you set the **Tuning Rate** switch.

In addition, there is a **Scan Speed** switch that can be used for fast or slow scanning. Also, there is a **Scan-Stop Interval** switch which provides selection of a long hold of about 9 seconds and a short hold of 3 seconds. There is another switch, the **Scan-Stop Function** switch, which switches the scan-stop function to either stop on a busy channel or stop on an empty channel. However, of all these switches, only the **Scan Start/Stop** switch is on the front panel. All the rest of the switches are on a DIP switch that is mounted in an enclosure below the top panel. The enclosure has an easily removed access cover. The switches are not marked as to at what they are set, so the user has to experiment.

The VFOs

I have already mentioned the **Memory Mode** having nine programmable channels. There are also two VFOs, **VFO A** and **VFO B**. First, the **VFO/Memory** switch is placed in the VFO mode, and then either **A** or **B** is selected via the **VFO** switch. An illuminated indicator shows you which VFO is in use. At this point, I quote from the instruction manual about the use of the VFOs. "If 145.75 is set with VFO A, and the VFO switch is pushed to select VFO B, the frequency readout will show VFO B's frequency, but 145.75 is still stored in VFO A's memory. Pushing the VFO switch again to return to the VFO A, '45.75' will be displayed on the readout. Accordingly, if the switch is pushed again, the frequency that was set with VFO B will appear. This allows you to set a certain frequency with one VFO, work up and down the band with the other VFO, and periodically check the set frequency simply by switching between the VFO A and B. It also allows you to search for a clear frequency with one VFO, while keeping your operating frequency with the other VFO. Once you have found a clear frequency, switch back to your operating frequency, inform the station you are in contact with of the new frequency, and switch back. It is that simple." It is.

Tone No.	Frequency	Tone No.	Frequency	Tone No.	Frequency
1	67.0Hz	22	141.3Hz	43	900.0Hz
2	71.9	23	146.2	44	1000.0
3	74.4	24	151.4	45	1600.0
4	77.0	25	156.7	46	1700.0
5	79.7	26	162.2	47	1750.0
6	82.5	27	167.9	48	1800.0
7	85.4	28	173.8	49	1300.0
8	88.5	29	179.9	50	2000.0
9	91.5	30	186.2	51	2200.0
10	94.8	31	192.8	52	2975.0
11	97.4	32	203.5	53	2550.0
12	100.0	33	210.7	54	2295.0
13	103.5	34	218.1	55	2125.0
14	107.2	35	225.7	56	———
15	110.9	36	233.6	57	———
16	114.8	37	241.8	58	———
17	118.8	38	250.3	59	———
18	123.0	39	500.0	60	———
19	127.3	40	600.0	61	———
20	131.8	41	700.0	62	———
21	136.5	42	800.0	63	———

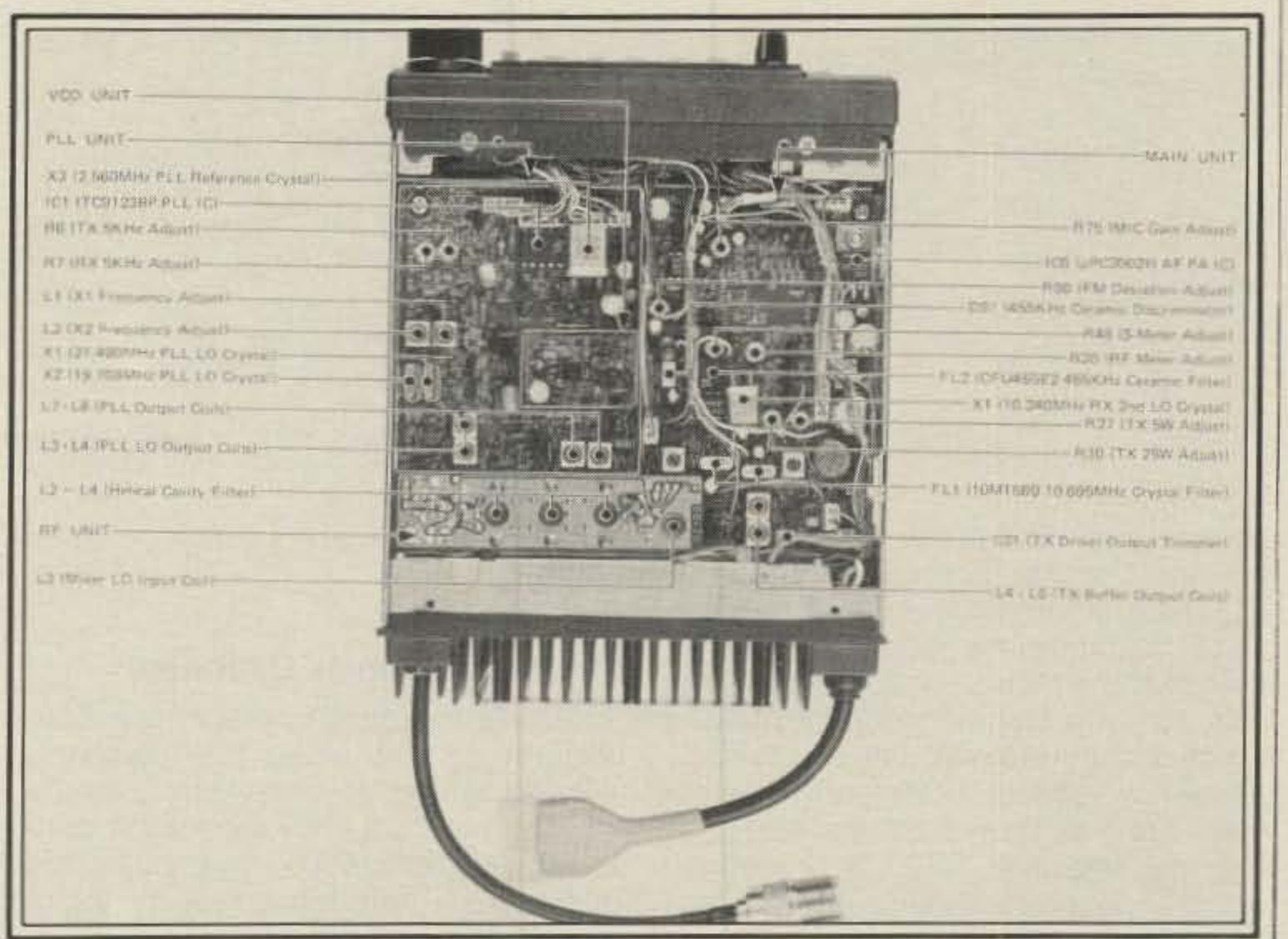
Table I– These are the encoder tones available in the transceivers.

The main tuning control is a knob that steps whichever VFO is being used. It has two tuning rates, either 5 or 15 kHz per step. The tuning rate is set by the **Tuning Rate** switch. When you reach the highest band edge, the frequency then jumps to the lowest edge. This prevents one from operating outside the band. Clockwise rotation increases the frequency, and counter-clockwise rotation reduces the frequency.

The Readout

These transceivers have a very nice readout. Across the top, LED indicators

Lots and lots of parts in a very small area. This is the main-unit side of the IC-27A. This photo is from the manual and gives an idea of how extensive the manual is.



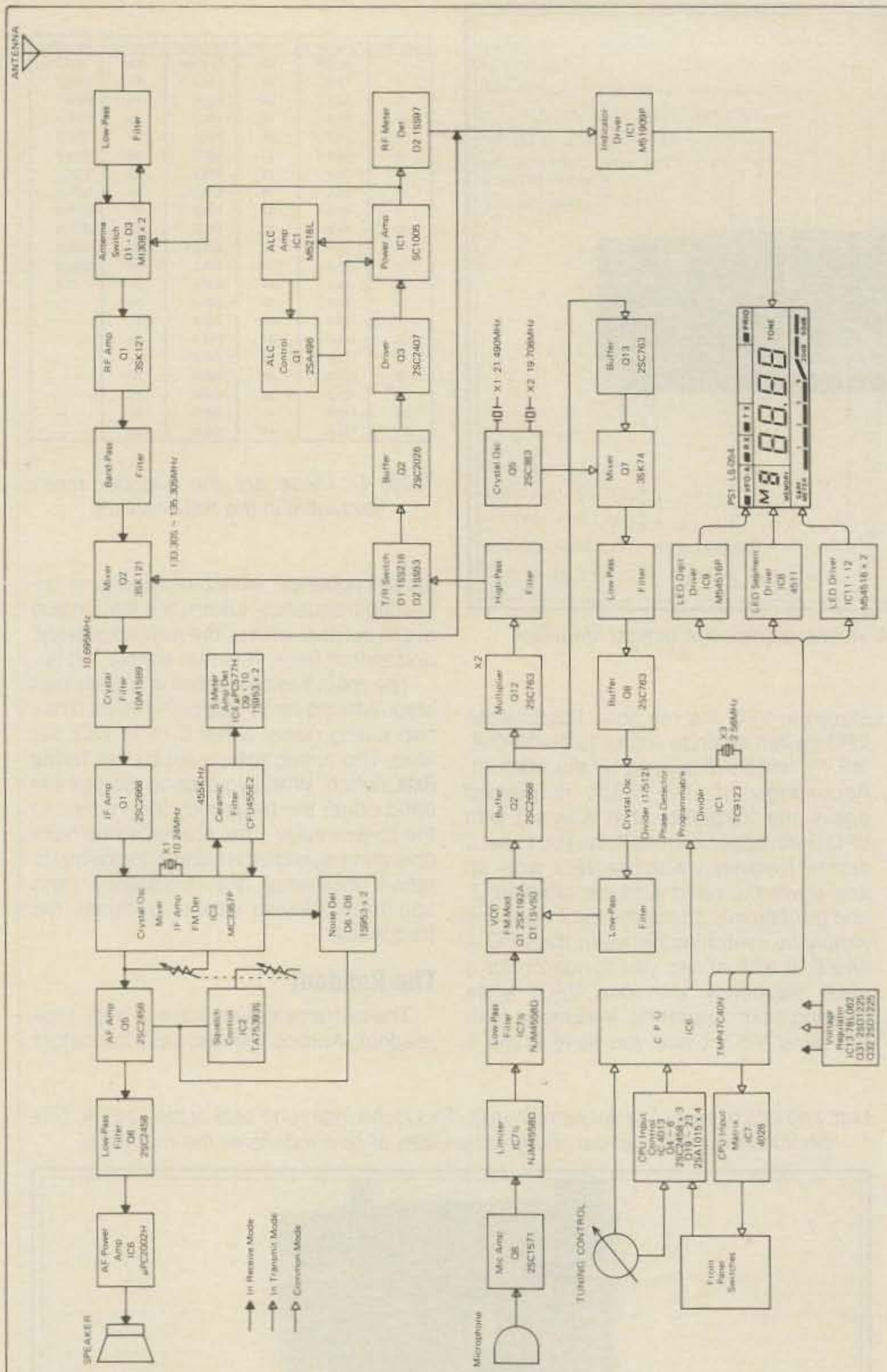


Fig. 1– The block diagram of the IC-27A.

show which VFO is in use, and RX and TX indicators show receiving or transmitting. Next is the duplex or simplex LED, and at the right is the priority indicator. At the left in the center section of the readout is the large channel indicator showing which channel is in use. Next is the large frequency readout, where on 2 meters there are four figures shown (46.94, for example, and on 450, 49.50). To the right of the frequency readout is the tone indicator. Across the bottom of the readout is a signal strength and relative output indicator.

Duplex or Simplex Operation

Duplex or simplex operation is accomplished by using either the **–Duplex** or **+Duplex** switch. In duplex operation the input/output frequency separation is automatically set to 600 kHz. Any other frequency separation can be set into the radios if 600 kHz is not desired.

Speech Synthesizer

One feature that is available as an option is a speech synthesizer. When this is installed in the radio, a push of a button gives you a very pleasant computer-generated voice that tells you the frequency to which the radio is set. This is an immensely valuable item in any radio going to be used in a mobile environment or for someone who is visually handicapped. In my case, I do a lot of traveling in my van, and I have installed the radio on an overhead shelf, which naturally doesn't lend itself to good visibility. It is easy to reach up, push the **Speech Synthesizer** switch, and get a voice readout. I tested this radio on a blind friend of mine, and he was so enthusiastic that he immediately ordered the transceiver. I checked with him the other day and his enthusiasm hasn't lessened.

The Microphone

Another thing I liked about the ICOM setup was that they provide a microphone with their transceivers. Not only that, the microphone that comes with these units has several special features. The microphone provided is the HM-23 model, and it has a 16-tone pad provided on the back. This, of course, can be used for Touch-Tone operations or for setting the tones for a tone-accessed repeater. Also, there are two push-buttons on the top of the microphone that are used for frequency control of the transceiver. One is the **UP** button and the other is the **DN** (down) button. Pushing either button increments the frequency up or down, and holding either one causes the frequency to be changed continuously.

Instruction Manual

The instruction manual provided with any ICOM radio has always been very good from my point of view. The books with these radios are no exception. Tuning instructions are very detailed, and circuit and block diagrams are included.

Performance

I had a chance to use both the 144 and 450 MHz units for several months. I tested them in different conditions, both mobile and fixed. We show the specifications list in nearly all our reviews in order to give the reader an idea of what the manufacturer specifies. The radios for review in *CQ* are checked against what the manufacturer states to make sure they meet the specifications. However, these specs often don't tell the whole story. In many high-density population areas a receiver will break down and not be able to "handle" all the strong signals from repeaters and two-way radios, and the multitude of transmitter signals. For example, on Franklin Mountain in El Paso there are simply scores of transmitters operating, and operating mobile in such

GENERAL				
Numbers of semiconductors	:	Transistor	57	
		FET	6	
		IC	24	
		Diode	110	
Frequency coverage	:	IC-27A: 144MHz ~ 146MHz		
		IC-27E: 144 ~ 146MHz		
Frequency resolution	:	IC-27A: 5KHz/15KHz steps (Australian version: 5KHz/25KHz)		
		IC-27E: 12.5KHz/25KHz steps		
Frequency control	:	Microcomputer based 5KHz step (or 12.5KHz step) Digital PLL synthesizer Independent Dual VFO Capability.		
Frequency stability	:	Within ±1.5KHz		
Memory channels	:	9 channels with any inband frequency programmable		
Usable conditions	:	Temperature: −10°C ~ 60°C (14°F ~ 140°F)		
		Operational time: Continuous		
Antenna impedance	:	50 ohms unbalanced		
Power supply requirement	:	13.8V DC ±15% (negative ground)		
		6A Max.		
Current drain (at 13.8V DC)	:	Transmitting: High (25W)	Approx.	6.0A
		Low (5W)	Approx.	3.0A
		Receiving: At max audio output	Approx.	0.6A
		Squelched	Approx.	0.4A
Dimensions	:	38(41)mm(H) x 140mm(W) x 177(191)mm(D)		
		( ): Shows the dimensions including projections		
Weight	:	Approx. 1.2kg		

TRANSMITTER		
Output power	:	HIGH 25W LOW 5W
Emission mode	:	$16F_3$ (F3E 16K0)
Modulation system	:	Variable reactance frequency modulation
Max. frequency deviation	:	±5KHz
Spurious emission	:	More than 60dB below carrier
Microphone	:	600 ohm electret condenser microphone with push-to-talk and frequency UP/DOWN switches. (IC-27A: with 16 key dual-tone pad.) (IC-27E: with 1750Hz tone burst unit.)
Operating mode	:	Simplex, Duplex (Any offset in-band in 100KHz increments programmable)

RECEIVER		
Receiving system	:	Double-conversion superheterodyne
Modulation acceptance	:	$16F_3$ (F3E 16K0)
Intermediate frequencies	:	1st: 10.695MHz
		2nd: 455KHz
Sensitivity	:	Less than 0.2μV for 12dB SINAD
		Less than 0.4μV for 20dB Noise quieting
Squelch sensitivity	:	Less than 0.15μV
Spurious response rejection ratio	:	More than 60dB
Selectivity	:	More than 15KHz at −6dB point
		Less than 30KHz at −60dB point
Audio output power	:	More than 2.0W
Audio output impedance	:	4 ~ 8 ohms

Table II– Specification chart. The transceivers met or exceeded all specs in our tests.

an area (intermodulation alleys, as they are called) can really be the ultimate test for any FM receiver. If one can listen to a given repeater without having intermodulation distortion, the receiver in the transceiver is a real winner.

I tested both transceivers under these conditions in El Paso and in the Los Angeles basin, and I can state that the transceivers did an outstanding job handling intermodulation problems. Receiver sensitivity is superb, and I received nothing but excellent reports on things such as transmitter audio quality, stability, etc.

The transceivers come with the microphone as I stated earlier. In addition, there is an extremely functional mobile mount included. The mount is rectangular in shape and the transceiver is slid inside the mount. There are two pressure pads activated by a convenient lever. When the lever is activated, the transceiver is locked firmly into the mount. This makes for an easy installation and removal of the rig from the car. In addition, a quick disconnect power cable is provided. The cable is fused in both leads. Also, all mounting hardware is provided, plus a microphone clip.

The IC-27A lists for $369, the IC-27H for $409, and the IC-47A for $449. The transceivers are manufactured by ICOM Incorporated, Osaka, Japan and are distributed by ICOM America, Inc., 2112 116th Ave. NE, Bellevue, WA 98004 (206-454-8155). CQ

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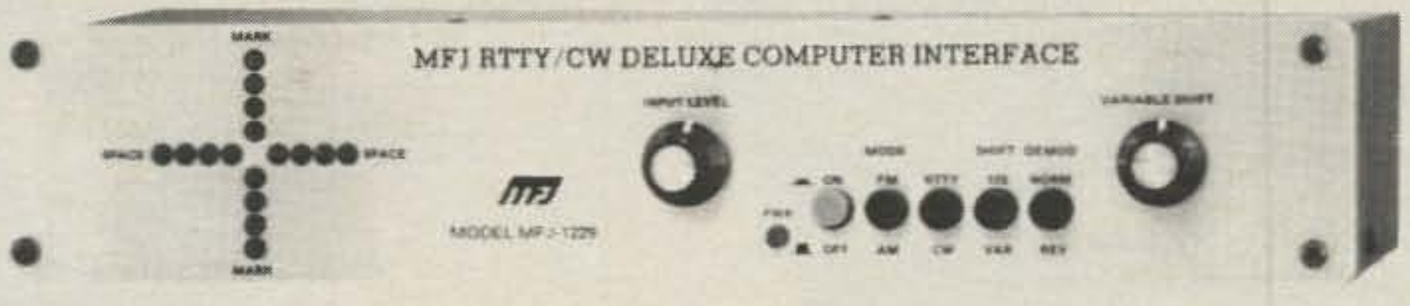

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FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

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Crosshair mark-space LED tuning array simulates scope ellipse for easy, accurate tuning even under poor signal-to-noise conditions. Mark and space outputs for true scope tuning.

Transmits on both 170 Hz and 850 Hz shift.

Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input.

Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12½x2½x6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

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Greatly improve your RTTY copying capabilities. Add a crosshair LED Tuning Indicator that makes tuning quick, easy with pin-point accuracy. **Add** mark and space outputs for scope tuning. **Add** LEDs that indicate 170, 425, 850 Hz shifts. Great for copying RTTY outside ham bands. **Add** sharp mark and space filters to improve copy under crowded/weak conditions. 170, 425, 850 Hz shifts. **Add** Normal/Reverse switch to check for inverted RTTY without retuning. **Add** output level control to adjust signal into your terminal unit. **Add** a limiter to even out signal variation for smoother copy.

Unit plugs between your tuner and receiver. Mark is 2125 Hz, space is 2295, 2550 or 2975 Hz. Measures 10x2x6 in. and uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, $9.95.

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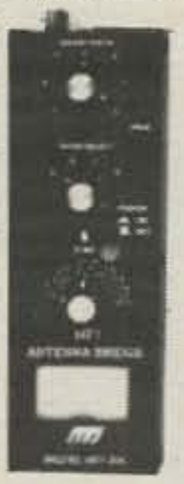
Huge 5/8 inch bold black LCD numerals make these two 24 Hour LCD clocks a must for your ham shack. Choose from a dual clock unit that features seperate UTC and local time display or the single clock unit that displays 24 Hour time.

Mounted in a brushed aluminum frame, these clocks feature huge 5/8 inch LCD numerals and a sloped face for easy across the room reading. Both clocks also feature easy set month, day, hour, minute and second functions and can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 in., MFJ-107, 2¼x1x2 in. Battery included.

MFJ ANTENNA BRIDGE MFJ-204 $79.95



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Here's a quick and simple 2 meter quad you can build in an evening

How To Build A 3 Element 2 Meter Quad

BY RUSS RENNAKER*, W9CRC

There have been many articles written about 2 meter antennas, and I make no claims that this is the greatest. However, it is simple to make using readily available material, and it is very effective. I replaced a five-element Yagi with this quad, and it outperformed my Yagi noticeably.

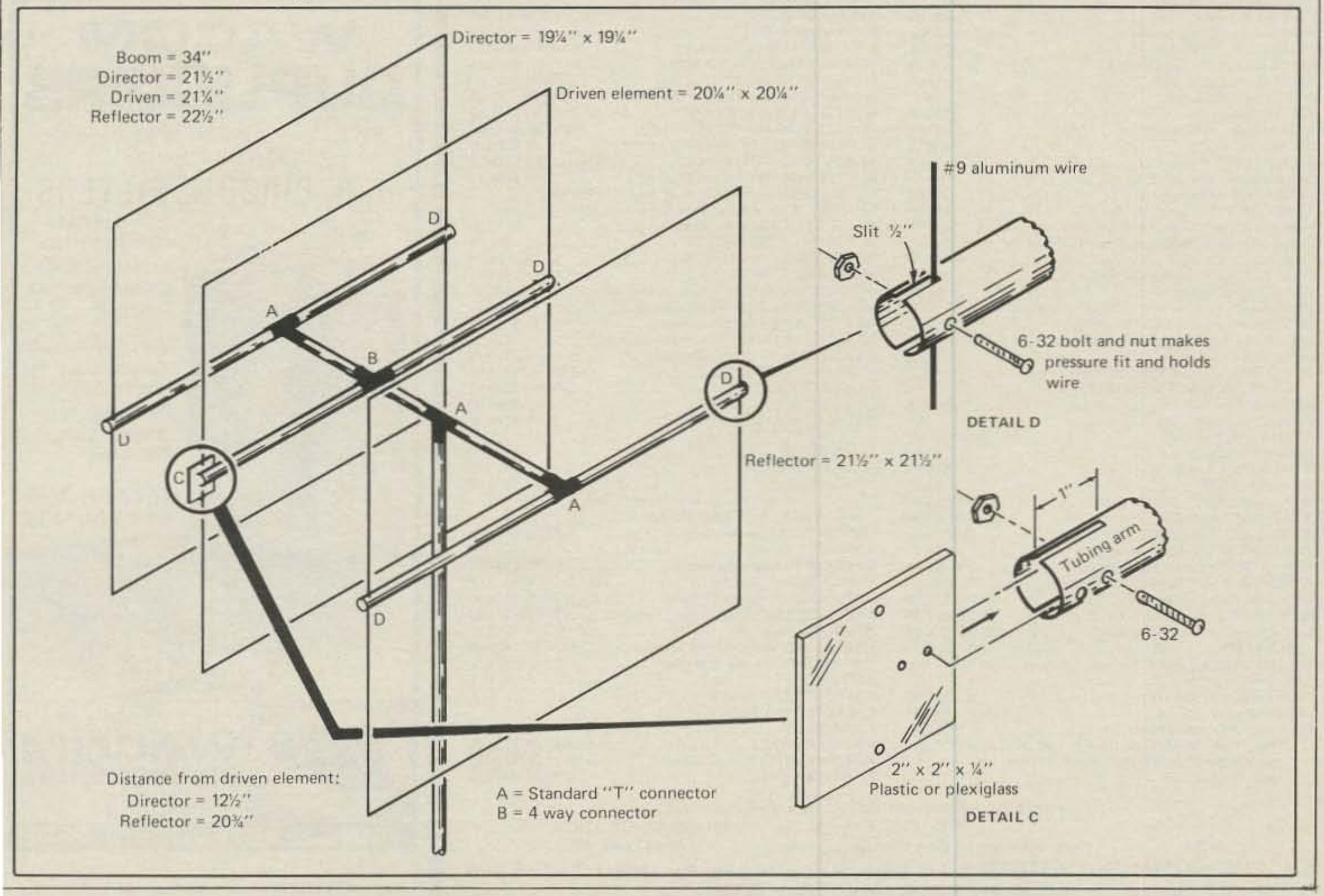
*1011 Linda Drive, Kokomo, IN 46902

The support frame and the mast are made of ¾" plastic tubing, which is available in any plumbing department. The elements are #9 hard-drawn aluminum wire, such as clothesline wire. Be sure it is not the soft-drawn pliable kind.

The director wire is 80" long. The driven element is 84" long, and the reflector is 89" long. Make the driven element ¾" longer (84¾"). This leaves ⅜" extra on each end to curl around the terminal bolts. All elements are bent into squares according to the dimensions shown in the drawing.

The tubing connectors at the three *A*'s are standard "T" tubing connectors. The one at *B* is a four-way connector. The mast connector (between the driven element and the reflector) should be located as near to the balancing point on the

Fig. 1– Mechanical drawing of the 2 meter quad. The PVC or plastic tubing and fittings are available at most hardware stores.



boom as possible. One way to do this is to place all three elements on the boom and locate the point of balance by suspending the whole thing over a thin piece of wood (or your finger) to find the center of balance. Then cut the boom at that point and insert the connector. Be sure to subtract the length of the connector from the length of the boom so it is still 34" long with the connector installed.

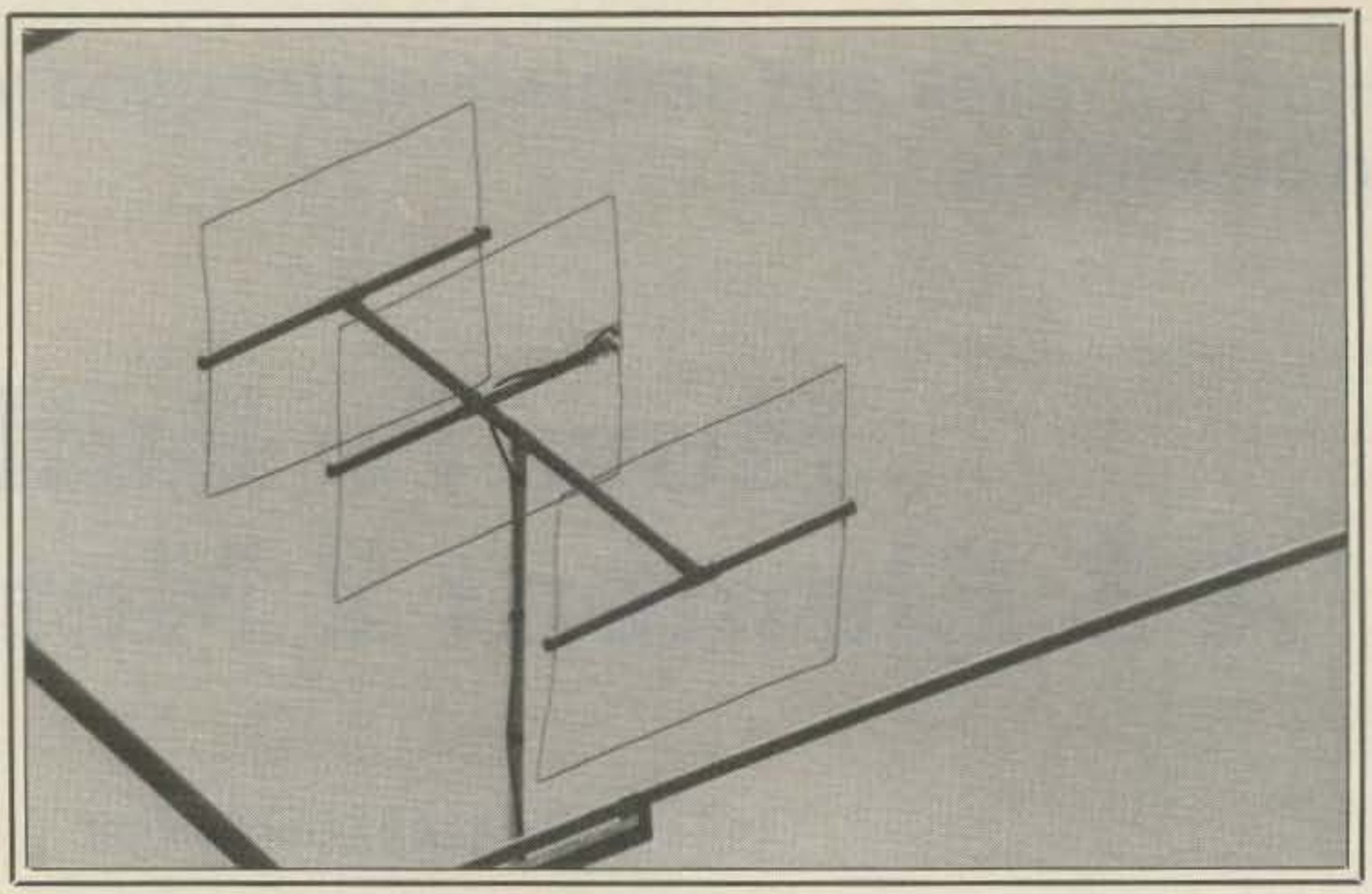
Drill out one section of the four-way connector at *B* so that it slides over the boom tubing. Then adjust the location of the loop for lowest SWR before cementing to the boom. I got mine down to 1.1:1 at 144.91, our repeater frequency. Secure all the "T" connectors with the cement. Be sure they all are lined up correctly, because when the cement sets they will be unmovable.

Drill a ⅛" hole ½" from the end of each cross arm (except the driven element arm at *C*). Saw a slit from the end of the tubing to the hole. Be sure the slit is at right angles to the boom. When you have formed the squares for the loops, press the wire through the slit to the hole. Secure with a 6-32 bolt through the tubing between the wire and the end (see *D*).

We need to attach the terminal block *C* to the other end of the driven element cross arm. Saw a slot back 1" from the end of the tubing and secure the terminal block in the slot with two 6-32 bolts (see *C* in drawing). The 8-32 bolts are for attaching the #9 wire and the coax leads. Curl the wire around the heads of the bolts (remember that we added ⅜" to each end for this). Secure with a nut on the opposite side. Use two washers and a second nut to secure the coax leads to the terminals.

For the supporting mast we used ¾" plastic tubing. It is pretty flimsy, however, so we inserted a ½" dowel rod in the tubing to stiffen it. You may have other ideas, but the mast should be of a non-metallic material. It should extend well below the elements. I made mine 5 feet long and placed it on top of my triband beam.

My quad has withstood some very high winds, ice, and birds, all of which were hazards with the Yagi I previously used. The front-to-back ratio is excellent, and the range is better than the Yagi by a good 10 percent. CQ



The finished product sits on top of W9CRC's triband beam.

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CQ REVIEWS:

The Kenwood TH-21AT 2 Meter Hand-Held Talkie

BY DAVE INGRAM*, K4TWJ

If you've followed the many evolutions affecting our world of 2 meter FM, you surely remember when this mode initially gained widespread popularity and VHF mobile rigs shifted from trunk-carried monsters to compact under-dash units. Few repeaters were capable of really good coverage during those early days, and you basically were fortunate to conduct a successful autopatch. Talkies were roughly the size (and weight) of masonry bricks, but their attractions pointed out several worthwhile benefits for all. Significant advancements have been made since that time, and one can now travel throughout our lands while realizing the fully reliable capabilities of both repeater and "direct" VHF communications as needed or desired.

As a result of FM's mass growth and development, hand-held talkies have become extremely popular items among today's amateurs. Their "ready for action" communications and autopatching capabilities are ideal for both daily use or light travelers, and they are an almost priceless asset during times of emergency. Until quite recently, however, even modern talkies were somewhat bulky for comfortably carrying on a daily basis (they created the "Dirty Harry look" of a .44 magnum when carried in a coat pocket). Enter the new Kenwood TH-21AT—a 1 watt output, frequency-synthesized 2 meter FM talkie that's only a couple of millimeters larger than a pack of cigarettes. This little beauty will fit right into a shirt pocket! It can be carried in a sport coat's vest pocket or lady's purse every day, and it will never be noticed until it's needed. In fact, I would say this new talkie swaps most of the bells-and-whistles complexities of larger microprocessor-controlled rigs for one very special feature: super small size. I'll take that trade any day.

The Kenwood TH-21AT Tiny Talkie. Unit is approximately the size of a pack of cigarettes, tunes 144.00 to 148.95 MHz, and runs 1 watt output.

Bearing shades of a Star-Trek-style communicator, Kenwood's Tiny Talkie measures 4.72"H × 2.24"W × 1.1"D (120 × 57 × 28 mm). The rig's weight is 0.57 pounds (280 grams) complete with battery pack and rubber ducky antenna. Direct tuning of the unit's 800 channels or frequencies is via top-mounted thumbwheels and a 5 kHz pushbutton—an easy to understand and use arrangement that doesn't require a separate memory back-up. There are two tiny recessed switches on the talkie's rear: one for +600 kHz/−600 kHz/simplex transmit, and one for high or low power output (1 watt or 150 milliwatts). The unit's squelch knob sits almost flush with the case and is adjusted by finger rotation of its top surface. Separate miniature jacks are provided for external earphone and/or microphone use, and a front-panel LED indicates transmit/battery condition. Rather than using a popular BNC antenna connector, the 21AT is fitted with an RCA phono-type receptacle that has three or four rounds of threads at its bottom. The talkie's matching flexible antenna is equipped with a similar "push and tighten" connector (Kenwood calls this "thread-loc," but I ignore the threads and use RCA to BNC or RCA to SO239 adapters when connecting mobile antennas or gain whips). The Tiny Talkie is supplied with thin ducky antenna, 180 maH NiCad battery pack (PB21), "wall-type" charger (BC-3 with clip adapter), earphone, and wrist strap.

A Closer Look

Close physical examination of the Kenwood TH-21AT reveals a well-crafted and very smooth-fitting case. It looks fairly sturdy, but I wouldn't care to drop it and check for damage. The battery clip slides on/off the talkie's lower rear, with positive snap action holding it perfectly in place. There are no rear or bottom connections for charging; the battery pack must be removed and snapped onto its supplied adapter/connector. That's one of the first modifications I plan after securing an optional battery case. Kenwood's logical suggestion is to carry two packs and swap/charge them as necessary. The talkie's keypad buttons don't protrude or catch on pockets like some units; they are almost flush and exhibit a nice pressurized feel. Overall, the unit seems to

*Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

General	
Frequency range	: 144 MHz – 146 MHz (TH-21E) 144 MHz – 148 MHz (TH-21A/AT) Note: Oceania Version 144 MHz – 146 MHz
Signal type	: F3 (FM)
Operating temperature	: –20°C ~ +50°C
Antenna impedance	: 50Ω
Power supply voltage	: 5.8V – 10.0V (rating voltage; 7.2V)
Power consumption	: At reception standby; Less than 28 mA At transmission (Hi); Less than 600 mA (Low); About 300 mA
Dimensions	: (W) 57 (65.5) x (H) 120 (127.5) x (D) 28 (32) mm The numbers in the parenthesis include projections.
Weight	: Approx. 280 g (including antenna and Ni-Cd batteries)
Transmitter section	
Output power	: Hi; 1.0W, Low; approx. 150 mW
Modulation system	: Reactance modulation
Max. frequency deviation	: ± 5 kHz
Unwanted reflection	: Less than –60 dB
Microphone	: Condenser type
Receiver section	
Reception system	: Double superheterodyne
Intermediate frequency	: 1st; 16.3 MHz, 2nd; 455 kHz
Sensitivity	: S/N more than 28 dB at –6dBμ (0.5 μV) input 12 dB SINAD; less than –12 dBμ (0.25 μV)
Squelch sensitivity	: Less than 0.25 μV
Selectivity	: –6 dB at more than 12 kHz –40 dB at less than 28 kHz
AF output	: More than 250 mW (8Ω load, distortion 10%)

Table I– Technical specifications of the Kenwood TH-21AT.

me like an attractive cross between a piece of jewelry and a relatively durable pocket radio.

Considering this talkie's small size and reasonably good RF output, you're surely wondering if it scrimps on internal circuitry and how much operation can be expected between NiCad battery recharges. The TH-21AT scores well in both of those areas. An examination of the unit's block diagram and comparison with other talkies reveal some favorable similarities. The transmitter's "RF amplifier string" (Q8, Q7, Q6, Q5) and the receiver's "front end" (Q1, Q2, Q3) are identical to those in Kenwood's "deluxe" 2.5 watt TR-2600 talkie. Size reduction was basically accomplished by using integrated circuits in IF, audio, and modulator stages, and only using three internal circuit boards. I think the Tiny Talkie should provide creditable and conservatively rated operation for many moons.

Concerning battery life, I ran a direct "transmitter current demands" versus "NiCad pack milliamp-hour rating" comparison between the TH-21AT and several popular talkies. The results indicated fully charged operating times midway between ICOM's IC-02AT (with standard BP3 pack) and Kenwood's TR-2600 (with standard PB26 pack). That's as good as anyone can expect, and it's usually ample for a day or two of normal operation between chargings.

My only criticism of the TH-21AT is surely minor. The volume control's knob and shaft are not protected from accidental side strikes and might break off level with the talkie's top if abused. Also, the transmit LED doesn't give any prewarning of battery depletion. A simple zener

diode in that line would indicate the Ni-Cad's "knee" of discharge. The latter problem can be sidestepped by simply carrying a spare battery pack.

Operating the TH-21AT

The real beauty of this pocket-size talkie is its flexibility. If you're always moving through airports, taxis, and hamfests, like the *CQ* gang, it's an ideal traveling companion. If you're office-confined with two extra inches of desk space, it provides good keep-in-touch capabilities. The talkie is also great for emergency use, or for cabling to an external RF amplifier and using mobile (overall, it's no larger than some hand mikes).

I purchased one of the first TH-21AT's available through our local dealer, charged the battery pack for its prescribed 8-hour period, then began putting the talkie to good use. Each afternoon, the XYL and I briefly rap over a difficult direct path—a challenge that separates talkies from toys. The 21AT cut through almost as well as my regular rig. Impressive! Next were the checks through "intermod alley"—an FMer's badland that makes any talkie other than an ICOM emit squeals and howls like a visit to the zoo. The TH-21AT performed identically to several other rigs—not great, but not that bad. That's actually a compliment for such a small unit. A number of repeater QSOs followed, and the talkie worked like a champ. The unit's autopatch capabilities also worked perfectly. There's a "transmitter key function" which holds the push-to-talk line energized for 1.5 seconds after the first tone number is pushed. That feature is convenient when punching telephone numbers while using "one hand operation."

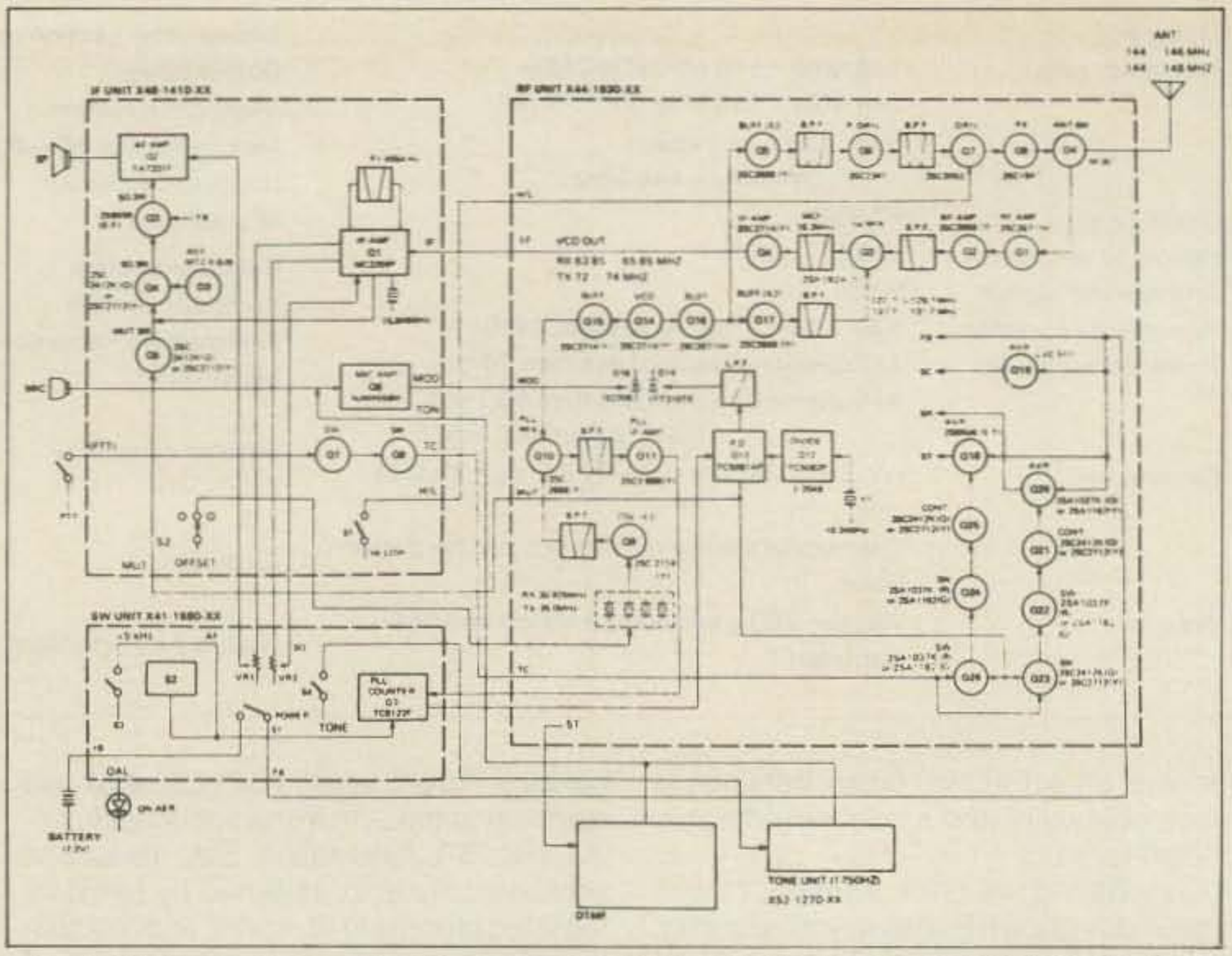

Fig. 1– Block diagram of the Kenwood TH-21AT. Unit is comprised of three basic pc boards and two smaller boards.

Both transmit and receive audio of the TH-21AT are pleasingly natural without noticeable low or high frequency response. Also, you don't need to "close talk" this unit's mike; a working distance of 2 or 3 inches seems to give the best results (check that for yourself using an across-room rig).

Although I've owned a pile of 2 meter talkies, I've always sought a unit small enough to carry comfortably, yet efficient enough for reliable communications. The TH-21AT fills that bill nicely. It's easy to use, it has decent power output, and its battery life is quite acceptable. I plan to enjoy it until wrist talkies become popular!

Conclusion

The Kenwood TH-21AT talkie has a number of attractions in its favor: easy thumbwheel frequency selection, respectable performance, light weight, and super small size. It's a "go anywhere" rig made for enjoyment, and it's also economical in cost. That's a winning combination in nearly every light.

A full line of optional accessories are due to compliment this talkie during the near future. These items include extra battery packs (PB21), an empty battery case that can be field-loaded with AAA-size cells (BT2), an oversize battery case for extended operation (EB2), and a DC-to-DC mobile adapter (DC21). Additionally, there's an external speaker/mike (SMC-30), an external headset/boom mike with VOX (HMC-1), soft carrying case (SC-8), antenna jack to BNC adapter (AJ3), and a tone burst module (TU6). For more information, contact Trio-Kenwood Corporation, 1111 West Walnut Street, Compton, CA 90220. CQ

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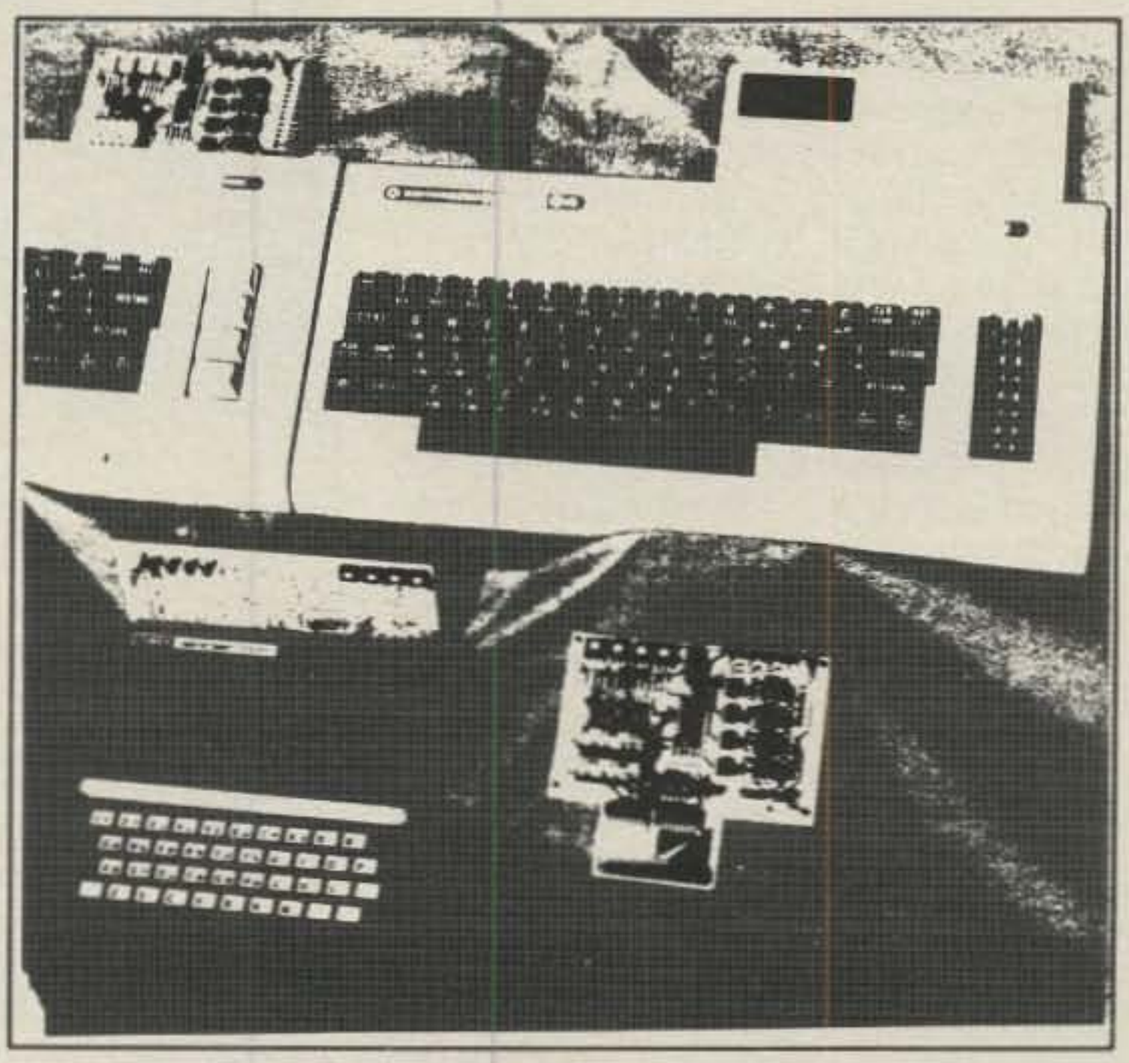

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CIRCLE 66 ON READER SERVICE CARD

One year later the Grenada invasion has begun to fade into history. Students resumed their studies, an election was scheduled, and things evolved into a normalcy. For KC2PK the memory is still vivid as he recounts the events leading up to his visit there on the first anniversary of the invasion.

"The Grenada Emergency Net Is Now Clear"

BY FRED M. JACOBS*, M.D., KC2PK

My wife, my daughter, and I returned to Grenada to observe a special reunion on the occasion of the first anniversary of the U.S.-led invasion, which took place in the early morning hours of October 25, 1983. At that time my daughter had been a first semester medical student at St. Georges University School of Medicine and was caught on the island by the political upheaval of the preceding week. She was then trapped in her dorm along with about 200 of her schoolmates in the fury of the surprise attack on the island.

I had had repeated radio contacts with Grenada starting in 1981 when my son was a student at St. Georges. We had a weekly contact with Don Atkinson, J37AH, a retired American who had been living on the island for more than 10 years. When my daughter arrived in August 1983, the weekly QSO's continued. I had visited Grenada in 1981 for a week, then as a visiting professor at the Medical School in 1982 for another two weeks. Thus, both my wife and I were quite familiar with the island, especially with the area around the medical school.

When the Peoples Revolutionary Government (PRG) became torn with internal dissention, we became alarmed and contacted the U.S. State Department for advice. During this and later contacts the State Department officials became aware of my amateur radio activities with Grenada and our knowledge of the local geography. While we and the other parents of students were very much disturbed by events on the island, it was not until the killing of the Prime Minister, Maurice Bishop, and several of his ministers on October 19, 1983, as well as the deaths of more than one hundred of his supporters, many of them women and children, that we came to fear for the physical safety of the students.

Left to right: Don Atkinson, J37AH, Stefanie Jacobs, Barbara Atkinson, and Dr. Fred Jacobs, KC2PK.

Throughout this period our only reliable contact with the island was with J37AH, who lived on a large ridge overlooking the campus. He indicated that the situation was "as quiet as a church mouse," but had no specific information regarding individual students. I had also been in contact with Mark Barettella, KA2ORK/J3, several times during the preceding few weeks, and I turned again to him, as he had a radio in his room in the dorm where my daughter was also living.

My wife and I traveled to Chicago on October 22 to attend a medical meeting. I was to make a scheduled contact with KA2ORK/J3 that night. Using a MARCO directory, I chose a name at random and called David Lieb, M.D., WA9BST, who generously invited my son and I to his home to use his rig. However, it appeared that the band had closed from Grenada to the Chicago area, and we were unable to make the contact. As luck would have it, an attempt at a phone call was successful, and we were able to speak to Stefanie, our daughter. She was terribly confused and frightened. We told her to sign up for the anticipated evacuation and decided to forego the medical meeting and return home at once, as we felt cut off without our radio contacts to the island.

We arrived back in New Jersey on Monday, October 24, and immediately contacted J37AH. His tone was reassuring. Information was also obtained which indicated that the students were to be

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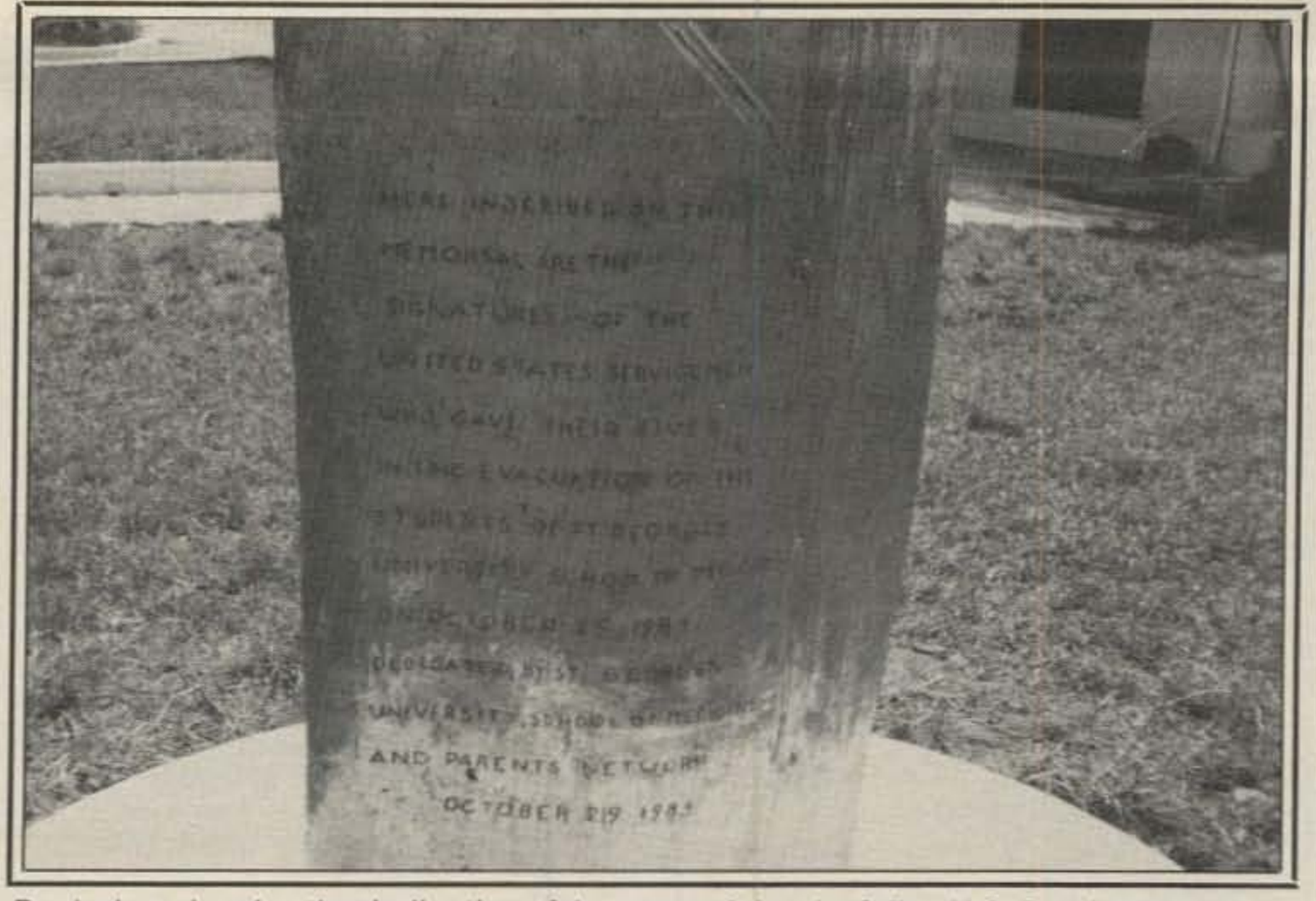
Memorial statue in honor of the fallen U.S. Servicemen on the Grand Anse Campus of St. Georges University School of Medicine, Grenada.



Back view showing the dedication of the memorial to the fallen U.S. Servicemen on t campus of St. Georges University School of Medicine, Grenada.

Radio shack of J37AH used by KC2PK/J3.

brought off the island under the protection of U.S. Embassy officials from Barbados who had arrived on the island several days before to handle "American interests." Thus, when we went to bed on the night of October 24 I felt more confident than I had for a week that everything was really going to be alright.

At 5:45 a.m., October 25, 1983 a friend, N2DRA, called to tell me that Mark was on the radio on 40 meters and that the island was under attack! In the early phase of the attack the students didn't yet know who the attacking force was. It was feared the the Cubans were invading the island, and consequently there was a great deal of confusion. My wife immediately called the State Department, and I established contact with KA2ORK/J3 on 7.244 MHz. The State Department confirmed that the invading force was, indeed, the United States and other Caribbean forces. The radio marathon was now underway. While my wife was called by State Department officers every ten minutes, I maintained radio contact with Mark for the next 34 hours and 13 minutes until the last moment before the students' evacuation from the dorm. Thus, the amateur radio link was operational throughout the invasion.

Information given to my wife, Miriam, by the State Department was transmitted by me to Mark, who then relayed this by phone to the Ranger commander at the other campus, which had been captured in the first hour of the attack. Information from the military concerning the students was similarly relayed to Mark, who transmitted to me, and was then relayed to the State Department or Defense Department by my wife by telephone. The frequency was changed as band conditions changed from 40 meters to 20 meters and then to 15 meters as the day wore on. At that time the FCC authorized a small group of amateurs to use a frequency outside of the U.S. band to try to minimize some of the interference. Thus, at 0020Z on October 26 we moved to 14.140 MHz only to find ourselves in the midst of the trans-Canadian calling frequency. We moved a few kHz off this frequency and stayed there until 1040Z October 26, when we moved to 7.301 MHz. At 1135Z we moved again, this time to 14.351 MHz, where we stayed for the remainder of the operation.

Finally, after a mentally and physically exhausting period of almost 35 hours of continuous operating, it became apparent that the military forces were arriving to evacuate the students. Mark hurriedly signed off, saying that he would try to reestablish contact later in "a better place." This was to be his last transmission, as he was forced to leave the radio behind as the students ran along the beach and into the surf to the waiting helicopters, while gunfire sounded all around them.

While all of this was occurring, a small, tense group had gathered in my radio shack. My son, a medical student now studying in Chicago, had rushed home at the first news of the invasion. Representatives of the press included a reporter from *The New York Times*, the Associated Press, as well as a team from ABC News. We were very quiet as we watched Casper Weinberger on TV announce that the Grand Anse campus had been "secured" and all students evacuated. I immediately called Don, J37AH, and asked for a visual confirmation. He told me that there was a "furious firefight" taking place on the campus at that very time, and he doubted that anyone could get out in the midst of the fighting! There was shock and silence in the room. Had we gone through all of this for nothing? How

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could we know if Stefanie was safe, or if there were any casualties among the students? Calls to the State Department brought only sympathy and understanding, but no further news. We were to wait another 10 hours before we finally heard from Stefanie when she called from South Carolina to tell us that all were safe. Miraculously, no one was hurt.

The next few days were a blur of activity. First, there was the joyous homecoming at Newark Airport and the constant press attention, and finally the opportunity for our little family to realize how close we had come to tragedy, how very near to changing our lives forever. The thought of returning to Grenada had already started to nudge into my mind. During the year I had many sleepless nights imagining the worst possibilities. Many times my mind would wander back to that tense and frightful time, and we finally decided to return to the island. We would pay tribute to those who had died in the invasion, and also give thanks to the Grenadians who helped the students during the curfew. I also wanted to transmit from Grenada on the anniversary of the attack in an attempt to put the entire affair behind me. It was sort of an exorcism.

On October 25, 1984 I was again on Grenada in the home of my friend Don Atkinson, J37AH. At 1650Z I checked to see if 21.300 MHz was clear. Then I transmitted the following: "This is KC2PK/J3 transmitting from the island of Grenada on the first anniversary of the U.S.-led intervention. I am using the station of J37AH. QRZ." The response was truly unbelievable. I worked the pileup as best I could, amazed and thankful that so many of the amateurs remembered my call from the previous year.

When the two hours I allotted to this activity had passed, I had worked 158 station, renewed some forgotten acquaintances, and felt relieved that the job was now completed. I had walked the beach where my daughter had run for her life, prayed with soldiers at the memorial monument erected on the medical school campus, and been accepted by the Grenadian amateurs with the warm hospitality so typical of this most beautiful of all places. My wife and I had come full circle. Amateur radio had, for those two terrible days a year ago, been the only link to the most important thing in my life. I can put it behind me now. The Grenada Emergency Net is now clear. CQ

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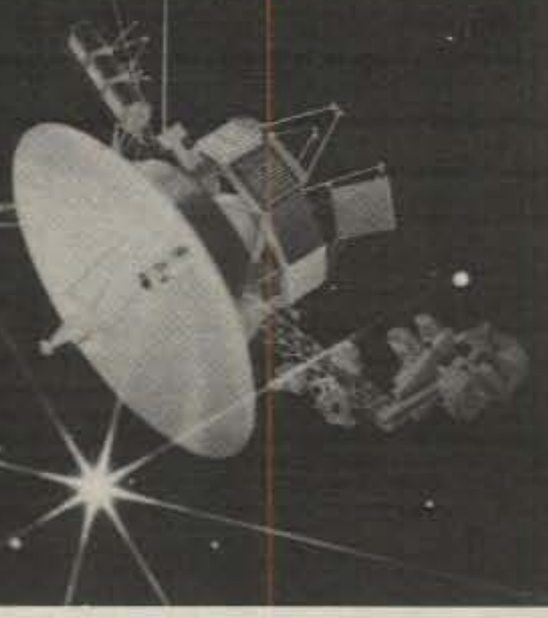

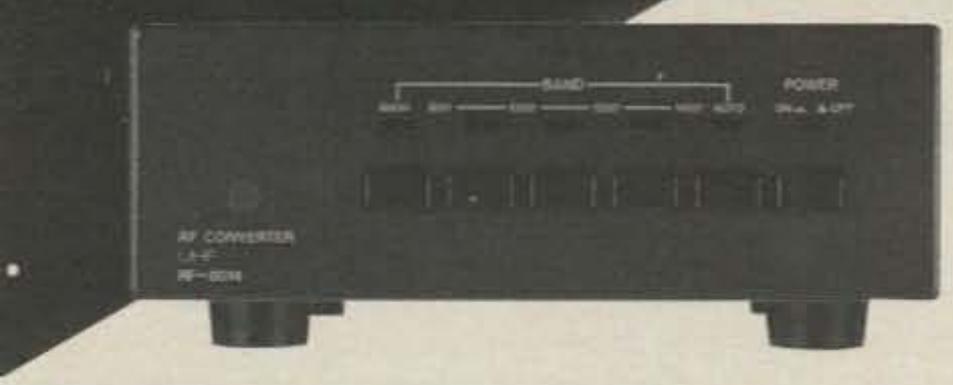

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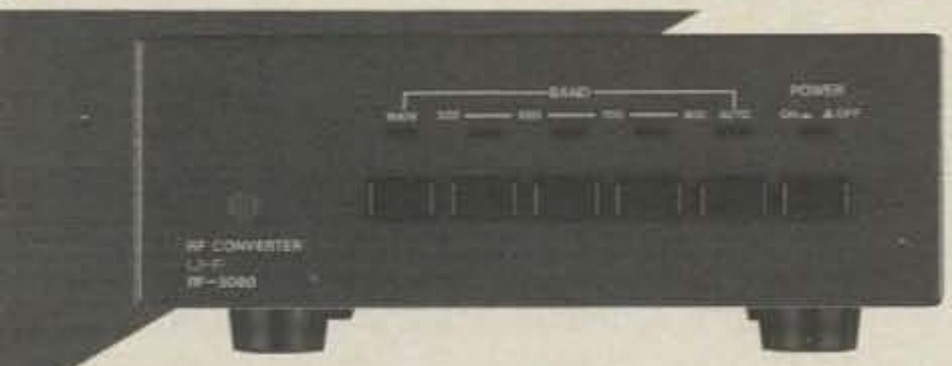

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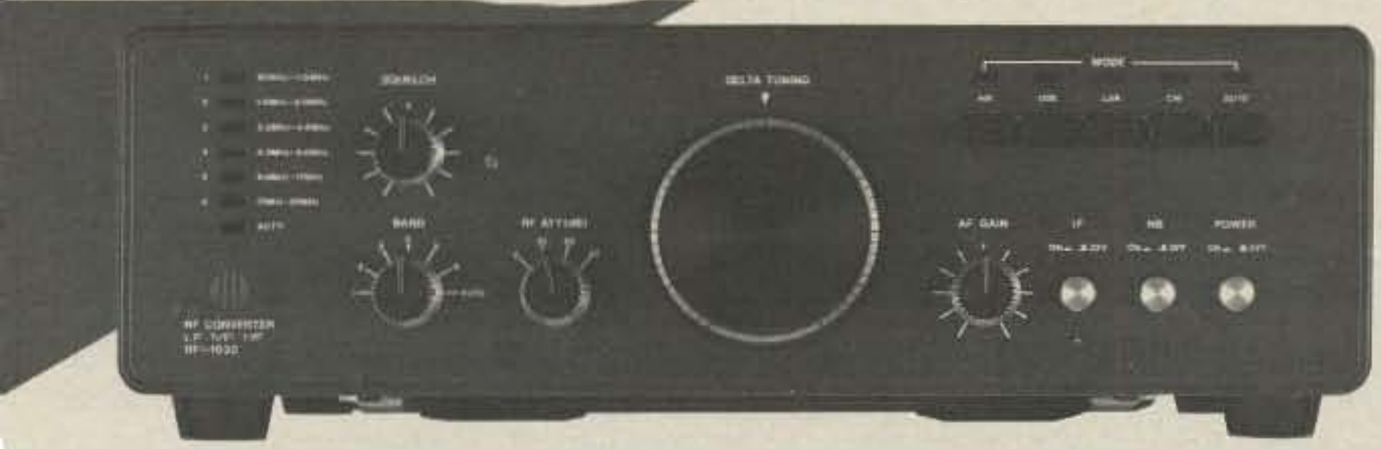

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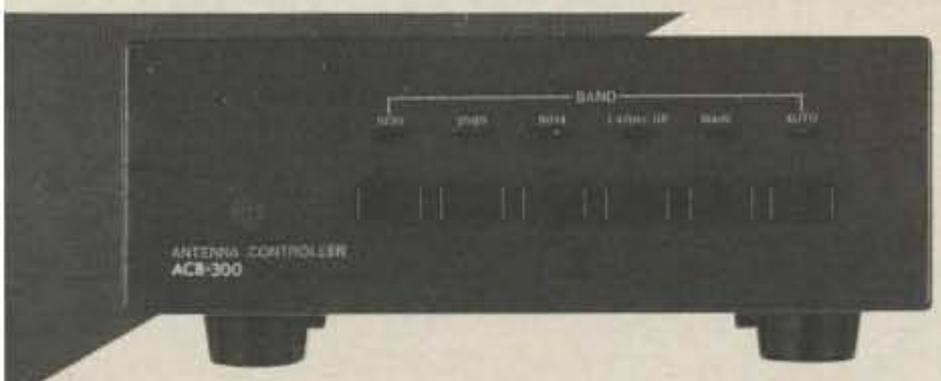

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● Wider Coverage (100 KHz ~ 1.4 GHz or above) with RF converters (optional). ● Computer controlled memory channel expansion (unlimited), High-Speed reprogramming, Record of Frequencies and Time, and all functions remote controllable with RC-4000 Interface (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

Announcing:

The First CQ World-Wide VHF WPX Contest

Attention all active amateurs! We have some exciting news about our all-new contest. Even if you're neither a contester nor a VHFer, *read on*. We think you'll want to be involved in this new concept in operating fun!

VHFers are well aware that there have been three popular VHF contests each year, in January, June, and September, and sponsored by the ARRL. Even non-contesters usually get on the VHF bands during these activities, if only to give out a few points and see what new DX might be workable.

HFers are well aware that there are two very popular prefix (WPX) contests each year, in March and May, sponsored by *CQ*. Even non-contesters often spend some time DX-chasing during these weekends, and they sometimes find the practice so invigorating that they spend more hours at the rig than planned.

Now we've taken the best components of the WPX and the existing VHF contests to create an all-new *CQ* VHF WPX competition which will appeal to nearly every type of amateur. This exciting and innovative contest offers new benefits to the "casual" contester, including:

- No mode limits!
- 48-hour contest period, allowing two "overnight" opportunities for extended tropo, scatter, etc.
- 50 through 1296 MHz bands only, to allow use of 100% commercially made and readily available gear.
- Simplified contest exchange: callsign and serial number.
- 8 categories of entry—a category for any type operator!
- Hundreds of awards on national and local levels of competition. Beautiful engraved trophies to national top-scoring stations in each category.
- *International* competition! This is the first real international VHF contest, with worldwide participation encouraged and rewarded.

We're asking everyone who can put a VHF signal on the air to participate in the new VHF WPX competition. Those lucky enough to have a "rare" callsign prefix (NA2A, KX6Z, etc.) have some advantage, as they will be in demand. If you personally don't have a "rare" prefix but have a friend who does, get together and use *his* callsign! Canadians are not all VE's; they can be CY, VY, XN, etc. Special callsigns can sometimes be issued by local licensing authorities, and we hope our VHF DX friends will pursue this. For the purpose of a WPX contest, a prefix is defined as the letters and numbers which establish a callsign's issued location. In the U.S., the prefix is always one or two letters plus a number (e.g., AA1, N2, WB4, etc.). DX prefixes 5W1, P44, and 4X6 are examples of prefixes that include two numbers.

To further elaborate on WPX contesting and to answer a few of the most obvious questions before they're asked, KT2B/7 counts as "KT7"; DL6CL/W2 counts as "W2"; NV60/2 counts as "NV2"; and WA2VUN/C6 counts as "C6." You can see that some interesting possibilities arise from this system. Station NF2L is one of only 26 stations in the world with the NF2 prefix. However, if he were to operate from Arizona, he would likely be the only "NF7" in the world! (This assumes the 7-area call assignments are not up to "NF" prefixes yet.) What an incentive for folks who live near a call-area to cross the line and operate portable!

Why a *prefix* contest? Well, for one thing, it's *fun*. The HF *CQ* WPX contests have become the second most popular amateur radio competitions in the world (based on actual logs received), a sure sign that folks love exchanging and seeking out new prefixes. Also, there are thousands of possible prefixes to work—over a thousand in W/VE alone. This will keep the contest lively, as a new prefix can appear at *any* time, not just if the band opens. Then there is the opportunity for modestly equipped VHFers to succeed in categories of competition structured to suit any amateur's level of operations. The "big guns"—the noted VHF contesters—will still be the cream of the crop and will compete with each other in the multiband QRO categories, but even this takes on new meaning in light of competition on an *international* scale.

What will it take to participate? That depends upon your level of participation. For the newcomer we offer a single operator, single band, low power level of competition. There is also an "FM only" category for those who haven't yet decided if VHF weak-signal work (or contesting) is for them. For the VHF/UHF enthusiast, we have single operator multi-band, and multi-operator multiband (high power) levels of competition. For the hiker/backpacker there is a separate "portable" category which applies only to those operators using temporary power sources.

The VHF WPXer can expect a very small financial investment to go a long way, as compared with HF/DX contest endeavors. Modest stations, operated competently, are likely to *win* most of the VHF WPX contest honors. Let the excellent July VHF *propagation* do the work. At this time of year 10 watt stations have made 1500 mile DX contacts on 2 meters. Some of these stories will make interesting reading in upcoming issues of *CQ*.

Is this contest fair to everyone? Not exactly, but it is difficult to conceive of a large-scale radio contest that would be. In the U.S., where about one-fourth of the national population resides within a 200 mile radius of New York City, the total number of contacts available on a VHF band is likely to be greater than elsewhere. However, a greater number of prefixes can probably be worked from the Cincinnati, OH area. Those U.S. amateurs living near a national border (VE) or a populated island (C6) might have some advantage. Japanese VHFers might have an edge on everyone: Where else are nearly a million licensed hams within VHF range of each other? European mountaintoppers will have some strategic advantages not found elsewhere. (Europe has a higher percentage of active VHFers in the amateur ranks than we do in the U.S.) But the idea is to compete in our local areas and. to have *fun!*

This first annual *CQ* World-Wide VHF WPX Contest is scheduled for the weekend of July 20, 1985. This is an ideal time of year for VHF and outdoor activities. The period has been carefully selected by a committee of active VHFers as one which historically produces the best *E*-skip propagation and also coincides with a summer meteor shower, the Delta Aquarids. The July weather in the densely populated areas of the Northern Hemisphere is ideal for portable operation, and with separate award categories for QRP and hilltop/portable stations, those of us who are "backpackers" have an excellent opportunity to achieve high honors with simple, lightweight equipment.

The success of any radio contest is dependent upon the enthusiastic support of the amateur community. The VHF WPX contest began as a proposal to *CQ* from an active contest club called SCORE (the Society of Contest Operators and Radio Experimenters)—a New Jersey-based group who uses the call K2XR in contest

operations—and developed into what will become the largest VHF contest in the world. We have a VHF WPX Contest committee comprised of active VHF contesters from around the U.S., and the committee's functions will include general administration of this new event in concert with *CQ*. A list of committee members and their functions will be published in a forthcoming *CQ*.

We are soliciting sponsors for VHF WPX award trophies. As has been the case with the other *CQ* contests, private individuals or radio clubs have sponsored the highly prized trophies. *CQ* will sponsor one major trophy for the VHF WPX, and SCORE will sponsor another. Please let us know if you or your club will sponsor a trophy. This is an opportunity to be part of a prestigious event, and all sponsors will be listed in the publication of contest results in *CQ*. Send your pledge or inquiry regarding awards sponsorship to SCORE, P.O. Box 1161, Denville, NJ 07834, or to *CQ*.

Contest rules for the *CQ* World-Wide VHF WPX Contest are listed below. We shall continue to publish updates on this exciting new program.

Rules For The CQ World-Wide VHF WPX Contest

Date, time: 0000 UTC July 20, 1985 to 0000 UTC July 22, 1985 (48 hours).

Bands: All authorized amateur bands and frequencies from 6 meters through 23 cm (50, 70, 144, 220, 432, 1296 MHz).

Modes: All authorized modes are allowed for contest credit, with the single exception that repeater contacts cannot be allowed or counted for contest credit. Satellites are considered repeaters.

Exchange: Consecutive serial number and callsign.

Multipliers: Prefixes worked per band.

Scoring: 1 point per QSO on 50, 70 or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times total number of prefixes worked (the sum of the prefixes worked per band).

Classes of entry: Single operator, single band; single operator, multi-band; single operator, single band, low power; single operator, multi-band, low power; multi-operator, single band; multi-operator, multi-band; portable (with temporary power source); FM only. Low power is defined as 25 watts PEP output or less.

Awards: For first-year participants, a commemorative certificate will be issued to *every* entrant to celebrate the first annual VHF WPX. Trophies to national top-scoring stations (per category). Certificates to top-scoring stations in each call area or country where special effort is demonstrated.*

**Let us know what you did to make your operation special. Documented special effort, regardless of final score, will be awarded.*

CQ REVIEWS:

The Ten-Tec 2510 OSCAR Satellite Station/Converter

BY DAVE INGRAM*, K4TWJ

Measuring 4½"H × 7½"W × 11"D, the Ten-Tec 2510 will fit comfortably into almost any amateur setup. The unit's color and front-panel layout match that of the popular Ten-Tec Corsair transceiver.

A notable event in amateur radio history took place on the morning of June 16, 1983. Our first Phase III satellite, OSCAR 10, was successfully launched into orbit and a new era of space communications was initiated. Being significantly more advanced and capable than any and all previous OSCARs, this new amateur satellite affords the communications equivalent of a new band quite unlike any of our existing allocations. Using OSCAR 10, for example, it is now possible to conduct roundtable discussions between two or three of the world's continents for several hours each day. These reliable and predictable communications are completely independent of the ionosphere's state, and, once accurately aimed, only slight hour movements of a station's satellite antennas are necessary for tracking. There is approximately 100 kHz of relatively clear spectrum available on OSCAR 10's popular mode B transponder, and the satellite is predicted to live many years. Additional plans are also being instigated for other long-range spacecrafts to soon join the new OSCAR. Amateur satellite communications have indeed come of age!

OSCAR 10's unique capabilities are due to two special concepts: its sophisticated linear band transponders, which are microprocessor-supported, and the satellite's highly eliptical orbit. Traveling some 20,000 miles from earth twice a day, the satellite is thus "line of sight" between many countries. Communicating via the (seemingly stationary) satellite during those "far from earth" times basically requires transmitting a CW or SSB uplink signal in the range of 435.050 to 435.160 MHz and receiving downlinked signals on 145.955 to 145.845 MHz. An approximate uplink power of 100 to 500 watts Effective Radiated Power (transmitter output + antenna gain – feedline loss) is quite adequate for transmitting, and a 10 dB gain circular polarized 2 meter antenna with a low noise preamplifier is suggested for receiving. The remaining item or items needed to complete that satellite station are an independently operating 70 cm all-mode transmitter and an all-mode 2 meter receiver (this full-duplex capability is vital, as you must be able to hear your own satellite-returned signals for frequency spotting and antenna "tweaking" on the satellite). Although you can purchase two separate-band VHF/UHF transceivers for OSCAR 10 use, the resultant expenditure can be rather steep, and it doesn't provide regular HF capabilities without the inclusion of an additional transceiver. Enter the new Ten-Tec Model 2510 OSCAR Satellite Station/Converter unit, a pseudo-transceive, full-duplex unit for operation in conjunction with your existing HF SSB/CW transceiver.

The Ten-Tec 2510 Satellite Station

Ten-Tec's new unit for mode B operation on OSCAR 10 (and future amateur satellites) contains a 70 cm SSB/CW transmitter and GaAsFET preamplified 2 meter to 10 meter receiving converter in one compact cabinet (4½"H × 7½"W

*Eastwood Village No. 1201 So., Rt. 11, Box 499, Birmingham, AL 35210

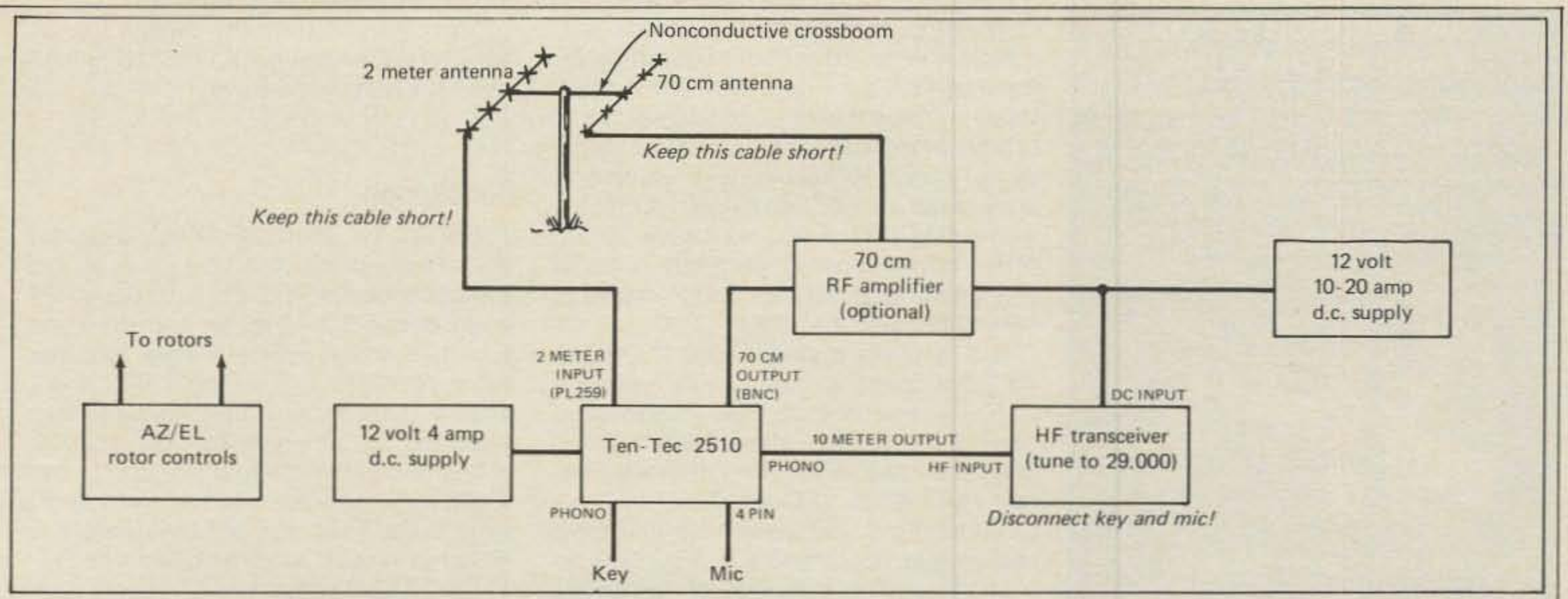


Fig. 1– Interconnection guide illustrating a typical OSCAR 10 setup using the Ten-Tec 2510. If the optional 70 cm amplifier is not used, the HF transceiver's DC supply can be tapped for also powering the 2510.

×11"D).The transmitter's output is continuously variable to 10 watts, and the receiving converter has a noise figure of less than 2.5 dB with a conversion gain of 25 dB. Additional specifications are listed in Table I. While the addition of circularly polarized antennas for 70 cm and 2 meters "rounds out" the system, you may desire to add a 10 watt input/70 watt output 70 cm linear amplifier for a margin of extra signal capability. The Ten-Tec's front-panel drive control and mike gain will be particularly useful at that time, as it is considered absolutely taboo to operate via OSCAR with excessive RF. This can easily be checked by comparing your downlink signal with the satellite's general beacon on 145.810 MHz. Your signal should never be stronger than the beacon, or the satellite's AGC can restrict other users (a full discussion of OSCAR 10 communications was featured in my August and September 1984 *CQ* "World of Ideas" column).

A number of circuit boards inside the 2510 comprise the 70 cm transmitter, 2 meter converter, common VFO, ALC, and control circuitry. Rear-panel connections are provided for 2 meter input, 10 meter receiver output, 70 cm RF output, DC input, key, and auxiliary amplifier keying. Microphone connection is via the front panel (a mike is not supplied). The 2510 requires 13.8 volts at 3 amperes (maximum) for operation. Assuming you are presently using a solid state transceiver with an external 12 volt supply, a "tapoff" can be added for related 2510 operation. Otherwise, a small DC power supply can be utilized.

Transmitter
Frequency Range: 435.0 to 435.5 MHz (435.0 to 437.0 MHz with optional oscillator board)
Modes: SSB & CW
Output Power: 10 watts
Automatic Level Control: Adjustable internally
Carrier Suppression: 50 dB minimum
Sideband Suppression: 30 dB minimum @ 1 kHz tone
Spurious & Harmonic Output: down 50 dB minimum
Input Power Requirements: 13 VDC @ 2 amps maximum
Receive Converter
Frequency Coverage: 145.790 to 145.980 MHz converted to 29.0 MHz, and tracks with 435 MHz transmitter
Noise Figure: less than 2.5 dB
Conversion Gain: 25 dB
Image Range: greater than 60 dB
Dynamic Range: 85 dB typical

Table I– General specifications for the Ten-Tec 2510 OSCAR satellite station.

Installation and Operation

Considering that many of you may not be familiar with OSCAR 10 setups, let's begin this discussion as the 2510 is unpacked from shipment and continue through its operation. An outline of satellite station installation and interconnections is shown in fig. 1. The satellite antennas are usually 10 dB gain "twist" arrays for 2 meters and 70 cm which are mounted on a nonconductive 6 or 7 foot crossboom and rotated in both azimuth and elevation (that nonconductivity reduces 70 cm/2 meter cross-modulation). *Short lengths of top-quality cables without any breaks or splices* are connected between the antennas and the 2510 satellite station (cable lengths exceeding 25 feet severely attenuate these VHF/UHF signals). The 2510's 10 meter output is then cabled to the HF transceiver's input (take all necessary precautions to avoid accidental keying of HF rig and "RFing" the 2510). Connect DC power, key, and mike to the 2510, and the basic setup is ready for action. If a 70 cm RF amplifier is included in the setup, diversify power-supply loading accordingly. I personally use an ICOM PS15 to power an IC-730 transceiver (low current demand on receive) and a 90 watt 70 cm amplifier, while a separate 4 amp supply powers the 2510. The supplies and RF amplifier run hot; thus, whisper fans are used for cooling (the 2510 and 730 are the setup's coolest parts!).

The previously described 2510 satellite station operates in a unique and very convenient manner. The setup's HF transceiver is first tuned to 29.000 MHz, while the 2510 is tuned to a desired OSCAR 10 operating frequency (such as 145.900 MHz for the passband's middle . . . an area for mixed SSB or CW QSOs). Assuming the satellite is in range and antennas are properly positioned, a few "blips" are tapped on the key while the 10 meter receiver is tuned ±300 Hz to spot your downlinked signal. Following that "Doppler compensation/zeroing," subsequent satellite operations are handled from the 2510 in a straight "transceiver manner." As downlink signals from others are tuned, a reassuring tap of the 2510's spot switch confirms that your own satellite returned signal is accurately tracking and ready for calling. OSCAR satellite operations have never been easier or more convenient.

Using the 2510

The Ten-Tec 2510 was put into operation within a couple of hours of its arrival, joining several other OSCAR 10 rigs being used, and also discussed in my new book explaining OSCAR 10 and Phase III satellites (publisher is Universal Electronics, 4555 Groves Road, Suite 3, Columbus, OH 43232). As mentioned earlier, the unit was used in conjunction with my ICOM 730, a 70 watt 70 cm amplifier, and "twist" antennas for 2 meters and 70 cm. Before switching the new system into action, I checked OSCAR 10 activity with my old standby setup: separate 2 meter and 70 cm transceivers with external RF preamp and linear amplifier. Would the 2510 perform equally? Maybe better? How? An interesting thought. Switching over to the

2510 setup, my first move involved transmitting CW on 70 cm and searching for my downlink signal around 29.000 MHz. Wow . . . there it was . . . crisp, clean, and slightly more readable than my old standby rig! The 2510's GaAsFET preamp isn't an S-meter zapper, but it sure works! My signal was shifted 200 Hz above 29.000 MHz, corresponding perfectly with its predicted Doppler. Goodbye sunspot minimum, hello (CQ) DX!

It only takes a single tune of OSCAR 10's bandpass to fall in love with the 2510. Whenever a desired station is received, the 70 cm transmitter is right on frequency and ready for action—no telltale zeroing" or VFO tweaking! In order to understand that statement, you must realize that OSCAR 10's (full duplex) operation permits hearing all on-frequency activities, including your own satellite relayed signals. Since non-2510 owners use separate 2 meter/70 cm units, anyone "coming on frequency" is immediately heard. It's quite unusual to show on someone's frequency "unannounced," and it's great for catching DX before others can swing their 70 cm transmitters into use.

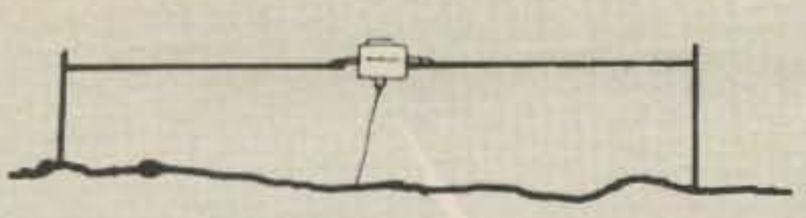
Our OSCAR activities turned into such a blast that XYL Sandy, WB4OEE, joined the action (female voices are a welcomed variety on the satellite). Sandy isn't (wasn't?) a prolific DXer and she wouldn't succumb to any "OM assistance," but she worked all continents within a single orbital cycle of 18 days, making friends from New Caledonia (FK1TK) to South Africa (ZS5NO) in fine style.

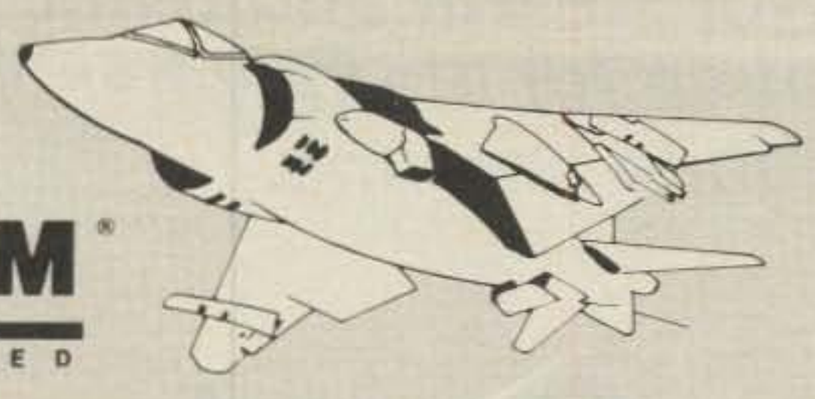
Conclusion

The Ten-Tec 2510 is a cleverly designed unit at a fair price, and it's a great way to join the action of OSCAR 10. Its GaAsFET preamplified 2 to 10 meter converter lets you fully enjoy your HF rig's features (noise blankers, RIT, variable AGC, etc.), and its 70 cm transmitter hosts selectable sideband, ALC monitoring LED, and full- or half-duplex control (mute or don't mute receiver during transmit). The unit doesn't include CW sidetone, but that feature is included in most electronic keyers.

The 2510 is backed by Ten-Tec's classic one year warranty and a fantastic service policy. In fact, I noticed an outstanding field service clause in their warranty. Should an in-shack problem develop which can be reasonably localized to an assembly or circuit board, Ten-Tec will write a 30-day memo ticket and supply a replacement assembly/board for the owner to exchange. The memo is voided upon return of the defective assembly. That owner assistance isn't mandatory; it's an optional favor. Such thoughtful consideration is, in my opinion beyond reproach!

For more information, contact Ten-Tec, Inc., Sevierville, Tennessee 37862.





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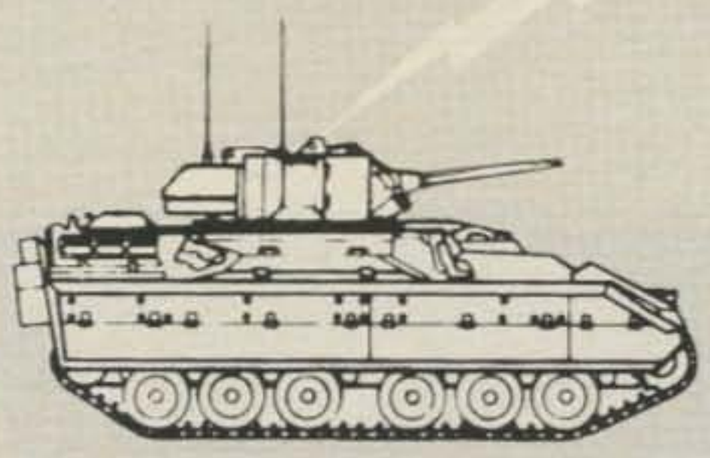

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With stealth and being mindful of security there's no cause for alarm when you build and install this mobile antenna.

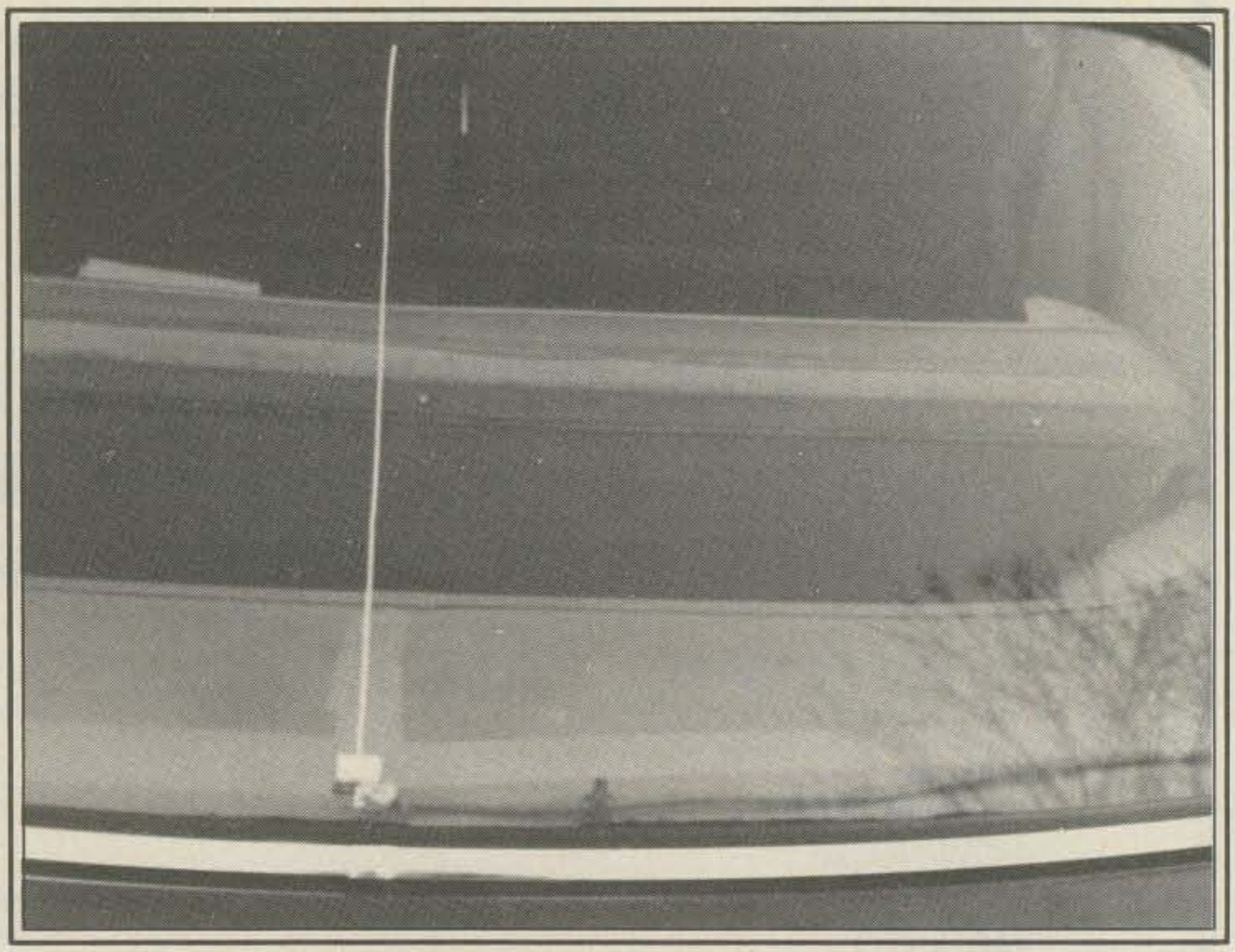
Construct A Concealed 2 Meter Mobile Antenna

BY MATT MAGGIO*, N4GSV

Many antenna manufacturers offer a variety of mobile VHF antennas, and many articles have discussed how to build homemade counterparts of most of the popular commercial varieties. However, the current selection provides little choice for the many amateur and commercial consumers who need an antenna that cannot be stolen, does not advertise that their vehicle has a radio in it, is not vulnerable to mechanical hazards such as car washes and ice storms, and can be easily assembled from readily obtainable parts. For many vehicles these problems of obtaining security without compromising electrical performance can be solved for less than $15 with the following design, which can be used on any sedan —except a convertible—having a rear window that is at least 20 inches from the bottom to the top of the exposed portion of the glass, as long as the car does not have a defroster grid.

When installed in a 1974 Plymouth Duster fastback, this antenna was invisible to a walking or driving observer from as little as 5 feet away, except for one located behind the car and not more than approximately 45° from the center line of the car. Even for those standing directly behind the car, the antenna becomes invisible at approximately 40 feet. No portion of the antenna or its feed is outside of the car, yet electrical performance does not suffer; this concealed antenna has performed at least as effectively—both duplex and simplex—as the quarter-wave magnetic mount that formerly sat on the trunk lid. This performance has not been affected by weather conditions, even when the rear window had more than 5 inches of fresh, wet snow sitting on it. During several months of use no directionality has been observed, confirming tests done indoors with a movable cardboard-and-foil mockup prior to actual construction.

*2232 Canterbury Dr., Burlington, NC 27215



The ⅛ inch alarm tape can be seen in this view of the rear window. The three radials are covered in plastic tape on the rear deck as per the text, and the coax is routed along the window edge.

Construction

The builder must decide for himself how much RG-58/U feedline he needs; 15 feet was sufficient for the Plymouth mentioned. Construction of this antenna begins with the preparation of the antenna end of the coax; the goal here is to have the last 19½ inches of intact coax covered with the outer braid, creating a result similar to the lower portion of a coaxial 2 meter base antenna made from RG-58/U (see fig. 1). While some prefer to start by turning the braid back with their fingers and then continue by pulling it back over the outer insulation until it reaches the required length, I prefer to remove the outer insulation from 19½ inches of the coax, cut this piece free,

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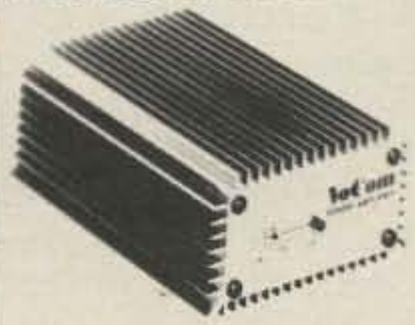

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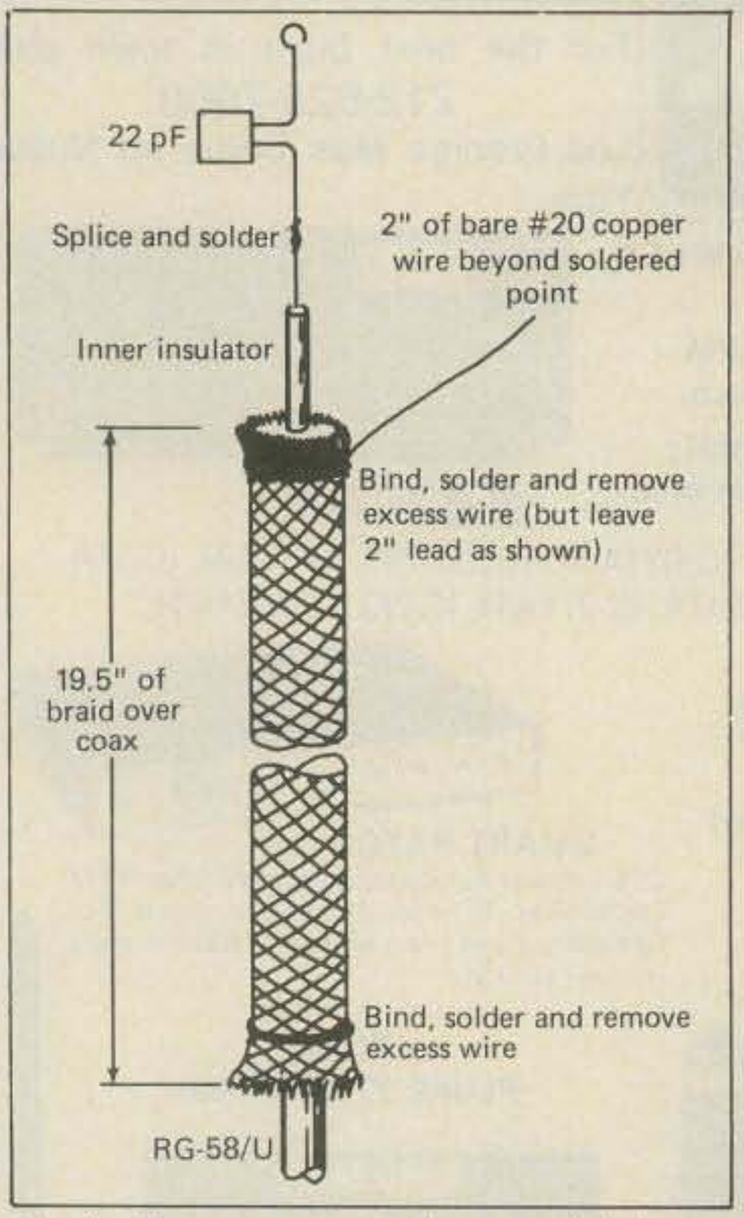

Fig. 1– How to prepare the coaxial sleeve for the 2 meter antenna feedline.

and then slide the braid from the inner insulation (braid moves much more easily when pushed than when pulled).

One end of the cable is then stripped so as to expose ½ inch of braid and inner conductor. The previously prepared 19½ inch section of braid is pushed onto the coax, starting from the untouched end; when it has been moved to the prepared end of the coax—with its front end even with the end of the black outer insulation —the half inch of braid from the end of the cable is folded back over the front of the 19½ inch piece of braid and secured to it by wrapping the assembly three times with a piece of bare No. 20 copper wire, which is then twisted like a "twist-tie" on a trash bag. The twisted area should then be soldered to provide mechanical security as well as electrical contact, and all excess wire other than the 2 inch piece shown should be removed.

One lead of a 22 pF printed circuit capacitor (Radio Shack 272-1066 or equivalent) is then shortened to ½ inch; this lead is soldered to the previously stripped center conductor of the coax. Bind the unattached end of the braid that was placed over the cable's outer insulation by wrapping it tightly with three turns of bare No. 20 copper wire, twisting this wire like a "twist-tie" and removing all excess wire beyond the twisted area. (The twisted section should not be more than ¼ inch long.) The completed coax assembly should now look like fig. 1.

The next step is the installation of two terminal blocks. The hardware used here normally is used to provide connections for foil loops protecting windows in burglar-alarm systems. The first connector (Radio Shack 49-504A or equivalent) should be placed approximately 1 inch above the midpoint of the lower edge of the back glass as shown in the photo; this block is installed on the inside of the window so as to connect to the foil tape strip that will run up from it as shown. When installing this block, make sure that the inside of the glass is clean and dry; after placing the block in position, press firmly on it for at least one minute in order to assure a firm bond. A second block should now be mounted on the car's rear shelf in the same manner; it should be positioned about 1 inch in from the midpoint of the back edge of the rear shelf.

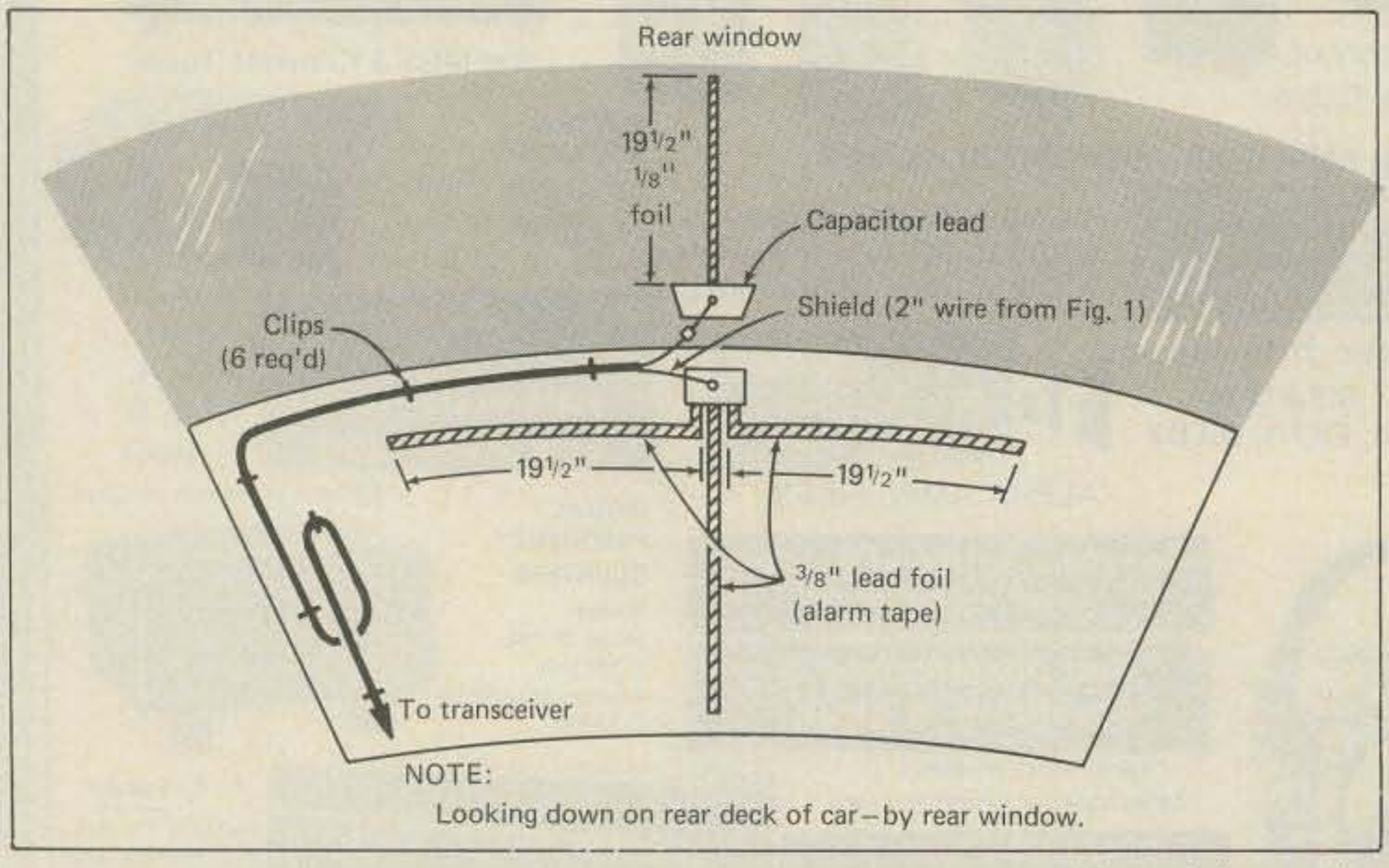

Fig. 2– Looking down at the rear deck, the layout for the three radials and the routing for the coaxial cable can be seen.

Both the radiator and the ground plane in this design are made from the lead foil tape (Radio Shack 49-502 or equivalent) commonly used for burglar-alarm window loops. The use of this tape as a ground plane allows this design to be used even in cars with a nonmetallic rear shelf, and it eliminates any need for drilling the shelf. The first step here is the preparation of the radiator, which is cut down from the tape's original ⅜ width to ⅛ inch in order to make the antenna less visible to outsiders, and also to make it even less of a visual obstruction to the driver. Its final width is the same as that of one line in a standard defroster grid. Secure a 2 foot length of the alarm tape to a smooth plastic or glass cutting board with pieces of narrow (¾ inch or less) masking tape placed across it at each end and at positions 8 inches from each end. Do not remove the backing from the foil tape at this time. Place a metal straightedge along the foil tape so as to leave ⅛ inch of foil showing along its entire length. Carefully hold the straightedge—and thus the foil tape—in position with firm pressure while slicing through the foil with a *sharp* single-edge razor blade or hobby knife. The foil should now be removed from the cutting board by carefully peeling back the masking tape used to hold it. Inspect the ⅛ inch wide piece to make sure that it is cut evenly; it may be necessary to repeat the above procedure several times before the result is acceptable.

Remove the screw from each terminal block; an offset screwdriver is very helpful for doing this. Peel the backing from the first ½ inch of the ⅛ inch wide foil and connect it to the block on the glass by anchoring it under the block's metal clip. Slowly peel the backing from the remain-

der of the foil tape as you press it into the position shown in the photo, always holding the already-anchored section of tape nearest the top of the window in place with your finger as you go. When you reach the top of the glass, use a sharp blade—with the window as cutting board—to cut the radiator 20 inches above its block.

Create the ground plane by first connecting one end of a piece of unmodified foil tape to the block on the rear shelf in the same manner as was done with the radiator. This tape is then applied along the midline of the shelf as far as is possible. Connect the end of the roll of tape to this same block—as if no other connection had been made here—and bring this section out approximately 1 inch before making a right turn in it as is done in window corners during burglar-alarm installations. Cut this tape 19½ inches from the place it separates from the section running down the middle of the rear shelf; repeat this procedure for the opposite side of the shelf. Cover all three ground-plane tapes with 1½ inch wide plastic tape ("Scotch Plastic Tape" or equivalent) that matches the rear shelf in color. This tape should cover all foil tape beyond the connector block and extend ¾ inch beyond the end of the foil segments that extend to the sides.

Next connect the free lead of the 22 pF capacitor attached to the coax to the block on the window. This should be done so as to leave as little excess length as possible. The bare wire attached to the braid placed over the coax should then be connected to the ground plane's block on the rear shelf. An offset screwdriver is very helpful for these two steps.

Attach the coax to the rear shelf along its intersection with the window as shown in the photo and in fig. 2 by using self-adhesive cable clips (Radio Shack 278-1639 or equivalent). Fig. 2 shows how the cable is routed to one rear corner of the rear shelf and then passes through an improvised strain-relief section made with three clips. This strain relief is of vital importance for the mechanical protection of this antenna from any accidental impact to the cable in the rear shelf or rear seat area. The Plymouth installation illustrated used three clips—one approximately 6 inches from the connector block, one in the shelf's rear corner, and one between—to secure the section of coax parallel to the bottom edge of the window. Your car may require more. In our case the cable was then passed to the transceiver—by going under the seat in the Plymouth—and secured with nylon cable ties (Radio Shack 278-1642 or equivalent). Other methods may be more suitable for your particular car. To provide mechanical protection for the radiator at the point where it rises from the block to the window, with a toothpick spread a drop of clear plastic cement onto the edge of the block and onto the window for ⅛ inch to each side of the first ¼ inch of the tape. Complete the installation by attaching the appropriate connector to the coax.

Operation

Adjust the antenna for minimum SWR by pruning the radiator ⅛ inch at a time until the best match is obtained for your usual frequencies. This antenna can be tuned for a 1.6:1 or less SWR across most of the repeater subband and for a maximum of 2:1 across the entire FM allocation. According to the ARRL's *The Radio Amateur's VHF Manual*, the added loss from a 2:1 match in 20 feet of RG-58/U amounts to no more than 0.22 decibel over that in a comparable system with a 1:1 match; probably more important as a practical matter is that the SWR found in a driveway test will be the real match found in operation at highway speeds under all weather conditions, unlike quarter-wave whips with considerable flex under a 70 mph wind load.

The burglar-alarm foil used for the elements was specified because of its ready availability. Other materials may be available in foil form that will provide still lower visibility by virtue of lacking mirror-like reflectivity; some of these may already be sold in appropriate widths (⅛ inch or less). Constructed as described above, this design is still ideal for those who would rather be heard and not seen. CQ

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

I recently asked John Hawkins, K5NW, contest editor for the *QRZ DX Bulletin*, if he would be interested in writing a guest editorial. He obliged with the following timely topic, one with which I am in full agreement.

Editorial by John Hawkins, K5NW

If you had bothered to listen in the American portion of the 40 meter phone band during the recent WW Phone contest you should have been appalled at what you heard. In almost every pile-up, there were unbelieveable numbers of people in the so-called constant call mode; I heard DX stations ask for "the station ending in such and such," and then get answered by every letter in the alphabet. Worse, I heard DX stations go back to callers with almost complete callsigns yet not be able to complete the QSO because of the continuous calling. Why is it that people cannot or will not accept that a DX station has actually answered someone else? Why can't or why won't these people simply shut up until the contact is over and the DX station stands by again?

Maybe they interpret the split frequency operation on 40 phone as carte blanche to use any operating technique they choose because they truly believe that what happens on the DX station's listening frequency is no skin off anybody's back. Maybe there is a tendency to be a bit less restrained on 40 and to just let it all hang out because of the anonymity created by the split frequency operation. After all, everyone is either transmitting or they are listening on the DX frequency; so, no one will know if a guy gets a little rambunctious. And finally, I guess there are some who just don't care what is right and wrong; it is they or you, and they're ready to do anything to win. Now, these are serious problems on any band, but especially so on 40 because virtually every DX QSO made on that band requires the DX station to listen in our band. If a DX station chooses not to listen above 7150 kHz, then we don't work him. Sure, the serious DX operator will spend much time listening for the USA (as he must if he wants to win), but it is the casual operator who we must be concerned with. He is the guy who could care less whether he wins the contest, but is willing to get on and give out his multiplier for those who are serious. That is, unless someone makes him mad.

During this past WW Phone, I heard some choice multipliers simply stop listening in the American phone band when the pile-up got out of control. Some issued warnings first, but most simply started listening on their own frequency. Some simply disappeared from the band. I also heard some choice multipliers who simply never listened in the American band. With the exception of US possessions in the Caribbean, there are no DX stations left in the world who are required to transmit above 7150 kHz, which pretty much leaves US hams at the DX station's mercy on 40 phone. My grim prediction is that if we don't clean up our act on 40 phone, we are going to find more and more casual foreign contesters bypassing the American phone band altogether.

I'm sure you found John's observations interesting. Your comments on contest-related topics are solicited.

Deadline for announcements of May activities is February 15th and March 15th for the June issue.

Have you checked the expiration date of your license lately?

73 for this time, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	Feb.	2-3	Vermont QSO Party
*	Feb.	2-3	New Hampshire QSO Party
*	Feb.	2-3	ZERO District QSO Party
	Feb.	2-3	RSGB 7 MHz Phone Contest
	Feb.	3	North American CW Sprint
	Feb.	9-10	QCWA CW QSO Party
	Feb.	9-10	West Coast 160 SSB Contest
	Feb.	9-10	YL-OM Phone Contest
	Feb.	9-10	Dutch "PACC" Contest
	Feb.	10	North American SSB Sprint
	Feb.	16-17	ARRL DX CW Contest
	Feb.	**22-24**	**CQ WW DX 160 SSB Contest**
	Feb.	22-25	OMISS QSO Party
	Feb.	23	"73" RTTY Contest
	Feb.	23-24	RSGB 7 MHz CW Contest
	Feb.	23-24	YL-ISSB Phone QSO Party
	Feb.	23-24	French Phone Contest
	Feb.	23-24	YL-OM CW Contest
	Mar.	1-31	Work All Mortons
	Mar.	2-3	ARRL DX Phone Contest
	Mar.	9-10	QCWA Phone QSO Party
	Mar.	9-10	West Coast 160 CW Contest
	Mar.	9-10	VIII Cadiz Tacita de Plata
	Mar.	9-11	Virginia QSO Party
	Mar.	16-17	YL-ISSB CW QSO Party
	Mar.	16-17	G-QRP Club CW Contest
	Mar.	16-17	Bermuda Contest
	Mar.	23-24	BARTG RTTY Contest
	Mar.	**30-31**	**CQ WW WPX SSB Contest**
	Apr.	20-21	VIGO World Fishing Contest
	Apr.	20-21	ARCI QRP SSB Contest
	May	4-5	County Hunters SSB Contest

**Covered last month.*

North American "Sprint"

C.W.: Feb. 3 S.S.B.: Feb. 10
Sunday 0000Z to 0359Z (Sat. night)

This is the spring edition of the "Sprint" run by the National Contest Journal. Take note that the starting time has been advanced to an hour earlier, but it remains as a 4 hour "Sprint."

North Americans will be contacting other North American stations as well as stations in other countries, single operator only.

Exchange: Call, QSO no., name, and QTH (state, VE province, or country).

Scoring: Multiply total QSOs by the sum of states, VE provinces, and other North American countries worked for your final score (U.S. and VE not countries; KH6 not a state). There are 8 VE provinces, Maritime and VE2 through VE8.

Frequencies: Three bands only, 3530–3550, 7030–7050, 14030–14050 kHz on c.w., and 3870–3910, 7210–7240, 14260–14290 kHz on s.s.b.

Awards: A trophy to the highest scoring station on each mode. Certificates to the top station in each USA call district, Canada, and other countries. The top 10 scorers, the winning team, and each member of the winning team will also be rewarded.

Team competition is limited to a maximum of 10 operators as a single unit. Pre-contest registration is required for each team at least 24 hours before the start of the "Sprint." W6OAT is the coordinator.

There are other detailed rules, a special QSY rule, etc. I suggest you write to W6OAT or K7GM if you do not have a copy of the National Contest Journal. Entries must be received no later than 30 days after the end of each "Sprint." The c.w. go to: Rusty Epps, W6OAT, 948-H Kiely Blvd., Santa Clara, CA 95051, and the s.s.b. to: Rick Niswander, K7GM, 1914 W. Cortez Circle, Chandler, AZ 85224.

RSGB 7 MHz Contest

Phone: Feb. 2–3 C.W.: Feb. 23–24
1200Z Sat. to 0900Z Sun.

Rules are the same as those used last year. Only single operator entries will be recognized. The following rules are for stations other than the British Isles.

Bands: Phone—7.04 to 7.10. C.W.—7.00 to 7.03. (B.I. stations please note that this will require split frequency on phone for U.S. stations.)

Exchange: RS(T) plus a three digit QSO number starting with 001.

Scoring: Stations in Europe score 5 points for each B.I. contact. Those outside Europe score 15 points per contact.

Multiplier: One for each different British Isle country prefix worked (G2, GC3, GD4, GI6, GJ8, GM3, GU5, GW8, etc.), maximum of 49 possible. No credit for GB prefix.

Final Score: Total QSO points times the country prefix multiplier worked.

Awards: Certificates will be awarded to the first, second, and third place winners in the British Isles, Europe, and non-

Europe in each section of the contest.

Include a summary sheet showing the scoring and a list of the country prefixes worked, and the usual signed declaration that all rules and regulations have been observed.

There is also an s.w.l. section with the scoring same as above. Overseas listeners log B.I. stations only. Record the call as well as the serial number sent. The call sign of the station being worked may only be repeated once in every three contacts logged unless it's a new multiplier.

Unmarked duplicate contacts will be penalized at ten times the number claimed. Logs containing in excess of five unmarked duplicates will be automatically disqualified.

Phone entries must be received no later than April 1st; c.w. April 22nd. This year they go to: G3OZF, RSGB HF Contests Committee, "Mayerin," Churchway, Stone, Aylesbury, Bucks., England.

YL-OM Contest

Phone: Feb. 9–10 C.W.: Feb. 23–24
1800Z Sat. to 1800Z Sun.

It's the YL's working the OM's in this annual activity organized by the YLRL. All bands may be used, but cross-band contacts or contacts with stations on net frequencies do not count.

Phone and c.w. are separate contests and require separate logs. The same station may be worked once only regardless of band.

Exchange: QSO no., RS(T), and ARRL section or DX country. (See *QST* for sections list.)

Scoring: Each QSO is worth 1 point. Multiply total by number of ARRL sections and DX countries worked for final score.

There is also a power multiplier of 1.25 for stations running 150 watts or less on c.w., and 300 watts p.e.p. on s.s.b. Multiply your final score by the above factor if you qualify.

There is a penalty of three contacts for each duplicate contact removed from the log by the contest committee.

Frequencies: CW—3555, 7055, 14055, 21195, 28195. SSB—3955, 7255, 14295, 21395, 28595. Plus or minus 15 kHz.

Awards: First-place cups to both YL and OM winners in each contest. Second and third place winners will receive certificates. The top scorers in each U.S. and VE call district and each DX country will also receive certificates.

Logs must be mailed by March 15th and received no later than April 5th to be eligible. This year they go to: Marty Silver, NY4H, 3118 Eton Rd., Raleigh, NC 27608.

QCWA QSO Party

C.W.: Feb. 9–10 S.S.B.: March 9–10
0001Z Sat. to 2400Z Sun.

This is the 28th annual QSO Party for the Quarter Century Wireless Association. It's a fun party to renew old friendships and to meet new friends.

Rules are the same as those used last year with a few modifications. CW and SSB are separate activities and require separate log entries. The same member may be contacted on each band for QSO points, but the chapter and "AL" multiplier are counted once only.

Exchange: QSO number, name, chapter (name or number), and state. If no chapter affiliation use "at large," or "AL."

Points: One point for each QCWA member worked on each band.

Multiplier: Each new chapter and one "AL" contacted, counted once only.

Score: Total number of QSOs multiplied by the total number of chapters plus one "AL" contact worked (well over 150 at last count).

Frequencies: CW—3545, 7045, 14045, 21055, 28055. SSB—3915, 7245, 14295, 21365, 28615. Plus or minus 15 kHz. Also 160 meters and 6 and 2 meters simplex.

Awards: Plaques to the top scorer in each party. Party QSO's can be applied to the many QCWA awards. Make your request on the summary sheet of your entry.

The standard QCWA log forms have 20 contacts to the page. If you prepare your

own, have columns for the time in UTC, station worked, QSO number sent and received, name, chapter, and state. *(A column indicating the band and the multiplier the first time it is worked would be helpful. Using a separate log sheet for each band would also be helpful.—ed.)*

Submit your entry right after each party, but no later than March 25th. CW logs go to: Eugene Santoski, K9UTQ, 1220 18th Street S, Wisconsin Rapids, WI 54494. SSB logs go to: William Haase, W9FPA, 1101 Downing Dr., Waukesha, WI 53186.

West Coast 160 Meter Contest

SSB: Feb. 9–10 CW: Mar. 9–10
0000Z Saturday to 2359Z Sunday

The West Coast 160 Meter Bulletin is promoting a series of 160 meter contests, adding to the ever increasing number of top-band activities.

Only single operator stations are eligible. There are two classes, subscribers and non-subscribers, and five subclasses: QRP, 250 watts, 1 kw, 2 kw, and 3 kw, PEP (power output × 2 = PEP).

Exchange: RS(T) and QTH.

Scoring: 10 points per QSO. There is a penalty of three QSOs for each duplicate contact that has not been deducted from the score.

Multiplier: Each U.S. state, VE province, and DX country worked.

Final Score: Total QSO points × (states + provinces + DX countries) worked.

Awards: Plaque to the overall winner in each class and certificates to the subclass winners in each U.S. state, VE province, and DX country.

A signed declaration indicating the PEP power used in requested. Reporting false power-rating claims means disqualification and being banned from participation for a period of three years.

Mailing deadline for SSB is March 31st and April 30th for CW entries. Logs go to: R. Koziomkowski, KA1SR, 5 Watson Drive, Portsmouth, RI 02871.

(The DX Window operating restriction was not mentioned. Hope this is only an oversight.—ed.)

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 9–10

It's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz, in the band sections recommended for contest operation by the IARU. The same station may be worked on each band, but on one mode only, phone or c.w., for QSO and multiplier credit.

Categories: Single operator, multi-operator, and s.w.l.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72).

Final Score: Total number of QSO's times the number of provinces worked on each band.

Awards: Certificates to the top scoring station in each category in each country and call areas of JA, LU, PY, UA9/0, VE/VO, VK, W/K, ZL, and ZS. Also second and third place awards if returns justify.

S.w.l.'s must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above. Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Att: F. Th. Oosthoek, PA0INA, P.O. Box 499, 4600 AL Bergen Zoom, The Netherlands.

ARRL International DX Contest

C.W.: Feb. 16–17 Phone: March 2–3
0000Z Saturday to 2400Z Sunday

Rules are the same as last year. However, I strongly recommend that you study the announcement in the December issue of *QST* for more details. Also send a large s.a.s.e. (2 IRC's for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit. Following is a brief outline.

Categories: Single operator, both single and all band. Multi-operator, one transmitter and two transmitters. Also multi-operator, multi-transmitter. Also QRP, all band only. Multi one and two transmitter stations must remain on a band at least 10 minutes once a contact is made. Multi-transmitter stations no limit, but only one signal per band.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each DX contact. DX get three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VE's. DX stations use US states (48) and VE districts VE1–8, plus VO for their multiplier (9). (Maximum multiplier of 57 per band.)

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSO's must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates to DX stations making over 500 QSO's.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is March 3rd, and they go to: ARRL DX Contest, 225 Main Street, Newington, CT 06111.

OMISS QSO Party

2100Z Fri. to 0200Z Mon., Feb. 22–25

This is the fourth annual QSO party for the OM International Sideband Society. Emphasis is on membership participation, but nonmembers are invited to participate.

The same station may be contacted on each band, 10–80 meters, SSB only. Single operator and multi-operator if two or more related OMISS members are in the same household.

Exchange: RS and QTH. State for U.S., prov./terr. for Canada, and country for DX stations (including KH6 and KL7).

Scoring: Two points for each OMISS member worked, one point for nonmember, contacted on each band.

Multiplier: Each U.S. state (48), each VE prov./terr. (13), and each DX country worked on each band.

Final Score: Total QSO points times the multiplier on each band. Add sums from each band for final score.

Awards: Plaques to top-scoring OMISS member and nonmember. Certificates to OMISS member winners in each state, prov./terr., and DX country.

Use a separate log sheet for each band and include a summary sheet showing the scoring and other essential information. Members should include their OMISS number. The usual signed declaration is also requested.

Entries must be received no later than March 30th by the party chairman: Doris Francis, NI4U, 2406 Sycamore St., Catlettsburg, KY 41129.

YL ISSBers QSO Party

Phone: Feb. 23–24 C.W.: March 16–17
0001Z Saturday to 2359Z Sunday

Rules are quite lengthy. Therefore, I suggest you send an s.a.s.e. to K0RDJ for a detailed copy. The party is open to all, but the emphasis is on membership participation.

The same station may be contacted on each band for QSO points, but it counts once only as a multiplier. You are required to take two rest periods of 6 hours each during the 48-hour contest period.

Exchange: Name, RS(T), SSBers number, US state, VE province, country, and DX/WK partner (non-members send no number).

Categories: Single operator, DX/WK partners, and OM/YL teams.

Points: Three points for each member contacted on own continent, six points if on a different continent. Non-member QSO's count only one point.

Multiplier: Only member stations count as a multiplier. One for each of the following: both DX/WK partners worked, each OM/YL team worked, each US state, VE province, and DX country worked. Two when DX/WK partners work each other, and two if your d.c. power input is 250 watts or less. *(Should add up to quite a sizable score.—ed.)*

Frequencies: Use the General Class portions of the US bands for both phone and c.w. On 20 avoid the net frequencies on 14313, 14332, and 14336. Check 40 and 80 meters on the hour. V.h.f. and u.h.f. may also be used, but simplex only.

Awards: Special certificates to the overall winners in each category. Regular certificates to the winners in each US state, VE province, and DX country.

Logs should be set up as outlined in the "Exchange" section above. All entries must be received by June 1st. They go to: Rick and Minnie Connolly, KØRDJ and NAØV, Star Rt. #1, Crocker, MO 65452.

CQ WW 160 Meter S.S.B. Contest

2200Z Fri. to 1600Z Sun., Feb. 22–24

Just a reminder that our 160 Meter S.S.B. Contest will be coming up the last weekend of this month. Extensive coverage has been given to this event with complete rules appearing in the December 1984 issue. There are no changes from last year's new format.

Exchange: Signal report and QTH (no QSO serial number).

Scoring: Contacts with stations within own country count two points; with stations in other countries but the same continent, five points; with stations in other continents, ten points.

The multiplier remains the same: each US state (48), VE province (12), and DX country. (US and Canada are not country multipliers.)

It is strongly requested that the "DX Window," 1825–1830, be kept free from W/K and VE/VO activity. Work the DX split frequency. (KP4 and KV4 should also observe this request.)

Mailing deadline for last month's C.W. Contest is February 28th. This month's S.S.B. Contest's deadline is March 31st. Send them to: Don McClenon, N4IN, 3075 Florida Ave., Melbourne, FL 32901. Of course, you can always use the *CQ* address: 76 N. Broadway, Hicksville, NY 11801. (Please indicate c.w. or s.s.b. on the envelope.)

"73" RTTY Contest

0000Z to 2400Z Sun., Feb. 23

This is the fourth annual RTTY contest sponsored by *73 Magazine* and the *RTTY Journal*.

The same station may be worked once on each band. Single operator stations are limited to 16 hours of operation. Multi-operators may operate the full 24 hours. Off times must be at least 30 minutes each and must be indicated in your log.

Classes: Single operator and multi-operator, single transmitter. Single and all band, 10–80 meters.

Exchange: RST and state or province for the U.S. and Canada. Others RST and a consecutive QSO number.

Scoring: Five points for contacts with Ws and VEs; 10 points for all other contacts.

One (1) multiplier point for each U.S. state (48), VE prov./terr., and DX country worked on each band.

Final Score: Total QSO points times the sum of the multipliers from each band.

Awards: Will be issued in each class to the winners in each U.S. call area, VE prov./terr., and DX country (minimum of 25 QSOs to be eligible).

Disqualification: Omission of the required entry forms, taking credit for duplicate contacts in excess of 2% of the total, and other discrepancies will be deemed grounds for disqualification.

Use a separate log sheet for each band, a dupe and summary sheet, and a multiplier check sheet. Indicate equipment and power used.

Contestants are requested to send a large SASE for official forms and final results. Mailing deadline is April 16th to: RTTY World Contest, c/o The RTTY Journal, P.O. Box RY, Cardiff, CA 92007.

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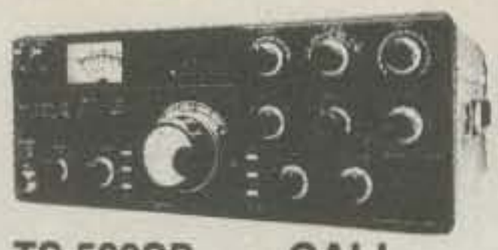

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TM-211A/ TM-411A . . . CALL

TR-2600
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TH-21AT/
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Announcing

•**Ground Hog Day 1985** - The Punxsutawney Amateur Radio Club will commemorate Groundhog Day 1985 with a Special Event on February 2 on 14.230 and 7.230 from 9 a.m. to 5 p.m. Certificate for legal-size SASE to: Kevin D. Fultz, KA3GGZ, RD #3 Box 161, Brookville, PA 15825.

•**Winter Carnival Radio Celebration** - Michigan Technological University ARC and the Copper Country Radio Amateur Assoc. have announced a radio celebration of Winter Carnival festivities in the northern most part of Michigan's Upper Peninsula. In association with the Copper Country Chamber of Commerce, they are issuing a certificate to all amateurs who make contact with any participating ham in the Copper Country between 0000 UTC January 29 through 0000 UTC February 5. Only one contact is required to get a certificate. Frequencies are 3.630, 7090, 14.095, RTTY; 3.705, 7.085, 7.125, 14.085, 21.085, 28.185, CW; and 3.930, 7.285, 14.305, 21.385, 28.500 phone. On CW listen for CQ WC. Send QSL and $1.00 to: Howard Junkin, N8FHF, 106 W. South Ave., Houghton, MI 49931.

•**Valentines Day Special Event** - The Oregon Tualatin Valley ARC will operate station KA7NPN from 0000Z to 2400Z February 10 in celebration of Valentine's Day and Oregon's 126th Anniversary of Statehood. Frequencies: 3.880, 7.280, 14.280, 21.380, 28.580. For a certificate, send $1.00 or a large size SASE to KA7NPN.

•**Grand Rapids, MI Radio Exams** - The Volunteer Examiners of The Grand Rapids Amateur Radio Association, Inc. in cooperation with the ARRL will conduct amateur radio exams in Grand Rapids, MI on the following dates: February 15, June 21, October 18, and February 21. An FCC Form 610 with check/M.O. (no cash) for $4.00 made out to "ARRL/VEC" should be mailed to: ARRL/FCC Amateur Testing, c/o Mike Bottema, K8EX, 930 92nd Street S.E., Byron Center, MI 49315.

•**Westland, MI Special Event** - Girl Scouts of Troop 578 will operate N8CKH from 1500Z to 2100Z February 23 on 7.240, 21.350, 144.200. Special Event QSL: SASE to W. Wheeler, Box 204, Westland, MI 48185.

•**Fourth ARRL Digital Communications Conference Call for Papers** - The ARRL will hold its Fourth Amateur Radio Computer Networking Conference on March 30 in San Francisco, CA. The conference will be in cooperation with the West Coast Computer Faire being held March 30 through April 2. The deadline for receipt of camera-ready papers is March 1. All papers should be mailed to Marian S. Anderson, WB1FSB, ARRL, 225 Main Street, Newington, CT 06111. If you plan to present a paper, request an author's kit and identify the title of your paper immediately. Technical papers are invited on all aspects of amateur packet radio and other forms of amateur radio digital communications via terrestrial, ionospheric, meteor-scatter, and satellite media, including AMSAT-OSCAR 10 and PACSAT.

•**International RTTY Art Competition** - The Wireless Institute of Australia is running an International RTTY Art Competition as part of its 75th Anniversary celebrations. Entries must be printable using a Siemens model 100 teleprinter, and must not contain more than three overlinings. A hard copy and Baudot tape must be supplied with each entry. Categories: (a) best hand-generated original submitted by its author outside VK; (b) Best hand-generated original submitted by its author who is a VK; and (c) Best non-original hand-generated or computer-generated RTTY picture. Entries close August 31, 1985 and must be sent to: WIA 75 RTTY Art Competition, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy, 3065, Victoria, Australia.

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

Feb. 9, **Cherryland ARC Swap'n Shop,** Traverse City, MI. Contact Paul Nepote, KA8HIB, 802 Fern St., Traverse City, MI 49684 (SASE).

Feb. 10, **24th Annual Midwinter Hamfest/Auction,** Mansfield, OH. Contact Dean Wrasse, KB8MG, 1094 Beal Road, Mansfield, OH 44905 (SASE). (Licensing exams will be given at Mansfield Campus of Ohio State University at 1 pm. Send SASE, check for $4 payable to ARRL/VEC, and 610 to Lloyd Nelson, N8BAZ, 630 Oak St. Lot 82, Mansfield, OH 44907.)

Feb. 16, **Texas VHF/FM Society Winter Convention,** Arlington, TX. Contact Merle Taylor, WB5EPI, at 817-274-6952.

Feb. 17, **Long Island ARC (LIMARC) Hamfest,** Melville, NY. Contact Hank, WB2ALW, at 516-484-4322 (evenings).

Feb. 23, **1985 Salem Mini-Hamfair,** Polk County Fairgrounds, Salem, OR. Contact Salem Repeater Assoc., P.O. Box 784, Salem, OR 97308.

Feb. 23, **Fort Myers City of Palms ARC Hamfest,** Fort Myers, FL. Contact George Sand, 1412 Winkler Ave., Fort Myers, FL 33901.

Feb. 23, **Glasgow, Kentucky Swapfest,** Glasgow Fleamarket Building 2 miles south of Glasgow, KY. Contact N4HCO, Rt. 4 Box 354, Glasgow, KY 41241.

Feb. 24, **Vienna Wireless Society Winterfest,** Vienna, VA. Contact Vienna Wireless Society, P.O. Box 418, Vienna, VA 22180.

Feb. 24, **Plateau ARA 7th Annual Hamfest,** Fayetteville, WV. Contact John Witt, W8OQC, 135 Daniels St., Fayetteville, WV 25840, phone 304-574-0532 or 574-1176.

Feb. 24, **La Porte ARC Winter Hamfest,** La Porte, IN. Contact LARC, P.O. Box 30, La Porte, IN 46350.

Feb. 24, **15th Annual Livonia ARC Swap'n Shop,** Livonia, MI. Contact Neil Coffin, WA8GWL, c/o Livonia ARC, P.O. Box 2111, Livonia, MI 48151 (SASE).

Feb. 24, **Davenport Radio Amateur Club Hamfest,** Davenport, IA. Contact Dave Johannsen, WBØFBP, 2131 Myrtle St., Davenport, IA 52804.

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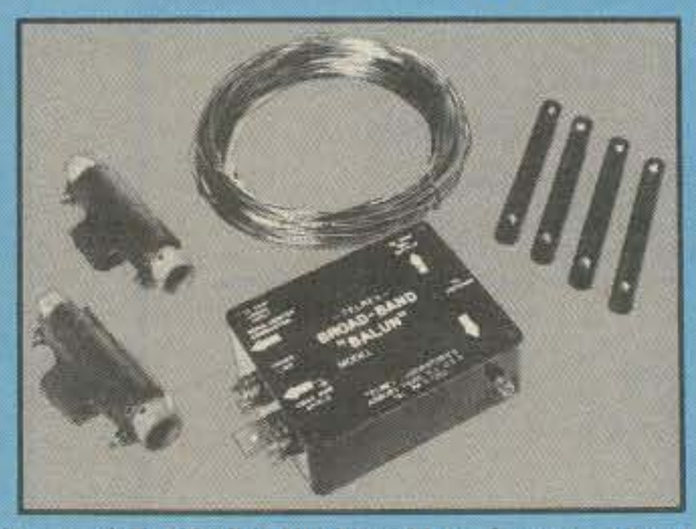

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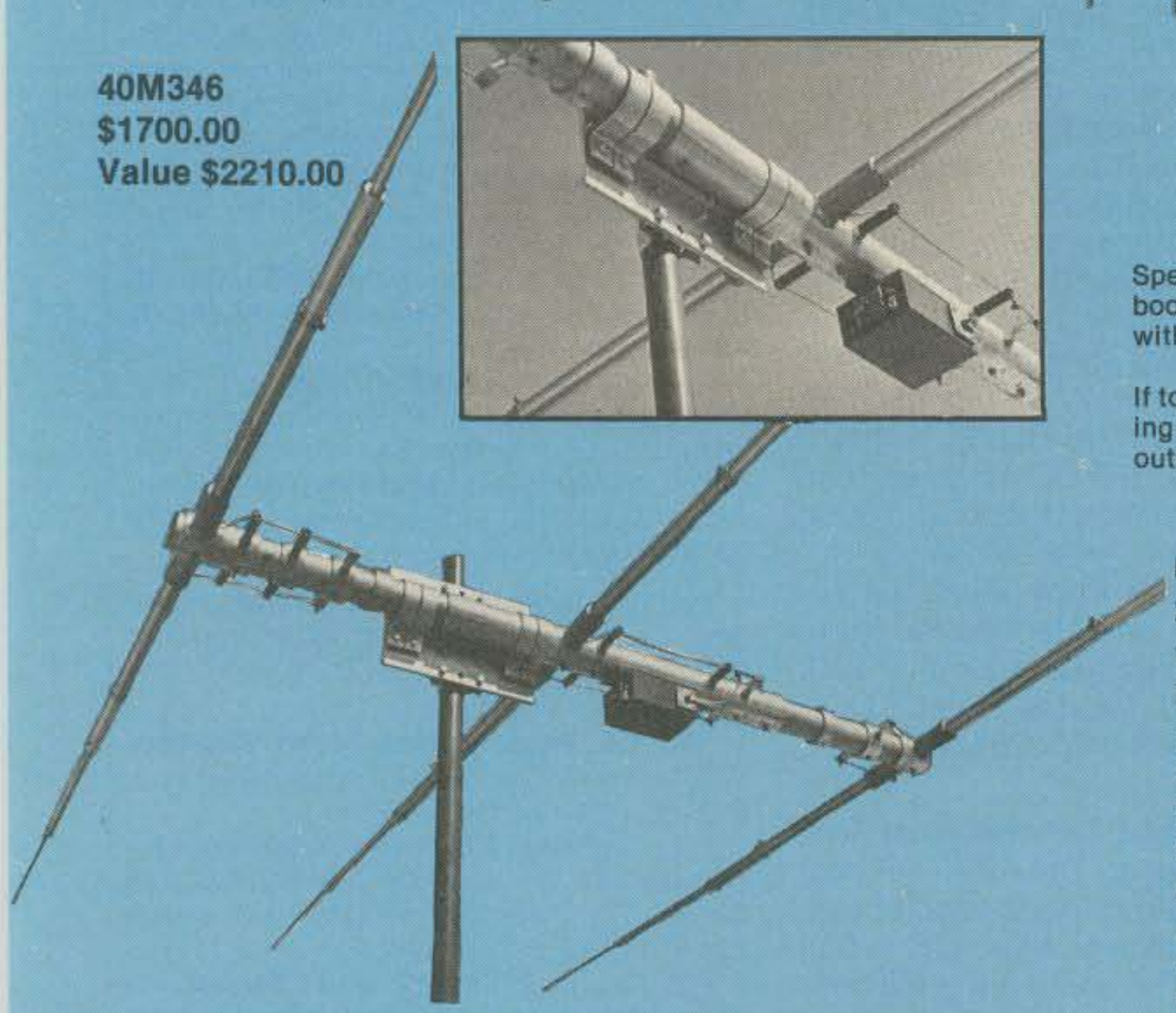

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20M646	20 Meter 6 element	(14 DBD)	1294.00	**995.00**
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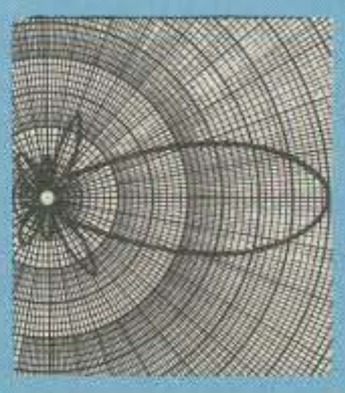

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THE INS AND OUTS OF THE WASHINGTON SCENE

Hams Cited In Surplus Giveaways

According to *The Washington Post*, an internal Army investigation confirmed that millions of dollars in surplus Defense property has been given away to amateur operators and their friends. The probe, according to *Washington Post* Staff Writer Howard Kurtz, was triggered by the House Appropriations subcommittee on defense, which in 1983 reported that Fort Sam Houston in San Antonia, TX, "gave radio buffs 'goody boxes' containing 11,612 kinds of surplus military items valued at $55 million." Reportedly, the Army was simultaneously buying over 3,000 of the same items.

The Army probe also found that the problem was not limited to Fort Sam Houston, but was nationwide in extent. Further, Army investigators determined that surplus equipment often was given to people who did not participate in the Army's Military Affiliate Radio System (MARS).

Among the cases cited by the Army investigative team, and reported in the *Post*, were the following:

- A former director of Mississippi MARS and his father were reported to have more than $100,000 in surplus equipment stored in their home;
- A state MARS director who was building a home borrowed heavy lifting equipment from the Army, while a MARS member who was also building a house took possession of an electric generator;
- Numerous MARS members were provided with used cars and trailers.

In general, Army investigators found that "the U.S. government literally lost accountability on nearly all the property." On receiving the results of the probe, Defense Secretary Caspar W. Weinberger immediately ordered corrective action taken to ". . . strengthen the procedures governing the reuse of excess Defense property."

GE Pulls Plug on PRCS

In a move that startled observers in government and industry alike, General Electric in late 1984 withdrew its support for a Personal Radio Communications Service (PRCS), a new radio service first proposed by GE itself. The service would have operated in the bands 898–901 and 937–940 MHz, and would have provided two-way radio service to the public through the use of repeaters which were connected to the local telephone network.

While stating that creation of a PRCS was still a good idea, GE told the FCC that it no longer had plans to build equipment for use by PRCS licensees. Within a week of this announcement, GE laid off 750 workers at its Lynchburg (VA) mobile radio plant "to offset declining sales and streamline the company," a GE spokesman told UPI.

Commission officials refused to comment on the GE move, though some Washington insiders voiced the opinion that politically, PRCS was "dead." Moving to keep the concept of a PRCS alive, however, was Gerald H. Reese, executive director of REACT International. Recognizing that nine groups representing two-way mobile radio systems used by government agencies, TV stations, utilities, various industries, and public-safety agencies across the country were vying for the same frequencies proposed for PRCS, Reese told *The Washington Post:* "Once again, personal radio users are being outshouted by the commercial interests whose products and services cost more and are less available to the majority of the American people."

Consideration of the nine petitions before the Commission poses a significant challenge to Private Radio Bureau Chief Robert Foosaner. Quoted by the *Post*, Foosaner said: "Each one of the nine petitioners has some valid need for the frequencies, and there are difficult competing interests [to be considered]." According to the PRB chief, at least twice the spectrum space now under consideration would be required to satisfy the demands made by the petitioners.

There are some who believe that the issue will boil down to a faceoff between the Land Mobile Communications Council (LMCC) and REACT International. The LMCC, which is also seeking an allocation for the Land Mobile service in the 220 MHz band, argues that the needs of industry and the public-safety sector are more important than the creation of a new service for consumers . . . a service for which demand is unknown.

The Commission is expected to consider the nine petitions as we go to press. And while the issue of which group wins the right to use the frequency bands in question may not appear to be of concern to amateurs, we should recognize that if the LMCC is frustrated in its attempt to secure a Land Mobile allocation at 900 MHz, it could well intensify its effort to take portions of 220 MHz from the Amateur service.

Interest in Spread Spectrum Continues

According to Hal Feinstein, WB3KDU, spread-spectrum coordinator for the Amateur Radio Research and Development Corporation (AMRAD), the FCC again appears ready to move the amateur spread-spectrum issue into rulemaking. Writing in *AMRAD Newsletter*, Feinstein states that among other things, the Commission has been studying regulation, enforcement, and self-policing matters pertaining to the use of this advanced modulation technique.

While no rulemaking documents on spread-spectrum modulation have been released at this writing, below is a summary of rules being considered:

1. No HF spread-spectrum transmissions will be authorized; all spread-spectrum experimentation will take place at 50 MHz or higher.

2. Three types of spread-spectrum modulation techniques will be authorized: frequency hopping, time hopping, and direct sequence.

3. All signals must be contained within the amateur band used. However, transmissions may use all of the frequencies authorized, regardless of whether subbands exist for phone and CW.

4. Amateurs must use one of three code-sequence generators specified by the Commission.

To assist the Commission in developing spread-spectrum modulation techniques in the Amateur service, AMRAD has started a group to address spread-spectrum standards. And while these and other studies continue, amateurs who want to experiment with spread-spectrum emissions may apply for Special Temporary Authorization (STA) from the Commission. To date, says Feinstein, the FCC appears willing to consider any reasonable experiment for approval under an STA.

If you are interested in spread spectrum and wish to participate in AMRAD's efforts, contact Hal Feinstein, WB3KDU,

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Revised Application for Station and Operator Licenses Now Available

The FCC has revised Form 610, Application for Amateur Radio Station and/or Operator License, with the new version dated June 1984 now available at field offices around the country. The revisions reflect the changes in the Amateur Rules which allow volunteers to administer amateur operator examinations; changes in the Novice exam procedure are also accommodated.

The new FCC Form 610 should be used immediately. Previous editions dated August 1980 or later will still be accepted *except* in cases involving examinations for new licenses or examinations to upgrade an operator class. The Commission will, at a later time, specify the date on which all previous editions of FCC Form 610 (prior to June 1984) will become obsolete.

Commission Nixes Extraterrestrial Paging Proposal

On August 7, 1984 On Page Enterprises ("On-Page"), a part of Beeple, Inc., filed a request with the FCC for a Special Temporary Authority (STA) to operate a one-way paging station at Sudbury, MA on 930.0125 MHz. The purpose of the operation was to offer the public a means by which to transmit radio messages, photographs, or drawings "to the Sun, the Moon, any of the planets in our solar system, or any designated star outside the solar system." The messages to be transmitted by On-Page would be supplied by its customers, who in turn would be mailed a copy of the transmission.

The Commission in late 1984 *denied* On-Page's request, noting, among other things, that it had failed to demonstrate that extraordinary circumstances exist to require temporary operations in the public interest. Instead, On-Page's request will be treated as an application for developmental authority (File No. 24719-CD-P/L-84).

ARRL Announces Digital Communications Conference; Calls For Papers

The Fourth ARRL Amateur Radio Computer Networking Conference will be held on 30 March 1985 in San Francisco, CA, in cooperation with the West Coast Computer Faire. The conference, which is devoted to digital communications techniques, should include papers on a variety of subjects, including amateur packet radio, network and system architecture, proposed standards, modulation and encoding schemes, and applications.

According to *QEX*, The ARRL Experimenters' Exchange, amateurs intending to present a paper are asked to forward its title, together with their request for an author's kit, to Marian S. Anderson, WB1FSB, ARRL, 225 Main Street, Newington, CT 06111. Camera-ready papers must be received by the League not later than 1 March 1985.

Proceedings will be sold at the conference and by mail from League headquarters.

Engineer Shortage Predicted

A recent report by the National Science Foundation (NSF) projects a shortage of qualified aeronautical/astronautical and electrical/electronic engineers, and of computer specialists, by 1987. The report, entitled "Projected Response of the Science, Engineering, and Technical Labor Market to Defense and Nondefense Needs: 1982–87," defines a "shortage" to exist when demand exceeds supply of newly graduated persons by at least 5 percent.

With specific reference to electrical/electronic engineers, the Foundation notes that its prediction of a shortage will only occur if high defense spending coincides with rapid economic growth. In that case, the shortage could be as high as 30,000 workers.

Shortages are also projected for mechanical and industrial engineering technicians and drafters.

Copies of the report (NSF 84-304) are available from the Division of Science Resources Studies, National Science Foundation, 1800 G Street NW, Washington, DC 20550.

Amateur Population on the Decline

Reversing an earlier trend, the Amateur service is now losing more licensees than it is gaining. According to data released by the Commission in October 1984, the number of operators licensed by 30 September 1984 (the end of the government's fiscal year—FY 84) stood at 409,923, down 0.2% from the number of operators licensed at the end of FY 83. During FY 84, 18,800 new operators joined our ranks, 16,184 amateurs upgraded, and 19,644 left the service.

According to John Johnston of the Special Services Division, Private Radio Bureau (PRB), FCC, Technician, Advanced, and amateur Extra class licensees increased in number, while the Novice and General categories registered losses. In particular, the net drop in Novice class licensees totaled 6,320. Since the majority of amateurs enter the service through the Novice ranks, a drop of this magnitude is something about which both the amateur community and the Commission should be—and are—concerned.

The Radio Club of America Establishes Florida Section

In June 1984 the Board of Directors of The Radio Club of America, Inc., approved the creation of a Florida section. As a result of this action, David Talley, W2PF, moved to invite the 77 club members residing in Florida to join the new group. To date, 34 club members have applied for charter membership, and they will hold their inaugural meeting in connection with the ARRL Southeastern Division convention and Hamboree to be held at the Flagler Dog Track in Miami, FL, on 2 February 1984. Until such time that elections are held, the following club members will serve as officers of the new section: Chairman, Capt. W. G. H. Finch; Vice-Chairman, Ramsey McDonald, W4OHD; and Secretary/Treasurer, David Talley, W2PF.

Any member in good standing with The Radio Club of America, Inc., is eligible to join the Florida section. For more information, contact Mr. David Talley, W2PF, Secretary/Treasurer, Florida Section, RCA, 10275 Collins Avenue #1533-S, Bal Harbour, FL 33154.

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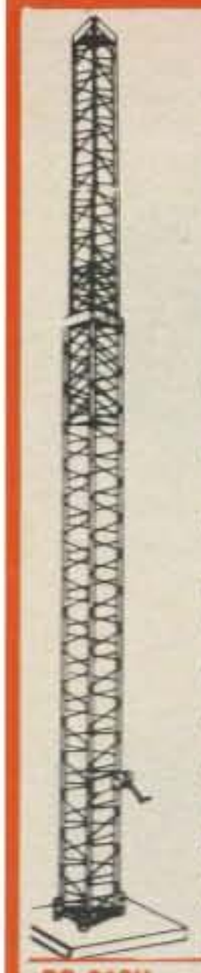

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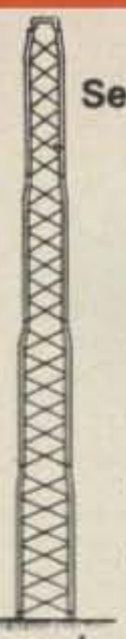

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HBX48	48 ft	10 sq ft	303	$399
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HDBX40	40 ft	18 sq ft	281	$379
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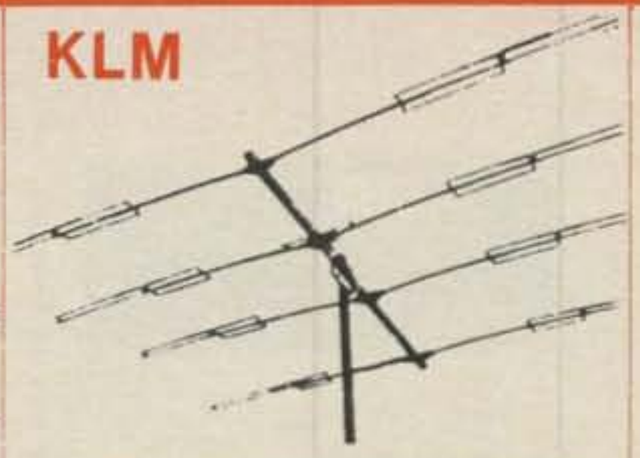

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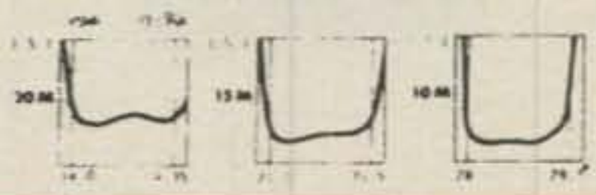

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- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

Model RMK-11 (roof mount kit with multiband radial kit $39.00.
Model STR-2 (Stub Tuned Radial Kit) $29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

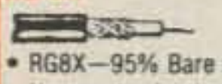
RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

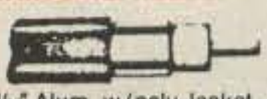


- RG8X—95% Bare Copper Shield
- Low Loss
- Non-contaminating Vinyl Jacket
- Foam Dielectric

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
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

HARDLINE/HELIAX™



Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax ™	$1.69/ft
⅞" LDF5-50 Andrew Heliax ™	$3.99/ft

select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259	$1.25	UG23D N Female	$2.95
UG21B N Male	$2.95		

ANTENNA WIRE & ACCESSORIES

14 Ga. Stranded Copperweld	$.10/ft
450 Ohm H.D. Line	$.16/ft
18 Ga. Copper coated steel wire ¼ mile long	$30
H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun	$11
Van Gorden Center Insulator	$6

HUSTLER

6BTV 80-10 mtr Vert	$129		
4BTV 40-10 mtr Vert	$89	5BTV 80-10 mtr Vert	$109
G6-144B 2-mtr Base	$89	G7-144 2-mtr Base	$119

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander	$219	A4 4-el Tribander	$289
R3 20/15/10mtr Vert	$279	A743/A744 40mtr Kit	$75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

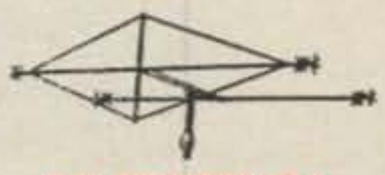
A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Discoverer 2-el 40-mtr Beam	**$319**
Discoverer 3-el Conversion Kit	**$199**
Explorer-14	$309
QK710 30/40 mtr. Add-On-Kit	$79
V2S 2-mtr Base Vertical	$49
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$189
TH2MK3S 2-el Triband Beam	$179
205BAS 5-el 20-mtr Beam	$349
155BAS 5-el 15-mtr Beam	$199
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$259
64BS 4-el 6-mtr Beam	$69
66BS 6-el 6-mtr Beam	$135
18HTS 80-10 mtr Hy-Tower Vertical	$439
LC-160 160-mtr Coil Kit for 18HTS	$45
214BS 14-el 2-mtr Beam	$49
2BDQ 80/40 mtr Trap Dipole	$69
5BDQ 80-10 mtr Trap Dipole	$129
BN86 80-10 mtr KW Balun W/Coax Seal	$22

MOSLEY

Pro37 7-el Triband Beam	$469
CL-33 e-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40 mtr Kit for TA33	$119



MINI-PRODUCTS HQ-1

LIST $182.50 SALE $159

- Wing Span - 11 ft
- Wind Area - 1.5 sq ft
- Boom - 54 in. long
- 1200W P.E.P. Input

ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type	$19
Model HT 2KW UHF Type	$29
Model LT/N 200W N Type	$39
Model HT/N 2KW N Type	$44
Model R-T 200W Deluxe	$29
Model HV 2KW Deluxe	$32

KLM

KT34A 4-el Broad Band Triband Beam	$349
KT34XA 6-el Broad Band Triband Beam	$499
80m-1 80-mtr Rotatable Dipole	$595
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$459
40m-4 4-el 40-mtr Beam	$649
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
2m-16LBX NEW-16-el 2-mtr Beam	$99
2m-22C NEW-22-el 2-mtr Satellite Antenna	$119
432-30LBX NEW-30-el-432 MHz Antenna	$99
435-18C 435 MHz Satellite Antenna W/CS-2	$119
432-16LB 16-el 432 MHz Beam	$69

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$99
Alliance U110 (3 sq ft rating)	$49
Telex HAM 4 (15 sq ft rating)	$219
Telex Tailtwister (20 sq ft rating)	$269
Telex HDR300 Heavy Duty (25 sq ft rating)	$519
Kenpro KR-500 Heavy duty elevation rotor	$189
KLM EL-3000 Moon Tracker Elevation Rotator	$349

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod	$19	HDT-5 5 ft Tripod	$29
HDT-10 10 ft Tripod	$49	HDT-15 15 ft Tripod	$69

Heavy Duty Tripods include mtg hdw-UPS Shippable

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 25G $49.50
45G $112.50 55G $134.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	$ 829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

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

TOWER/GUY HARDWARE

3/16 "EHS Guywire (3990 lb rating)	$.15/ft
1/4 "EHS Guywire (6000 lb rating)	$.18/ft
5/32 " 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 "CCM Cable Clamp (3/16 " or 5/32 " Cable)	$.45
1/4 "CCM Cable Clamp (1/4 " Cable)	$.55
1/4 "TH Thimble (fits all sizes)	$.45
3/8EE (3/8 " Eye & Eye Turnbuckle)	$6.95
3/8 "EJ (3/8 " Eye & Jaw Turnbuckle)	$7.95
1/2 "EE (1/2 " Eye & Eye Turnbuckle)	$9.95
1/2 "EJ (1/2 " Eye & Jaw Turnbuckle)	$10.95
3/16 " Preformed Guy Grip	$2.49
1/4 " Preformed Guy Grip	$2.99
6 " Diam - 4 ft Long Earth Screw Anchor	$14.95
500D Guy Insulator (5/32 " or 3/16 " Cable)	$1.69
502 Guy Insulator (1/4 " Cable)	$2.99
5/8 " Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Socketfast Potting Compound	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

TEXAS TOWERS

Telephone (214) 422-7306

VISA MasterCard

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CIRCLE 112 ON READER SERVICE CARD

ICOM SPECIALS

IC-751
Plus 2 Bonus Items
- PS-35 Internal AC Supply
- SM-6 Desk Microphone

Regular $1598.50
$1399 Save $199.50

IC-27A, IC-27H,
IC-37A, IC-47A
All Now Available
Call For Special Sale Prices!
Save $$$!

IC271A/H 2 mtrs
IC471A/H 70 cm
Perfect Oscar Equipment
Call For Special Prices!

Repeaters
RP310 440 MHz.....$899
RP1210 1.2 GHz.....Call

IC-2AT $219
IC-3AT $239
IC-4AT $239

All Accessories in Stock!

BP2 Battery Pack	$39.50
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC35 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95

IC-745
List Price $999
Compact General-Coverage
Full-Feature HF Transceiver
Call For Special Low Price!

IC730 80-10m mobile unit
Special Price $589

IC505
6m multimode
List $449

Call For Special Price

IC-290H 2 mtrs
IC-490A 70 cm
All-Mode Transceiver
Call For Special Price

IC-02AT
New 2m HT

Call! For Your Special Price!

IC-120 1200 MHz Receiver
List $499 Call For Price

R71 Receiver
Call For Special Price

YAESU SPECIALS

FT980 CAT SYSTEM
AC Power Supply, Full Break-in CW,
SSB/AM/FM/FSK, RF Speech Processor
List Price $1659
CALL FOR SPECIAL PRICE

FT-ONE
With Four Free Filters
List Price $3074
Call For Your Special Sale Price

FT-270RH
New 45 watt 2M mobile.
List $439
Call For Your Special Sale Price

FT-230R 2mtr FM.....List $359
FT-730R 440 MHz FM....List $399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory of Up/Down Scan

Call today for Special Discount
Price & Save $$

FT-209RH
NEW High Tech
2mtr HT
5 Watt Output
NOW IN STOCK
CALL FOR YOUR SPECIAL PRICE

FT757GX
with General Coverage RCVR
includes CW keyer, AM/FM, CW filter
List Price $859
CALL FOR SPECIAL PRICE

FT726R
(Optional modules for 6m, 430, 440 MHz)
Great for Satellite Work
List $899.00
CALL FOR SPECIAL PRICE

FT-77
Perfect Mobile Rig
List $599
CALL FOR SPECIAL PRICE

VHF/UHF Multimode Portables

FT-690R 50MHz.....List $379
FT-290R 144MHz.....List $399
FT-790R 430MHz.....List $399

Call today for Special Discount
Price & Save $$

FT-203R/TT
NEW 2mtr HT
w/VOX* &
Touch-Tone Pad
CALL FOR YOUR SPECIAL PRICE

**YH-2 headset required for VOX operation.....$19.95*

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Sat: 9am - 1pm

OTHER SPECIALS

MIRAGE AMPLIFIER SALE!

B1016
$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
MP-1 and MP-2 Peak Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage 105-125 VAC Output 13.8 VDC ± 05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
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

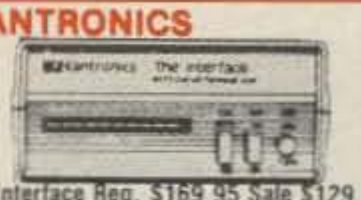
MODEL RS-50A

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

CP1-20	$219	CP1-64	$219
MP-20	$129.95	MP-64	$129.95
VIC-20 MBAText	$79	C-64 MBAText	$79

All AEA Keyers, Antennas & Accessories In Stock!

KANTRONICS



The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95
CHALLENGER $89.95 UNIVERSAL TU $189.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

AMERITRON
AL-80
SALE $599!

AL-80 1000W Output (single 3-500Z) $599
AL-82 1500W Output (pr 3-500Z tubes) $1199
AL-1200 1500W Output (3CX-1200 tube) $1299
RCS-8 5 Pos Remote Antenna Switch $119
ATR-15 1500W Antenna Tuner $259

HAL SALE!
NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

TEN-TEC SALE!

CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!

425 Titan New 3KW amplifier in stock-only $2195!

TEN-TEC
New 2M HT
Full Featured!
List $319 Sale $279.95!

4229 2KW Tuner Kit $189.95!

SANTEC

ST142 $249
ST222 $279
ST442 $289
LS202 $229

KDK FM2033
List $339 Sale $299

MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941C 300 W Tuner	$89.95
989 Deluxe 2KW	$299.95

OSCAR/VHF DX EQUIPMENT

TRANSCEIVERS

KENWOOD

TR9130 2m All Mode 25W	$CALL
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
HL160V 2m 160W out/3-10W in	$289
HL45U 70cm 45W out/10W in	$179
HL90U 70cm 90W out/10W in	$319

ANTENNAS

CUSHCRAFT

A144-20T 2m 20el cir pol	$75
416TB 70cm cir pol	$59
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
435-18C 70cm w/cir switch	$119

HARDLINE & HELIAX

½" Aluminum Hardline	$.79/ft
½" LDF-50 Heliax	$1.69/ft

OSCAR PACKAGE DEALS

PACKAGE #1

Ten-Tec 2510 Satellite Station	List $489
THL HL45U 70cm 45W Amplifier	List $199
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 $1533
PACKAGE PRICE—ONLY $1249 DELIVERED!
SAVE OVER $300!!

PACKAGE #2

Yaesu FT290R 2m Transceiver	List $399
Yaesu FT790R 70cm Transceiver	List $399
Mirage D24 70cm 40W Amplifier	List $210
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!
SAVE OVER $450!!

PACKAGE #4

Yaesu FT726R VHF/UHF Duplex Xcvr	List $899
430/726 70cm Module	List $289
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

TOTAL LIST PRICE $2527
PACKAGE PRICE—ONLY $2125 DELIVERED!
SAVE OVER $425!!

Select Low Loss Transmission Line, Coax, Rotor Cable and Power Supplies from Listing in our other advertisements.

We can substitute items and make any changes needed to fit your requirements. Please call for our Special Sale Prices and SAVE $$$.

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KENWOOD SALE!

TS-930S

Top of the Line HF Transceiver

- General Coverage Receiver
- Superior Dynamic Range
- All Solid State—28 VDC Final
- QSK CW
- Optional Automatic Antenna Tuner
- Dual VFO w/8 Memories
- Dual Mode Noise Blanker
- RF Speech Processor
- Built-In AC Power Supply
- MUCH, MUCH MORE

TS-930S w/Antenna Tuner List $1799
TS-930S w/o Antenna Tuner List $1599
CALL FOR SPECIAL SALE PRICES!

TS-430S

Most Advanced, Compact HF Transceiver $899.95

- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM
- 10Hz Dual Step Digital VFO
- Eight Memories w/Lithium Back-up
- Memory and Band Scan
- IF Shift—Notch Filter
- Speech Processor
- Narrow/Wide Filter Selection
- IF Shift
- Full Selection of Options Available

CALL FOR SPECIAL SALE PRICE!

TS-830S—TS-530S 160-10 Meter HF Transceivers

- All Solid State Except Driver and Final Amplifier
- Wide Dynamic Range
- Variable Bandwidth Tuning (TS-830)
- IF Shift
- RF Speech Processor
- Adjustable Noise Blanker
- Full Selection of Optional Crystal Filters
- Built-In AC Power Supply

TS-830-S List $949.95 TS-530S List $739.95
CALL FOR SPECIAL SALE PRICES!

TS-130SE Compact 80-10 Meter Transceiver

- All Solid State
- 100W Output
- IF Shift
- Speech Processor
- Noise Blanker
- Narrow SSB/CW Filter Option

TS-130SE List $629.95
CALL FOR SPECIAL SALE PRICES!

TL-922A Linear Amplifier

- 160-15 Meters
- 2KW PEP Input Power
- Pair of Rugged 3-500Z Tubes Included
- Compatible with all Kenwood Transceivers and Many Others
- Built-In 110V-220 VAC Power Supply

TL-922A List $1229.95
CALL FOR SPECIAL SALE PRICES!

TR-7950/7930

- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- 45 Watts (TR-7950) 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

TR-7950 List $399.95 TR-7930 List $359.95
CALL FOR SPECIAL SALE PRICES!

TM-211A/TM-411A 2m/70cm FM Transceiver

- 25W Output
- Priority Watch
- Ultra Compact
- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

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Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Getting On The Air

Getting a Novice license is often the easier part of becoming an active operator on the Novice bands. Assembling one's initial station can take more time and effort than were expended earning one's license. Then there is the matter of getting up courage to get on the air and work those first few jittery contacts.

I make a clear distinction between license holders and license users (operators). Amateur radio has too many people who are licensed but do not operate. These license holders are on the sidelines; they are not participants. If you are among this inactive group, I hope this article convinces you to become an operator —a license user.

This month's column includes references to previous Novice columns which cover specific subjects in detail. Previous issues or reprints of articles are usually available from *CQ* at $2.00 each.

Equipment

The November 1977 through March 1978 Novice columns provide a five-part article on amateur radio station installation tips. That article covers selection and installation of equipment and station accessories. If you intend to use older equipment, that five-part article would be particularly useful, since it covers selection and use of separate receivers and transmitters, plus the less sophisticated early transceivers. This month's article just relates to current transceivers.

I work with many new amateurs each year, and most of them have the same problems and related questions. This article contains answers to the most common questions, plus a few of my own observations.

Many beginners start off by telling me that they intend to get something cheap just to get started on the air. This is a common thought, but it is the wrong approach. An experienced amateur can achieve remarkable results with junk equipment, but a new amateur has trouble obtaining reasonable results when using excellent equipment. The combination of inexperience and a poor station costs the amateur radio service thousands of operators; poor operating results discourage them to the point where they stop operating. Many of these people let their licenses lapse; the remainder simply shift from operator to licenseholder status.

2814 Empire Ave., Burbank, CA 91504

Here is 25-year-old Timothy Porter, KA8SZR, of Jackson, Michigan. He was active on 11 meter CB 10 years before he obtained his Novice license in July 1983. Tim's station includes a Kenwood TS-520-SE transceiver, 40 meter dipole, 80 meter dipole, 10/15/20 meter 4-element Swan Yagi-Uda beam antenna, and a Heath electronic keyer. Most of his operating activity is on the 40 and 80 meter bands. Tim has the Rag Chewer's Certificate (RCC), Ten American Districts (TAD) award, and 10 wpm code certificate.

Superb communications equipment is available to amateurs at a reasonable cost. The Novice license is now issued for a ten-year term, and it is renewable. There is no reason to shy away from top-notch gear just because you have not yet upgraded past Novice. Get the best equipment and accessories your financial situation will permit. If you decide to get used equipment, it is advisable to buy gear that was manufactured within the past decade.

Used Gear

Amateurs are still in the process of changing to completely solid state transceivers, which keeps hybrid (combination transistor and tube) transceivers available at relatively low prices. Very little money is lost if you purchase good used gear and sell it a year or so later. It is not unusual to sell such equipment at the price at which you purchased it. Used gear provides the best dollar value when it is purchased, plus the least dollar loss when it is sold. It has been my experience that most outfits selling used amateur gear do not check it before offering it for sale. For this reason it is best to buy gear only from stores that allow you to return used equipment (within about 15 days) if you are not satisfied with it, and to be granted full purchase-price transfer towards any other unit one decides to buy.

Get an experienced amateur to help you select equipment and check it out for proper performance. If you know a cooperative, knowledgeable amateur, it is advisable to check your newly acquired equipment at her/his shack, where its performance can be compared with that of the existing station equipment, using known antennas, accessories, and a proven ground system.

If you have an active local amateur radio club, it is a good idea to join it and to become active in it. It is usually safe to purchase used gear from other members of your radio club. Club bulletins often advertise suitable equipment and station accessories, and asking prices are usually 20% lower than those in stores.

New Gear

Now that the Novice license term is ten years and the license is renewable, Novices are more willing to consider the purchase of new gear. I do not know a transceiver on today's market that is less than satisfactory. Basically, you get what you pay for. Do not expect a $750 transceiver to provide all the features and performance of a $1500 unit. Transceivers are contradictory equipment in the amateur radio service; they are primarily designed for mobile use, but most of them are never installed in a vehicle of any type. Most transceivers are operated in fixed (home) stations, using power supplies to convert 117 VAC house power to the 12 VDC required to power such transceivers.

It is important for Novices to realize that transceivers are primarily designed to provide voice communications. Radiotelegraph transmission and/or reception characteristics of most modern transceivers are usually marginal. The keyed output wave may be too abrupt, causing a harsh sound to receiving operators. The keyed output wave is distorted (rounded) with some rigs, making it difficult to copy code characters. The single most common shortcoming of modern transceivers is the lack of a suitably narrow band filter for copying radiotelegraph (code) signals. There is no need to use a filter wider than 150 Hz and I consider any filter wider than 300 Hz to be too wide for code operation. Most of the transceivers just have an SSB filter installed in them, and SSB filters are 2500–3000 Hz wide. If you operate radiotelegraph using a 3 kHz wide SSB filter, you are listening to 10 to 20 times as much natural interference (QRN) as is necessary; you are also sub-

ject to additional man-made interference (QRM) from other stations near (but not on) your frequency. Fortunately, narrowband code filters are normally available as accessories to transceivers; they are also available from independent organizations.

Transceivers are sold with many optional accessories. In addition to code filters, noise blankers, remote frequency controls, a.c.-to-d.c. power supplies, loudspeakers, antenna tuners, and linear amplifiers, other accessories are offered with transceivers. You need the power supply and the code filter to initially supplement your transceiver.

The first thing you should do with your transceiver is to learn the function of each control. The instruction manual is the guide to a good understanding of every control, and controls can be located front, back, side, top, or bottom. Connect your rig and check out receiver controls one by one, listening to signals on an active band. You will become aware that many receiver and transmitter controls do not need to be adjusted for months (or years) once they have been adjusted to their proper settings. Learn which controls are in this category, and leave them alone until the need for further adjustment becomes necessary. After you have become familiar with the receiver controls, learn the function of each transmitter control. It is best to study transmitter control functions with the power off at first; then turn the power on and check actual control operation.

Ground

The September through November 1978 Novice columns detail amateur radio station grounding. This article is not intended to summarize that coverage, which warrants reading. It is important to ground your station to the best available ground. Do not assume that you will achieve a satisfactory ground by attaching your station ground lead to a cold-water pipe, a.c. ground point, or telephone ground point. Either put in a good ground system, as detailed in my amateur radio station grounding article, or connect to several external points which you think may provide some connection to earth ground. Transceiver chassis voltages will follow the best (lowest resistance) path to ground, no matter what you connect to. Use ground braid (stripped coax shield) for all ground connections; do not use wire. All ground connections should be made to the ground stud on the rear of the transceiver.

Antennas

The May through July 1983 Novice columns cover dipole antennas in great detail. That article explains how dipoles function; it provides step-by-step construction details, including all dimensions. The dipole is the most popular antenna with new amateurs. It is easy to

Michael Betz, WB8ZFO, submitted this picture of his son (Mike, KA8ROX). KA8ROX upgraded from Novice to General about the time his photograph appeared in the May 1984 Novice column. He was lucky enough to receive 73 as his number in the Marion, Ohio Popcorn 100 Bicycle Tour. He strapped his Drake 22C 2 meter FM transceiver to his bike, allowing him to monitor tour control communications provided by amateurs.

This is 15-year-old Ilan S. Yacobi, KB6CYC. He was born in New Jersey and he recently lived in Santa Monica for one year. Ilan has returned to Tel Aviv, Israel, where he has resided eight of the last nine years. His station includes a Johnson Viking Adventurer transmitter (purchased for $10 at a swapmeet), Heath MR-1 Commanche receiver ($20), 10–40 meter dipole, and a 15 meter groundplane antenna. His contacts include amateurs in 30 states and 10 countries. He particularly enjoys working DX operators and high-speed rag chewing. His code speed is about 30 wpm. Ilan prepared himself and he obtained a Novice license during December 1983. He credits Russ Mason (N6JVG , who took this picture) with introducing him to DX operation. Listen for Ilan from 4X4/4Z4-land (Israel); he expects to be operating from there with a new call sign and a new rig.

construct and erect. Simply stated, the higher you erect a dipole, the better its performance will be. It is worth your time and effort to get is as high as possible.

The amateur radio station installation tips article (November 1977 through March 1978) discusses the use of other antennas. At the present time 10 meter band operating conditions are poor, and they will continue to worsen until we hit the 1987 low point in the sunspot cycle. Consequently, it is not a good time to put up a 10 meter monoband beam, or a 10/15 meter duoband beam. If you want some long-range (DX) capability with a directional antenna, a 15 meter monoband Yagi-Uda or quad beam can be installed. The simple random wire, with a tuner and SWR (standing wave radio) meter, provides operating capability on all bands, but a good random-wire antenna tuner is expensive.

Accessories

The amateur radio station installation tips article also discusses station accessories such as manual telegraph keys, semi-automatic keys (bugs), fully-automatic keys (electronic keyers with paddles), desks, clocks, SWR meters, antenna tuners, feedlines, and other items. The April 1982 Novice column provides headphone information. It advises you to use headphones to improve your operating results and to minimize annoyance to others in the home. The August 1983 Novice column tells you more than you are likely to ever need to know about feedlines. It includes a recommendation to use RG-213/U coaxial cable whenever a 50 ohm feedline is needed in an amateur radio station.

Operating

Previous Novice columns have been devoted to operating information more often than to any other subject. The August through November 1981 Novice columns cover operating tips in good detail. It is useful to beginning operators, as well as to those who have been operating a year or two. The October 1984 Novice column covers operating privileges. The June 1984 Novice column tells what the terms and abbreviations that are heard on the air and appear in print mean. The November 1984 Novice column provides information about zero beat, offset tuning, automatic transmit frequency offset, plus related data. This is essential reading for all new operators; it tells you how to avoid an operating error that leads to unintentional interference and incomplete contacts. The February 1984 Novice column provides useful conversion data; it shows simple Celsius/Fahrenheit temperature conversion, plus UTC/GMT to local time conversion. Both of these conversions are needed when one starts contacting DX (foreign) stations. Operating etiquette is covered in the December 1982 Novice column and the ARRL Nov-

ice Roundup Contest has been detailed in several January issues. If you are interested in low-power (QRP) operation, the May 1981 Novice column contains information that should improve your knowledge of this subject. Reciprocal licensing and third-party traffic agreements are discussed in the April 1981 Novice column. The January through March 1979 Novice columns cover QSL cards in every respect. The exchange of QSL cards is an integral part of amateur radio, but many amateurs do not know how to use these cards properly. The September 1980 Novice column includes additional QSL card data. The November and December 1979 Novice columns cover the so-called Phillips Code that amateurs use, including lists of the phonetic abbreviations that are most commonly heard on the air. The June through August 1979 Novice columns cover code (radiotelegraphy) in good detail. If you are a code enthusiast, this article will interest you from start to finish.

If you want a copy of the printed aids I distribute during the licensing courses I instruct, enclose a self-addressed, stamped envelope (s.a.s.e.) with your request for this list. Instructors are invited to obtain a set of my printed aids for unrestricted duplication and distribution to their students.

Activity

Do not wait a long time before getting your initial station on the air. Your Novice ticket is usually received two to three weeks after the 610 form is sent to the FCC. Make sure you have your station assembled and operable when your license is received. Start operating as soon as you get your ticket. Keep the first few contacts short to minimize the initial strain you are likely to experience. As you become more at ease, lengthen your contacts by chatting with other amateurs as if they were present in your shack. Do not send code faster than you are able to copy it with ease. Accuracy is more important than speed for good code contacts. Errorless code sounds good at any speed. Operate a minimum of five hours per week to increase your code proficiency at a reasonable rate. Do some contest operating just to get the feel of it. There are contests every weekend, and some of them specifically promote Novice band operation. Learn to be a good code operator so that you will always have that operating option available. Do not be one of the majority of SSB/voice operators who knock radiotelegraph operation, when the fact is that many of them are such poor code operators that other amateurs do not want to work them on code.

Once your code receiving proficiency reaches 15 to 17 wpm, it is advisable to switch to a good electronic keyer. The transition is easy, but the initial practice should be conducted off the air. Once you have mastered correct manipulation of the electronic keyer paddle, high-speed code contacts will become easy. Do not send too fast for the other operator involved in a contact. Inputs are needed from both operators to make a conversation interesting.

Avoid the old-fashioned system of monologues alternating back and forth between two operators. If you ask a question, follow it with a break sign (BK) to let the other amateur know you expect an immediate reply. Keep your code conversations two-way and natural.

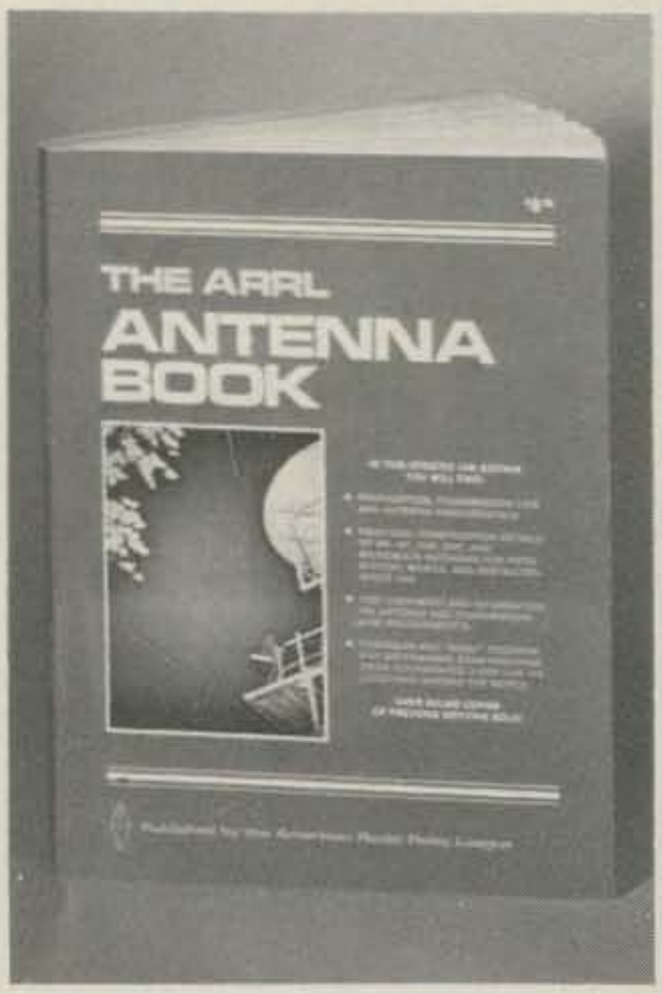
Summary

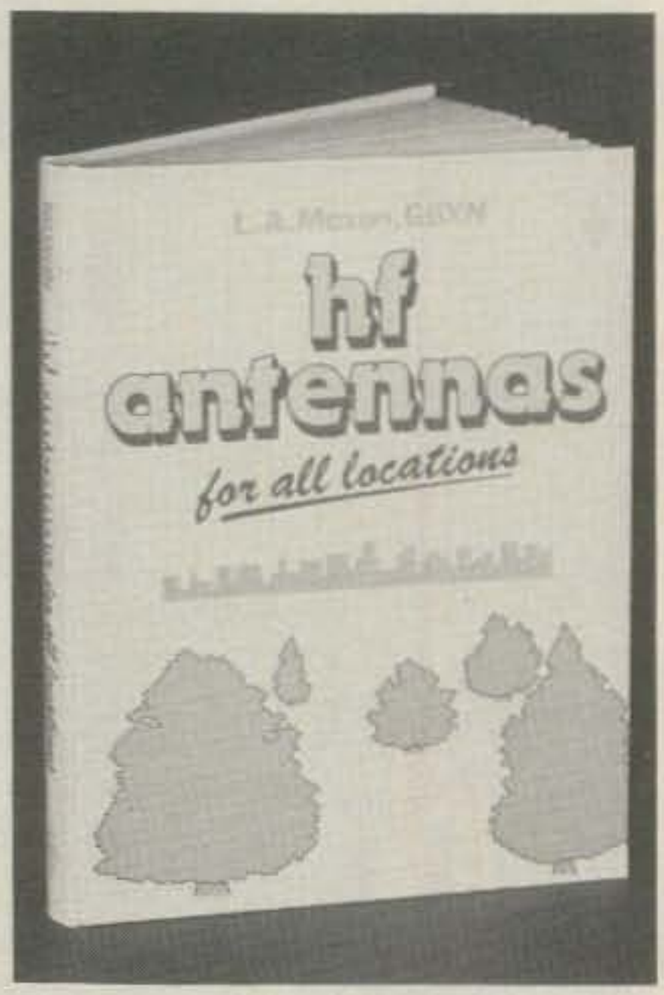
It is hoped that this article will convince license holders to become license users (operators). Newer amateurs are urged to read the referenced articles to learn more about the indicated subjects. Get good equipment and accessories, set up an efficient station, operate from a heated/cooled room, and take pride in becoming a good radiotelegraph operator; there are very few such amateurs.

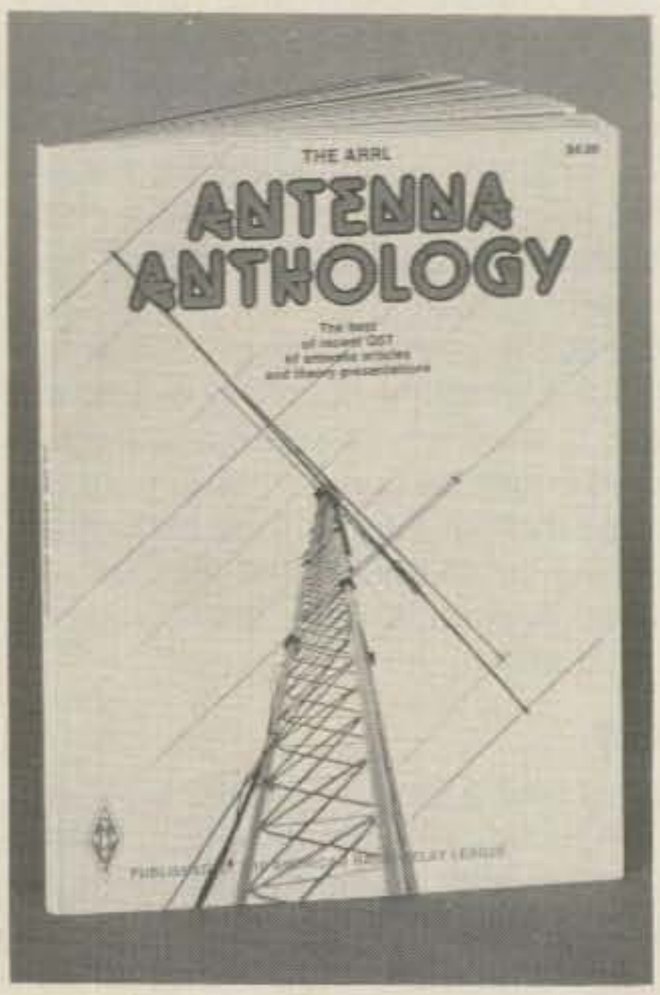
73, Bill, W6DDB

BOOKS

"A STATION IS ONLY AS EFFECTIVE AS ITS ANTENNA SYSTEM"







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HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and Its Environment; Single-element Antennas; Hortizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00**.

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CQ

W3NGN has prepared both a tutorial and a construction project on a c.w. filter for the Novice operator. It's a good chance to learn or brush up on filters while you enjoy a weekend project.

How To Build A C.W. Filter For The Novice Operator Part I

BY ED WETHERHOLD*, W3NGN

Most readers of *CQ* will agree (emotionally, at least) that home-constructed equipment is preferable to commercially-built equipment. This is especially true if the equipment performs effectively and is easy and inexpensive to build. These characteristics are of particular importance to the Novice amateur radio operator because of the many disadvantages with which this individual may have to contend. For example, the younger Novice usually is financially dependent on his or her parents, has limited time for radio construction projects, is inexperienced in building electronic equipment, and usually is unfamiliar with the important operational characteristics of communication circuits. In addition, the Novice bands are crowded, thus making c.w. reception difficult. A most logical home-construction project for the Novice is an easy-to-use c.w. filter that can be built over a weekend at low cost (less than $15) and that *has performance equal to or better than that of commercial c.w. filters costing much more.*

Although many articles have been published on the multi-resonator c.w. filter (see references 1 through 8 at the end of this article), the material was not presented in a manner suitable for application by the Novice. This article will discuss the contruction of a passive inductor-capacitor (LC) c.w. filter in a manner that can be appreciated by the Novice. This filter is ideally suited for the Novice because of its ease of construction, low cost, and superior performance.

*102 Archwood Ave., Annapolis, MD 21401

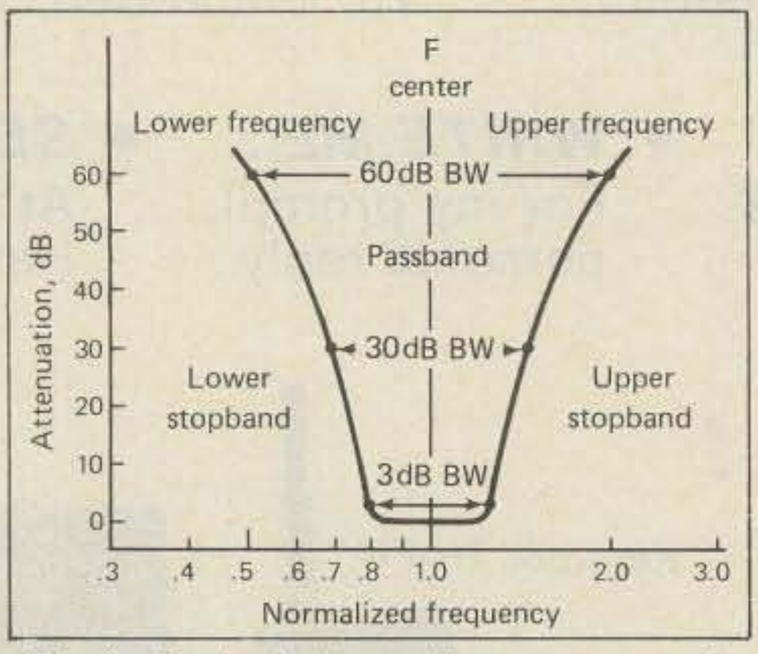


Fig. 1– Typical attenuation response of a bandpass filter.

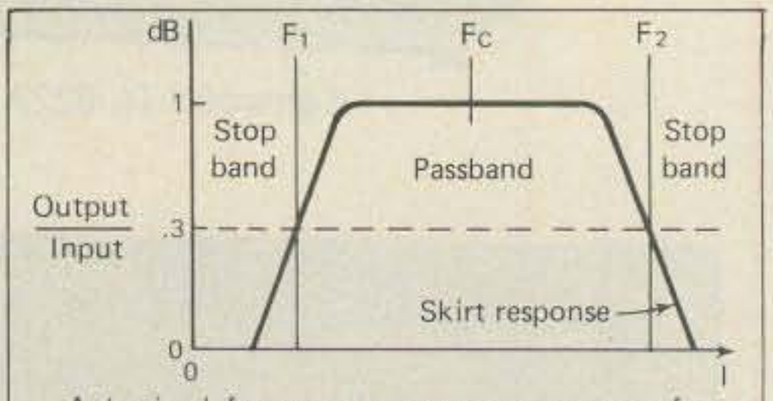
Characteristics of C.W. Filters Suitable for the Novice

The type of filter most suitable for c.w. reception is the "bandpass" filter. This filter passes a band of frequencies with almost no attenuation while substantially attenuating frequencies outside the passband. This means that those annoying low- and high-pitched notes you usually hear in your headset will be attenuated or almost eliminated, thus reducing your operating fatigue and making it much easier to hear the c.w. signal you are trying to copy.

Fig. 1 shows a typical attenuation response of a bandpass filter. Attenuation in decibels (dB) is plotted vertically, while normalized frequency is plotted horizontally. The filter center frequency (Fc) has a normalized value of unity. By normalizing all frequencies relative to the center frequency, the response curve then is universally applicable for any desired center frequency in Hz. The attenuation at any frequency (in Hz) can be obtained from the graph by dividing the frequency by the center frequency to find the normalized frequency. The attenuation corresponding to the normalized frequency is then read from the curve. For example, if a bandpass filter has a center frequency of 750 Hz and the response shown in fig. 1, the attenuation at 375 and 1500 Hz (at normalized frequencies of 0.5 and 2.0) is 60 dB.

Some of the important parameters that characterize a particular bandpass filter response are indicated on the response curve. These are the center frequency; the 3 dB, 30 dB, and 60 dB bandwidths; and the lower and upper frequencies at the 3, 30, and 60 dB attenuation levels.

As the name indicates, the center fre-



A typical frequency response curve for a bandpass filter. The passband portion of the filter curve is the area (delineated by limits F1 and F2) beyond which the response is attenuated 3 dB. These points are also called the *cutoff frequencies.* The filters are designed to attenuate or stop everything beyond the cutoff frequencies. The *everything beyond* is the continuous spectrum of frequencies that are filtered out. These are also called the *stopbands,* the bands that are stopped. The *skirt response* (or skirt selectivity) is the bandwidth at the point of highest attenuation. The shape of the curve, or the *shape factor,* is the ratio of highly attenuated bandwidth to low attenuated bandwidth.

quency is the geometric center of the filter response. If the filter response is plotted on semi-log graph paper (graph paper on which one axis is logarithmic and the other is linear), as in fig. 1, the left and right portions of the response curve will have a symmetry about the center frequency. As you can see this symmetry in fig. 1. An interesting characteristic of this symmetry is that the lower frequency at any given attenuation level is the reciprocal of the upper frequency at the same attenuation level. For example, the lower and upper normalized frequencies at the 60 dB attenuation level are 0.5 and 2.0.

Another important parameter of the bandpass response is its relative percentage bandwidth. This parameter is defined as 100 times the 3 dB bandwidth divided by the center frequency. For example, the relative 3 dB bandwidth of the response in fig. 1 is 46.6%. Equations relating these parameters are given in Appendix A. Other parameters will be explained as they are introduced.

Most commercial c.w. filters have many features such as variable bandwidth, selectable center frequency, and the ability to notch out strong signals in the filter passband. The experienced c.w. operator no doubt can profitably use these filtering refinements with little difficulty; however, the inexperienced Novice may find these features more confusing than helpful.

By making the filter bandwidth and center frequency fixed, and by omitting the notch-out capability, it is possible to build a simple 5-resonator, passive, LC filter for less than $15. This low-cost filter has skirt-selectivity equal to or better than that of the many commercial filters now available. Even the active c.w. filter designs recently published in amateur radio magazines (references 9, 10, 11, and 12) are inappropriate for Novice construction because of construction complexities or inadequate performance.

Some disadvantages of the passive filter are its fixed center frequency and bandwidth; however, once the center frequency and bandwidth have been selected, the Novice will seldom find a need to change them. Consequently, these limitations are acceptable to minimize cost and to simplify the construction and operation of the filter. The only filter control really necessary is a double-pole double-throw (D.P.D.T.) switch to insert or remove the filter from the audio system. Some advantages of the passive filter are its inherent stability and its insensitivity to r.f. fields. Also, the cost of batteries is eliminated because a power supply is not needed.

Although the bandwidth of the passive filter cannot be varied during operation, any one of four fixed 3 dB bandwidths (471, 329, 270, and 216 Hz) can be selected for construction. Bandwidths less than about 200 Hz are not recommended for Novice use, because it is too difficult to keep the desired signal within the filter passband.

This article gives design and construction details for all of the four previously mentioned bandwidths. As an example of how the design information is applied, the assembly and test of a filter with the 471 Hz bandwidth is explained.

How To Evaluate The Performance of a C.W. Filter

The most common performance parameter you will find concerning any commercial c.w. filter is the 3 dB bandwidth. A commonly advertised 3 dB bandwidth is 150 Hz, but this is only part of the story! Equally important are the filter bandwidths at the 30 and 60 dB attenuation levels. These high attenuation bandwidths determine the filter's ability to reject strong signals outside the filter passband. This filtering ability is defined as "shape factor," which is the ratio (always greater than one) of the two bandwidths at two different attenuation levels on the filter attenuation response curve. The 3 and 30 dB or 6 and 60 dB attenuation levels are the most frequently used levels for determining the filter shape factors. These shape factors, in combination with the 3 dB bandwidth, permit you to compare intelligently the attenuation performance of different filters. If the manufacturer does not provide this information, you should request it before considering purchasing a filter.

Of course, the best filter response will have the smallest shape factor. For example, a perfect filter response will have vertical sides and a shape factor of 1.00 because the 3, 6, 30, and 60 dB bandwidths all will be equal. The measured shape factors at the 30/3 dB and 60/6 dB attenuation levels of the passive LC filters to be discussed are about 1.82 and 3.04 for the widest c.w. filter response (measured BW 3 dB = 471 Hz) and about 2.1 and 3.5 for the narrowest response (BW 3 dB = 216 Hz). The filter with the narrower passband response has poorer shape factors than the broadband filter, because the narrower response requires higher inductor Q than the broadband response if the shape factors are to be identical. Because the inductor Q is the same for all filter designs, the shape factors of the narrower bandwidth filter are slightly poorer (greater) than those of the broader filter. By comparing the passive-filter shape factors with those of the commercial filters, it is possible to determine which filter type has the better performance.

Surplus Inductors Are Well Suited For C.W. Filter Construction

Surplus toroidal inductors are used in amateur audio filter construction because of their availability, low cost, and satisfactory performance (reference 13). Fig. 2 is a photograph of the two inductor types used in the c.w. filter construction, and fig. 3 shows the lead connections.

The potted inductors have four insulated leads and a nominal inductance of 86 mH. Although it is not possible to vary the inductance of the potted inductor, this is no problem because special designs have been developed in which the fixed 86 mH value can be used. When narrow-

Fig. 2– This photograph shows four of the potted 86 mH inductors and one unpotted 44 mH inductor used in the c.w. filter construction. The Tinnerman clips are used to mount the potted inductors in the filter box.

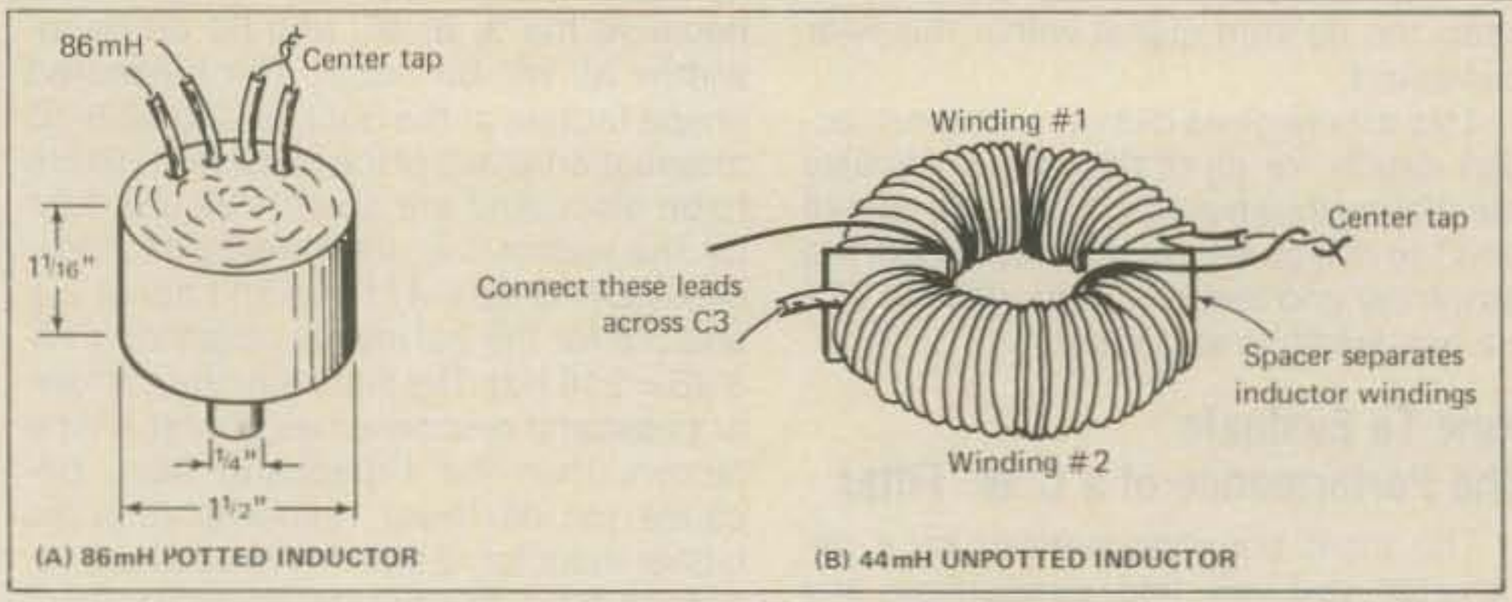


Fig. 3– This pictorial diagram shows the inductor lead connections required for the filter designs in Table I. The four leads of the potted inductors are cut to the proper length, and then the two outside leads are connected together to get the center tap and the 86 mH required by the designs in Table I. The unpotted inductor is modified by removing turns to get the design value shown in Table I, and the two adjacent leads are connected as shown. Appendix A gives modification details.

DESIGN NO.	F-C (HZ)	C1,5 (NF)	C2,4 (NF)	L2,4 (MH)	C3 (UF)	L3 (MH)	R-T (OHM)	BW-3 (HZ)	FL-3 (HZ)	FH-3 (HZ)	FL30 (HZ)	FH30 (HZ)	R.C (%)
1	764	504	504	86	1.00	43.3	654	504	553	1057	449	1301	6.63
2	756	516	516	86	1.02	43.5	648	499	546	1045	444	1286	6.78
3	747	528	528	86	1.04	43.7	643	494	540	1034	439	1272	6.93
4	739	540	540	86	1.06	43.8	637	490	533	1023	434	1258	7.08
DESIGN NO.	F-C (HZ)	C1,5 (NF)	C2,4 (NF)	L2,4 (MH)	C3 (UF)	L3 (MH)	R-T (OHM)	BW-3 (HZ)	FL-3 (HZ)	FH-3 (HZ)	FL30 (HZ)	FH30 (HZ)	R.C. (%)
5	764	504	252	172	1.00	43.3	925	356	607	963	520	1123	6.63
6	756	516	258	172	1.02	43.5	917	353	599	952	514	1110	6.78
7	747	528	264	172	1.04	43.7	909	350	592	942	508	1098	6.93
8	739	540	270	172	1.06	43.8	901	346	585	932	502	1086	7.08
DESIGN NO.	F-C (HZ)	C1,5 (NF)	C2,4 (NF)	L2,4 (MH)	C3 (UF)	L3 (MH)	R-T (OHM)	BW-3 (HZ)	FL-3 (HZ)	FH-3 (HZ)	FL30 (HZ)	FH30 (HZ)	R.C. (%)
9	764	504	168	258	1.00	43.3	1132	291	633	924	557	1049	6.63
10	756	516	172	258	1.02	43.5	1123	288	625	913	550	1037	6.78
11	747	528	176	258	1.04	43.7	1113	285	618	903	544	1025	6.93
12	739	540	180	258	1.06	43.8	1104	283	611	893	538	1014	7.08
DESIGN NO.	F-C (HZ)	C1,5 (NF)	C2,4 (NF)	L2,4 (MH)	C3 (UF)	L3 (MH)	R-T (OHM)	BW-3 (HZ)	FL-3 (HZ)	FH-3 (HZ)	FL30 (HZ)	FH30 (HZ)	R.C. (%)
13	764	504	126	344	1.00	43.3	1307	252	649	901	581	1007	6.63
14	756	516	129	344	1.02	43.5	1296	250	641	891	574	995	6.78
15	747	528	132	344	1.04	43.7	1285	247	633	881	567	984	6.93
16	739	540	135	344	1.06	43.8	1275	245	626	871	561	973	7.08

Table I– Five-resonator c.w. filter designs using 86 mH potted inductors. Bandpass c.w. filter values for L1 and L5 = 86.0 mH. C1,5 and C2,4 are in nanofarads (504 nF = 0.504 μF). L3 inductance is obtained by removing turns from a 44 mH inductor as specified in Appendix A. For optimum performance, the filter input and output terminations should be within 10% of the listed R-T values. The FL-3, FH-3, FL30, and FH30 frequencies are the theoretical lower and higher 3 and 30 dB frequencies of the filter attenuation response.

er bandwidths are desired, additional inductors are added in series to get the larger inductance values that are required. Using several inductors in series is practical only because of the low cost of the potted inductors (about 50 cents each). These junked and commercially unusable inductors were made available to me by the C & P Telephone Company of Maryland for distribution to the amateur radio fraternity. (Send a stamped, self-addressed envelope to me for further information about how to get these inexpensive inductors and other useful parts for the construction of the 5-resonator, passive LC filter).

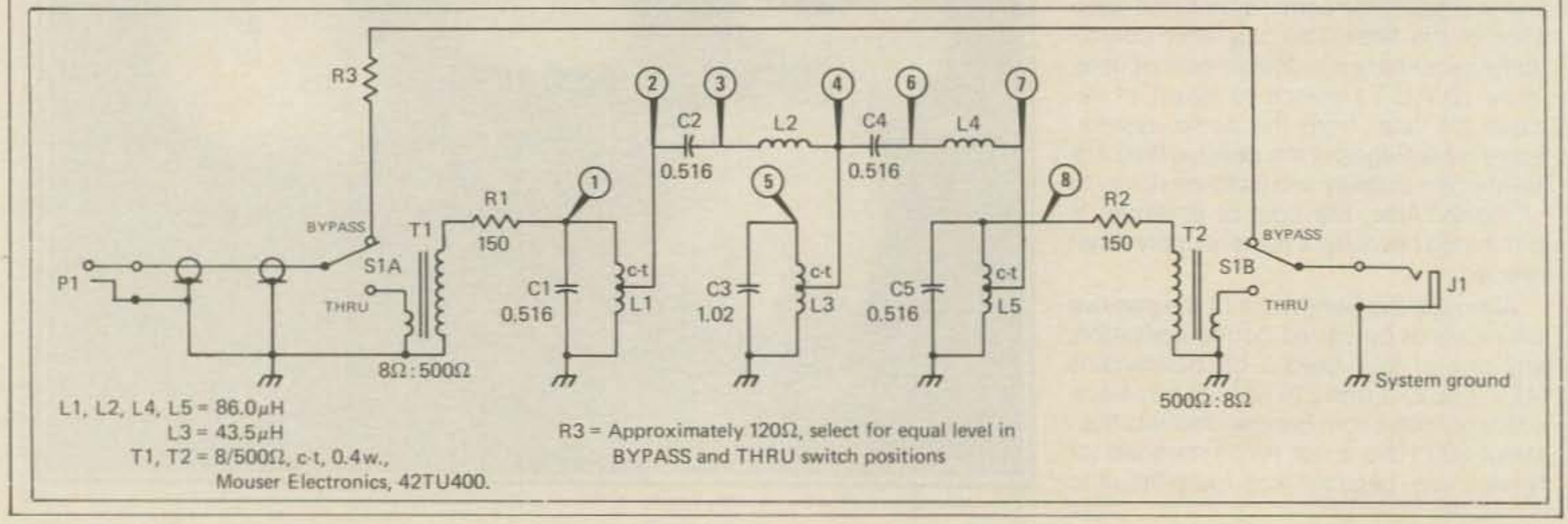
The unpotted inductor is 44 mH, and only one is required per filter. It is fortunate that this inductor is not potted, because its inductance must be varied to get the special values required by the different designs. By varying this inductance, slightly different capacitor values can be used, thereby eliminating the disadvantage of being constricted to only one special set of capacitor values.

For construction of the filter having the widest bandwidth, a total of four 86 mH and one 44 mH inductors is needed. For the 329, 270, and 216 Hz bandwidths, the number of 86 mH inductors required are 6, 8, and 10, respectively.

Precalculated Designs Simplify Filter Selection and Construction

Table I is a listing of computer-calculated designs for the four previously mentioned bandwidths. Figs. 4 and 5 show the schematic and pictorial diagrams of the filter. The first group of four designs in Table I is for a calculated 3 dB bandwidth of about 500 Hz (see the 9th column, "BW-3"). The second, third, and fourth groups are for bandwidths of about 350, 285, and 250 Hz. Inductor losses cause the actual 3 dB bandwidths to be from 5.6% to 13.6% narrower than the computer-calculated values, and this accounts for the difference between the actual and tabulated bandwidths. The first

Fig. 4– Schematic diagram of Novice c.w. filter, design #2. See fig. 5 for the pictorial wiring diagram of this filter. R-T = 648 ohms, 3 dB bandwidth = 499 Hz; R.C. = 6.7%. All resistors are in ohms, capacitors are in mF, and inductors are in mH. All resonant circuits are tuned to 756 Hz ± 2%.



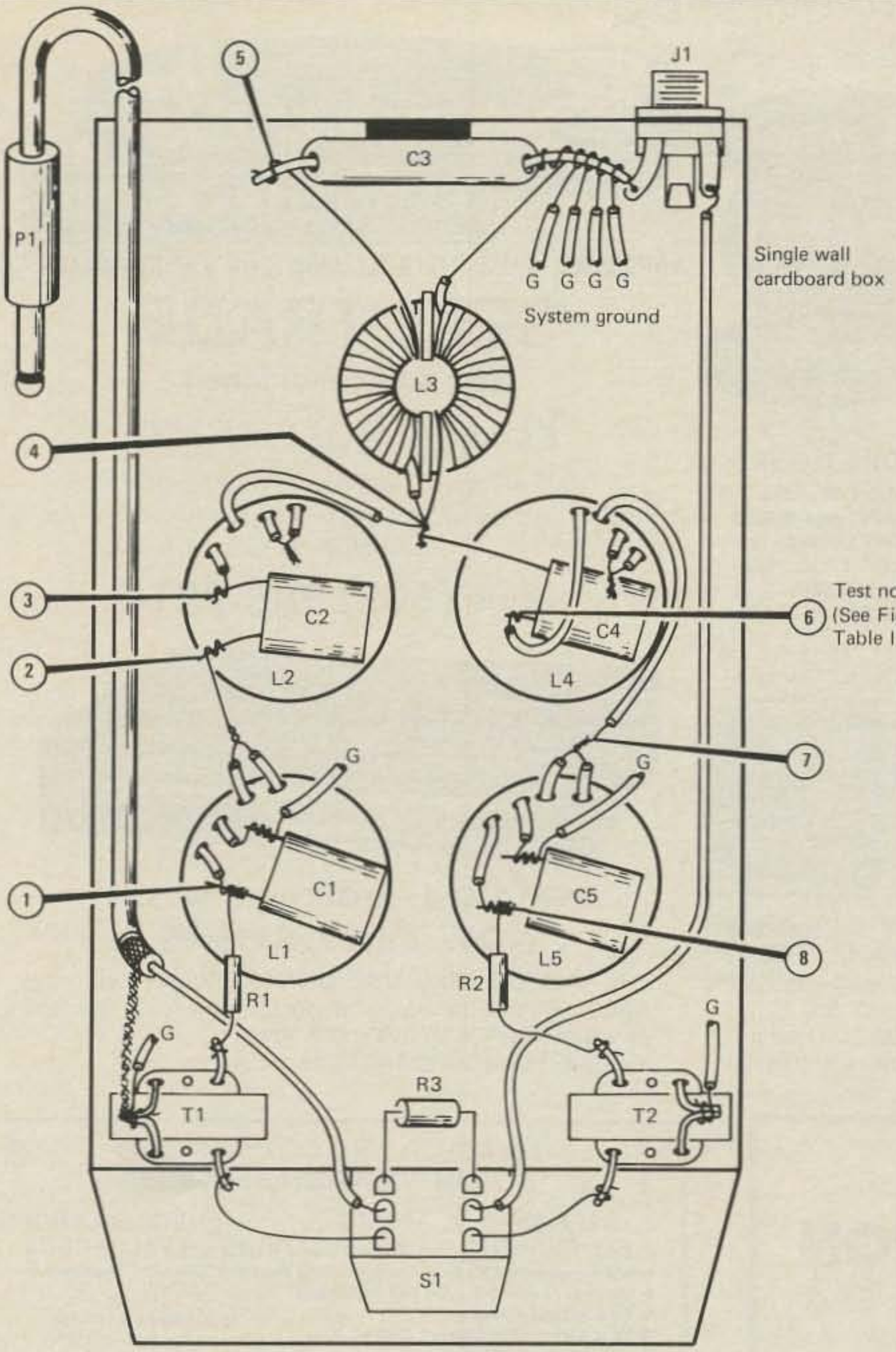


Fig. 5– Pictorial diagram of Novice c.w. filter wiring. This diagram applies only to designs 1–4 in Table I. Designs 5–16 require additional 86 mH inductors to be wired in series to give the design values of L2 and L4.

three design groups (designs 1–12) are recommended for novice construction, because they are easier to assemble than designs 13–16 in the fourth group, and the bandwidths are slightly wider, so tuning is easier.

All designs were calculated for a center frequency of about 750 Hz, because this is the sidetone frequency most commonly used in transceivers. However, designs within 10% of any center frequency between 600 and 1000 Hz are available from me if you include a stamped, self-addressed envelope for a response. All designs are calculated so that capacitors C1, 5 and C3 are standard values (or nearly so). In all designs inductors L1 and L5 are 86 mH, and inductors L2 and L4 are multiples of 86 mH. The value of inductor L3 varies between 43.3 and 43.8 mH, depending on the desired filter bandwidth and center frequency. The 44 mH inductor is modified to the value listed in Table I by removing a few turns as explained in Appendix B.

For proper performance the filter must be terminated in its design impedance. The termination impedance (R-T) of the designs in Table I varies from about 640 ohms to 1300 ohms, depending on the filter bandwidth. The actual filter input and output terminations should be within 10% of the design value for satisfactory operation. The proper values of termination impedance are easily matched to a 4 or 8 ohm impedance level with 500, 1000, or 1200 ohm transformers (available from Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071). Any mismatch greater than 10% between the design impendance and the input and output transformer secondary impedance is easily corrected by inserting half-watt resistors of the proper value either in series or in parallel with the secondary windings of the transformers. The resistor values shoud be such that the combination of the resistor and the transformer impedance will closely approximate the required filter termination impedance. The slight reduction in audio level caused by the added resistors is easily corrected by increasing the receiver audio gain. How to match the filter to impedance levels other than 8 ohms is explained under the heading "Filter Installation."

The 10th and 13th columns of Table I list the low and high frequencies at the 3 and 30 dB attenuation levels. These data allow a close approximation of the filter response to be sketched on a sheet of semi-log graph paper to illustrate the selectivity of the design. The actual 3 dB bandwidths are from 5.6% to 13.6% narrower than the calculated values, but the 30 dB bandwidths (calculated from the 30 dB frequencies) are closer to the actual values. The last (14th) column of Table I lists the reflection coefficient percentage (R.C.%). This is a parameter that is used to identify a particular filter design. A design having an R.C. less than 8% is relatively insensitive to component tolerance and termination impedance variations; however, as the R.C. percentage increases, the filter becomes more sensitive to these variations. For best results, the actual capacitor values should be matched to within 2% of the values listed in columns 3, 4, and 6. CQ

(To Be Continued)

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Last month we discussed atmospheric influences on propagation and VHF path losses. You will recall that we established that a "typical" 144 MHz station might have a total station gain of 206 dB, while an "ideal" station whose equipment is maximized in all areas would have a total station gain of about 260 dB, thus overcoming severe path losses commonly encountered at the very high frequencies.

Now we can venture into tropospheric effects on VHF/UHF propagation and discuss the more esoteric modes of long-range VHF/UHF communication. The most prevalent form of enhanced VHF/UHF propagation is **tropospheric bending.** Although there is still much to be learned about this common phenomenon, its character and intensity are closely linked to weather conditions, not surprising, since as we stated last month the troposphere contains our weather system. Tropospheric bending, often referred to as "tropo" by VHFers, occurs most commonly in the warm-weather months and creates enhanced propagation (i.e., lower than normal path losses) most typically along the trailing edges of barometric high-pressure areas and along lines of inversions[1]. These tropo-enhancing conditions are often reported in local weather forecasts, so keeping abreast of weather conditions and changes is a rewarding practice for VHF/UHF DXers.

Note that enhanced "tropo" conditions appear to have more influence at the shorter wavelengths (higher frequencies) and tend to reduce path losses by increasingly greater degrees as we work up the spectrum. For example, 50 MHz tropo is generally limited to about 300 miles, while at 144 MHz and above it may extend to 500 or even 1500 miles. The weekend of September 8–9, 1984 produced some of the best VHF/UHF tropo along the U.S. Atlantic coast in years, to the recollection of many VHFers. Stations reported dozens of contacts of over 1000 miles DX on 144 through 1296 MHz during an enhanced condition lasting more than 48 hours.

Another form of tropospheric enhancement is **ducting**, or the transmission of VHF/UHF electromagnetic waves over defined paths as though propagated through a duct or tunnel. VHF/UHF DX to about 2500 miles distance[2] has been reported via this "ducting" of signals. The duct is so called because it apparently behaves like a tunnel with a floor, walls, and ceiling; stations at the proper geographic location *and altitude* to be "within the duct" can communicate freely with other stations located along the duct, but those located outside of, or above or below, the duct are often not able to take advantage of this exciting medium. VHF/UHF enthusiasts have often reported being "outside the duct," or above or below it, thus having to sit by anxiously while listening to local friends in the duct work DX which they themselves cannot hear. How disappointing!

Tropospheric ducts form most often over water in the lower latitudes (near the equator), but have been known to form at reasonably high latitudes (about 50°) and also over inland regions. Ducts have their most major influence on the bands 144 MHz and above, but may enhance 50 MHz propagation occasionally. From my own experience I'd say the best place to install a VHF/UHF station would be on a hill near the ocean—not too big a hill, about 1000 feet or so. Alternatively, I'd want to set up on a mountain, 3000 to 4000 foot elevation, within about 100 miles of a coastline. These seem to be the prime spots for VHF tropo work.

There are other modes of VHF propagation which come to mind that are neither tropospheric nor line-of-sight, and at least one mode which is line-of-sight "direct wave," but allows long-haul DX on the VHF/UHF bands. These are: auroral reflection (**aurora**), sporadic-*E* reflection (**E-skip**), *F2*-layer ionospheric reflection, meteor scatter, and earth-moon-earth lunar communication (**moonbounce**). All these modes are exciting and require extremely sophisticated equipment.

Aurora, or the reflection of waves from the auroral curtain, can produce extended propagation on all the VHF/UHF bands, but more frequently is workable on just 50, or possibly 50 and 144 MHz. The reflected signals usually sound raspy and distorted, an effect created by the constantly changing nature of the aurora. It has been my observation that aurora is most often workable on 50 MHz first, and then may become workable on 144 MHz and then 220 MHz. Therefore, monitoring the 50 MHz band is a very good indicator of aurora conditions.

Aurora can produce DX to perhaps 2000 miles, but most commonly creates low-loss VHF paths between points that are (1) located at the northern latitudes[3] and (2) less than 1000 miles apart. Because the erratic reflections from the auroral curtain produce such distorted signals, the most effective mode of operation by far is CW. Keyed CW signals which are aurorally reflected can sound very raspy and lacking in any tonality even when received with a good SSB/CW detection system, but they are easier to copy than aurora SSB and far easier to copy than the continuous-carrier modes.

To successfully work aurora, you must aim your antenna toward the auroral curtain, which will generally peak toward *magnetic* (not true) north, but may move slightly to the east or west of that central heading. During intense auroral disturbances, you'll tend to hear the aurora-produced distortion even on relatively local signals. For real DX work, ignore the very strong "Au" signals and tune around looking for very weak ones who may be toward the fringe of the aurora range. The better-equipped stations (i.e., kilowatts and large antennas) will be most successful, but even very modest stations should have some success.

Aurora can occur at any time of day and year, but is most prevalent in the late afternoon hours and around the beginning of spring and autumn.

Sporadic-E skip occurs most often on 50 MHz, but its appearance on 144 MHz is well known and always exciting. This short ionospheric skip is created when "clouds" of dense ionization form in the lower ionosphere, about 50 miles above the earth, thus allowing reflection of VHF waves which would normally pass through the ionosphere with little loss. These "clouds" of ionization do not mend to form a complete blanket, or layer, of ionization as is the case with much higher altitude *F*-layer which produces long skip at HF; also, these clouds of ionization form and dissipate rather *unpredictably*, hence the name "sporadic-*E*."

Signals reflected from a single *E*-layer cloud might propagate 200 to 800 miles, creating a **skip zone** of 400 to 1600 miles; further, the concurrent formation of *E*-clouds over different areas can create situations which promote **double hop** *E*-skip to perhaps 3000 miles or beyond. This most exciting and unpredictable mode of propagation occurs most frequently during the summer months and seems to be precipitated by thunderstorm activity. Monitoring VHF television broadcasts, especially Channel 2, for long-range DX interference to local stations is a good way to keep watch for *E*-skip in the VHF amateur bands. When the *E*-skip becomes very short (i.e., 400 miles or so) on 50 MHz, then it is time to QSY to 144 MHz in hopes of finding *E*-skip propagation on the higher band. *E*-skip at 220 MHz or above is either very rare or nonexistent.

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Long skip resulting from *F2*-layer reflection effects only *one* VHF band: 50 MHz. Six-meter DX enthusiasts are lucky that solar Cycle 21, which peaked in 1980, produced fantastic international propagation, allowing 12,000 mile QSOs via multi-hop *F2* for many. As discussed last month the the *F2*-layer ionization becomes most intense and MUF reaches highest in the spectrum during solar activity peaks which occur roughly every 11 years. Cycle 21 saw MUF's of about 70 MHz, allowing European VHFers the opportunity to "hop the pond" to U.S. and Canadian listeners on the 4 meter European amateur band. Cycle 21 also frequently produced MUF's of 50 MHz, especially during the late fall of 1979 and 1980, allowing worldwide propagation via multihop *F2* skip. As this is written in late 1984, we are on the downslope of Cycle 21 and 50 MHz *F2* has been rare or nonexistent of late; however, we can expect its return at the peak of solar Cycle 22, which might occur about 1990.

During periods of intense solar activity there are many indicators of anticipated propagation and MUF. These include the W1AW ARRL broadcasts and the WWV (NBS) broadcasts which advise of solar flux and sunspot numbers. As with the HF DX bands (14–28 MHz) the MUF is related to the sun's position and is generally highest at about noontime for the midpoint of the desired path; for example, a path from New York City to London would peak at about 9:30 a.m. local time in New York, which relates to 2:30 p.m. local time in London. A path from New York to Tokyo would be best at about 6 p.m. local time in New York. The correct beam heading for 50 MHz *F2*, as with the HF bands, is generally toward the desired station via the shortest great-circle route.

The most challenging of methods by which VHF/UHFers work long distances is **moonbounce.** The staggering thought of reflecting signals from the moon's surface might convince you that this wouldn't even be possible, but I assure you that the practice has become increasingly popular since its first successful amateur attempt in 1953. Since the troposphere and ionosphere are basically transparent to VHF/UHF waves, lunar communications is really just a very long-distance line-of-sight mode with normal square-law signal path losses. Due to the round-trip path length of nearly a half-million miles and the fact that the moon's surface is not a mirrorlike reflector, the path losses are overwhelming at about 253 dB at 144 MHz; however, as we found in our calculations last month, these losses can be overcome with top-notch equipment.

Besides the obvious path losses, other difficulties encountered by moonbounce enthusiasts include sighting problems, near-field obstacles, polarization ("Faraday") rotation, and possible health hazards resulting from use of megawatt-level effective radiated power on the UHF bands. The antenna size requirements for successful EME work, even at the legal power limit, are formidable. Even at 1296 MHz or above,[4] the antenna's cross-section frontal area would need to be about 500 square feet.

To attempt EME communications, cooperating stations aim at the moon; thus, precise knowledge of the "other station's" location is not required. Most successful EME work is done at night to allow for the "quietest" possible skies, although there are effects noted by moonbouncers which suggest that galactic noises heard at night can rival daytime sun noise in intensity. It should theoretically be possible for any two stations who can simultaneously view the moon to establish communications at 144 MHz or above via lunar reflection. An actual visual sighting is unnecessary and may be prevented by cloud cover or fog; lack of a visual sighting calls for more sophisticated methods of establishing the correct antenna heading, however, and many moonbouncers are not equipped with the hardware required for other than visually-sighted steering.

Moonbounce enthusiasts make most of their contacts via prearranged scheduling and usually attempt to make a contact for at least half an hour. Typically, it is prearranged that one station will call for a time interval—such as 2½ minutes—and then the other station will call for a similar interval. Obviously, to do this effectively the cooperating stations must have well-calibrated clocks, usually set to WWV. The long calling intervals are to allow the receiving station to experiment with antenna heading (and possibly polarity) and receiver frequency. Remember, the moon is a moving target traveling at about 1000 miles per minute! The long total schedule duration is to allow for the happenstance of proper polarization alignment during the agonizingly slow polarization rotation of the reflected wave. In all, moonbounce is tough work requiring not only a top-notch station, but also considerable practice and expertise. As such, there are still only a virtual handful of active moonbounce enthusiasts in the world. The numbers are growing, however, and the activity is regarded as *the* long-term goal of many active VHFers.

Compared with EME, *meteor scatter* seems a rather tame mode of long-haul VHF communication. Most active VHFers (other than those who are exclusively on FM) have heard at least one meteor "burst," created by the very brief reflection of a signal from the ionized trail of a burning meteor.

Meteors are the "falling stars" of our nighttime skies, but are actually particles of space matter which are constantly entering the earth's atmosphere. These bits of matter usually vaporize from the intense heat created by the friction of their

travel as they approach the earth; the burning generally occurs in our ionospheric *E* region, about 50 miles above the earth's surface, but occasionally a meteor will fall to earth without totally vaporizing, and then the particle becomes, by definition, a *meteorite.*

The trail of ionization created by random meteors creates the opportunity for VHF signal reflection of very brief duration. The resultant communications possible from a single such "burst" of signal may only be a syllable of voice or a "dit" or "dah" of Morse CW—certainly not enough information for a QSO. With considerable patience, a complete contact might be made via "random" meteor scatter, but such a contact may take hours, requiring dozens of brief bursts before real recognition occurs. However, this is a sport, and what is sport without challenge? If it was easy, anybody could do it, and this statement certainly applies to meteor scatter work.

Happily, there are predictable times of year when dozens of meteors per hour shower our ionosphere, creating brilliant displays for astronomical observers and greatly improving the chances of meteor scatter QSOs for VHFers. These meteor "showers" are termed just that, and the really big showers occur every summer and late fall; the **Perseids** meteor shower in late July through mid-August and the **Geminids** in mid-December are the most productive showers for radio work. The Perseids shower is so intense that it is visible around the clock (but most easily seen at night) and has caught the attention of astronomers, meteorologists, and students of the earth sciences for hundreds of years.

To improve the chances for successful QSOs via meteor scatter, especially during periods when a major shower is not in progress, cooperating stations call on prearranged frequencies and schedules, much like for moonbounce work. Usually meteor schedules are established with much briefer calling periods than those used for moonbounce, and the informational content of each transmission should be as "dense" as possible; i.e., since the bursts are brief, the object is to get across as much information as possible in each burst, thus yielding transmissions such as "W1AB de W2XY NJ W1AB de W2XY NJ W1AB de W2XY NJ W1AB de W2XY NJ BREAK BREAK BREAK" on SSB or "W1AB de W2XY W1AB de W2XY W1AB de W2XY W1AB de W2XY K K K" on CW, sent at 40 wpm or so. The meteor scatter forum is no place for calls such as "W1AB in Plymouth, Massachusetts this is W2XY in Trenton, New Jersey calling . . . ." There just isn't time for extraneous syllables which yield no important information.

On SSB, the only voice mode worthy for meteor scatter work, a meteor scatter call might sound like this: "CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY CQ W2XY BREAK BREAK BREAK." This is an excellent calling format because it delivers the most information using the fewest number of syllables, and it repeats the information several times, which greatly improves the possibility of someone copying it all.

A suitable voice reply to W2XY's voice CQ might be "W2XY W9YZ W2XY W9YZ W2XY W9YZ W2XY W9YZ W2XY W9YZ W2XY W9YZ W2XY W9YZ W2XY W9YZ BREAK BREAK BREAK." This contains all required information and repeats if frequently enough that W2XY might copy W9YZ's entire callsign. This all sounds quite tricky, and there is certainly a technique required for meteor scatter work, but after some practice it's not so difficult. At 50 MHz the meteor scatter signals are frequently strong enough to be copied in just a few tries, and even modestly equipped stations (e.g., 100 watts output to a 12 dB gain antenna system) are reasonably successful. At 144 MHz the path losses are much higher, and maximizing station equipment is a prerequisite to success. At 220 MHz the mode is even tougher, and only the best-equipped stations have any success. I don't know of anyone working meteor scatter on 432 or 1296 MHz with any reliability, although those stations with moonbounce capability might generate enough ERP[5] to make contact.

Most meteor scatter work is done in the very late-night and early-morning hours, from 2200 to 0800 hours local time, although this period is extended during major meteor showers. DX to about 1200 miles can be expected via meteor scatter, but shorter distances, down to normal "tropo" range, can be worked more consistently. I'd recommend the neophyte meteor scatter operator attempt his first work on 50 MHz, and only after listening to others. This observation of local technique can go a long way toward enhancing the chances for success.

Next month we'll talk about the "nuts and bolts" of VHF/UHF work: the equipment, antennas, and accessories that constitute a good station. Until then.

73, Steve, WB2WIK

Footnotes

1. **Inversion** is a short form for "tropospheric temperature inversion," which is a condition created by a warm air mass overrunning a cold air mass, thus inverting the normal situation of decreasing temperature at increasing altitudes. Normally, there is about a −3°F change in air temperature per 1000 foot altitude in our troposphere, but during an "inversion" the lower air mass is cooler than the upper air mass.

2. Over water; somewhat less over land.

3. Usually above 40° and nearly always above 35° N latitude. Proximity to the earth's northern geomagnetic pole is the single most important factor in establishing frequent and reliable aurora opportunities. For this reason, the VE1's and VE2's have the best chances at "Au," followed by W1's, etc.

4. Actually, the same size antenna is required for two-way EME regardless of frequency of operation, since the path loss, like antenna gain, is related to wavelength; a 23 dB antenna at 144 MHz might be a good moonbounce system, while 32 dB might be required to produce similar results at 432 MHz.

5. **E**ffective **R**adiated **P**ower; this is transmitter power appearing at the antenna multiplied by antenna gain expressed arithmetically (not in dB). A station with 1000 watts at the antenna and 23 dB antenna gain would have 200 kilowatts ERP.

This little "field expedient" antenna can be put together in practically no time.

How To Build Cheap And Easy Two Meter Antennas

BY ROY A. NESTE*, W0WFO

Are you interested in a low-cost 2 meter antenna that is easy to build using cheap parts; that requires no tedious matching and adjusting; that is almost invisible; that is portable, compact, quickly assembled; and that can be converted into a beam? If so, we have one here.

First, let's take up the ultra-simple antenna as shown in fig. 1. This is designed as an invisible, hanging, vertical half-wave antenna. You can hang this in the house, motel room, up in a tree, etc. You will notice that the bottom section is kicked out a bit to bring the s.w.r. down to a usable value, but you may find that the lower section can hang almost straight down without affecting your s.w.r. too much. For portable use you can bend the two sections together and roll them up in a ball for storage. *Caution*: Be sure that the bottom section is connected to the center conductor. If not, don't grab your soldering iron; just turn it upside down.

Now we will go to fig. 2 for the same antenna, but here it is designed for tabletop use instead of as a hanging antenna. All you need is a 3 foot piece of $^3/_8$" dowel rod. Drill a hole near the top and use a #4 machine screw and nut (wing nut is even easier) to attach it to one of the holes in the SO-239 connector, and put the bottom in some type of a holder so it will stand by itself—lots of room for ideas on that. You can switch from a hanging antenna to the one shown just by adding the dowel rod. You can adjust the top and/or bottom sections of the dipole for s.w.r. It seems to have a good match around 90 degrees between them, but it may be a little better if the top is vertical. If you prefer a more stable antenna, you could go to a #12 wire, or higher.

Now if you want a more dressed-up version of the antenna in fig. 2 you can make the one shown in fig. 3 as follows. Pick up a piece of white PVC pipe. I used ¾", as the store had a small piece left over which cost me $1.50, and the tubing was two pieces made out of an old TV antenna. You will have to use your ingenuity as to a portable stand to hold it up.

For extra gain you can convert this to a 2-element vertical Yagi simply by making a vertical element which is 5% longer (2") and placing it about 16" behind it (see fig. 4). The reason for using a reflector instead of a director is that a director should have a spacing of about 0.1 wavelength for best gain. However, if you do that, the radiation resistance of a 2 meter beam using 2 elements is about 15–20 ohms (poor match). If you use a reflector, however, the spacing should be a little less than 0.25 wavelength, and then the radiation resistance is about 50 ohms, so you get maximum gain and at the same time a close match to 52 ohms. As yet I have not tried a reflector on mine.

Incidentally, I tried both of my antennas in the basement and keyed up a repeater 35 miles away with almost full quieting. I then keyed up another repeater 50 miles away, though weakly.

A "J" antenna gives you a dipole antenna as well, but you have to add a quarter-wave stub and then adjust the feedpoint, so the above antennas are much easier to build and use than the "J," and not as cumbersome. Try it. You might like it! CQ

*Box 108, Park River, ND 58270

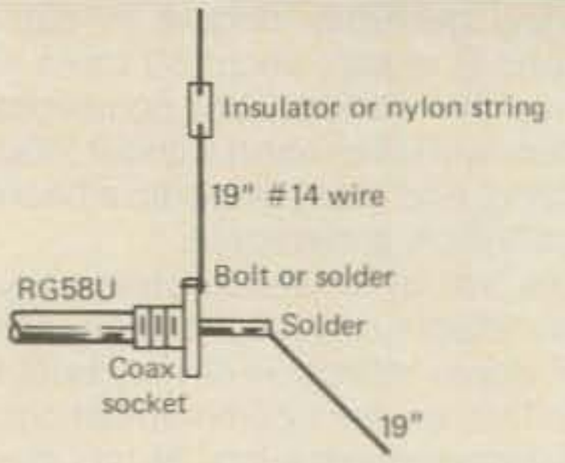

Fig. 1- The ultra-simple version made on an SO-239 connector.

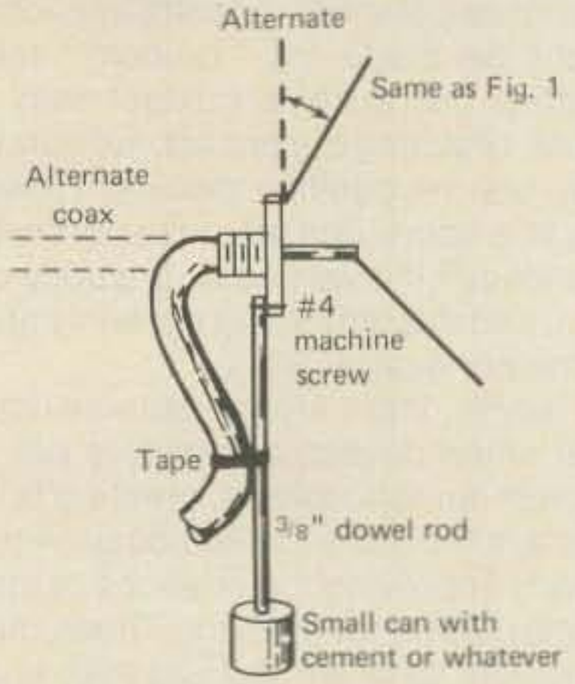

Fig. 2- A tabletop version using a dowel and a simple base.

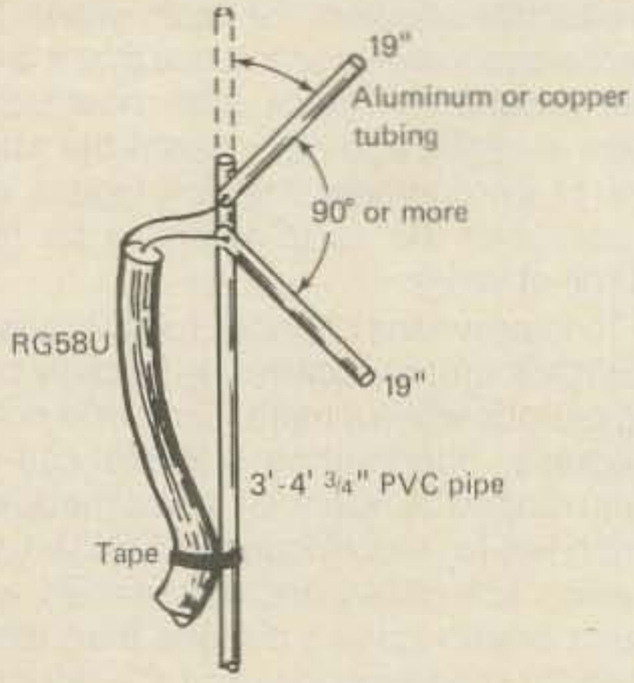

Fig. 3- The antenna can be dressed up via the use of PVC tubing available at hardware stores.

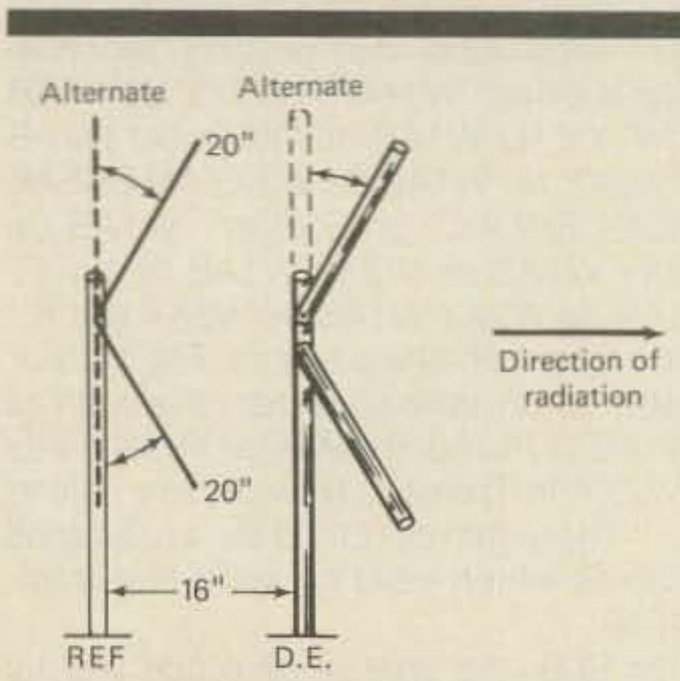

Fig. 4- Adding another element can increase the gain.

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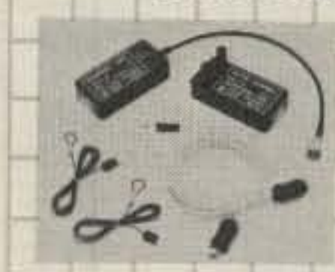

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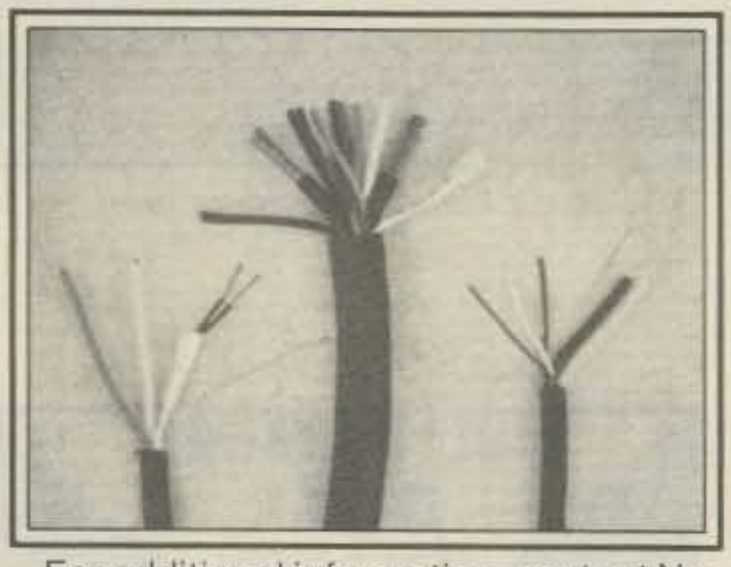
CQ SHOWCASE

Nemal Electronics ST-1 and ST-2 Cables

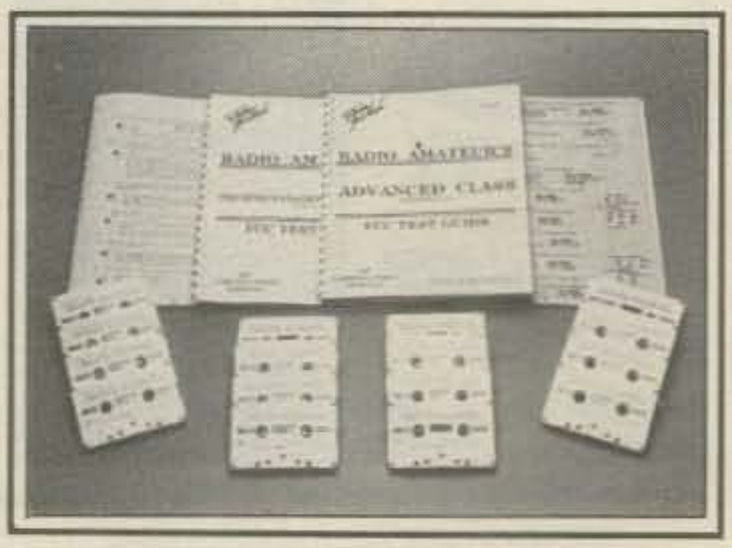
Nemal Electronics has introduced a new line of direct burial actuator cable for satellite earth station and communications applications. Each type provides the proper cabling for both motor power and sensor/control in a single polyethylene jacket suitable for direct burial. Nemal ST-1 consists of 2 conductors of 16 gauge and 2 conductors of 22 gauge with foil shield and drain wire. The ST-2 contains 2 conductors of 12 gauge and 3 conductors of 22 gauge with foil shield and drain wire. Nemal also offers a line of five types of satellite control cables which contain motor, sensor, polarotor, and coaxial signal lines.



For additional information, contact Nemal Electronics International, Inc., 12240 N.E. 14th Avenue, North Miami, FL 33161, or circle number 101 on the reader service card.

Gordon West's Radio School's Licensing Aids

Gordon West's Radio School offers two ways to assist in upgrading an amateur radio license or in starting out in amateur radio. You can either learn by reading their Radio School FCC test guides, or learn by listening to their stereo code and theory cassettes.



Theory tapes include questions and answers, plus the *sounds* behind certain FCC questions. For example, if the question talks about full break-in (QSK) operation, you will hear the difference in stereo between semi- and full break-in. Four stereo, long-play tape cassettes comprise each Technician/General, Advanced, or Extra class course. The Technician, Advanced, and Extra class theory 4-set courses are $39.95 each, plus $3.00 for postage and handling. Applicants who plan to study for the Novice test will receive two theory course tapes. The complete Novice cassette theory course is $19.95, plus $2.00 postage and handling. Contact Radio School, 2414 College Drive, Costa Mesa, CA 92626, or circle number 105 on the reader service card.

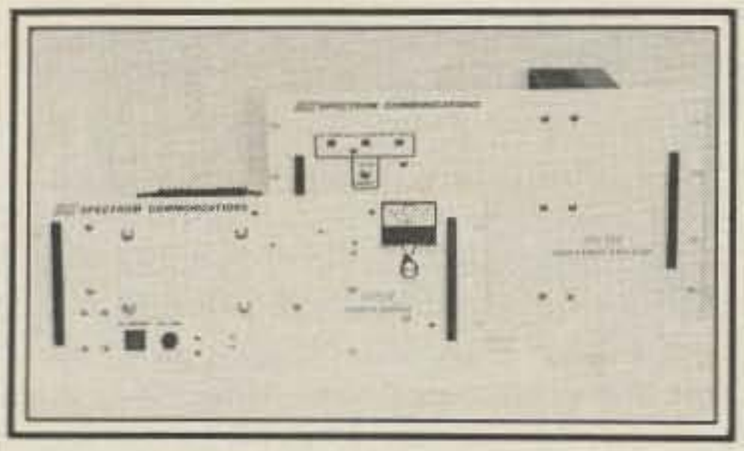
MFJ-550 Microphone Equalizer

The MFJ-550 Microphone Equalizer will improve transmitted SSB speech for maximum talk power, maker says. The unit evens out speech peaks and valleys to produce cleaner, more intelligible speech on the receiving end. The MFJ-550 also reduces bassy peaks due to acoustic resonances within a car, for mobile operation. The microphone equalizer plugs between microphone and rig with a standard four-pin microphone jack on the unit and shielded output cable to the rig (included). Front-panel features include bass, midrange, and treble variable controls that provide ± 12 dB boost or cut at 490, 1170, and 2800 Hz; a microphone gain control; and an on/off/bypass switch with "on" LED. The bypass switch connects the microphone directly to the rig.

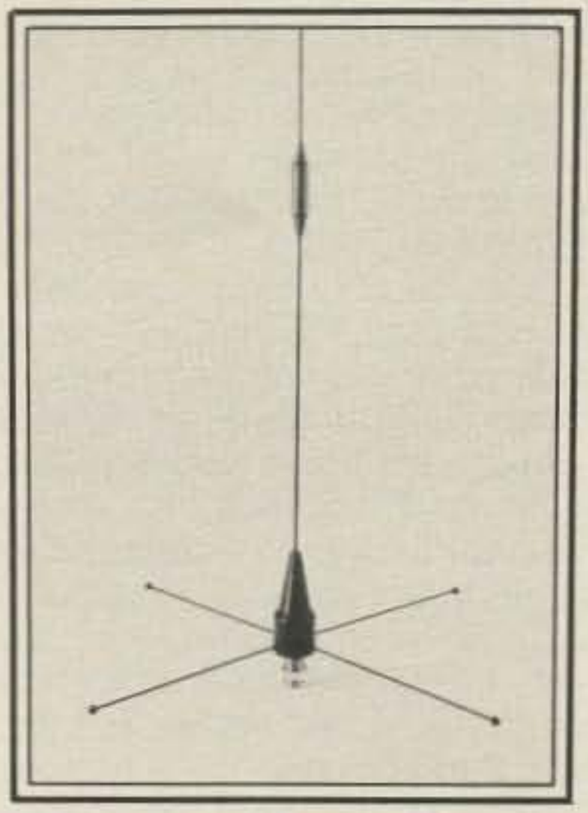
The MFJ-550 is housed in MFJ's black aluminum cabinet and uses a 9-volt battery, 12 VDC or 110 VAC with AC adapter, MFJ-1312, ($9.95). The unit comes with a one-year unconditional warranty and a 30-day money-back guarantee, and is available for $49.95 plus $4.00 shipping from MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762, or for more information circle number 103 on the reader service card.

Spectrum Repeater/Base Power Amplifier & Power Supply

The Spectrum SCA100V is a 150 watt repeater/base station amplifier that operates in the 136–174 MHz range. Its massive heat sink and cooling-system design allow cool operation even under 100% continuous-duty conditions in a hot environment. The unit also features automatic Hi VSWR shutdown/"bypass" with 4X auto-reset circuit; auto amp bypass if power supply should fail or if amp should overheat; tight RF shielding; and heavy-duty construction. A 100 watt UHF version is also available.



The SCP30 is the companion power supply for the SCA100V amp; its output is 13.6 VDC at 25 amps continuous (30 amps intermittant). For more information on the SCA100V, contact Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown, PA 19401-9616, or circle number 106 on the reader service card.



Larsen FB2-450 Antenna

Larsen Antennas' FB2-450 antenna features their exclusive Kulrod T™ Teflon-coated finish for corrosion resistance and maximum performance. The ⅝ over ½ wave collinear whip with four integral ground-plane radials delivers 4.5 dB gain, compared to a quarter-wave antenna on a suitable ground plane. The FB2-450 operates in the 450–470 MHz frequency range and has "N"-type hardware. The FB2-450 comes complete with bracket and hose clamps for mounting on a 1½ inch to 2½ inch diameter pole. For more information contact Larsen Antennas, P.O. Box 1799, Vancouver, WA 98668, or circle number 102 on the reader service card.

"WHERE HAVE ALL TH GONSETS GONE?"

BY PETER PUTNAM*, W9DHK

Bill Pasternak wrote a fine article for the July 1982 issue of *CQ* magazine outlining the development of equipment for the v.h.f. operator who was on during the late 50's and through the 60's. I read it eagerly, since I first became a ham in the early 60's and started on 6 meters myself. All his descriptions of the trials and tribulations caused by what now appears as inadequate equipment brought back memories of my own early attempts to communicate. His conclusion that all the fun of the v.h.f. bands had ended really took me by surprise; I still operate on 6 meters and I am having more fun than ever before.

Yes, the Gonsets are all gone except for the stray that turns up at a ham flea-market or auction once in a while. It looks just as outmoded as an Apache and an SB-10 would if held up for comparison. Those rigs have faded from the scene because something else which was more convenient or less bulky or had better performance came along. But the fun which the low bands provide hasn't faded, nor has the fun of the v.h.f. bands.

The SCR-522 transmitter that I converted to 6 meters by taking out the tripler is a thing of the past. My Sixer and my Polycomm 6 are in ham heaven, too. So is my Heathkit Shawnee, which was used mobile with the obligatory Saturn 6 halo. The halo is still around, however, which brings us to this tale.

The sunspot cycle was supposed to have peaked in 1979, leaving a v.h.f. desert in 1980. Those who stuck around know that solar activity didn't decline as fast as the pessimists had predicted, and the fall/winter of 1981 provided those at the right place at the right time with some outstanding examples of DX. My QTH is in the Tennessee Valley just north of San Francisco, a location not conducive to radio propagation of any form (except TVI), so one of the best places in the area for a shot to the west is Point Bonita, which is at the edge of the Pacific Ocean and has about a 100 foot straight drop to the water. One can drive to the very edge. A rusty steel fence which has some of its railing missing provides a perfect support for an antenna. Days following a solar flux peak are the clue to go to this site and stick the halo into the fence, which puts it 3 feet off the ground but 100 feet above the water. However modest this antenna arrangement may seem, it was satisfactory for working Japan with an FT-620B, a 10 watt s.s.b. rig quite comparable to the Shawnee and Polycomm 6 in complexity.

But there's more. From a similar nearby location Sheldon, NI6E, and I used a 5-element beam on a 10-foot piece of mast to work ZL1MQ in New Zealand. In this case we used an ICOM IC-551, another 10 watt s.s.b. rig with frequency memory and scanning features, which was powered by a 12 volt lead acid battery, as the car could be driven no closer than 50 feet from the station location. T32AB on Christmas Island was also on that day, and since the band was otherwise empty, we enjoyed a leasurely ragchew. The 10 watt, 5-element beam station was adequate to work the C5AEH 6 meter expedition in Africa, as well as several South American stations.

There is still more. Sheldon worked VP5D in the Caribbean while mobile in motion on the Golden Gate Bridge with the IC-551 and a quarter-wave whip attached to the top of the car with a magnet. The log sheets for that catch were lost, but another contact under the same conditions a week later reestablished the time and date for an eventual QSL exchange.

Six is Still Fun!

If foreign DX doesn't turn you on, how about WAS? Sheldon worked all states with a 10 watt rig and a 5-element beam from a less than desirable QTH. The East Coast was worked primarily in the winter

*333 Durant Way, Mill Valley, CA 94941

using the F2 layer, and sporadic-E brought in the rest during the summer. Low power means waiting for other QSO's at times or even waiting for another better opening, so this project might easily take two years, neatly dispelling the myth that the challenge is gone. In fact, the closest states may prove to be the hardest; Nevada is a bear from the San Francisco area, while Alaska and Hawaii prove easier.

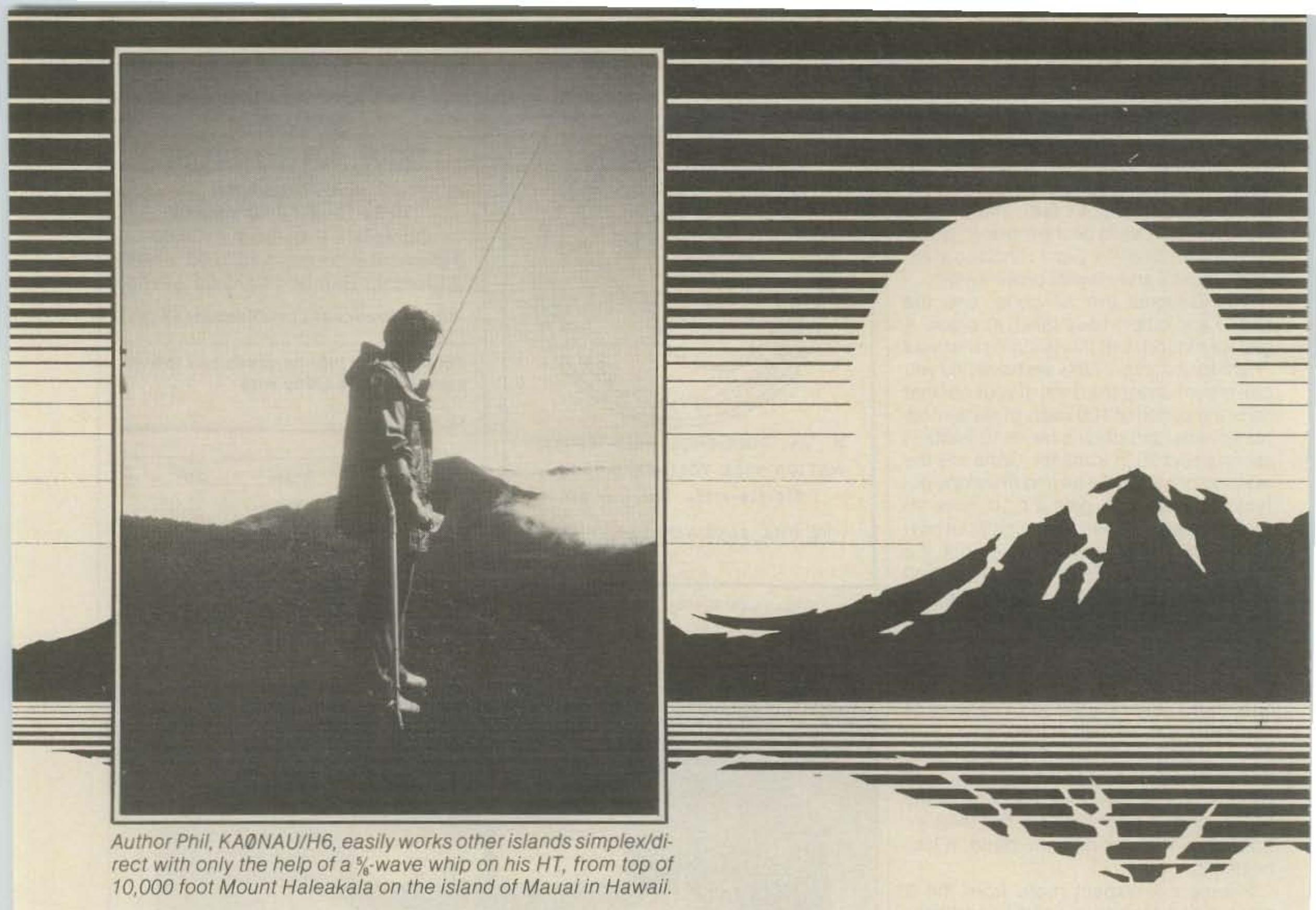
The Gonsets are all gone, and the IC-551 and others have taken its place. A gap was found, and this is the rig that was "right for its time." Now we have rigs you can mount under the dash of your car that have the punch of 100 watts of plate-modulated a.m., but draw a mere 10 watts in receive and 35 in transmit. Gone are the masses of heterodynes and envelope detectors. Everybody gets a b.f.o. now, so you can always revert to c.w. without having to worry about whether or not the equipment at the other end will permit that mode. No longer do we need to search for the 50.25 crystal when 50.4 is occupied; rigs are still crystal controlled, but the crystal provides the reference for a synthesizer which will generate any frequency you want in the band with steps of 100 Hertz and remember it when you turn off the rig. If you desire, the rig will scan discrete frequencies or through a band of your choice. These features were totally unavailable during the 60's, but their introduction has not hurt the band; it has helped it.

People can expect more from the 6 meter band than they used to and they can get it. With better equipment the band becomes more interesting, and band occupancy will rise, giving more and more opportunity for experimenters to play with sporadic-E, meteor scatter, F2, troposcatter, backscatter, or perhaps EME. Band occupancy is the limiting factor. The band is often open to someplace with no operator.

Jim Treybig, W6JKV, completed an expedition to XF4 devoted almost entirely to 6 meter operation; 600 lucky people will have a card that won't be duplicated for quite a while, not to mention his previous trip to Fiji and Tonga which made 1500 6 meter types happier. Would he have done as well with 100 watts of a.m.? Would we at the other end?

It's true that the introduction of f.m. and repeaters to 2 meters has had a profound effect on the nature of the use of that band. In some ways it is better and in some it is worse. In any case, people haven't been buying 2 meter rigs to keep their checking accounts active.

Six meters hasn't seen that revolution. Everybody monitors 50.11 u.s.b. instead of 50.4, and the spacing between QSO's in progress tends to fall in 5 kHz increments instead of 150 kHz steps. When the band is really busy, activity will spread up to 50.2. Everyone is friendly and a good time is had by all. It's just like it was in the good old days—except better.



Author Phil, KAØNAU/H6, easily works other islands simplex/direct with only the help of a ⅝-wave whip on his HT, from top of 10,000 foot Mount Haleakala on the island of Mauai in Hawaii.

Crossing the waters for a DXpedition can also put you right in your own backyard. Here's one of those perfect spots that requires no passport, visa, or special license.

Take Your 2 Meter HT For A KH6 Vacation

BY PHIL HARRISON*, KA0NAU

While most of us remember to include a mobile or portable rig of some sort when preparing for a vacation by automobile, it's easy to forget that useful item when traveling by air, since weight and space are critical. However, if Hawaii is your destination, there are some good reasons why your 2 meter HT should go along on the trip.

Besides help with directions in Honolulu's maze of streets and the enjoyment of an occasional QSO with local and visiting amateurs, there's a chance to use Hawaii's interfacing repeaters for inter-island work, and even some simplex direct between islands from higher elevations.

Yes, in addition to the palm-lined beaches portrayed in the travel brochures, Hawaii is indeed a mountainous state in which you can easily drive to 10,000 foot Mount Haleakala on Maui. There's a repeater there, to be sure, but you can easily reach most of the other islands simplex direct. This operator did, and with only the help of a ⅝-wave whip I was able to work other hikers on Oahu from Maui, across about 50 miles of ocean.

One of the big benefits of making contact with other ops around the island is that Hawaiian weather can vary considerably from one side of an island to the other. Usually the upwind side is showery while the leeward side is sunny. On the 2 meter band you can usually locate an OM

*1701 Saint Andrew's Drive, Lawrence, KS 66044

or YL who will be glad to report the weather from another location. One of the problems with operating in such a mountainous island environment, though, is that most rigs don't have the "punch" to get through the mountain to the other side. In that instance it is important to work through the mountaintop repeater, if available, or through the repeater of a nearby island. Also, driving, or better yet hiking, to the top of a mountain or ridge certainly produces the best results.

When you arrive on the island, usually at Honolulu on the island of Oahu, take a little time to locate the repeaters listed in the ARRL Repeater Directory. The interface patterns are simple: The downtown Honolulu repeater interfaces with the Lihue repeater on the island of Kauai; the Diamond Head repeater interfaces with the repeater at the top of Mount Haleakala on the island of Maui, which in turn interfaces with another repeater on the top of the "Big Island," Hawaii. Therefore, from your Waikiki hotel room you can literally work all the major islands in the state of Hawaii with your 2 meter HT, and maybe even find some operators on some of the minor islands.

With regard to HF expeditioning, remember that the OMs back home will appreciate hearing from you if you are operating from one of the less-populated neighboring islands. QSOs with Honolulu area amateurs (island of Oahu) are common enough, but how many mainland operators have worked Kauai, Molokai, or Lanai? On the balance, the island of Kauai seems to be the best location for some serious HF work. A couple of hotels there have large, vacant fields adjacent to their premises, and there are almost no high-rise buildings on the island. The scenery, beaches, and generally slower pace are perhaps preferable to the bustle of Honolulu and the crowded resorts of Maui. The prices on Kauai are a little lower, and hotel personnel can be a little more accommodating. Set up your shack on the *lanai* (veranda) of your resort room and you'll soon draw a small crowd of onlookers, each hopeful that your next QSO will be to their home town. Those onlookers will probably include some of the many Japanese and Australian tourists who visit Hawaii's nearly perfect shores.

Even though it seems like an exotic location, Hawaii is indeed part of the United States, so you can use your own call sign with the /H6 suffix tacked on the end.

Best of all, you'll find the aloha spirit of Hawaiian hospitality to be one of the real delights whether you decide to just take the HT or go all the way with the big rig. Local amateurs are at least as friendly as on the mainland—maybe more so—and are happy to answer your questions about local operating customs. By the way, have you ever worked a station on board a submarine? That's just one of the surprises that Hawaii has to offer. So don't forget your HT, enjoy the trip, and Aloha 73! CQ

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The story of the month as told by Clay is:

Ira Clay Crowder, WD4HRN
All Counties #235, 8-7-79

"I was born in Bessemer, Alabama in 1938. After schooling, in 1956, I went into the United States Army. In 1957 I went to Fort Devens, Massachusetts for training as a High Speed Morse Code Interceptor. In April 1957 I was sent to Germany, my first of three tours of duty. I spent three years in Germany and France and in 1959 was sent to Fort Rucker, Alabama. I was assigned as Communications Chief for training at the United States Army Aviation School, where I remained for three years. In 1963 I was assigned to the MARS station (K4WEF, AA4WEF). That same year I received my General class amateur license with the call WA4RMX.

"In 1964 I was again on my way to Germany, and this time I was ready to work the world from a DX station. It took me three months to get a German call, and I was assigned DL5HH. While I was in Germany this time, I worked all states and was able to get 173 countries confirmed. In 1967 I returned to Fort Hood, Texas.

"One day while tuning around 14.336 I heard a lot of stations giving and receiving reports from mobile stations. When I heard a break in the action, I asked what was going on and was told about the County Hunters' Net. The NCS told me a few things about County Hunting. I thought that out of over 5,000 cards I surely would have most of the counties, but to my amazement I only had cards from 750 counties. At that time a new County Hunter was born. I had always been one for a challenge.

"Eight months later it all came to a halt. I was sent to South Vietnam, where I was assigned to the 199th Light Infantry Brigade as Communication Chief. During the final three months in Vietnam I set up and operated MARS station AB8AAM.

"I left Vietnam in April 1969 and was assigned to Fort Gordon, Georgia at the United States Army Southeastern Signal School as an instructor. Between teaching and operating I finally got up to 2990 counties by 1971.

"In August I was sent to Germany and received the call DA2IC. A lot of field duty kept me from operating much on this tour. In September of 1974 I returned again to the United States and was assigned to Fort Huachuca, Arizona. I was not permitted to have an antenna there,

Clay, WD4HRN, All Counties #235, at home in Ozark, Alabama.

so I had to do my radio operating from the car. In January 1977 after twenty years and two months I gave it all up and moved back to Alabama. I went back to college and was off the air for nine months.

"In December 1977 the County Hunting bug bit me again and I was off and running. I was down to 50 counties, but between working and going to school, my radio time was limited to only two hours a day. By the time of the Atlanta County Hunters Convention in July 1979 I was down to only two counties to go. One was Hawaii County, Hawaii, and the other was Gray County, Kansas. I talked with Dr. Tom, WA0YJL (now KB0KS), about Gray County and Bill, K5IW, arranged a schedule for me with KH6JIB for my last county in Hawaii. I finished them all by contacting Dr. Tom for my last one in July.

"At the present time I work for Northrup Worldwide Aircraft Services, Inc. as an Avionics Technician at Fort Rucker, Alabama. My work is on the UHIH (Huey) Helicopter. My number two son is now a ham (KB4LFH).

"I would like to thank all the mobiles who went out of their way to help me. Most of all I would like to thank Sue, my wife, and my children, James, Michael, and Tina, who put up with me during those trying times getting up in the middle of the night to work the last one in a state or stopping on a county line to wait my turn to run a county on the Net.

"Last but not least, I would like to thank all the wonderful people I have met on and off the air. Gob bless all of you! 73, Clay, WD4HRN"

333 South Lincoln Ave., Mundelein, IL 60060

Special Honor Roll
All Counties
#484 Bernard L. "Buddy" Mael, WA7YID, All Counties #110, 10-13-73
Stephen H. Morris, W1AQE, CW Endorsement, 10-9-84

USA-CA Honor Roll

3000		1500		500	
WA7YID	513	N2CWG	697	W9JBR	1976
		WA7YID	698	G3GWT	1977
2500				W8LQJ	1978
N2CWG	574	**1000**		KC4SF	1979
WA7YID	575	N2CWG	858	NØWA	1980
		SM7TV	859	YU7DX	1981
2000		KC4SF	860		
N2CWG	629	NØWA	861		
WA7YID	630				

Awards Issued

After working hard at it all summer, Bernard L. "Buddy" Mael, WA7YID, finished them all and now has All Counties #484 Mixed, 10-20-84.

Harry Incho, N2CWG, has been busy on the CW bands and has added gold seals for USA-CA 1000 #858, USA-CA 1500 #697, USA-CA 2000 #629, and USA-CA 2500 #574 to his certificate. All seals are dated 10-5-84.

Boris Goransson, SM7TV, claimed USA-CA 1000 #859 Mixed, 10-5-84.

James E. McClory, Jr., KC4SF, qualified for USA-CA 500 #1979 and USA-CA 1000 #860 Mixed, 10-9-84.

Dennis J. Johnson, NØWA, caught up on his paperwork and sent for USA-CA 500 #1980 and USA-CA 1000 #861 Mixed, 10-10-84.

USA-CA certificates were issued to:

Jack Jarouce Carr, W9JBR, #1976 Mixed, 10-2-84.

G. W. Taylor, G3GWT, #1977 Mixed, 10-5-84.

Roy Tordiff, W8LQJ, #1978 Mixed, 10-6-84.

James C. McClory, Jr., KC4SF, #1979 Mixed, 10-9-84.

Dennis J. Johnson, NØWA, #1980 Mixed, 10-10-84.

Mico Avramovic, YU7DX, #1981 Mixed, 10-23-84.

Awards Available

Catch 22 Award. Applicant must submit verified evidence of two-way contact with other amateur stations located on the 22nd parallel of latitude north (see list). A contact with a Hong Kong station is obligatory.

Only contacts after 1 January 1980 are valid. Endorsements for mode and band may be requested. The award is available in three classes: Class 3—contacts with at least 15 countries; Class 2—contacts with at least 20 countries; and Class 1—

contacts with at least 25 countries. All awards will be returned by airmail and upgrade stickers may be applied for with a fee of U.S. $1.00.

Countries List: VS6 Hong Kong, CR9 Macau, BY China, BV Taiwan, XV Vietnam, XW Laos, XZ Burma, S2 Bangladesh, VU2 India, A4X Oman, A6X U.A.E., HZ Saudi Arabia, ST Sudan, SU Egypt, 5A Libya, TT8 Chad, 5UT Niger, 7X Algeria, TZ Mali, 5T5 Mauritania, CN Morocco, C6 Bahamas, CO Cuba, XE Mexico, KH6 Hawaii.

Send certified log extracts only—no QSL cards. Make payment in check or cash ($7.00 U.S. or equivalent) to H.A.R.T.S. If sending postal money order, please leave payee blank. Send to Awards Manager, H.A.R.T.S., G.P.O. Box 541, Hong Kong.

The BARA Award. This award is sponsored by the Binghamton, New York Amateur Radio Association. Requirements: Contact four club members plus the club station, W2OW, *or* contact five club members. To apply, forward a list of contacts showing calls, time, date, frequency, mode, and signal report. Upon verification with the club members they will send the certificate. If you have any endorsements to be added to the certificate, they will add them for the cost of return postage.

Send list and fee of $2.00 U.S. to BARA, P.O. Box 853, Binghamton, NY 13902 USA.

The BARA Certificate.

"La Rioja" Award. This permanent award, organized by the Radio Club Rioja and sponsored by the Rioja Autonomous Community, is open to all licensed radio amateurs in accordance with the following rules and conditions.

1. The "La Rioja" award is an attractive plaque comprising the coat of arms of the Rioja and engraved with name, call sign, and serial number.

2. Valid contacts are those made on or after 11 June 1984.

3. The award may be obtained on HF or on V-U-SHF.

4. Modes are CW and SSB. FM is also permitted on V-U-SHF.

5. To obtain the award, QSLs of contacts with five different stations in the Rioja must be presented. At least one of these stations must be located outside the capital, Logrono.

6. Contacts via active repeaters are not valid, and QSLs for V-U-SHF contacts must offer no doubt in this respect.

Diplom La Rioja, by RCR, Logrono.

7. Contacts with mobile or portable stations are only valid on V-U-SHF.

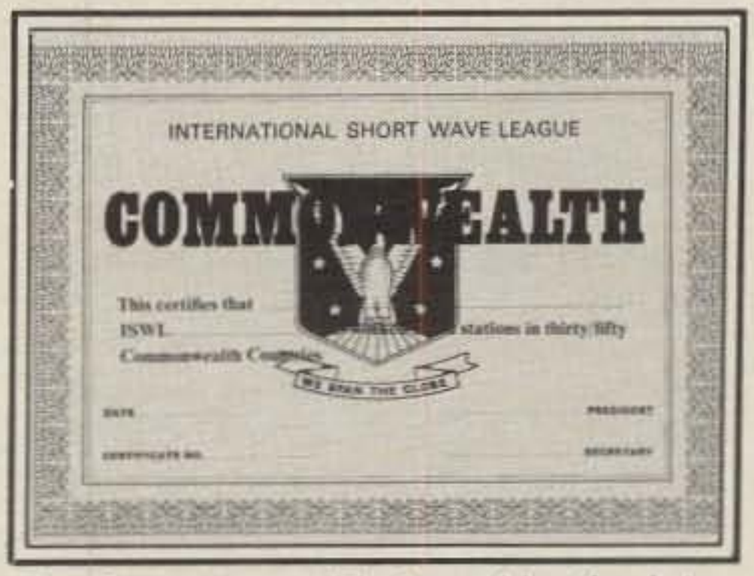
8. If one of the stations contacted is EA1RCR, then rule 5 will be considered as satisfied, and a QSO with a station outside Logrono, the capital, will not be necessary.

9. QSLs and a list of details of each QSO should be sent to Radio Club Rioja, "La Rioja" Award, P.O. Box 318, Logrono (La Rioja), Spain.

10. Any violation of these rules involving deception or "unsporting" conduct will result in permanent disqualification.

11. All decisions regarding the interpretation and application of these rules will be made by the Awards Committee of the Radio Club Rioja, and their decisions will be final.

Commonwealth Awards, ISWL. This award is issued for verified contact/reception of 50 different countries within the British Commonwealth of Nations. (SW BC listeners need only reception of 30 countries.) Send GCR list of SWLs together with fee of 1.50 if in U.K., or $5.00 U.S., or 10 IRC's to Mr. Clifford A. Tooke, 6 Chelmer Avenue, Raleigh, Essex, SS6 7TB, England.



The Commonwealth Award by the International Short Wave League.

Worked DX Stations—a DIG Award.

Worked DX Stations. The WDXS is a diploma recommended by the DARC and is available to all licensed radio amateurs and SWLs who can prove contacts with radio amateur stations on or after 1-1-64 as follows.

Class 4: DX stations work 200 EU stations including 10 contacts on 80/40 meter band. EU stations work 200 DX stations including 20 contacts on 80/40 meter band.

Class 3: DX stations work 500 EU stations including 25 contacts on 80/40 meter band. EU stations work 500 DX stations including 50 contacts on 80/40 meter band.

Class 2: DX stations work 1000 EU stations including 50 contacts on 80/40 meter band. EU stations work 1000 DX stations including 50 contacts on 80/40 meter band.

Class 1: DX stations work 2000 EU stations including 100 contacts on 40 meters and 20 contacts on 80 meters. EU stations work 2000 DX stations including 100 contacts on 40 meters and 20 contacts on 80 meters.

The diploma is available for contacts on all shortwave bands and modes (mixed) or for contacts in CW only (CW Award). No QSLs, only GCR list and fee of 7 DM or 10 IRCs sent to Awards Manager, Walter Hymmen, DL8JS, P.O. Box 1925, D-4980 Bunde, West Germany.

Mico, YU7DX, with his small daughter in Novi Sad, Yugoslavia. Note the "frame" composed of part of Mico's collection of "DX" QSL cards.

Notes

As usual at this time of year we are in the worst of our winter weather. I hope you are having a good start on the New Year and all is well with you and yours.

73, Dorothy, WB9RCY

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Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Product Peek: Part IV

This month author Thurber concludes his "peek" into new and interesting antenna-based products with Part IV of the series. He also provides some straight talk on grounding systems for HF verticals.
—K2EEK

Last month in Part III of the Product Peek series we highlighted the Unadilla/Reyco/Inline product lines and featured the offerings of Grove Enterprises and RF Products. We also described several variants of the Windom and broadside curtain, as contributed by W0MBP. Finally, in our continuing review of hamshack software, we described K3LF's Antenna Design Software package for the Apple computer and KD1O's Hampak contest logging programs for the Commodore 64.

This month we will wrap up the Product Peek series with several products and the manufacturers behind them. We'll look at the products of Skylane Quads, Certified Communications, Ten-Tec, and BHC. We'll then digress for a review of "Murphy's Engineering Laws," and finally, we'll present some hopefully useful notes on vertical antenna grounding and radial systems. Let's first wrap up our "product peek."

Product Peek

Skylane Quads. Don Sanders, W4BWS, advises us that he has taken over the Skylane business, with the passing of W1YM. Don is in the process of building up the business, and he makes the rounds of many of the same hamfests that we do. In an interesting conversation with him, he reaffirmed his strong belief in the quad and in its competitiveness with the Yagi.

To review, the basic quad element consists of two half-wave dipoles with their ends folded around until they meet. This forms a square loop, one-quarter wavelength on each side, having an approximate 2 dB gain over a reference dipole. But how did this unusual type of antenna come about?

The development of the Yagi-Uda parasitic beam in the late 1920s by Drs. Hidetsugu Yagi and Shintaro Uda represented a major advance in antenna technology. Later, around 1940, a group of American engineers were installing missionary station HCJB in the Andes. Due to the high humidity, altitude, and power of the station, the Yagi arrays which were in use generated tremendous corona discharges from the ends of the elements. The chief engineer, the late Clarence Moore, W9LZX, developed the idea of using a driven closed loop with no end points to minimize corona discharges. He also showed that parasitic loops could be used to form directional arrays.

Despite a large number of quad articles in the amateur press over the years, the antenna has not had an acceptance in the U.S. equal to that of the Yagi. However, in other parts of the world the quad has enjoyed considerably greater popularity. This is due largely to the lower cost and wider availability of materials for the quad than the Yagi, which requires relatively expensive aluminum.

The quad is very tolerant of element spacing, which allows the elements of 10, 15, and 20 meter tribanders to be mounted in the same plane. Spacings of from 0.1 to 0.2 wavelengths may be used with relatively minor performance difference. The multiband quad is fed either by: (1) direct feed of all driven elements, with the driven elements simply being paralleled; (2) use of a separate feedline to each driven element, using quarter-wavelength linear matching transformers; (3) individual Gamma or Omega matches for each band; or (4) ring transformers. The latter method of feeding is probably the most satisfactory for multiband operation, and can provide a good match for 50 ohm coax to each driven element. This ensures a low SWR on all bands using but a single feedline. Quad spreaders may be made of many substances, including wood, plastic pipe, fiberglass, aluminum, and bamboo. A quad constructed of good materials can survive severe weather such as ice and high winds.

Some of the inherent advantages of the quad cited by its devotees include: (1) more gain than a Yagi for a given boom length; (2) a one-element (2 dB) gain advantage over a Yagi, resulting in more gain for a given size and weight; (3) low "Q" for broad, "no tune" bandwidth; (4) capture area greater than a beam or a dipole; (5) inexpensive to construct; and (6) reduced "end effects" from nearby trees and other objects.

The Skylane line consists of several multiband quad configurations to cover 40–10 meters, in 2-, 3-, and 4-element versions. Available spreader materials include bamboo (least expensive), fiberglass (more expensive), and a "super fiberglass" (most expensive). Though designed primarily for the five traditional HF bands, the quads are adaptable to the new WARC frequencies. At this writing, prices range from $130 for a 2-element tribander with bamboo spreaders to $590 for the "Special 40," which includes 40 meter coverage. A complete line of ring matching transformers, spreaders, booms, wire, hardware, and other quad parts is also available from Skylane, whose address is 359 Glenwood Ave., Satellite Beach, FL 32937.

For a more detailed examination of the quad, you may wish to read my *CQ* series which appeared in three parts in the August and December 1981 and April 1982 issues. Look for the article "A Primer: The Cubical Quad Antenna."

Certified Communications. "The Wireman," Pres Jones, N8UG, operates this supply house located at 4138 South Ferris Ave., Fremont, MI 49412. Certified is a major CB-to-10 custom conversion house, with conversions of thousands of SSB, AM, and FM transceivers under its belt. However, wire and cable constitute its major business, and the firm is also expanding into the sale of antennas and antenna accessories.

A recent Certified catalog shows a wide variety of coax and other shielded cables, and the catalog listings handily include useful specs and manufacturer comparisons. Pointedly, their catalog candidly advises that purchasing a "satisfactory" length of coax is not necessarily the simple proposition that it might seem at first glance.

Coaxial cable listings and ads generally use the familiar RG/U designations and descriptions. The term is extracted from Federal military specifications, and represents a convenient means of getting close to what you want. However, you must be wary: the terminology is not always specific. For example, the designator "RG8/U" does not pin down size, capacity, shielding, stranding, dielectric, plating, or jacketing—only that the cable is of 50–52 ohm nominal impedance. You must specify everything else. Thus, it's well worth your while to be knowledgeable regarding coax specs, as you can waste a great deal of money by over- or under-buying for the job at hand. Certified, as a cable specialist, is available for consultation to recommend the right cable for the right job. The firm also sells antenna wire, dipole kits, antenna relays, insulators, baluns, radial kits, and the like.

Ten-Tec, Inc. This well-known equipment manufacturer has acquired the

317 Poplar Drive, Millbrook, AL 36054

Bassett line of multiband fixed-station and single-band mobile antennas. The fixed station trap dipoles are offered in 13 models covering various band combinations from 10 through 75 meters. The fixed antennas use the classic Bassett-style helium-filled traps which are rated at 2 kw PEP.

The single-band mobile whip antennas feature helium-sealed inductors with stainless-steel top whips. Models are available for all bands from 2 through 75 meters with power ratings of 750 watts PEP. Various accessories are also offered, including a mobile deck mount, 3–30 MHz mobile antenna matcher, 5 kw balun, and custom commercial versions of both the fixed station and mobile antennas.

The Bassett/Ten-Tec antenna coils, traps, and baluns are pressurized to one atmosphere with helium gas. Why is this done? According to the manufacturer, it is done to prevent corrosion. Ten-Tec's technical literature points out that amateurs must be concerned with two types of corrosion in their antennas. The first is the chemical reaction that takes place when two dissimilar metals come into contact. The second (and most common type) takes place when electrical current passes through these two metals. Chemical reactions only occur between certain metals, but when electrical current passes through two different metals, the range of chemical combinations and opportunity for corrosion increase. An everyday example is the corrosion that occurs around a battery terminal.

In amateur antennas two sources of current must be considered. When two dissimilar metals are joined, a thermoelectric couple is formed at all temperatures (except absolute zero), and a voltage is generated between the two metals. Numerous thermocouples exist in ordinary antenna installations, particularly in solder joints where lead, tin, copper, and brass are joined and where aluminum, copper, and stainless-steel hardware are connected. Also, voltages are generated by currents flowing down the antenna element. In the presence of an electrolyte or ionizing substance, corrosion can occur.

To reduce corrosive electrolytes that can come into contact with the antenna system, sealed containers for traps, coils, and baluns may be used. As a further precaution, the air in these containers may be replaced with a medium that does not combine with other substances. The best medium to use to reduce electrolytic action is an inert gas—one incapable of chemical action with other substances. Helium is an excellent choice for several technical reasons, most notably the fact that it has a high ionization energy level. Long-term loss of the gas through osmosis is minimized by using helium at a pressure of one atmosphere.

For more information on Ten-Tec's antenna product line, contact the firm at its Sevierville, TN 37862 address.

The BHC Balloons. As a youngster and newly-licensed amateur, I played around —unsuccessfully, I must admit—with balloon-lofted antennas for experimental and Field Day use. However, the dime-store, gas-filled balloons just didn't have the lift required for even the lightest of skyhooks. For nearly 30 years I had not given such antennas a second thought.

A display at a recent hamfest brought balloon-lofted antennas back into focus. I spoke with Bob Hutchinson, WD5EQM, of BHC, who was promoting "Emergency Antenna Balloons" for Field Day use. Bob was selling 10 foot, military-surplus weather balloons for under $20 apiece. He finds them excellent for lofting very tall (200–500 ft.) vertical antennas, as well as king-size longwires. According to Bob, the volume of the balloons is approximately 500 cu. ft. when fully inflated, though normally you would not need to fill the balloons to more than 200–300 cu. ft., which would provide the necessary lift for most wire antennas.

Either hydrogen or helium gas can be used to inflate the balloons. Hydrogen gas is inexpensive, about $15 for 200 cu. ft., and the gas is readily available at welding supply houses. Also, sometimes BHC has military-type hydrogen gas generators available for $20–25. These generators fill four or five balloons. However, while hydrogen gas represents the least expensive way to fill the balloons, it is very flammable, and thus extreme caution is required in handling.

Helium is much safer to use, but costs considerably more than hydrogen. Helium has as much lift as hydrogen, but it is an inert gas and nonflammable. Helium costs about $40 for 250 cu. ft. and is available from the same sources as hydrogen. Lifting capacity of the balloons is, of course, dependent on the volume of the contained gas, less the weight of the balloon itself. For example, the 10 ft. balloon with one "bottle-full" of fill gas (200 cu. ft. of hydrogen or 250 cu. ft. of helium) would have a lift of 15 lbs. for a helium balloon, or 12 lbs. for a hydrogen balloon.

According to Bob's experience, on windy days you can run a longwire sloper using the wire itself for the tether. Or, you can tether from up-wind with lightweight nylon cord, suspending the vertical wire directly under the balloon. Needless to say, long and tall antennas along these lines have considerable gain over ordinary, quarter-wave verticals and half-wave dipoles, especially pronounced on the higher HF bands where airborne aerials become super-long in terms of wavelength. Although these antennas have the capability to stay aloft for extended periods of time, they are nevertheless best suited to temporarily Field Day or DXpedition operation.

For more information, contact BHC, the Bob Hutchinson Co., Inc., 1716 Woodhead, Houston, TX 77019.

Murphy's Engineering Laws

You've probably read of or "personally experienced" one of the many versions of Murphy's Engineering Laws. We saw

No -91-92

the following Murphy incarnation in *The Atlanta Ham*, the publication of the Atlanta Radio Club, in the June 1984 issue. We gleefully reprint the laws here, taking special note of laws #1, 5, 9, and 10, which seem particularly directive on antenna construction projects of all types:

1. Always draw your curves, then plot your reading.

2. Do not believe in miracles—rely on them.

3. Firmness of delivery dates is inversely proportional to the tightness of schedule.

4. Dimensions will always be expressed in the least usable term. For example, velocity will be expressed in furlongs per fortnight.

5. Any wire cut to length will be too short.

6. Tolerances will be accumulated unidirectionally toward maximum difficulty to assemble.

7. A fail-safe circuit will destroy others.

8. A transistor protected by a fast-acting fuse will protect the fuse by blowing first.

9. Any error in calculation will be in the direction of most harm.

10. In specifications, Murphy's Law supersedes Ohm's Law.

11. If a safety factor is set through service experience at an ultimate value, an ingenious idiot will promptly calculate a method to exceed the safety factor.

12. Given any problem containing 'n' equations, there will always be 'ntl' unknowns.

13. Any sufficiently advanced technology is indistinguishable from magic.

Okay, so how well is Murphy's Law enforced in *your* hamshack?

Of Grounds and Ground Planes

In several Antennas columns over the past five years we have covered vertical antennas. However, we have focused primarily on the antennas themselves, rather than on the grounding systems on which they rely so heavily. Thus, it's time to back up a bit to cover this important aspect of the total vertical antenna performance picture.

In researching this area we found that most of the spadework had already been done by Don Newcomb, W0DN, in connection with his development of his line of Butternut HF verticals. A tip of the hat to Don is in order for his kind permission to draw heavily on his research here. I have adapted much of the following treatment from his monograph, "Notes on Ground/Radial Systems."

Ground Mounting. A vertical antenna, in its simplest form, is electrically equivalent to one-half of a dipole antenna that is stood on end. When the antenna is mounted close to the ground, the earth below it takes the place of the "missing half" of the dipole. If ground conductivity is outstanding, a short metal stake or rod may provide an adequate ground connection; such a basic grounding scheme is shown in fig. 1. Keep in mind that, for the most part, the use of a short, 5 to 8 foot ground rod is for lightning protection only, not for effective RF grounding of an HF vertical.

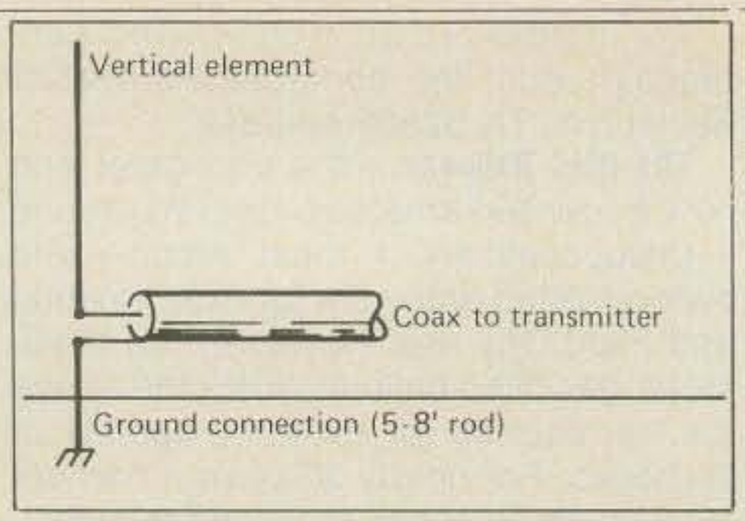

Fig. 1– Basic vertical-antenna grounding scheme. If ground conductivity is excellent, an adequate ground connection may be had using a single short metal stake or ground rod. However, in almost all cases the efficiency of the vertical antenna will be greatly improved if radial wires are used. Over 100 radials may be required to approach a zero ground loss! For the most part, a ground rod is useful only as a DC ground or as a tie point for radials. It does little to reduce ground losses at RF.

In almost every case, the efficiency of a vertical antenna will be greater if radial wires are used to improve ground conductivity. Some points to remember for ground-mounted radials are:

1. Radial wire size is unimportant, and radials may be of any convenient length. If possible, however, make them 0.3 wavelength or longer.

2. Radials need not all be the same length, nor must they be laid out in a straight line. It's pointless to cut radials to resonant lengths, because the ground will detune them.

3. Installation of an elaborate radial system at ground level can't substitute for the *ground plane* necessary for satisfactory operation of a vertical antenna installed on a roof or tower.

Radials can be left on the surface, although they may constitute a hazard. It's usually more convenient to slit the sod and to push the radials into the slits to a depth of a few inches. A large number of long radials are more effective in reducing ground losses than a small number of shorter ones. The greatest loss, however, will occur in the earth near the antenna's base, where current flow is greatest. Thus, it's generally best to use a larger number of radials of shorter length than a smaller number of longer ones for a given amount of wire. As a rule, the best HF ground system will consist of as many radials of the greatest length you can manage.

In some cases wire mesh or so-called "chicken wire" may be substituted for, or used in connection with, radial wires for at least part of the ground system. Fig. 2 shows a comprehensive grounding system for ground-mounted HF verticals. A minimum of eight radials, each 0.3 wavelength at the lowest frequency of operation, should be used. A metallic ground screen of 4–16 sq. ft. is highly desirable. Exact dimensions are not important, but the overall area covered by the conductors should be maximized.

Efficiency. The importance of reducing losses in the ground system can be seen from an examination of a vertical antenna's feedpoint impedance. At resonance this consists of three components: (1) antenna radiation resistance; (2) conductor loss resistance; and (3) earth (ground) loss resistance. An unloaded quarter-wavelength vertical antenna has a radiation resistance of about 35 ohms, with negligible conductor (ohmic) loss. However, ground-loss resistance may be very great if no measures are taken to reduce it. In some cases the ground loss resistance may even exceed the antenna radiation resistance! These three components may be added together to arrive at the feedpoint impedance of a resonant (no reactance) antenna.

Since the radiation resistance is an index of the amount of applied power that is consumed as useful radiation rather than simply lost as heat in the earth or in the conductors, the radiation resistance should be kept as high as possible in relation to the total feedpoint impedance for

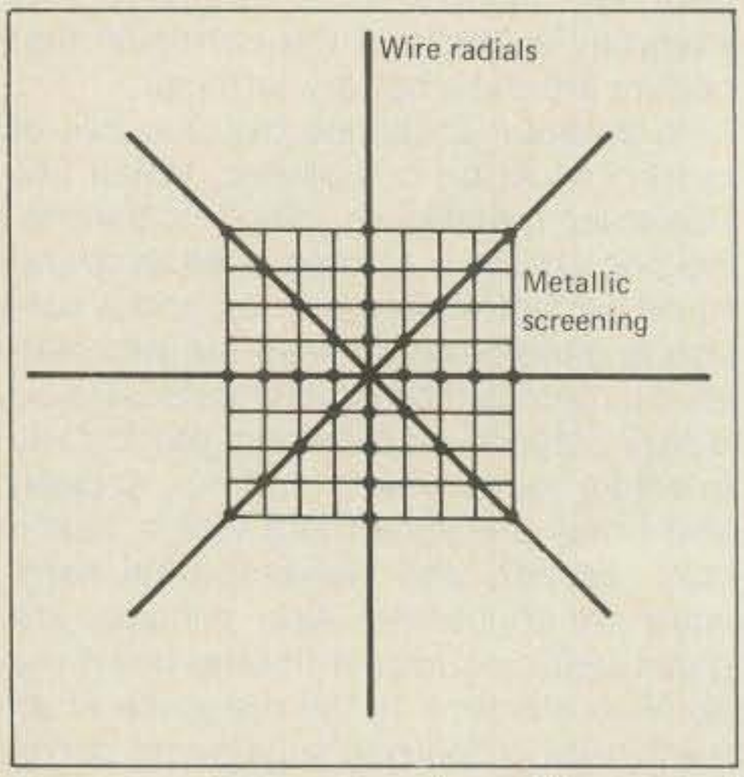

Fig. 2– Comprehensive HF vertical grounding system. An excellent ground radial system for ground-mounted verticals is shown above. It makes use of a minimum of eight radials; for the best results, they should be cut "long," to approximately 0.3 wavelength on the lowest frequency band. Use of more than eight radials would be desirable. However, a ground screen helps to minimize ground losses that occur in the earth near the base of the antenna, where current flow is the greatest. This ground screen may be made of screening, such as chicken wire; a surface area of 4 to 16 feet is suggested. The use of the ground screen can compensate to some extent for the lack of a large number of radials.

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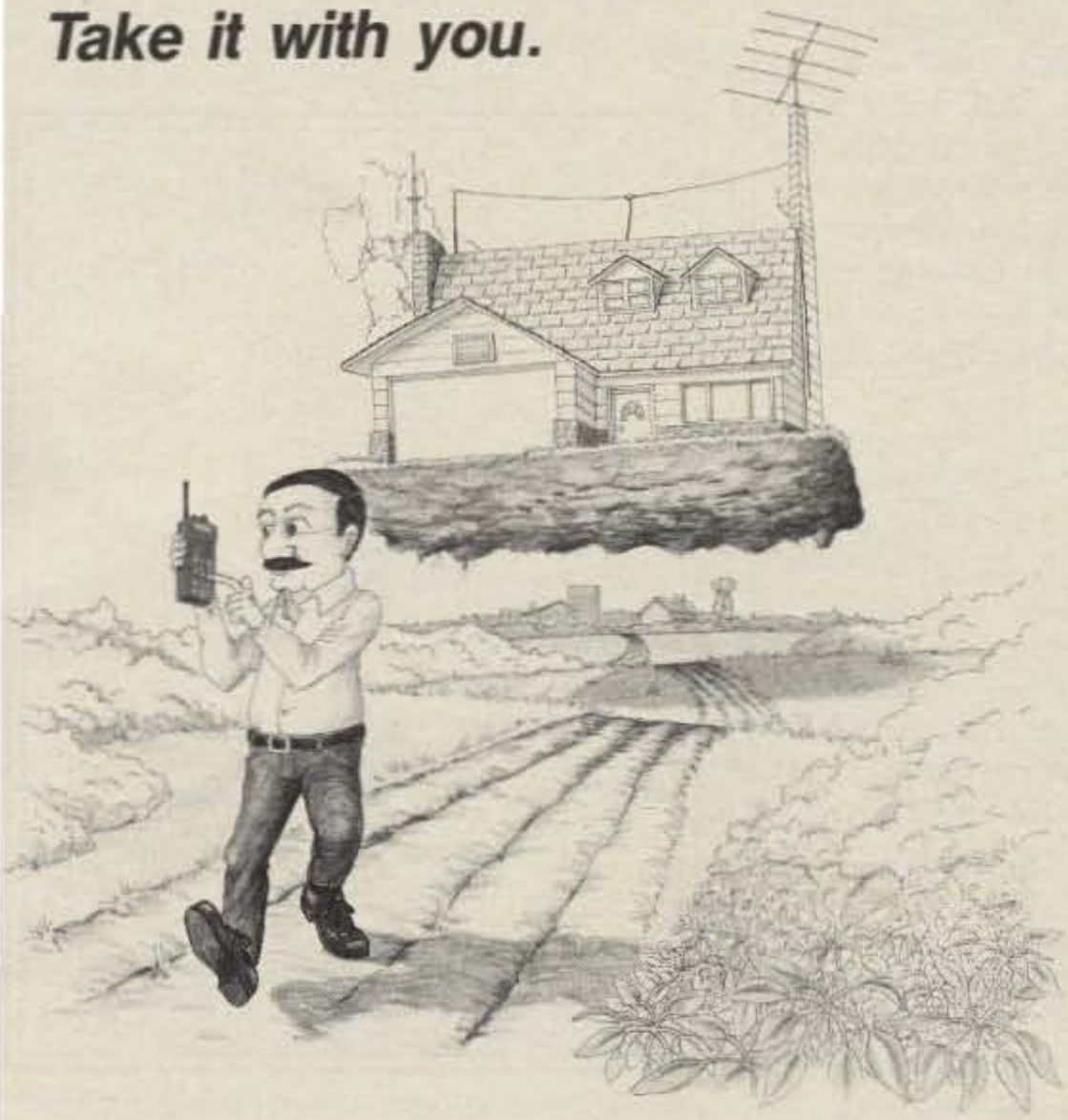

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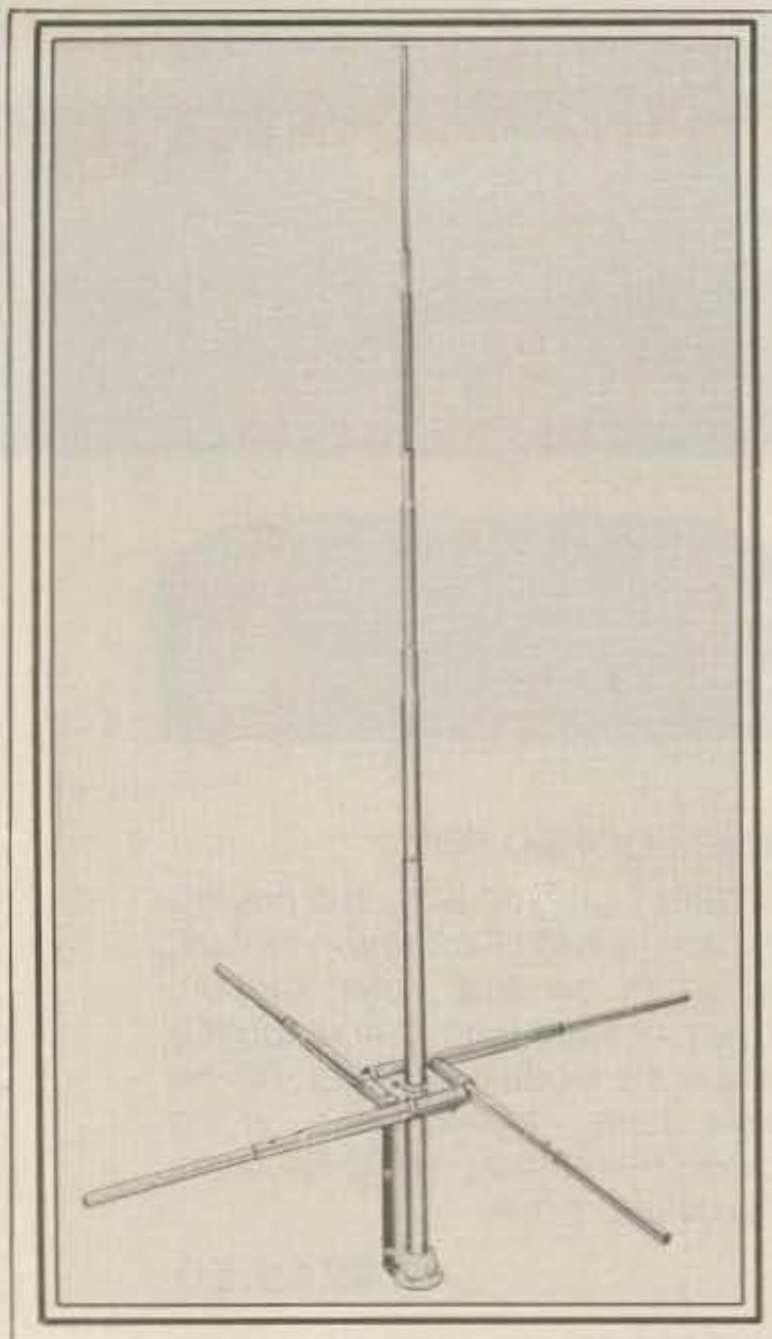


The problem of ground-loss resistance may be minimized by mounting the vertical antenna some distance above the earth over an artificial ground plane consisting of resonant radials. Four resonant radials provide a low-loss ground plane system for vertical antennas at base heights of one-half wavelength or more. This contrasts favorably with the more than 100 radials needed to approach 0 ohms loss resistance at ground level. (Photo courtesy Radio Shack)

maximum efficiency. Efficiency of a resonant antenna, expressed as a percentage, may be found by dividing the radiation resistance by the total feedpoint resistance.

As a vertical antenna is made progressively shorter than a quarter-wavelength, the radiation resistance drops rapidly, and conductor losses from the loading inductors increase. Running through some simple mathematical calculations shows that the shorter that a vertical antenna is, the less efficient it must also be for a given ground-loss resistance. Stated another way, more elaborate grounding systems must be used with shorter verticals for reasonable efficiency.

If the ground-loss resistance could be reduced to zero ohms, then the efficiency of a short, loaded vertical would increase dramatically. Unfortunately, more than 100 radials, each one-half wavelength long, would be required to approach a zero ground loss, so lower efficiency with shorter radials must usually be accepted for the sake of convenience. Nevertheless, short verticals over less than ideal ground systems are often more effective DX performers than are horizontal di-

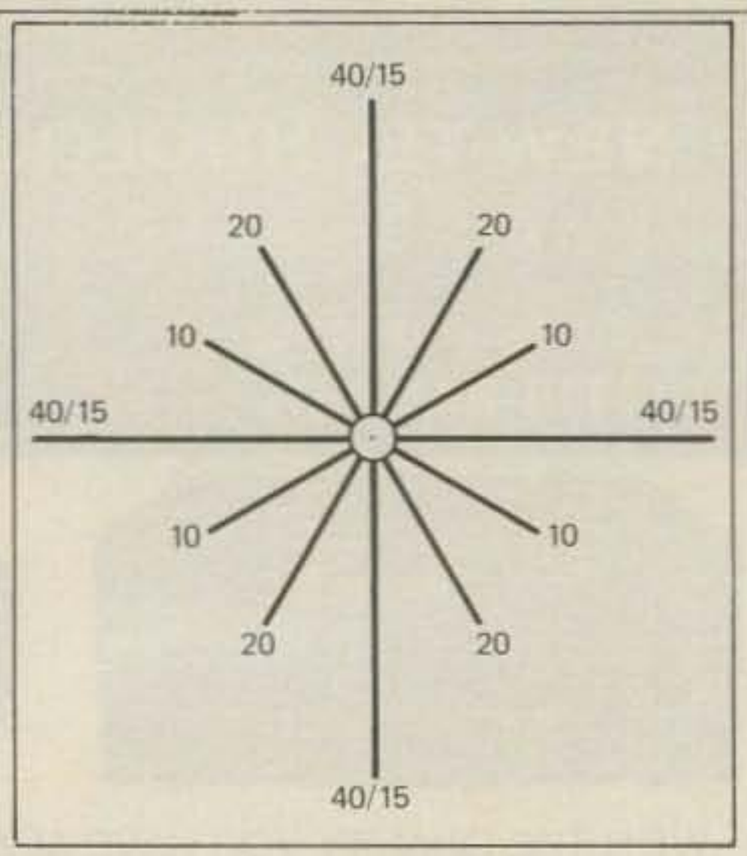


Fig. 3– Twelve-radial HF ground plane. An elevated ground-plane system that uses a total of 12 resonant radials is shown above. The system uses 4 resonant radials for 40/15 meters, another set of 4 for 20 meters, and a third set for 10 meters. These lengths may, of course, be adapted for other band combinations.

poles, which must be placed well above the earth (especially on the lower HF bands) to produce usable low-angle radiation. Verticals, on the other hand, are inherently low-angle radiators.

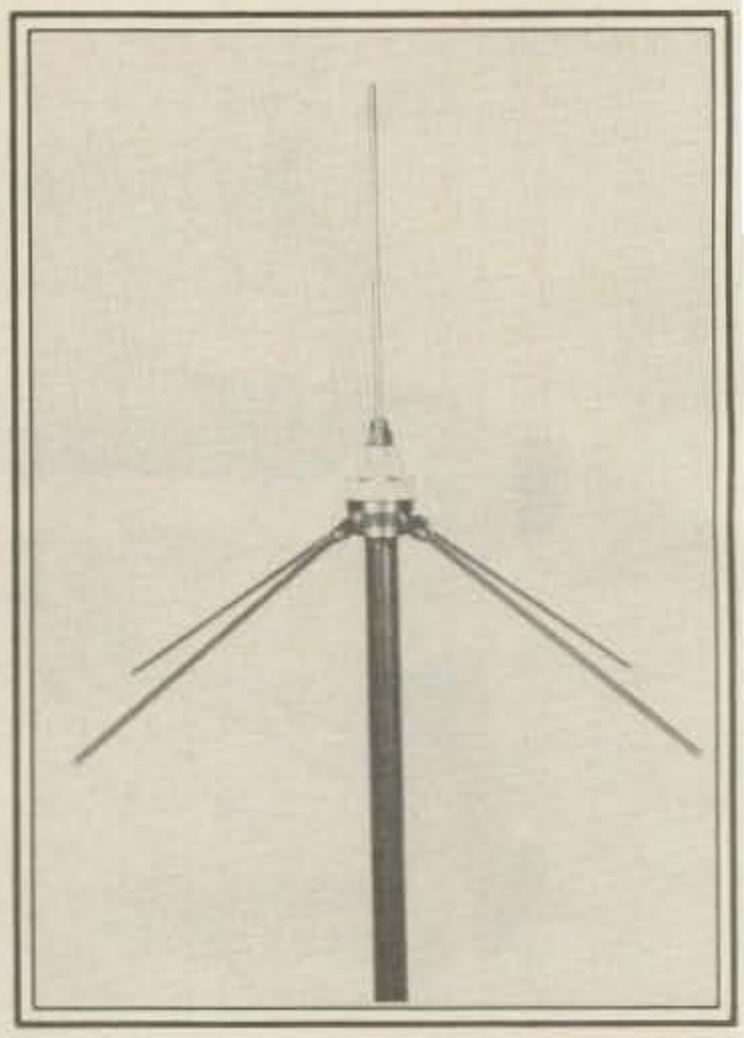
Elevated Installations. The problem of ground-loss resistance may be minimized by installing the vertical some distance above the earth over an artificial *ground plane* consisting of resonant (usually quarter-wavelength) radials. Four resonant radials provide an adequate, low-loss ground-plane system for verticals at base heights of one-half wavelength or more. This arrangement contrasts very favorably with the more than 100 radials for zero ohms ground loss resistance at ground level.

At base heights below one-half wavelength, more than four radials will be required to provide an adequate ground plane that is of significantly greater conductivity than the lossy earth immediately below the antenna. Still, a slightly elevated vertical with relatively few radials may be more effective than a ground-level vertical operating over a larger number of radials, because the elevated ground-plane antenna is likely to be more in the clear.

Fig. 3 shows a 12-radial ground-plane system that uses 4 resonant radials for 40 meters, another set of 4 for 20 meters, and a third set for 10 meters. A separate set for 15 should not be required, because the 40 meter radials operate as resonant ¾-wavelength radials on that band. Radials may slope downward as much as 45 degrees without any significant effect on operation. Radials for different bands should be separated as much as possible, and the far end of each radial should be insulated from supporting wires. The 12-radial system of fig. 3 is a very good one, but it requires at least 12 tie-off points.

Regardless of the number of radials used in either elevated or ground-level systems, all radials should be attached to the ground connection at the antenna feedpoint using the shortest possible leads. As already indicated, an elaborate radial system at ground level can't be used with a rooftop or tower-mounted antenna, as the length of the ground lead would effectively become part of the antenna. Note also that if a metal mast or tower is used to support a vertical antenna, all radials should be connected to the mast or tower at the ground connection of the antenna feedline. This is because one of the functions of a resonant radial is to detune a supporting metal structure for antenna currents that might otherwise flow on the structure and thus inadvertently turn the vertical antenna system into a vertical longwire with unpredictable results.

Other Mounting Schemes. When a vertical can neither be ground mounted nor used with an elevated ground plane, operation may still be possible if connection can be made to a large mass that is directly connected or capacitively coupled to the ground. Such possibilities include central-air-conditioning systems and the structural steel frames of buildings. Some operators have experienced good results with verticals extended horizontally or semi-vertically from metal terraces which serve as the ground connection. Alternatively, a quarter-wavelength



While the antenna shown here is for VHF, the principles also apply to HF verticals: ground-plane radials may slope downward as much as 45 degrees without any significant effect on performance. Drooping the radials tends to raise the feedpoint impedance of the antenna, making for a better match to common 50 ohm cables. (Photo courtesy Herb Kreckman Co.)

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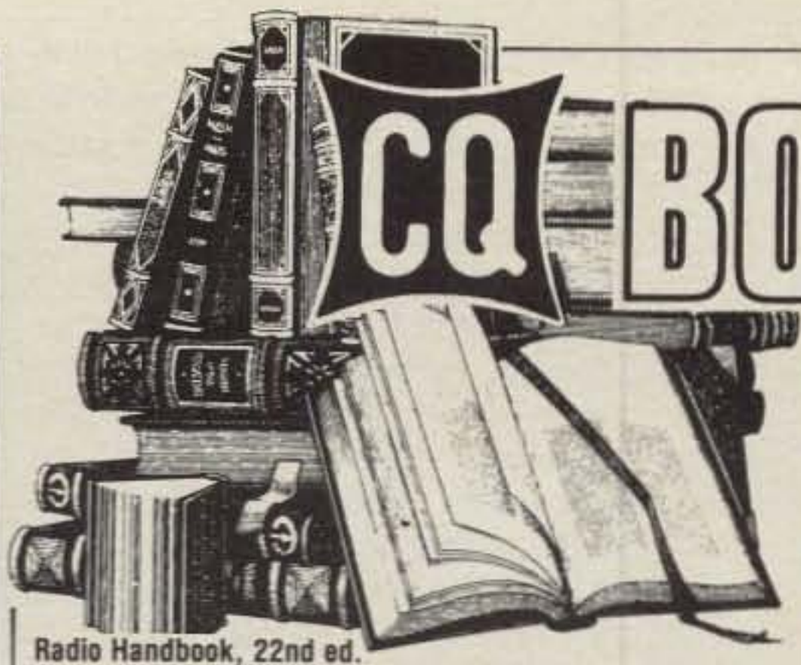

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vertical may be window mounted if a short ground lead to a cold-water pipe can be used. If a long lead must be used, tuned radials may be required for resonance on one or more bands.

Mobile Home (MH) and Recreational Vehicle (RV) Installation. We're a nation on wheels, so any discussion of antenna grounding systems would be incomplete without addressing these specialized installations.

The principles of vertical antenna installation on MHs and RVs are the same as for their fixed-station counterparts, and they involve two main considerations. The first is that of erecting the vertical in the clearest possible spot, away from obstacles (including the MH or RV itself) that can interfere with radiation from the antenna. The second is that of installing the best possible ground system beneath the antenna.

Fortunately, the metal bodies of both MHs and RVs can be used as highly conducting ground planes for vertical antennas in the same way that automobile and truck bodies provide the "grounding" for short verticals for mobile operation. The metal body of an auto, truck, MH, or RV may be considered to be one plate of a capacitor. The surface area of even a small automobile is quite large and in close proximity to the earth. Thus, its body is tightly coupled to the earth below

The principles of vertical-antenna installations for use on mobile homes and recreational vehicles are the same as for fixed installations. In both cases it's important to erect the vertical in the clearest possible spot, and to install the best possible ground system beneath the antenna. (W8FX photo)

and may be seen as an extension of the earth itself—a sort of hill as far as radio frequencies are concerned, but one having higher conductivity than the earth itself. MHs and RVs, having much greater surface area, will provide a more extensive, effective ground system than a large number of radial wires occupying the same space as the vehicle.

As in mobile installations, a vertical may be mounted almost anywhere on the vehicle and made to operate with reasonably low SWR. However, the best location is generally in the middle of the vehicle's roof, at the center of the vehicle's ground plane, and at a point where the antenna won't be in the "shadow" of any part of the vehicle. It's usually not practical to attach a tall vertical to the roof itself, so the next best procedure is to install a vertical with its base at the same level as the roof, preferably near the middle of one of the longer sides. The exact way in which this may be done is a matter of convenience, but a short mast extending from ground level to the roof of the vehicle and placed alongside the MH or RV would provide a solid support with a minimum of modification to the vehicle.

For portable operation such a mast could simply be lashed alongside the vehicle with the base in a shallow hole in the ground for additional support. There would be no harm in extending the mast a few inches above the roof level to allow the attachment of ropes which could be used to hold the mast firmly against the side of the vehicle and to prevent sidesway. For L-shaped mobile homes a vertical should be placed in the corner of the "L" so that the metal roof will provide ground-plane coverage over 270 degrees.

The base of the antenna should not be more than a few inches away from the

FEB 1985

This Olympic Torch Relay communications vehicle used in the 1984 Olympics torch-carrying route sports an Aluma Towers Model BD-150, 50 ft. crank-up tower partially extended (the vehicle belongs to AT&T). The vehicle was used as a communications center for the 30 or so vehicles involved in the torch-carrying run. In a matter of a few minutes the tower can go from the traveling position to being fully extended and on the air.

MH or RV so that the shortest possible lead may be run from the antenna's ground connection to the vehicle's metal body. A good electrical connection to the body is extremely important. In the case of mobile homes it's a good idea to make sure that good electrical contact exists between the different parts of the vehicle's body, too.

For permanent installations, the bottom of the mast may be set deeper in the ground, and concrete may be used for increased strength and stability. The upper portion of the mast should be attached securely to the sides of the building. Various verticals may use different mounting techniques and requirements, so be sure to select a mast that is suited to the particular installation. Just make sure that the mast doesn't extend more than a few inches above the level of the roof so that the ground lead may be kept short.

Wrap-Up

This month we have concluded the four-part Product Peek series with a look at the antenna wares of four suppliers. We also highlighted ol' Murphy's Engineering Laws and presented an overview of vertical-antenna grounding systems.

Next month we will examine a very promising antenna software development, that of "Annie." What's that, you say? Join us next month, gang, to find out!

73, Karl, W8FX

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

OSCAR Gateways: A Link to the Stars

Judging by the favorable response to our August and September 1984 columns featuring OSCAR 10, many of you are quite interested in amateur satellite communications. That's a great idea, especially considering the present lull in sunspot activity along with the extensive DX capabilities being provided by our new OSCAR satellite. While HF bands are noticeably lacking in good propagation, several hours worth of international QSOs are daily occurrences on OSCAR 10. If you've been postponing satellite activities until they are "perfected" or easier to understand, look again. Your time of enjoyment may have arrived.

One means by which an area's amateurs can preview Phase III satellite action involves a concept known as gateways. This arrangement is also a perfect bright lights and glamour way of introducing young nonamateurs into our fascinating world of person-to-person worldwide communications. Simply explained, a gateway consists of an OSCAR setup which can link your local FM repeater to the satellite. A pocket-size talkie can then be used for contacting stations around the world via the gateway. There are several ways of setting up a gateway, and they range from simple to sophisticated. The "ultimate concept" suggested in my May and October 1984 columns, for example, featured mode conversions and broadband relaying. A less complex arrangement could operate on two or three fixed frequencies while interfacing FM and SSB worlds via straight audio links. The quickest, easiest, and most attractive means of rigging a satellite gateway, however, involves mutually combining the expertise and facilities of a local OSCAR 10 operator with those of a nearby FM repeater operation. This "OSCAR to repeater" patching concept bears a striking resemblance to club-meeting-type demonstrations, except involved parties can actually take turns in the satellite station's "cockpit." This technique of sharing an exciting new frontier with local friends (if you are a satellite operator) or giving OSCAR a "trial spin" before setting up your own station (if you are a repeater-operating FMer) has several advantages over a single "full house" visit. Everyone gets an equal ringside seat, and gateway controllers ensure a successful overall operation.

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

Overview of Gateway Concepts

Considering that both 2 meter FM and OSCAR satellites reflect unique yet similar amateur radio pursuits being brought together via a common gateway, let's briefly compare their concepts for a clearer understanding by all. A range-extending FM repeater is usually positioned on an area's hill or high point and is used for relaying one transmission at a time. Repeater input and output are usually within the same band and separated 600 or 1000 kHz. Coverage usually varies between 50 and 200 miles, depending on the terrain. Conversely, satellite's linear and broadband translator simultaneously relays numerous QSOs from a vantage point thousands of miles above the earth's surface. Its coverage includes up to one third of the world. Separate amateur bands are used for input (uplink) and output (downlink) to avoid desensing problems aboard the small satellite and at each operator's setup. FM operations are discouraged on amateur satellites because of excessive energy requirements, and thus communications are usually SSB or CW in nature. That stipulation is satisfied in a basic gateway arrangement with simple and direct audio links between the repeater and OSCAR setup.

At least two amateurs are required for conducting a satellite gateway operation: the gateway controller or satellite operator and a repeater controller or quickly-elected 2 meter "group leader." Why two controllers? The satellite operator will have his hands full aiming antennas, maintaining proper levels on uplink and downlink signals, and ensuring smooth operations on the satellite. Uninformed OSCAR operators, extremely weak stations, or DX with unusual accents usually instigate a pause in gateway operation while the gateway controller switches to direct satellite operation and explains what's happening. During that time the 2 meter FM group leader is needed to retain sanity on the repeater, explain the gateway delay, answer resultant questions, plus coordinate a mutually agreeable list of stations awaiting their turn on the gateway. Newcomers continually join a repeater's operation, also requiring frequent explanations of in-progress activity. If the news media become interested in this unique event (an attractive possibility), an additional "Public Relations Coordinator" will be needed to provide an informative account of what's happening without interrupting the 2 meter or gateway controllers.

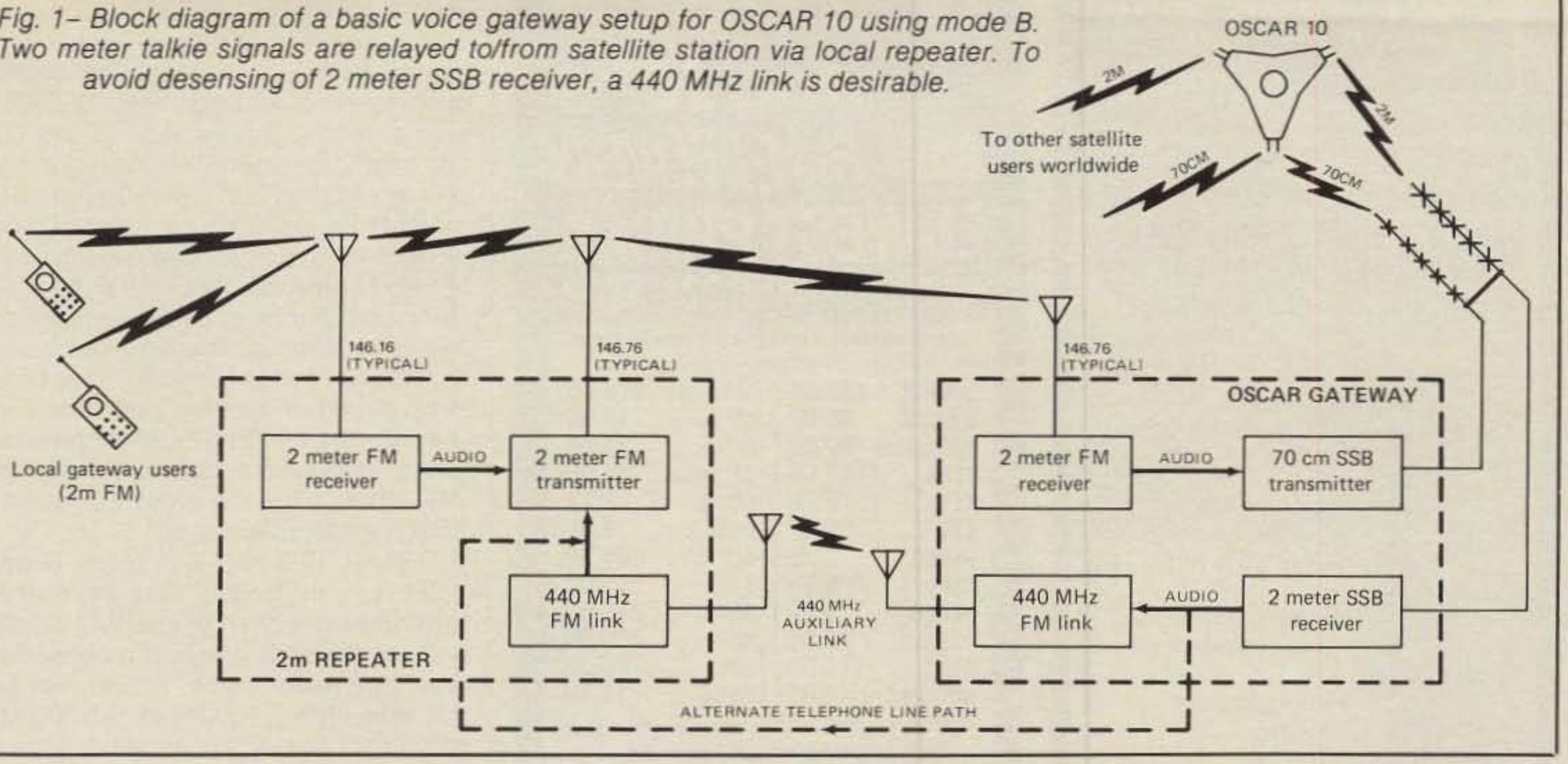
A mutual working agreement between the OSCAR operator and FM repeater users is a good point at which to begin. This will require some preplanning at both ends. During a predicted time for a gateway operation, the satellite should be in a previously checked optimum communications position, and the area's repeater should be open for general non-priority use. Likewise, gateway operations during wee hours or daily drive times are usually unattractive. Late evenings, however, may be useful for "debugging" a gateway prior to announcing the event. Finally, the OSCAR operator should be invited to hold an informal chat via the FM repeater, explaining amateur satellites and getting everyone to look forward to the big event.

Rigging the Gateway

As most of us have learned through working with phone patches and traffic handling, a quality-performance station is highly desirable before bringing others into our operations. That situation is especially true in the case of gateway activities. While many satellite operators might become naturally accustomed to weak-signal communications, FM repeater operators usually enjoy perfect copy and noise-free conditions. Considering those differences, the satellite station should be checked or improved to ensure top operation and the best obtainable signal-to-noise ratios (the XYL and I have worked quite a bit of DX via OSCAR 10 without an external GaAsFET receive preamp, for example, but I wouldn't want to put those weak signals on a gateway setup). The typical OSCAR station should be capable of 50 watts SSB output. Use "twist" antennas with at least 11 dB gain and include a high-gain/low-noise preamp, plus the usual 70 cm and 2 meter units. Stay especially wary of downlink desensing by closely spaced uplink and downlink antennas. Nonconductive PVC crossbooms are useful here. A number of satellite station ideas were also included in my August and September 1984 *CQ* columns.

Assuming the satellite station and 2 meter FM repeater are located within the same general area, uplink audio can be acquired by directing an FM rig's speaker

Fig. 1– Block diagram of a basic voice gateway setup for OSCAR 10 using mode B. Two meter talkie signals are relayed to/from satellite station via local repeater. To avoid desensing of 2 meter SSB receiver, a 440 MHz link is desirable.



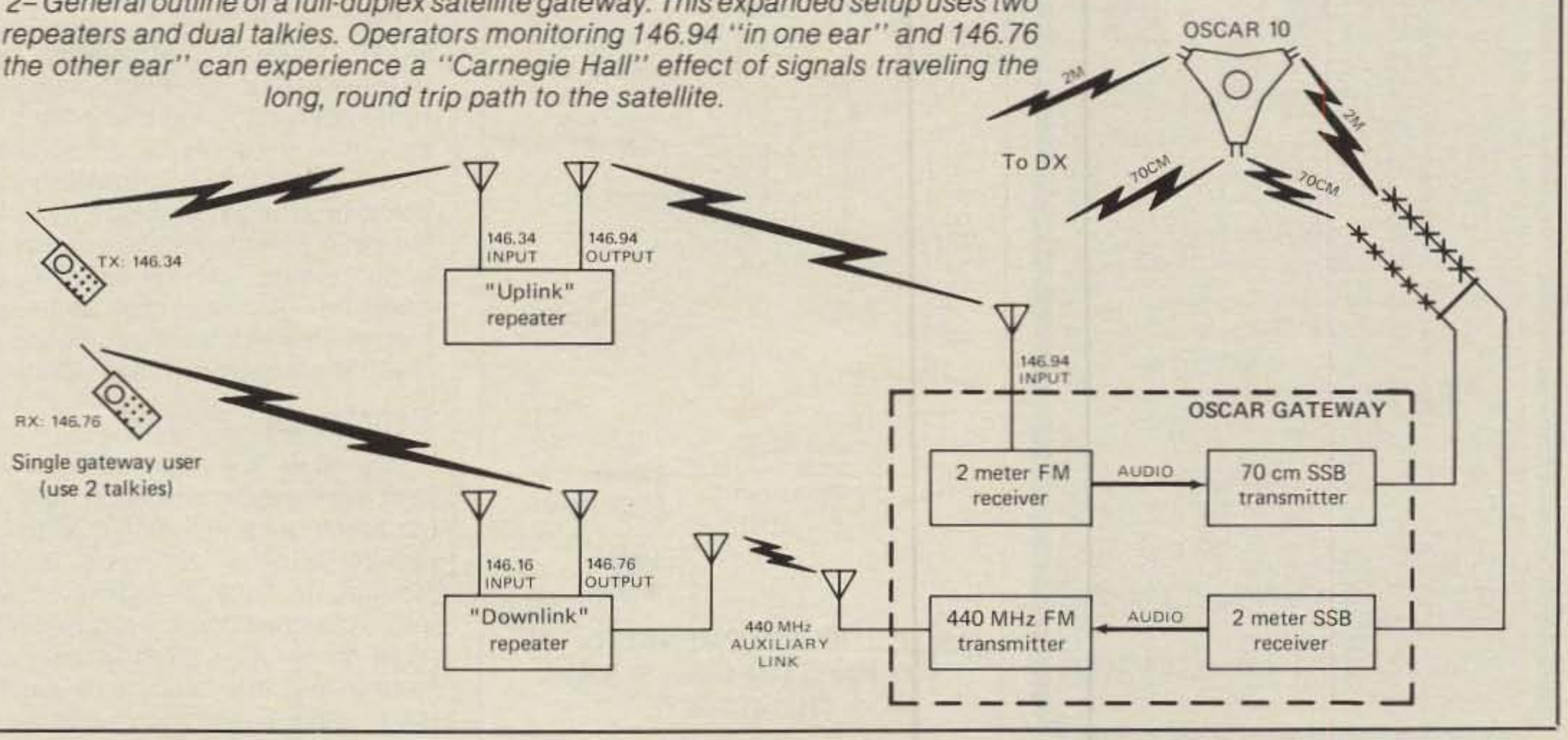
output to the uplink SSB transmitter's mike input. Each installation will require its own form of impedance and level matching here. I've personally found that a 1 megohm resistor in series in the "hot" lead between mike and speaker connections works fine while allowing me to monitor "patched" audio. Tune the FM rig to the repeater's output frequency and then add a suitable antenna for "full quieting" copy.

Interfacing the downlink SSB rig's audio to a 2 meter repeater can be a tricky situation. The previously mentioned FM rig interconnection idea might be useful "in reverse" here, but remember you'll be receiving the satellite around 145.900 MHz while trying to relay it to a repeater around 146.160 or 147.150 MHz. Extreme desensing of the downlink probably will be experienced unless you can use 100 milliwatts into a beam antenna "hidden" from satellite antenna view . . . and have a bit of good luck. An easy way to check this approach involves monitoring received satellite signals as usual while keying the planned downlink-relaying FM transmitter. If incoming signals are not zapped, you're in luck. A much better alternative is using an auxiliary 440 MHz FM link or passing audio to the repeater via telephone lines. Both of those capabilities are fairly commonplace with many 2 meter repeaters. Whichever way you choose, remember to properly condition all levels and ensure minimum noise and distortion in the 300 to 2400 Hz range. In other words, strive for downlink receiver quality at each 2 meter FM receiver's output. A bit of planning is also beneficial at this time. If there are two repeaters near the OSCAR setup, a full duplex gateway might be rigged for follow-up demonstrations at a later time. One repeater would be used for gateway uplink and the other for gateway downlink. Amateurs with one talkie would "oddball split" accordingly. Amateurs using two talkies could hold one to each ear and hear both sides of the fascinating "Carnegie Hall" delay created when signals moving at 186,000 miles per second travel some 60,000 kilometers round trip. That effect makes quite an impression!

Operating Procedures and Notes

Following successful interconnection of the gateway setup, there are considerations of when, where, and how the system should be operated. The knowledgeable satellite operator can begin by checking orbital predictions several weeks in advance and compiling a selec-

Fig. 2– General outline of a full-duplex satellite gateway. This expanded setup uses two FM repeaters and dual talkies. Operators monitoring 146.94 "in one ear" and 146.76 "in the other ear" can experience a "Carnegie Hall" effect of signals traveling the long, round trip path to the satellite.



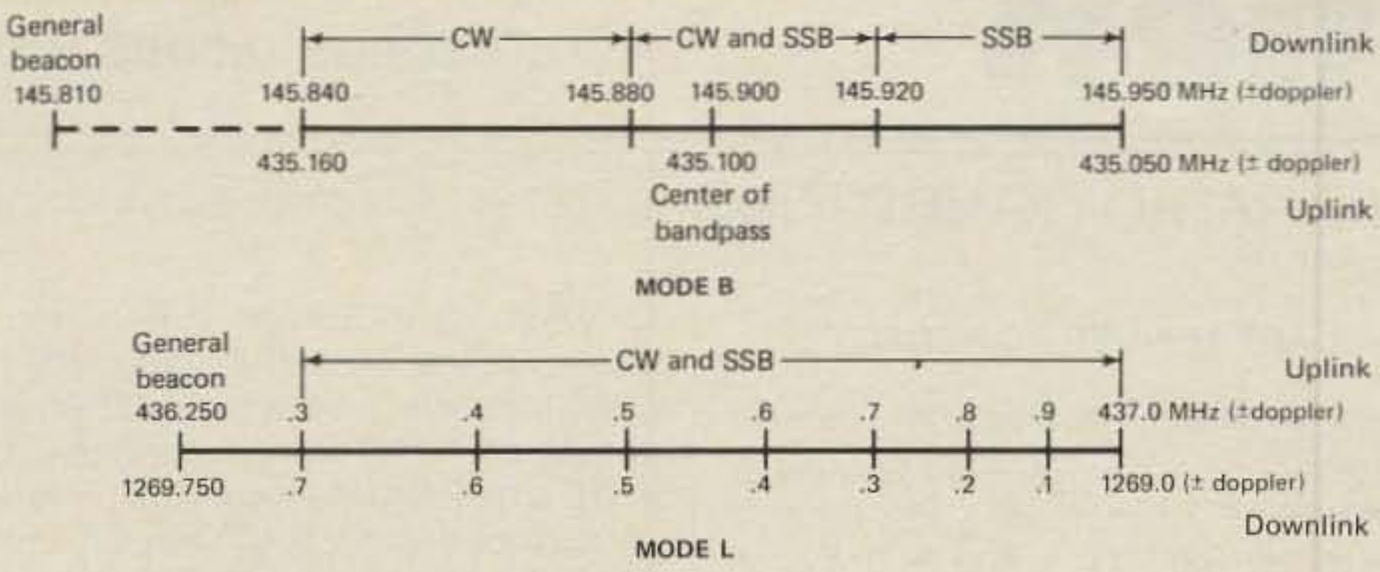
tion of tried-and-proven satellite positions and times. That outline can be compared with a similar hand-down chart of repeater activity. I suggest the satellite operator consider times when OSCAR 10 is in a good signal location for his QTH and antennas, when DX is fairly good and spin modulation is minimal, and when the mode B transponder will be operational at least 45 minutes. Likewise, utilization of the FM repeater shouldn't conflict with basic community or public-service commitments. Although there are not specific limitations, I don't advise maintaining each period of gateway operation more than 45 minutes. That semi-short window keeps enthusiasm high while providing "breathers" for the satellite, repeater, and gateway controllers.

OSCAR 10's 150 kHz mode B passband is "soft divided" into three areas: lower-portion CW, upper-portion SSB, and middle-portion mixed modes. Gateway operations thus should be conducted within ±25 kHz of 145.900 MHz (downlink). Satellite communications are line-of-sight rather than skip propagation; thus, transponder QRMing should be avoided.

A list-type operation coordinated by the 2 meter FM group leader is the least confusing means of operating a gateway setup. The list can be updated every few minutes while the gateway controller double checks satellite activity. Each FMer should be instructed on QSO length, giving both call signs plus "over" or "go ahead" to ensure understanding by others, and "talking up" to *project* his or her voice over the longest path it has ever traveled (this is a special "knack" acquired only through satellite operating experience; the gateway controller can demonstrate it via gateway or tape recorder). Incidentally, CQ calls are quite acceptable via gateway-linked 2 meter repeaters. Greater response will result from "CQ from K4HAL via K4TWJ gateway" than from "QRZed OSCAR," and remember to *project* that voice (not louder, but more . . . err uumph . . . authoritative—with a roll, not "snappy"). Also remember that good discipline is necessary for overall success. Should the 2 meter leader lose control (pardon the expression), the gateway operator can drop repeater patching and move to maintain a good image on the satellite. Bear in mind that each of us is an ambassador of international friendship and goodwill, and use the gateway privilege accordingly.

Conclusion

Gateway operations can be a quick and easy way to introduce both unfamiliar amateurs and action-monitoring nonamateurs to the exciting world of satellite communications. Personally, I feel that our lack of newcomers is due to nonexposure on our part. Electronically oriented youngsters are taunted by flashy computer advertising, etc., while we quietly



Mode B Frequency Guide

Exclusive of Doppler shift.

Uplink		Downlink		
		145.987	Beacon, Engineering	
435.025	Scheduled Use	145.972	SSC	H1
435.035	Scheduled Use	145.965	SSC	H2
435.038		145.962	Upper Limit	
.040		.960		
.045		.955		
.050		.950		
.055		.945		
.060		.940		
.065		.935		
.070		.930		
.075		.925		
.080		.920		
.085		.915		
.090		.910		
.095		.905		
435.100	Center Band	145.900		
.105		.895		
.110		.890		
.115		.885		
.120		.880		
.125		.875		
.130		.870		
.135		.865		
.140		.860		
.145		.855		
.150		.850		
.155		.845		
.160		.840		
.162		145.838	Lower Limit	
435.165	Scheduled Use	145.835	SSC	L2
435.175	Scheduled Use	145.825	SSC	L1
		145.810	Beacon, General	

Fig. 3– Bandpass relations of OSCAR 10's mode B transponder. Notice the inversion of uplink and downlink frequencies. (Note: Antenna polarizations are right-hand circular. Information courtesy AMSAT.)

have the time of our lives and fail to share that fun with the outside world. A basic satellite gateway can be the first step in removing our "cloak."

Our described gateway setup was quite basic in nature. However, there are unlimited possibilities for expansion and sophistication. Leading that list might be an earth-based wideband and linear transponder similar to the one aboard OSCAR 10 itself, but frequency coordinated for a particular area's users. Such transponders are quite difficult to properly construct, however, and their cost is usually substantial. Also, amateur satellites are free gifts from the great beyond. Financial support is only logical among serious operators. The nonprofit organization behind all OSCARs is AMSAT, P.O. Box 27, Washington, DC 20044. Although AMSAT hasn't financially recuperated from OSCAR 10's construction and launch, additional and even more exciting satellites are proceeding towards reality as funding allows. OSCAR enthusiasts are encouraged to join AMSAT. Membership is $24 a year including a subscription to its top-quality, informative publication "Orbit." An up-to-date bi-weekly newsletter, "Amateur Satellite Report," is also available for $22 a year.

I would like to thank both AMSAT and its vice-president, Rip, WA2LQQ, for their assistance with this month's column. Rip wrote a 14-page "how to do it" manual on gateway setups which is available from AMSAT by sending a self-addressed manila envelope with three units of postage to AMSAT.

While satellite gateways are a fascinating means of experiencing amateur satellite communications, they can't compare to owning and operating your own OSCAR setup as desired. Actually, the ability to personally enjoy an expensive satellite thousands of miles from earth is quite unique. Sunspot minimum? I would never know it. Last night I enjoyed pleasant chats with several VKs and JAs. How about you?

73, Dave, K4TWJ

A Special Message To All OSCAR Users

As this column is being written, activity on OSCAR 10 is higher than ever before. This situation is great, but we must *all* remember that *rules of equal sharing are vital to satellite survival.* No one's downlink signal should ever be stronger than the beacon, and DX pileups must be minimized. Remember there *isn't* a DXCC award for OSCAR 10 contacts. Enjoy your QSOs! It's preferable to "steer clear" of pileups rather than contribute to excessively loading satellite power sources. If you are DX, move swiftly to designate call areas (W1, W5, DL, ZS, etc.) and govern your callers with authority. Together we can all enjoy a fascinating world of satellite communications.

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Cycle 21 continues to decline much as predicted in this column in the December 1984 issue. The Royal Observatory of Belgium reports a monthly median sunspot number of 12.6 for October 1984. The highest daily level recorded was only 25, and this occurred on October 11th, 18th, and 19th. The sun was completely spotless on four days, including October 28th, which was during the *CQ* World-Wide DX Phone Contest period.

Based on October's median level, the 12-month running smooth sunspot number centered on April 1984 is 50. This is a decline of three from the March level. A smoothed sunspot number in the mid 30's is forecast for February 1985.

February Propagation

Declining sunspot activity, coupled with normal seasonal changes in h.f. propagation conditions, is expected to result in few *10 meter* openings during February. The band occasionally may open to Europe and the east from the eastern states between 10 a.m. and noon. There's a slightly better chance for openings to Africa between the same hours, and some of these may extend to the western states. Somewhat better conditions should exist towards South America, with openings possible between noon and 4 p.m., and occasionally as early as 10 a.m. from all sections of the country. The western states are favored for openings towards the South Pacific and Asia, with some possible between 2 and 5 p.m. When conditions are better than normal, some of these openings may extend towards the eastern states between 3 and 6 p.m. local time.

While some fairly good openings are forecast for *15 meters*, the band is expected to open considerably less frequently and to fewer areas of the world than during the earlier winter months, or when compared with February propagation during periods of high solar activity. The band is expected to open first towards Europe, Africa, and the east between 9 a.m. and 2 p.m. in the eastern states, and until noon in the western states. Openings towards South America should be possible throughout much of the daylight period, with conditions peaking between noon and 4 p.m. Openings towards Australasia and the South Pacific and to a lesser extent to the Far East and Asia should be possible on some days between 4 and 8 p.m. local time. These openings favor locations in the western half of the country, but may extend further east when conditions are High Normal or better. The path to Antarctica should peak between 3 and 6 p.m.

Twenty meters should be the best overall band for DX propagation during February. Look for a window of fairly good openings in almost all directions for an hour or two after sunrise. The band should peak again towards Europe and the east between noon and 3 p.m. in the eastern states and between 11 a.m. and 1 p.m. in the west. Propagation should be best towards Africa between 3 and 6 p.m. in the east, and to 4 p.m. in western states. Look for *long-path* openings from the western states to Europe and Africa for an hour or two after sunrise. Openings towards the south should peak again during the late afternoon, with the band remaining open to as late as 8 p.m. Check until 10 p.m. for regular openings deep into South America and to Antarctica. Evening openings to the South Pacific, Far East, and Asia should peak between 6 and 9 p.m. in the eastern states and between 7 and 11 p.m. in the west.

During the hours of darkness *40 meter* DX propagation is expected to be optimum. Check between 6 p.m. and 2 a.m. for openings to Europe, Africa, and the east from eastern states, and until midnight in western states. South America should be within range between 7 p.m. and 5 a.m. From the west coast, the band should open to the South Pacific, the Far East, and Asia between 2 and 7 a.m., with openings to the South Pacific often extending towards the east coast between 5 and 7 a.m. local time.

Eighty meter openings are also forecast to many areas of the world during the hours of darkness. Best bet for Europe and the east is between 8 p.m. and 1 a.m. in eastern states and between 8 and 10 p.m. in the west. Check openings towards South America between 8 p.m. and 4 a.m. from all sections in the country. From western states there is a chance for some good openings towards the South Pacific between 4 and 7 a.m., with possibilities in the eastern states between 4 and 7 a.m. local time. Conditions to the Far East and Asia are expected to be poor, but an occasional opening should be possible from western states between 3 and 7 a.m.

DX openings to several areas of the world are forecast for *160 meters* during the hours of darkness. While signal levels may be weaker, and the band will open less frequently than *80 meters*, conditions this February are expected to be considerably better than during the years of high solar activity. Look for openings to Europe and Latin America, and possibly to the South Pacific area.

Remember that DX conditions on *40, 80,* and *160* meters peak when it is just breaking dawn at the *eastern* end of a path.

A seasonal increase in static levels is expected during February.

Short-Skip Conditions

On *160 meters* no significant skip is expected during the daylight hours. Up to at least 1300 miles should be possible at night, often extending up to a one-hop short-skip limit of 2300 miles. On *80 meters,* expect openings up to around 250 miles during most of the daylight hours, with the skip lengthening to between 350 and 1300 miles just after sundown, and between 750 and 2300 miles by midnight. On *40 meters* daytime skip should be possible between 250 and 750 miles, extending to between 750 and 2300 miles during the evening hours to about 8 p.m., and then from between 1500 and 2300 miles until shortly after sunrise. Daytime skip on *20 meters* should range between 750 and 2300 miles to about 4 p.m. Between 4 and 6

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for February 1985

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 15, 25	A	A	B	C
High Normal: 4, 14, 16-19, 26	A	B	C	C-D
Low Normal: 1-3, 5, 9-10, 12-13, 20, 23-24, 27-28	A-B	B-C	C-D	D-E
Below Normal: 6, 8, 11, 21-22	B-C	C-D	D-E	E
Disturbed: 7	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 good-to-fair (B-C) on Feb. 1-3, good (B) on the 4th, good-to-fair (B-C) on the 5th, fair-to-poor (C-D) on the 6th, etc.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate 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 *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 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.

February 15-April 15, 1985
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Central Europe & North Africa	10-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	17-18 (1) 18-19 (2) 19-00 (3) 00-02 (2) 02-04 (1) 18-20 (1)* 20-21 (2)* 21-23 (3)* 23-00 (2)* 00-02 (1)*
Northern Europe & European USSR	*Nil*	08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (1)	17-19 (1) 19-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	08-09 (1) 09-10 (2) 10-12 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-16 (2) 16-19 (1)	18-20 (1) 20-22 (2) 22-23 (1) 20-23 (1)*
West Africa	10-13 (1)	08-10 (1) 10-12 (3) 12-14 (4) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	18-20 (1) 20-00 (2) 00-02 (1) 22-01 (1)*
East & Central Africa	11-13 (1)	09-11 (1) 11-15 (2) 15-16 (1)	13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	19-22 (1) 22-00 (2) 00-01 (1)*
South Africa	10-13 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	18-20 (1) 20-22 (2) 22-00 (1) 21-23 (1)*
Central & South Asia	*Nil*	08-10 (1) 16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-20 (1)	19-22 (1) 04-06 (1)
Southeast Asia	*Nil*	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	19-22 (1) 05-07 (1)
Far East	*Nil*	16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	13-14 (1) 14-16 (2) 16-17 (1)	12-15 (1) 15-18 (2) 18-20 (1)	15-19 (1) 19-23 (2) 23-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	15-18 (1)	09-11 (1) 14-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-18 (1) 18-21 (2) 21-23 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Central America & Northern Countries of South America	09-12 (1) 12-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-13 (1) 13-15 (2) 15-16 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-18 (2) 18-19 (1)	17-19 (1) 19-22 (2) 22-00 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	*Nil*	08-09 (1) 09-13 (2) 13-14 (1)	06-07 (1) 07-09 (2) 09-11 (2) 11-13 (2) 13-14 (3) 14-16 (2) 16-17 (1)	17-19 (1) 19-22 (2) 22-00 (1) 00-02 (2) 02-03 (1) 19-21 (1)* 21-00 (2)* 00-01 (1)*
Northern & Central Europe & European USSR	*Nil*	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-15 (1)	19-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	08-11 (1)	07-12 (1) 12-14 (2) 14-17 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
West Africa	09-12 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	18-20 (1) 20-22 (2) 22-01 (1) 21-00 (1)*
East & Central Africa	*Nil*	08-11 (1) 11-14 (2) 14-15 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-17 (2) 17-19 (1)	19-22 (1)
South Africa	09-12 (1)	07-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	19-22 (1) 20-21 (1)*
Central & South Asia	*Nil*	08-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-07 (1) 18-20 (1)
Southeast Asia	*Nil*	10-12 (1) 17-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-21 (1)	05-07 (1) 18-20 (1)
Far East	*Nil*	10-12 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (1) 13-15 (1) 15-17 (1) 17-19 (1)	19-22 (1) 21-23 (1) 23-00 (1) 00-02 (1)*
South Pacific & New Zealand	13-14 (1) 14-16 (2) 16-17 (1)	12-15 (1) 15-18 (2) 18-20 (1)	15-19 (1) 19-23 (2) 23-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	15-18 (1)	09-11 (1) 14-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-15 (1) 15-17 (2) 17-18 (1) 18-21 (2) 21-23 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Central America & Northern Countries of South America	09-12 (1) 12-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-13 (1) 13-15 (2) 15-16 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-10 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	*Nil*	14-15 (1) 15-18 (2) 18-19 (1)	17-19 (1) 19-22 (2) 22-00 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

Far East	14-18 (1)	14-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	10-12 (1) 12-14 (2) 14-16 (1) 16-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-21 (3) 21-23 (2) 23-01 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Australasia	14-17 (1)	08-10 (1) 13-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-01 (1)	01-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1) 05-06 (2)* 06-07 (1)*
Central America & Northern Countries Of South America	09-13 (1) 13-15 (2) 15-16 (1)	07-08 (1) 08-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	11-13 (1) 13-14 (2) 14-16 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	14-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-01 (1) 04-06 (1) 06-08 (2) 08-14 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-04 (1)*
McMurdo Sound, Antarctica	*Nil*	13-16 (1) 16-18 (2) 18-20 (1)	16-19 (1) 19-22 (2) 22-01 (1) 07-10 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time) WESTERN USA TO:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80* Meters*
Western & Southern Europe & North Africa	*Nil*	08-12 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1) 20-22 (1)*
Central & Northern Europe & European USSR	*Nil*	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 22-00 (1)	19-21 (1) 21-22 (2) 22-23 (1) 20-22 (1)*
Eastern Mediterranean & Middle East	*Nil*	08-11 (1)	07-11 (1) 11-13 (2) 13-15 (1) 22-00 (1)	18-21 (1)
West Africa	09-12 (1)	07-09 (1) 09-11 (2) 11-12 (3) 12-14 (2) 14-15 (1)	04-06 (1) 06-08 (2) 08-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	18-22 (1) 20-21 (1)*
East & Central Africa	*Nil*	08-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-17 (1)	18-20 (1)
South Africa	09-12 (1)	08-10 (1) 10-13 (2) 13-15 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-17 (2) 17-18 (1) 23-01 (1)	18-21 (1) 20-21 (1)*
Central & South Asia	*Nil*	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	05-07 (1) 19-21 (1)
Southeast Asia	16-18 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 21-23 (1) 02-04 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)
Far East	*Nil*	14-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 11-13 (2) 13-16 (1) 16-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-21 (1)	06-08 (1) 08-11 (2) 11-17 (1) 17-19 (2) 19-20 (3) 20-22 (4) 22-23 (3) 23-04 (2) 04-05 (1)	19-21 (1) 21-22 (2) 22-05 (3) 05-07 (2) 07-08 (1) 22-01 (1)* 01-05 (2)* 05-07 (1)*
Australasia	14-17 (1)	09-12 (1) 14-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-03 (1)	00-02 (1) 02-03 (2) 03-05 (3) 05-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)
Central America & Northern Countries Of South America	09-12 (1) 12-14 (2) 14-15 (1)	07-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	06-07 (1) 07-09 (3) 09-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-22 (2) 22-02 (1)	18-20 (1) 20-00 (3) 00-03 (2) 03-06 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	10-12 (1) 12-14 (2) 14-16 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-16 (3) 16-17 (2) 17-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-22 (2) 22-00 (1)	18-20 (1) 20-01 (2) 01-03 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	12-15 (1) 15-18 (2) 18-20 (1)	16-19 (1) 19-22 (2) 22-02 (1) 06-07 (1) 07-09 (2) 09-10 (1)	22-02 (1) 02-04 (2) 04-06 (1)

*Indicates best time to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.

p.m. the skip should lengthen to between 1500 and 2300 miles, with the band out by 9 p.m. on most nights. On *15 meters* skip should range between 1300 and 2300 miles during most of the daylight hours between 9 a.m. and 6 p.m., with the band dead for short-skip an hour or so after sundown. An occasional *F*-layer short-skip opening may be possible on *10 meters* during the afternoon hours over distances between approximately 1300 and 2300 miles. An occasional sporadic-*E* opening over shorter distances may also be possible.

V.H.F. Ionospheric Openings

Best chances for ionospheric openings on the v.h.f. bands are during periods of radio storminess, when h.f. conditions are Below Normal or Disturbed. Such openings on *2* and *6* meters usually are characterized by flutter fading and distortion, and result from the intense regions of ionization that accompany auroral displays. Auroral-type openings usually range in distance from a few hundred up to approximately 1300 miles. Check the Last Minute Forecast at the beginning of this column for those days during February that are expected to be Disturbed or Below Normal.

No significant meteor showers are scheduled for February, so few, if any, meteor-type ionospheric openings are likely to occur.

This month's Propagation Charts contain band-opening predictions for major DX paths for the period February 15 through April 15, 1985. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of these charts appear in this column.

Big Radio Storm

The hiss in your receiver and the lack of signals on November 16 weren't due to an open antenna lead or a component going bad. This was caused by blackout conditions on the HF bands that accompanied one of the most severe ionospheric storms to occur in several years. The storm began at 2230 UTC on November 15th, reaching peak intensity on the 16th. It began to subside on the 17th, ending by November 18th. On November 17th, the instability of the earth's geomagnetic field as measured by the A-index rose to as high as 112. Normal readings are generally less than 15. For several hours on the 17th the ionosphere virtually disappeared, and HF propagation in mid and high latitudes was impossible. This radio storm was accompanied by wide-spread auroral activity which was visible over much of North America and northern Europe. Reports have also been received from Japan, and from a traffic helicopter pilot over Honolulu.

73, George. W3ASK

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATIONS AROUND THE WORLD

My DX airs, my OM bears
But says he sometimes wishes,
That I could spare time off the air
To help him do the dishes.
(Amateur Radio News Service)

Here on the western rim there are signs that Spring is not far off. Along with the brighter days and the trees in bloom a Local came up around the curve of the hill last week. It was not long before we knew that the new season was with us.

"What do you make of this?" he asked, thrusting a sheet at us. We read it carefully. The three lines there said,

"Seek DX Always
Stand Tall
Never Grow Old!"

We handed it back. "You've been talking with the Old Timer again," we said, and the Local nodded. "How did you know?" he asked, and we did not bother to answer the obvious. We suspected that this one had not come to bandy idle words, and he had not.

"All I did was ask the Old Timer how one should prepare for the coming years of low sunspot activity, and all he would tell me were these three things. He said they were the three precepts that every DXer has to learn and will learn either early or late. He even told me that if one is to be ready for the Great Days of DXing, one has to prepare. 'Be Prepared!' was what he kept saying to my questions. What do you make of it?"

Years ago we ourselves had learned to be prepared. Some may think that the Hero of Mafeking was responsible, and initially we leaned toward the same thought. Then we realized that we had better be prepared for confused Locals wandering down the hill to us after talking with the Old Timer. "DXers can think for themselves," the Old Timer explained to us, "but often the problem is that they have the answers but do not understand the questions." We thought it best then not to push the point that there were times when we ourselves had some problems with matching answers to the questions. But we still had the Local on our hands. "Was that all he said?" we asked, and the Local continued in his puzzlement.

"No. I did ask him to explain," the Local said, "and he told me that all DXers eventually learn of the Ancient Mysteries of DXing. He said that one has to learn many of them, but that these three are the Primary Mysteries, and I had to repeat them every morning and every evening. What do you make of that?"

Gene, RA3AA; Valery, UV3GM; Alex, RA3AF; and SWL Yuri are members of the Moscow University Radio Club, UZ3AZO. In "Victory-40" operation UZ3AZO (ex-UA3KBO, UK3ABO) will be using the ER3A call, the only one with the ER prefix. (Photo by Novosti)

We were a bit reluctant to rush in where the Old Timer had previously trod. We urged the Local to tell us more, and he did. It hardly took much urging.

"Actually, he didn't tell us too much. All he would say is that when I mastered the first precept, I would find understanding, and everything would be clear to me." The Local paused, and it was hard to bear the hurt look in his eyes. "But I don't!" he protested. "I don't at all!"

Here we were with the New Year hardly behind us and a crisis already at hand. When one is mixed up with DXing for some decades, the assumption always is that the answers to even the most obscure questions are known and readily at hand. We knew that the Old Timer was right in saying that when one knows the answers, it is easier to understand the questions. Many who have taken FCC examinations learn that.

"A DXer must always live with DX in his mind," we started out. "One thinks DX, listens for DX, and longs for DX. One listens and prepares—always! For some to whom the DX call has not been loud nor clear, the signs of weak dedication show early. They may even say that DX is more promise that achievement. Never believe that." We thought that we were being right to the point, but the Local was holding up his hand.

"Never mind all those warm-up pitches," he told us. "Just tell me how a short DXer like me, hardly over five foot five, can ever stand tall even with elevator heels. And how does a DXer keep from growing old? When I first joined the DX Club all I saw were old men. How

Valery Gromov, UV3GM, made a considerable contribution to the elaboration of recent USSR amateur call-sign changes. (Photo by Novosti)

about telling me something about these last two precepts. I'm already spending all my free time seeking DX."

We had to realize that any drawn-out explanations would go nowhere. Every DXer wants to be on the Honor Roll *now*! The understanding will come later when "now" becomes "remember when," but some will even argue that that will be too late.

"All you have to remember," we said, trying to shift gears, "is that any DXer is always highly regarded in amateur circles—at his local radio club, among his friends, and by anyone who learns that here is an individual who sits at home and talks with friends all over the world. DXers are the true internationalists. Nowhere a DXer travels will he ever come as a stranger. What some others may think is highly remarkable, DXers consider commonplace. DXers themselves are remarkable and unusual. They walk tall! And when you meet other DXers, all of you walk tall."

Perhaps we had not answered all the questions, but we definitely had slowed down this Local. He was thinking. "You mean that as a DXer I gain stature?" he asked, and we hardly had to reply to the question. "DXers always stand tall, and true-blue DXers stand the tallest of all. That's the way it has always been, and that's the way it will always be. Believe it!"

77 Coleman Dr., San Rafael, CA 94901

The WPX Program

Mixed

1133	W7DG	1136	JF1RDC
1134	YB0ZM	1137	VE7EIK
1135	JK1PTF	1138	JA2BXV

S.S.B.

1689	YU7BPQ	1691	KY6I
1690	YK1AO		

C.W.

2296	NF5Z	2300	I8YRK
2297	UR2RLR	2301	JG1RYQ
2298	HA8QC	2302	JR1UIO
2299	YU7BPQ	2303	OK2BVX

WPNX

224 KA5SBS

Endorsements

Mixed: 450 YB0ZM, JF1RDC, JA2BXV, NE8V. 500 YB0ZM, NB2T, JA2BXV, NE8V. 550 KI8B, JA1EF, JA2BXV, DJ3TF. 600 KI8B, JA1EF, DJ3TF. 650 KI8B, JA1EF, DJ2TF. 700 JA1EF, KI8B, DJ3TF. 750 JA1EF, DJ3TF. 800 W8LKG, JA1EF, DJ3TF. 850 JA1EF, DJ3TF. 900 JA1EF, DJ3TF. 950 JA1EF, KP4V, K2POF, DJ3TF. 100 JA1EF, KP4V, DJ3TF. 1050 SK6AW, KP4V. 1100 SK6AW, KP4V. 1400 N4UH. 1850 N9AF.

S.S.B.: 350 YU7BPQ, YK1AO, SM6DHU. 400 EI8AU, KZ2W, YU7BPQ, YK1AO, F6GPG, SM6DHU. 450 EI8AU, KZ2W, YU7BPQ, YK1AO, F6GPG, SM6DHU. 500 EI8AU, YU7BPQ, YK1AO, F6GPG, SM6DHU. 550 EI8AU, YU7BPQ, YK1AO, F6GPG, SM6DHU. 600 EI8AU, YU7BPQ, YK1AO, F6GPG, SM6DHU. 650 EI8AU YK1AO, F6GPG, SM6DHU. 700 YK1AO, F6GPG, SM6DHU. 750 F6GPG, SM6DHU. 800 SM6DHU. 850 WA0DCQ, SM6DHU. 900 SM6DHU. 950 I1POR, SM6DHU. 1000 I1POR, SM6DHU. 1050 I1POR. 1100 I1POR. 1250 WA1JMP.

C.W.: 350 HA8QC, YU7BPQ, JG1RYQ, SM6DHU. 400 PA3DBG, HA8QC, YU7BPQ, N1BAX, JG1RYQ, SM6DHU, KA9GZM. 450 HA8QC, YU7BPQ, W4DGX, N1BAX, JG1RYQ, SM6DHU. 500 HA8QC, YU7BPQ, N1BAX, SM6DXU. 550 HA8QC, YU7BPQ, SM6DHU. 600 OK3CFF, HA8QC, YU7BPQ, SM6DHU. 650 HA8QC, SM6DHU. 700 HA8QC, K2PK, SM6DHU. 750 K2POF, SM6DHU. 800 SM6DHU. 850 SM6DHU. 950 WA1JMP. 1250 LZ1XL.

10 meters:	OK2BVX, K0HQW.
15 meters:	EI8AU, PA3CBG, YK1AO, JA2BXV.
20 meters:	YK1AO.
40 meters:	I1POR, W0ULU.
80 meters:	KC8YM, I1POR.
Asia:	JO1BMV, YK1AO, K2POF, JA2BXV.
Africa:	I1POR.
No. America:	WC4K, YK1AO, K0HQW.
Europe:	K0HQW, WC4K, JO1BMV, YK1AO, OK2BVX.
Oceania:	I1POR.

WPX Award of Excellence: KA3A.

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.

Of this we were sure. In long years past we ourselves had come with questions. It is a rare one who cannot recall the everlasting asking. We also recalled being told by the Old Timer that we could never even think of being true-blue until we stopped asking questions. "That, and calling 'CQ DX,'" he had said, and we were so tied up comprehending all of this that we had forgotten to ask questions we still had on our list. But we also started understanding that often what the Old Timer said was only to point the way or to start us thinking. We believed that this was what he was doing, and we still had the Local on our hands. This one was not finished with his questions.

"Okay," he said, "I'll buy the idea that a real DXer is always thinking DX, always tuning for DX, or always working DX, and that we DXers must be considered among the Anointed Ones. But how about not growing old? Everyone grows old. Tell me how chasing DX keeps one from getting older. I can understand a lot of what the Old Timer says, but is that logical at all? Tell me!"

When one spends time checking the listing of Silent Keys, it might be considered that this could be a valid query. But always there are things in DXing that run counter to expectations. One has only to consider those DX acquaintances who, though long in years, are still active daily and always questing for DX. These come filled with an energy and vitality and continuing interest that belies any calendar. It is easy, where DXers are concerned, to realize again the premise that age is only a state of mind, and DXers seldom lose the joy that comes early, stays long, and is nourished by years of DXing. We tried to explain all of this to the Local.

We got that far-away look that comes when your audience is hearing the words but not getting the ideas. "Like whom?" the Local asked sharply, and we were ready.

"Like Don Wallace, for one," we were quick to reply, and then continued on running off a string of easily recognized DXers' names. But before we really beat him down, he was holding up a hand.

"Maybe there is something in all of this," he said, "and it might even be that you are right. I did see Don Wallace at the DX Convention last year, and though he may be a bit on the skinny side, he definitely is a tall one. He really walks tall! And at the DX Forum he was right in the front row asking questions. I remember talking with a couple of others you mentioned, and they did not seem old to me. The way they talk DX, they are just like the rest of us. There was Merle and Howard, and Sam who is always on the air. There are always a bunch such as these at the club meetings. When you think of it, they seem to have all the DX that ever came down the track, and they seem to be in there every time something shows. But when I think of old DXers, I think of really old DXers, the *really* old ones."

The longer this Local talked, the slower he talked, and we waited for him to think things out. Finally the lights started flickering again. "You know something," he said when he again found his voice. "I'm trying to think of any DXer I know who really acts old, and I can't. Maybe I'm beginning to understand just a little of what the Old Timer meant. I think that if I am a real DXer I will always be seeking DX. And because of this, I will walk taller and never grow old, right?"

Of course he was right. We could even remember what we heard said about one DXer a long time back: "He never grew up and hardly grows older." We have always thought of that and how sometimes you have to stop and look closely to see what is plainly before you. The signs and the truths are always there. Some DXers see them sooner than others. Most all true-blue DXers know and understand them, but one must learn that it all comes from seeking DX. Seek DX always.

4U1VIC

When one goes DXing with low power, a low antenna, or a poor QTH, it is learned early that if at first you don't succeed, try again. The DXAC is trying again on the U.N. Vienna Center. This came during the October meeting of the ARRL Board of Directors when the General Manager was directed by the Board to prepare a report on the status of 4U1VIC. Last year the DXAC considered the status of the United Nations International Center in Vienna and decided that it did not merit country status. With the matter brought up at the last board meeting, it does seem possible that someone is thinking kindly of these U.N. enclaves and nudging just a bit. All this is supposed to come again before the ARRL Board at their January meeting, and maybe by the time you read this you can be learning whether your 4U1VIC QSL is or is not. Also keep in mind that the UNESCO Center in Paris has similar sterling qualities.

Apparently there was more than passing interest in DX matters at the Fall ARRL Board meeting. They also instructed that a film be made and maintained of the decisions on DXCC country applications, that this file be available to the membership, and that studies be made of listing in the DXCC countries list the criteria

The WAZ Program

10 Meter Phone

286	JA2FJB	288	W4WIJ
287	JR2MIN	289	JF1PHJ

15 Meter Phone

208 JI3AOD

20 Meter Phone

516 WA6SLO

15 Meter C.W.

113 JA2FXV

20 Meter C.W.

226 JA1BFF

40 Meter C.W.

51 W4WJ

80 Meter C.W.

4 W3AF

All Band WAZ

S.S.B.

2908	GW4KGR	2911	K5BG
2909	F6DYG	2912	EA3AQC
2910	WD6BLH		

C.W. and Phone

5821	LU8DPM	5828	HB9AUT
5822	DL1VJ	5829	K1UKC
5823	DJ1GA	5830	OK1AXT
5824	DF3ZE	5831	N3BGY
5825	PA3AWW	5832	JR1UIO
5826	YU7BPQ	5833	AB2Y
5827	WA9YZN		

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.

This is the station at 4U1ITU with Ted Robinson, F8RU, at the operating desk. Often operated by visiting amateurs in other years, 4U1ITU was the first of the United Nation agencies to show on the air. 4U1UN at the U.N. Headquarters in New York has been on the country list, and there is a possibility of more U.N. countries showing in the immediate future. (WA8MOA photo)

Here is the crew at 4U1VIC, and if what is read comes true, they will be handing out a new country along about this time. This is the station at the International Atomic Energy Agency on Wagramerstrasse in downtown Vienna. From the left are John Oakberg, NK4N/OE3ZOC; Tim Hammond, WA7QFS/OE1ZHA; Jerry Barton, ex-WB8CIG and now OE3JBU; Walter Kutschera, KA2RRX/OE1ZUS; Horst Eisenlohr, ex-DL9OL and now OE3OLW and the president of radio club at 4U1VIC; Dick Olsen, K7AWD/OE1ZOS; and Klaus Gaertner, DF1KG/OE1KGB.

for deletion, as well as some thinking toward modernizing the whole DXCC process. Anyhow, check the Vienna decision, for as has been noted before, everything comes to the DXer who waits—long enough.

Sunspot Cycle 21

In a DX Test not too far back one disgusted DXer commented that Halley's Comet would be here before improved band conditions. With the comet visiting every 76 years, the feeling might be that this DXer was fretting just a bit.

Halley's Comet will be brightest in February 1986, when it will be at perhelion—unfortunately, however, on the side of the sun opposite from us. In December of this year some naked-eye sightings will start to be reported, and a year from now it will be seen low in the southeastern sky. More will be heard on Halley's Comet. What about sunspots?

This month the smoothed 12-month number should be roughly where the previous cycle was in 1974. That cycle bottomed about the end of 1976 or early 1977, the decline flattening as the cycle neared the bottom. The new cycle takes off quickly, rising relatively fast. The February smoothed should be about 37; the bottom below 10. In the last two cycles the count did not reach as high in numbers as did the prior two cycles. Cycles 20 and 21 thus did not have the high smoothed sunspot numbers that Cycles 18 and 19 did. On the other hand, Cycle 20 did not bottom as low as the prior two cycles. Some say that when the smoothed 12-month running average gets to about the 150 mark, conditions are not going to improve much more with higher figures. Back in July 1982 there was an active period when the daily mean sunspot numbers got up to a count of 272 in the middle of that month per the figures of the Sunspot Data Index Center in Belgium. The average for that month was 102.

There is always more interest in the numbers when there are fewer of them. Something has to account for the bad band conditions, and DXers have a need to kick around the numbers. When the bands are jumping and even 6 meters is bringing respectable DX to the Deserving, there is neither the time nor inclination to worry.

5 Band WAZ

Standings as of November 1, 1984

All 200 zones worked:

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

The top 13 contenders for 5 Band WAZ:

1.	DK5AD, 199	7.	W8VUZ, 198
2.	JA3EMU, 199	8.	LA9GV, 198
3.	N4WW, 199	9.	W6GO, 198
4.	EA8XS, 199	10.	K4CEB, 198
5.	K6YRA, 199	11.	OK1MG, 198
6.	N4JF, 199	12.	W2YY, 198
		13.	SM5AKT, 198

291 Stations have attained the 150 zone level

Look for the bottom around 1987. In this column we mention all of this to get your attention. Elsewhere in *CQ* you should note what George Jacobs and Ted Cohen have to say. They bring technical expertise to the matter. Always keep in mind, however, that the good days of DXing, like Halley's Comet, are coming. It's just that the next couple of years may seem like 76 years to the eager but needy DXer.

In our impressionable years a couple of decades back we often would have to listen to one on 75 meters tell of the glorious days of Cycle 18, "when you could work anyplace in the world, day or night, on 10 meters!" These were the days of a.m. and few beams. We believed and were downcast that we had missed the feast. About 10 years later on a traffic net this one was asking for the QSL address of a UA3 in downtown Moscow. Our fragile illusions were shattered. Maybe things never were as good as some remember them to have been.

Just keep in mind that cycles come and cycles go. You can work DX at the top of the cycle and you can work it at the bottom. The figures you see are averages, either for the month or for the 12-month period. There will always be good days—some days better than others. Remember back in 1982 when this cycle had daily counts up in the 270s, and the month average was down around 105? The lowest daily count during that month was 30.

4M4SS

The Radio Club Valezolano Valencia will be putting this special callsign on the air during the visit of Pope John-Paul to South America. They will have it on the air the last week of January, from January 26th to January 28th. They plan to be on all bands on CW and SSB. If you want a direct QSL, send 3 IRCs; otherwise, they will send the cards via the various bureaus.

QSLs for 4M4SS go to P.O.B. 510, Valencia, ZP 2001. Romulo Velasquez and Pablo Rodriguez R., the president and the activity coordinator for the Valencia Radio Club, are ramrodding this effort. It should be coming on the air shortly after you read this.

Mallorca Radio Club

In downtown Palma, the locals have formed the Palma Radio Club, a branch of the national URE club, and have the callsign EA6URP. They plan to be active on all bands and in most of the major DX tests. The mailing address for EA6URP is P.O.B. 34, Palma de Mallorca (Balearic Islands), Espana. EA6GP would like DXers to give the club station a call if they hear it on the air.

Grupo Argentino de CW

A few years back we talked with Jose Ahumada at the Reston ARRL Convention just outside of Washington, D.C. He was in Washington with a military mission from Argentina, and his home call was LU2DX. Subsequently we queried Jose about the possibility of South Shetland operations. He answered and corrected some of our information from other sources. One day we asked Jose why he knew so much about South Sandwich. "Oh, I was

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	1240	N6AW	1017	K2QF	843	AI6Z
2715	F9RM	1699	SM7TV	1231	N6JM	1003	N3ED	837	VE2FOU
2680	YU1HA	1697	N2AC	1226	W7CB	999	G3ZRH	828	K2POF
2488	YU2DX	1689	I2PHN	1219	YU7KV	999	W6OUL	827	PY1DFF
2398	K6JG	1677	I8YRK	1217	PY4OD	994	YU2CBK	824	VE2PD
2382	W2NC	1660	YU7AW	1207	NN4Q	992	W8ILC	801	YU1OHF
2305	K2VV	1648	W8CNL	1200	KL7AF	990	YU2CQ	783	K7CU
2277	K6XP	1603	I6SF	1194	JA1VRQ	982	N4IB	742	JH8NYK
2237	VE3GCO	1577	K9BG	1187	EA9IE	956	WD9IIC	707	OE1KJW
2109	N4MM	1554	YU1DZ	1174	W8RSW	955	N3RL	701	K8HF
2030	W4BQY	1517	WØSFU	1164	CT1LN	951	KO8T	698	NE6I
1964	W9DWQ	1501	KF2O	1150	N5TV	933	N2AIF	696	KJ7N
1951	YU7BCD	1491	WA1JMP	1140	I2MQP	929	EA2IA	683	WB1GOO
1875	N4UU	1467	K6ZDL	1131	W1NG	922	W6YMH	675	IØAOF
1855	N6JV	1401	K6DT	1126	YU4YA	915	N8BJQ	662	K9LJN
1840	N9AF	1401	IN3ANE	1125	LA7JO	910	YU1SZ	657	ND6U
1838	N4NO	1356	N6FX	1116	YU7AJD	905	WØJIE	630	WI4K
1815	PAØSNG	1334	SM3EVR	1116	WB8ZRL	876	DK2BL	622	KN1J
1790	YU2TW	1311	W9NUF	1098	WA8YTM	865	EA1JO	619	JA6GWU
1748	N6CW	1291	K8LJG	1095	KA3A	860	WD4RAF	600	N3KR
1740	K5UR	1250	N4NX	1018	G4FAM	853	AI8S		

S.S.B.

2632	F9RM	1498	WD8MGQ	1101	CT4NH	939	XE1OX	759	CT1BY
2227	IØZV	1495	I6ZJC	1092	ZP5RS	926	KC8CC	748	N3ED
2054	K6JG	1479	K5UR	1064	G4CHP	908	WB6GFJ	747	N3RL
2028	IØAMU	1450	W9DWQ	1030	KC4OV	902	KC8YM	721	IN3AHO
2026	K6XP	1396	W4BQY	1028	JH1VRQ	900	K8LJG	707	WB6SRK
1968	K2VV	1396	YU7AW	1025	N6FX	894	AC2J	693	ON6IT
1951	ZL3NS	1383	N4UU	1013	N4NX	889	W2LZX	690	WO4L
1944	K2POA	1365	N4NO	1008	I1HAG	869	XE1XF	680	CT4UW
1895	N4MM	1348	VE1YX	1005	W6YMV	864	WA2FKF	667	JH5FOO
1695	I4ZSQ	1341	WA4OMO	996	YU7DX	859	W1NG	663	KBØC
1678	HB9AAA	1341	N2SS	996	TG9GI	846	W3GXK	661	K8ZZU
1654	WØYDB	1248	KF2O	993	N2AC	845	WAØDCQ	650	W6YMH
1653	I2PHN	1208	WB2NYM	992	I8KCI	811	VE2PD	649	IK5ACO
1646	I8YRK	1203	I6NOA	992	W9NUF	810	IØSGF	617	WI4K
1634	IØMBX	1191	WF4V	980	W3ARK	798	N4IB	615	WN5MBS
1622	CT1UA	1167	CT1FL	958	WB8ZRL	795	PY4OD	612	YBØACL
1621	OZ5EV	1138	I2MQP	956	NN4Q	792	Z21GJ	610	VO1AW
1606	I8KDB	1136	PY3BXW	950	N5TV	787	WØULU	600	KK5P
1588	PAØSNG	1112	W2NC	946	I1POR	787	W2XQ	600	W7KWI
1578	YU7BCD	1105	WA4OIB	944	KL7AF	765	W6LQC		

C.W.

2833	YU7DX	1561	W9DWQ	1274	W9FD	897	KL7AF	741	EA1JO
2144	W2NC	1544	N4UU	1227	YU3NP	871	IT9VDQ	732	JA5SIX
2010	W8RSW	1537	G2GM	1162	K6ZDL	862	AK9Z	726	AK2H
1850	DL1QT	1503	N2AC	1099	N6FX	848	W1IHN	708	YK1AO
1841	K2VV	1469	VK4SS	1092	W4WJ	828	W1NG	700	VE2FOU
1817	W8KPL	1452	N4MM	1091	I2DMK	827	NN4Q	694	AI6Z
1812	WA2HZR	1449	VE7CNE	1087	N4YB	813	JH1VRQ	687	G4FAM
1794	N6JV	1442	YU7SF	1032	I1YRL	800	N6TV	664	YU2CQ
1774	K6JG	1372	I6SF	1032	JE1JKL	788	AG5C	655	SM5DAC
1700	K6XP	1363	K5UR	1004	JA1KRU	781	N3ED	652	OE1KJW
1643	W3ARK	1345	VO1AW	1000	KF2O	776	DJ1YH	633	W2XQ
1638	ON4QX	1305	LZ1XL	990	PY4OD	755	N4NX	601	F6HKD
1605	N4NO	1294	K9QVB	929	W9NUF	748	N2AIF	600	W6YMH
1596	W4BQY	1292	YU7AW	921	K8LJG	744	KA3A	600	N3RL
1573	YU7BCD	1278	4X4FU	902	KA7T				

there with the first LU-effort back in the 50s," was all he would say. We had to dig through the old magazine file to finally find Jose, a bit slimmer perhaps, in a photo of the operation way back then. Recently when reading the Grupo Argentino bulletin we came across a listing of the operations in the Antarctic by the Grupo, and over the years they have made a lot of chilly QSOs. Take a look at the list.

1955, South Sandwich, LU2ZY/LU3ZY, 1700 QSOs, CW, Argentine Navy sponsored.
1977, South Sandwich, LU3ZY, 2500 QSOs, CW, Navy/Grupo Argentino.
1979, Staten Island, LU7Z, 7100 QSOs, CW-phone, Grupo Argentino.
1981, South Shetland, LU5ZI, 17000 QSOs, phone, Grupo Argentino.
1982, Staten Island, L8D/X, 6900 QSOs, CW-phone, Grupo Argentino.
1982, Antarctic, LU1ZE, 750 QSOs, CW, Grupo Argentino and research agency.
1983, Orcadas, LU5ZA, 5000 QSOs, phone, Radio Club Argentino & Navy.
1983, South Shetland, LU3ZI, 20125 QSOs, CW-phone, Grupo Argentino & Antarctic Research.
1983, Orcadas, LU1ZA, 1000 QSOs, phone, Argentine Navy.
1984, Orcadas, AZ5ZA, 13200 QSOs, CW-phone, Radio Club Argentino & Navy.

The feeling is that someone is going to note one or more of the above callsigns and recall working it. All we will say is that QSLs for the Grupo Argentino operations should go to GACW, 2025 Carlos Diehl, 1854 Longchamps, Buenos Aires, Argentina. If you note Radio Club de Argentino (RCA), you might try them at C.C. 97, Correo Central, 1000 Buenos Aires, Argentina.

There has been a report that a Soviet station may show from one of the South Sandwich group, the station being part of a group approved by Great Britain, one of the claimants to the group, and Argentina also holding onto a claim. The call of the station has been mentioned as possibly 4K1I. This is mid-summer to the south and the height of the Antarctic season.

The New Bands

In October the FCC released a Notice of Proposed Rulemaking (NPRM), PR 84 960, proposing that the WARC frequencies at 18 and 24 MHz be opened to amateurs and revising the current window out of the 10 MHz band. However, the FCC said that government fixed operations on 18 MHz would delay amateur use of that band prior to 1989. The 12 meter band, 24,890 to 24,990 kHz, would be available to amateurs on a primary basis. RTTY from 24890 to 24930 kHz, SSB, AM, NBFM, facsimile, and SSTV from 24930 kHz to the top of the band, and CW everywhere. The band will be available to Generals and higher.

The proposed rulemaking makes 30 meters (10.1–10.15 MHz) a permanent amateur band, and the window at 10.109–10.115 MHz is no longer held from amateur usage. It was also proposed that amateurs have 902–928 MHz available immediately except for amateurs in Colorado, Wyoming, and U.S. possessions in Region III.

Comments on all of this were due in December, and possibly by the time you read this things will be far down the pike.

Some Sketchy Early Spring Notes

The Kansas City DX Club took an unusual action last Fall. At a regular meeting they voted to reduce the dues. The feeling was that with over a $1000 in the bank they were ready for most anything. The ARRL's request for a declaratory ruling by the FCC (PRB-1) was out for comments, with these due just before Thanksgiving. This was the request for the FCC to exercise preemptive authority over state and local authorities' regulating of amateur transmitters and antennas. This proposal drew a lot of attention from DXers, especially in areas where limits on antennas have been imposed.

The International DX Convention will be at the Holiday Inn on Ventura Blvd. in Fresno this year from April 19–21. Ted Algren, KA6W, should be able to help with registration. George Hitz, W1DA, in downtown Sudbury, Massachusetts, ran into some problems with needed QSLs when "MA" got changed to "ME." Those two-letter state identifiers! Actually, they came about years back when the post office was trying to fit all the addresses into a 24-letter maximum line length to fit the optical scanners for sorting mail. Though the post office has supported us from youth to old age, we will quickly admit that when we address mail we write the full state in capital letters. Years ago we found many sorting mail who were not sure if "MI" was Michigan or Minnesota, or whether "AK" was Alaska or Arkansas. Maybe we still cling to our "low-tech" years. Recently we asked a young salesman in a computer store if he had ever seen a crystal radio set. He said he had, but it turned out that he meant a crystal-controlled, not a cat's whisker. There is a difference.

Don Riebhoff, K7ZZ, notes that while he did break a bone in his foot going over the wall to the local watering spot in Saignon, it was a year after the Spratly 1S1A effort. Scott Gant broke his ankle before the 1S1A effort on the same water hazard, but he went to Spratly just the same, foot in a cast. That effort also had John Lunsford, Travis Pederson, and Frank Ostrich among the crew. Don will be finishing school in the Monterey area about this time,

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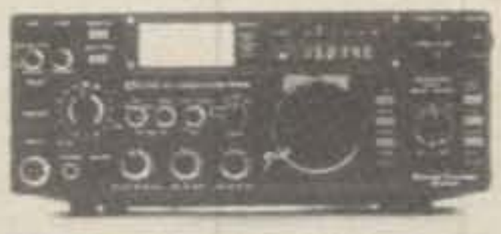

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1373	YB0BZZ		

C.W.

621	I8YRK	623	LA3IBA
622	G4LQN		

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310	W4DPS/313	275	NA5W/297
310	KS2I/313	275	KB8KW/297
310	W2SUA/310	275	KD5ZM/281
310	WB1DQC/310	275	ZL1BOQ/280
310	YU1DZ/310	200	KB8CU/212
300	LA7JO/308	150	KT1H/171
300	W7FP/307	150	VE3GQV/154
300	ZL1BIL/307	3.5/7 MHz	KB5EK
300	WA0DCQ/306	28 MHz	N3BNA
300	SM4CTT/305	QRPp	KT1H

C.W. Endorsements

310	ON4QX/315	275	EA2IA/286
310	K6LEB/312	275	W0HZ/281
275	W7CNL/298	275	DL1QT/277
275	SM6CST/297		

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.

and you probably will hear from him from CT1-Portugal and nearby areas before long.

If you are looking for a Southern California check-point for the *CQ* Awards, Chris Williams, KG6AR, 1117 South Del Mar Ave., San Gabriel, CA 91776, will give your cards the needed scanning.

Kerguelen was due to show before Christmas with the new FT prefix as either FT8XA or FT4XA. This used to be FB8X country, but there is a new prefix system in France which should not be news by now. Rajiv Ghandi, who took over as the Prime Minister in India when his mother was assassinated, is VU2RG.

The W/K number declined slightly in the first three-quarters of last year, while the VEs increased a bit. The W/Ks dropped about one-third of one percent in the totals (about 1550). There were still over 400K U.S. licensees, however. The Canadians gained 1145, the 1983 total licenses being 22,697. In the U.S. most of the loss was in Novice licenses expiring, some concern being expressed at the attrition at the initial entry level.

Zone 2 for the WAZ Award is often a difficult one, but VE2USA was there in late October. Richard Moran, WD8CRY, notes that the QSLs for that effort go to KA8SEW (SASE or IRC needed). WD8CRY was part of the operation.

Paul Caboche, 3B8AD, notes the concern in Mauritius over the use of fictitious or improper callsigns. Paul handles QSL chores in the Mauritius group and does not hesitate to lodge a complaint with the Director of Telecommunications when he comes across a bogus callsign. Two instances Paul noted in some correspondence concerned a 3B8 call by a visiting W/K, and an HB9 who was currently on the air with a 3B8 call when then in Mauritius on vacation. Since 1979 amateurs visiting Mauritius are issued a provisional license which requires use of their home call with a 3B8 suffix, or whatever suffix might be proper. Any other callsign, whether on the air or noted in callbooks or other publications, will bring a quick protest. Apparently the Telecommunications Agency follows up immediately on these protests.

The San Felix operation by CE0AA/X last Fall is remembered by most DXers, many of them happily, but it also points out how fast a country can become very rare because of lack of activity. The first operation from San Felix came in April 1965, when W4QVJ, W4DQS, W8FGX, W8ZCT, and W9EVI put the islands on the air. They used a Hallicrafter SR-150 and SX-117 for gear. The second operation came in 1972, when Wayne Warden, W9IGW, and Joe Goggin, K9KNW, signed their home calls /CE0 in April of that year. It was 12 years before San Felix was again available with CE0AA/X showing on the air. What does it all mean? Work them when you can! Every time we hear from Don Riebhoff we think of how Vietnam, Laos, Cambodia, and others were once available, some of them about every day of the week. Libya, Afghanistan, and Iran were once like that. Conditions change, but once you've worked them, you may have saved yourself weary years of worry.

Amateurs in Manitoba used the CG4 prefix during December to mark the 250th anniversary of La Verendrye's arrival. The French explorer entered southern Manotoba in 1734 during a period when France was disputing British sovereignty awarded under the treaty of Utrecht.

73, Cass, WA6AUD

DX Ten Years Back

In February 1975 VS5MC finally had his plans for transportation fall apart, and the 1S1MC plans were down the drain. Bill Pomeroy, VQ9BP, said that in the 1974 Desroches effort VQ9BP/D made 2020 QSOs, but only 624 requests for QSLs had been received. Even then there was a hope that Bouvet would show for the patient DXers, and 3B8DA was headed for St. Brandons, 3B7. UK1PAA was on from Franz Josef Land. FR7AI was saying he hoped to be on from Glorioso before long, and K2FJ was headed for Anguilla and Dominica. Father Dave Reddy was returning to Easter Island and was planning to be active again. The U.S. communications station near Asmara in Ethiopia was shelled by rebels, and Spain was moving military units into Ceuta and Melilla to keep one of the neighbors from taking over. There was a rebellion in Malagasy, the Kurds were fighting in Iraq, U.S. personnel were being evacuated from Phnom Penh, and Oman had a rebellion on its hands with arms reported as being supplied from neighboring South Yemen. LU1ZA was on from the South Orkneys, and Arvoredo Island was on with PU, PR, ZV, PS, and ZZ prefixes, all Brazilian. W4ZR was on the way to the Turks/Caicos for the coming *CQ* WPX Test, and K4DNU was on from Midway Island.

QSL Information

All of the following was accomplished with a lot of help from W9LNQ and others.

AI5P/TF to W3HNK
AP2ZA to W6NLG
BV0W to W4WJ
CU5BOH to CT1BOH
DJ0SB/C6 to DJ0SB
F5RV/TK to F5RV
F0AHY/FC to DL4FF
FY7AE to WA4WTG
FW0BX to ZL1AMO
GD4W0Y to KA1JKN
HG19HB to HA5KKG
HP1XKR to JA7AGO
J3ABG to WA4WTG
J5WAD to UA4PW
LU1ZI to LU2CN
LZ2JF to WA4WTG
PY4WAS/PU8 to PU4WAS
PS7AAW/PY0F to PT2BZ
PY0FN to PY7VEB
PJ8DSS to SM5AQD
TI1C to TI2CCC
TG9HH to N5HH
TJ1BF to WA4WTG
TR8DM to F3CTW
P29RY to WA4WTG
U1ZM to UX1ZBZ
V2AK to WA4WTG
VP2MLD to WB2LCH
VP8AOB to K0JW
VQ9DG to WA3HUP
W6TEX/C3 to W6TEX
VE2USA to KA8SEW
VK9YR & VK9YJ (these two only) to K9IL
YZ3F to YU3MX
ZF2BN to W4HET
ZF2GE to WA4WTG
ZP5KS to WA4WTG
ZS3HL to KE1A
4U39UN to W2MZV
4V2C to W5VUX
4Z4DX to WA4WTG
4Z4HF to WA4WTG
5N24AMA to 5N8AMA
5Z4MX to SM3CXS
5Z4RH to WA4WTG
6Y5RL to WA4WTG
6D1FIC to K9AUB
8P6GG to N4CTC
8P6AH to WA4WTG
8P6IB to WA4WTG
9M3HB to N4FFN
CM2QP to Box 1, Havana, Cuba
D68WB to PB 542, Grand Comoros, Republic of Comoros (via France)
EA6URP to POB 34, Palma de Mallorca, Balearic Islands, Espana
FH8CB to POB 50, F97610, Mayotte Island (via France)
HC1SK to BP 8283, Quito, Ecuador
HI8RCD to POB 1157, Santa Domingo, Dominican Republic
HI0MFP to POB 2191, Santa Domingo, Dominican Republic
HK6KKK to PB 880, Pereira, Colombia
PZ1DV to POB 9006, Paramaibo, Brazil
PZ8AR to BP 566, Paramaibo, Brazil
TL8GE/ST0 to Y. Delatouche, F6FYD, BP 8, F78 570, Andresy, France
TR8JYC to French QSL Bureau
TG9EO to PB 10F, Guatemala City, Guatemala
TT8CW to Jacques Calvo, F6GXB, Box 70, F91605, Savidny, Cedex, France
XT2BR to POB 116, Ouagadougou, Voltaic Republic
YB0TK to Box 160/KBYT, Jakarta 12180A, Indonesia
YB0ZM to Box 160/KBYT, Jakarta, 12180A, Indonesia
4M4SS to PB 510, Valencia, ZP 2001, Venezuela
XE1IF (by K4IIF) to Manuel G. De Lera, XE1XF, P.O. Box 907, Mexico 1, D.F., Mexico, or to the XE Bureau.

Dan & Frank Have It All!

IC-751

IC-745

ICOM

IC-02A

FT-209 RH

FT-980 CAT

YAESU

FT-757 GX

TR-7950

CP-1

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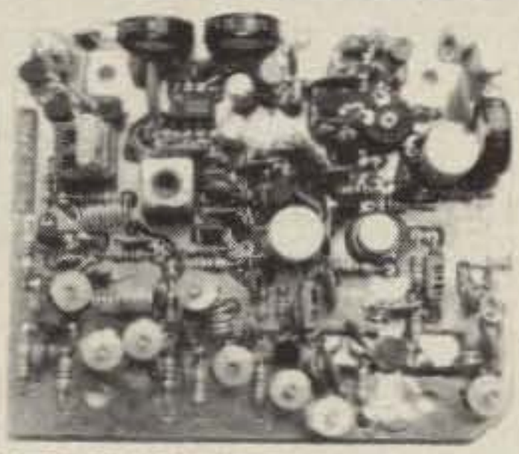

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Ticket Talk

BY DICK BASH*, KL7IHP

Happy Presidents' Day and welcome to the February, 1985 column of *Ticket Talk*, a column devoted to answering questions you may have about the amateur radio licensing structure. If you still have questions, please write me c/o *CQ* or else at the address shown below. *A reply will be sent to those enclosing a self addressed stamped envelope.* If you can't wait for an answer, either call me at (415) 278-8275 between 10AM and 6PM, Monday thru Friday, California time, or else call your local FCC Field Office.

About the NEW Questions

Just before I finished the January issue of *Ticket Talk*, I received the new Technician/General batch of questions from our friends at the FCC and from a couple of Volunteer Examiner Coordinators (VEC's). Since then I have had a chance to review them and find that about 90% of the questions in PR Bulletin 1035B, dated October, 1983, have been changed and **basically made better.** The FCC told the VEC's they could use the old October, 1983 questions for 6 months (read that to mean until May 1, 1985) and then they have to use the questions from PR Bulletin 1035B, dated November, 1984.

You must be very careful, therefore, to be darn sure that the study materials you purchase cover the test you're going to take! If you are preparing for the Technician/General written test, first check with the VEC in charge and find out if his/her tests are based on the 1983 or 1984 questions. Then make sure that the study materials you purchase cover the appropriate set of questions. The publication out right now (December 15, 1984) by Ameco covers the 1983 questions. At the time of this writing the ARRL does not have a publication covering either set of these 500 questions. Neither does Bash Educational Services. Gordon West of West Radio School has some material out on the October, 1983 questions but I haven't seen it personally.

This chaos will also be happening to the Advanced and Extra Class questions, so those of you preparing for those exams should be sure that you don't fall into the trap of studying the wrong stuff come exam time. At the time of this writing, I know of no company with a publication covering the volunteer exam questions for Advanced and/or Extra.

Emergency Communications

On the new 1035B there are several questions regarding *emergency communications.* What are they and when do they apply? Well, 97.3(w) of the Rules is very specific and defines emergency communications as *any amateur radiocommunications directly relating to the immediate safety of life of individuals or the immediate protection of property.* Let's emphasize the word "immediate" here. If you're down in some other country and the local terrorists shoot and kill some people and you want someone to come and get the bodies three days later, that does not justify emergency communications. This happened, by the way. Let's face it; in an emergency the rule book goes out the window. But you had better be able to justify your actions! If you declare an emergency then you mean that there's a problem affecting someone's life or property *now*, not in the past. A typical example of an emergency communication is when the hurricane is roaring and power lines are falling, people are injured or endangered, etc. Reread the definition, emphasize the word "immediate," and you'll have no troble with the question on the written test!

FCC Emergency Declaration

Also on the Technician/General PR Bulletin are several questions regarding the declaration of a communications emergency *by the FCC.* Those questions are all based on 97.107 of the FCC's Rules. Basically that rule states that the FCC may declare a general state of communications emergency exists whenever an emergency disrupts normally available communication facilities in any widespread area(s). What could cause such a problem in the first place? Well, hurricanes, tornadoes, and other weather phenomena will do it! Also earthquakes can destroy normal communication facilities. When the FCC makes such a declaration of a communications emergency, they may, at their option, specify either whole amateur radio bands or just specific parts of those bands for use *only by amateurs participating in emergency communication within or with such affected area or areas.* What that boils down to is that if you want to ragchew, run your net, etc., plan on doing it someplace else!

It is possible for an amateur radio operator to request that the FCC declare a

**Bash Educational Services, Inc., P.O. Box 2115, San Leandro, CA 94577*

general state of communications emergency. However, the amateur can't declare it himself/herself. Keep in mind that *only the FCC can actually declare the emergency*. If an amateur determines in his/her mind that the FCC ought to make such a declaration, the amateur simply contacts the FCC Engineer-in-Charge in the area and that FCC employee will carry the ball from there. What he'll likely do is evaluate the situation by asking the amateur the local conditions and pass that on to his/her superiors in Washington. The FCC can act very quickly when it needs to, so relax.

Once the FCC has issued such a declaration, you must know that *operation of and with amateur stations in the area concerned shall be only in accordance with the requirements set forth in 97.107, but such requirements shall in nowise affect other normal amateur radiocommunication in the affected area when conducted on frequencies not designated for emergency operation.* That's enough info to answer the various questions, but be smart—read the complete text of the regulation once to familiarize yourself with what's going on. These are the FCC's rules and they go by them. They also expect you to as well.

Maximum Power You Can Use

There's a good question (3A-3.1) on the new PR Bulletin for Tech/General tests that asks you:
Notwithstanding the numerical limitations in the FCC Rules, how much transmitting power shall be used by an amateur radio station?

The question has caused some folks problems because they fail to read the Rules carefully. In 97.67(a) it states the *exact* answer:
Notwithstanding other limitations of this section, **amateur radio stations shall use the minimum transmitting power necessary to carry out the desired communications.**

What this means is if you don't really need that 200 watt amplifier to work the ham across town using the local repeater, then *turn it off!* We all fall prey to wanting to be the "big gun" in the DX pileups, but I and all those experienced DXer's out there will tell you it ain't the power you got that's important—it's technique, style, and smarts! I have worked plenty of DX stations with 100 watts and there are many who have earned DXCC QRP (100+ countries) using 5 watts or less! So the Rule has some practical applications as well. If we would all turn off our amplifiers, we would suddenly hear more foreign stations out there.

That's enough to get you thinking for this month. Spring is coming soon. Practice your code. It'll keep you warm on cold nights. Ha! See you next month!

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(Central Time)

CIRCLE 84 ON READER SERVICE CARD

HELP NEEDED for a 30-year-old victim of multiple sclerosis in securing free radio equipment. Unable to work due to disability. Recently received Novice ticket. Has 40 meter inverted V and antenna tuner. Needs receiver and transmitter or transceiver to get on air. Would like a Commodore 64, interface and software because of limited mobility. If you have anything to donate, please call Toni at 202-225-5865 (collect) between 9 and 6.

SERIOUSLY . . . WE WILL HELP YOU LEARN THE EXTREMELY PROFITABLE BURGLAR ALARM BUSINESS. This field is growing 30% plus yearly. Starting information $2.00 (redeemable with purchase). Security Electronics International, P.O.B. 1456-HQ, Grand Rapids, Michigan 49501.

CINCINNATI ARRL '85. Fifth Annual Ohio State Convention & Flea Market. February 22–24, 1985; Great Oaks Vocational Campus, Sharonville (Cincinnati), Ohio. Just off I-75 & I-275. Hospitality room Friday & Saturday. Forums, vendors, indoor fleamarket, FCC exams, meetings, food, women's activities, banquet & Wouff Hong. Admission ($5) includes all convention awards. Add $5/regular space, $10/reserved space for flea market. Special hotel rates. For information telephone 513-563-7373 (vendor), 513-851-1056 (flea market), 513-921-3844 or 513-471-4775 (general).

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Heath, Swan, and others. Six ½" red LED digits in a 5" wide by 1½" high and 9" deep metal cabinet. For Collins "S" line our model DAD-6C at $279.95 plugs into existing jacks and tube sockets. No holes to drill! Our DAD-6D at $269.95 for the Drake "C" line just plugs into the injection jack. No installation! FT-101's and TS-520's (see last month's ad) use our models DAD-6Y and DAD-6K (respectively). Thirty-day money back. Two-year warranty. Write for prices and information. GRAND SYSTEMS, Dep't. D, P.O. Box 3377, Blaine, Washington 98230, phone (604) 530-4551.

ROSS $$$ USED FEBRUARY SPECIALS: KENWOOD TS-430 $585.00, TS-820 w/CW filter $469.00, TS-130 $459.00. ICOM 701 $419.00, YAESU FT-620B $285.00, FT-301D $379.00, FT-101 $359.00. DENTRON MLA-2500 $495.00. ROBOT 400 $299.00. Send for Complete used list—more than 300 items. If this month's specials are not what you are looking for, phone or send call letters and phone # for a personal price quote. Over 6,000 Ham-related items in stock. Closed Mondays at 2:00. PRICES CASH, FOB PRESTON. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 phone (208) 852-0830.

CANADIANS: Sell IM-2410 Freq. counter, as new, $195.00. HW-8 with band indicators, .5 watt audio board, and Free 13.8V-3A power supply, $140.00. 13.8V-10A regulated power supply H.B. $25.00. Postage $4. M.O. plse. Kopulo, VE1CGT, St. George, N.B. EØG 2YØ.

ALPHA 374, 3 kw 10–80, just back from factory, all updates, $1100.00. SB614, new $125.00. Charles Cloud, WB3CPW, RR2 Box 41-T, Greentown, PA 18426.

FOR SALE: Robot 70A, Model 400 & Model 800, $550 + UPS shpg. TS-830S, CW fil, hand mike, $675 + shpg. HAL system: CT 2200 communications terminal & KB-2100 keyboard, $550 complete + shpg. K3UKW, Tony Musero, 1609 So. Iseminger St., Phila., PA 19148, phone 215-271-8898 after 6PM EST.

AN/PRC-74 AND AN/PRC-104 transceivers, modules and accessories wanted. T. Stroh, N6JSD, 21930 Valerio St. No. 11, Canoga Park, CA 91303.

FOR SALE. Antique and modern radio and TV tubes, parts and books. SASE for book or parts list. H. Lash, 19 E. 157th Street, South Holland, IL 60473.

WANTED: Each make and model of bug manufactured before 1935. Vibroplex, Martin, Boulter, MacDonald, etc. Also all spark and Boston key models. Need pre-1900 telegraph: keys, sounders, etc. Neal McEwen, 1128 Midway, Richardson, TX 75081. Visitors welcome. Please write for info. 73 de K5RW.

COMMODORE-64 5 BAND DXCC LOG includes custom beam headings, distances to DX, plus continent, country, zones, QSO'ed/QSL'ed on any band, phone or CW, upon country name or call sign entry. Diskette and instructions $18.99 ppd. Sondor Software, P.O. Box 416, Sarnia, Ontario, Canada N7T 7J2.

APPLE OWNERS: Five Band DXCC, WAS, WAZ Scorecard Programs. Simplify your record keeping! CRT/Printer reports. Requires Apple II + /e/c, disk, 80 columns. Includes disk with 3 programs, doc, and postage. KB8VV, 1226 Winghaven, Maumee, Ohio 43537.

WANTED: Tubetester, late or semi-late model. Tubetester requiring repairs considered. Joe, 2748 Meade, Detroit, Mich. 48212.

HAMMARLUND owners and collector-factory original parts, manuals, literature, etc. Send $2.00 plus SASE for lists. Hammarlund Receiver Service by former factory service manager. Wayne Cordell, K4HCS, Blue Ridge Communications, 770 C New Stock Rd., Weaverville, NC 28787, phone (704) 645-7070.

WANTED: Schematic or info on Bullet 12 volt 16 amp (kit) power supply. Also need Jerrold QDMX tower sections 6, 7, 8, and base mount. Packy, AE3O, 5028 Sidney Rd., Mount Airy, MD 21771, phone 301-831-5501.

AEA CP-1 computer interface with MBA-TOR software cartridge for Commodore 64. Will do Morse, Baudot, ASCII, and Amtor for $210. Paul Adler, 83 Lamplighter Lane, Fairfield, CT 06430 (203-259-9376).

Please send all reader inquiries directly.

Please send all reader inquiries directly.

COLLINS R-388/URR: Am seeking shop/technical manuals. Hazou, 315 East 69 St. Apt. #LK, New York, NY 10021.

KENWOOD 520S, complete CW station. Bencher Paddle, MFJ Keyer, MFJ wattmeter/SWR. Multiband (80–2 m) extendable ant. Price $475. Call 1-405-355-4475, X2503. Wayne Lambert, FAOBC 11-84, BTRY C OSB, Ft. Sill, OK 73503.

HELP! Desperately need Hallicrafters HT-37 power transformer in good condition. State price. KA8GEF, 9401 Grand Division, Cleveland, Ohio 44125.

DR. ROGER MOODY, WA3NFW, Technical Information Service, 5004 E-W Hwy., Riverdale, MD 20737. FCC test assistance, technical questions. Send $10 for initial consultation/advice.

WANTED: Heath HG-10 VFO. Must be in working order and reasonably priced. KB8QC, 7338 North Pisgah Drive, West Chester, Ohio 45069.

PRE-TUNED five-eighths-wave two-meter magnet-mount antennas. $19.95 complete plus $3.00 shipping. Write for catalog page. George Shira, Rt. #7, Box 258, Anderson, SC 29624.

OLD 4–7 PRONG TUBES, DeForest TV Parts, Wollensak 1515, 1500 watt isolation transformer, AM-FM car radios. Svirmika, 6601 S. Whipple, Chicago, IL 60629.

1985 REVISED RADIO AMATEUR AWARDS DIRECTORY OF THE WORLD $8 US to Stateside; $10 US to DX from VE3XN, Garry Hammond, 5 McLaren Avenue, Listowel, Ontario, Canada N4W 3K1.

COMMODORE 64 Computer, 1541 disk drive, both 6 mos old, excellent, $325, FOB. Les Basham, 735 Caves Hwy., Cave Junction, OR 97523.

TEN-TEC DELTA with 280 AC power (NB installed), $475, FOB. Excellent, like new. Ten-Tec Speech Processor for above, $85.00. Les Basham, 735 Caves Hwy., Cave Junction, OR 97523.

HARK: Hear Amateur Radio (Over) "Radio Archives" newsletter. SASE. TIMM, 2308 Garfield #304, Minneapolis, MN 55405.

HARK: Hear Amateur Radio (Over) high-tech crystal sets. SASE. TIMM, 2308 Garfield #304, Minneapolis, MN 55405.

SELL: TRS-80 Videotex computer terminal, built-in modem and software, like new $125. K. Johnson, P.O. Box 10063, Austin, TX 78766.

SEND LARGE SASE for *QST, Riders, 73, Ham, CQ, Wireless World*, books and catalogs. J. Wasiewicz, 229 Sarles Lane, Pleasantville, NY 10570.

WANTED: VHF-UHF TV signal strength meter. SELL: 120' super strong guyed steel tower in 20' sections. $150 per section, whole tower $700, U Pick Up only. Tim Colbert, WA8MLV, 13609 Colony, Burton, OH 44021.

WANT: Old Antenna Books, Handbooks, and *CQ* Magazines! Also need pre-1940 *QSTs*. KT7H, 5519 12th Ave. NE, Seattle, WA 98105.

CASI COMPUTER PORTRAIT SYSTEM with inventory for sale. Almost new equipment purchased for $9,000.00, selling for $5,000.00 for quick sale. W6FYP (503) 935-2970.

WANTED: OMRON 12SR, PICKETT N4ES, CORVUS 500, HP32E. State condition and price. K3RCF, William B. Adams, P.O. Box 1467, Springfield, VA 22151.

MAGNAVOX model MX-MU-1, 50.5 mhg, will interchange with AEL-DT decoders, $75. Have three unit.., send M.O. to KB4ASY, 527 Grand Ave., Gadsden, AL 35901, or call evenings 205-543-2150.

TRADE: Robot 80 camera, 70 monitor, Heath HW-18 for 6M or other equip. Camera monitor used little, both intermittent since purchased. W4LQI.

FOR SALE: Mini-Products Quad, like new, $40. John Mills, 907 Monroe St., Endicott, NY 13760.

NATIONAL HRO-60 rcvr., 50 kHz to 50 MHz. Complete set, great cond., only $149 U ship. Send SASE to KA1LBM, Mark McCormack, 125 Rumford St., Concord, NH 03301.

SELL: Hallicrafter SX 111 and HT40 (chirp). N2ETF, Peter Sirelson, 9 Dekay Rd., Warwick, NY 10990.

SELL: DL-QTC (German); Boonto 260A Q-meter; Gen. Rad. 650A imp. bridge; H.P. X532A freq. mtr; H.P. X485B det. Paquee, 53 Jerome Ave., Trumbull, CT 06611.

WANTED: OMRON 12SR, PICKETT N4ES, CORVUS 500, APF Mark 55, HP32E. State condition and price. K3RCF, Wm. B. Adams, P.O. Box 1467, Springfield, VA 22151.

HRO COIL SET & case, very old, $70. Motorola, RCA, and G.E. low-band F.M. factory manuals, $8 ea. K6KZT, 2255 Alexander, Los Osos, CA 93402.

WANTED: Heath HG-10B VFO to go with my HW-16. Will pay shipping. DA2CE, Chris Snyder, C/511 MIBH Box 1662, APO NY 09178.

Please send all reader inquiries directly.

Mosley RodeMaster mobile antenna, $35. Don Bishop, NØEA, 5625 So. Sycamore #102, Littleton, CO 80120 (303-794-5067).

FOR SALE: TRS 80 MDL 1 computer, 2 Percom drives, RS232, quick prntr II, DBL density board, $750. OBO. Rick Thompson, 626 Valkyrie, KI Sawyer AFB, MI 49843.

WANTED: National NC183D or TMC GPR-90 with matching speaker. Would be interested in inop unit if exterior in good condx. Rich Dixon, W7QZO, 6655 NE 33rd St., Redmond, OR 97756.

FOR SALE: HW-2036A 2 meter rig, factory assembled, $100. I pay shipping. N8BPI, Box 25004, Lansing, MI 48909.

DRAKE R4, MS4, Hy-Gain 18 AVT/WB-5 vertical, all mint condx, $175 or trade for 6 mtr amp. Larry Jones, WB5KYK, 1836 N. Sumner, Pampa, TX 79065.

KENWOOD TS180S C.W. and dual SSB filters $500. P.S.30 pwr. sup. $80. Heath HW101 pwr. sup., C.W. filter, new finals, some extra tubes $175. Regency HR212 2 meter, 11 sets of xtals $45. All in excellent condition, will ship U.P.S. W9AUO, Ben Frish, Rt. 3 Box 96, Bloomington, IL 61701.

NAVY TYPE RCK Radio Receiver, RCA reconditioned, 115–156 MHz AM, Mint Condition, Best Offer. R. W. Boyd, Box 793, Stn "A", Montreal, P.Q. H3C 2V5. Tel: (514) 481-4830 after 18:00 hrs.

NEEDED: Donations of HAM/SWL books, equipment, cassettes, etc. for school program. G. Skloot, KE2N, JHS 180Q, 320 B. 104 Street, Rockaway Park, New York 11694.

UR TRIPOLE ANTENNA 6–160 without tuner, new, used 2 weeks, cannot use, lot too small, stainless steel hardware, $50. K4VGD 1-305-852-2109.

SIX METER KILOWATT, homebrew but professional construction, design by WA0ABI, built into Heath cabinet, requires power supply. Tom Nodst, 1812 Neihardt, Branson, MO 65616, 417-334-8076, $235 postpaid.

YAESU FT-DX-560 Transceiver, CW Filter, Spkr, Mint $300. W6MQK, 1049 N. Holliston, Pasadena, CA 91104, (818) 798-9345.

FOR SALE: Swan MB-40A all solid state 40 meter SSB/CW xcvr, 160 watts input, 3H × 8½W × 9D, with mobile mount, $160. C. Bright, 4115 Buckley Ridge Ct., St. Louis, MO 63125.

POOR STUDENT trying to get started in amateur radio needs donations of equipment, books, parts, etc. to get on the air. Anything appreciated! Jim, Box 388, Sioux Falls, SD 57101.

NEEDED: Manual and/or schematic for Swan Cygnet 260B. Will buy or pay photocopying costs. WA8SCO, George Brand, P.O. Box 506, Lewiston, MI 49756.

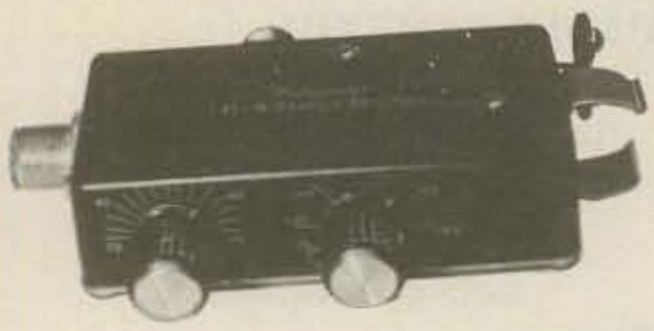
WANTED: GR-1236 IF Amplifier and GR874 MRL Mixer. Rudolf Six, KA80BL, 30725 Tennessee, Roseville, MI 48066.

FOR SALE: Yaesu FRG-7700 Receiver $300, mint condition, four mo. old. Steve, KA7OKC, (206) 734-9391.

DRAKE T4XC, R4C, MS4, AC4, 7075 mike, NB4, 1500 Hz, 500 Hz, 250 Hz, 6 kHz filters, xtals for 160m, 30m, and SW bdcst, Sherwood mods, F-Tango 1st IF filter, complete set spare tubes, spare relay, Palomar P305 preamp, muffin fan, dust covers, cables, and more, $675. Also DRAKE R4A with spare tubes, $125, and YAESU FT7 with mike, cables, and mobile bracket, $200. All excellent with manuals. Shipping extra. Dick, KA1SA, (617) 332-4342 after 8:00 pm.

WANTED: Butternut 160–10, call 503-479-7075.

R-X Noise Bridge



- **Learn the truth about your your antenna.**
- **Find its resonant frequency**
- **Adjust it to your operating frequency quickly and easily.**

If there is one place in your station where you cannot risk uncertain results it is in your antenna.

The Palomar Engineers R-X Noise Bridge tells you if your antenna is resonant or not and, if it is not, whether it is too long or too short. All this in one measurement reading. And it works just as well with ham-band-only receivers as with general coverage equipment because it gives perfect null readings even when the antenna is not resonant. It gives resistance and reactance readings on dipoles, inverted Vees, quads, beams, multiband trap dipoles and verticals. No station is complete without this up-to-date instrument.

Why work in the dark? Your SWR meter or your resistance noise bridge tells only half the story. Get the instrument that really works, the Palomar Engineers R-X Noise Bridge. Use it to check your antennas from 1 to 100 MHz. And use it in your shack to adjust resonant frequencies of both series and parallel tuned circuits. Works better than a dip meter and costs a lot less.

The price is $59.95 in the U.S. and Canada. Add $4.00 shipping/handling. California residents add sales tax.

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Send for FREE catalog describing the R-X Noise Bridge and our complete line of SWR Meters, Preamplifiers, Toroids, Baluns, Tuners, VLF Converters, Loop Antennas and Keyers.

Palomar Engineers

Box 455, Escondido, CA 92025
Phone: (619) 747-3343

Please send all reader inquiries directly.

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.

DON'T WAIT ANY LONGER TO PULL OUT WEAK, RARE DX!

Can't hear the weak ones when conditions are bad? Receiver lacks sensitivity on 20, 15, or 10? Get the world-famous Palomar preamplifier. Continuously tuneable from 160 to 6 meters, it gives 20 db extra gain and a low noise figure to bring out those weak signals. Reduces image and spurious responses too.

A unique RF sensing circuit automatically bypasses the preamplifier during transmit. The bypass handles 350 watts - just right for transceivers. Use a linear? Put the preamp between your rig and the linear.

Panel controls give continuous adjustment of gain and back-to-receive time.

Also available for SWL's: the receive-only preamplifier that was found best by World Radio TV Handbook.

Get your Palomar preamplifier today. You can hear the difference!

Model P-310X
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Model P-312X
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Add $4 shipping/handling U.S. & Canada. Calif. residents add sales tax.

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Send for FREE catalog describing the Preamplifiers, and our complete line of Loop Antennas, Noise Bridges, SWR Meters, VLF equipment, tribander beams, computer interfaces and more.

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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

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.

CIRCLE 34 ON READER SERVICE CARD

ICOM 2-Meter Mobile

IC-27H

Compact Size No Compromise

Now ICOM offers the best choices in compact 2-meter FM mobiles...the IC-27H 45-watt compact and the IC-27A 25-watt ultra compact mobile.

Size. The ICOM IC-27A and IC-27H measure only 5½"W x 1½"H x 7"D (IC-27H is 9" deep).

Easy to Operate. Even though the IC-27A and IC-27H are the smallest mobiles they have large operating knobs which are easy to use in the mobile environment.

32 PL Frequencies. The compacts come ready to go with 32 PL frequencies.

Internal Speaker. The compacts feature an internal speaker which allows the mobiles to be mounted in a variety of compact locations.

9 Memories. The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

Scanning. The ICOM compacts have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel...and the scanning speed is adjustable.

More Features. Other standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan and internally adjustable transmit power.

An optional IC-PS45 slimline external power supply and IC-SP10 external speaker are also available.

See the IC-27A/H compact mobile transceivers at your local ICOM dealer. For superb performance and reliability your only choice is an ICOM.

Also Available are the IC-37A 220MHz and IC-47A 440MHz 25 watt compact mobiles.

CIRCLE 37 ON READER SERVICE CARD

ICOM

First in Communications

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