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Amateur Radio

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CQ

Season's Greetings

12
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THE RADIO AMATEUR'S JOURNAL

KENWOOD

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TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

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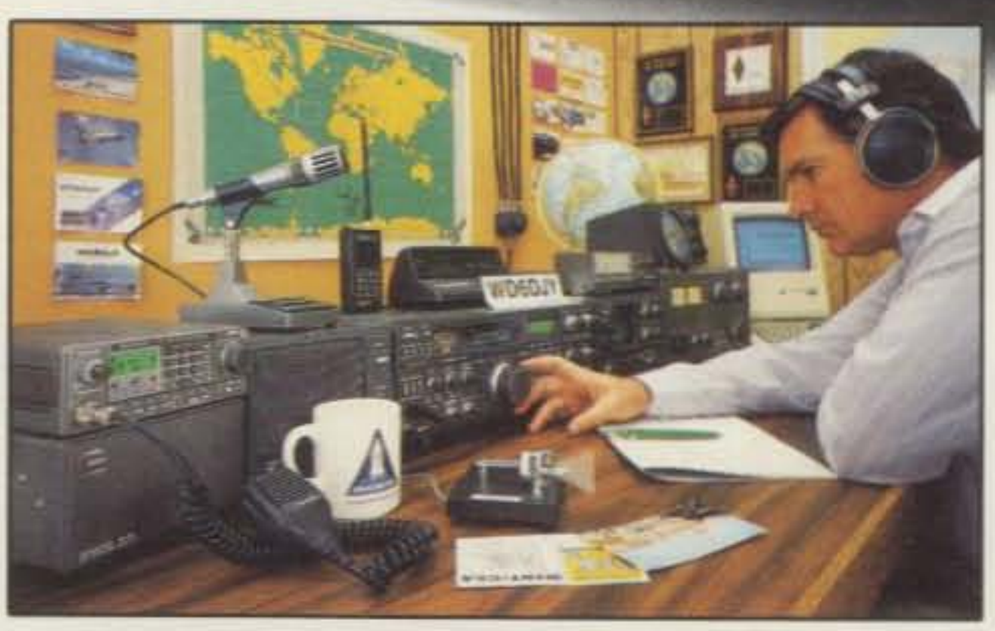

More TS-940S information is available from authorized Kenwood dealers.

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"Digital DX-terity!"

TS-430S

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- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:
- PS-430 compact AC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands
- AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands
- TL-922A 2 kW PEP linear amplifier
- FM-430 FM unit
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- YK-88A (6 kHz) AM filter
- MC-42S UP/DOWN hand mic.
- MC-60A/80/85 deluxe desk mics.
- SW-2000/200A SWR/power meters
- SW-100A SWR/power/volt meter
- PC-1A phone patch
- HS-4, HS-5, HS-6, HS-7 headphones

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- Wide receiver dynamic range, Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- Noise-blanker threshold level control.
- IF shift (passband tuning).
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- SSB monitor circuit.
- Built-in digital display, (fluorescent tube), with analog dial.
- Narrow/wide filter selection on CW.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner/SWR/power meter.
- SP-230 external speaker.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

TS-530SP HF transceiver.

This "Cents-ational" HF transceiver is recognized worldwide for superior and dependable performance.

- 160-10 meters, LSB, USB, CW, all Amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- IF shift tunes out interfering signals.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220 W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone.
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

More information on the TS-830S and TS-530SP is available from authorized Kenwood dealers.

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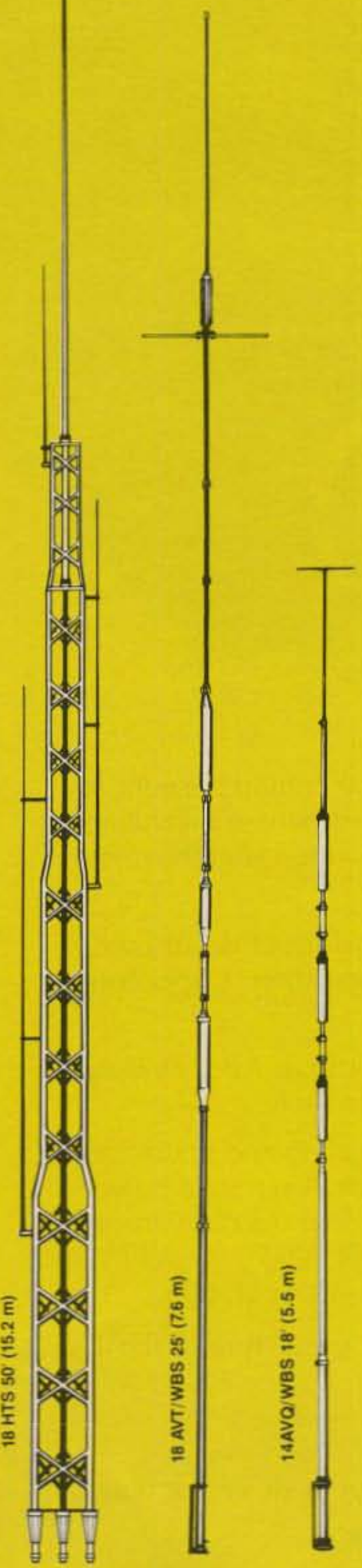
Hy-Gain broadband vertical antennas load the new auto-tune solid state rigs, require minimal space and provide low angle radiation without the expense or the problems of support structures.

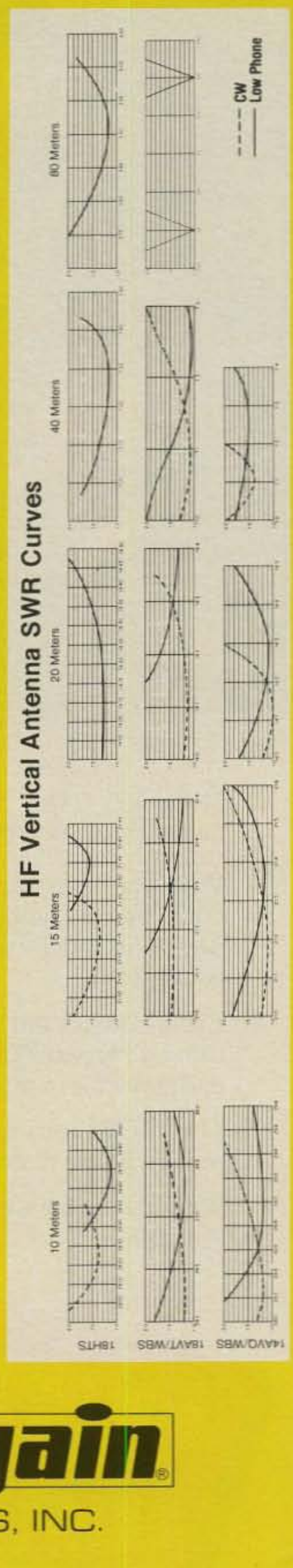
18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils for consistent performance at 2:1 or lower VSWR on 40-10 meter band edges; bandwidth on 80 meters is approximately 40 kHz with VSWR below 2:1. A factory tuned matching network for 50 ohms impedance is dc grounded for lightning protection and reduced precipitation static. The mechanical integrity of this antenna is so stable that performance does not change with the weather. The 18AVT withstands winds to 80 mph (128 km/h) without guying. All stainless steel hardware is included.

14AVQ/WBS (40-10 meters) Offers very similar construction and the same excellent broadband performance as 18AVT over the entire 40, 20, 15 and 10 meter bands; automatic band switching with mechanically superior large-coil Hy-Q traps and very low angle radiation pattern. The smaller, low visibility size also makes the 14AVQ very suitable for roof mounting. The optional 14RMQ roof mounting kit includes base plate, mast and radial/guy wires. All antenna hardware is stainless steel.

18 HTS (80-10 meters. 160 meters with optional loading coil) The superb reliability of the 18 HTS is manifest in installations now over 20 years old. And, with the improvements we made over the years, the 18HTS is now better than ever. Automatic band selection is achieved through a unique stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼ wavelength (or odd multiple ¼ wavelength) exists on all bands. For example, outstanding broadband performance on 20, 15 and 10 meters is achieved with an extended ¾ wave collinear. On 80 meters bandwidth is approximately 250 kHz at 2:1 VSWR. With the optional base loading coil exceptional performance is also provided at 160 meters. The galvanized tower requires no guying and withstands winds to 100 mph (160 km/h). A special hinged base allows complete assembly at ground level and permits easy raising and lowering. Includes stainless steel hardware.

Other Hy-Gain vertical multiband antennas are available though not shown here. The 12AVQS (20, 15, 10 meter) is similar to 18AVT above but with VSWR of 1.5:1 or less on all bands. The 18VS (80-10 meter) comes with a base loading coil and may be installed on a short mast driven into the ground. All include stainless steel hardware.





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Every component is chosen to work well below its rating. The power transformer is our own, using a Hypersil® tape wound core, generously designed for excellent regulation. Capacitors and inductors are also made in-house for close quality control.

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The TITAN could easily be your final FINAL AMPLIFIER.

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The Radio Amateur's Journal

ON THE COVER: Walt Disney World's Goofy helps us celebrate the holiday season. On the left is Steve Treiber, N4JRT, the President of the Walt Disney World ARC, and on the right of Goofy is Jim Scholten, AD1V, Secretary, Treasurer, and Trustee of W.D.W.A.R.C. Photo by Larry Mulvehill, WB2ZPI.

DECEMBER 1985 **VOL. 41, NO. 12**

FEATURES

DEPARTMENTS

Zero Bias AN EDITORIAL

Back in June I wrote about amateur radio getting publicity via a natural disaster. I wasn't trying to be prophetic in the light of recent history in Mexico City, but I did want to point out that "good" came about through some real human suffering. The suffering did occur and the tragedy lingers on for many people. In retrospect, if there was not one scintilla of media coverage on amateur radio other than what appeared in our own press, we amateurs would still have derived a positive benefit for ourselves. We can (and do) feel really good about ourselves and amateur radio. It does work.

On one hand, the task was monumental, impossible to plan for or even to organize an immediate collective response. People, individual people, stepped in and took up the task of trying to help in any way possible. When all else failed, amateur radio came through, and very proudly I say amateurs came through. Individual amateurs stayed on the air for days on end handling emergency traffic and requests for aid, and were simply a voice out there letting these people know that they were not alone and that help was coming.

National press and TV coverage of the earthquake was immediate, and since the only hard information was coming from amateur radio, they all scurried about to find amateurs to show. I am still getting clippings from local newspapers showing pictures of amateurs. These amateurs are not "stars" or self-consumed with inflated egos. Rather, they look tired and worn after many hours and days of keeping open a communications link. There weren't the stories of who did what first nor one-upmanship nor totals of tens of thousands of messages handled. It was the story of people—people in trouble—and a group of people with skills, radio equipment, and a lot of heart doing remarkable things.

Naturally, we can expect more people to become aware of and hopefully interested in amateur radio through this exposure. Even though a lot of us were not directly involved with the crisis period, we all represent those who were. Your antenna is a little less of a menace in the neighborhood now, and the tremendous good that was done by amateurs and amateur radio has changed a lot of folks' views of your activities. People are more inclined to ask questions about amateur radio now while everything is still fresh in their minds, so take the time to answer them, and if possible invite them over to see how it works. What we do is not that mysterious. It's only how we get there that is.

In this holiday season everyone's spirits get buoyed up. We'd all like the year to end on a happy note, find great stuff under the tree, and be able to look forward to an even better 1986. The happy feeling is enthusiasm, and our dedicated fellow amateurs have given all of us a present in their selflessness. Share the pride by sharing the hobby this year. In the months to come we'll find out exactly who did what, how it was done, and all of the details that really only interest us—those who are already amateurs. The victims of this disaster, their families and friends, the public at large, and perhaps potential amateurs see us differently now, or may even see us for the first time. It's a positive time all around right now. Let's use it.

Each of us has his own way of celebrating the holiday season. Most traditions involve family and close friends who gather together and share in the celebration. It's a warm and joyous feeling. We wish each other well, send cards, and exchange gifts. People have even been known to wish season's greetings to total stangers. It's infectious, and it makes you feel good. This morning I got a clipping in the mail from Otto Dedrick, W6NGK, concerning the Mexico City earthquake. The article was written by Tom Hennessy (not an amateur) and appeared in the September 24 edition of the Long Beach, California *Press-Telegram*. Mr. Hennessy shares with his readers his own experience with amateur radio during the height of the first days' effort to bring help to the stricken city. I called the newspaper and asked for permission to reprint the article, as I thought it was done from a unique position. It's a tremendous PR piece for amateur radio written by a nonamateur. Reading it does make you feel good to be part of the process.

So if amateur radio needs a boost in your neighborhood this coming year, slip a copy of Mr. Hennessy's article in with your usual greeting card.

73, Alan, K2EEK

"Ham" radio was compassion's only open line to stricken Mexico

by Tom Hennessy

Beyond eavesdropping, I know little about amateur radio operators, more popularly known as "hams."

There is a short-wave receiver in our house. For two years it has provided pleasant listening: cross-country gossip, the joy of a Missourian contacting a ham in Tahiti, the lament of a snowbound New Englander about to go outside to get more logs for the fire.

On Thursday, all that changed. When the earth rumbled fearfully beneath Mexico, our receiver suddenly became an arena of drama and caring.

With much of Mexico isolated, one of the first to speak to the outside world was Frank Meckel, a radio operator 18 miles north of Mexico City. Amid the horror, his voice was soft and magnificent as he fielded questions from U.S. hams. "Frank Meckel at your service."

Hours after the first quake, he retransmitted a newscast from an English-language FM station in Mexico City. It gave more information than U.S. networks had that evening.

From the moment of the first quake, Meckel, fellow Mexican operators, and U.S. counterparts performed incredibly.

What happened was this. As the hours wore on, Americans who once may have viewed ham operators as harmless hobbyists began realizing they were virtually the only people in a position to obtain information about the fate of loved ones in Mexico.

By the hundreds, then by the thousands, inquiries poured into Mexico via amateur radio. "Is the Garcia family safe?" "Can you get word about the Mendozas?"

Via radio and whatever phones were working, Mexican operators found the answers and sent them crackling back to the U.S.

"The Portillos are fine, but had to be evacuated."

"Your family has no personal injuries, but they have had material damage. Two houses collapsed."

Emotion rode high. In Walla Walla, Wash., an anxious relative stood by a ham requesting information about her family. Assured that the family was safe, the Washington operator's voice broke. "She's crying," he said, "and so am I."

Not all messages were reassuring. "We have an emergency situation here with two dead," a voice said urgently, then vanished into the ether.

Battling static, confusion and sleepiness, the hams kept on. One in Mexico apologized that he was stepping away for "a bit of breakfast." It was four o'clock in the afternoon. Another, named Luis, was still answering inquiries hours after someone noted he had not slept for two days.

When more power lines were lost in Mexico City Sunday (knocked down during excavation work), some operators went over to batteries, then recharged them from automobiles.

Occasionally, but only rarely, an inquiry revealed materialism. "Was our boat damaged?" one American asked. Amid the talk of life and death, the question was rightfully ignored.

Other inquiries made it clear that some in the U.S. did not comprehend the extent of the devastation. An Alaskan wanted relatives in Mexico to phone her collect. "Negative, negative," said a ham. "We are isolated from the world."

Learning her house in Mexico had been destroyed by the second quake, a Kansas City, Mo., woman radioed: "I feel pretty bad. We had the home just the way we wanted it. But I guess we're lucky. I guess a lot of people are buried."

Throughout, there was drama. "A mother was pulled out of a (collapsed) maternity hospital and was no sooner pulled out than she had her baby," said one ham, location unknown.

"It's a heckuva way to come into the world," responded a ham in Texas.

Offers to help poured through the U.S. airwaves. "I'll do whatever you want me to do," a Maryland operator told another in Mexico City. One U.S. ham offered to make long-distance calls at no charge. Another advised that a trauma team was en route to Mexico from Oregon.

Yet another regretted having to leave his radio for an overseas business trip. His final transmission: "My heart goes out to you."

It would be inaccurate to say everything went perfectly. For one thing, there were more inquiries than the hams could handle in months. And, on occasion, a very few hams blocked out emergency traffic with idle chatter.

But as I left for work Monday, the amateur radio operators were still on the job. A calamity had produced a world without strangers or international borders; a radio world populated by people who, bone-weary, still could not do enough for one another.

"Amateur" radio operators?

Not by a long shot.

PACKET EVOLUTION

ANOTHER BREAKTHROUGH FROM AEA

Packet + RTTY= Pakratt™ PK-64.

If you 've read about packet, or are already into it, you know how exciting it is. With the hot new Pakratt PK-64 we've just brought a new dimension to packet. The Pakratt PK-64 is a complete, fully assembled and tested packet radio controller which, together with a Commodore 64 or 128 computer, can convert your shack into a packet operations center.
And we've included a new version of our advanced MBA-TOR™ software to make it the first packet controller with AMTOR, Baudot, ASCII and Morse. But an even more exciting part of the Pakratt controller is its great price.

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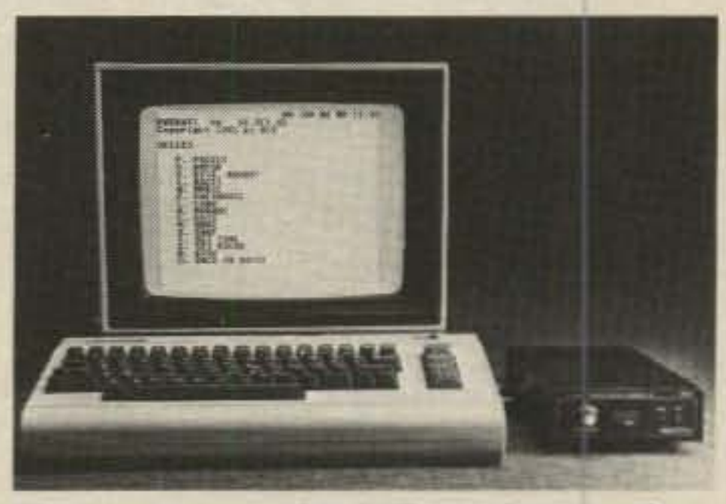
Just plug the Pakratt controller into the C-64's game cartridge slot, add a mic connector for connecting to your particular transceiver, and you're set.
If you're anxious to try it out, our new "quickstart" manual section can get you on the air in under ½ hour.

Simply Powerful

The versatile Pakratt controller shows messages and connect status simultaneously on your Commodore with a unique split-screen display. And it lets you



PK-64 shown with HF modem option.
Computer not included.

send letter-perfect text from the text editor software while monitoring incoming messages. The 20K byte QSO buffer stores more than 20 video screens of text! Disk commands let you save specific operating parameters for quick set-up for emergency services, clubs, and multiple frequency use. And the Pakratt controller's standard, TAPR style modem gives you 300 and 1200 baud operation with great HF/VHF performance.

We can't possibly list all of the important features of Pakratt here. But the absolutely best part of the Pakratt PK-64 is that it's at your dealer now. So stop reading, run down to your local dealer, and check Pakratt out. Because the real challenge will be to find one after the other hams see it.

Pakratt PK-64. Packet Power from AEA. At amateur radio dealers everywhere.

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Our Readers Say:

Supports Expansion of Novice Privileges

Editor, *CQ:*

I strongly support the proposed expansion of Novice privileges. During the peak of the last sunspot cycle, I sat on the island paradise of Kauai, Hawaii and operated HF (or monitored) for 8–12 hours a day. In the bands most crowded condition, the 10 meter QSOs clustered between 28.5 to 28.7 MHz. I carried on some 3 hour ragchews in the 29 MHz range with never a trace of QRM or a breaker. Those who oppose opening parts of 10 meters to Novices because of the fear of QRM are basing their arguments on a false premise.

Some of my nicest sideband QSOs were with Australian and Japanese Novices. Most of them were more gentlemanly and polished than many of the lids who thought 30 years in ham radio had turned them into radio royalty who owned a certain frequency.

We probably blew it when we nixed no-code for 220 MHz. If we don't get some substantial activity on the upper bands, we may lose them. We now have another chance to bring some life to these bands.

Yes, I was first licensed over 30 years ago and am an Extra. But I am not for the status quo, because our wonderful hobby is in the final stages of a terminal illness. If we want it to survive, we had better spawn some offsprings in a hurry. I am depressed from listening day after day to discussions of gallbladder operations and who is taking the most medication. Let's add to WAS, et al the "TMP Award" (Takes Most Pills Award).

Most everyone talks about getting "fresh blood" into the hobby. We had better, because even Geritol can't revive the "tired blood" that now flows, ever so slowly, through the arteries of ham radio.

Richard C. Rhodes, KH6IO
San Antonio, TX

"QSL—Sends Spoons" Goes On

Editor, *CQ:*

It seems that the "odd" QSL bit has turned into a "Can you top this?" contest, and I couldn't sit idly by and let my style of QSLing go by.

Butter—spoons—flags are nice, but coming from the poorer class of amateur, I had to resort to a more common item found in abundance in our area— namely, anthracite hard coal. So as an entry into the Crazy QSL Card Contest, I have been giving QSLs to a number of stations in the form of a three to five pound chunk of anthracite hard coal. I would put my call letters on the coal chunk with decals found in the local hardware store, and then rubber stamp the QSO information on a self-stickum label and place it on one of the more flat parts of the coal chunk.

What makes this a one-of-a-kind, unique QSL card is that the coal comes from the hardest hard coal that is mined anywhere in the world. I take walks out on the mountains here and pick up these coal chunks at random that have been left by the coal-mining company. At present I have a number of chunks lying around the shack.

I have been QSLing in this manner since the early 1950s. So if I ever work you sometime, you might earn yourself a chunk of coal.

Allen Breiner, W3TI
Tamaqua, PA

PS: Like your mag, especially the DX column. I'm also a home brewer. Keep up the gud werk.

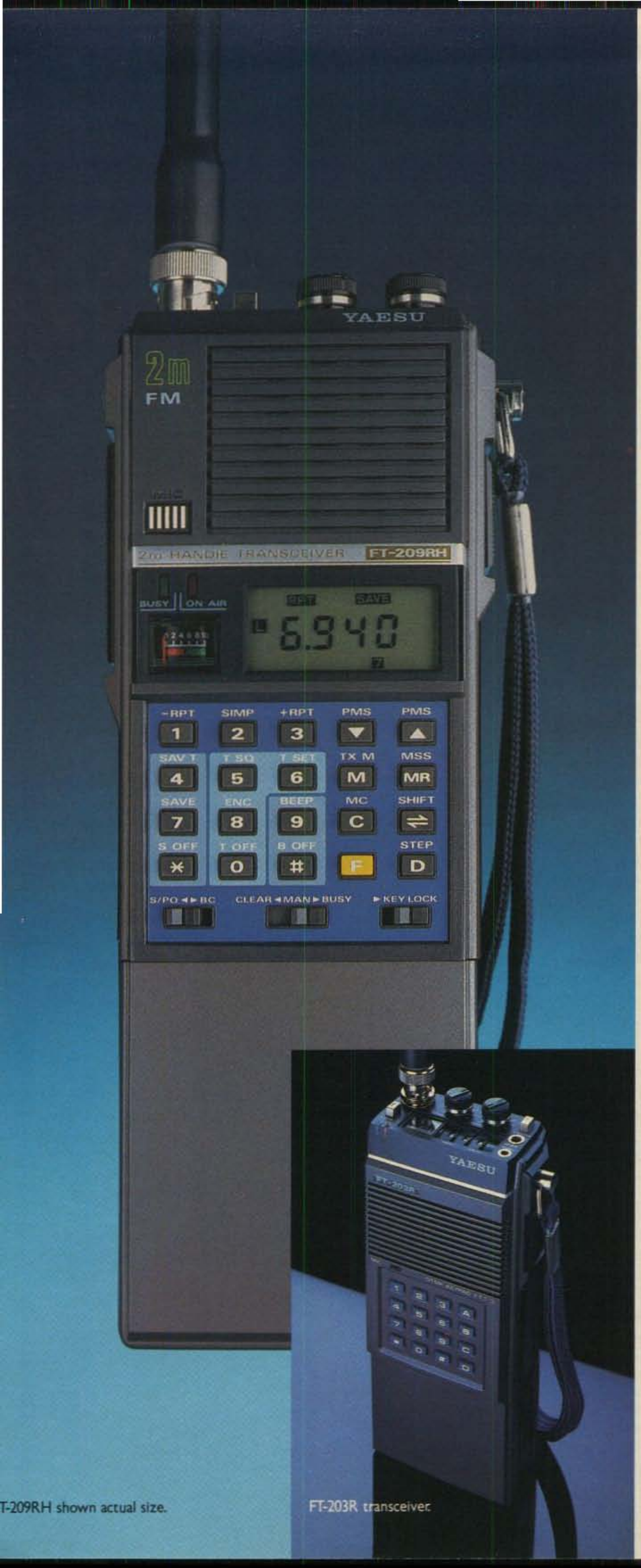
VHF To The Point

Editor, *CQ:*

Please allow me the opportunity to express my personal feelings re the June 1985 VHF column by Steve Katz, WB2WIK. As you are certainly aware, the technological evolution in electronics, which has also impacted upon amateur radio, has resulted in each of us playing a game of "catch up" just to keep pace with the universe of changes affecting our hobby, and our understanding of same. As a result, it is easy to lose sight of some of the basic principles which are quite necessary for not only a practical understanding of how things function, but also why they function as they do, and what steps can be taken to better ensure the desired result.

In reviewing this particular column, please be aware that Mr. Katz more than adequately, and in straightforward understandable English, provided a scenario about the basic principles of frequency modulation, FM antennas, and most of the problems and questions frequently encountered and asked by all of us at one time or another. His handling of this subject matter was clear and concise, informative, and did not require a review of volumes of handbooks, license manuals, or other specialized texts. He should be commended for his accomplishment! By design or accident, Mr. Katz somehow managed to circumvent the unnecessary, esoteric, technical jargon usually contained within journals supposedly oriented toward a wide range of readership.

Harry G. Hess, K9MDK
Oak Lawn, IL



FT-209RH shown actual size.

FT-203R transceiver.

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For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

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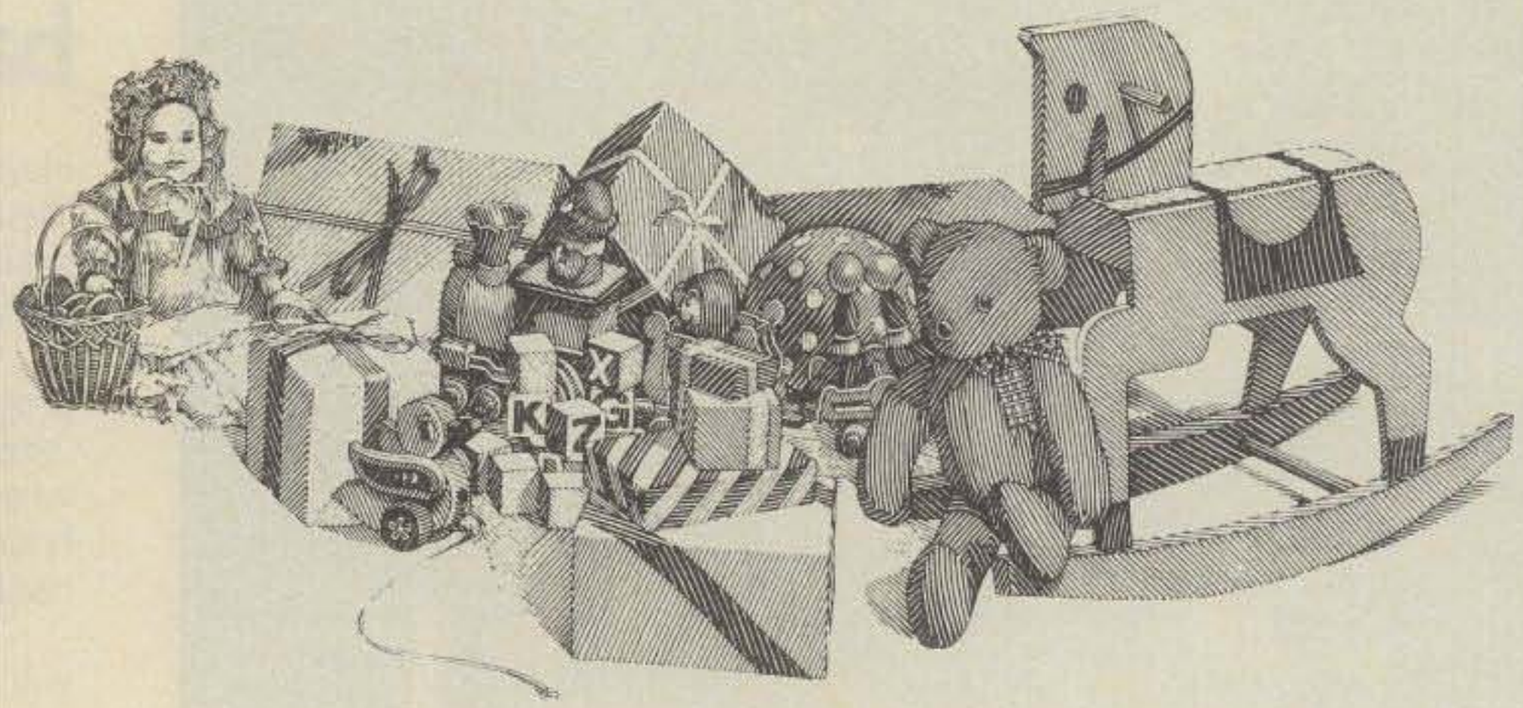

• **DX Hall of Fame Nominations** - The *CQ* DX Awards Advisory Committee is now receiving nominations of prominent DXers deserving consideration for the DX Hall of Fame. Names, calls, and a list of accomplishments should be mailed to Committee Chairman John Attaway, K4IIF, P.O. Box 205, Winter Haven, FL 33882. Nominees to the DX Hall of Fame should have made major contributions to DX over a period of several years, at no personal gain to themselves, and often at great personal sacrifice.

• **Northwest Amateur Radio Society Formed** - The Northwest ARS is a new general radio club serving Houston, Texas, and communities north of downtown. Meetings of NARS are held on the next to the last Friday of the month at the Cypress Creek Emergency Medical Services Building, 16650 Sugar Pine Lane, Houston. For more information on the club, contact the Northwest ARS, 17802 Birch Forest, Spring, TX 77379.

• **Rag Chew Net To Be Formed** - WB0YCQ would like to get in touch with anyone interested in starting a rag chew net on 6 meter FM simplex, 52.660 in San Diego County, San Diego North County, and beyond. Contact Henry Kirschner, WB0YCQ, 266 Carissa Drive, San Louis Ray, CA 92056-1745.

• **Piper Cub Airplane Fly-In** - Piper Cub owners and pilots will attend a Piper Cub "Fly-In" in Lock Haven, Pennsylvania from July 13–19, 1986. Volunteers are needed to help with the event, which will include over 1,000 participants. Amateur radio clubs in the area will provide communications, including a "fly-in talk-in" and possibly a Special Event station. For more information, contact John B. Kruk, K3KR, 407 Irwin St., Lock Haven, PA 17745.

• **W1FHP From "Little Town of Bethlehem"** - Bethlehem, Connecticut station W1FHP will be operating the entire month of December on 10, 15, 20, and 40 meters as a Christmas Special Event. There will be an award for working any four Bethlehems around the world. Send only a stamp and if possible an address label to Hen House Gang ARC, Hard Hill, Bethlehem, CT 06751.

• **Ham Central 1985** - On Sunday, December 1, Radio Central ARC will hold Ham Central 1985 at the Lutheran School, St. James, Long Island, New York, Doors will open at 7:30 a.m. for sellers and 9:00 for the public, and will close at 3:00 p.m. This will be an ARRL Hamfest with prizes and seminars. For more information, contact Bob Yarmus, K2RGZ, at 516-981-2709, or Andy Feldman, WB2FXN, at 516-928-3868.

• **NOARS Annual Awards Banquet** - The Northern Ohio Amateur Radio Society will hold their annual awards banquet on Saturday, December 7, in Lorain, Ohio. The cost is $10 per person. Tickets must be obtained by November 28th (*we hope this reaches you in time—ed.*) from Gary Gargus, N8DIU, 1965 N. Ridge Road, Lorain, OH 44055 (216-277-6171).

• **Handi-Ham Winter Hamfest** - The annual Handi-Ham Winter Hamfest will be held Saturday, December 7, at the Eagles Club in Faribault, Minnesota starting with registration at 9 a.m. There will be a Handi-Ham equipment auction, dinner at noon, followed by a program. Talk-in on 19/79. For more information, contact Don Franz, W0FIT, 1114 Frank Avenue, Albert Lea, MN 56007.

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at 13.8 V - High Power = 5. watt

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From: Everett L. Gracey, President

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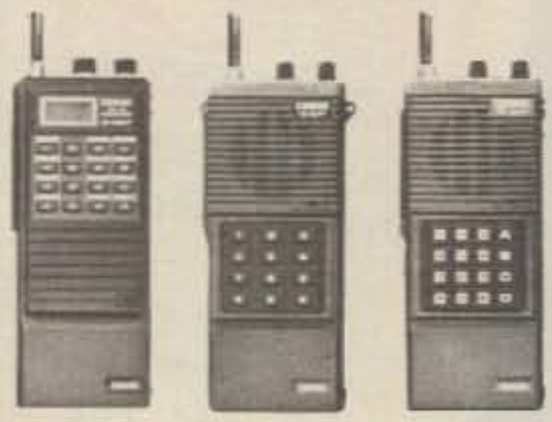

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The Silver City Kilowatt

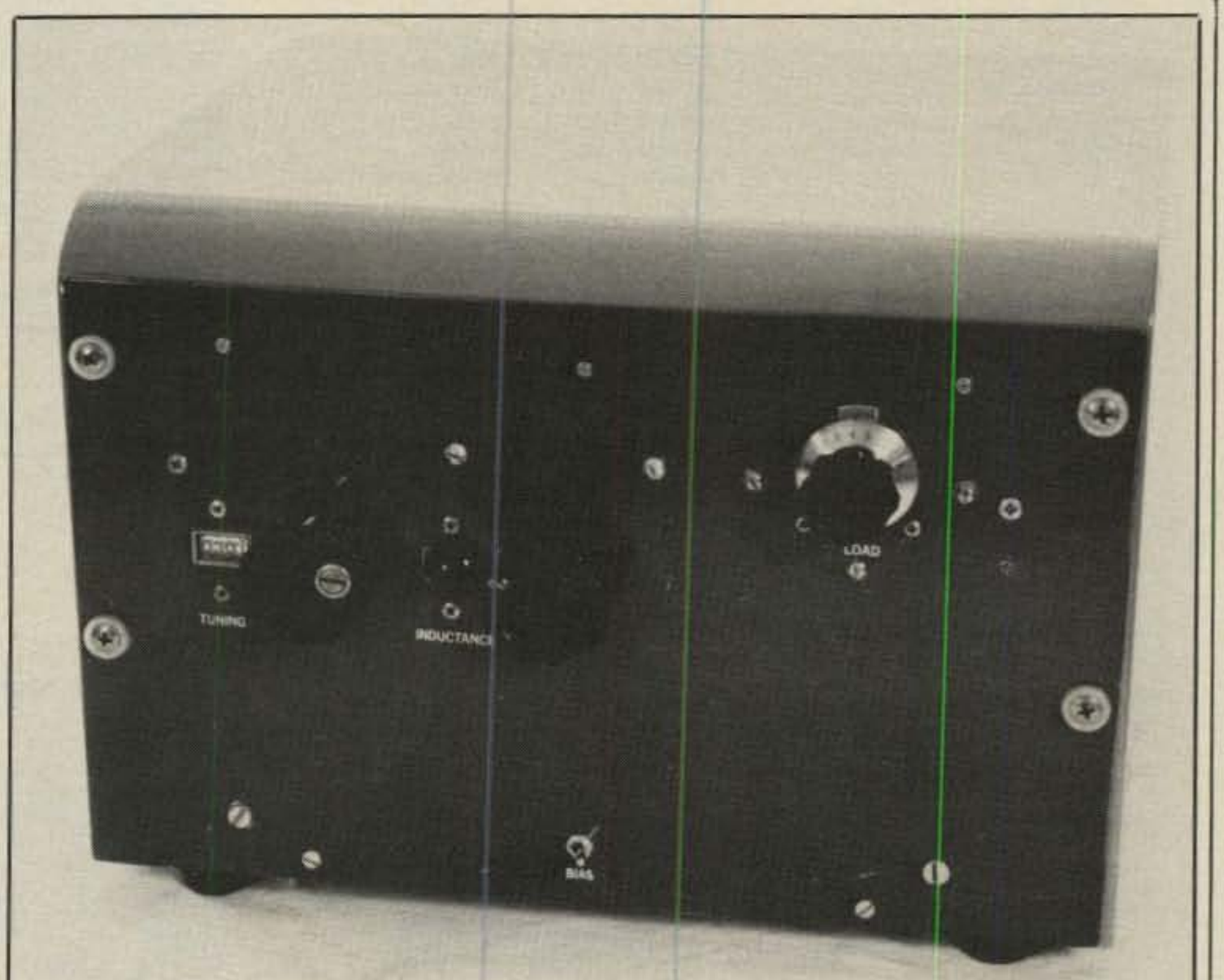
Or, How to Beat the High Cost of Power

BY DEAN BATTISHILL, W5LAJ*, AND LEW McCOY, W1ICP**

This is the story of how to build a low-price kilowatt amplifier. Dean, W5LAJ, did the construction work on this little jewel. I, Lew McCoy, am doing the writing of how it was built. (At the outset I should add the remark that if you have any problems, write to Dean, not me.)

During one of our frequent discussions about the high cost of living, and particularly the cost of some amateur gear, Dean made the observation that there are items that amateurs can build and save quite a few bucks. Among other remarks, he said that he thought he could build a KW amplifier for about $100, and naturally I challenged him. However, I lost my challenge as you can see from this article. There were no ground rules as to how Dean would get the parts, or what he would use. However, he set out to show that by careful selection of junk-box components, plus swapping savvy added to careful fleamarket purchases, the result could be the amplifier shown in the photographs.

Don't expect to go to some parts store and buy the components used here. In the first place, a parts store would probably never carry them, and if they did, they would cost a fortune. You are going to have to attend fleamarkets to find similar components. You are going to have to search through your junk box. You will have to collect sales catalogs from people who sell surplus. You will have to know Ohm's law so you can make substitutes. You are going to have to search your buddy's junk storage. In other words, you are going to have to use that supposedly special quality with which all amateurs are endowed—ingenuity! However, if you persevere, you'll wind up with a really nice linear amplifier with more features than any



Here is the Silver City Kilowatt, nothing pretentious, but it sure gets the job done. At the far left is the turns counter for C1, which in our case was a vacuum variable. However, an air variable is fine. (Keep in mind that we used what we had and could scrounge). Next, to the right, is the variable inductor, and in the upper right-hand corner, the output tuning.

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	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.

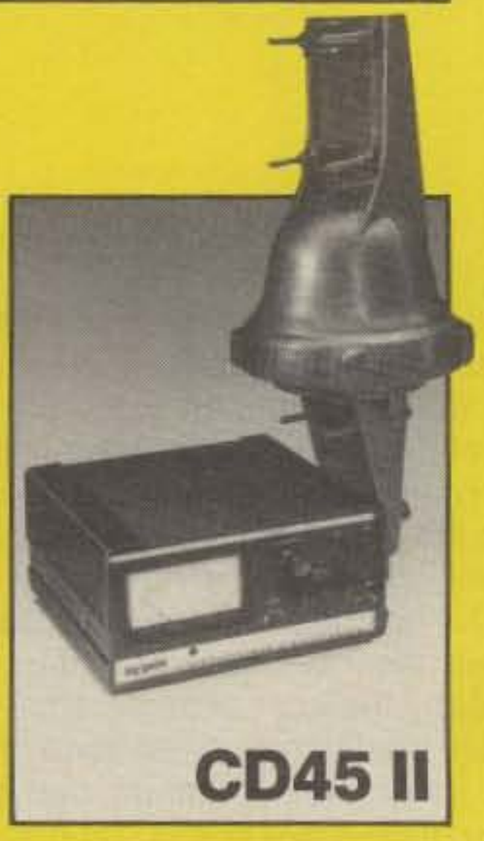
T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

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.

HDR300

AR40



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- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
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- 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.

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And working the DX has never been easier with dual VFOs, single-button VFO/memory swap for split-frequency operation, eight memories, and push-button quick memory and band scan.

The 757 also lets you listen from 500 kHz to 30 MHz with its high-performance general coverage receiver. The transmitter covers 160 through 10 meters, including the new WARC bands, with 100 watts output on sideband, FM and CW.

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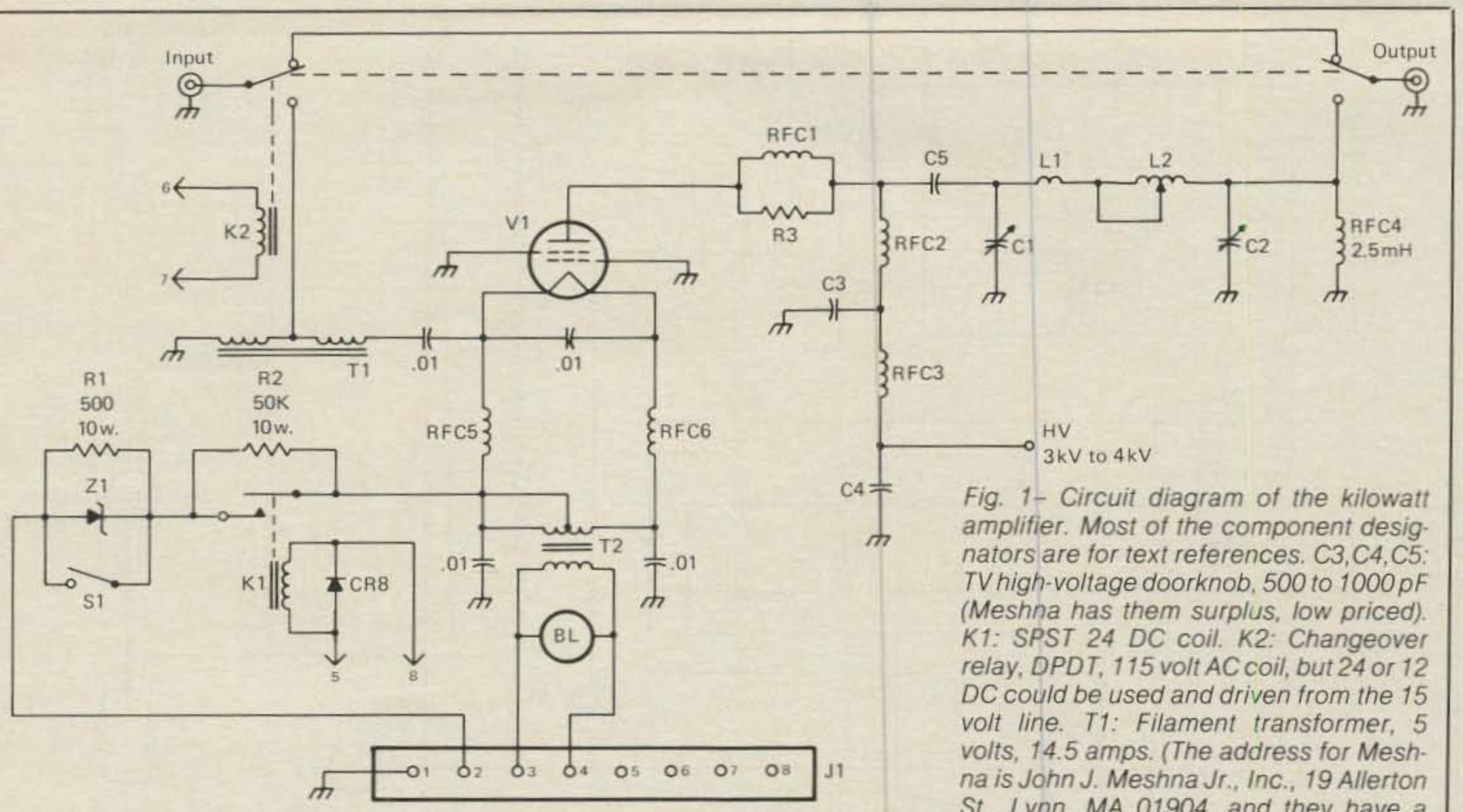
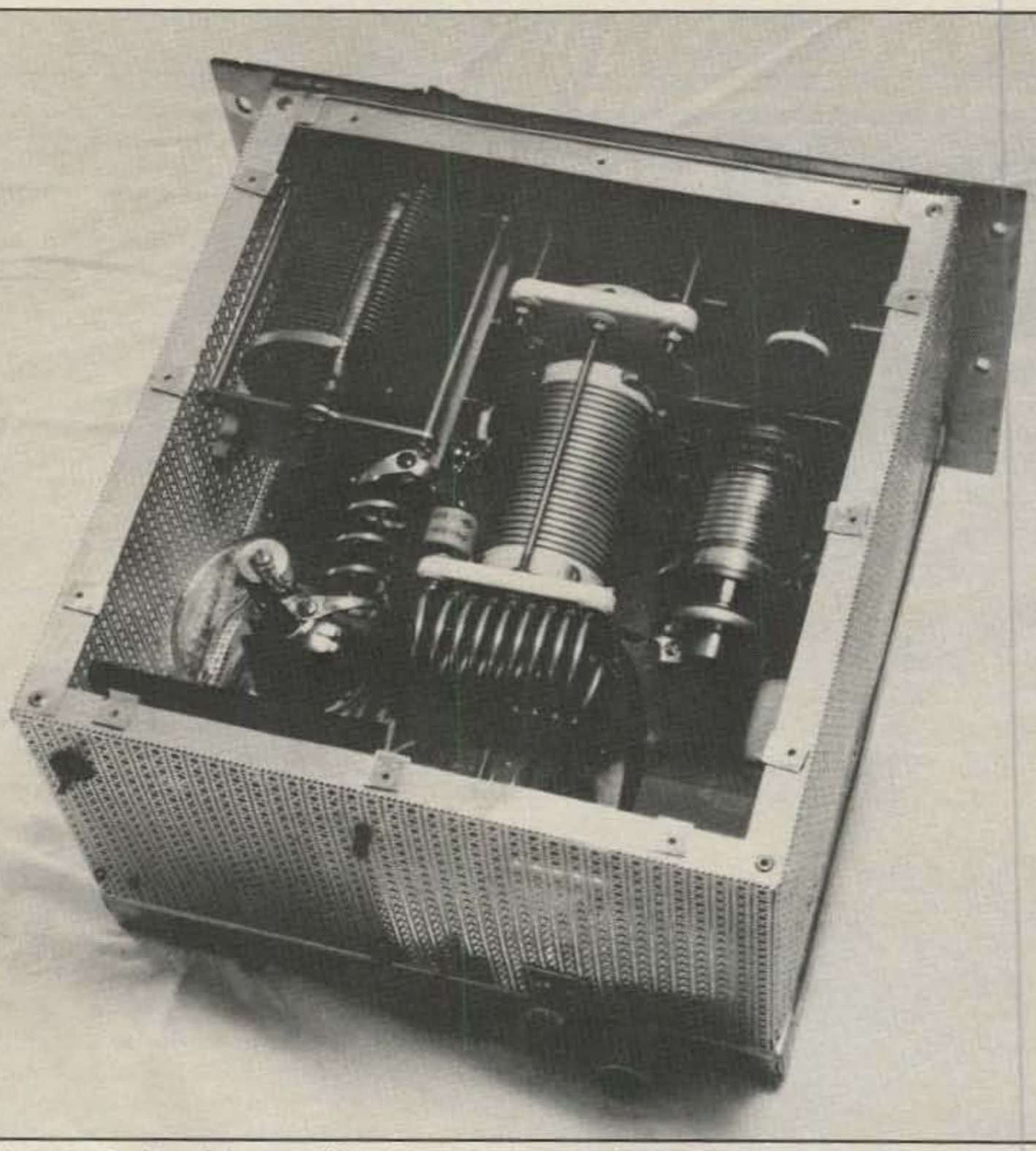


Fig. 1– Circuit diagram of the kilowatt amplifier. Most of the component designators are for text references. C3,C4,C5: TV high-voltage doorknob, 500 to 1000 pF (Meshna has them surplus, low priced). K1: SPST 24 DC coil. K2: Changeover relay, DPDT, 115 volt AC coil, but 24 or 12 DC could be used and driven from the 15 volt line. T1: Filament transformer, 5 volts, 14.5 amps. (The address for Meshna is John J. Meshna Jr., Inc., 19 Allerton St., Lynn, MA 01904, and they have a catalog. Palomar Industries advertises monthly in CQ.)



This is the inside of the amplifier. The tube is at the far back corner, and the muffin fan is just visible.

commercial unit, and it won't cost you an arm and a leg.

What It Is

The amplifier was designed as two units—the amplifier itself and a separate power supply. All metering for the amplifier is done in the power-supply section—and for a good reason. One of the problems we have is TVI, and it is much easier to simply bypass the meter leads rather than do extensive metal work to shield the meters if they are in the RF unit.

The amplifier was designed to run at least a kilowatt input. I realize that amateurs now measure power in output, with 1500 watts PEP being the legal limit. However, in this case it is easier to talk in terms of a kilowatt input versus output, so forgive us for being old-fashioned.

Fig. 1 is the circuit of the linear, and grounded-grid operation was chosen for the mode of operation. Several different tubes can be used in the amplifier, including a 4-250 (less power), the 4-400, or a 3-500Z. In this case, it depends on what you can acquire in the way of tubes. The amplifier initially had a 4-400 in it that was acquired used (for free) from an FM broadcast station. However, at a recent fleamarket a 3-500Z was acquired for (forgive us!) only $5.00.

I know I mentioned it above, but before going on I should add that any of the parts that were not on hand were obtained, primarily, at nearby hamfest fleamarkets. (Nearby in New Mexico means within 350 miles!) The cabinets and chassis just

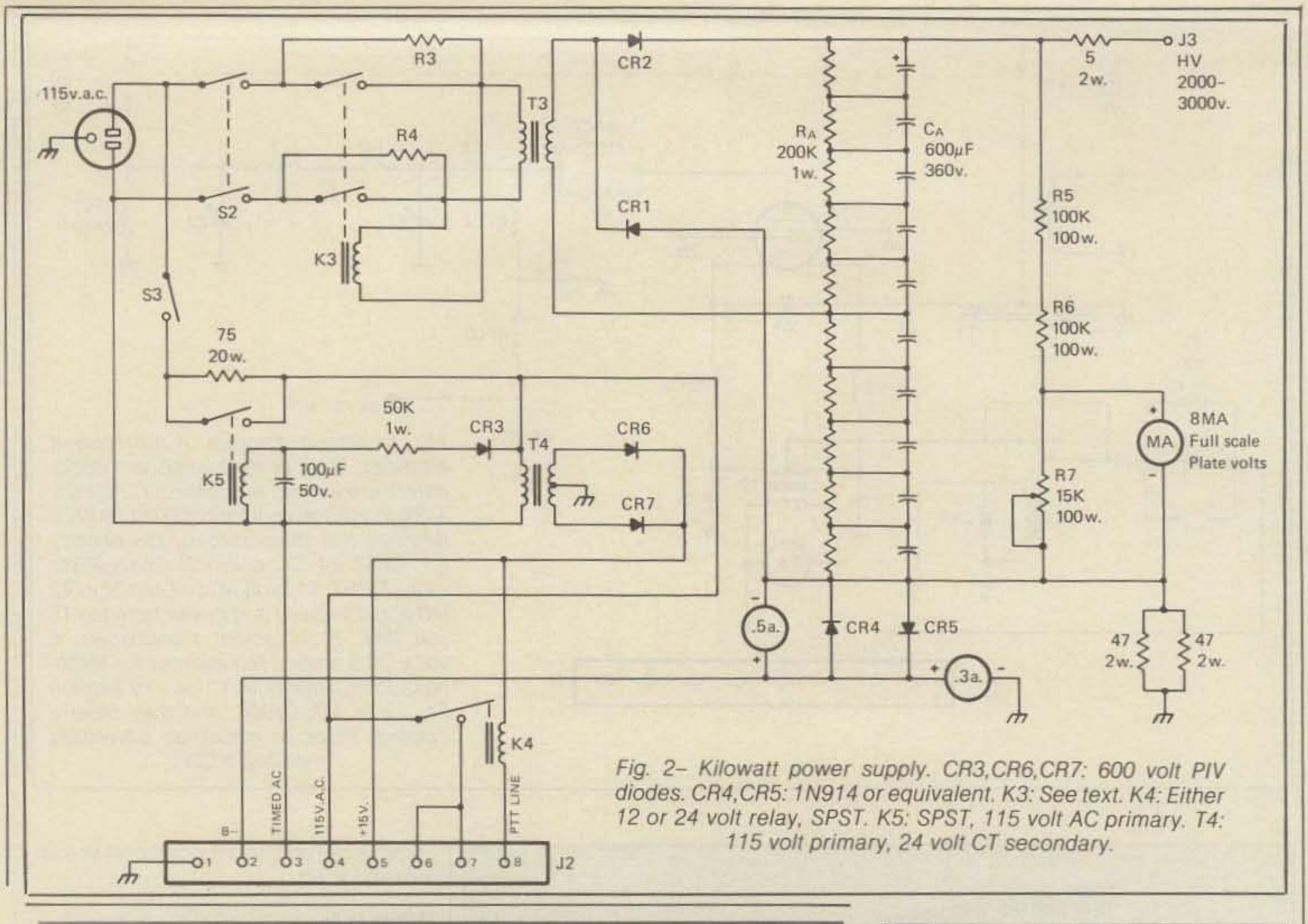


Fig. 2– Kilowatt power supply. CR3,CR6,CR7: 600 volt PIV diodes. CR4,CR5: 1N914 or equivalent. K3: See text. K4: Either 12 or 24 volt relay, SPST. K5: SPST, 115 volt AC primary. T4: 115 volt primary, 24 volt CT secondary.

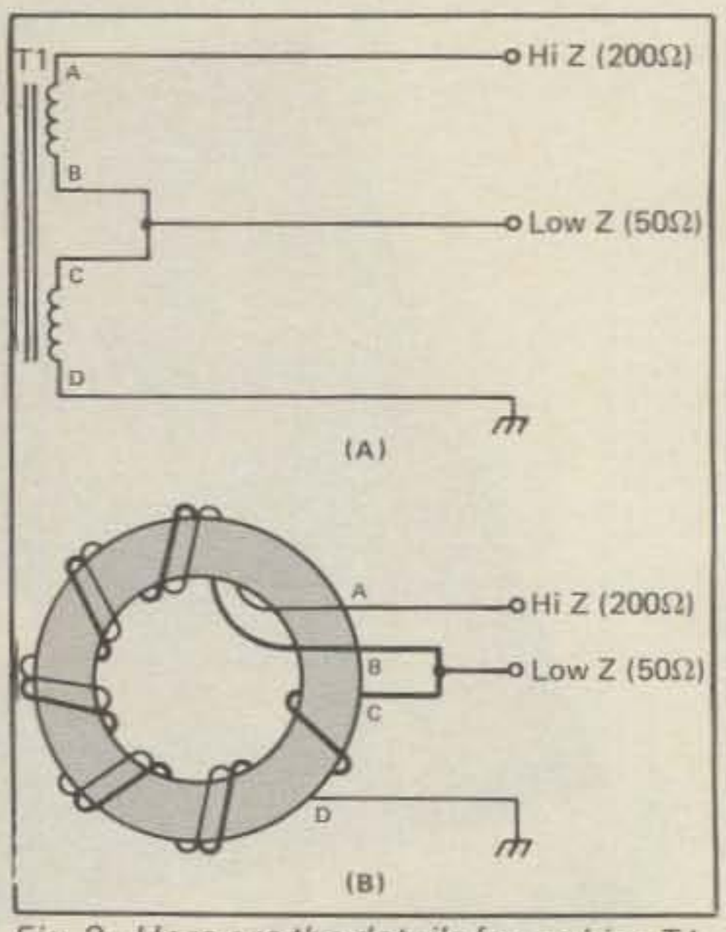


Fig. 3– Here are the details for making T1.

enough connections. B1 is the blower motor—more about that in a moment.

Power Supply

The power supply is shown in fig. 2. The supply, as much as the amplifier, is where scrounging ability and ingenuity come into play. In this supply the power transformer has a 115 volt primary with an 1100 volt center-tapped secondary with a 500 mA rating. There are several

happened to come from the local garbage dump. In fact, the chassis was made from aluminum "Do Not Walk On The Grass" signs! So if we emphasize scrounging, we really mean it.

Circuit Details

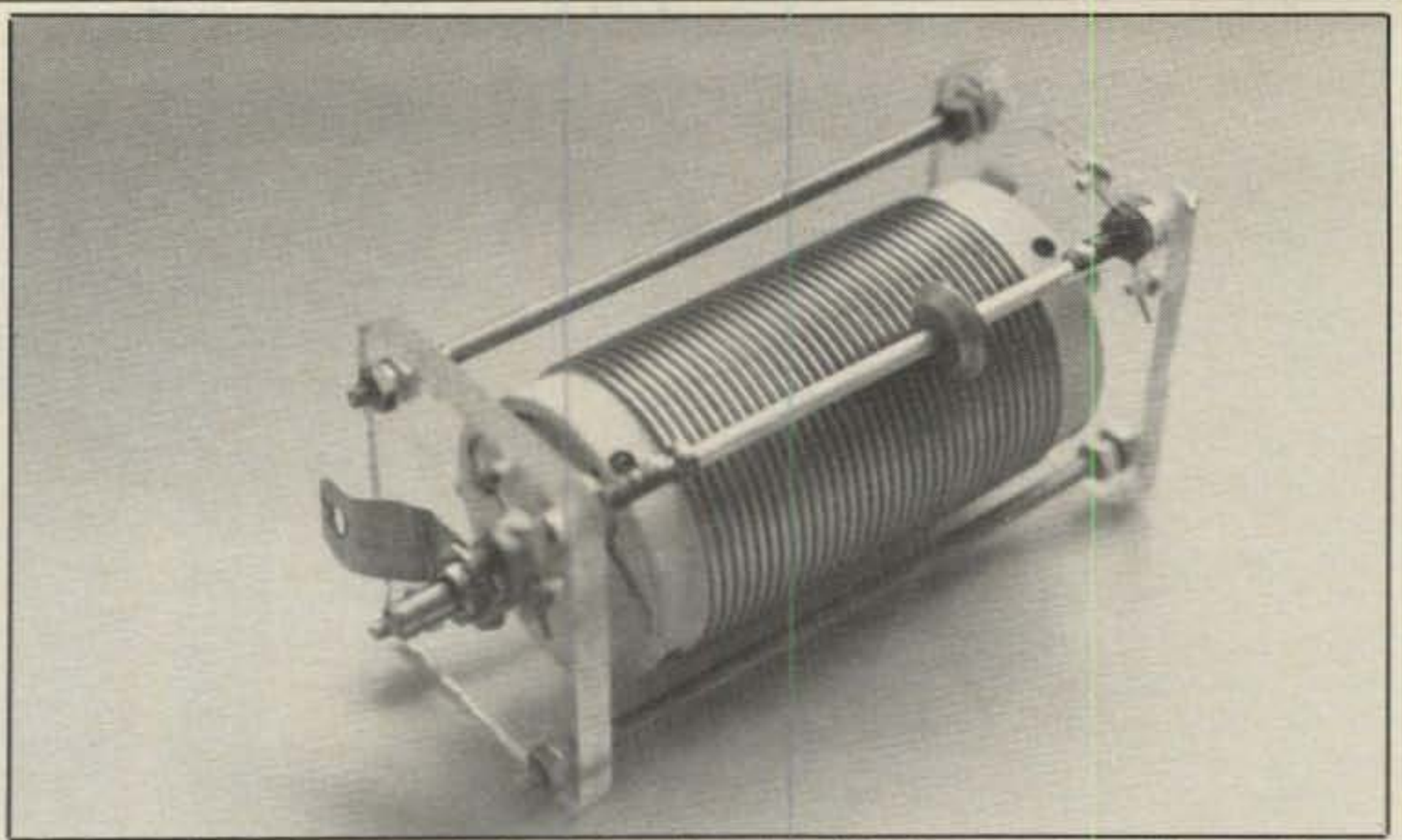
This amplifier has a carefully measured output of about 750 watts with the 4-400 and well over 800 watts with the 5-500Z. Referring to fig. 1, you'll note that a roller inductor, L2, is used for the tank circuit coil. We had one on hand, and this eliminated the need for a tapped coil and necessary switching. Dean has built several amplifiers and Transmatches and is an amateur who likes to experiment. Along these lines, just to prove it could be done, he took a roller inductor from one of the old ARC-series (there are plenty of those around) and built the roller inductor shown in the photo. Such an inductor wound with No. 14 would easily handle a kilowatt, so there is amateur ingenuity! However, in the amplifier shown here, an old B&W roller of 18 uH was in the junk box, so it got used.

L1 is the separate coil to provide a better Q for 10 and 15 meters. It consists of 8 turns of ⅛ inch diameter copper tubing, 1¾ inch outside diameter and 2⅜ inches long. You will probably find that when on 10 or 15 you will have a few turns of the roller inductor in use along with L1.

Originally, a 4-400A was used for V1, and operating bias was obtained by the use of Z1, a 6.8 volt Zener diode. The line which connects from pin 2, J1 to the center-tap of the filament transformer is keyed via the push-to-talk line. The relay K1, which is also in this keyed line, provides resistor-developed bias (R2) under key-up conditions. The purpose of R1 across Z1 is to ensure a return for the B minus in case Z1 failed.

Back over in the tank circuit, C1 is a 150 pF maximum variable. This value is not critical, but should be at least 150 pF. A greater maximum is okay. I mentioned the ARC-5 roller above; these same ARC-5s (80 and 40 meter models) have 150 pF variables that could easily handle 1 kilowatt. C2 is a three-section broadcast-type variable, 400 pF per section, with the stators connected in parallel for a maximum of 1200 pF. C3, C4, and C5 are television door-knob type capacitors (5000 volts), and any value from 500 to 1000 pF is suitable.

RFC1 is a VHF parasitic choke consisting of 2¾ turns, ¾ inch diameter, 1½ inches long, No. 12 solid wire, wound over three 150 ohm, 2 watt resistors connected in parallel (R3). RFC2 is a Millen Co. R175-A plate choke. (I probably attended at least 15 hamfests and flea-markets last year and saw R175-A chokes at all of them.) Of course, any suitable plate choke can be used. RFC3 is an Ohmite Z28 (about 20 uH) and really isn't necessary, but Dean likes additional filtering, so he had one and put it in. It is a 20 uH choke and could be wound on a ¼ inch diameter polystyrene rod. Incidentally, complete details for making your own plate choke (and filament choke) are given on page 24-8 of the 1985 *ARRL Handbook*.



This is a roller inductor made from the roller of an ARC-5 transmitter. The end plates are made from ¼ inch thick poly sheet. The shafts and bearings are obtained from old volume controls which have ¼ inch diameter brass shafts and bushings. A little ingenuity helps here.

RFC4 can be any 1 mH to 1.5 mH RF choke. Its purpose is to provide a DC short to ground in the event C5 should fail. Without RFC4 in the circuit, some very lethal voltages could occur on your antenna!

T1 is an unbalanced-to-unbalanced 4 to 1 transformer (see fig. 3 for details). It consists of 10 double turns of No. 18 enamel-covered or Formvar wire wound on a Palomar Engineers powdered iron core (T-80). The T-80 has an O.D of 0.8 inches and an I.D. of 0.5 inches. Fig. 3 is a drawing of this transformer. RFC5 and 6 is the filament choke, and it is 40 bifilar turns of No. 12 enamel, close-spaced, wound on ½ inch diameter, 7.5 inch long ferrite rod (Palomar Engineers FR-1).

J1 is an octal jack, but can be any kind of a terminal strip, as long as it has

Bottom view of the amplifier. The socket used was an E.F. Johnson type. Note the neat cabling of leads.

things to keep in mind here. First, with most of the transformers available as junk or surplus, the builder is better off to think in terms of a voltage doubler as is used here. You are going to need from 2000 to 3500 volts DC at about 300 to 400 mA. As a rough rule of thumb, this means a high voltage AC secondary anywhere from 800 to 1200 volts. In a voltage doubler the multiplying factor is 2.8 times the secondary of the transformer. In the case of the supply shown here, we are looking at 1100 volts AC times 2.8, or just about 3000 volts DC out.

When you start to hunt, keep in mind that you cannot parallel two transformers unless they are identical. However, you can put two different transformers in series to get the necessary voltage. For example, TV transformers for the old tube-type sets are excellent, as nearly all of them have plenty of current ratings for our purpose. TV tube-set power transformers usually are rated at 300 mA or more, so there should be no overheating of one when two are used in series. Suppose you have a transformer with a 550 volt secondary and another with 450. These can be connected in series to get 1000 volts, and in a voltage doubler we come out with close to 3000 volts. It should also be pointed out that the primaries of the transformers should be connected in parallel. The windings must be phased correctly or the secondaries will "buck" each other and a much smaller voltage results. In the interest of safety, it is a good idea to put a 115 volt lamp in series with the primaries when testing for the correct connections. This will lower the voltages so they won't be "quite so lethal," if you forgive the expression. As far as we are concerned, power transformers are one of the cheapest items to get—forgive the expression, but there are plenty of ways to skin a cat.

As with power transformers, there are plenty of relays around that can be used. Simply because a relay has a 24 volt DC coil shouldn't stop the smart builder. It is very easy to make a supply to run such relays, so think different! The same is true of meters. Panel meters are really in plentiful supply at fleamarkets. Note our plate voltage meter has an 8 milliampere full-scale reading in its original use. Gosh, isn't Ohm's Law wonderful! The measurements chapter of your handbook gives you the formulas for using millammeters as voltmeters, etc. Incidentally, please don't write to us asking us to figure out the proper resistance in order to make an odd-ball milliammeter into a desired voltmeter. That is why you have to know Ohm's Law! Also, the *ARRL Handbook* is an excellent guide.

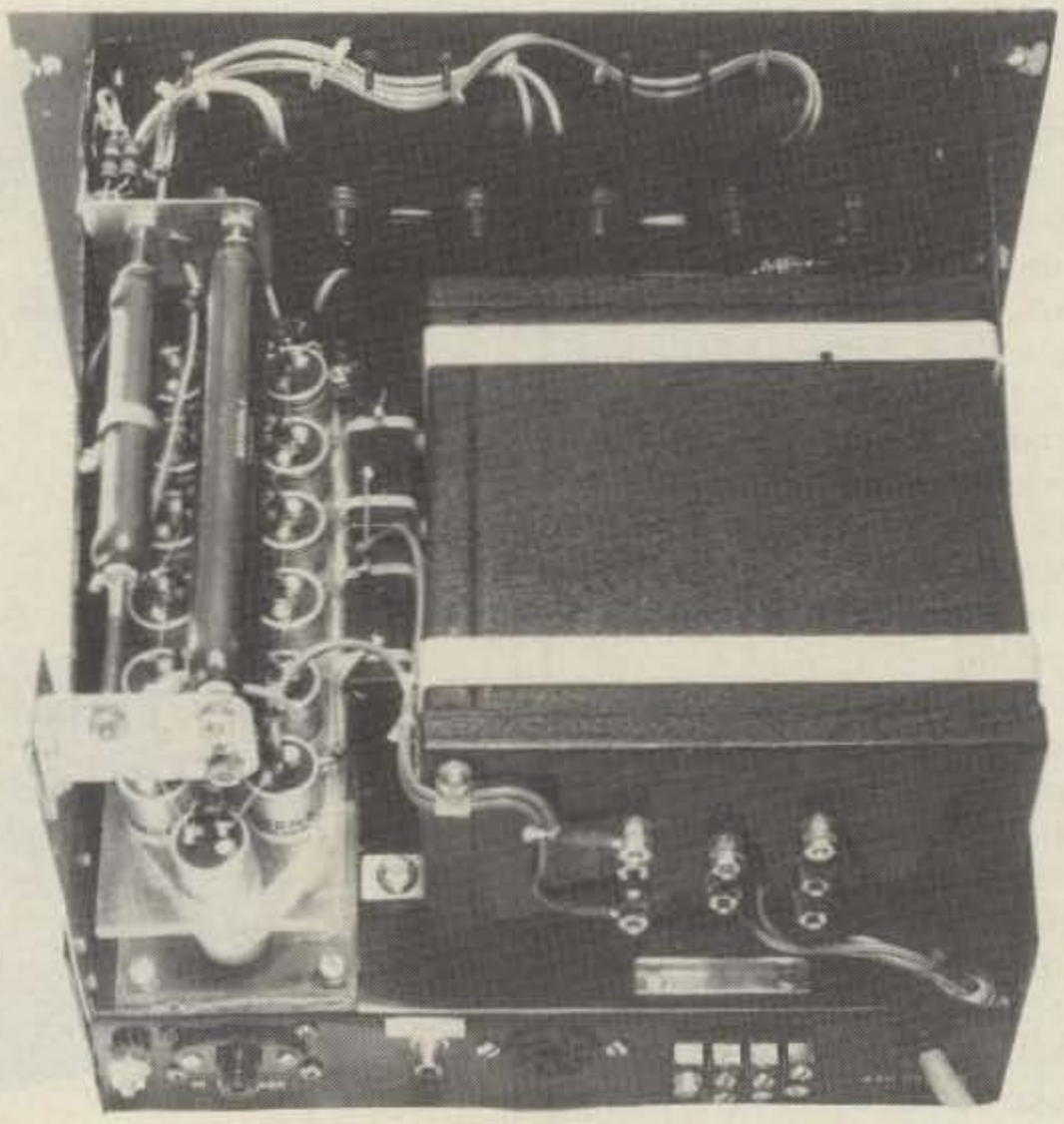
The two rectifiers in the power supply—CR1, CR2—are 6 kV at 750 mA units available from Meshna surplus ($1.25 each!). The electrolytic capacitors in series across the high-voltage secondary

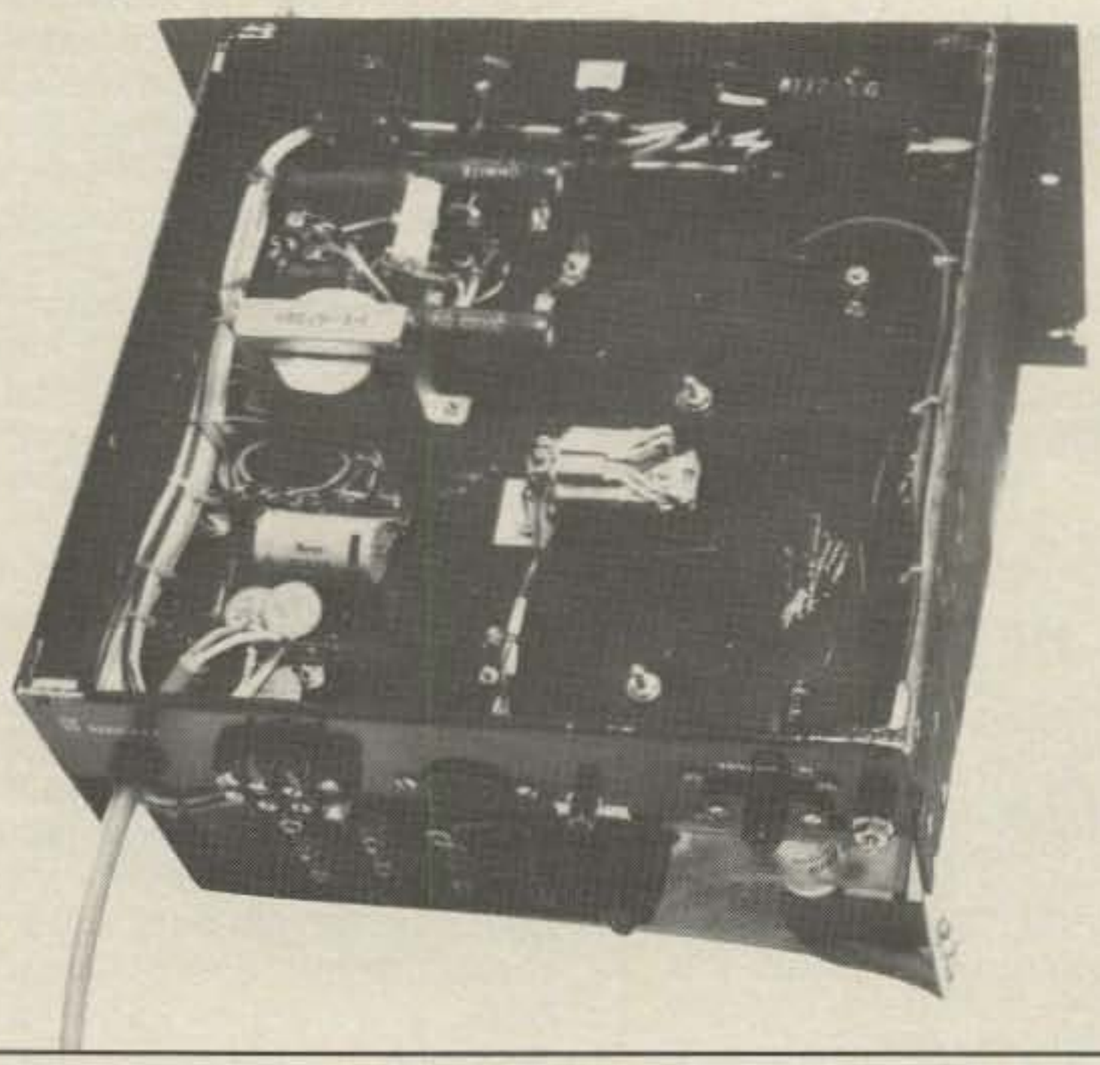
This is the power supply in its junkyard cabinet—a little cleaning and painting does a wonderful job.

are rated at 600 uF at 360 volts (about $1.25 each) and are photoflash types, also available from Meshna. A total of 10 capacitors give a working voltage of 3600 volts at 60 uF (which is more than adequate capacitance). If you should have a higher DC voltage, then add two or four more capacitors, with associated resistors, to the string. We did a story about using photoflash capacitors in a high-voltage supply that appeared in *CQ*. It would be a good idea to read this article, as it shows mounting techniques for the photoflash-type capacitors. We have built four of these type supplies in the last three years, and all are operating without problems, but there are precautions to be observed in mounting the capacitors.

As a matter of fact, if this is your first attempt at working with high voltage, **you**

Here is an inside view of the supply.





Bottom view of the power supply.

cannot be overcautious. Any voltage over 50 volts should be treated as lethal, so be careful!

Along the safety lines, note the two 47 ohm, 2 watt resistors at the bottom of the diode rectifier string. These are very important resistors because the metering of the amplifier is done in the negative lead. These two paralleled resistors put the negative high-voltage return above ground by their 23½ ohms. Many newer amateurs who haven't worked with high-voltage supplies have the very mistaken idea that the negative or ground side of a power supply is not dangerous. It is just about as lethal as the positive side, so keep that in mind! I have always had my doubts about any high-voltage supply that has its metering on the positive side of the high voltage. Again for newcomers, most meters are only insulated for 500 volts DC, so be aware, and take care.

Getting back to the supply, you'll note that two husky bleeder resistors are used across the resistor/photoflash capacitor string. Dean is a great believer in a "stiff" or well-regulated supply, plus the fact that he had the resistors on hand so he used them. I might add that these are not really necessary, but that was the way Dean built the supply. By the same token, over at the primary side of the transformer there is a delay resistor in both legs of the AC. Only one leg is needed, but again, Dean likes "overkill." I better first explain what these resistors do. Depending on what the surge ratings for current are for the power rectifier diodes, it is sometimes easy to hit them too hard with an initial charge of current when the supply is turned on. By putting a resistor momentarily in series with the primary it softens the initial charge, protecting the rectifiers, and for that matter, the capacitor bank. Note that the resistor is in series with the relay coil, so a momentary delay is built in before the relay closes, putting the full primary on. The resistor values are not critical, and anything you can find from 25 to 200 ohms will work.

Tube cooling of the seals is very important. If you happen to have access to a pressurized socket with chimney all well and good, but these are very hard to find used, plus they cost more than the whole amplifier if bought new. Many commercial amplifiers do not use these pressurized sockets and merely mount a fan vertically so that the air blows across the tube. I just completed the Heath kilowatt amplifier for product review, and it uses a single vertically mounted fan for cooling two tubes—and I might add does an excellent job. So all that is needed here is a muffin fan mounted vertically a couple of inches or less from the side of the tube so that the air is directed across the top and bottom of the tube.

The construction methods and chassis sizes are up to the reader. The accompanying photographs will give the prospective builder many ideas. For example, one doesn't need a rotary inductor (although it is recommended). In other words, we have provided you with ideas, and from what Dean has done, I would say anyone can build a kilowatt for well under, say, $200, and that is a real bargain in this day and age.

Using This Kind of Tank Circuit

We would be remiss if we didn't consider the newer amateurs who have never used a pi network tank circuit with

a roller inductor. Ideally, the pi network should have three variables—the input capacitor, the inductor, and the output capacitor when one desires to cover many bands and different frequencies. However, only a few of the earlier era transmitters used this method. They went to a tapped and switched inductor in the interest of economy (and other reasons). However, for maximum output versus minimum input (best efficiency), the variable inductor is the way to go.

Tune-up is fairly simple in these days of output indicators, assuming we are working into a 50-load or antenna system. For any given band set the output capacitance to maximum capacitance, and reduce the drive from the exciter so that your amplifier is running low power, say 100 watts or less. (Keep in mind here that the tube you are using is capable of running out of resonance with practically any power less than its rated plate dissipation.) Adjust the input capacitor and roller coil for an output indication and/or dip in the plate current reading (indicating resonance). Once you find resonance and output, decrease the output capacitor as you watch the output indicator. Touch up the inductor and other capacitor, always looking for maximum output. Increase the drive and gradually bring your power up. Once you find the correct settings for the inductor, write down the settings so you'll be able to refer to them later. Keep in mind that for a 50 ohm load, or any given load, there is only one *best* setting for all three controls. If the load varies, then will probably have to peak your settings differently.

There is another very important point to keep in mind about this type of tank circuit. It has a fairly wide matching range for a mismatched load. For example, you can have a mismatch of 2 or 3 to 1 and still have the output as if it were a 50 ohm load. That is one of the beauties of the completely variable pi networks. In other words, with a tapped coil and switch such as all commercial amplifiers use, one is *locked* into using a 50 ohm load with no mismatch.

We mentioned earlier that the push-to-talk line applies or removes bias as required. This same line, pin 8 of J1 and J2, controls the antenna changeover relay. You realize, of course, that pin 8 is connected to the push-to-talk line of your transceiver.

There is a timed AC line built in so that the "in-rush" current to the filament of the tube is limited. This is as recommended by EIMAC. When S3 in the power supply is turned on, there is a time delay set up via the 50K resistor and 100 uF capacitor across the coil of K5. The 75 ohm resistor across the contacts of K5 provides the "in-rush" current limiting.

Conclusions

If you have never operated an amplifier in grounded-grid operation such as this one is, **never** turn on your exciter and drive the amplifier tube without the amplifier plate current being on. Otherwise you'll quickly destroy the tube. The amount of drive for full output on a single tube amplifier like this is about 50 watts or slightly more.

Although we have mentioned safety several times, such a point bears repeating. In the last ten years amateurs have gotten away from tube rigs and gone to solid-state. Solid-state and transistors usually mean a maximum of 12 volts DC, and most of us have come to treat that voltage as harmless. However, the voltages we use to run tube rigs are lethal and can kill you very quickly (and not pleasantly). So when working on this or any high-voltage power supply be alert—and very careful.

As Dean has said, this was a labor of love plus a challenge. It would be interesting to know just how inexpensive an amplifier could be built with the use of good scrounging. Go to it!

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CQ REVIEWS:

The Telex/Hy-Gain HAM-IV Rotor System

BY JOHN J. SCHULZ*, W4FA

One sees many antennas reviewed in various amateur radio magazines, but it is not too often that one sees a review on a beam rotator. Therefore, it was a real pleasure for me to be able to do this review on one of the most classic rotators used by amateurs. I can't remember exactly, but I recall the first rotator in the HAM series being produced in the early 1950's.

This review is concerned with the latest rotator in the HAM series—the HAM-IV as manufactured by Telex/Hy-Gain. The HAM-IV rotator retains the classic HAM rotator series design with a bell-shaped upper casing which is securely fastened to a lower casing which protects the motor and gearing assemblies. A bottom platform which slightly extends from the bottom casing is securely fastened to an external platform, and the motor drive causes the entire upper and bottom casing assembly to rotate on ball-bearing rings. The photographs tell most of the story. Besides the motor and gearing assemblies, the rotator housing encloses limit switches to stop the motor at the extremes of its 360-degree rotation, a solenoid operated brake/wedge mechanism to lock the gearing in place when the rotator is stationary, and a gear-driven potentiometer which supplies position information to a control box. The design is basically that of the original HAM rotators with various improvements that have evolved over the years. However, most important, it retains the beautiful balance, weatherproofing, and ruggedness of the original design.

Table I shows the specifications for the HAM-IV. One might note a number of things from the table. The HAM-IV is a fairly heavy unit, with a weight of over 20 lbs., but it can also handle a heavy antenna load (7.5 or 15 square feet of load, as discussed later). The rotation time is

- **Input Voltage:** 120 VAC 50-60 Hz
  Optional: 220 VAC 50-60 Hz
- **Motor:** 24 VAC, 2.25 Amp, Capacitor Start, Capacitor Run
- **Power Transformer:** 120 VAC/26 VAC 10% duty, thermal switch protected
  Optional: 220 VAC/26 VAC 10% duty thermal switch protected
- **Meter Transformer:** 120 VAC/23 VAC Continuous duty
  Optional 220 VAC/23 VAC Continuous duty
- **Meter** DC voltmeter 1000 ohms/volts, 1 MA full scale
- **Meter Scale:** Direct reading: North centered, 5° increments
  Optional South centered, 5° increments
- Recommended 8-wire interconnect cable: Stranded Copper

Maximum Length	Gauge for Terminals 1 & 2	Gauge for Terminals 3-8
125' (38M)	#18 (1.19mm)	#22 (.76mm)
200' (61M)	#16 (1.42mm)	#20 (.97mm)
300' (91M)	#14 (1.75mm)	#18 (1.19mm)
500' (152M)	#12 (2.12mm)	#16 (1.42mm)
800' (244M)	#10 (2.95mm)	#14 (1.75mm)

- Maximum Antenna Size
  A. Tower Mounted as per Figure 1 - 15 square feet (1.4M²) of wind surface area.
  B. Outside Tower or Mast Mounted as per Figure 2 or 3 - 7.5 square feet (.67 M²) of wind surface area.
- Maximum Interconnect Cable Resistance:
  A. Terminals 1 and 2: .8 ohm
  B. Terminals 3,4,5,6,7, & 8: 2.0 Ohms
- Rotation Time: 45 - 60 seconds with 60 Hz input
- Brake: Positive, electrically operated wedge. 75 segments spaced 4.8° apart
- Rotator size: 8 inches (20 cm) maximum diameter by 13.5 inches (34 cm) high.
- Maximum antenna mast size: 2-1/16" O.D. (52 mm).
- Mounting hardware: Stainless steel hardware and plated steel clamp plate.
- Control unit size: 8.5 inches (21.6 CM) wide x 9.0 inches.
  (22.8 CM) deep x 4.3 inches (11.0 CM) high.
- Shipping volume: 2,280 cu. in. (37,350 ccms).
- Shipping weight: 23.4 pounds (10.6 kg).

Table I– Specifications for the HAM IV rotator.

*c/o CQ magazine.

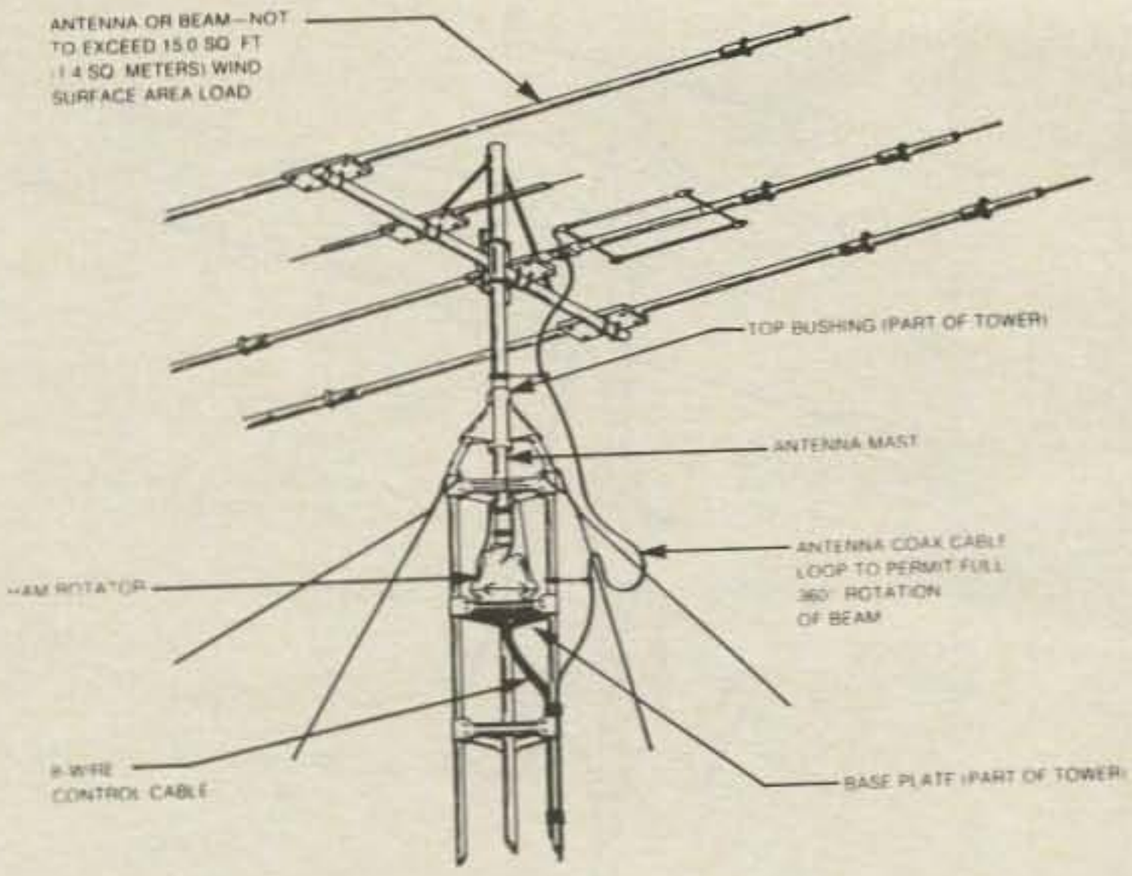
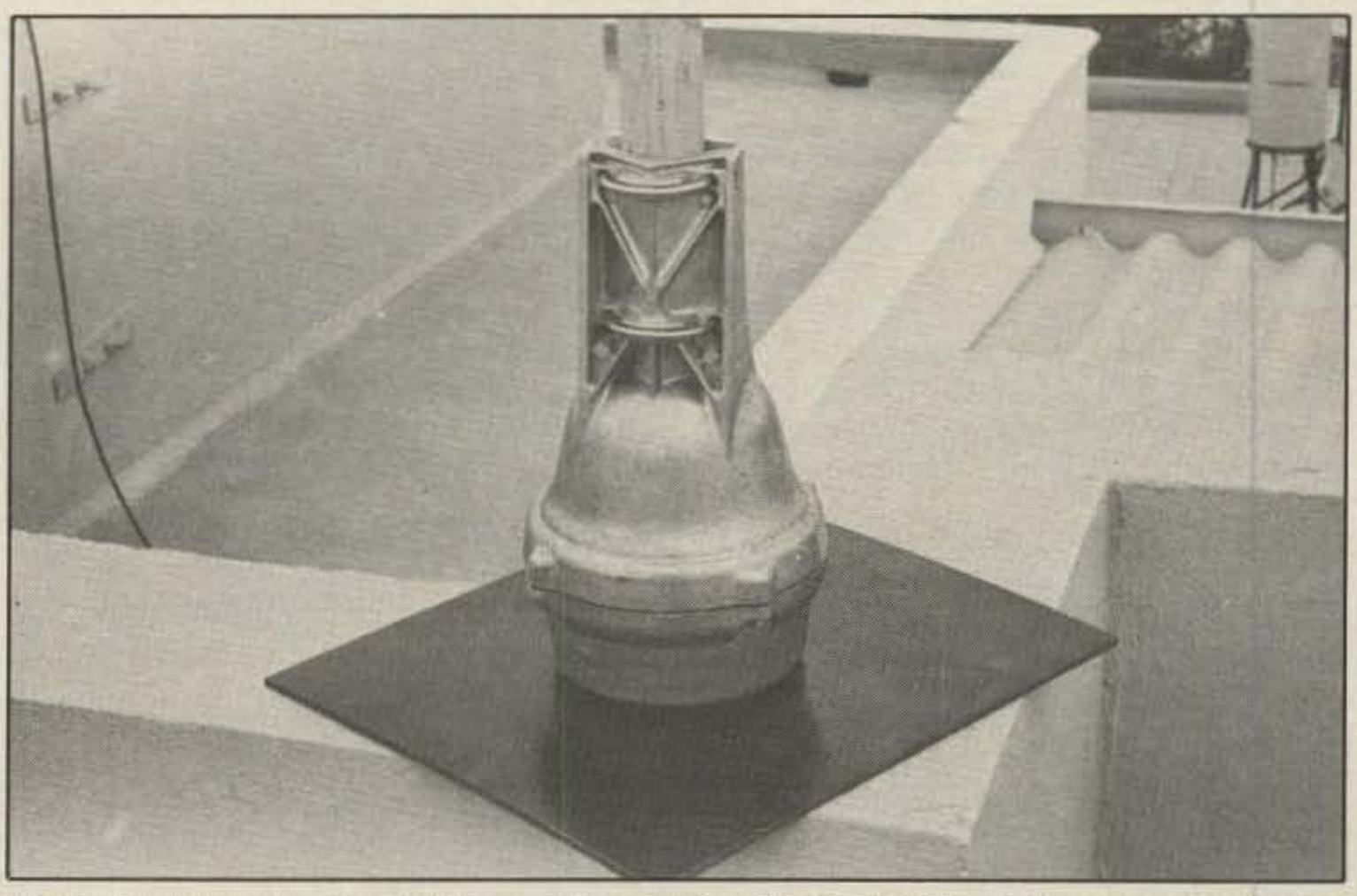


Fig. 1– Preferred "inside" tower mounting of the rotator.



The HAM-IV being prepared for mounting. It is set on a plate for preliminary testing, but the plate also illustrates how the rotator would be mounted if the mounting style of fig. 1 were used.

45–60 seconds, which is a good compromise between being able to turn an antenna reasonably quickly and yet not jerk it around such that accurate headings are difficult with a sharply beam-focused, high-gain antenna. The wire gauge listing shows that for practical rotator cable sizes, the rotator can be located up to 800 feet from a control box. Most users will rarely have more than a 125 foot cable run, and in such a case the wire gauge sizes required (#18 and #22) are very reasonable. In any case, an eight-conductor control cable is required both to power the motor in the rotator and to transmit limit switch settings and position data back from the rotator to the control box.

Setting up and using the HAM-IV is simple enough, but one does have to do a bit of planning. The basic HAM-IV is meant to be used as shown in fig. 1. That is, the rotator is secured flush to a base plate *inside* a tower, and the beam mast passes through a top bushing on the top of the tower. The dead weight of the beam used is not all that important as compared to wind loading during storms, rotational inertia, unbalanced weight, etc., and this method of rotator mounting provides a maximum of resilience against the latter factors. It requires a bit of work in that

four holes may have to be drilled in the mast base plate to accommodate the rotator, and the mast and/or rotator mounting may have to be shimmed so the mast rotates freely through 360 degrees in the mast top bushing. The mast itself should be as short as possible, and steel pipe with a 1.9 inch O.D. and 0.145 wall thickness is recommended by the manufacturer for a single beam. Using this method of rotator installation, a beam with 15 square feet of wind surface area can be accommodated. The wind surface area presented by some typical beams is as follows, although one has to know the exact figure for a specific beam one plans to use:

Beam Type	Wind Surface Area
Triband, 3-element (10/15/20 meters)	4–5 sq. ft.
Triband, 4-element	6–7 sq. ft.
3-element, 10 meter	2–3 sq. ft.
4-element, 15 meter	4–5 sq. ft.
3-element, 20 meter	5–6 sq. ft.
4-element, 20 meter	6–8 sq. ft.
5-element, 20 meter	10–11 sq. ft.
2-element, 40 meter	6–7 sq. ft.

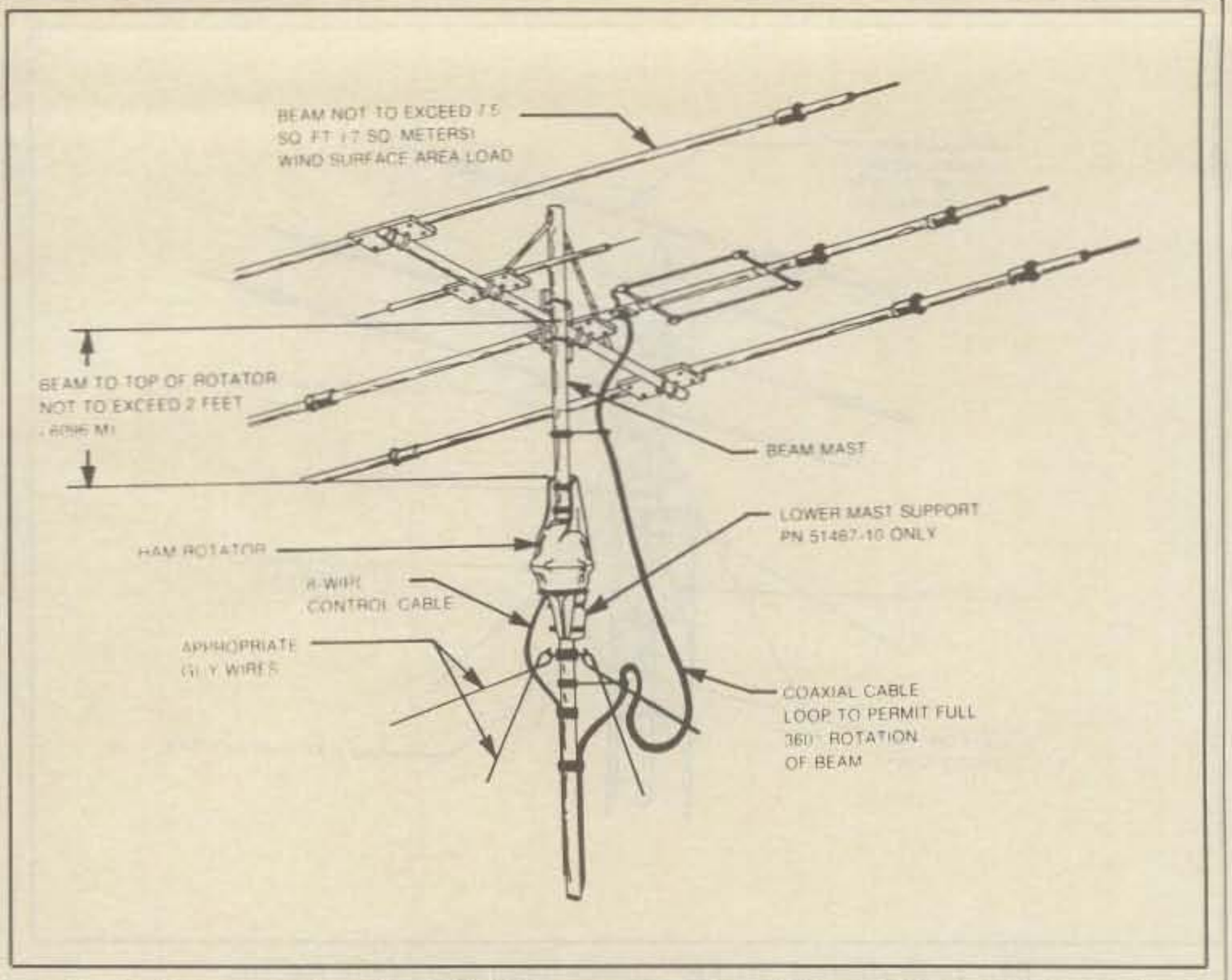
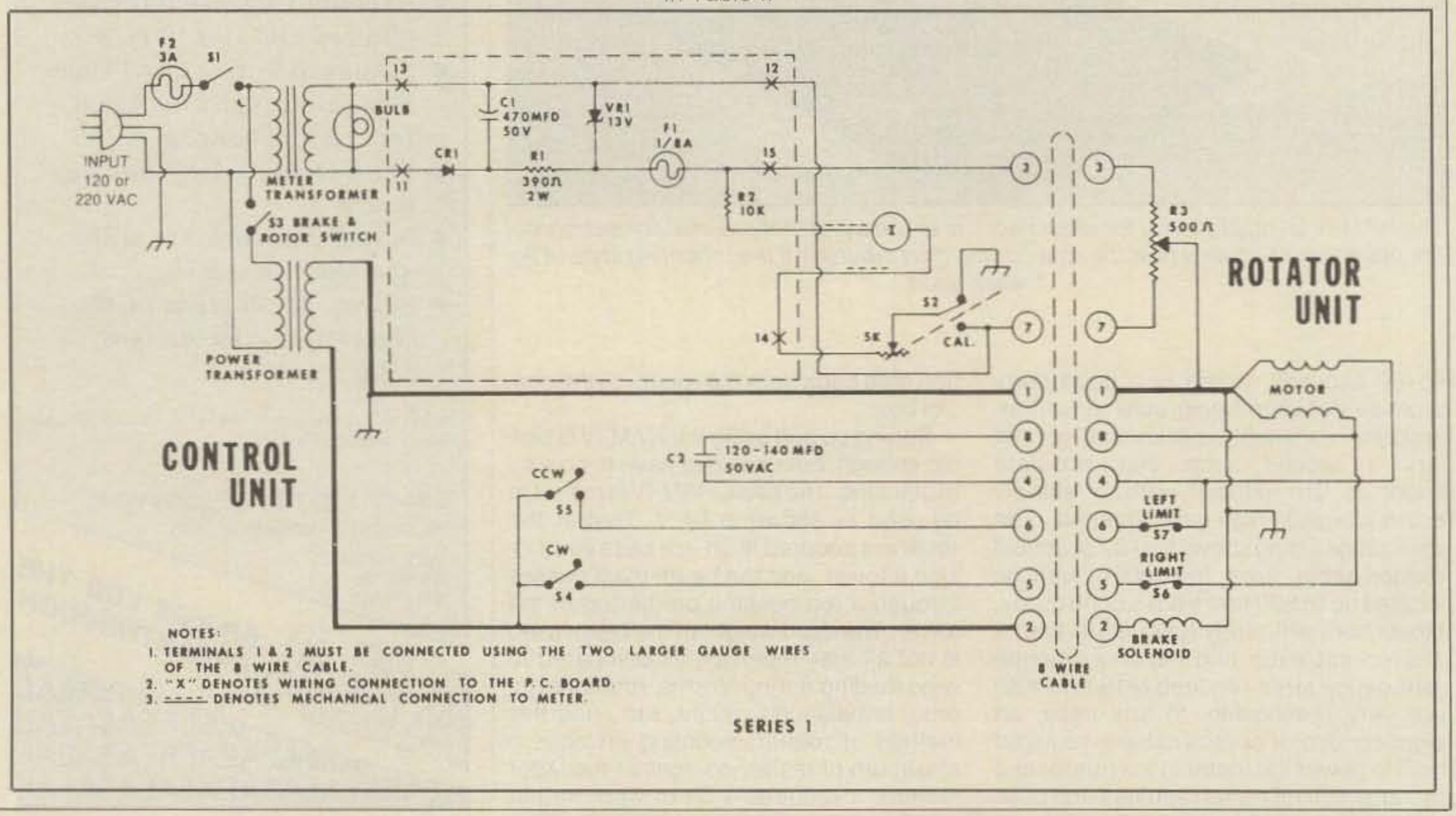


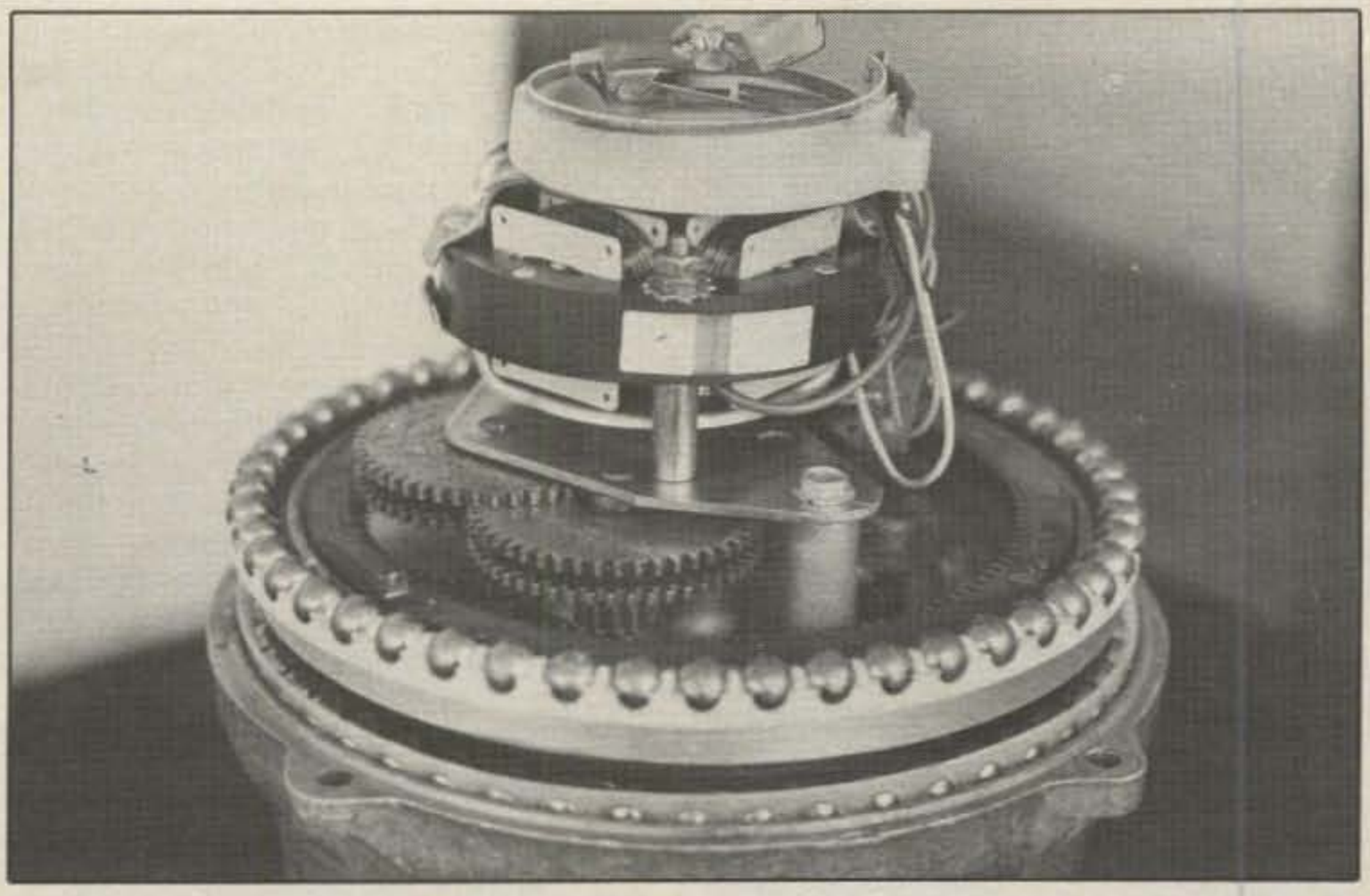
Fig. 2– Optional mast or "outside" tower mounting of the HAM IV, which results in reduced antenna wind-surface-area handling capacity.

Therefore, the HAM-IV rotator, all other factors being equal, can handle just about any HF beam antenna the average amateur is about to use when the mounting shown in fig. 1 is used. If the mounting method is changed to that of fig. 2, the situation changes a bit. First of all, one must purchase an optional lower mast support kit (Hy-Gain Part No. 51467-10 at about $70) in order to mount the rotator on a mast (maximum outside diameter 2$\frac{1}{16}$"). This type of mounting is somewhat simpler, and no shimming procedure is necessary. However, the maximum wind load that the rotator can handle is reduced to 7.5 square feet. This is true whether the lower mast on the rotator is the actual antenna mast or just a piece of pipe which extends the rotator bottom outside of a tower. As can be judged from the foregoing table, for relatively small antennas the simpler mounting procedure of fig. 2 for the rotator may be satisfactory. But, if one is going to do the work and go through the expense of putting up a mast, the extra effort of going through the mounting procedure shown in fig. 1 is highly recommended.

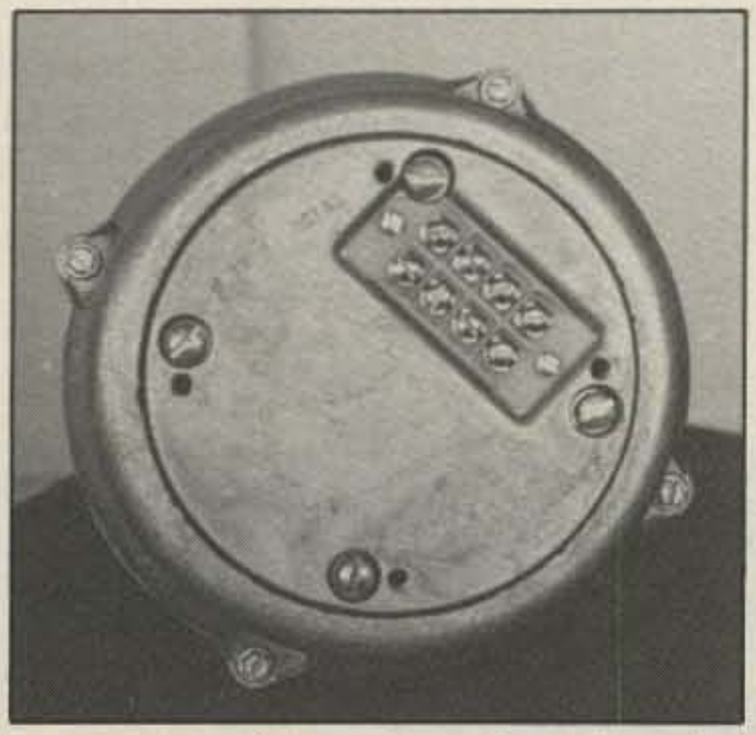
The control box that comes with the HAM-IV is basically the same as that used on earlier HAM series rotators except

Fig. 3– Electrical diagram of the control and rotator units. The specifications for the eight-wire interconnecting cable are given in Table I.





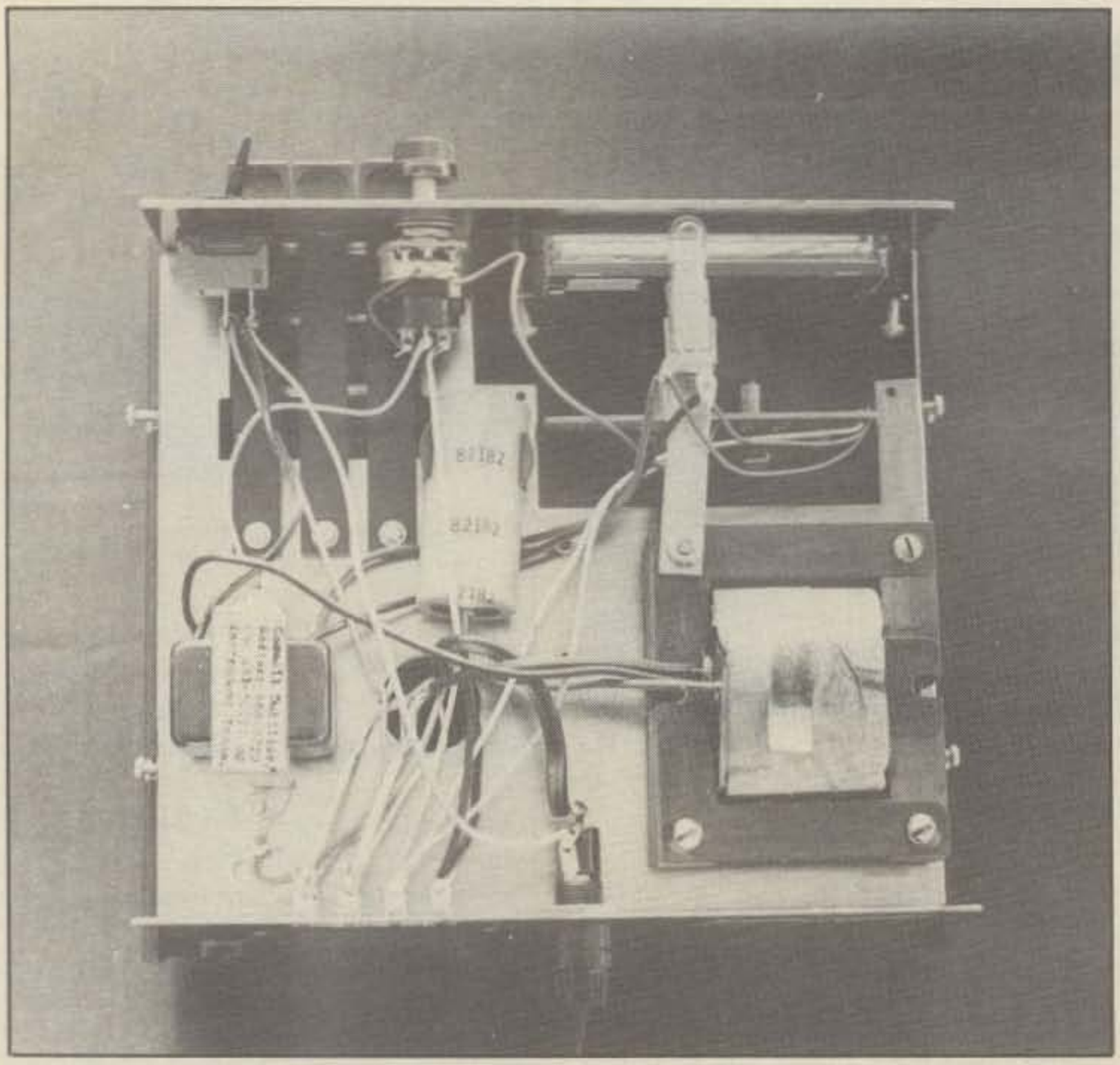
A look inside after the top bell has been removed. The actual motor is on top with the gearing below. The limit switches to stop the motor after a full rotation are on the opposite side and cannot be seen.



The bottom of the unit has four threaded holes for baseplate mounting and the cable connector strip.

that it has been restyled for a bit "sharper" appearance. The circuitry of the control box and its electrical interface with the rotator is shown in fig. 3. Basically, a DC voltage supply loop is used for the position indicating meter circuitry, and an AC supply is used for operation of the rotator motor and the brake solenoid. The calibration control allows for full scale (south) setting of the meter and can be reset whenever necessary to account for minor variations in circuit component values. The position indicating meter has a north-centered meter scale, but the reversible scale can be turned over so it displays a south-centered scale. The procedure requires a bit of manual dexterity since the meter has to be partially disassembled. Operation is absolutely straightforward, after initial calibration, and one

The control unit is housed in a smartly stlyed plastic/metal enclosure. The meter center is north, but the scale can be reversed to show south as center.



A look inside the control unit shows the motor transformer on the right and the separate meter transformer on the left. A small PC board (not visible) contains the meter rectifier and other small components.

simply depresses the brake release lever switch and either the CW or CCW rotation lever switch. One does have to develop a slight "feel" for the switches in that after turning the rotator it is very advisable to let the rotator coast down before engaging the brake. Various magazine articles have appeared over the years describing circuitry to add automatic, delayed coast down to the control boxes for the HAM rotators. For casual use of the rotator, such a modification is not really necessary if one develops just a slight bit of discipline in the use of the controls for the HAM-IV.

The manual that comes with the HAM-IV is very well done, and one should read it before completing the final plans for an antenna installation. The manual discusses the various mounting options for the HAM-IV, materials required, check-out procedure, maintenance procedures, etc. There is a complete parts list and sufficient pictorials and diagrams such that one should be able to perform any normal maintenance or repair procedure.

The HAM-IV that was put into service performed flawlessly with a tribander, and there is little that can be said except that the HAM-IV is the best yet in a tried and proven series of HAM rotators. With normal maintenance, and as long as it is used within its ratings, the rotator should serve well for many years. There is a 12-month warranty on materials and workmanship. CQ

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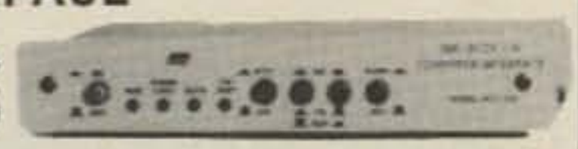

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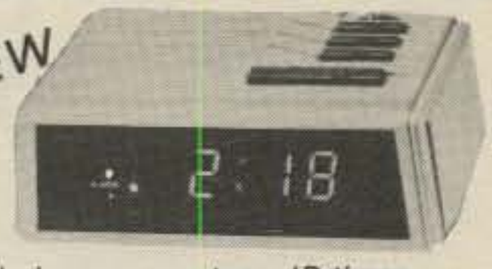

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Take a few minutes to read N2BFG's article on time and really find out what those minutes mean. They didn't always mean the same thing.

A MATTER OF TIME

BY RICHARD S. MOSESON*, N2BFG

June 30, 1985: Time skips a beat around the world as official timekeepers insert the 12th-ever "leap second" to keep time in step with the earth's rotation.

November 17, 1883: High noon in Washington, D.C. In New York City, it's 12:12 p.m. Clocks in Boston read 12:24. It's only 11:32 a.m. in Dayton, Ohio. And in Baltimore, it's 12:02.[1]

These two examples give us a glimpse of how timekeeping has changed in the past century, as we've gone from local "sun-time" in each city and town to world-wide standard times measured by super-accurate atomic clocks.

As amateurs, we're very concerned with time. And many of us take great pride in keeping our clocks and watches exactly in sync with WWV or CHU, the U.S. and Canadian government time services. But take your extremely accurate digital wristwatch outside and compare it with the time on a sundial. Chances are they won't agree. For example, at 12:00 noon in Cleveland, Ohio, a sundial would probably read 11:30. A sundial in Boston would say it's nearly 12:30. That's because the standard time by which we run our lives is an average of the local times throughout our time zone—a **mean** time.

We amateurs take standard times and good old Greenwich Mean Time for granted. We learn quickly how to use GMT to set up skeds with friends halfway around the world, or to track the orbital path of a satellite.

What's that? How can I be writing an article about time and not know that GMT isn't GMT any more? That Greenwich Mean Time is now known as Coordinated Universal Time, which, for some strange reason, is abbreviated UTC? Except when it's abbreviated as Z? It's quite simple. I know why. And so will you, if you read on.

What Is Time?

This may seem like a silly question, but try to define it. Science hasn't been able to. We can measure time very precisely, but we can't define it. In our everyday lives we know that time measures the passage of history and the duration of events. Scientists call these two different "types" of time "epoch" and "interval," respectively. And we know that time passes at, well, one second per second. But it's not as simple as that. For starters, how do we know how long a second is?

Once upon a time, it was 1/60th of a minute, which was 1/60th of an hour, which was 1/24th of a day. Which was very imprecise, since the length of a day varies with subtle changes in the Earth's rotation. Modern science needed a much more precise measure.

Dr. Charles F. Dowd, an early headmaster of Skidmore College, was a strong proponent of establishing a standard time zone across the country. Dowd and Allen, working independently, came to virtually the same plans at the same "time." (Photo courtesy George S. Bolster.)

In 1956 the International Conference of Weights and Measures defined the "ephemeris second" as 1/31,556,925.9747th of the time it took the earth to make one full trip around the sun, beginning at 12:00 noon on January 4, 1900.[2] That was the scientific standard for 11 years, until the 13th General Conference of Weights and Measures in 1967 redefined the second as the number of times an atom of cesium-133 oscillates in the ephemeris second.[3] That comes to 9,192,631,770.

So, scientifically, a second is the amount of time it takes a

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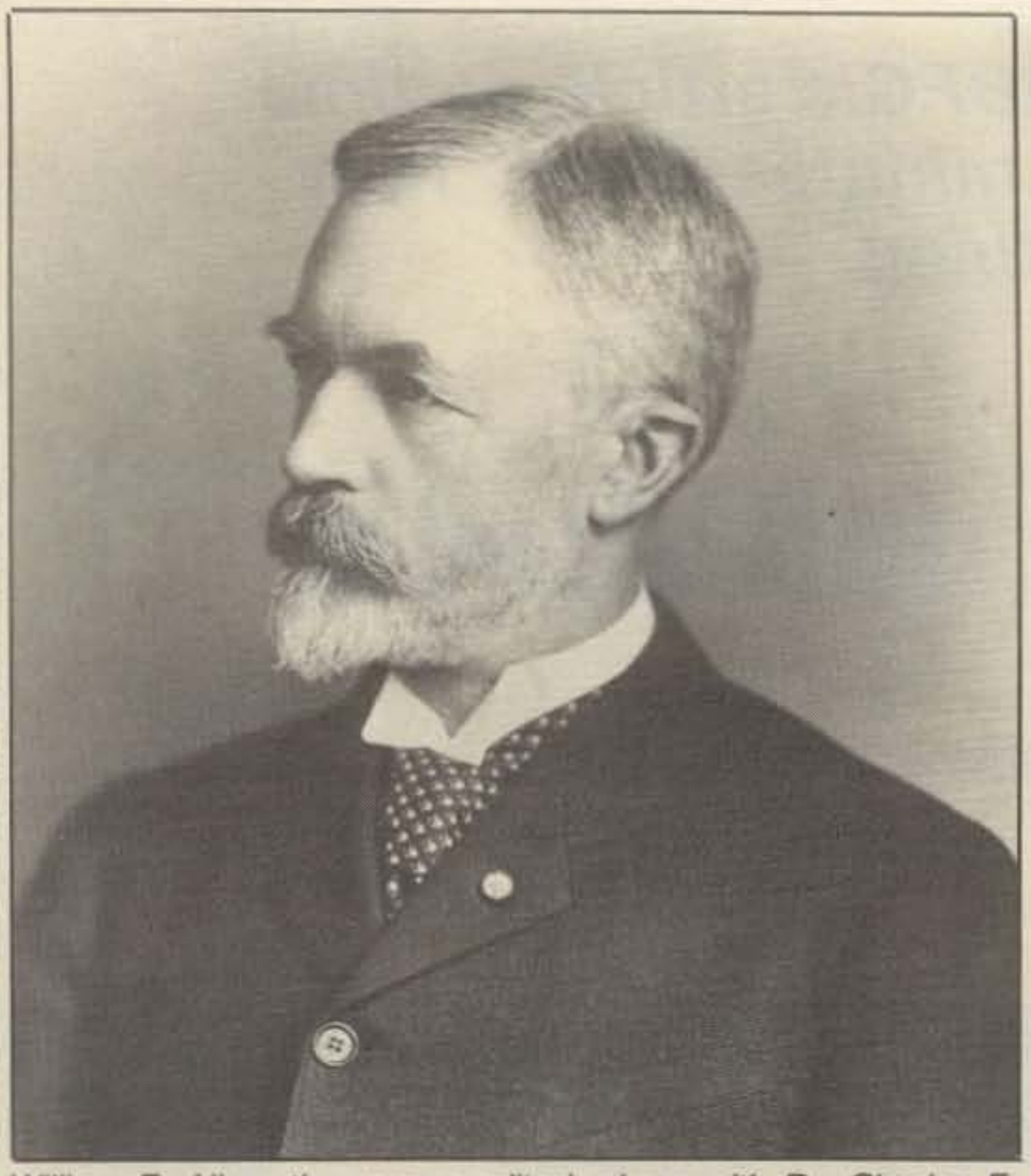


William F. Allen, the man credited, along with Dr. Charles F. Dowd, with devising and putting into place the first system of standard times in the United States. Their system was quickly adopted by most of the world. (Photo courtesy Association of American Railroads.)

cesium atom to do 9,192,631,770 flip-flops. One flip, by the way, is known as a "magnetic moment."[4]

But What Time Is It?

Now that we know how long a second is, how can we tell what time it is? With an atomic clock we can't. It measures only interval (duration), not epoch (time in relation to history). We'll have to back into telling time the way scientists backed into defining a second (the number of atomic flips in the "old" second).

Historians disagree on who first divided the day into 24 hours, but by the 17th century the basic elements of timekeeping had also become the basic elements of navigation. Navigators had learned to use readings of the sun and stars to determine their latitude, or north-south position. But there was no reliable way to work out longitude—where in the world you were on an east-west basis. The use of quesswork—called "dead reckoning"—often resulted in dead sailors, shipwrecked far off course.

Enter Greenwich

In 1675 King Charles II of England ordered construction of a royal observatory at Greenwich, on what was then a country hilltop. (Today, it's a suburban area of London.) The primary assignment to the Astronomers Royal was to find, in the stars, a reliable way to determine longitude.

It took many years, but in 1767 the Royal Greenwich Observatory published its first annual nautical almanac — predicting the positions of the moon and the stars each night over Greenwich.[5] Now sailors could look into the sky and, by comparing what they saw with the predictions for Greenwich, calculate their distance east or west of the "Greenwich meridian." That was the imaginary north-south line of longitude, passing through Greenwich and stretching around the world.

The nautical almanac established Greenwich as the center of the navigator's world. It was another 66 years, though, before it would become a timekeeping center, as well. Starting in 1833, a big canvas ball was lowered from the tower of the Greenwich Observatory at precisely 1:00 p.m. everyday—one hour "post meridian," or *after* the sun had crossed the Greenwich *meridian*. Ships in the harbor used the time marker to set their clocks, and later "traded" time with other ships at sea.

Introduction of the telegraph brought an added service from Greenwich—time signals sent electrically to train stations and cities in England and in Europe.[6]

From Ships and Trains to Standard Time

The growth of rail travel wreaked havoc with timekeeping in the United States. Until late last century there were no time zones nor standard times. Towns and cities kept their own time, based on local noon—the moment the sun passed directly overhead. As Carlton Corliss explained it in *The Day of Two Noons,* "When it was noon in Chicago, it was 12:31 in Pittsburgh; 12:24 in Cleveland; 12:17 in Toledo . . . 11:50 in St. Louis . . . and 11:27 in Omaha."[7]

This profusion of times made it difficult for railroads to establish reliable timetables. Some tried to simplify matters by establishing "railroad time" along portions of their routes. But by 1883 there were at least 68 different railroad times in use. And a traveler going by rail from Maine to California would have to reset his pocket watch about 20 times to keep up with changes enroute.[8]

Enter Dr. Charles F. Dowd, a New York educator, and William F. Allen, editor of the *Official Guide of the Railways* and secretary of the railroad group that began meeting in 1872 to adopt summer timetables. Both were strong proponents of establishing standard time zones across the country.

Dowd, reasoning that the sun appeared to travel across 15° longitude each hour (360°/24 hours), proposed that the country be divided into zones 15° wide, based on the meridian at Greenwich. Times would be the same within each zone, with a one-hour difference between zones. Allen, apparently working independently, came up with a similar plan.[9] In October 1883 the railroads agreed to operate according to five standard time zones, four for the U.S. and one for Eastern Canada. (Each U.S. time zone extended 7½° to either side of 75°, 90°, 105°, and 120° west longitude, roughly the longitude of Philadelphia, PA; Memphis, TN; Denver, CO; and Fresno, CA.[10].)

The Day of Two Noons

November 18, 1883 was the day time "stood still" in much of the United States. Clocks in cities around the country were stopped or moved ahead to match the new standard times, based on the master clock at the U.S. Naval Observatory in Washington, D.C. Clocks in New York City were stopped for 3 minutes and 58 seconds to let Eastern Standard Time catch up. Philadelphia had only a 36-second adjustment.[11]

Atomic Clocks

How do atomic clocks work? And who invented them? As Roger Beehler of the National Bureau of Standards explains the clock's operation, cesium atoms are put into a tube called a resonant cavity, inside a long beam machine which *is* the atomic clock. The atoms are irradiated with a electromagnetic field, and they align themselves in the field with one magnet. At the proper frequency, they basically flip from one polarity to the other. They flip back and forth at a fixed rate, and keep doing it as long as the field is at the exact resonant frequency. (If the field is off frequency, the atoms do nothing.) That rate, when the atoms are flipping, is exactly 9,192,631,770 per second. Conveniently, the frequency needed to make them flip is 9.192631770 GHz, and the count of the flipping atoms is fed back as a frequency standard to keep the field on frequency.

According to Dr. Winkler of the Naval Observatory, the idea of an atomic clock was first suggested 40 years ago in a lecture by Professor A. Rabi of Columbia University. The oscillation of the cesium atom was first observed in 1952 by Harold Lyons of NBS, according to Beehler. The first atomic standard in full-time operation was at Britain's National Physical Laboratory in 1955.

The next year an international conference adopted standard time worldwide and established Greenwich, England—long the zero meridian for sailors—as the prime *time* meridian as well. Other suggestions for 0° longitude included Jerusalem, Paris, and the Great Pyramids of Egypt.) Thus was born, on June 26, 1884, Greenwich Mean Time.[12]

The switch to standard time was not universally accepted at first, even in the United States. While the railroads all operated on standard times, many towns and cities steadfastly remained on local time. It wasn't until 1918—amid World War I—that Congress passed the "Standard Time Act," establishing standard time zones throughout the United States.[13]

So What About UTC?

Greenwich Mean Time was the unchallenged world standard for time measurement for only 40 years. Old timers may remember that before 1925 the GMT day began at *noon*, not midnight. That's because mean times were based on the position of the sun at noon.

In 1925 the International Astronomical Union decided that the astronomical day should start at midnight instead of noon. Since the GMT day still began at noon, the scientists decided to call their new midnight-based time 'Universal Time," or UT. The British, not wanting to lose the prestige of having GMT as the world time standard, switched the GMT day to begin at midnight, as well.[14]

But confusion between the old and new GMTs persisted, and in 1971 the Consolidated Committee on International Radio (CCIR) recommended replacing GMT with UTC "wherever possible." But that was only a recommendation. There wasn't an official directive to use UTC instead of GMT until three years ago (in the International Telecommunications Union's [ITU] 1982 edition of *Radio Regulations*).[15]

Wait A Minute . . .

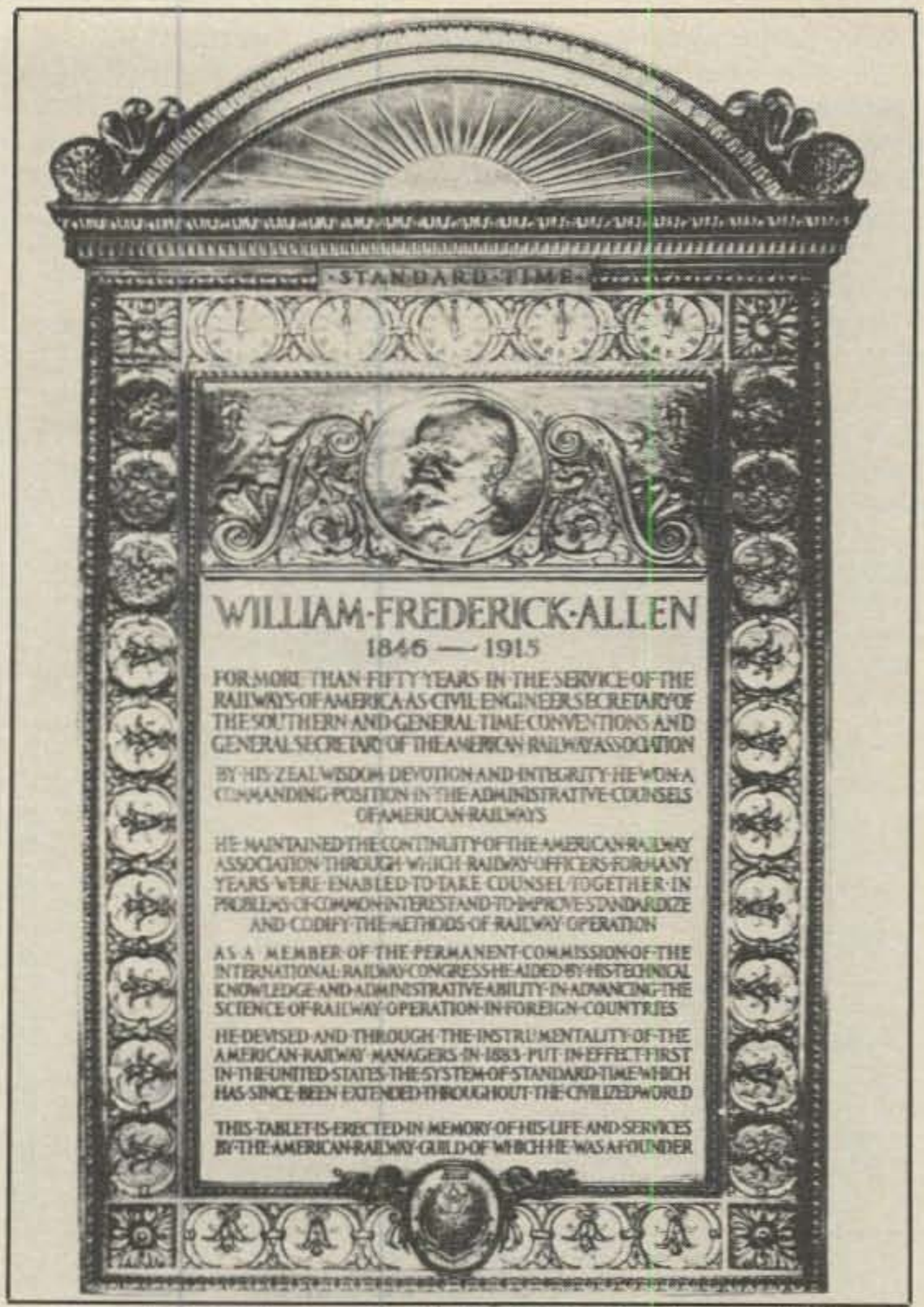
. . . How'd that "C" sneak into UT to make UTC? (I should've known better than to think I could slip something like that past you.)

The "C" stands for "Coordinated," as in "Coordinated Universal Time." So why is it abbreviated UTC? Simple. UTC is French—or rather, the abbreviation of the French words that mean "Coordinated Universal Time" in English. The world time gurus decided that the abbreviation should be "language-independent," so that anyone would know what UTC meant, regardless of his language. The French abbreviation was chosen because the International Time Bureau (or BIH—for Bureau Internationale de l'Heure) is in Paris.[16]

The BIH *coordinates* the readings of Universal Time transmitted to Paris from some 150 atomic clocks at observatories and laboratories around the world. The coordinated reading becomes UTC. (All time services must keep their time to within one millisecond of the UTC scale. WWV's accuracy is closer to three *micro*seconds, according to Roger Beehler, Chief of Time and Frequency Services for the National Bureau of Standards in Boulder, Colorado.)

ZZZZZZZ . . .

WAKE UP! Now that we've covered GMT and UTC, we have only "Z" to figure out. You can find "Z" and all the other letters (except "J") on the U.S. Defense Mapping Agency's "Standard Time Zone Chart of the World" (Chart #76; DMA Stock # WOBZC76). The letters start one zone east of Greenwich with "A" and continue eastward to "M" on the western side of the International Date Line. And rather than continuing around (no one's sure why), they bounce back to Greenwich and start again, with "N"—one zone west—and continue westward to "Y" on the eastern side of the date line. (The half-zone on each side of the date line accounts for using 25 letters instead of 24.



A plaque in Washington, D.C.'s Union Station honors William F. Allen, one of two men credited with devising and putting into effect the first system of standard times in the United States. (Photo courtesy Association of American Railroads.)

The U.S. Eastern time zone, by the way, is Zone "R." Central is "S," Mountain is "T," and Pacific is "U.")

According to Dr. Gernot Winkler, Director of Time Service for the U.S. Naval Observatory in Washington, D.C., the letter codes go back to the early days of radio. "As communication became worldwide," he notes, "it became necessary to note the originating time of any message. The military adopted a letter system to identify each zone, with Greenwich Time being "Z" (for the Zero Meridian)."

But Rocky Martin of the Defense Mapping Agency's Hydrographic Division suggests that the system was used even earlier. "Before radio," he says, "ships traded time at sea . . . the signal 'Flag J' meant 'Time will follow.' . . . As the time zones became internationally accepted, the hoist would end with the flag representing the time zone."

Why is there no zone "J"? Martin explains: "Since 'J' already had a time meaning, it was the obvious letter to drop when 25 letters were needed to set up time zones." Martin says no one's sure who developed the letter codes for time zones, but he thinks it might have been the British or the International Hydrographic Association.

Leaping Ahead

We began this article by noting the latest "leap second" on June 30, 1985, when an extra second was added to the day. This is done to keep atomic time in step with astronomical time, which is still used by navigators. Atomic time, used mostly by scientists, is much more precise than astronomical time and is not affected by things such as changes in the speed of Earth's rotation.

Atomic time started out precisely even with astronomical time,

at 0000 hours, January 1, 1958 (the official "starting point" for atomic timekeeping).

Since 1958, Beehler says, the two times have slipped apart by about 22 seconds. In 1972 the ITU decided to let the time scales go their separate ways (not that they had much choice), but to adjust UTC by a full second when the two standards got to be 9/10 of a second apart. The BIH in Paris decides when these "leap seconds" are needed.

In general, there has been one leap second each year since 1972. The exceptions, according to Beehler, have been 1972, when there were two leap seconds, and 1980 and 84, when there were none. Beehler says the rate of change in the Earth's speed is not constant, and in the past five years it hasn't been slowing down as quickly. Winkler adds that, if the rate of slowdown continues to decrease—or if Earth actually speeds up a little—the BIH may have to *take out* a second sometime in the future.

Early Timekeeping

Early man could only record the passing of natural cycles—daylight and darkness, the changing phases of the moon, the cycle of seasons. Early astronomers, watching the sky just before dawn and just after sunset, saw that the sun seemed to move slowly eastward among the stars, and that it made one full cycle around the sky in one cycle of the seasons.[17]

Time historians don't agree on who first divided the days and nights into hours. The Babylonians, Egyptians, and Greeks all seem to be given equal credit.[18] Dr. Winkler of the Naval Observatory says the Babylonians were probably the first to divide day and night into 12 parts each. He says division by 12 was a "natural consequence" of nature's division of the year into approximately 12 months.[19]

The Egyptians and the Romans, however, seem to share credit for minutes and seconds. The Egyptian astronomer Ptolemy, using a Babylonian measuring system based on a scale of 60, divided the hours into 60 equal parts, then divided each of those parts by 60. The Romans came up with the names, calling the larger parts "pars minutae primae," or "first small parts," and the smaller time segments became "pars minutae secundae," or "second small parts." From those we get "minutes" and "seconds."[20]

But What Time Is It?

You mean you've read through all this and you still don't know what time it is? Well, you could find out by tuning your computer to the GOES weather satellite. WWV has been transmitting computer time code there for 10 years and currently has over 1,000 users. Or you might look down at your watch, and when the big hand is on the twelve . . .

Footnotes

[1] From *Dinsmore's American Railroad and Steam Navigation Guide and Route-Book* for October 1857, courtesy Association of American Railroads.

[2] *New York Times*, 6/3/82.

[3] *Ibid.*

[4] Roger Beehler, Chief Time & Frequency Services, National Bureau of Standards, Boulder, CO. Interview, 6/25/82.

[5] *Wall Street Journal*, June 11, 1984.

[6] *Ibid.*

[7] Carlton Corliss, *The Day of Two Noons*, Association of American Railroads, Washington, D.C., 1956, p. 6.

[8] *Ibid.*

[9] Ian Bartky, "The Invention of Railroad Time," *Railroad History* Bulletin No. 148, The Railway & Locomotive Historical Society, Spring 1983.

[10] *op cit.*, Corliss, p. 9.

[11] *Time and Clocks For The Space Age*, James Jespeson and Jane Fitz-Randolph, Athenum, New York, 1979, p. 32.

[12] *op cit.*, *Wall Street Journal.*

[13] *op cit.*, Corliss, p. 18.

[14] Dr. Gernot Winkler, Director of Time Service, U.S. Naval Observatory, Washington, D.C., Interview, 1982.

[15] *op cit.*, Beehler.

[16] *Ibid.*

[17] *World Book Encyclopedia*, Vol. 19, p. 226.

[18] The *World Book* says "The division of the day into 24 hours, an hour into 60 minutes, and minute into 60 seconds probably came indirectly from the ancient Babylonians." The *New York Times*, in December 1983 quotes Prof. Owen Gingerich of Harvard, and says, "The night appears to have been divided first, by the Ancient Egyptians." The *Wall Street Journal*, in a June 1984 article says, "Because the Earth rotates 360 degrees every day (a period the Greeks had already divided into 24 hours). . ."

[19] *op cit.*, Winkler, Telephone interview, 3/20/85.

[20] *The Mystery of Time*, Harry Edward Neal, Julian Messner, New York, 1966, pp. 54-55.

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50	RG58/U	Two PL-259	278-971	11.95
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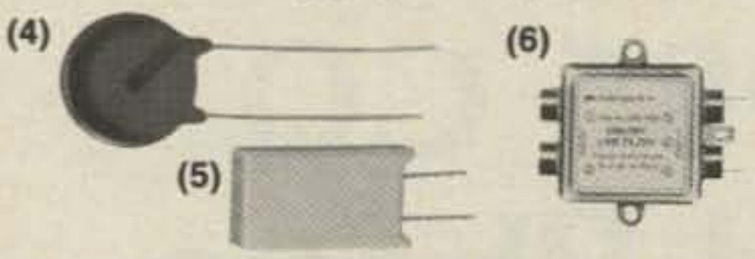

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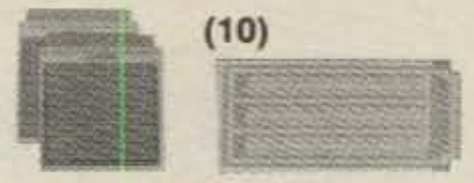

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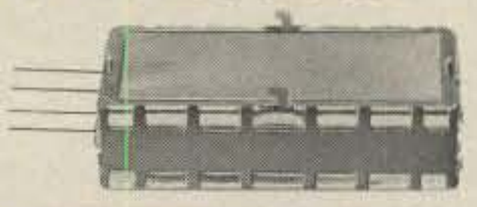

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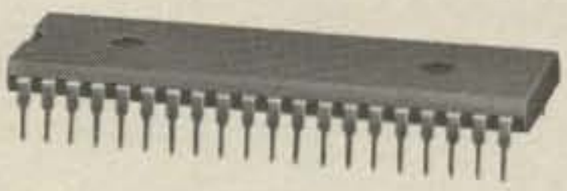

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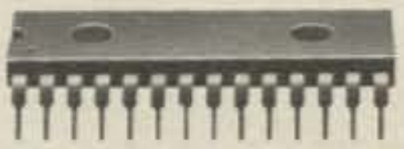

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Ivan, VE3INQ, has been a dependable CW regular in the contest for a number of years.

The K9RS team with their third and final antenna-supporting balloon. L–R: K9RS, NA9D, and K9KM. They made the high QSO list with 679, and the highest score in Illinois.

Here is true dedication. Eli, PT7BZ, made 104 phone contacts, and it is his summer time!

Results of the 1985 CQ 160 Meter CW and Phone DX Contests

BY DONALD McCLENON*, N4IN

Activity continues to increase, as antennas, equipment, and sunspot conditions all keep improving. Overall conditions were reported good for both modes on at least one of the two nights for each mode. We did not get the fantastic conditions that prevailed two years ago, but contacts made, and number of stations reported active, were up about 30% from last year. There were 6107 active calls used on CW and 6269 on phone, plus about 170 extra operators at the multi-op stations.

Very few logs contained comments on a requirement for use of serial numbers in the contest exchange. It was practically a rerun of last year, so again no serial numbers or country designations are needed.

The DX window concept which worked so well for many years now seems to be ignored by most DX stations in both modes, for various reasons. In effect, that part of the band was not usable, making the rest more crowded. There is no practical way for contest scorers to later determine who worked what in or out of a window. Any DX station may designate where he wants calls made, as on the other bands. There are sure to be a few "policemen" keeping the DX frequency reasonably clear. There is such a variety of allowed frequency allocations in participating countries, that many DX stations couldn't use the designated window anyhow. We will try it without restriction next time and solicit your comments.

The quality of operating and logging has decreased markedly over the past few years. A surprising number of CW operators can't seem to read the code very well. They can't tell S from H or J from W, and they often interchange F and L. N prefixes become K or vice versa, and WB/WD prefix errors are common. Some letters that are copied correctly are switched when written down, so W3AB becomes W3BA.

Phone ops have trouble with rhyming letters like I, Y, J, K, and B, C, D, E, G, P, T, Z, as well as WB/WD prefix errors.

Some handwriting is so bad that it is impossible to guess what the call should be. Up to now we have tried several possibilities against the master list and latest callbook, before giving up and calling it a zero-point "DUD." Be sure strangers can tell the difference between your O and D, your U and V, and particularly your N and W. Faint or fuzzy patches in log copies should be touched up before submitting. Some people cut off a line or two when Xeroxing. We don't have ESP, so those calls are deleted from your score. It takes days longer to process bad data, and from now on the errors described will be zeroed out instead of being corrected and credited as in the past. This time 180,000 calls were run through the computer, and thousands of them required the individual research and treatment described for their correction.

Several DX stations have requested a full 48-hour contest period as now exists in other worldwide competitions. This would produce a huge increase in European scores, with very little W/VE change. Note that 6 of this year's top 10 CW scores were Europeans, and only 3 were W/VE. There is no point in making it even more lopsided.

CW Contest—January

Conditions were good but not excellent over most of the world, quite similar to last year. Some stations did better than before, and some not as well. Better antennas seemed to pay off. All 50 states, 10 provinces, but only 93 countries were on, so there were less multipliers available this time. If you missed only one state, it was probably South Dakota, and Canadian P.E.I. was also very scarce. Some of the better multipliers for North Americans were 3B9, 5B4, 5T5, 5Z4, 7X4, 9H1, 9M2, 9Y4, C31, CX, EA6, EA8, EA9, GD, GJ, GU, H44, HK, HL, HZ, IS, J7, J8, KL7, KX6, LX, OHØ, OY, P29, PZ, SV5, TK, All Russian prefixes, VP2M, VP2V, VS6, Y, YB, ZK.

There were several multipliers that only worked transceive on-frequency in the win-

*3075 Florida Ave., Melbourne, FL 32904

dow. To be fair to so many who gave up these multipliers rather than transmit there, no W/VE gets credit for any of them. There is no penalty other than loss of these points and multipliers. None of these DX stations submitted a log, so they must have learned disqualification would result.

With all the care now being exercised to keep the master list of participants free of phonies or erroneous calls, and the certainty of catching all unmarked dupes, when someone logs about 40% dupes or phonies, we have no choice but to disqualify him. This happened to 4 CW entrants this time, and many more were left off who were well "over the edge" and eligible for the same. This warning should be a word to the wise!

The following number of active stations were reported from each country having over 10 participants:

Country	Stations	Country	Stations
W	3026	SM	22
OK	572	UR	21
G	393	LZ	20
UA	363	SP	19
UB	260	F	18
JA	230	UL	15
DL	221	UQ	15
UA9	136	EA	14
VE	133	GW	14
YU	86	OZ	13
GM	69	UO	13
PA	53	OE	12
UC	46	UA2	10
I	39	UF	10
UP	33	UI	10
HB	32	UM	10
OH	31	Others	126
LA	22	Total	6107

There were about 50% more active CW stations than last year, with large increases in the top countries of this list.

The world high-scoring station was in Europe for the first time ever. He is GW3YDX with 336,255 points. A close second is European EA2OP with 331,044 points. The next 10 world high scorers were as follows, with asterisks denoting multi-op stations. W1CF 315,078, LZ1KDP* 303,040, EA3VY* 298,302, GMØAAS* 297,918, HB9AMO 292,166, K1ZM 262,344, K5NA 245,895, KV4FZ 225,081, OHØBA 203,680, N9MM* 203,385. Top 10 scores in the W/VE Single Operator, DX Single Operator, and Worldwide Multi-Operator categories are shown in the score boxes.

Conditions were enough below last year so that no one bettered the old QSO, multiplier, or country total records. QSO leaders were W1CF (WA2SPL op.) 823, N9MM* 789, K1ZM 772, N7DF 761, K5NA 743, W8JI* 701, WØAIH* 698, K5RR* 697, K9RS* 679, WAØTKJ* 657, AA1K 644, W4RX 642. Multi-ops starred.

Outside W/VE, high QSO totals were GW3YDX 613, GMØAAS* 596, LZ1KDP* 596, HB9AMO 581, EA2OP 559, OHØBA 543, EA3VY* 527. High contact totals outside N.A./EU were W1BIH/PJ2 311, 4X4NJ 271, YV1OB 251, UZ9FWR* 208, EA9EU 196, YV3AGT 195, UG6GAW 169, RL8PYL* 168, KX6DS 159, UAØZBP 150.

Multiplier leaders were W1CF, W1ZM 102; K5NA 97; K2EK, W8JI 93; W3BGN, N9MM 91; W1RR 90; AA1K, KV4FZ 89; GW3YDX 87. DX multiplier leaders not shown above were EA2OP 84, EA3VY 83, HB9AMO 82, GMØAAS 81, LZ1KDP 80.

Second World High Single-Op DX Phone J87UEE run by Bob, K4UEE. He wants advice as to where you would like him to operate next.

I4YNO used a 2-element switchable-direction wire Yagi suspended from this 213 foot high water tower.

Countries worked leaders were LZ1KDP 59; OHØBZ 57; GW3YDX, LZ2CJ 56; HB9AMO, UR1RWX 55; GMØAAS, YU3EF 50; UA1DZ, UP2PQ 49. Highest W/VE country totals were W1CF, K1ZM 48; K5NA 43; W8JI 41; W3BGN 40; N9MM 39; K2EK 38; W1KM, W1RR 37.

The European High Scorer's Plaque, donated by Don Busick, K5AAD, goes to Ron G.D. Stone, GW3YDX. As mentioned before, he is the first European to become world high scorer, but this year no one sponsored that award. We need individuals or groups interested in furthering 160 meter operation to sponsor awards for the top World trophy and other continents/countries, as well as trophies in all categories for the multi-op class. If you or your club is interested, contact Frank Anzalone, W1WY, to work out arrangements. Single and multi-op winners for each state, province, and country will receive *CQ* certificates.

Phone Contest—February

The first night was too noisy for most, but the second was quite good for that time of year. Many stations worked all 50 states. Ten provinces were active with no VO2, VE8, or VY. VE1BPY was the only P.E.I., and very few worked any of the active VE6's. There were no really rare states, since all had at least several representatives. Most people finished up with MS, NM, or WY. Ninety-eight countries reported activity, among which most W/VE would be happy to log C31, C6, CE, CP, CT3, CX, EA6, EA8, EA9, EI, FC, FG, FM, GU, HKØ, HR, HZ, IS, IT, J3, J7, KP4, KX6, LU, LX, OE, SV, SV5, TG, TK, All Russian prefixes, VP2V, VP5, VP8, VS6, ZP, ZS, 4U1, 4X, 5B4, 7X5, 9M2.

The master call list shows the following number of calls in each country with more than 10 participants:

Country	Stations	Country	Stations
W	2636	YU	26
UA	960	F	25
UB	881	OE	23
G	445	PA	14
UA9	220	SP	14
VE	156	OH	13
I	92	UQ	13
OK	61	LZ	12
UL	58	UA2	12
DL	50	UI	12
UP	42	UR	12
EA	41	UF	11
UC	39	KH6	10
HB	38	LX	10
GW	28	YV	10
GM	27	Others	278
		Total	6279

Top world score of 324,064 was made by single-op VE3CVX, who was also world high in 1983 with about half that score. The next 10 were as follows, with asterisks denoting multi-op stations: VP9IJ* 285,940, K1ZM 278,600, KV4FZ 271,166, OK3KFO* 270,480, VE3MFA 257,661, W1CF 237,024, KC8MK* 222, 404, AA1K 221,200, UR1RWX* 219,473, J87UEE 206,925. Top 10 scores in the W/VE Single Operator, DX Single Operator, and Worldwide Multi-Operator categories are shown in the score boxes.

World high QSO leader OK3KFO* with 1060 and runner-up K1ZM with 1053 topped last year's record 1006. Following them were KC8MK* 988, UR1RWX* 984, W1CF 971, W9ZRX 940, WØEJ 930, W9AZ* 922, WAØTKJ* 843. Outside W/VE, besides those already shown, high QSO totals were: VP9IJ* 645, LZ2CJ 616, UP1BZR* 585, YU2CRT* 544, KV4FZ 486, GW3YDX 468, RB5QW 453, J87UEE 432, T77V 429. Outside N.A./EU, high contact totals were: UA9AKO 350, YV2IF 165, YV3AGT 118, YV3ALK 110, UG6GAW 105, PT7BZ 104.

Multipliers were way up this year, with so many new countries on. Leaders were AA1K, K1ZM 100, KV4FZ 98, W1CF 96, K2EK 95, KC8MK 91, J87UEE, WA4JXI 89, VP9IJ 85, AA4MM 83, VE3CVX 82, VE3MFA 81. DX multiplier leaders not shown above were: VP2EAG, YV2IF, YV3AGT 66; GW3YDX, YV3ALK 62; XE1HHA 61; T77V 58; EA7CEC, EA3ALD 57.

Countries worked totals were also up this year. Leaders were KV4FZ 53, YU2CRT 48; GW3YDX 47; AA1K, K1ZM, HB9CIP, I4YNO, OK3KFO 45; EA3CCN 44, EA3ALD, J87UEE 43. Best W/VE country totals were AA1K, K1ZM 45; W1CF 41; K2EK 40; WA4JXI, KC8MK 36.

Top single-operator VE3CVX won the Top World trophy in 1983 which is vacant this year for lack of a sponsor. This year's winner of the Don Busick, K5AAD Top Single Operator European Plaque is Ron G.D. Stone, GW3YDX, who is also the CW European Plaque winner. As for the CW contest, we need donors for top single-op world W/VE, and other continents/coun-

Aggregate CW and Phone Club Scores

Total Score	Club Name	CW	Phone
3,222,987	Yankee Clipper Contest Club	W1CF	K1ZM
1,459,580	Frankford Radio Club	W3BGN	VP9IJ
877,701	Potomac Valley Radio Club	W4RX	W3GG
659,188	Bulgarian Contest Group	LZ1KDP	LZ2CJ
580,584	Kansas City DX Club	N7DF	N7DF
524,319	Southeast DX Club	N4PN	J87UEE
472,730	Grand Mesa Contesters	KIØG	KG7Z
418,627	Northern Ohio Amateur Radio Soc.	W8JI	KC8MK
396,728	Viimsi Radio Club	UR1RWX	UR1RWX
285,163	Mad River Radio Club	AD8C	AD8C
270,739	Central Virginia Contest Club	N4EHJ	WU4G
270,480	Club OK3KFO	—	OK3KFO
260,507	Radio Club Zagreb	YU2CRT	YU2CRT
250,643	Kankakee Amateur Radio Soc.	W9AZ	W9AZ
249,961	Rubber Circle Contest Club	K7QQ	K7LXC
238,548	North Texas Contest Club	K5RR	N5JB
214,379	Dixie DX'ers	NQ4I	WI4R
205,302	Kuanas Polytech Inst Radio Club	UP1BZR	UP1BZR
166,219	Bavarian Contest Club	DFØBV	LX9BV
133,504	Leningrad Radio Club	UA1DZ	—
133,422	Amateur Radio Club of O.S.U.	—	W8LT
130,867	Central Arkansas DX Club	KB5DN	KB5DN
130,036	Radio Club Mihail Pupin	YU1EXY	—
127,413	Radio Club Teplice	OK1KPU	OK1KPU
123,750	Radio Club I. Cancar	YT3T	—
121,818	Colorado Contest Conspiracy	WØUA	—
115,502	Mississippi Valley DX Club	WØHBH	WØHBH
113,520	Eastern Iowa DX Assoc.	—	VP2EAG
112,132	The Other Club	W7EJ	—
106,932	Stockport Radio Society	G4OBK	G4XKR
104,988	Radio Club Senta	YU7JDE	—
104,864	Radio Club Chomutov	OK1KSO	—
101,570	Davenport Amateur Radio Club	WØBXR	—
92,400	Modena DX Group	—	I4YNO
87,354	Southwest Ohio DX Assoc.	K8MN	—
84,490	Ashtabula Radio Club	N3BJ	—
82,968	Dayton Amateur Radio Assoc.	W8IMZ	W8IMZ
79,422	Lakeway Amateur Radio Club	—	N4FNB
76,096	Central Arizona DX Assoc.	K7OX	—
75,656	Radio Club Felberova	OK1KFQ	—
72,380	Radio Club OK3KFV	OK3KFV	—
70,192	Western Washington DX Club	W7IEU	KA7AUH
69,823	Oslo Society of NRRL	LA4O	—
69,216	Radio Club Omega	OK3KFF	—
63,780	Amateur Radio Transmitting Soc.	N4XM	—
61,504	Lynchburg Amateur Radio Club	K4XL	—
54,961	LMRE	—	XE1HHA
50,300	Southern California Contest Club	K6SE	—
47,481	Texas DX Society	KA5SBS	—
46,655	Radio Club OK3KWK	OK3KWK	—
46,274	Tallinn Radio Club	UR2RHF	—
44,975	Guernsey Amateur Radio Soc.	GU3HFN	—
42,294	ARC of Greater Milwaukee	N9AW	—
33,880	Radio Club OK3KZA	OK3KZA	—
33,124	San Diego DX Club	AA4M/6	—
31,768	Petaluma DX Society	WB6EGE	WB6EGE
31,430	Radio Club SP5KEI	—	SP5INO
30,287	Radio Club Ceskom	OK1KZD	—
28,545	Southern Calif. DX Club	W6TMD	—
27,860	Byelorussian Polytech Inst.	UC1AWG	—
24,510	Murphy's Marauders	N1JW	—
23,817	Neenah Menasha ARC	—	WB9SAU
23,595	Radio Club Nachod	OK1KNA	—
20,169	Radio Club VST	OK3KAG	—
17,850	Carolina DX Assoc.	—	WA4UNZ
16,096	Radio Club Stochov	OK1KYS	—
15,660	Tri-State DX Assoc.	—	K4XO
14,430	Radio Club Hradiste	OK2KYO	—
12,758	Murgas Amateur Radio Club	WB3FYT	WB3FYT
11,748	Nagoya Univ. Radio Club	JA2YKA	—
9,619	Kettle Moraine Radio Amateur Club	N9KS	N9KS
8,075	PZK	—	SP6ZFU
5,936	Sendai College Radio Club	JA7YCQ	—
5,660	Radio Club Banoles	—	EA3RCD
3,915	Osaka Univ. Radio Club	JA3YKC	—
3,133	Radio Club Bilina	OK1ORA	—
2,223	Coconino County Radio Club	NF7E	—
2,052	Willamette Valley DX Club	KA7FEF	—

tries, as well as trophies for all categories for the multi-op class. If interested, you or your club should contact W1WY to line it up. Single and multi-op winners for each state, province, and country will receive *CQ* certificates.

Club Competition

Yankee Clipper Contest Club more than doubled their last year's score to over 3 million points, well out in front. Frankford Radio Club came from way down in the pack to second place with nearly 1.5 million points. For some reason, we did not get the LZ1KDP phone log, which would probably have raised the Bulgarian group from fourth to second or third place. Northern Ohio ARS (NOARS) seems to have dropped out of the race this time. There were 78 clubs reporting, and 33 of them had six-figure scores or better. Last year there were only 23 scores this high.

Next Time

The CW Contest will be held the last full weekend of January 1986 (Jan. 24–26), and the Phone Contest the last full weekend of February (Feb. 21–23). Send your large SASE to *CQ* with enough postage for the log and summary sheets you plan to use. You can make up your own logs with Universal or GMT, info sent and received, multiplier first time worked with sequential number, and QSO points.

Include a summary sheet with your entry, showing the scoring and other essential information, and a signed declaration that all rules and regulations were observed. CW mailing deadline is Feb. 28, and Phone is March 31.

For best service, send logs to 160 Meter

KB5CX operators KE5BB and KA5UVO displaying special T-shirts and hats printed just for the contest.

Contest Director Don McClenon, N4IN, 3075 Florida Avenue, Melbourne, FL 32904 USA. They may also be sent to *CQ* 160 Meter Contest, 76 North Broadway, Hicksville, NY 11801 USA. Indicate CW or Phone on the envelope. Also send good photos for publication. Any will do, but black-and-white work best.

Rules Summary

Class: Single operator and multi-operator.

Exchange: DX stations: Single report only. W/VE stations: Signal report and state or Canadian area.

Scoring: Own country, 2 points. Own continent outside own country, 5 points. Other continents, 10 points. (Note that USA and Canada count 5 points for each other.)

Multiplier: Each US state (48), Canadian area (13), and DX country. KH6 and KL7 are counted as countries. Canadian areas include VO1, VO2, VE1(NB), VE1(NS), VE1(PEI), VE2, VE3, VE4, VE5, VE6, VE7, VE8(NWT), VY(Yukon). Maritime mobiles are considered countries in each Region. USA and Canada do not count as countries; only the states and provinces.

Score: Total points times total multipliers.

Enjoy the 1986 contests and invite your 160 meter friends to join us.

73, Don, N4IN

Soapbox W/VE CW

Short verticals *do* work—*W1CF (WA2SPL Op.)*. Out into the woods in knee-deep snow to fix a fried switch 20 minutes into the contest—*N1ACH*. Use of amplifier almost tripled last year's barefoot score—*KN2Q*. Why a window when W3BGN transmits in it while Europe is coming in?—*KA1SR*. Went wild when KX6DX answered my CQ—*K3UA*. Used spectrum analyzer to follow jamming and cursing stations in DX window as they QSY'd, and got their identification when they called CQ—*VE3INQ*. Took several hours to fix rig that blew just as contest began. Then had high line and fence noise—*AA1K*. J73EH and ZB2EO only worked stations in window. Those who abstained are at a 2-multiplier disadvantage—*W3BGN, W3FV, others. (Not so; no W/VE gets those multipliers or several others like them—N4IN)*. Beverages laid on top of 3 feet of snow work fine—*N3BJ*. Biggest thrill was working UAØ—*KA5SBS*. Highlight was raising P29PR on a CQ—*W5KL*. Pleased I was able to work *anybody* with my setup. Some people do exceptionally well at receiving—*W5SOD*. W/VE must also stay out of 1907–1912 JA window—*AA4M/6*.

Thrill to work W1BB again—*K8MFO*. Many

Top 10 Scores

Top 10 W/VE Single Op. CW		Top 10 W/VE Single Op. Phone	
W1CF	315,078	VE3CVX	324,064
	(WA2SPL Op.)	K1ZM	278,600
K1ZM	262,344	VE3MFA	257,661
K5NA	245,895	W1CF	237,024
K2EK	187,488		(WA2SPL Op.)
W3BGN	183,183	AA1K	221,200
VE3MFA	177,520	K2EK	198,645
N7DF	165,732	W9ZRX	169,026
AA1K	165,362	WØEJ	150,408
W1RR	164,700	N7DF	141,525
W4RX	151,946	N4NX	115,362

Top 10 DX Single Op. CW		Top 10 DX Single Op. Phone	
GW3YDX	336,255	KV4FZ	271,166
EA2OP	331,044	J87UEE	206,925
HB9AMO	292,166		(K4UEE Op.)
KV4FZ	225,081	GW3YDX	157,356
OHØBA	203,680	LZ2CJ	139,356
W1BIH/PJ2	193,725	T77V	137,170
YU3EF	165,952	VP2EAG	113,520
YV1OB	154,380		(KJØD Op.)
4X4NJ	152,574	YV2IF	104,808
UA1DZ	133,504	I4YNO	92,400
		YV3AGT	73,062
		EA3ALD	71,934

Top 10 Multi-Op. CW		Top 10 Multi-Op. Phone	
LZ1KDP	303,040	VP9IJ	285,940
EA3VY	298,302	OK3KFO	270,480
GMØAAS	297,918	KC8MK	222,404
N9MM	203,385	UR1RWX	219,473
W8JI	194,463	CG3NNR	154,570
UR1RWX	177,255	WU4G	152,560
WØAIH	152,438	YU2CRT	149,407
LZ2CJ	149,058	W9AZ	149,184
K5RR	133,364	WAØTKJ	139,032
YU1EXY	130,036	W8RA	136,800

persistent CQ'ers seem able to hear only Alpha-76 owners—*K6TS*. A few W's in the JA window ruin it for everyone—*N8BJQ/6*. Contest highlight: tearing down shack wall to remove meanest yellow cat you ever saw! Don't ask how he got in there—*N4PN*. A contester on 160 needs a very understanding XYL—*KA7T*. Keep USA out of JA window—*W7BYK*. After several losers called CQ on top of my pileup, I gave up in disgust and went to bed—*KD7SP*. Good conditions, proficient, polite operators. Let's do it again—*K7OA*. Thrill finding another WY station in the contest—*W7HLA (WY)*. The Saturday nite EU opening was fantastic; never before worked so many of them—*N9MM*. Brave W9TW climbed up 200 feet to attach antenna in −67° wind-chill factor—*WØBXR*. Wonderful to EU Friday night, best ever here—*WØUA*. Only battery power in my trailer with −30° wind-chill factor outside. I must be crazy—*WØUY*. It took 3 antenna supporting balloons to make it—*K9RS*.

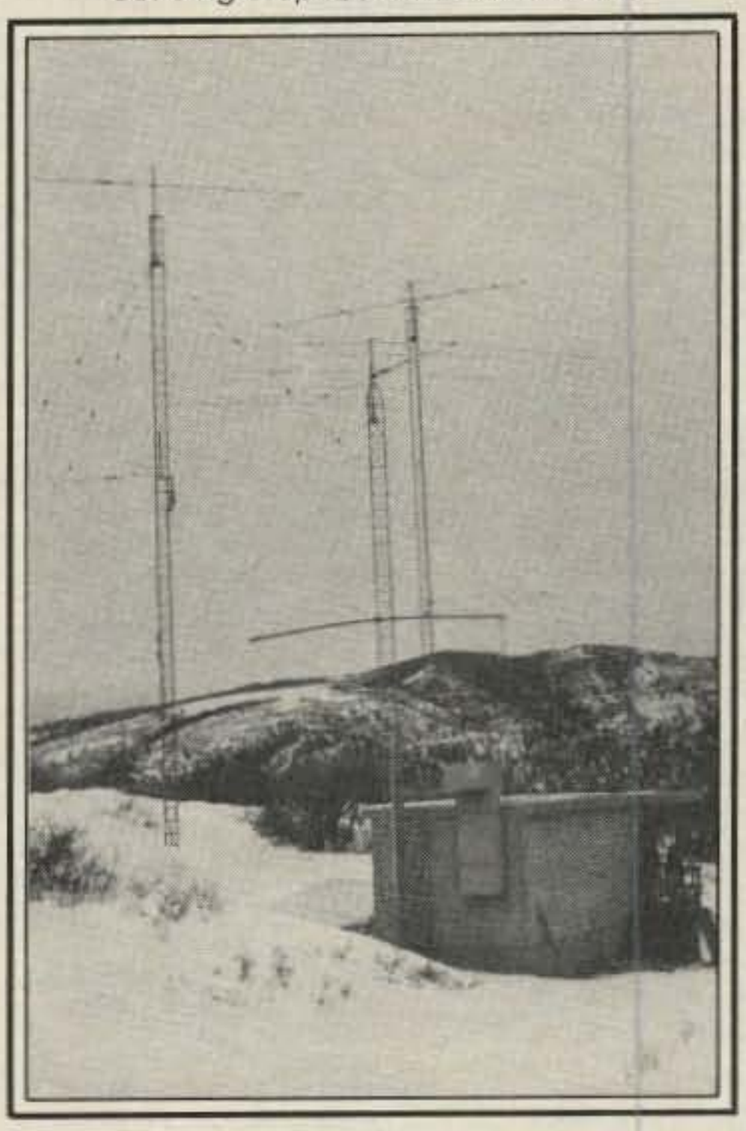
Soapbox DX CW

When our summer QRN starts rising to a weekend peak, I realize it's the CQ contest time again—*VK6HD*. Best ever from down here. Beverage helped reduce QRN—*W1BIH/PJ2*. After a week of antenna work, we had the poorest conditions ever for the contest. Will be back in 86—*OK1KQO*. We need more power for deaf U's and EU's—*JA3YKC*. Got too sleepy. When woke up, contest was over. Next year, will use alarm clock—*9M2AX*. Finally got 160 operating privileges; first ever 160M from here. Best QSO times are my sunset and your sunrise—*KX6DS*. First worked my OM EA3VY and stayed on, having a good time—*EA9KQ*. Overslept second morning. Lost lots of points. What the heck, I catch you next time—*LA7JO*. Our summer is bad contest time, but love top band—*CX8DT*. Planned to only work a short time to test my computer logging system, but got involved again—*KV4FZ*. Secret of success was sending wife and baby away for weekend—*GW3YDX. (He was World high scorer—N4IN)*

Soapbox W/VE Phone

Super contest. Band was pretty good both nights. Keep 'em coming—*VE3CVX*. My first contest ever. It was loads of fun—*VE7ETY*. Biggest thrill was working VK6HD long path—*W1CF (WA2SPL Op.)*. 160 was really jammed with signals, wasn't it?—*W2LX*. With low power and antenna, I heard a lot of "QRZ?" that weekend—*KA2VAJ*. A 5-minute limit should be imposed on everyone on any given frequency with a minimum QSY of at least 10 kHz—*W2FJ*. What do you find in the window? Panes!—*K2FL*. The amplifier helps, but the horizontal dummy load has to go!—*KN2Q*. Overall, conditions were excellent for the end of February—*AA1K*. Road racing and 160 meter contesting are not compatible hobbies the same weekend—*W4TMR*. Colossal T/storm shut me down first nite. Much better second one, with good DX—*N5JB*. Heard several say they needed NM, but they gave up after 2 or 3 tries when I called them—*N7AIH (NM)*. Sure is a frustrating band. Can't raise all those stations I hear—*N6JM*.

Antenna expert Barry, W9UCW, had the highest single-op QSO total in Illinois.



CW multi-op KIØG at 10,000 feet could only be reached by snowmobile or skis. After getting there, they made 512 QSOs.

Thrill to get 42 states and 6 countries with 100 W and a wet string antenna on west coast —*WB6JMS*. Fun to work this contest on the other side of the pond, and give many a rare Utah multiplier. QSL my home QTH—*DJ8WL/W7*. If anyone doubts my being in Mont, an SASE will get you a handful of sagebrush—*KS7T*. First time ever on 160; sure had a ball—*KR7Y*. With W0EJ and KC8MK splattering on each end of the window, it was almost impossible to hear any DX—*KC8JH*. Both *CQ* 160M tests are great fun, and my favorites. Activity is incredible!—*WA0TKJ*. After the amplifier blew up twice, and the snow static let up, we settled down to enjoy the contest—*KD0QL*. The courtesy and patience shown by everyone during the first night high QRN were a credit to amateur radio—*N7DF*.

Soapbox DX Phone

When the antenna-supporting kite was up, everyone could hear me—*VP2EAG*. As a newcomer to 160, the contest was perfect, as nearly every contact was a new state or country—*PT7BZ*. Lost 10 hours to power outage—*LZ2CJ*. Our group are all dedicated *CQ* contesters WWDX, WPX, etc. U.S. stations very loud in Europe were not hearing the tens of Europeans calling 'em back. A lot of fun, we'll be back next year—*I4YNO*. Contest kept wife awake, so had to quit early—*W2ZZ/CT3*. Had a nice time in my favorite contest—*XE1HHA*. Pleased to get operating permission and to give a new country to DX stations who gave me new ones from my home QTH—*J87UEE (K4UEE)*. Little or no observance of the window on either side this time—*GW3YDX*. Much fun our first try; will do it again next year—*HB9CIP*.

CW Multi-Op Station Crews

K1RQ & KB1W, KS1N, WB1EYL. **K1XM** KQ1F. **W10P:** KA1KCD, KW1Z, N1BBM, WA1JHV, WB1FDY. **K2RD** & Net. **K2XA** & NET. **W2XL** & NA2N, KY2J. **K3UA** & W3FSB. **N3KZ:** KH6CP, KM3T. **N4BP** & N4UM. **WA4JXI** & WA4SVO. **WS4Y** & KB4LTQ, KB4LXR, WA6VVA. **N4PN** & K4SB, N4RJ, W8ZF. **N4XM** & KD4U. **N4SF** & AA4NC, N4EL, NW4B. **K4XU** & W3ESU. **N4EHJ** & K4JM, KG4W, N4ND, W4HJ. **KB5DN** & AF5M. **K5RR** & K5MR, K5ZD, NR5K. **KC5DX** & NN5E. **KA5SBS** & K5LZO, NM5M. **K6NA** & N6ND. **W6VLD** & K6TXA, WA6DPQ. **WA6RKE:** KF6NX, W6HDO, W6JTA, WA6RXM. **WB6EGE:** KA6OPN, N6MQ, N6QC, W86WPO. **W7FU** & KG7D, KT7G. **W7TJ** & W7XR. **K7QQ** & W7WA, Net. **K7LXC** & K7HBN, K7WA. **W7BYK** & K9VFY, NG7P, W7WKR. **W8JI** & KG8MK, KW8N, N8ATR, N8DCJ, N8DMM, W8CAR. **AD8C** & AD8P. **K9RS** & K9KM, NA9D. **W9AZ:** AK9F, K9IFO, K9NR, K9ZO, WB9HAD. **N9MM** & N9NC, W9ZRX. **WØAIH** & KØFVF, KMØO, WØUC. **KIØG** & KAØLRW, KVØK, NDØE, WØKEA. **KØUK** & KD7EY. **W0BXR:** N2AWE, K9AYK, KAØVA, N9OK, W9TW. **WAØTKJ** & ABØS, WBØDRL. **VE2QJ:** VE2FLD, VE2SD, VE3FXF. **UZ9FWR:** UA4YWA, UA9FAL, UA9FKM, UA9FNR. **UZ9AWH:** UA9ABO, UA9ACA, UA9ATR. **UZ9CWG:** RV9CWG & RV9CCI. **LZ1KDP:** LZ2UU, LZ2QA, Stef, Anton. **LZ2CJ** & LZ2SC. **OK1KSO/P:** OK1AEZ et al.

OK1KPU: OK1JDX et al. **OK1KFQ:** OK1DDW et al. **OK1KQO:** OK1DFW, OK1FCW, OK2BTW, OK2MMW. **OK3KFV:** OK3CHX et al. **OL5BJW:** OL5BKB et al. **OK3KFF:** OK3CII, OK3CQA, OL8CNT. **OK3KWK:** OK3AUI, OK3IAG, OK3TEI. **OK3KZA:** OK3CLM, OK3CUG, OK3TCK, OK3YCT, OK3YDX, OK3YFT. **OK1KZD:** Not shown. **OK1KNA:** Not shown. **OK3KAG:** OL3CIR et al. **OK1KYS:** OK1FRF et al. **OK2KYD:** Not shown. **OK1ORA:** OK1DHP +2. **G3FVA:** G3SVW, G3ZDM, G4HON, G4MYB. **UR1RWX:** UR2RRJ, UR2RRR, UR2-083-167. **UZ6LWZ:** UA6-150-1103, UA6-150-1070. **UZ3RXX:** UA3RFF, UA3-151-705, UA3-157-890, UA3-157-857. **UZ3AWC:** UA3AGX, UA3-170-533. **UZ4HWS:** UA4HSV, UA4-133-1714, UA4-133-2017. **GU3HFN:** GU3MBS, GU4WRP, GU4WTN. **JA2YKA:** JA9SSY, JF2DQJ, JI2NPL, JJ1BTC, JR2GMC. **JA7YCQ:** JR7MZC, Ikeda. **JA3YKC:** JE3MAS, JH4RHF. **RL8PYL:** RL7PAV, UL7PAE, UL7PAO, UL7PBY, UL7PCZ. **UM9MWO:** UM8MFJ, UM8-036-94, UM8-036-101. **UQ1GWY:** UQ2GIU, UQ2GJH. **UP1BZR:** UP2BDW, UP2BJK, UP2BOQ, UP2-038-346, UP2-038-728. **PI4ZA:** PAØMS, PAØMUN, PAØNZH, PAØPAZ, PAØSHY, PA3AFF, PA3BAS, PA3CLH, PA3CPZ, PA3CVI, PA3DSB. **PA3ADJ** & PA3ABA, PA3DQW, PAØKMS, **LA4O:** LA4HW & LB3HC. **GMØAAS:** GM3OLK, GM3YOR, GM3ZSP, GM4EJI, GM4HBG. **EA3VY:** EA3AIR, EA3AVV, EA3DXD, EA3FER, EA3KU. **UT4UWV:** RT5UN, UB5RCA. **UB4IZZ:** RB5IZ, UB5IEP, UB5-073-3131. **DJ1BZ/A** & DL3SAS, DL3SAU, DL3SAZ, DL5TV. **DFØBV:** DL6RAI, DL7MAE. **DLØMZ:** DK7PE, DF2PI. **UC1WWC:** UC2WBP et al. **UC1AWG:** UC2-009-105, UC2-009-490, UC2-188-030. **UC1AWA:** Atrohow, Pristawko, Budkewich. **UC1WWX:** UC2-006-43 & Oleg. **YU1EXY:** YU1MSK, Dragan, Vel. **YT3T:** YU3BQ, YU3EIJ. **YU2CRT:** YU2AW, YU2DQ, YU2LOW, YU2MM, YU2OG, YU2RA. **YU7JDE:** YU7MDZ, YU7MHI, YU7NXG.

Phone Multi-Op Station Crews

AK1L & KA1X. **K3UA** & W3FSB. **N3KZ:** KH6CP, KM3T, Net. **K4LYY** & WR4U. **WA4JXI** & WA4SVO. **N4FNB** & KA4UEU, KC4LU, WD4PRQ. **WU4G** & KI4GM, N4EHJ. **KB5DN** & AF5M, KB5RF, KD5ZM. **KB5CX** & K5MS, KA5PEL, KA5UVO, KE5BB, KE5BC, WB8TCT. **WB6EGE:** KA6OPN, N6MQ, WB6WPO. **NK7U** & NI7T. **W8RA** & NF8C. **KC8MK** & KV8M, KW8N, N8ATR, N8DCJ, N8DMM, W8JI. **W8LT:** KD8NS, WD8IXE. **W9AZ:** K9IFO, K9NR, WB9HAD, Lori. **W9JOO** & WD9EMM. **KG7Z** & NØDWR. **KDØQL** & KDØOZ, NØBSA. **WAØTKJ** & ABØS, KØUR, WBØDRL. **CG3NNR:** VE3NNR, VE3KRP. **UZ9KWF:** UA9KAJ, UA9KBY. **VP9IJ** & W3MA. **LZ1KOZ:** Ivanov, Uzunov. **OK3KFO:** OK3CMZ et al. **OK3KWK:** OK3IAG, OK3TEI. **G3XWZ/A** & G3MY, G3IQM, G4WQN. **UR1RWX:** UR2RNA, UR2RRJ, UR2RRR. **EV4AW:** Blinov, Enoktaev. **UZ3AYQ:** RA3DUU, RA3DVR. **I4YNO** & I4JMY, I4OUT, I4ZNU, IK4CFV. **UQ1GWT:** UQ2GFB, UQ2-037-341, UQ2-037-360. **UP1BZR:** UP2BOQ, UP2-038-346, UP2-038-728. **UP1BXI:** UP2BLG, UP2PAY. **SP6ZFU:** SP6HTQ, SP6IUV. **EA3RCD:** EA3CXV, EC3BZI, EC3BZZ. **HB9CIP** & HB9CXZ. **UB4MXG:** RB5MAZ, UB4INI, UB5MNL. **UZ4HWS:** UA4HSV, UA4-133-1714, UA4-133-2017. **YU2CRT:** YU2AW, YU2OG, YU2OH, YU2RA, YU2WJ.

Number groups after calls denote score, total QSOs, multiplier, and DXCC countries worked. Multi-op scores follow single-op listings. State, province, and country certificate winners are shown in boldface.

CW SCORES
SINGLE OPERATORS

Connecticut				
W1WEF	**40,932**	**295**	**54**	**10**
N1JW	24,510	255	43	2
W1WY	20,845	108	55	15
K1KI	15,408	120	48	9
Maine				
AD1G	**23,766**	**161**	**51**	**13**
K1SA	4,023	67	27	2
Massachusetts				
W1CF	**315,078**	**823**	**102**	**48**
			(WA2SPL Op.)	
W1KM	110,372	309	82	37
W1PL	75,040	356	70	23
W1AX	30,385	184	59	13
KR1R	26,445	288	41	2
KA1DWX	9,214	125	34	3
W1OPJ	3,129	64	21	2
New Hampshire				
W1RR	**164,700**	**496**	**90**	**37**
N1ACH	96,114	401	83	30
AK1L	32,550	273	50	8
K1TR	2,580	60	20	2
Rhode Island				
KS1J	**32,706**	**308**	**46**	**7**
KA1SR	13,000	125	40	8
Vermont				
K1IK	**57,015**	**336**	**63**	**16**
New Jersey				
N2MM	**95,480**	**444**	**77**	**25**
W2FJ	63,308	331	68	19
W2BHK	61,446	330	66	22
W2CVW	26,999	219	49	9
K2FL	13,072	160	38	3
KC2X	2,436	51	21	3
New York				
K1ZM	**262,344**	**772**	**102**	**48**
K5NA	245,895	743	97	43
K2EK	187,488	597	93	38
W2YV	85,544	343	74	25
K2VV	58,872	338	66	15
KN2Q	36,771	305	51	9
W2DW	7,440	115	30	3
W2GKZ	6,570	105	30	2
K2QF	4,727	71	29	3
Delaware				
AA1K	**165,362**	**644**	**89**	**35**
W3NX	40,527	270	57	14
Maryland				
W3LPL	**127,100**	**535**	**82**	**28**
			(AI3M Op.)	
W3GG	44,368	313	59	12
N3CO	31,806	247	54	8
W3GN	7,623	111	33	2
Pennsylvania				
W3BGN	**183,183**	**538**	**91**	**40**
W3GM	106,255	428	79	29
W3UM	94,546	386	82	30
W3TS	85,820	493	70	21
N3BJ	84,490	490	71	16
W3FV	66,436	375	68	18
K3ND	46,551	255	59	19
W3CV	34,200	190	60	17
W3AJS	31,374	242	54	8
W3UHP	25,990	252	46	5
K3WW	20,776	149	49	13
K4JLD	15,651	125	47	9
N3ARK	8,925	113	35	4
K3OO	6,665	96	31	3
KD3H	5,921	84	31	3
WB3FYT	5,550	88	30	2
K3NZ	5,487	84	31	2
W3ARK	3,480	65	24	2
Alabama				
N4KG	**34,080**	**232**	**60**	**12**
WZ4F	12,599	135	43	3
Florida				
N4IN	**80,730**	**348**	**78**	**28**
W4BV	29,406	201	58	13
K8UNP	8,100	101	36	4
Georgia				
NQ4I	**49,168**	**396**	**56**	**7**
N4NX	48,174	345	62	10
N4UZ	22,372	212	47	7
WI4R	10,179	123	39	2
Kentucky				
NO4R	**66,990**	**562**	**55**	**4**
NV4H	35,568	311	52	3
North Carolina				
W4TMR	**39,700**	**366**	**50**	**4**
NK4Q	30,680	216	59	10
K4PB	27,456	259	48	5
W4DGJ	3,048	62	24	2
South Carolina				
K4CNW	**73,834**	**464**	**67**	**16**
W4NL	52,544	329	64	16
Tennessee				
K4XO	**36,417**	**257**	**61**	**9**
AA4H	23,876	228	47	4
N4HQT	12,492	163	36	2
WM4Z	2,618	58	22	2
Virginia				
W4RX	**151,946**	**642**	**82**	**29**
K4XL	61,504	406	62	13
W4XD	32,880	310	48	4
W4YE	29,328	248	52	6
W4KMS	9,135	123	35	2
K4FPF	3,288	64	24	3
Arkansas				
W5KL	**35,669**	**305**	**53**	**5**
Louisiana				
N5TV	**25,350**	**232**	**50**	**6**
W5KC	18,326	164	49	5
Mississippi				
W5XX	**54,188**	**378**	**62**	**12**
New Mexico				
N7AIH	**11,223**	**126**	**43**	**2**
W7LHO	10,600	125	40	2
Oklahoma				
N5AFV	**6,930**	**90**	**35**	**2**
Texas				
K5GN	**122,320**	**575**	**80**	**28**
N5JB	17,442	97	57	12
KB5UL	16,808	182	44	2
W5QF	15,408	144	48	3
N5UA	14,617	122	47	7
W5SOD	4,760	68	35	1
W5IRP	4,154	67	31	1
K5ZD	1,240	28	20	3
California				
KI6O	**57,645**	**316**	**61**	**11**
K6MO	46,740	246	57	12
K6SE	39,100	186	50	11
AA4M/6	33,124	238	52	10
W6TMD	28,545	213	55	10
WB6JMS	15,410	138	46	8
K6TS	12,464	128	41	6
N8BJQ/6	11,200	127	40	5
W6BA	10,665	100	45	6
N6JM	6,293	86	29	6
AA6EE	2,232	45	24	2
KN5S	1,512	33	21	2
Arizona				
K7OX	**76,096**	**364**	**64**	**15**
W7YS	9,399	116	39	3
NF7E	2,223	57	19	2
Idaho				
KA7T	**37,995**	**289**	**51**	**5**
W7IWU	2,240	50	20	2
Montana				
KS7T	**29,970**	**244**	**54**	**6**
Nevada				
KD7SP	**8,814**	**103**	**39**	**3**
Oregon				
W7EJ	**112,132**	**578**	**68**	**16**
AI7B	109,720	583	65	14
KA7FEF	2,052	48	18	2
Utah				
N5CT	**19,080**	**197**	**45**	**3**
K7OA	13,524	152	42	2
Washington				
W7KJI	**56,791**	**395**	**61**	**11**
W7AWA	31,920	245	56	8
W7IEU	9,082	101	38	5
K7UU	3,425	61	25	2
W7ACP	3,404	64	23	3
K7RIE	830	34	10	2
AK7F	252	14	9	1
Wyoming				
W7HLA	**6,574**	**82**	**38**	**2**
KB7M	32	4	4	1
Michigan				
W8UVZ	**100,396**	**501**	**76**	**22**
W8VSK	29,355	187	57	13
K8CV	25,776	245	48	3
K8OOK	3,500	58	28	2
Ohio				
K8MFO	**137,530**	**599**	**85**	**30**
K8MN	87,354	522	69	17
W8FN	59,500	330	68	19
KC8JH	46,534	399	53	5
WA8MLV	34,528	294	52	5
W8DN	32,595	277	53	5
W8IMZ	29,155	268	49	3
			(WB8MRU Op.)	
W8ILC	23,664	192	51	7
WA8FHF	14,432	155	44	2
N8FXL	8,365	112	35	2
N8AXA	2,222	46	22	2
West Virginia				
K8OQL	**33,072**	**259**	**53**	**9**
WA8AJN	29,600	275	50	3
Illinois				
W9YYG	**86,730**	**514**	**70**	**17**
W9UCW	82,209	522	67	16
W9PNE	29,214	243	54	5
NA9J	23,355	240	45	2
W9QWM	12,060	119	45	3
K9AGB	8,568	76	42	4
KG9D	6,080	86	32	2
W9FSD	330	15	11	1
W9HOT	280	14	10	1
Indiana				
W9RE	**59,776**	**399**	**64**	**12**
W9WM	12,062	150	37	3
Wisconsin				
WA1UJU	**49,343**	**428**	**53**	**2**
N9AW	42,294	317	57	8
W9MQZ	26,352	211	54	5
WB9HRO	18,032	177	46	4
W9HE	13,172	154	37	3
N9KS	5,907	82	33	2
Colorado				
WØUA	**121,818**	**508**	**79**	**26**

You may not be able to solve the world's problems. But at least you can listen.

The Panasonic Command Series.™ With double superheterodyne tuning, you'll hear the world loud and clear.

Now it's easy to listen in on the world's hot spots. With the Panasonic RF-B600 Command Series FM/LW/MW/SW receiver.

Its advanced microcomputer-controlled tuner lets you preset up to nine different frequencies. And reach them at the touch of a button. Or, press the appropriate buttons and tune in any desired frequency with direct-access digital tuning. It'll lock right in to every signal with a PLL quartz-synthesized tuner. Once tuned in, the Panasonic double superheterodyne system helps deliver a clean, consistent signal.

There's even built-in auto-tuning to let you scan the shortwave band automatically, as well as manually. All this means you can tune in Berlin, pick up Paris, or locate London in an instant. Without dialing all over the band.

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RF-B300

Batteries not included.

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just slightly ahead of our time.™

CIRCLE 80 ON READER SERVICE CARD

KG7Z	51,606	375	61	10
WØGOR	25,542	200	54	8
KJØG	23,912	225	49	5
K9PQG	10,560	123	40	2
WØIZV	1,992	40	24	2
Iowa				
NØBB	**35,860**	**299**	**55**	**3**
KØRW	18,350	155	50	6
Kansas				
N7DF	**165,732**	**761**	**84**	**31**
WØUY	23,177	210	49	3
NØUU	1,760	38	20	2
Minnesota				
WØHW	**81,472**	**511**	**67**	**13**
Missouri				
WØHBH	**52,497**	**420**	**57**	**4**
NØTT	9,009	111	39	2
New Brunswick				
VE1BRA	18,944	122	32	2
VE1BHA	1,309	25	11	2
Newfoundland				
VO1AW	**1,070**	**21**	**10**	**2**
Nova Scotia				
VE1YX	**25,256**	**115**	**41**	**13**
Quebec				
VE2TY	**11,536**	**86**	**28**	**2**
Ontario				
VE3MFA	**177,520**	**429**	**80**	**27**
VE3ABG	130,424	376	68	20
VE3INQ	98,472	290	66	20
VE3DZV	95,166	389	51	3
VE3OME	64,206	239	54	10
Manitoba				
VE4JB	**78,648**	**278**	**58**	**6**
Saskatchewan				
VE5RA	**110,124**	**352**	**63**	**13**
VE5XU	101,820	347	60	8
VE5UF	89,700	305	60	9
British Columbia				
VE7BS	**74,480**	**262**	**56**	**10**
VE7IG	55,000	198	55	12
Aland Island				
OHØBA	**203,680**	**543**	**67**	**57**
Alaska				
KL7AF	**11,616**	**72**	**24**	**10**
Armenia				
UG6GAW	**60,060**	**169**	**39**	**38**
Asiatic Russia				
UA9MR	**40,090**	**136**	**38**	**38**
UA9SAA	31,936	112	32	32
UA9AJX	29,898	108	33	33
UAØZBP	21,312	150	18	6
UA9ADE	4,466	39	14	14
UAØKBW	2,715	23	15	11
UAØDW	2,358	73	6	4
UA9ULB	22	4	2	2
Australia				
VK6HD	**27,291**	**85**	**33**	**9**
Bermuda				
VP9LB	**31,920**	**167**	**38**	**4**
Brazil				
PY1BVY	**3,383**	**23**	**17**	**6**
Bulgaria				
LZ2DF	**47,300**	**195**	**44**	**43**
LZ1KCP	19,747	122	31	31
LZ1HY	7,350	72	21	21
Canary Island				
OH2BEJ/EA8	**1,944**	**18**	**12**	**11**
Ceuta				
EA9EU	**107,525**	**196**	**55**	**39**
Colombia				
HK3DDD	**1,215**	**14**	**9**	**3**
Curacao				
W1BIH/PJ2	**193,725**	**311**	**63**	**18**
Czechoslovakia				
OK1DFP	**73,353**	**342**	**49**	**43**
OK3CEM	66,336	316	48	45
OK3CQR	60,490	289	46	44
OK2EC	55,650	301	42	39
OK1KFW	49,444	241	47	43
		(OK1ACO Op.)		
OK2BVG	39,114	229	41	40
OL8COS	33,984	238	36	36
OL9CPG	30,938	246	31	31
OK2FD	30,894	198	38	38
OK1ARI	25,482	207	31	31
OK2PLA	25,420	211	31	31
OK2HI	24,854	177	34	34
OK1DRU	24,769	208	31	31
OL6BES	24,211	208	31	31
OK3BRK	22,575	156	35	34
OK1ATP	19,926	91	41	39
OL8COJ	19,683	197	27	27
OK3KFO	16,704	149	29	29
		(OK3CMZ Op.)		
OK3CXS	16,576	160	28	28
OK1DVO	15,876	156	27	27
OK1MZO	15,201	151	27	27
OK1DZL	14,300	146	26	26
OK1DOZ	13,546	151	26	26
OK1DXW	12,864	139	24	24
OK1DBM	12,525	123	25	25
OK1DXK	11,492	67	34	32
OL9CPN	11,050	113	25	25
OK1AXB	11,025	123	25	25
OL5BMM	10,971	127	23	23
OK2BHQ	10,478	98	26	26
OK2QX	10,244	94	26	26
OK1AXK	9,384	107	24	24
OK1AYD	9,042	117	22	22
OK1VK	8,764	71	28	28
OL1BLN	7,854	96	22	22
OK2PAW	7,788	108	22	22
OK1DVK	6,912	36	36	36
OK3TAY	6,593	105	19	19
OL5BJD	6,272	130	16	16
OK1KZ	6,260	92	20	20
OL1BLR	6,102	102	18	18
OK2PAU	5,206	74	19	19
OK2BCZ	4,471	76	17	17
OK1AIJ	4,384	86	16	16
OK1ZTW	4,029	63	17	17
OK3CTQ	3,856	65	16	16
OL3BIQ	3,822	51	21	21
OK2PGT	3,392	61	16	16
OL1BKO	2,940	82	12	12
OK2BWM	2,256	25	16	16
OK2BCI	1,989	18	17	17
OK2PIO	1,360	38	10	10
OK3CSO	1,230	36	10	10
OK3KEU	1,104	45	8	8
OK2BWH	602	28	7	7
OK2ABU	518	22	7	7
OK1DZD	400	25	5	5
East Germany				
Y22TO	**9,200**	**92**	**20**	**20**
England				
G3XWZ/A	**106,818**	**378**	**57**	**44**
G4OBK	104,709	347	57	39
G3BDQ	20,826	98	39	32
G3SJX	16,730	84	35	28
G4ARI	5,360	59	20	20
G4SLE	5,080	61	20	20
G2CIL	3,876	44	19	19
G8QZ	3,496	30	23	23
Estonia				
UR2RHF	**46,274**	**258**	**34**	**34**
UR2RCO	352	10	8	8
European Russia				
UA1DZ	**133,504**	**440**	**56**	**49**
UA3PFN	56,610	237	45	45
RA6AOS	44,004	220	38	38
RA3DOX	42,042	209	39	39
UA6AF	36,894	180	39	39
UA6BJF	30,168	160	36	36
RA3DX	29,546	167	34	34
UA3YBJ	24,222	147	33	33
UA4QM	24,057	137	33	33
UA3LAR	21,312	125	32	32
UW3GL	11,868	99	23	23
UA3DRR	9,790	88	22	22
UA4NFV	5,264	60	16	16
RZ6AWP	1,911	29	13	13
		(UA6-101-1632 Op.)		
Faeroe Island				
OY7ML	**11,200**	**79**	**28**	**28**
Finland				
OH2DL	**11,544**	**87**	**26**	**26**
OH3TQ	9,558	70	27	27
France				
F8VJ	**38,409**	**88**	**59**	**41**
F3AT	20,545	111	35	31
Georgia				
RF6FFW	**34,713**	**132**	**29**	**29**
RF6QAI	1,638	20	9	9
UF6FBB	822	15	6	6
Greece				
SV1JG	**41,237**	**176**	**43**	**40**
SVØAA	39,330	156	45	41
Hong Kong				
VS6DO	**23,139**	**131**	**27**	**24**
Ireland				
EI9J	**21,417**	**129**	**33**	**33**
Israel				
4X4NJ	**152,574**	**271**	**59**	**46**
Japan				
JA1GTF	**56,376**	**129**	**54**	**34**
JA5DQH	33,456	126	41	34
JA7NI	11,132	81	22	16
JE1SPY	9,504	76	22	16
JA1DDH	8,493	76	19	13
JR1CFG	4,848	49	16	12
JA3BCT	3,500	43	14	10
JH7RYQ	1,377	28	9	7
JK1AFI	570	23	6	6
JH7AJD	57	4	3	3
JA1AAT	54	6	3	3
JA8LN	34	7	2	2
JR1ZTT	5	1	1	1
JH6NBW	2	1	1	1
Kaliningrad				
UA2EC	**21,384**	**159**	**27**	**27**
Kirghiz				
UM8MM	**18,676**	**78**	**28**	**28**
UM8MIR	329	7	7	7
Latvia				
UQ2PQ	**117,130**	**405**	**53**	**49**
UQ2OC	91,260	305	54	47
UQ2PM	18,212	124	29	29
UQ2GNL	2,954	44	14	14
Lithuania				
RP2BIH	**11,866**	**132**	**17**	**17**
UP2BKT	11,004	106	21	21
UP2BLF	8,262	98	17	17
Malaysia				
9M2AX	**1,350**	**24**	**9**	**9**
Marshall Island				
KX6DS	**55,980**	**159**	**36**	**13**
Melilla				
EA9KQ	**8,360**	**38**	**22**	**22**

K4XU, Dick Frey, operating CW as his father and multi-op partner W3ESU observes. Their counterpoise antenna system has been featured in several technical articles.

Moldavia				
UO5OB	**66,968**	**284**	**44**	**42**
Netherlands				
PA3BFM	**129,456**	**378**	**62**	**48**
PA3DFT	49,536	315	32	32
PA3PFW/A	31,220	175	35	32
PAØLOU	29,952	154	39	36
PAØMRN	4,232	38	23	23
New Zealand				
ZL3GQ	**39,780**	**103**	**39**	**10**
Norway				
LA2GV	**99,630**	**415**	**45**	**40**
LA7JO	91,256	397	44	44
LA7SI	2,376	26	18	18
Papua New Guinea				
P29PR	**4,697**	**46**	**11**	**7**
Poland				
SP5INQ	**54,079**	**249**	**41**	**40**
SP4EEZ	34,716	209	33	33
SP9EEE	20,436	158	26	26
SP4JWR	17,275	140	25	25
SP4EAK	7,568	70	22	22
SP9DH	10	2	1	1
Portugal				
CT1AOZ	**102,778**	**237**	**59**	**32**
CT1BOH	70,070	215	55	40
Spain				
EA2OP	**331,044**	**559**	**84**	**46**
EA2CR	3,021	33	19	19
Switzerland				
HB9AMO	**292,166**	**581**	**82**	**55**
Tadzhik				
RT5UL/UJ	**38,700**	**124**	**36**	**36**
Turkoman				
UH8DC	**22,625**	**100**	**25**	**25**
Ukraine				
UB5ZAL	**109,512**	**367**	**54**	**44**
UB5WF	70,012	300	46	42
UB5GBC	60,525	256	45	45
UB5WCQ	41,680	200	40	39
RB5WW	41,065	184	43	38
UB5UKH	32,908	168	38	37
UB5QKC	32,901	199	33	33
RT5UA	30,324	150	38	38
UB5FAN	26,040	172	30	30
RB5IQ	24,500	130	35	35
RB5IA	22,016	132	32	32
UB5IUA	21,421	128	31	31
UY5VA	15,344	106	28	28
UB5EPV	14,994	150	21	21
UB5VAA	13,257	102	27	27
UT4UC	12,840	77	30	27
UB5VKO	11,528	112	22	22
UB5VK	10,465	94	23	23
UT5UFV	2,196	41	12	12
Uruguay				
CX8DT	**7,300**	**39**	**20**	**7**
Uzbek				
RT5UY/UI	**1,800**	**24**	**10**	**10**
Venezuela				
YV10B	**154,380**	**251**	**62**	**19**
YV3AGT	125,580	195	65	21
Virgin Islands				
KV4FZ	**225,081**	**446**	**89**	**42**
Wales				
GW3YDX	**336,255**	**613**	**87**	**56**
GW3JI	37,920	183	40	35
West Germany				
DK6AS	**103,569**	**340**	**57**	**46**
DL1BU	88,893	330	51	36
DL8MBS	55,480	287	40	39
DK3KD	54,428	246	44	41
DL1JF	45,825	240	39	37
DL8CM	28,120	155	37	36
DL1AM	6,456	57	24	24
White Russia				
UC2AA	**109,368**	**394**	**49**	**48**
UC2WO	28,770	181	30	30
UC2WBT	7,560	77	20	20
UC2IDZ	68	4	4	4
Yugoslavia				
YU3EF	**165,952**	**465**	**64**	**50**
YU4YA	99,269	348	53	46
YU3RW	23,544	132	36	34
YU7AJD	300	15	4	4
YU7SF	26	5	2	2

MULTI-OPERATORS

Massachusetts				
K1RQ	**129,246**	**587**	**78**	**26**
K1XM	93,126	380	83	32
Rhode Island				
W1OP	**9,153**	**153**	**27**	**2**
New York				
K2RD	**54,954**	**252**	**71**	**20**
K2XA	48,896	176	64	23
W2XL	43,848	294	58	14
Pennsylvania				
K3UA	**112,258**	**504**	**82**	**29**
N3KZ	35,280	317	48	8
Florida				
N4BP	**106,334**	**515**	**79**	**28**
WA4JXI	68,931	401	69	18
WS4Y	38,454	355	51	5
Georgia				
N4PN	**117,624**	**628**	**78**	**23**
Kentucky				
N4XM	**63,780**	**469**	**60**	**8**
North Carolina				
N4SF	**109,032**	**577**	**77**	**24**
K4XU	107,152	601	74	21
Virginia				
N4EHJ	**118,179**	**561**	**81**	**28**
Arkansas				
KB5DN	**38,200**	**355**	**50**	**2**
Texas				
K5RR	**133,364**	**697**	**77**	**24**
KC5DX	63,510	504	58	7
KA5S8S	47,481	365	57	11
California				
K6NA	**121,765**	**483**	**71**	**20**
W6VLD	40,432	268	56	12
WA6RKE	38,690	241	53	9
WB6EGE	27,608	196	56	10
Washington				
W7FU	**109,478**	**495**	**67**	**15**
W7TJ	107,448	461	74	20
K7QQ	88,527	456	69	18
K7LXC	73,970	409	65	15
W7BYK	46,516	331	58	10
Ohio				
W8JI	**194,463**	**701**	**93**	**41**
AD8C	123,680	589	80	27
Illinois				
K9RS	**124,764**	**679**	**74**	**22**
W9AZ	101,459	577	71	18
Indiana				
N9MM	**203,385**	**789**	**91**	**39**
Wisconsin				
WØAIH	**152,438**	**698**	**82**	**28**
Colorado				
KIØG	**101,033**	**512**	**71**	**19**
KØUK	96,949	566	67	15
Iowa				
WØBXR	**101,570**	**603**	**70**	**19**
Kansas				
WAØTKJ	**116,846**	**657**	**74**	**21**
Quebec				
VE2OJ	**45,276**	**216**	**44**	**3**
Asiatic Russia				
UZ9FWR	**76,500**	**208**	**40**	**40**
UZ9AWH	34,749	122	33	33
UZ9CWG	1,085	21	7	7
Bulgaria				
LZ1KDP	**303,040**	**596**	**80**	**59**
LZ2CJ	149,058	415	63	56
Czechoslovakia				
OK1KSO/P	**104,864**	**386**	**58**	**49**
OK1KPU	76,232	327	52	48
OK1KFQ	75,656	347	49	45
OK1KQO	73,300	335	50	46
OK3KFV	72,380	330	47	44
OL5BJW	72,275	334	49	42
OK3KFF	69,216	329	48	43
OK3KWK	46,655	262	43	41
OK3KZA	33,880	236	35	34
OK1KZD	30,287	248	31	31
OK1KNA	23,595	191	33	33
OK3KAG	20,169	194	27	27
OK1KYS	16,096	115	32	32
OK2KYD	14,430	153	26	26
OK1ORA	3,133	74	13	13
England				
G3FVA/P	**24,054**	**131**	**38**	**33**
Estonia				
UR1RWX	**177,255**	**493**	**65**	**55**
European Russia				
UZ6LWZ	**82,836**	**298**	**52**	**46**
UZ3RXX	38,160	209	36	36
UZ3AWC	13,754	112	26	26
UZ4HWS	4,496	51	16	16
Guernsey				
GU3HFN	**44,975**	**252**	**35**	**35**
Japan				
JA2YKA	**11,748**	**93**	**22**	**17**
JA7YCQ	5,936	67	16	10
JA3YKC	3,915	52	15	12
Kazakh				
RL8PYL	**59,280**	**168**	**40**	**40**
Kirghiz				
UM9MWO	**360**	**11**	**6**	**6**
Latvia				
UQ1GWY	**19,080**	**162**	**24**	**24**
Lithuania				
UP1BZR	**99,750**	**377**	**50**	**45**
Netherlands				
PI4ZA	**92,850**	**358**	**50**	**43**
PA3ADJ	61,542	314	39	36
Norway				
LA4O	**69,823**	**332**	**41**	**40**
Scotland				
GMØAAS	**297,918**	**596**	**81**	**50**
Spain				
EA3VY	**298,302**	**527**	**83**	**48**

Ukraine

UT4UWV	**66,308**	**291**	**44**	**38**
UB4IZZ	48,520	226	40	39

West Germany

DJ1BZ/A	**112,545**	**328**	**61**	**44**
DFØBV	85,104	375	48	43
DLØMZ	52,762	209	46	40

White Russia

UC1WWC	**45,705**	**260**	**33**	**33**
UC1AWG	27,860	145	35	35
UC1AWA	22,734	166	27	27
UC1WWX	384	14	6	6

Yugoslavia

YU1EXY	**130,036**	**377**	**59**	**45**
YT3T	123,750	430	55	46
YU2CRT	111,100	375	55	46
YU7JDE	104,988	372	52	42

Check logs are gratefully acknowledged from the following: DL6RAI, DL7MAE, LA8DY, N2RT, N7CEE, OH1XX, OK1DQW, OK1DRQ, OK1IAR, OK2BPU, PA3BFH, PI4DEC, RA1AO, RA3EA, RB5VW, SP1ADM, UA3QQQ, UA3RFZ, UA4CLT, UA9XS, UB5KDO, UB5VEG, UBØKA, UO5OJM, UZ9KWF, VE4AAU.

Disqualified: K3TUP, N3CXB, OK1HCH, UP1BWR.

PHONE SCORES
SINGLE OPERATORS

Connecticut

W1ODY	**110,405**	**668**	**71**	**17**
K1KI	73,140	449	69	16
W1WY	4,428	45	36	6

Maine

N1CTD	**15,006**	**159**	**41**	**5**

Massachusetts

W1CF	**237,024**	**971**	**96**	**41**
		(WA2SPL Op.)		
KR1R	**51,950**	**470**	**50**	**7**
K1KNQ	**24,860**	**234**	**44**	**9**
KQ1F	**13,872**	**120**	**48**	**10**
K1XM	**7,421**	**73**	**41**	**6**

New Hampshire

N1ACH	**62,622**	**418**	**63**	**17**
AF1T	36,568	276	56	9
W1RR	19,516	196	41	10
KE1E	2,709	54	21	3
W1UCI	2,163	44	21	2
W2LX	2,142	45	21	4

Rhoda Island

KA1SR	**94,879**	**461**	**79**	**28**

Vermont

K1LPS	**39,666**	**247**	**66**	**15**
KA1ETQ	13,650	146	42	5

New Jersey

W2FJ	**66,669**	**383**	**71**	**20**
N2RM	48,360	338	60	13
K2FL	19,728	177	48	9
N2LT	14,689	172	37	7
W2CVW	14,532	155	42	6
W2ORA	2,882	55	22	3
W2SDO	1,463	34	19	3

New York

K1ZM	**278,600**	**1053**	**100**	**45**
K2EK	198,645	791	95	40
K2VV	74,337	423	71	21
K2RD	46,848	298	64	17
K5NA	41,706	263	63	15
KN2Q	22,410	219	45	5
K2XA	15,456	160	42	7
WB2TKD	6,293	88	31	4
KA2VAJ	5,292	86	27	3
W2DW	4,321	64	29	3
W2XL	3,725	70	25	2

Delaware

AA1K	**221,200**	**825**	**100**	**45**
W3NX	40,114	270	62	10

Maryland

W3GG	**65,152**	**435**	**64**	**17**
K3ZO	63,189	433	63	15
WA3YJA	2,160	51	20	2

Pennsylvania

W3GM	**87,016**	**506**	**73**	**20**
W3TS	85,358	555	67	16
W3BGN	29,440	250	46	15
K3OO	27,018	207	57	11
W3UHP	23,150	209	50	5
K4JLD	17,232	153	48	11
W3AP	15,582	160	42	8
KC3LV	13,005	128	45	7
KA3AVB	8,976	121	33	3
WB3FYT	7,208	94	34	5
KC3AD	6,820	101	31	3
KB3QH	5,539	88	29	3
K3WW	3,900	53	30	7
W3ARK	1,958	40	22	3

Alabama

WZ4F	**72,896**	**459**	**68**	**17**

Florida

AA4MM	**107,900**	**529**	**83**	**29**
N4IN	64,974	313	78	27
KB4HF	55,835	372	65	15
W4PZV	26,880	149	64	21
W4BAA	12,330	115	45	12
W4WKQ	4,031	68	29	2

Georgia

N4NX	**115,362**	**622**	**78**	**26**
WI4R	86,520	530	70	18
WD4RCO	36,234	220	66	18
K4VHC	12,060	122	45	6
W1UA	2,958	42	29	6

North Carolina

W4TMR	**55,440**	**410**	**60**	**13**
KF4HK	49,962	320	66	15

South Carolina

W4NL	**68,675**	**446**	**67**	**17**
WA4UNZ	17,850	158	50	10

Tennessee

K4RIG	**79,530**	**528**	**66**	**15**
N4HQT	15,532	160	44	4
K4XO	10,755	99	45	9
N4BSN	4,905	47	45	5

Virginia

W4TMN	**14,508**	**165**	**39**	**6**
W4KMS	9,766	112	38	5
W4WJJ	3,408	65	24	2
N3RC	2,200	45	20	4

Arkansas

WA5NFC	**36,396**	**304**	**54**	**8**

Mississippi

N5GDO	**18,148**	**155**	**52**	**7**

New Mexico

N7AIH	**8,815**	**103**	**41**	**2**

Texas

N5JB	**47,125**	**306**	**65**	**14**
N5UA	22,385	177	55	10
K5RR	2,375	43	25	2
		(K5ZD Op.)		
W5IRP	480	20	12	1

California

K6HNZ	**93,100**	**527**	**70**	**17**
K6EID	18,603	154	53	7
WB6JMS	18,512	154	52	8
N6JM	5,676	80	33	3
W6CN	5,056	73	32	3
KN5S	4,255	88	23	2
N6PE	1,974	41	21	2

Arizona

KR7Y	**27,832**	**226**	**56**	**7**
NF7E	14,214	141	46	4

Idaho

KA7T	**13,689**	**139**	**39**	**6**

Montana

KS7T	**13,872**	**131**	**48**	**4**

Nevada

KD7SP	**50,304**	**339**	**64**	**13**

Oregon

AI7B	**42,180**	**270**	**60**	**12**

Utah

DJ8WL/W7	**21,120**	**168**	**55**	**7**

Washington

KA7AUH	**61,110**	**390**	**63**	**12**
W7AWA	44,312	320	58	8
K7LXC	26,418	207	51	8
AK7F	3,776	50	32	3

Wyoming

KB7M	**1,533**	**35**	**21**	**2**

Michigan

N8BQV	**20,670**	**170**	**53**	**7**
W8VSK	8,085	102	35	3
K8OOK	3,480	54	29	2

Ohio

KC8JH	**69,120**	**398**	**72**	**21**
AD8C	55,449	397	61	12
W8IMZ	30,149	213	59	10
N8FXL	14,124	144	44	4
W8EX	7,790	80	41	8
N8AXA	4,768	67	32	2
K8HF	1,760	38	20	2

West Virginia

K8DQL	**53,680**	**391**	**61**	**11**
WA8AJN	52,110	432	54	9
W8VEN	18,100	160	50	6
NJ8Z	5,292	89	27	3

Illinois

W9LNQ	**22,880**	**179**	**55**	**8**
KR9G	18,700	149	55	6
W9HOT	4,608	66	32	2
KB8AC	3,422	53	29	2

Indiana

W9ZRX	**169,026**	**940**	**78**	**23**
W9RE	6,732	80	36	5
W9WM	5,332	80	31	2

Wisconsin

WB9SAU	**23,817**	**211**	**51**	**6**
N9KS	3,712	58	29	2
WB9HRO	468	18	12	2

Colorado

NØBQV	**62,307**	**439**	**63**	**12**
WØGOR	44,550	289	66	13
WØGOQ	39,150	296	58	8
KØUK	16,245	162	45	5
KYØA	11,528	112	44	4
KØGAS	6,042	78	38	2
KJØG	1,909	40	23	2

Iowa

WØEJ	**150,408**	**930**	**72**	**20**
NØBB	9,761	106	43	2
KØDGX	7,410	86	39	4

Kansas

N7DF	**141,525**	**818**	**75**	**22**
WØCEM	27,719	233	53	4

Minnesota

WØHW	**17,836**	**161**	**49**	**4**

Missouri

WØHBH	**54,534**	**398**	**61**	**11**
KAØIQR	8,471	71	43	10
KØCS	8,440	95	40	5

Newfoundland

VO1AW	**520**	**13**	**8**	**2**

Nova Scotia

VE1YX	**23,856**	**117**	**42**	**11**
VE1BNN	16,512	63	48	19

Quebec

VE2QO	**23,199**	**132**	**37**	**3**
VE2DTI	15,876	93	36	4
VE2TI	14,632	101	31	3

Ontario

VE3CVX	**324,064**	**799**	**82**	**28**
VE3MFA	257,661	651	81	26
VE3OME	99,297	346	59	12
VE3ABG	40,720	212	40	6
VE3CWE	8,381	59	29	3

Saskatchewan

VE5RA	**62,757**	**233**	**57**	**10**

British Columbia

VE7ERY	**53,142**	**221**	**51**	**3**
VE7ETY	43,401	186	51	7

Andorra

C31OF	**49,303**	**190**	**47**	**42**

Anguilla

VP2EAG	**113,520**	**336**	**66**	**22**
		(KJ0D Op.)		

Armenia

UG6GAW	**30,225**	**105**	**31**	**31**

Asiatic Russia

UA9AKO	**52,900**	**350**	**23**	**23**
UA9MR	3,641	72	11	11

Bahamas

C6AER	**3,360**	**32**	**21**	**6**

Balearic Is.

EA6VQ	**3,525**	**46**	**15**	**15**

Brazil

PT7BZ	**50,286**	**104**	**51**	**23**

Bulgaria

LZ2CJ	**139,356**	**616**	**42**	**42**

Czechoslovakia

OK1KPU	**25,699**	**169**	**31**	**31**
		(OK1JDX Op.)		
OK3CDX	22,110	138	33	33
OK1KJA	19,173	118	33	33
OK1DWC	3,344	40	19	19
OK2BHQ	2,460	37	15	15
OK2QX	948	17	12	12
OK1AXB	585	13	9	9

England

G4OBK	**3,591**	**33**	**21**	**20**
G4XKR	2,223	24	19	19

European Russia

RA3DKE	**14,940**	**100**	**30**	**30**
UA3AQW	12,688	114	26	26
UA1WCM	7,272	66	24	24
UA3ICB	4,068	47	18	18
RV6AF	3,667	36	19	19
UA3ATV	2,760	34	15	15
RZ6AWP	860	18	10	10

France

F3NG	**1,012**	**19**	**11**	**11**

Italy

I4CSP	**6,725**	**52**	**25**	**25**

Kazakh

RL7LCV	**3,420**	**32**	**12**	**12**

Latvia

UQ2GNL	**7,458**	**68**	**22**	**22**

Lithuania

RP2BIH	**18,707**	**297**	**13**	**13**
RP2BIO	8,205	108	15	15
UP2PBW	5,258	46	22	22
UP2BLV	4,140	56	15	15

Luxembourg

LX9BV	**16,660**	**119**	**28**	**28**
		(LX1WW Op.)		

Madeira

W2ZZ/CT3	**5,040**	**29**	**18**	**17**

Malaysia

9M2AX	**5**	**1**	**1**	**1**

Mexico

XE1HHA	**54,961**	**178**	**61**	**16**

Moldavia

UO5ONQ	**21,998**	**114**	**34**	**34**
UO5ONA	12,383	80	29	29

Paraguay

ZP5JCY	**2,640**	**22**	**16**	**12**

Poland

SP5INQ	**31,430**	**173**	**35**	**35**
SP9EEE	4,131	50	17	17
SP6DVP	621	15	9	9

San Marino

T77V	**137,170**	**429**	**58**	**47**

St. Maarten

KK9A/PJ7	**8,559**	**61**	**27**	**12**

St. Vincent

J87UEE	**206,925**	**432**	**89**	**43**
		(K4UEE Op.)		

Spain

EA3ALD	**71,934**	**235**	**57**	**43**
EA3CCN	60,270	239	49	44
EA7CEC	43,206	113	57	42
EA1AWW	1,568	22	14	14

Ukraine

RB5QW	60,690	453	35	35
UB5JNQ	7,850	64	25	25

Venezuela

YV2IF	**104,808**	**165**	**66**	**30**
YV3AGT	73,062	118	66	34
YV3ALK	64,170	110	62	32

Virgin Islands

KV4FZ	**271,166**	**486**	**53**	

Wales

GW3YDX	**157,356**	**468**	**62**	**47**
GW4IOI	25,789	131	37	34
		(GW8TVX Op.)		

West Germany

DL8PC	**12,528**	**86**	**29**	**29**
DL7MAE	8,975	74	25	25
DJ3HJ	3,260	34	20	20

Yugoslavia

YU3EF	**60,732**	**281**	**42**	**42**

MULTI-OPERATORS

New Hampshire

AK1L	**61,389**	**456**	**57**	**12**
	Pennsylvania			
K3UA	**65,675**	**383**	**71**	**19**
N3KZ	47,025	368	57	14

Alabama

K4LYY	**74,970**	**468**	**70**	**18**

Florida

WA4JXI	**114,810**	**480**	**89**	**36**

Tennessee

N4FNB	**79,422**	**594**	**62**	**10**

Virginia

WU4G	**152,560**	**823**	**80**	**24**

Arkansas

KB5DN	**92,667**	**591**	**69**	**17**

Louisiana

KB5CX	**39,294**	**297**	**59**	**12**

California

WB6EGE	**4,160**	**59**	**32**	**2**

Oregon

NK7U	**90,090**	**548**	**70**	**18**

Michigan

W8RA	**136,800**	**776**	**75**	**22**

Ohio

KC8MK	**222,404**	**988**	**91**	**36**
W8LT	133,422	792	74	21

Illinois

W9AZ	**149,184**	**922**	**72**	**19**

Indiana

W9JOO	**14,720**	**136**	**46**	**6**

Colorado

KG7Z	**65,792**	**451**	**64**	**14**
KDØOL	47,731	366	59	8

Kansas

WAØTKJ	**139,032**	**843**	**72**	**19**

Ontario

CG3NNR	**154,570**	**493**	**65**	**12**

Asiatic Russia

UZ9KWF	**8,740**	**50**	**20**	**20**

Bermuda

VP9IJ	**285,940**	**645**	**85**	**33**

Bulgaria

LZ1KOZ	**20,434**	**115**	**34**	**34**

Czechoslovakia

OK3KFO	**270,480**	**1060**	**49**	**45**
OK3KWK	11,970	82	30	30

England

G3XWZ/A	**38,120**	**242**	**40**	**37**

Estonia

UR1RWX	**219,473**	**984**	**41**	**41**

European Russia

EV4AW	**26,593**	**145**	**29**	**29**
UZ3AYQ	9,146	154	17	17

Italy

I4YNO	**92,400**	**365**	**50**	**45**

Latvia

UQ1GWT	**19,494**	**137**	**27**	**27**

Lithuania

UP1BZR	**105,552**	**585**	**36**	**36**
UP1BXT	1,518	30	11	11

Poland

SP6ZFU	**8,075**	**65**	**25**	**25**

Spain

EA3RCD	**5,660**	**60**	**20**	**20**

Switzerland

HB9CIP	**94,650**	**370**	**50**	**45**

Ukraine

UB4MXG	**17,670**	**106**	**30**	**30**
UZ4HWS	3,434	36	17	17

Yugoslavia

YU2CRT	**149,407**	**544**	**53**	**48**

Check logs are gratefully acknowledged from the following: CX4HS, EA7OI, OH1XX, RA3EA, RB5DX, UB5KCA, UP2-038-1729, Y2-13112-E39.

Disqualified: EO3AOW, OE3WQB.

HOW TO EQUIP YOUR FIRST STATION.

A guide from Madison Electronics

If you're going to be an amateur radio operator, you're going to need a station to operate. Madison Electronics has some advice for you—the first time amateur—on how to equip an amateur station that will give you hours of pleasure and operating capabilities. Your first piece of equipment is going to be the most important—a transceiver.

YOUR FIRST TRANSCEIVER

We recommend starting out with a transceiver and not a receiver, even though you may not yet have a license to transmit. By buying a transceiver, you are ready to go on the air the instant you get your license, and you also have a good piece of gear that can be used as the foundation for building a more elaborate station in the future.

There are three transceivers we feel will do an absolutely fabulous job for the first-time amateur. These transceivers are the Kenwood TS430S, the ICOM IC-735, and the Yaesu FT757GX. All three receive both the shortwave and amateur bands; offer SSB and CW operation; are small enough to fit easily in any shack, and transmit on all the amateur bands. Don't forget that you will also need a power supply for your transceiver. Call Madison for more information on any of these radios and our most recent price.

THE PERFECT FIRST ANTENNA

To receive and transmit on the amateur bands you'll need a good antenna—preferably something that's easy to put up, doesn't take a lot of space, and covers all the amateur bands. Our recommendation is the Butternut HF6V vertical antenna. To connect your new transceiver to your new antenna you'll need coaxial cable—about 100 feet with PL259 connectors on each end should do the job. Madison sells the Butternut (and other fine antennas)and the cables. Call us for our most recent quote.

NECESSARY STATION ACCESSORIES

Now that you've got a rig, coax, and an antenna, you'll need some station accessories. We recommend an electronic keyer by Hamkeyer plus a keyer paddle. When you upgrade to General, you'll also need a microphone, either handheld or desk. Madison sells the widest variety of station accessories for all types of rigs, so call us for more information and pricing.

A BIGGER ANTENNA

After you've been on the air for a while—and if you have the room—your attention will turn to more elaborate antennas. Try using a Cushcraft A4 beam for 10-15-20 meters. Put it on top of Rohn 25G tower (we'll sell you the Rohn with both the base and rotor plate). Turn your new beam with the Telex Hy-Gain Ham IV rotator (an amateur favorite). Naturally enough, you'll also need another 100 feet of coax, and also 100 feet of rotator control cable. By now you know who to call for pricing information: Madison.

THE FINAL TOUCH

With a better antenna, your attention will next turn to more power. The answer is Kenwood's TL922A linear amp, a maximum power amplifier that is small enough to sit on a desk and powerful enough to crash pileups. Madison sells the Kenwood amp, so you can call us for a quote.

LAST WORDS ON BUYING EQUIPMENT

Madison Electronics has been selling amateur gear to novices and old timers alike for over 30 years. We back everything we sell with our personal guarantee and we take care of the warranty work on the equipment we sell. We also take care in answering your questions about amateur radio. We won't oversell you into more equipment than you really need for your first station, and we won't overcharge you. You can always count on us for honest service and prices, and good advice. And always call us for information and prices on any piece of gear, from digital packet radio to UHF. We'll be glad to help. Good luck on getting that ticket. We'll look forward to working you on the air.

73&Good DX
Don

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CIRCLE 84 ON READER SERVICE CARD

CQ REVIEWS:

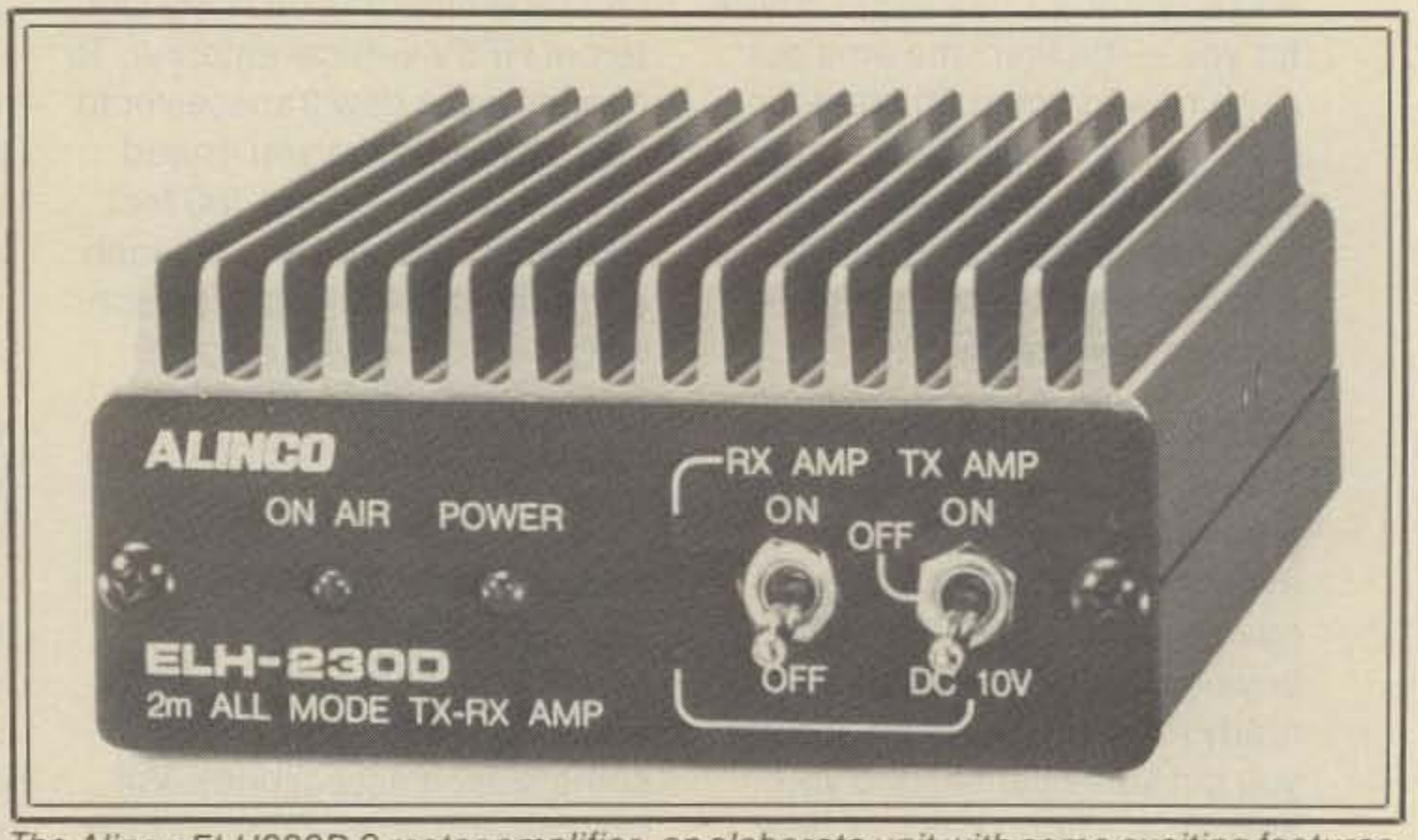
The Alinco ELH230D 2 Meter RF Amplifier

BY DAVE INGRAM*, K4TWJ

Ten years ago, reviewing a 2 meter RF amplifier would have required including a preliminary discussion of FM concepts, repeaters, and OSCAR satellites. Today, however, 2 meter FM and SSB or CW operations are amateur radio's most popular and thriving areas of interest. Bearing those facts in mind, we will assume you are generally familiar with our present span of 2 meter activity and proceed with this discussion of an impressive new linear amplifier for talkies and low-power rigs.

The ELH230D is one of several new items recently introduced by Alinco Electronics Corp. of Reno, Nevada. It's a 2 meter 15 to 30 watt all-mode (linear) RF amplifier with an internal FET receiving preamp in a small and quite attractive cabinet. Two and a half or three watts from a hand-held talkie or portable rig will drive the Alinco to a solid 30 watts output. One watt of drive will produce at least 15 watts output from the amplifier. Minimum driving/keying power for the ELH230D is 200 milliwatts, and maximum drive is 5 watts. In other words, the unit is especially designed as "seven league boots" for most of today's talkies. An overview reveals two attractive points of the ELH230D: its small size and its smart-looking front panel. It can be hidden beneath a car seat, but it begs to show its flair from any auto's dash or center console. The amplifier's gray wraparound cabinet includes a full-length heatsink on top, and its front panel is black with two miniature switches and four LEDs. The switches control receive preamp on/off transmit amplifier on/off, and a special 10 volt regulated output. LEDs indicate power, transmit/on-air, receive preamp enabled, and 10 volt output energized. The rear panel has SO239 input and output connectors, a small molex socket for power connection, plus a coaxial jack for the 10 volt output line (more about that feature later).

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



The Alinco ELH230D 2 meter amplifier, an elaborate unit with some exciting features.

Frequency range: 143 to 149 MHz
Mode: FM-SSB-CW
Amplification: 10 dB minimum
RF Power out: 3 W in 30 W out
RF Power out: 1 W in 15 W out
Maximum input: 5 watt
FET RX pre-amp: 10 dB gain
Transmit switching: carrier operated or manual control
Matching Network: 50 ohms
Antenna connectors: SO-239
Power Required: 11 to 15 VDC
Current Required: 6.5 amp transmit, 80 ma receive
Regulated Power: for HT's DC volts
Fuse: 10 amp
Size: 7" × 3½" × 1½"
Weight: 1 lb.

Table I– Technical specifications of the Alinco ELH230D.

The amplifier includes an internal RF sensing circuit and relay for T/R switching, and a flush-mounted slide switch on the cabinet's bottom selects fast or slow time constants. Fast is used for FM, while slow minimizes relay dropout between words on SSB.

Installation and hookup of the Alinco amplifier is a snap and shouldn't require more than a few minutes. The amplifier's supplied power cord is first connected to a 12 volt/6.5 amp DC supply, auto cigarette-lighter plug, or fuse-block push-terminal (connect it on the ignition key-switched side to avoid possible inductive spike damage during engine cranking). An antenna with an SWR of 1.5 to 1 or less and capable of handling 35 watts is connected to the amplifier's output, then a 3 or 4 foot interconnecting coax cable is mated between the amplifier and low-power transceiver. An included under-dash mounting bracket completes the installation. It's that simple. "Barefoot" or straight through operation is achieved with the amplifier off. When switched on, the 10 volt output is activated and the receive preamp is selectable.

Points of Interest

A brief study of the amplifier's schematic (fig. 1) reveals some clever design ideas. Two transistors, TR1 and TR2, are used for activating relay RL1, which switches in transmit amplifer TR5 (note stripline circuits on its input and output), a nice feature for rugged use. TR4 regulates the bias on TR5, another "deluxe" feature. TR3 regulates the voltage to receive preamp TR6, a popular 2SK125 FET that provides 10 dB of gain with a noise figure slightly below 2 dB. It's not in

the GaAsFET category (that transistor alone would cost almost as much as this complete amplifier), but it's a definite help when tuning weak SSB signals or initially setting up a mode B OSCAR station. In fact, I use the ELH230D with my portable OSCAR 10 setup only for its preamp. It's also a good "backup" when one's GaAsFET preamp unexpectedly dies. Considering today's expansions in VHF/UHF technology, all-mode RF amplifiers with receiving preamps seem the only way to go. Incidentally, Alinco's 70 cm RF amplifier is an OSCAR operator's delight—30 watts output for mode B transmit and a low-noise GaAsFET preamp for mode L receive.

The unit's previously mentioned 10 volt DC output is obtained from its 7810 regulator circuit. This voltage can be used for externally powering a hand-held talkie while mobile without draining its rechargeable battery. Using this feature calls for checking your talkie's input voltage range, purchasing suitable connectors at a nearby Radio Shack, and wiring that cable. My own Yaesu FT208R, which uses a 10.8 volt battery pack, works fine from the 10 volt source, but some talkies require slight modifications for battery-pack bypassing and/or external powering. As another idea to consider, I rigged a clip for charging my TH21AT's extra battery pack from the 10 volt line rather than adding a series-wired dropping resistor and redrilling a battery clip for powering the (9 volt maximum input) rig. Use your own ingenuity in this area.

Using the Alinco Amplifier

The ELH230D proved to be a great little amplifier, and it serves a dual purpose in my particular case. The amplifier is used mobile with a small talkie for "big rig" capabilities without flashy underdash enticements to possible vandals, and it's also swapped around for using only its receive preamp as needed with one of my OSCAR 10 setups. I'm also planning a large rechargeable battery pack for 2 meter operations with the amplifier and a portable 2 watt SSB rig. Visualize that arrangement: rig in one coat pocket, amplifier in the other, and a power pack slung over the shoulder . . . a real confederate amateur, eh?

Our first operations with the amplifier were through a repeater roughly 60 miles away while mobiling with an Avanti antenna on the auto's rear window. My TH21AT's barefoot signal was too noisy to copy; the ELH230D boosted it to almost full quieting. Subsequent operations continue proving likewise, especially when communicating over difficult "direct" paths—a rather normal part of our daily routine (and, according to reports, routines of many others). Once you become accustomed to the talkie and amplifier concept, you feel undressed leaving home without them. The amplifier gets slightly warm during periods of heavy use, but that temperature seems to hit a leveling point rather than continuing to rise. Actually, it feels only as warm as a 25 or 40 watt FM transceiver. Performance of the receive preamp is more noticeable on SSB than on FM, mainly because of FM's capture effect and possible intermod increases in metropolitan areas. The (transmit) amplifier's signal quality on any mode is exceptionally clean, and its second harmonic output is practically nonexistent. That's probably because the amplifier's design is also aimed toward marine and commercial markets.

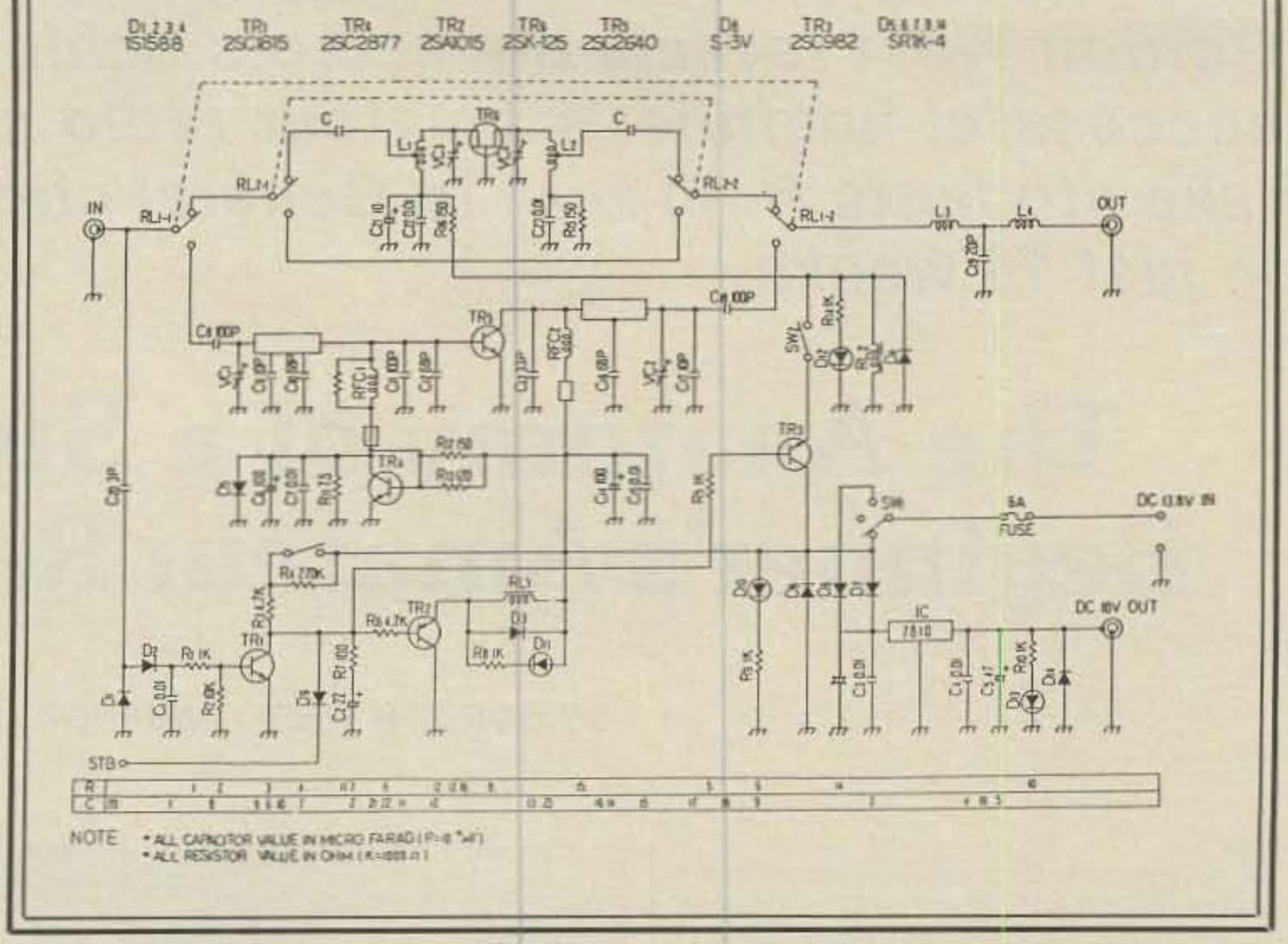


Fig. 1– Schematic diagram of Alinco's ELH230D.

Conclusion

If you're looking for a quality talkie amplifier at a fair price, the Alinco ELH230D definitely warrants checking out. Its all-mode capabilities and receiver preamp are two assets which can only become more appreciated in the future. As we've said before, our VHF and UHF bands are tomorrow's prime spectrum of activity.

If you're interested in a higher output power 2 meter amplifier, take a look at Alinco's 1 to 3 watt input, 50 watt output ELH260D. If 70 cm is your desire, their ELH730D turns 3 watts input into 30 watts output and includes a GaAsFET receive preamp to boot. Current mating power supplies with dual metering are also available. For more information on any of these items, contact Alinco Electronics Corp., P.O. Box 70007, Reno, Nevada 89570, or one of their nationwide amateur products dealers. CQ

After 4,000 graduates in 10 years of teaching, Gordon West reveals the secrets behind teaching a successful beginner's amateur radio class that will take students from zero to General class in just 18 weeks.

The Anatomy of a Successful Beginner's Amateur Radio Class

BY GORDON WEST*, WB6NOA

The new volunteer examination program, with the published FCC test questions and answers, makes it easy for an amateur radio instructor to teach a ham class. With little difficulty to the instructor and the students, it's quite easy to hold an 18-week class and take students with no knowledge of the code or theory all the way through their Novice license, through their Technician class license, and to their General class license.

Let's face it. Times have changed. Most students and beginning amateurs are no longer constructing their equipment from components found around the shack. They're going out and buying it. The new FCC test questions reflect this trend; there is a slow movement from the "how to build it" type questions to "how to operate properly" type questions. This is good. I think we need a lot more operating questions as well as operating instruction before the new amateur gets on the air.

The upcoming outline of classroom instruction reflects a very successful 18-week course that will lead the prospective amateur radio operator through the questions and answers, as well as successfully passing the Novice, Tech, and hopefully, General class exams. Yes, a lot of the instruction is the teaching of rote memorization of questions and answers. Hopefully, along with the rote memorization of a particular question are some philosophies behind the question, and why the answer applies to today's world of amateur radio and operating.

Putting it frankly, isn't the most important part of amateur radio the learning process that takes place once you're on the air? I think it is, and the 18 weeks serves as the launching platform for our new amateur radio operators. I have calculated that it would take at least a full year of three hours a week classroom instruction to adequately teach the electronics principles and theories found in Element 3, Technician class. Not many amateurs would receive their Tech license by devoting a whole year to this project, so we all are relegated as instructors to pack as much information as possible into 9 weeks for Novice and 9 weeks for Technician/General and to steer our students in the right direction of becoming a good amateur. Again, part of this is rote memorization of test questions.

Visual aids really bring a point home. Here Gordon West, WB6NOA, demonstrates his point using a giant version of the Simpson 260 VOM.

We need your help as an instructor. We must immediately lock prospective students into a program that will give them solid instruction and lead them to positive license passing scores. Let me share with you an 18-week course under the new volunteer examination system that works—and works well, with a 98% passing rate for Novice, 89% passing rate for Technician, and catch this, an 85% passing rate for the volunteer-administered General class code test!

Time and Place

The time will be 9 weeks for Novice and 9 weeks for Technician/General class. The class session will last 3 hours, beginning at 7:00 p.m. and ending by 10:00 p.m. The suggested class evening is Monday through Thursday, or a daytime class on Saturday or Sunday afternoon.

Gordon West recently elected "Instructor of the Year" by ARRL

Each 7:00 to 10:00 p.m. class session will be broken up into two parts—one for theory and operating and one for code practice. The theory starts at 7:00 and goes until 8:00. Actual on-the-air operating time is from 8:00 to 8:20, and from 8:20 to 8:40 is a classroom break during which students can come up and talk over the air as a third party. From 8:40 to 9:30, we go into code practice. The code is sent by the instructor, with an electronic keyer, at a rate of 14 words per minute, and spaced out to 5 words per minute for Novice, and then spaced down to increase up to 14 words per minute for General class.

The classroom location should accommodate 50 students. You should strive for an *enrollment* of 50 students, too. Adequate and secure parking is a must. Access by the handicapped is also a must. The classroom should consist of comfortable chairs and tables. Chairs alone with students writing on their laps is difficult. The classroom should be well lit, with smoking prohibited. Students can smoke outside during the break.

The classroom should have a chalkboard as well as carpeted floor or curtains to minimize echoes when the code is being sent. The classroom should also be well ventilated to ensure that the room does not get stuffy, which leads to sleepiness. The instructor should have a podium, but should also be allowed to move freely throughout the classroom to check the individual progress of each student.

The 9+9 week course should be well publicized, and I have included some examples of single publicity fliers that work. Ham stores, the ultimate benefactors of new stu-

*2414 College Drive, Costa Mesa, CA 92626

Fig. 1– This sign is placed at marinas and yacht clubs to attract boaters with some knowledge of communications to get in on the world of amateur radio.

dents, will surely go all out to publicize your event. However, you will find your greatest referral of new students coming from presently licensed amateurs who have friends and kin who will want to take your course. Good publicity should surely bring 50 students to your classroom on the first night. If you stick to the following program, I can just about guarantee that you'll have more students than you started out with at the end of your 18th week.

Class Schedule

Nine weeks for Novice, and then nine weeks for Technician/General class. That simple. You may wish to add on two additional weeks for the actual in-the-classroom tests. Anything longer or shorter than this very successful program may not lead to the results we expect.

The Novice Class

You will have more than enough time to teach Novice theory and code in 9 weeks. You will be preparing students to know all 200 FCC test questions, of which 20 in specific categories will be administered on the actual Novice exam. We suggest multiple-choice answers for the examination team (or individual) that will give the test. The code test will consist of a 5-minute message at a rate of 5 words per minute, 13 word per minute character speed, containing letters, numbers, and 3 punctuation marks.

The following materials are suggested for the first 9 weeks:

•ARRL "Tune in the World" book, or

•Ameco Novice Class Radio Amateur FCC Test Manual, and

•Radio School 4-Set Stereo Code Learning Course Tapes,

•Inexpensive code oscillator kit.

For the instructor, the American Radio Relay League has published an excellent Novice class instructor's guide. This 60-page book is available to all registered instructors, so it's a good idea to join the League and pitch

Loraine McCarthy, N6CIO, is the Code Programs Manager.

in with their instructor program. The guide goes into details you wouldn't believe!

Your 9-week session should parallel precisely the FCC Novice class questions in the following order:

Week 1: Rules and Regulations—Introduction to dits and dahs.

Week 2: Operating Procedures—Code Lesson 1.

Week 3: Radio Wave Propagation—Code Lesson 2.

Week 4: Amateur Radio Practice—Code Lesson 3.

Week 5: Electrical Principles—Code Practice Lesson 4.

Week 6: Circuit Components—Code Practice on numbers and callsigns.

Week 7: Practical Circuits—Code Practice QSO's.

Week 8: Signals and Emissions—More Code QSO's.

Week 9: Antennas and Feedlines—Sample Code Tests.

Week 10: Final 20 Question Examination—Final 10 Question 5 wpm Code Test.

It's important that all students have a list of all 200 FCC Novice test questions. This will allow them to chart their progress as well as star any question with which they may be having a problem. The Ameco book lists the questions in the exact order as they appear on FCC Bulletin 1035A, updated, and makes for logical classroom progression. Each session you simply teach the question, the right answers, the right answer to look for on the test, *and then try to demonstrate this question and answer in the real world of amateur radio.* Tell them why this is an important question and how to relate it to amateur radio operating.

Each code session is developed around our suggested code lesson plans as outlined in this article. The suggested format has been developed by Extra class instructor Loraine McCarthy, N6CIO, who teaches all levels of code practice for classroom instruction through the Southern California Community College District, as well as through our Radio School classes. Her code programs work, and work well. In fact, by week number 6 you should find that most students will already be beyond 5 words per minute.

The students should send code in unison, in the classroom, with their code practice oscillators. This is always a big treat for them—and it provides many laughs. Like conducting a choir, your waving arms should lead them into short staccato dits and the three times as long

LESSON 1

CHARACTERS

E	.	N	_ .	S	. . .
T	_	A	. _	O	_ _ _
M	_ _	I	. .		

LETTERS FOR PRACTICE

M A T I N E E I A T M T I E A M I I E T N A T E I

N A T E M I E I T N A M M E I N E T I A M A M T E

WORDS FOR PRACTICE

MAN IN TIN TIME TAME TENT NAME TAN MEN

MINT MET TEN EAT TEA EATEN TEAM MEANT MAIN

NAT NAT MAT MATE IN AN AM AIM ATE ANT MEAT

MINE ME NITE

SENTENCES AND PHRASES FOR PRACTICE

TEN MEN EAT.

AN ANT ATE MEAT.

MEN IN TENTS.

NITE TIME

MAN IN TIN.

NAME A TAN MAN.

Fig. 2– This is a copy of Lesson 1 of the Morse code. The student must, of course, put in time on his own to practice.

dahs. After a while, all those 50 oscillators and buzzers will begin to play in unison, and you will have developed some good code-sending techniques.

Remember, for the Novice license test applicants must demonstrate their ability to not only receive the code at 5 words per minute, BUT TO SEND IT, TOO.

Throughout the Novice course, bring in live equipment to demonstrate proper techniques in getting on the air. Encourage your students to start considering radio equipment. After all, when they're preparing for their General class license, this radio gear can be put to use ON THE AIR, just as soon as their Novice class license call letters arrive.

So week 10 is the big night of the Novice test, and everything should go smoothly. Don't run the test yourself. Always let someone else come in and test your students. Take my word for it; this way no one can accuse you of letting slide by a student who may have been a favorite but poor in code receiving or technical knowledge. It only takes one person to give the Novice test—not the three volunteer examiners under the new VEC program.

It's also a good idea, during the Novice class sessions, to bring in films, video tapes, and other refreshing "extras" that will keep up the students' interest in our hobby of amateur radio. I also invite in several local amateurs who are good in public speaking to demonstrate their own favorite mode of amateur radio operating.

After the test session all Form 610 applications are sent to the FCC in Gettysburg for license call letters. It will take only three weeks for these call letters to come through, because your Novice examiner does all the test corrections. The students will be at an all-new plateau when they walk out of a successfully passed Novice test classroom!

Technician/General Class

The next 9 weeks will be devoted to Element 3 Technician class theory as well as, for those who wish to pursue it, the General class code course. Just like before, 7:00 to 8:00 p.m. is the review of the theory questions; 8:00 to 8:40 is practical radio operation, break, and radio operating time; and 8:40 to 9:30 is the code portion of the class. I usually leave the last half hour, 9:30–10:00, for students who may wish to hang around and ask more questions after the class officially lets out.

Materials for the second 9 weeks will include the following:

•ARRL Technician Class License Manual, or

•Ameco Technician Class FCC Test Manual, or

•Radio School Technician Class FCC Test Guide, Second Edition.

May 1, 1985 was the start-up of examinations based on only the new Element 3 test questions, dated November 1984. The ARRL and Radio School Guide reflects these new revised test questions, and the Ameco book gives you plenty of information as well as a new test question supplement to prepare students to pass the new revised Element 3 examination. Volunteer examiners who will administer the Element 3 tests will only use the new revised test questions after May 1, 1985. The new 500 test questions are similar to the old 500 test questions, and books based on anything other than the new volunteer examiner tests would certainly be discouraged, because the FCC is no longer giving these older exams. Any one of the above books should work out well.

For code practice the Radio School Inc. Stereo General Class Code Course has been a worldwide favorite for going from 5 words per minute to 14 words per minute. The code is generated at 14 wpm and spaced down to the appropriate 5 to 14 wpm rate. Five tapes specifically train a student on how to pass the new volunteer examiner 10 question 13 wpm code test.

You should also encourage your students to get on the air when their Novice call letters arrive to further practice their code in preparing for the General class test. Of course, if you have some students who only want to get their Technician class licenses, you may allow them to leave early and skip the code portion of class. However, encourage them to stay for at least the first session to see how easy it is to go from 5 to 6 words per minute in just one night.

Your 9 weeks of Technician/General class code and theory instruction should take place on the following schedule:

Week 1: Rules and Regulations—5 wpm Code Practice.

Week 2: Operating Procedures—6 wpm Code Practice.

Week 3: Radio-Wave Propagation—7 wpm Code Practice.

Week 4: Amateur Radio Practice—8 wpm Code Practice.

Week 5: Electrical Principles—9 wpm Code Practice.

Week 6: Circuit Components—10 wpm Code Practice.

Week 7: Practical Circuits—11 wpm Code Practice.

Week 8: Signals and Emissions—12 wpm Code Practice.

Week 9: Antennas and Feedlines—Typical 13 wpm Code Tests.

As before, be sure to relate your pursual of each question and answer with the real world of amateur radio. For instance, in Week 9 you study the test question, "What is standing-wave ratio?" Give them the answer that will appear on the test, talk about the incorrect answers (*distractors*), and then go one step further and show them how to practically measure SWR with an inexpensive SWR bridge. Then show them that certain things—such as moisture at the antenna feedpoint; an antenna cut too long, too short; or driving a staple straight through a piece of coax cable (providing you have a rig that will stand a high SWR for just a moment)—will change the SWR.

Show and Tell

Let's talk more about these little demonstrations such as shorting out a piece of coax, or lighting a light bulb, or making contact with a station in Hawaii on a tuned-up trash can.

HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	849.00	**749.95**
PS-55 External power supply	160.00	**144.95**
AT-150 Automatic antenna tuner	349.00	**314.95**
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	**779.95**
PS-35 Internal power supply	160.00	**144.95**
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
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**
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	**1199**
PS-35 Internal power supply	160.00	**144.95**
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 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

IC-720A 9-band xcvr • **(CLOSEOUT)** •	1349.00	**749.95**
PS-15 20A external power supply	149.00	**134.95**
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	39.00	
MB-5 Mobile mount	19.50	

Other Accessories:	Regular	SALE
PS-15 20A external power supply	149.00	**134.95**
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	**234.95**
OPC Opt. cord, specify 2, 4 or 6-pin	5.50	
SP-3 External base station speaker	49.50	
SP-5 Remote speaker for mobiles	25.00	
CR-64 High stab. ref. xtal (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	**129.95**
SM-8 Desk mic - two cables, Scan	69.95	
AT-100 100W 8-band auto. antenna tuner	349.00	**314.95**
AT-500 500W 9-band auto. antenna tuner	449.00	**399.95**
AH-1 5-band mobile antenna w/tuner	289.00	**259.95**
GC-4 World clock • **(CLOSEOUT)** •	99.95	**79.95**

ICOM

HF linear amplifier	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1795.00	**1299**

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	449.00	**399.95**
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	699.00	**599.95**
EX-106 FM option	125.00	**112.95**
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25W 2m FM/SSB/CW	699.00	**569.95**
AG-20 Internal preamplifier*	56.95	
IC-271H 100W 2m FM/SSB/CW	899.00	**759.95**
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	799.00	**699.95**
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1099.00	**969.95**
AG-35 Mast mounted preamplifier*	84.95	

For a Limited time!
With the purchase of an IC-271A/H or IC-471A/H get the matching PREAMP* for only • $1.00 Extra.

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	99.00	**89.95**
PS-35 Internal power supply for (H)	160.00	**144.95**
PS-15 External power supply	149.00	**134.95**
SM-6 Desk microphone	39.00	
EX-310 Voice synthesizer	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	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	549.00	**479.95**
IC-490A 10W 430-440 SSB/FM/CW	649.00	**579.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	369.00	**299.95**
IC-27H Compact 45W 2m FM w/TTP mic	409.00	**359.95**
IC-37A Compact 25W 220 FM, TTP mic	449.00	**299.95**
IC-47A Compact 25W 440 FM, TTP mic	469.00	**399.95**
PS-45 Compact 8A power supply	112.95	**99.95**
UT-16/EX-388 Voice synthesizer	29.95	
SP-10 Slim-line external speaker	29.95	
IC-3200A 25W 2m/440 FM w/TTP	549.00	**489.95**
UT-23 Voice synthesizer	29.95	
AH-32 2m/440 Dual Band antenna	32.95	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
IC-1271A 10W 1.2 GHz SSB/CW Base	999.00	**889.95**
ATV-1200 ATV interface unit	TBA	
PS-25 Internal power supply	99.00	**89.95**
EX-310 Voice synthesizer	39.95	
UT-15S CTCSS encoder/decoder	79.95	
IC-120 1W 1.2 GHz FM Mobile	499.00	**449.95**
ML-12 1.2 GHz 10W amplifier	339.00	**299.95**

Repeaters	Regular	SALE
RP-3010 440 MHz, 10W FM, xtal cont.	999.00	**899.95**
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1199.00	**1089**
Duplexer 1210 1.2 GHz duplexer	1199.00	**1089**
Cabinet	249.00	

Order Toll Free
Use your Credit Card!

Hand-held Transceivers		
Deluxe models	**Regular**	**SALE**
IC-02AT for 2m	349.00	**289.95**
IC-04AT for 440 MHz	379.00	**289.95**
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	**189.95**
IC-2AT with TTP	269.50	**199.95**
IC-3AT 220 MHz, TTP	299.95	**239.95**
IC-4AT 440 MHz, TTP	299.95	**239.95**

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts **SALE**	**359.95**
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier **SALE**	**79.95**
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-7000 25-2000 MHz, 117V AC	899.00	**789.95**
RC-12 Infrared remote controller	TBA	
R-71A 100 kHz-30 MHz, 117V AC	$799.00	**659.95**
RC-11 Infrared remote controller	59.95	**49.95**
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	**144.95**
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	39.95	
CR-64 High stability oscillator xtal	56.00	
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Students love these little demonstrations, and they are easy to pull off. Here's a list of my most favorite and often talked about classroom demos:

•Establishing skywave contacts on an antenna-tuner tuned trash can (using a water pipe as a ground counterpoise).

•HT contact with a station 80 miles away on 2 meters.

•Listening to a pileup.

•Talking HF off a mobile antenna and asking the other amateur what he thinks is the best part about amateur radio.

•Letting a student call home to say hi to the babysitter via autopatch.

•Listening for the down link signal of an amateur satellite.

•Showing off QSL cards.

•Playing back that rare DX conversation with King Hussein or Barry Goldwater.

•Playing back W5LFL saying your call letters from space.

•Tuning up a light bulb.

•Transmitting on a coat hanger.

•Showing feedline loss with a terminated load wattmeter.

Okay, you get the idea. You have to be a showman as well as an instructor. Absolutely correct! We are teaching a very technical subject to students who may want to only learn enough to get their license and get on the air. We can't necessarily keep them out of the amateur service just because they don't want to learn all the intricacies of sweeping a trap with a noise bridge. However, we need to try to excite them enough to look into some of these other semi-technical areas of ham radio.

You will need "to read" your students. If they're into computers, then bring in computers and tie them into your amateur radio setup.

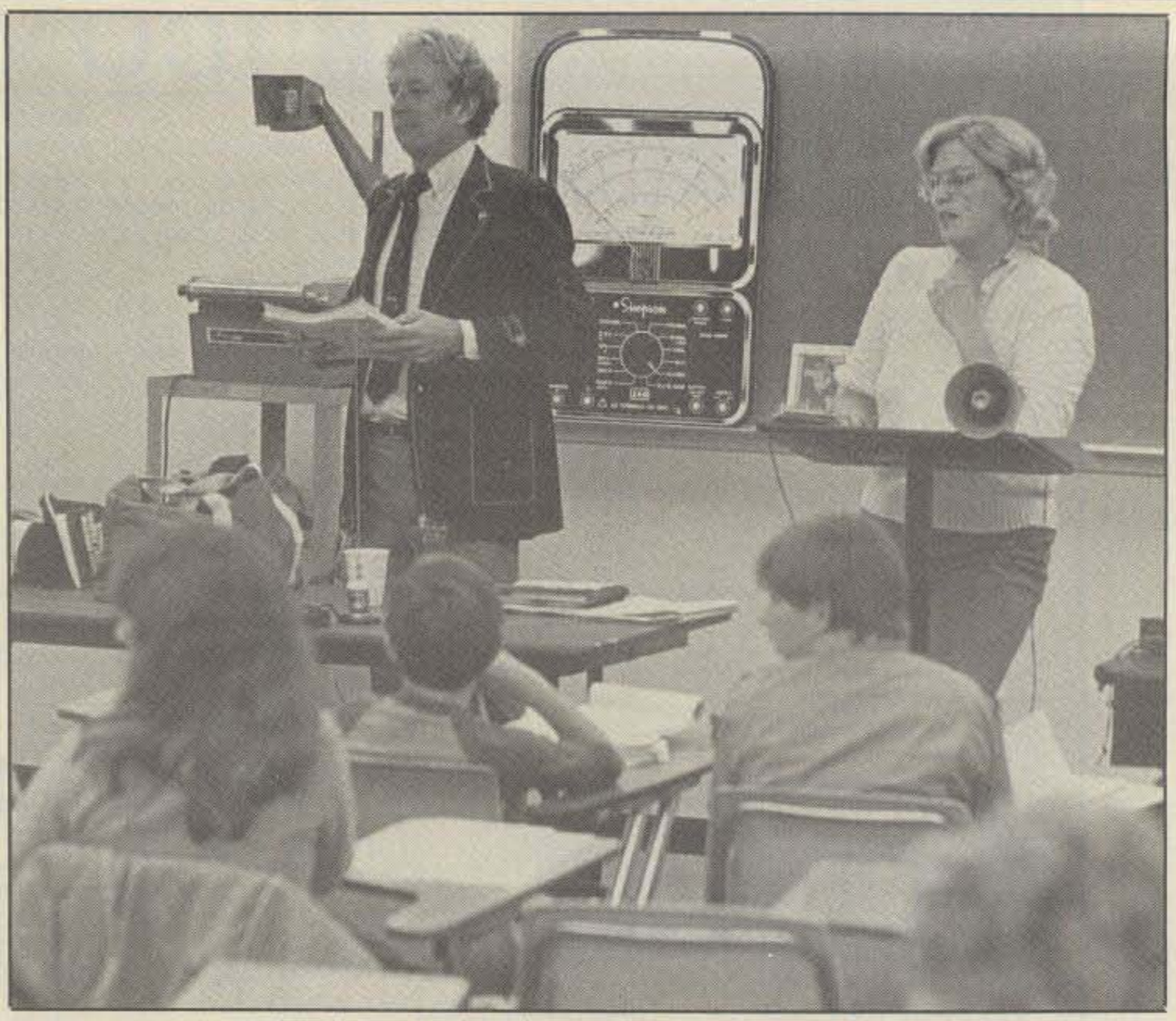
Okay, back to the final session of the General class course. Session 10 is the examination. You will need to contact a local volunteer examiner team ahead of time to schedule the exam in your classroom. If you have 50 or more students, let the examiners come into the classroom. The students will feel more at home, and the examiners will appreciate a place to administer their tests.

Find out ahead of time whether or not they're going to give a multiple-choice code test or fill-in-the-blanks code test. Encourage the use of multiple-choice code tests using approved code-test tapes.

For the written material, determine ahead of time whether or not they are ARRL or W5YI affiliated. If they are, the test answers will be the exact ones your students have been studying in their Radio School Test Guides and Ameco and the ARRL license manuals. If the volunteer examiners are not with the ARRL or W5YI, watch out! The examiners may develop their own scheme of right and wrong answers that will throw most of your students. Nothing is worse than the unexpected, and that's what they may get if it's not an ARRL or W5YI plan.

You can assist the volunteer examination teams by having the students fill out, ahead of time, their 610 forms and double-checking them for accuracy. You might also give the volunteer examination team these 610 forms ahead of time so that the team members might presign the forms to expedite the testing process. It normally takes a solid 3 hours to test 50 students in both code and theory.

The students should have no problem at all in passing the theory test. After all, they know every question and every right and wrong answer that's going to be on the test ahead of time from their test guides. There should be no surprises.



In nine weeks, the student is prepared to take an amateur radio exam. Here WB6NOA and N6CIO head up a typical evening class.

For the code test, your practice examination on Week 9 will surely let the students know whether or not they're going to be capable of passing the code test the first time. Nine weeks is plenty of time to take students from 5 wpm to 13 wpm in classroom study as well as an hour a day of home study with the stereo code tapes plus on-the-air practice. It's not a question of whether or not a student can pass the code test in 9 weeks. It's simply a question of whether or not the student *wants* to pass it in 9 weeks! Again, 9 weeks is plenty of time to go from 5 to 13 wpm.

Summary

So there you have it—a structured 9 + 9 week class schedule with 2 additional weeks for examinations. This schedule works, and works well. Your hardest part as an instructor and Elmer will be putting on a real show for your students. Anyone can stand up and read questions and answers out of a study guide, but it takes a very special type of instructor to relate to the students' learning needs and to keep them interested in this hobby called amateur radio as they plow through hundreds of questions that may seem meaningless with regard to getting on the air and becoming a good amateur.

During the hours of classroom session it's our responsibility to expose students to proper amateur radio operating techniques. On the examination there are few questions regarding band plans for 2 meters. It will be our responsibility to teach students band plans and proper operating techniques throughout any radio band, whether it be 2 meters, 10 meters, or DX chasing on 20 meters. There are no questions on etiquette, and again it's our responsibility as instructors to show them good operating techniques, or other techniques that they should leave behind from other radio services.

The thing we don't want to do is turn out students who have passed their tests but have no idea of how to get on the air. If we do this, we have failed as instructors. Not only will we help them through tests, but we also will help them in their beginning years of getting on the air properly and being well received by the amateur radio community that turned them on to your course in the first place.

There's a lot that we haven't talked about in this article on how to be a good instructor, but those things come naturally. There are no books that will tell you the value of humor, self-testing, live demonstrations, and a good laugh at ourselves when we accidently load up right on top of someone else's transmissions and then get chewed out on the air for it!

If you'll stick with the 9 + 9 week plan, the service *will* grow. You will also find that the word will spread quickly on how successful your class is, and how easy it is to get into the world of amateur radio. You will also feel a great sense of achievement when you next tune in to the Extra class portion of the band and hear that student who one year ago started your class and is now on the air as an Extra class operator and an excellent addition to the amateur radio service.

With all the confusion of test changes, question updates, and the availability of who's going to give the tests and how and when, it's up to us, as instructors, to clear the way for more newcomers to join our ranks through fun and complete code and theory classroom instruction. CQ

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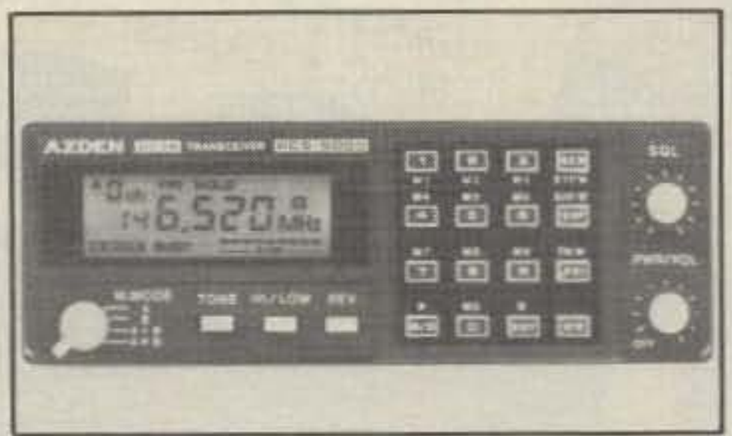
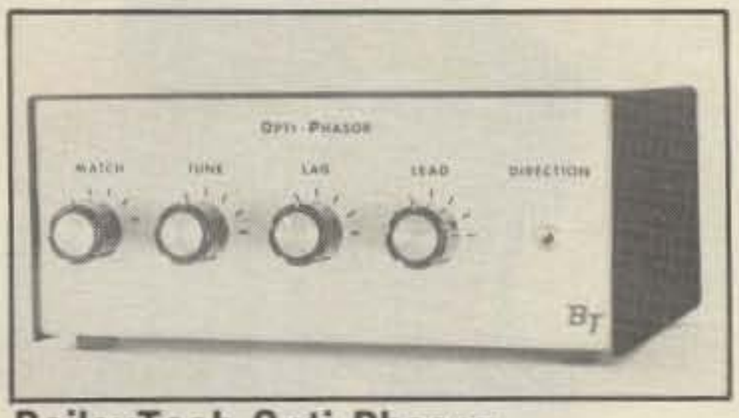
With the PK-64, all software is supplied. Also, all cabling is supplied to connect with transceiver and computer. The PK-64 is priced at $219.95. The deluxe modem option (HFM-64) is $99.95. For more information, contact Advanced Electronic Applications, Inc., P.O. Box C-2160, Lynnwood, WA 98036, or circle number 101 on the reader service card.



Azden PCS-5000 2 Meter FM Transceiver

Amateur-Wholesale Electronics has announced the Azden PCS-5000 2 meter microcomputer FM transceiver. The PCS-5000 has a frequency range of 140.000–152.995 MHz. This allows the unit to be used for CAP and all MARS frequencies. The unit measures 2"H × 5½"W × 7¼"D. The microcomputer facilitates features including up to 11 non-standard splits, 20 channels of memory in which offset and PL information can be stored, dual memory scan, scan lockout in memory mode, two ranges of programmable band scanning, with selectable scan increments, busy scan and delay scan in both the memory and band-scan modes, discriminator scan centering, and more.

Other features of the PCS-5000 include high/low power, 16-key Touchtone pad, multi-function dynamic microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, and fuses. The PCS-5000 is distributed by Amateur-Wholesale Electronics. Inc., 8817 S.W. 129 Terrace, Miami, FL 33176. Contact them for more information, or circle number 103 on the reader service card.



BaileyTech Opti-Phasor 40 Meter Phasing Unit

BaileyTech has introduced the Opti-Phasor, an in-the-shack 40 meter phasing unit designed to drive a pair of dipoles or inverted Vees to obtain a directional pattern and 4 dB gain. Either of two directions may be selected by throwing a switch. Variable reactance phasing allows the current to be precisely balanced in the two dipoles so that deep nulls off the back and optimum gain can be achieved. A front-to-back ratio of 20 dB or more is typical and the null is steerable. The five controls are *lead, lag, match, tune,* and the *direction* switch. Standard female UHF connectors are provided on the back of the phasor for the transmitter and two feedlines. A separate 52 ohm coax feedline is needed to drive each dipole.

The Opti-Phasor will match a 52 ohm transmitter at full legal power. An SWR indicator or reflected power meter is needed to adjust the match. The user supplied dipoles are hung parallel about 25 feet apart. Size is 7½"W × 3⅜"H × 6⅛"D. Color is beige with black top. List price is $120. For more information contact BaileyTech, 304 West S. College St., Yellow Springs, OH 45387, or circle number 104 on the reader service card.

dateline... Washington, D.C.

a regular feature by
THEODORE J. COHEN, N4XX

THE INS AND OUTS OF THE WASHINGTON SCENE

FCC Declares Limited Preemption of State and Local Regulations Concerning Amateur Facilities

The Commission has declared a limited preemption over state and local regulations concerning amateur radio facilities. In its Memorandum Opinion and Order in the matter of PRB-1, the FCC stated that it took this action because there is a strong federal interest in promoting amateur communications.

The issue of federal preemption was raised by the American Radio Relay League (ARRL) in July 1984, when the League filed a Request for Issuance of a Declaratory Ruling. The filing asked the Commission to delineate the limitations of local zoning and other local and state regulatory authority over federally licensed radio facilities. Of particular concern were local ordinances that precluded or significantly inhibited effective, reliable amateur communications. In most cases, these ordinances involve ordinances pertaining to the heights of antenna structures.

In its original filing, the ARRL conceded that local authorities could enact ordinances designed to ensure the safety and health of persons in the community. However, it was argued that such regulations should not preclude effective amateur communications.

According to Ray Kowalski, Chief, Special Services Division, Private Radio Bureau, FCC, the Commission recognized that there are certain general state and local interests that may legitimately affect amateur radio facilities. However, state and local regulations that preclude amateur communications are in direct conflict with federal objectives and must be preempted.

The Commission declared that local regulations that involve placement, screening, or height of antennas based on health, safety, or aesthetic considerations must ". . . reasonably accommodate amateur communications and (must) represent the minimum practicable regulation to accomplish the purpose of the local authority. Note that preemption does not extend to restrictive covenants, which the FCC holds to be "private contractual agreements" between individuals and their communities.

It is interesting to note that over 1600 comments were filed with the Commission in this matter. In general, cities, counties, local communities, and housing associations supported the imposition of restrictions as a means by which to address their concerns relative to antenna structures, "eyesores," and radio-frequency interference (RFI). The Department of Defense, the American Red Cross, and local civil defense and emergency organizations viewed the Amateur service as a pool of skilled radio operators, and saw amateur stations as a readily available backup communications network. Faced with this dichotomy, the Commission opted for "limited preemption." In doing so, it cautioned state and local jurisdictions that ". . . regulations which involve placement, screening, or height of antennas based on health, safety, or aesthetic considerations must be crafted to accommodate reasonable amateur communications, and to represent the minimum practicable regulation to accomplish the local authority's legitimate purpose."

Misuse of Amateur Bands Mars Otherwise Laudatory Amateur Communications With Mexico

Reports reaching your Washington Editor indicate that the major radio and television networks in the U.S. grossly misused amateur communications in the aftermath of the Mexican earthquake. Specifically, the networks used amateur communications to conduct routine business with their employees and others in Mexico City. In many cases communications centered on subjects such as crew makeup, wages, hotel accommodations, meals, and overtime pay. Complaints were filed with the FCC by a number of individuals, though it is not known as we go to press whether the Commission will take action.

Amateurs are cautioned to ensure that their stations are used properly when the press is involved. Recordings of our communications, of course, can be used by the media, but the communications cannot be "staged" or otherwise designed specifically for news-gathering purposes. Further, for amateurs to permit their stations to be used for commercial purposes represents an erosion of the purpose of the Amateur service, and could lead to similar incursions into our bands by operators of other services.

Rules Concerning Volunteer Examination Program Amended

In a Report and Order released in September 1984, the Commission amended Section 97.26 of its Rules to eliminate the 30-day wait before an applicant for an amateur examination can retake the same or higher examination element which the applicant failed. In doing so the FCC noted that there was no persuasive evidence that an applicant who waited 30 days between tests would be better prepared for the next test than an applicant who waited a shorter period.

Some Volunteer Examination Coordinators (VECs) had expressed the concern that if the Rule was amended, they would be overly burdened by eliminating the waiting period. The Commission responded by noting that VECs were not obligated to give examinations on demand or in any way to alter their current procedures. Further, said the Commission, VECs are already required to maximize the number of different exams they use and to change the questions frequently.

As part of the same Report and Order, the FCC stated that it would continue to require public announcements of all examinations. In cases where the number of candidates at any one examination session may be limited, however, the FCC emphasized that the announcement should alert the public to such a limitation.

ARRL Forms Spread-Spectrum Committee

Earlier this year the FCC authorized spread-spectrum emissions in amateur bands above 420 MHz. However, the Commission did not provide technical standards for spread-spectrum use; as such, implementation of the authoriza-

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tion will be delayed until 1 June 1986 (those amateurs wishing to experiment now with spread-spectrum emissions may do so by obtaining a Special Temporary Authorization [STA] from the Commission's Private Radio Bureau).

In order to develop the technical standards required for implementation of the FCC's new spread-spectrum rules, the ARRL has formed a "Spread Spectrum Committee." If you are interested in participating in the activities of this committee, and, specifically, in writing standards for amateur radio spread-spectrum communications, write to Dr. Larry E. Price, W4RA, President, ARRL, 225 Main St., Newington, CT 06111. Outline your qualifications and mark the envelope: "Spread Spectrum Committee."

According to *QEX*, the ARRL Experimenter's Exchange, here are the type of standards to be considered by the committee: frequencies of operation, chip rate, the code, code rate, spreading function, transmission protocol(s), including the method of achieving synchronization, modulation type, type of information transmitted, and method/frequency(ies) for identification.

PACSAT: A Mailbox in Space

It has been some time since we last covered the progress of PACSAT (PACket SATellite). But according to Harold Price, NK6K, project manager for PACSAT, development of the orbiting mailbox is on schedule.

Writing in the September 1984 issue of *Personal Communications* magazine ("PACSAT: The Mobile Satellite for the Developing World"), Price notes that PACSAT is scheduled for launch by the Space Shuttle sometime in 1987. The satellite, now being developed jointly by the Radio Amateur Satellite Corporation (AMSAT) and Volunteers in Technical Assistance (VITA), will use packet-radio techniques to create a "mailbox," or "bulletin board," in the sky. It will circle the earth in a low polar orbit at an altitude of 500 miles, and will pass over the north and south poles once every 90 minutes. Because the earth rotates on its axis once every 24 hours, PACSAT will therefore pass over any point on the earth four times a day. Further, operators on earth will "see" PACSAT roughly 10 minutes on each pass, and so there will be plenty of time each day to transfer data to and from the satellite.

PACSAT is intended for use by amateurs. It will have two transponders working "up" in the band 420–450 MHz and "down" in the band 144–148 MHz. However, during its first year of operation, and assuming that the necessary waivers can be obtained from the FCC, one of the transponders will be "loaned" to VITA in order to determine how store-and-forward message-handling satellites can be used as mail systems for developing countries. Such a system is particularly vital to VITA since a major portion of its work involves the dissemination of agricultural, weather, and engineering information to its volunteers around the world.

For more information on PACSAT, write or call AMSAT, P.O. Box 27, Washington, DC 20044 (301-589-6062), or VITA, 1815 North Lynn St., Arlington, VA 22209 (703-276-1800).

As a final note, Japanese amateurs have built a similar packet satellite called JAS-1. It is due to be launched on a Japanese rocket sometime in late 1986.

FCC Review Board Upholds Decision on W6VCE

As reported here in July 1985, the FCC revoked the station license of James W. Smith, W6VCE, and suspended Smith's Advanced Class operator license (for the remainder of its term) for repeated violations of the Commission's rules. Specifically, Smith was cited for malicious interference, failure to identify, and broadcasting when he caused interference to the input of a repeater operating on 147.99 MHz in the San Diego, CA area.

Smith appealed the Commission's action to an FCC Review Board. However, the Board, which met in late September 1985, upheld the previous decision on W6VCE's licenses.

Representing the Commission before the Review Board hearing was Carol Fox Foelak, a lawyer with the Private Radio Bureau.

FCC Lashes Out At Pirate Broadcast Stations

In late summer, U.S. Marshals, under the direction of Assistant U.S. Attorney Steven Snider of Ft. Smith, AK, and accompanied by an investigator from the Dallas District Office of the FCC, served a warrant and seized radio transmitting equipment used by Russell E. Rierson of Boonesville, AK. According to Richard Engelman, Enforcement Division, Field Operations Bureau (FOB), FCC, Rierson had been operating an unlicensed "pirate" radio station on various frequencies in the 6 and 7 MHz broadcast bands. Close-in direction finding by FCC personnel from the Dallas Office revealed that the station, located at Rierson's residence, was operating on a frequency of 7440 kHz and identifying as "KBBR." Previously, the Dallas Office had monitored Rierson identifying as "KRZY" and "Captain Crazy." If convicted, Rierson faces a maximum penalty of one year in jail, a fine of up to $10,000, and forfeiture of his equipment.

In another case, an investigator from the FCC's Kansas City District Office located an unlicensed broadcast station operated by Liam P. Ryan in Kirkwood, MO. Mr. Ryan used a frequency in the 7 MHz band. His operation was terminated only one week after he was first detected by FCC monitoring stations, and a $1,000 Notice of Apparent Liability ("fine") was issued for his unlicensed operation.

Information on pirate broadcast stations should be furnished to Federal Communications Commission, Field Operations Bureau, Attn: Richard Engelman, 1919 M Street NW, Room 744, Washington, DC 20554 (202-632-6345)

Dennis R. Patrick Approved For Reappointment As FCC Commissioner

FCC Commissioner Dennis R. Patrick, who has served as a Commissioner since 5 December 1983, was reappointed to serve a seven-year term that began 1 July 1985. Nominated to the post by President Reagan, Patrick's thinking on communications issues reflects the current "free market" thinking that is so prevalent in Washington these days. However, at his nomination hearing Patrick made the following remarks: "Deregulation is not an end in itself. Our regulatory goal is consumer welfare, maximizing the public interest. For this reason, I do not hesitate to support regulatory intervention where the public will not be protected by the market alone." Among his goals for the current term, said Patrick, is one to reexamine the manner in which the Commission allocates spectrum.

Your Washington Editor joins the staff of CQ in wishing all of our readers a Joyous Holiday Season.

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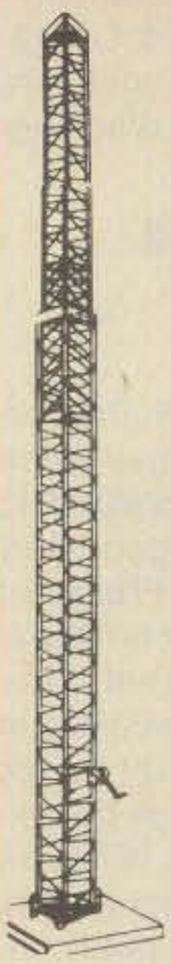

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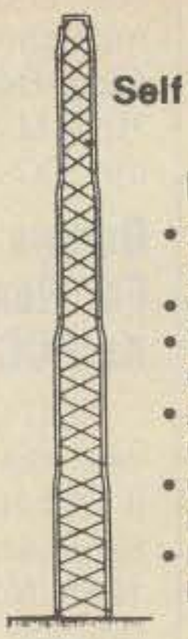

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HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
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HDBX48	48 ft	18 sq ft	363	$489

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WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
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RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

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½" Heliax™	$25	$25	$25	$25
⅞" Heliax™	$49	$49	$49	$49

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UG21B N Male $2.95 UG23D N Female $2.95

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ALPHA DELTA

DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40mtr Kit for the A3	$75
A4 4-el Tribander Beam	$269
A744 30/40mtr Kit for the A4	$75
R3 20, 15, 10mtr Vertical	$259
AV5 80-10mtr Vertical	$99
D40 40mtr Dipole	$149
40-2CD 2-el 40mtr Beam	$279
A50-5 5-el 6mtr Beam	$79
215 WB NEW 15-el 2mtr Beam	$75
3219 19-el 2mtr Beam	$89
220B 17-el 220MHz Beam	$89
424B 24-el 432MHz Beam	$75
ARX2B 2mtr Vertical	$39

hy-gain

Limited Quantities purchased at old prices. Call for current prices.

- Discoverer 2-el 40-mtr Beam
- Discoverer 3-el Conversion Kit
- EXPLORER-14 SUPER SPECIAL
- QK710 30/40 mtr Add-On-Kit
- V2S 2-mtr Base Vertical
- V4S 440MHz Base Vertical
- TH5MK2S Broad Band 5-el Triband Beam
- TH7DXS 7-el Triband Beam
- TH3JRS 3-el Triband Beam
- 205BAS 5-el 20-mtr Beam
- 155BAS 5-el 15-mtr Beam
- 105BAS 5-el 10-mtr Beam
- 204BAS 4-el 20-mtr Beam
- 64BS 4-el 6-mtr Beam
- 18 AVT/WB 80-10mtr Vertical
- 18HTS 80-10 mtr Hy-Tower Vertical
- 23BS 3-el 2mtr Beam
- 25BS 5-el 2mtr Beam
- 28BS 8-el 2mtr Beam
- 214BS 14-el 2-mtr Beam
- 2BDQ 80/40 mtr Trap Dipole
- 5BDQ 80-10 mtr Trap Dipole
- BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

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

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

NEW HF4B "Butterfly" Compact Beam $189 -delivered (cont. USA)

HF6V $129 Delivered (Cont. USA)
- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

Free Shipping On Butternut Accessories Also When Purchased With Antenna

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
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
435-40CX 435 MHz Satellite Antenna w/ CS-2	$159

MOSLEY

TA-33 3-el Tribander	$239
TA-33JR 3-el Tribander	$189
PRO 37 7-el Tribander Beam	$469
S 403 3-el 40-mtr Beam	$699

MINI-PRODUCTS HQ-1 $159

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
KLM EL-3000 Moon Tracker Elevation Rotator	$369
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

ROTOR CABLE

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)

ROHN GUYED TOWERS

10 ft Stack Sections

20G $39.50 45G $112.50
25G $49.50 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	$899
FK2558	58 ft	13.3 sq ft	$949
FK2568	68 ft	11.7 sq ft	$999
FK4544	44 ft	34.8 sq ft	$1199
FK4554	54 ft	29.1 sq ft	$1299
FK4564	64 ft	28.4 sq ft	$1399

25G Foldover Double Guy Kit $219
45G Foldover Double Guy Kit $249
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7×7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.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
1/2×9EE (1/2"×9" Eye to Eye Turnbuckle)	$9.95
1/2×9EJ (1/2"×9" Eye & Jaw Turnbuckle)	$10.95
1/2×12EE (1/2"×12" Eye & Eye Turnbuckle)	$12.95
1/2×12EJ (1/2"×12" Eye & Jaw Turnbuckle)	$13.95
5/8×12EJ (5/8"×12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D 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 (does 6-8 ends)	$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	$29	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

VISA MasterCard

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

TEXAS TOWERS

ORDER TOLL FREE
1-800-272-3467
Texas, Alaska & for information
1 (214) 422-7306

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)

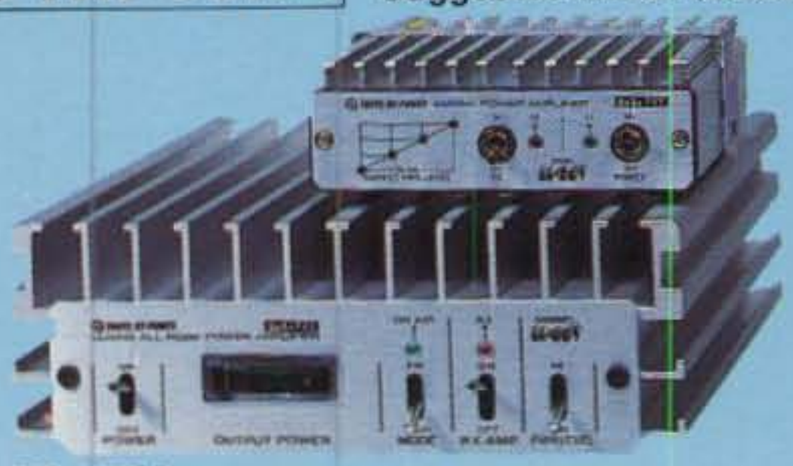
ENCOMM 1986

KENPRO
KR-2000RC
Suggested Retail $459.00

SANTEC
ST-20T
Suggested Retail $349.95

WELZ CORP. SP-420
Suggested Retail $74.95

THL CORP. HL-35V
Suggested Retail $89.95



HL-85V Suggested Retail $189.95

KDK FM-240
Suggested Retail $369.00

Catalog featuring..

SANTEC® ST-20T

a SMART Radio... the INTELLIGENT Choice

	VHF FM TRANSCEIVER MODEL ST-20T	UHF FM TRANSCEIVER MODEL ST-40T
Suggested Retail	$349.95	Coming 1st Quarter 1986
Frequency Range	142.000 to 150.995 MHz	440 MHz to 449.975 MHz
Type of Emition	F3	F3
Memory Channels	10 Channels	10 Channels
Antenna Impedance	50 ohms	50 ohms
Power Source	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V Nicd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
Selectivity	± 15 KHz at 60dB down	± 15 KHz at 60dB down
Audio Output Power	400mW at 8 ohm	400mW at 8 ohm

Note: See Accessory List for ST-200 for Compatible Accessories.

• TWO SEVEN-DIGIT AUTO DIAL MEMORIES • ONE HAND, ONE FINGER SIMPLIFIED KEYBOARD ENTRY OF INFORMATION • 142-150.995 OPERATION FOR M.A.R.S. AND OR C.A.P. • TEN MEMORY CHANNELS FOR 10 DIFFERENT REPEATER OPERATIONS PLUS 'SCANLOCK' FOR LOCKOUT OF ANY ONE CHANNEL OR MULTIPLE CHANNELS WITHOUT REPROGRAMMING • SANTEC'S MULTIPLE MODES OF SCANNING • 3.5—5 WATTS OUTPUT • DIRECT 12 V.D.C. OPERATION • SUB-AUDIBLE TONE COMPUTER CONTROLLED • MICROPROCESSOR CONTROLLED ENCODE/DECODE OPTION AVAILABLE • TIME OF DAY QUARTZ CLOCK • ANALOG METER MOUNTED FOR BEST D.F. ING • AUTOMATIC ENTRY OF STANDARD OFFSET FOR BAND WITH EACH NEW ENTRY • ANY CTCSS TONE IN ANY MEMORY CHANNEL • SLIDE ON/OFF BATTERY PACK COMPATIBILITY • SANTEC/ENCOMM, INC.'S TWO YEAR EXTENDED SERVICE PERIOD AT NO EXTRA COST •

SANTEC®

COMPATIBLE "THUMBWHEEL" SYNTHESIZED HANDY

ST-200ET
144 MHZ

ST-400ET
440 MHZ

SPECIFICATIONS	ST-200ET	ST-400ET
* GENERAL *		
Frequency Range (MHz)	144-147.995*	440-449.995
Battery Pack (V/mAHr)	8.4/250	8.4/250
Receive Squelched Norm	18 mA	22 mA
RX At Full Volume	130 mA	130 mA
Transmit (Low Power)	220 mA	300 mA
Transmit (High Power)	550 mA	700 mA
Dimensions mm	60 X 170 X 40	60 X 170 X 40
Weight (with Battery)	490 gms	490 gms
* TRANSMITTER *		
Output Pwr. (Hi, Lo)	1.5W, 0.15W	1.5W, 0.15W
Spurious Transmitted	<60dBc	<-60dBc
Deviation Limit	5 kHz	5 kHz
Pickup Device	Condenser Mic	Condenser Mic
* RECEIVER *		
Receiving System	Dbl. Superhet.	Dbl. Superhet.
I.F. Frequencies	10.695 1st.	21.6 1st.
	455 kHz 2nd.	455 kHz 2nd.
Receive Sensitivity	<0.25 uV @ 12dB	<0.35 uV @ 12dB
I.F. Bandwidth	30 kHz @-60dB	30 kHz @-60db
Operating Temp	-10 - +60 C	-10 - +60 C
Suggested Retail Price	$199.95	$249.95

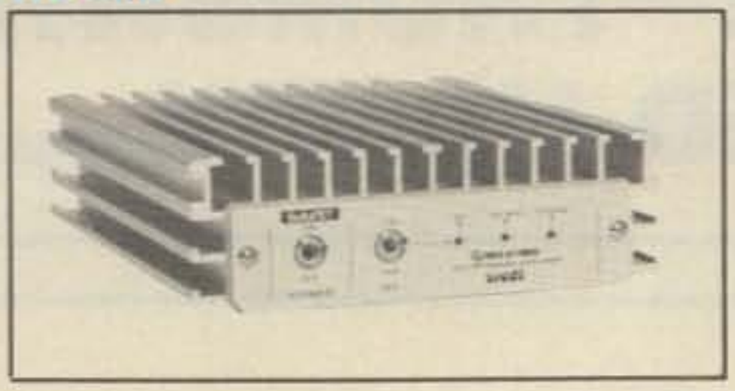
ACCESSORIES
KT-BP450 - Battery Suggested Retail 49.95
SKT-BA Battery Case Suggested Retail 7.95
SKT-PA DC/DC Conv. Suggested Retail 15.95
ST-MC Mobile Charger Suggested Retail 6.95
SKT-LC Leatherette Case Suggested Retail 9.95
HSA-2/HBM-1 Headset/Mic Suggested Retail 34.95
STK-BP Battery Pack Suggested Retail 24.95
STK-BC Battery Charger Suggested Retail 9.95
KCS-100 Dual Charger Suggested Retail 99.95

TOKYO HY-POWER LABS, INC.

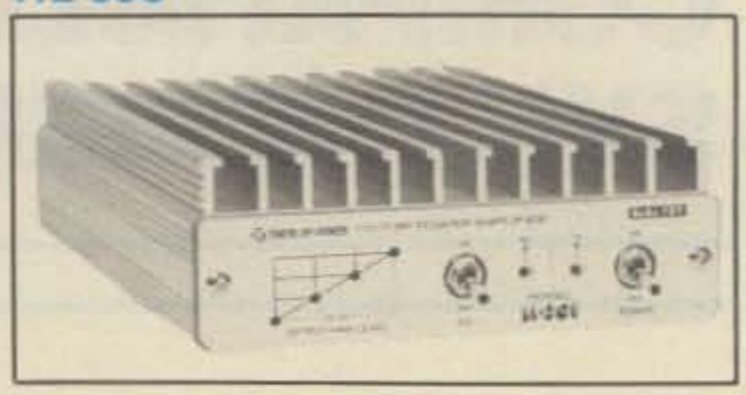
UHF AMPLIFIERS

HL-120U

HL-60U



HL-30U

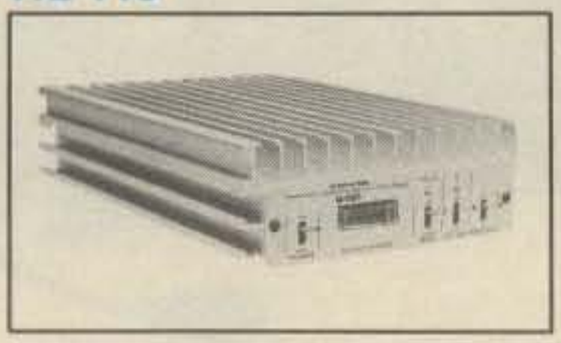


MODEL	HL-120U UHF SSB/FM/CW AMPLIFIER 100 WATT	HL-60U UHF SSB/CW/FM AMPLIFIER 60 WATT	HL-30U UHF SSB/CW/FM AMPLIFIER 30 WATT	HL-20U HUF SSB/FM AMPLIFIER 20 WATT	HL-30V VHF FM AMPLIFIER 25 WATT
Sugg. Retail	$399.95	$249.95	$149.95	$129.95	$76.95
Description	430 MHz band all mode amp with low noise GaAsFET type preamplifier. Low-loss 'N' connectors. Oscar ready!	430 MHz band all mode amp with low noise GaAsFET type preamplifier. Plenty of punch for portable OSCAR.	430 MHz band all mode amp with low noise GaAsFET type preamplifier. The optimum level for UHF mobile.	430 MHz gain block amp Power for mobile, base and ATV.	VHF multi-purpose amplifier for SSB or FM. ECONOMICAL Best Buy in $/Watt.
Frequency Range	430-449.995 MHz	430-449.995 MHz	430-449.995 MHz	430-449.995 MHz	144-148 MHz (Export 150 MHz avail)
Modes	SSB, CW, FM, TV	SSB, CW, FM, TV	SSB, CW, FM	SSB,CW,FM	FM
Supply Volts @ Amps	DC +13.8V @ 17-19 A	DC +13.8V @ 9 amps	DC +13.8V @ 5 AMPS	DC +13.8V @ 4 AMPS	DC +13.8V @ 4 Amps
R.F. Power-Out (AVG)	100W	50 Watts	30 Watts	20 Watts	25 Watts
R.F. Power-In (NOM)	12 Watts	12 Watts	2 Watts	3W or 100mW (selected internally)	2.5 Watts
Connector In/Out	TYPE 'N'	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'
Pre-amp Type	GaAsFET	GaAsFET	GaAsFET	NONE	N/A
Output Meter Type	LIGHTED METER	N/A	L.E.D.	NONE	N/A
Dimensions	218W x 82H x 299D m/m	150W x 45H x 164D m/m	100W x 35H x 170D m/m	100W x 30H x 158D m/m	100W x 30H x 158D m/m
Weight	3.5 Kg	1.2 Kg	550g	520g	520g

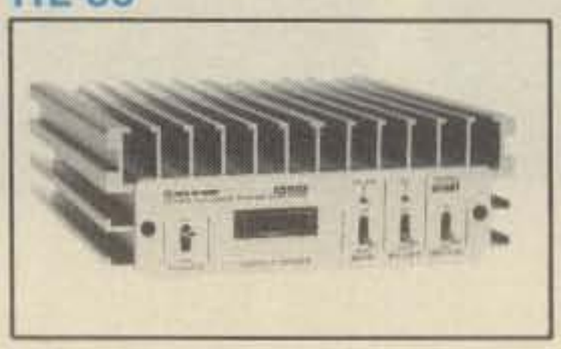
VHF LINEAR AMPLIFIERS

HL-160/V25

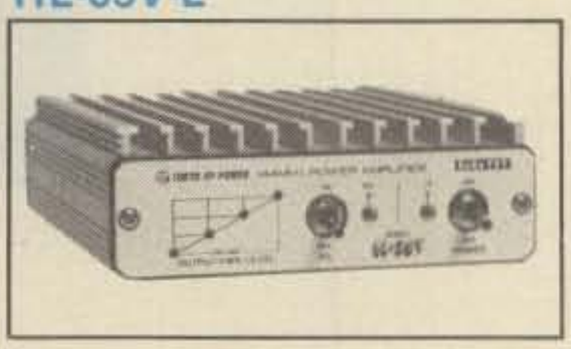
HL-110



HL-85



HL-35V-L

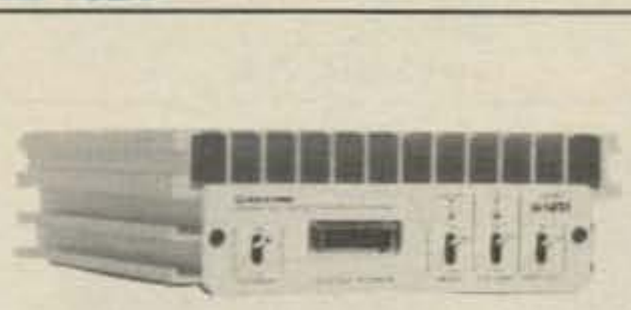


MODEL	HL-160V and HL-160V25 VHF 160W OUTPUT METER PREAMP	HL-110V VHF AMP 100 WATTS OUTPUT METER PREAMP	HL-85V VHF 80 WATT GaAsFET PREAMP METERING	HL-62V VHF SSB/FM AMP, GaAsFET PREAMP	HL-35V/L VHF FM/SSB AMP 25 WATT GaAsFET PREAMP
Sugg. Retail	$379.95 HL-160V $299.95 HL-160V25	$259.95	$189.95	$169.95	HL-35V $89.95 HL-35V/L $99.95
Description	144 MHz all mode amp with low noise FET type preamplifier. 160 Watts out from 3, 10, Watts with 160V (25 W 160V25)	144 MHz all mode with MOS-FET preamp	144 MHz all mode amp with low noise GaAsFET type preamplifier. 80 Watts Output with 10 W drive.	144 MHz all mode amp with GaAsFET type pre-amplifier.	VHF multi-purpose amplifier for SSB or FM. ECONOMICAL Best Buy in $/Watt with SSB capability and GaAsFET PRE-AMPLIFIER.
Frequency Range	144-148 (Export Available 150-160 MHz)	144-148 MHz	144-148 (Export Available 150-160 MHz)	144-148 MHz	144-148 MHz
Modes	SSB, CW, FM	SSB,CW,FM	SSB, CW, FM	SSB, CW, FM	FM(35V) FM/SSB/CW (35V/L)
Supply Volts @ Amps	DC +13.8V @ 23A (V25: 22A)	DC +13.8V @ 15 AMPS	DC +13.8V @ 12 amps	DC +13.8V @ 7.5 A	DC +13.8V @ 4 Amps
R.F. Power-Out (AVG)	160W	100 Watts	80 Watts	60 W	25 Watts
R.F. Power-In (NOM)	3 or 10 (V25: 25W)	10 Watts	10 Watts	10 Watts	2.5 Watts
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'	TYPE 'M'
Pre-amp Type	F.E.T.	MOS-FET	GaAsFET	GaAsFET	GaAsFET
Output Meter Type	LIGHTED METER	LIGHTED METER	LIGHTED METER		L.E.D.
Dimensions	218W x 82H x 299D m/m	172W x 60H x 263D m/m	172W x 60H x 184D m/m	150W x 45H x 164D m/m	100W x 35H x 150D m/m
Weight	3.5 Kg	2.2 Kg	2.0 Kg	1.2 Kg	520g

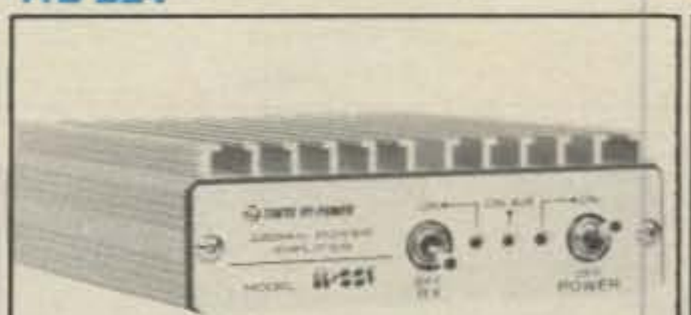
TOKYO HY-POWER LABS, INC.

VHF AMPLIFIERS AND PREAMPS

HL-102V



HL-22V



HRA-2

HRA-7

MODEL	HL-102V 220 MHz AMPLIFIER + PREAMP	HL-22V 220 MHz FM AMPLIFIER 20 WATT	HRA-2 MAST MOUNTED GaAsFET PREAMP 2 METERS	HRA-7 MAST MOUNTED GaAsFET PREAMP 70 CM
Sugg. Retail	$259.95	$99.95	$129.95	$129.95
Description	220 MHz all mode amp with low noise FET type preamplifier. 90 Watts out from 10 OR 25 Watts drive.	220 MHz VHF FM Amplifier GaAsFET Preamplifier	Mast mounted pre-amplifier using GaAsFET technology for lowest noise in the active device.	Mast mounted pre-amplifiers using GaAsFET technology for lowest noise in the active device.
Frequency Range	220-225 MHz	220-225 MHz	HRA-2: 2 Meters	HRA-7: 70 CM
Modes	SSB, CW, FM	FM	SSB/FM	SSB/FM
Supply Volts @ Amps	DC +13.8V @ 18A	DC +13.8V @ 5 AMPS	9-12 @ 200 mA	9-12 @ 200 mA
R.F. Power-Out (AVG)	90 W	20 W	GAIN: HRA-2 20 dB	GAIN: HRA-7 18dB
R.F. Power-In (NOM)	10 OR 25 W	3 W	Noise Fig.: HRA-2 1.0 dB	Noise Fig: 0.8 dB
Connector In/Out	TYPE 'M'	TYPE 'M'	TYPE 'N'	TYPE 'N'
Pre-amp Type	F.E.T.	GaAsFET	GaAsFET Semiconductor Helical Resonator	GaAsFET Semiconductor Helical Resonator
Output Meter Type	LIGHTED METER	L.E.D.	N/A	N/A
Dimensions	172W x 60H x 263D m/m	100W x 35H x 150D m/m	180W x 82H x 75D m/m	180W x 82H x 75D m/m
Weight	2.5 Kg	520g	550g	550g

HF ANTENNA COUPLERS

HC-2000

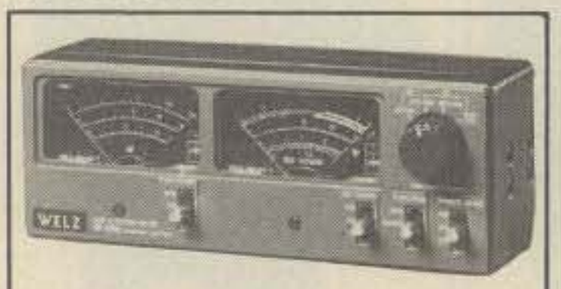
HC-400

SPECIFICATIONS	HC-2000	HC-400	HC-200
Band of Operation	1.9-3.5-7-10-14-18.21-24.5-28	1.9-3.5-7-10-14-18.21-24.5-28	3.5-7-10-14-18-21-24.5-28
Power Metering	Pwr-VSWR Two Meters	Pwr-VSWR Coaxial Meter	Fwd.-Rev.-V.S.W.R.
Input (Watts)	2000 W PEP Max @ 50 Ohms (500 on 1.9)	400 W PEP Max @ 50 Ohms	200 W PEP Max
Impedance Range	10-500 Ohms	10-250 Ohms	10-250 Ohms
Size (W x H x D) MM	100 X 34 X 149	326 X 130 X 400	210 X 84 X 187
Weight	9.6 kgm	3.4 kgm	2.2 kgm
Connector Type	6 UHF plus Balanced Output	4 UHF plus 1 Terminal	4 UHF plus 1 Terminal
Suggested Retail	**$379.95**	**$229.95**	**$99.95**

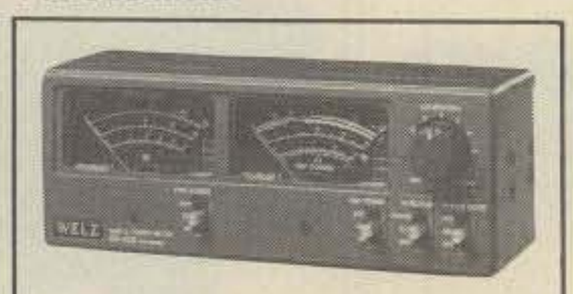
WELZ CORP.

POWER METERS

SP-825
1.8-1300 MHz



SP-425
140-525 MHz



SP-225
1.8-200 MHz

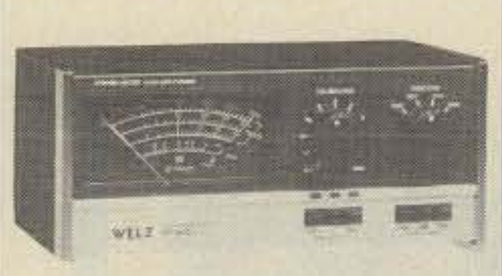
SP-122
1.6-60 MHz 2kW

Model	SP-825 AUTOMATIC SWR 1.8 - 1300 MHZ	SP-425 DUAL METER VHF/UHF	SP-225 DUAL METER HF/VHF	SP-122 HIGH POWER HF	SP-450 HIGH POWER VHF
Suggested Retail	$169.95	$119.95	$119.95	$89.95	$149.95
Freq Range	1.8-200, 430-450, 800-930, 1240-1300	140-525 MHz	1.8-200 MHz	1.6-60 MHz	140-470 MHz
Power Range (FWD)	2-15-150 W	5-15-150 W	5-15-150 W	20W-200W-2KW	50-300-1500W
(REF)	1-3-30	1-3-30 W	1-3-30 W		
Accuracy (FWD)	± 10% F.S.	± 7% F.S.	± 7% F.S. (160-200 10%)	± 10% F.S.	± 10% of Full Scale
(REF)	± 10% F.S.	± 10% F.S.	± 10% F.S.	± 10% F.S.	
SWR Sensitivity	SENSOR S-1: 2W; S-2:2W	2.5 WATTS	1 WATT	3 WATTS	30W
Insertion Loss	SENSOR S1:0.2 dB; S2:0.3 dB OR LESS	140-250: 0.1 dB 250-400: 0.2 dB 400-525: 0.3 dB	0.2 DB OR LESS	0.1 DB OR LESS	Less than 0.1 db
Available Measurements	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR., TRUE PEP, SWR	AVG. PWR, SWR, PEP	AVG PWR, REF PWR, VSWR
Connector Type	S1: 'M' TYPE S2: 'N' TYPE	'N'	'M'	'M'	'N'
Indicators	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	LED, PEP-AVG. LED-SWR	
Power Required	DC 13.8V 400 mA	DC 13.8V 300 mA	DC 13.8V 300 mA	DC 13.8V 200 mA	NONE
Size	192W × 72H × 65D m/m	192W × 72H × 65D m/m	192W × 72H × 65D m/m	120W × 72H × 85D m/m	160W × 65H × 133D m/m (body)
Weight	1240g	850g	850g	680g	1.15 kg
Sensor Type	EXTERNAL TWO SENSORS	INTERNAL	INTERNAL	INTERNAL	EXTERNAL REMOTE

SP-220
1.8-200 MHz 200W

SP-230
1.8-150 MHz 750W

SP-600
1.8-500 MHz 2kW



SP-450 140-500 MHz 1500W

Model	SP-220 SINGLE METER HF 200W 1.8-200	SP-420 VHF/UHF SINGLE METER	SP-230 SINGLE METER HF 150W	SP-430 VHF/UHF SINGLE METER	SP-600 3 SENSOR HI-PWR 1.6-500
Suggested Retail	$59.95	$74.95	$49.95	$49.95	$159.95
Freq Range	1.8-200 MHz	140-525 MHz	1.8-150 MHz	140-150 MHz; 420-450 MHz	S1: 1.6-60; S2: 1.8-200; S3: 130-500 MHz
Power Range (FWD)	2-20-200W	4-20-200W	15W-150W	5 W - 60 W	S1: 20W-200W-2KW S2, S3: 20W-200W
(REF)					
Accuracy (FWD)	± 7.5% F.S. (2W: 5% F.S.)	± 10% F.S. or better	± 7% F.S.	± 7% F.S. or less.	± 10% F.S.
(REF)	FWD PWR AT 160-200 MHz: 15%				
SWR Sensitivity	1 WATT	1 WATT	2 WATTS	2 WATT	S1:1.5W S2:1W S3:2W
Insertion Loss	0.2 DB OR LESS	0.2 dB	0.2 DB OR LESS	0.2 dB	S1:0.1 S2:0.1 S3:0.25dB
Available Measurements	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR PEP MONITOR	AVG. PWR., SWR	AVG. PWR., SWR	FWD PWR, REV PWR, VSWR
Connector Type	'M'	'M'	'M'	'M'	'M'
Indicators	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR	LED, PEP-AVG, LED SWR VOLTMETER FOR CAR	LED FOR TRANSMIT, ON-AIR VOLTMETER FOR CAR	LED RANGE INDICATORS
Power Required for Lamps	DC 13.8V 300 mA		DC 13.8V 100 mA	DC 13.8V 100 mA	13.6 VDC FOR LIGHTS
Size	120W × 72H × 85D m/m	120W × 72H × 85D m/m	110W × 67H × 36D m/m	110W × 67H × 36D m/m	220W × 91H × 113D m/m
Weight	540g	540g	270g	270g	1.7 Kg
Sensor Type	INTERNAL	INTERNAL	EXTERNAL	EXTERNAL	INTERNAL

WELZ CORP.

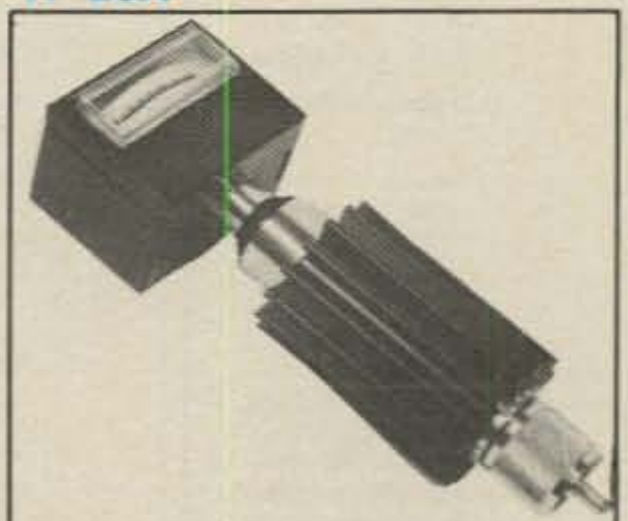
POWER METERS AND ACCESSORIES

SP-10X

RP-120

TP-05X

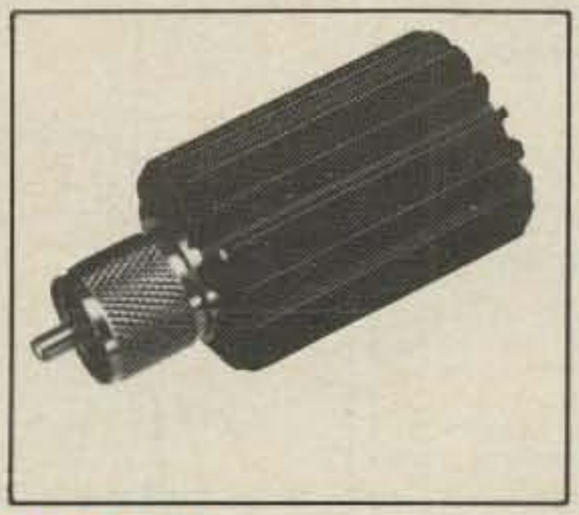
TP-25A



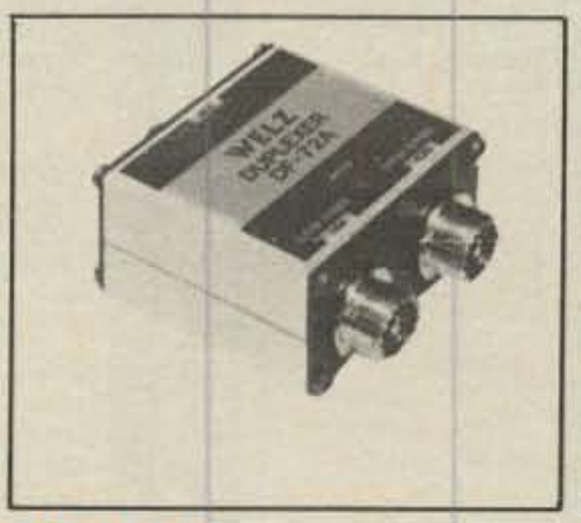
Model	SP-10X PORTABLE POWER METER	RP-120 QRP AND QRPp METER	TP-05X - HANDY POWER CHECKER	TP-25A MOBILE POWER CHECKER	CH-20A TWO POSITION R.F. SWITCH
Sugg. Retail	$43.95	$59.95	$24.95	$34.95	$34.95
Description		Really Low Power Reading .50 mw to 20 W			A High Isolation Factor R.F. Switch Coax Connections to Cavity Housing
Freq Range	1.8-150 MHz	500kHz-60MHz	50-500MHz	50-500 MHz	DC-900 MHz
Power	20W-200W	0.2W-2W-20W	5W	25W	1000 Watts
Accuracy	± 15% F.S.	± 10% F.S.	± 10% F.S.	± 10% F.S.	
Min VSWR	Sensitivity 3W		1.1:1 or Less	1.1:1 or Less	1.1:1 (DC-500 MHz) 1.15:1 (500-900 MHz)
Insertion Loss	0.2 DB OR LESS	0.1 DB OR LESS	TERMINATING TYPE	TERMINATING TYPE	
Measurements	FWD, REV POWER, VSWR	FWD, REV POWER	POWER	POWER	
Connector Type	'M'	'M'	BNC	'M'	'M'-CH2OA 'N'-CH2ON
Size	110W x 90H x 32D m/m	110W x 90H x 32D m/m	42W x 58H x 33D	42WX 150H x 33D m/m	60dia x 50H m/m
Weight	210g	230g	75g	150g	520g
Sensor Type	INTERNAL	AMPLIFIER TYPE INTERNAL 2 AAA CELLS			

WELZ DUMMY LOADS—DUPLEXERS

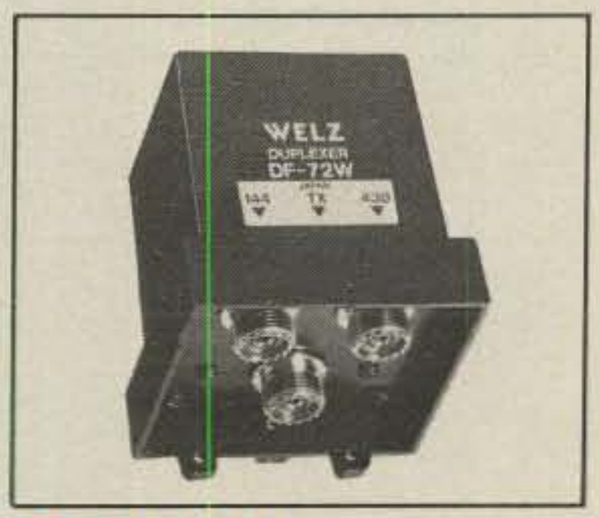
CT-530 CT-1010



CT-20A/N



DF-72A/N



DF-72 WA/N

Model	CT-530 HIGH POWER LOAD	CT-1010 HIGH POWER LOAD	CT-20A/N DUMMY LOAD	DF-72A/S DUPLEXER	DF-72WA/N DUPLEXER
Sugg. Retail	$79.95	$99.95	$14.95-A $22.95-N	$29.95-S $49.95-A	$49.95
Description	DUMMY LOAD DC-450 MHz 450W PEAK FAN COOLED LOAD For General Amateur and Lab Use.	DUMMY LOAD DC-150 MHz 1000W PEAK FAN COOLED LOAD For General Amateur HF Use.	DUMMY LOAD DC-500 MHz 100W PEAK General Purpose Load For Amateur and Lab Use	DUPLEXER FOR DUAL BAND RADIO USE	OUTDOOR MOUNTED BAND DUPLEXER
Frequency Range	DC-450 MHz	DC-150 MHz	DC-500 MHz	144-430 MHz Bands	144 and 430 MHz Bands
Power (AVG)	100 W Average	200 W Average	20 W Average	150W max	150 W Average
Power (PEAK)	500 W Peak	1000 W Peak	100 W Peak		
Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
VSWR	1.2:1 or less (0-250MHz) 2:1 or less (250-450MHz)	1.1:1 or less (0-50MHz) 1.4:1 or less (50-150MHz)	1.15:1 or less	1.2:1 max	1.2:1
Connector	'M'	'M'	CT-20A-'M' CT-20N-'N'	'M'	'M'-72WA 'N'-72WN
Dimensions	85W x 96H x 148D m/m	85W x 96H x 148D m/m	34 dia x 75L m/m	60H x 30W x 61D m/m	75H x 78W x 81D m/m
Weight	70g	70g	70g	145g	300g

DIAMOND

ANTENNAS AND ACCESSORIES

DP-EL770H DUAL BANDER

Suggested Retail
$39.95

Features
120 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
A ⅝'s wave load whip for VHF and stacked ⅝'s waves for UHF. Mounts are available. Perfect for dual band radios with amps.

Gain (dB GP = 0)
3.0 dB (VHF), 5.5 dB (UHF)

Input Power
+20 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.98 M

Weight
210 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-EL770E DUAL BAND

Suggested Retail
$34.95

Features
50 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
A ⅝'s wave load whip for VHF and stacked ⅝'s waves for UHF. Great for dual band radios. Duplexers available separately. Mounts available.

Gain (dB GP = 0)
3.0 dB (VHF), 5.5 dB (UHF)

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.98 M

Weight
210 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR770 DUAL MOBILE

Suggested Retail
$34.95

Features
Dual Band Fiberglass Antenna. Standard 'M' Connector Mount. Easy Installation. Rugged Construction.

Description
A ¼ wave for VHF and ⅝'s wave for UHF. Rugged dual band antenna.

Gain (dB GP = 0)
0 dB (VHF), 3.42 dB (UHF)

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56 M

Weight
320 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR701 UHF or DP-SR201 VHF MOBILE

Suggested Retail
$29.95

Features
50 Watts Input Mobile Antenna. Standard 'M' Connector Mount. Easy Installation.

Description
Fiberglass Encased ¼ wave type spring base mobile antenna. Rugged Construction.

Gain (dBi)
2.15 dB-SR201
3.42 dB-SR701

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56 M

Weight
380 gm

Mount Model
DP-SPM Magnetic Mount
DP-TRK Trunk Lid Mount
EC-5 ¾" Hole Mount

DP-SR120 1200 MHZ MOBILE

Suggested Retail
$34.95

Features
1296 MHz Fiberglass Antenna. Low Loss 'N' Connector Mount. Easy Installation - No Tuning

Description
Colinear Gain array in an easy to use fiberglass form. Rugged antenna spring base. Spring base screws to mount.

Gain (dB GP = 0)
5.15 dB

Input Power
50 Watts

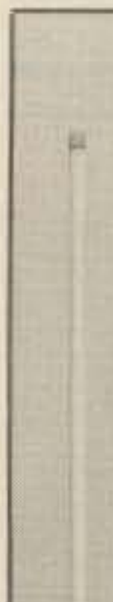
Impedance
50 Ohms

VSWR
1.5:1 or less

Length
0.56

Weight
320 gm

Mount Model
DP-SPN Magnetic Mount
DP-K4TN Trunk Lid Mount



DP-BDY770 DUAL BAND BASE/REPEATER

Suggested Retail
$79.95

Features
High Power - 200 Watt Capability Standard 'M' Connector. Easy Installation.

Description
Stacked ⅝'s wave C-loaded for both VHF and UHF usage.

Gain (dBi)
2.8 dB (VHF), 5.8 dB (UHF)

Input Power
200 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.3 M

Weight
1 kg

Mount Model
Provided for 30-62 mm dia mast. Nothing else to buy.

DP-BDY790 DUAL BAND BASE/REPEATER

Suggested Retail
$89.95

Features
High Power - 200 Watt Capability Standard 'M' Connector. Easy Installation.

Description
Stacked ⅝'s waves C-loaded for both VHF and UHF useage.

Gain (dBi)
4.5 dB (VHF), 7.2 dB (UHF)

Input Power
200 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.7 M

Weight
1 kg

Mount Model
Provided for 30-62 mm dia mast. Nothing else to buy.

DP-BDY1218 1200 MHZ BASE/REPEATER

Suggested Retail
$99.95

Features
High Gain 18 Element Colinear. Low Loss 'N' Connector. Easy Installation.

Description
18 Elements in a fiberglass package. 100 Watt capability for repeater use.

Gain (dBi)
12.0 dB

Input Power
100 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
2.0 M

Weight
0.9 kg

Mount Model
Mounts to 30-62 mm diameter pole.

D-130 SUPER DISCONE WIDEBAND

Suggested Retail
$69.95

Features
25-1300 MHz Super-Discone Antenna. Transmit on 50,144,430, 1200 MHz Monitor 25-1300 MHz with one antenna.

Description
All stainless steel discone and vertical radiator for TX. Rugged Construction, wide bandwidth

Gain (dBi)
0 dB

Input Power
50 Watts

Impedance
50 Ohms

VSWR
1.5:1 or less

Length
1.7 M

Weight
1 kg

Mount Model
Adapts to 25-50 mm masts

DP-RH2SB 'RUBBER DUCK'

Suggested Retail
$11.95

Features
Diamond Duck - Helical Whip. Standard 'BNC' Connector Mount. 144-148 MHz

Description
Replacement rubber coated whip for handy talkies.

Input Power
5 Watts

Impedance
50 Ohms

Length
10.4 cm

Weight
25 gm

Mount Model
HT BNC

DP-RH7SB 'RUBBER DUCK'

Suggested Retail
$11.95

Features
Diamond Duck - Helical Whip. Standard 'BNC' Connector Mount. 440 MHz Band

Description
Replacement rubber coated whip for handy talkies.

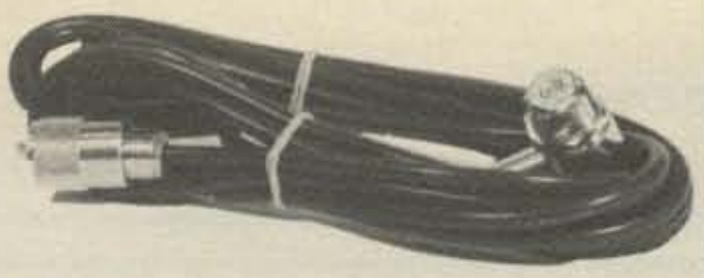
Input Power
5 Watts

Impedance
50 Ohms

Length
6.8 CM - RH7
10.4 CM - RH2

Weight
20 GM

Mount Model
HT BNC

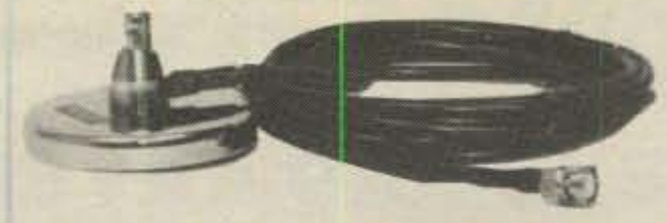


EC-5 CABLE ASSEMBLY
The EC-5 provides an 'M' mount for a ⅝ inch hole in the vehicle to mount any of the 'M' type antennas from Diamond or others which are not provided with mount.

Suggested Retail $10.95

DP-SPM Super Magnetic Mount
This is the one that really grips the metal. For those larger gain antennas in the mobile you need the DP-SPM.

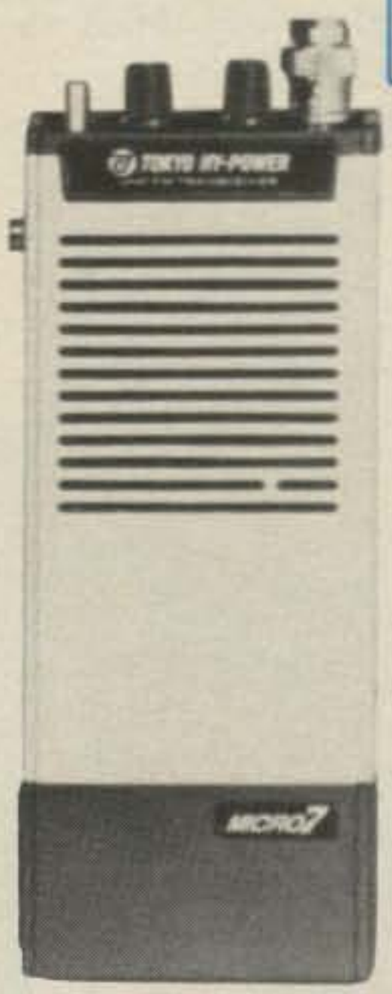
Suggested Retail $24.95



DP-MRX BNC to BNC Antenna Extender.
Use with the BNC walky antenna for fast easy installation in the 'other car' or in a rental vehicle. Use your own antenna or the RH-2SB or RH7-SB 'Rubber Duck' from Diamond.

Suggested Retail $29.95

THL CORP.



HT-7 UHF-FM Utility Transceiver Great for Antenna Parties

SPECIFICATIONS	
GENERAL	Suggested Retail $99.95
Frequency Band	440-449.995 MHz
Channels	3 Channels (1 installed)
Mode	F3
Antenna	50 Ohm, BNC connector
Power Supply	6 VDC (5-7.2V) Neg Gnd.
Current Drain	Squelch 20mA
	Max Audio — 100mA
	Transmit — 180mA
Size	65W X 160H X 32D (mm)
Weight	420 gm with antenna and battery
RECEIVER	
Circuitry	Double Superhet 21.4 MHz, 455Hz
Sensitivity	1uV for 18db S + N/N
Selectivity	+/−7.5kHz at 6db and +/−10kHz at 60db down.
Audio power	Nominal 200 mW for 10% distortion 1kHz
TRANSMITTER	
Power output	200mW Nominal
Modulation	Direct FM
Max Deviation	8 kHz
Spurious	−40 dBc or better
Microphone	Separate Condenser Mic

(All specifications are subject to change without notice or obligation as improvements in technology are available.)

DP-TRB Trunk Lid Mount
Provides a sturdy water resistant mounting for the "M" type antenna which is permamently affixed to the vehicle but requires no hole to be drilled. Stainless steel body and chrome over brass fittings. Cable includes a soft rubber wedge to keep water out of the trunk.

Suggested Retail $24.95

(Sample of Encomm's Limited Warranty)

Limited Warranty

Encomm, Inc. warrants this product against defects in material and workmanship for a period of 90 days from the date of purchase by the original purchaser. Encomm, Inc. will at its option repair or replace any and all defective parts, assemblies or entire units as it deems proper, free of charge for both the parts and the labor necessary to correct any defects in material or workmanship for the 90 day period.

The purchaser is responsible for the transportation costs of returning the equipment to and from Encomm, Inc. or its designated repair center for purposes of obtaining the warranty service described in this form.

EXTEND SERVICE PERIOD

FOR A PERIOD OF TWO (2) YEARS FROM DATE OF PURCHASE THE ORIGINAL PURCHASE MAY OBTAIN EXTENED SERVICE ON ALL THE SEMICONDUCTOR COMPONENTS USED IN THIS UNIT NOT INCLUDING FINAL TRANSISTORS. FAILURES CAUSED BY IMPROPER INSTALLATION, STATIC DISCHARGE, ABUSE, OR UNAUTHORIZED ALIGNMENT ARE NOT INCLUDED. MAXIMUM CHARGE FOR THIS SERVICE WILL BE ONE HOUR AT THE THEN CURRENT ENCOMM, INC. SHOP RATE.

The above warranty does not include incidental or consequential damages and Encomm, Inc. disclaims any liability for any such damages. All implied warranties, if any, are limited in duration to the above-stated 90 day warranty period. Some states do not allows the exclusion of limitation on indicental or consequential damages or on how long an implied warranty lasts, so the above limitations may not apply to you.

The completion and return of the enclosed registration form is a condition precedent to the warranty coverage and the above undertaking to repair. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

KENPRO

KEYS AND KEYERS

KP-100 SQUEEZE KEY

The KP-100 Squeeze key uses CMOS ICs and Silicon transistors in the keying circuit. Provides keying via a solid state device or relay contacts. Monitor speaker for built-in sidetone. Sidetone frequency, volume, dot-dash weight, and speed are all variable from outside the cabinet. ACS (auto character space) provides an exact character space of three dots when selected. AC or 12 VDC operation.

Suggested Retail $99.95

Encomm, Inc. Staff

TOM GENTRY K5VOU
President

STEPHANIE GENTRY
Sec./Treas./Acct.

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Dealer Support Mgr.
Customer Service

BRUCE SALNAVE WA5WAL
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Dealer Support

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JON SUEHIRO NN5T
QC Manager
Technical Staff

The staff appreciates your support for Encomm products. If we may be of any assistance, at any time, please do not hesitate to contact us.

ENCOMM, INC.
1506 Capital Avenue
Plano, Texas 75074
Phone: 214-423-0024
GII FAX: 214-423-0061
Office Hours: 9 a.m. - 5 p.m. CST
Monday-Friday

KP-200 MEMORY CONTEST KEYER

The KP-200 provides eight memories of 512 bits each for a total of 4096 bits of battery backed-up memory in two banks of 4 memories each. The memories may be replayed individually or in the banks of four using the 'ALL' recall function. Automatic and semi-automatic keying is provided either by a silicon switching transistor or relay contact. Variable weight and speed as well as variable frequency and volume are available from outside the cabinet. Playback interrupt and insertion is also available.

Suggested Retail $239.95

KK-50, KK-60, KK-70

Quality C.W. keys with heavy base and variable tension and contact spacing. Adjustable grip spacing and lever length for most comfortable keying.

KK-50 $24.95
KK-60 $41.95
KK-70 $59.95
(Suggested Retail)

KENPRO ROTORS

A Turn In The Right Direction

KR-400RC
Light Duty Motor
360° Round Controller
400 Kg.CM Torque
3 el Tri-Bander
Suggested Retail $169.95

KR-5400A
AZ-EL Satellite
500 EL Motor • 400 AZ Motor
Oscar Crossed Arrays
Suggested Retail $319.95

KR-2000RC
Heavy Duty Motor Unit
360° Round Controller
2000 Kg.CM Torque
Monoband Stacks 20-10M
Suggested Retail $459.00

SPECIFICATIONS	KR-500	KR400/KR-400RC	KR-600/KR-600RC	KR-2000/KR-2000RC	KR-250
Input Voltage	117/230 VAC	115/230 VAC	115/230 VAC	115/230 VAC	117/230 VAC
Power Consumption	30 VA	40 VA	40 VA	100 VA	37 VA
Motor Voltage	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø	24 Volts 2Ø
Rotation Time	61 Sec @ 60 Hz	50 Sec @ 60 Hz	53 Sec @ 60 Hz	67 Sec @ 60 Hz	43 Sec @ 60 Hz
End Stop Type	Mechanical	Mechanical	Electrical and Mech.	Electrical and Mech.	Mechanical
Rotational Torque	350 in lbs	340 in lbs	520 in lbs	1736 in lbs	170 in lbs
Stationary Brake Torque	1750 in lbs	1500 in lbs	3470 in lbs	8680 in lbs (brake on)	520 in lbs
Vertical Load Max	N/A	440 lbs	440 lbs	550 lbs	
Capacity In Sq. Ft. Ant.	11 sq. ft.	11 sq. ft.	19 sq. ft.	27 sq. ft.	4 sq. ft.
Maximum Mast Size	1.5-2.5 in. dia.	1.5-2.5 in dia.	1.5-2.5 in. dia.	2-2.5 in.	1-1.5 in. dia.
Maximum Mounting Size	1.25-1.625" dia.	1.5-2.5 in. dia.	1.5-2.5 in. dia.	Tower Mount	1-1.5 in. dia.
Cable Type	6 - #22	6 - #22 or larger	6 - #22 or larger	8 - 2@#18 6@#20	6 - #22
Control	4.33" x 6" x 7.5"	4.33" x 6" x 7.5" aprx	4.33" x 6" x 7.5" aprx	4.33" x 6" x 7.5" aprx	7" x 3.35" x 12.4"
Rotator	12.4" x 5.6" dia.	10.63" x 7" dia.	10.63" x 7" dia.	13.6" x 8.9" dia.	12.4" x 5.6" dia.
Weight	5.5 lbs	9.9 lbs	10 lbs Rotor/5.5 lbs Control	20 lbs Rotor/5.5 lbs Control	6.4 lbs
Suggested Retail	$179.95	$139.95/$169.95	$229.95/$239.95	$439.95/$459.00	$79.95

NOTE: The KR-5400A and KR-5600A are combinations of the KR-400/KR-500 motors and the KR600X/KR500 respectively. The 'A' suffix indicates internal relays for external controller.

KENPRO
ROTATORS
Precision Power at an Affordable Price . . .

KDK FM-X40 Series

FM-240 2 Meters
FM-740 70 cm

SPECTACULAR MOBILE SIMPLICITY

- Superior features, simpler to use for 2 meters, MARS, CAP
- Compact size for better fit in today's automobile
- 16 fully programmable memory channels, plus priority call channel, plus 2 VFOs for today's user
- Subaudible encode and decode standard for today's 2 meter bands
- Subaudible frequency programmed by freq, no chart needed
- Speech synthesis option for voice VFO
- Superior man machine interface—one knob and one button, program all of the features easily—alphanumeric LCD prompts
- 16 button speaker/mic with UP/DN lock-out switch
- VFO Steps Size—2.5-40KHz, programmable (× 10 with Speed on)
- Band Scan—Programmable limits and modes, CARRIER, AUTO & DELAY. Scan steps same as set for VFO steps.
- Memory Scan—Programmable modes, SKIP, CARRIER, AUTO & DELAY.

FM-240
Suggested Retail $369

FM-740
Suggested Retail $429

Specifications KDK FM-240 (and FM-740)	
General	
Supply Voltage	13.8v ± 15%, negative ground.
Consumption	Transmit: 1.5A @ 5w, 5.5A @ 25w Receive: .4A @ 0 sig., .6A @ max volume.
Temp. Range	– 10 deg. C to 60 deg. C.
Dimensions	40H × 140W × 170D mm (Body only)
Weight	1.0Kg (Body only)
Transmitter	
Freq. Range	FM-240 142.000 - 150.00 MHz (FM-740 440.00 - 449.975 MHz)
Output	High = 25 watts, Low = 5 watts (High = low, (Low = 1W) (FM-740 High = Low)
Modulation	Variable reactance frequency modulation
Max. Deviation	± 5KHz
Spur. Emmis	More than 60dB down from carrier
Duplex Offset	Programmable ± .1 to 12.7MHz (set at ± .6KHz ex-factory)
Tone	Programmable 74-250.3 (34 EIA tones) Encode and Decode
Receiver	
Int. Freq	1st = 10.7MHz, 2nd = 455KHz (1st-21.4MHz 2nd-455KHz)
Sensitivity	Better than 12dB SINAD @ .2uV
Squelch Sens	Better than .15uV
Bandwidth	+ 6KHz @ – 6dB
Selectivity	+ 12.5KHz @ – 60dB
Image Ratio	Better than 70dB
Audio Output	More than 2w, 8 ohms load, 10% THD
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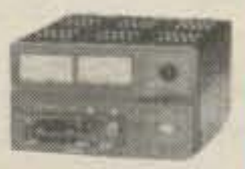

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Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Novice Licensing Data—Part VI

This article covers all of the material one must know to pass an FCC Novice written examination (FCC element two). All parts should be studied prior to attempting to pass the test. The first five parts of this article provide an overall introduction to this instruction material, plus in-depth coverage of electrical principles, circuit components, practical circuits, signals and emissions, operating procedures, amateur radio practices, and half of the rules and regulations. Previous issues of *CQ* are usually available at $2.25 each; requests can be sent to *CQ*, 76 North Broadway, Hicksville, NY 11801. If you know someone who is interested in becoming an amateur radio operator, you should bring this article to his or her attention.

Rules and Regulations—Last Half

2A-13.1. Under what circumstances, if any, may the control operator cause false or deceptive signals or communications to be transmitted? None.

2A-13.2. What is the term for a transmission from an amateur radio station of the word MAYDAY when no actual emergency has occurred? This would be the transmission of a false distress signal, because Mayday is the voice distress signal. It would be in the general category of transmitting false or deceptive signals. Since Novices are only allowed to communicate by code, this voice transmission question appears to be inappropriate.

2A-14.1. Under what circumstances, if any, may an amateur radio station be used to transmit messages for hire? None. Compensation may not be accepted in the form of goods, money, services, or anything else.

2A-14.2. Under what circumstances, if any, may the control operator be paid to transmit messages from an amateur radio station? None.

2A-15.1. What is one of the five principles which express the fundamental purpose for which the rules for the amateur radio service are designed? Any one of the following: (A) Voluntary non-commercial communication service, which is particularly useful during emergencies when regular communication services are overburdened or inoperative. (B) Contributions to the advancement of the radio art. (C) Communication and technical advances. (D) Creation of a pool of trained operators and technicians. (E) Improvement of international goodwill.

2814 Empire Ave., Burbank, CA 91504

Here are Carol, KA1LYS, and Paul, KA1LYQ, Kennett of Putnam, Connecticut. Paul designed and built their special radio room at a cost of $2700. Their station includes a Kenwood TS-430-S transceiver with a matching antenna tuner. They obtained Novice tickets during June 1984 and finished building their shack during October 1984. They intend to keep the nutmeg state easy to contact.

2A-20.1. Callsigns of amateur radio stations licensed to Novice class operators are from which callsign group? Group D. A typical Novice-type callsign is KB6STN, which is referred to as a 2 by 3 callsign. It has two letters in the prefix (KB) and three letters in the suffix (STN). Typical callsigns are shown herein:

License Class	Callsign Group	Typical Callsign	Called
Extra	A	WF6H	2 by 1
Advanced	B	KE6AR	2 by 2
General/Tech	C	N6AGC	1 by 3
Novice	D	KB6STN	2 by 3

2A-20.2. What is the format of a group D callsign? It consists of a two-letter prefix (such as KB), followed by a numeral indicating the FCC region (one through zero, with zero representing ten), plus a three-letter suffix (such as STN). KB6STN is a group D format callsign.

2A-20.3. What are the callsign prefixes for amateur radio stations licensed by the FCC? The prefix starts with the letter A, K, N, or W. It may contain a second letter. Whether the prefix consists of a single letter or two letters, it is followed by the single digit numeral (zero through nine) which applies to the applicant's station location at the time she/he requested a station license.

2A-20.4. What determines the number in an amateur radio station callsign? The FCC radio callsign area in which the station will be located, as stated on the FCC form 610 application.

2A-21.1. With which amateur radio stations may an FCC-licensed amateur radio station communicate? All. Presently there is no restriction against contacting amateurs in any country. However, there are countries which do not have licensed amateurs (such as Albania), and there are countries with only one or two amateurs (such as Turkey and Red China).

2A-21.2. With which nonamateur radio stations may an FCC-licensed amateur radio station communicate? The FCC authorizes cross-service operation on a temporary basis. In an emergency, amateurs can be authorized to communicate with MARS (Military Affiliate Radio System) and or RACES (Radio Amateur Civil Emergency Service) stations. A popular nonemergency FCC authorization of this type occurs each May. Amateurs are permitted to contact military stations as part of the Armed Forces Day activities.

2A-21.3. Under what circumstances may an FCC-licensed amateur radio station communicate with another amateur radio station in a foreign country? Presently there is no restriction against contacting amateurs in any country. If one government notifies another government that it objects to such amateur radio communications, they are forbidden. Foreign amateurs are referred to as DX, and contacting distant stations is called DXing.

2A-21.4. Under what circumstances (other than RACES operation) may an FCC-licensed amateur radio station communicate with a nonamateur radio station? Whenever the FCC authorizes such communications. (See reply to 2A-21.2.)

2A-21.5. What is the term used in FCC rules to describe transmitting signals to receiving apparatus while in beacon or radio control operation? Transmission phenomena, which is a type of experimental operation.

2A-22.1. How often must an amateur radio station be identified? At the end of each transmission, plus within ten-minute intervals during a long transmission. When using a series of transmissions in which no single transmission exceeds three minutes, identification is just required within each ten-minute interval. Identification is not required at the end of each transmission in a series of such short transmissions.

2A-22.2. How would you identify your amateur radio station communications? By using the callsign assigned to the station by the FCC.

W6DDB has been Santa Claus for several thousand children each year. During his breaks he operates W6LS, Lockheed California's club station.

2A-22.3. Do the FCC rules require an amateur radio station to identify at the beginning of a transmission? No. This requirement was dropped October 1981.

2A-22.4. Do the FCC rules require an amateur radio station to identify at the end of a QSO? Yes. If third-party traffic is being handled, both stations must be identified.

2A-22.5. What is the FCC rule for amateur radio station identification? American amateurs are required to identify their own stations (only) at the end of each transmission, or within ten-minute intervals during a series of short (not more than three minute) transmissions. Both stations must be identified only if international third-party traffic is being handled.

2A-22.6. What is the least number of times an amateur radio station must transmit its station identification during a 15-minute communication? Twice. Within the initial ten-minute interval, and at the end of the transmission.

2A-22.7. What is the least number of times an amateur radio station must transmit its station identification during a 25-minute communication? Three times. Within the first two ten-minute intervals, and at the end of the transmission.

2A-22.8. What is the least number of times an amateur radio station must transmit its station identification during a 35-minute communication? Four times. Within each of the three ten-minute intervals, and at the end of the transmission.

2A-22.9. What is the longest period of time during a communication that an amateur radio station does not need to transmit its station identification? Ten minutes, maximum.

2A-22.10. What is the least number of times an amateur radio station must identify itself during a five-minute communication? Once. At the end of the transmission. *(The August through November 1981 Novice columns provide many useful operating tips.)*

2A-23.1. What amount of transmitter power may an amateur radio station use? 200 watts PEP output, maximum.

2A-23.2. What is the maximum transmitter power ever permitted to be used at an amateur radio station transmitting on frequencies available to the Novice class operator? 200 watts output peak envelope power (PEP), maximum.

2A-23.3. What is the amount of transmitter power that an amateur radio station must never exceed when transmitting on 3725 kHz? 200 watts PEP output, maximum. 3725 kHz is in the 80 meter Novice subband.

2A-23.4. What is the amount of transmitter power than an amateur radio station must never exceed transmitting on 7125 kHz? 200 watts PEP output, maximum. 7125 kHz is in the 40 meter Novice subband. This power limitation applies to all classes of licensees, Novice through Extra. No American amateur is allowed to exceed this power limitation while operating in any American Novice subband.

2A-24.1. Should an amateur radio operator receive an official notice of violation from the FCC, how promptly should he/she respond? Within ten days.

2A-24.2. Should an amateur radio operator receive an official notice of violation from the FCC, to whom does he/she respond? The response must be sent to the engineer who issued the notice, taking care to use the address of the FCC office from which the notice was received.

2A-24.3. Should an amateur radio operator receive an official notice of violation from the FCC relating to some violation that may be due to the physical or electrical characteristic of the

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Doug, KA5UVJ, and Angie, KA5VEP, Otoupal are from Fort Davis, Texas. At least, Fort Davis is the closest town (17 miles) to the McDonald Observatory, which is up the hill from their home. Their remote site means very little man-made interference (QRM) and excellent receiving conditions. They run a Heath HW-101 transceiver, using dipoles on 10, 40, and 80 meters. They were licensed during the last two months of 1984. Doug was an avid shortwave listener before he became an amateur.

transmitting apparatus, what information must be included in the response? If it is commercially manufactured equipment, identify it by make (manufacturer's name) and model. If you isolate and eliminate the problem, describe what you found and how you corrected the cause of the violation notice. If the equipment supplier, or the manufacturer's authorized service group, identifies and corrects the problem, include the same information in the response to the FCC. If the equipment in question is homebrew (not commercially manufactured), tell the FCC what you found to be the trouble, and what you did to correct it. If someone else does this work for you, provide the same information. Whether the offending equipment is commercially manufactured or homemade, if you decide to avoid the reported problem by changing to other equipment, tell the FCC its make and model, plus when you expect to receive it.

2A-25.1 Whom does the FCC hold responsible for the proper operation of an amateur radio station? The station licensee, plus any other licensed amateur who may have been the control operator when the violation occurred.

2A-25.2. When must an amateur radio station have a control operator? Whenever it is being used to transmit emissions, except where a station is operated by authorized remote control.

2A-25.3. Who may be the control operator of an amateur radio station? Any FCC licensed amateur radio operator, operating within the privileges of her/his own license. If a control operator uses privileges that are above those of the station licensee, special identification must be used. An example of this could be KB6SAD/W6JEP, wherein a Novice station (KB6SAD) is being operated above the Novice privileges by an amateur (W6JEP) with higher operating privileges. This dual identification is common when a General through Extra licensee is checking bands and/or modes the Novice station licensee is not allowed to use.

Summary

This completes the sixth part of this seven-part article. Seven of the nine FCC subelements have been covered in detail. The concluding part covers radiowave propagation, plus antennas and feedlines. You should make sure that your code proficiency will be good enough to pass the five words per minute code test next month. Be ready to take the Novice examination as soon as possible after you finish reading next month's column.

Antennas & Accessories

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

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Spotlight on Software

Piggybacking on the expanded theme of the column, author Thurber focuses on a wide range of amateur radio software that has the potential to make your hamshack computer hum. Read on for an interesting and wide-ranging presentation.
—K2EEK

Last month we zeroed-in on HF propagation, revisiting our mini-primer which appeared in the April 1984 issue. We were primarily concerned with computer-based determination of propagation parameters, in particular by examining MUFPLOT V2, a new version of a popular software package for the Apple and Commodore 64 computers. We then opened the mailbag for reader input, and also highlighted some interesting hamshack reading matter. To close out the column, we introduced and described several new software offerings for various computers popular in the hamshack.

This month we'll take advantage of our newly defined column title, *Antennas & Accessories*, to continue an examination of new software for the hamshack. We'll cover a wide range of software for the IBM-PC, Atari, Radio Shack, Commodore 64, and Timex/Sinclair machines. We'll again open the reader mailbag, and finish up with a comprehensive update of the Amateur Radio Software Sources Listing which we have published from time to time in the column. First, however, before digging into this month's material, I'd like to digress somewhat with some information on the Handi-HamS™ and Twin Oaks Associates.

Handi-Hams

Several months ago I became aware of an unusual and interesting amateur radio service organization, known as the Courage Handi-Ham System. Bruce Humphreys, KØHR, its director, filled me in on the organization. I'd like to share that information with *CQ* readers.

The Handi-Ham System is an international service organization of both handicapped and able-bodied radio amateurs serving people in all states and in some 32 countries overseas. Its goal is to bring the excitement of amateur radio to persons with severe physical, sight, hearing, or speech handicaps. The system offers essentially three major, direct services to its handicapped students and members. These include educational material and close personal tutoring and supervision; amateur radio equipment on a loan basis; and specially adaptive devices for ease of station control. The system is a part of the Courage Center, located in Minneapolis, which is a nonprofit organization providing rehabilitation and independent living services to people with physical disabilities and speech, hearing, and vision impairments. The center's goal is for its members to achieve greater independence and a richer life.

Shown here is Dr. Tom Linde, KZØT, an active member of the Handi-Ham Program. Tom, a psychologist with the Veterans Administration in Knoxville, Iowa, is also the proprietor of Twin Oaks Associates, a sideline and avocation which combines his hobby with his academic training. Twin Oaks markets several computerized Morse code training programs for the Apple series of personal computers. (Photo courtesy Bruce L. Humphrys, KØHR)

The system provides study guides and materials, as well as the opportunity to attend special training sessions and to help others become amateur radio operators. It also provides volunteer help for the installation of equipment and antennas, and it supports regularly scheduled on-the-air nets to foster relationships between Handi-Ham members. A quarterly journal, called *Handi-Ham World*, is also published.

For more information on membership and on the equipment loan program, Contact the Courage Handi-Ham System, 3915 Golden Valley Road, Golden Valley, MN 55422. It's sure that Bruce, KØHR, would welcome your inquiries.

In the same breath, so to speak, we'd like to mention Twin Oaks Associates, which is operated by Handi-Ham member Dr. Tom Linde, KZØT. Tom offers a pair of Morse code training programs, Tutorsoft and Testmaster, for the Apple family of personal computers.

While there is no business tie-in between the Handi-Hams and Twin Oaks, Tom tells me that his two computer programs resulted from observations he made of student needs for code training at radio camps. Twin Oaks Associates evolved into a sideline and avocation for Tom, one which combines his hobby with academic training as a psychologist.

The pair of computerized Morse code training programs Tom offers run on the Apple II, II+, IIc, and IIe; they'll also run on an Apple III with an emulator. The programs require 48K of RAM and one disk drive. Features include programmed learning; user-selectable menus; variable speed of 5.3 to 48 wpm; variable pitch; and automatic performance grading.

C.W. Tutorsoft teaches basic character, word, callsign, and QSO phrase recognition. The program is oriented to allow people who have no prior training in, or knowledge of Morse code to adequately train themselves in preparation for the Novice, General, and Extra class exams.

C.W. Testmaster is an advanced trainer for those having a thorough working knowledge of Morse code basics, and who are actively preparing for an amateur code exam. The disk contains two separate QSO-like exams, as well as a completion-type quiz which follows the exams. The program scores user comprehension, and supplemental review exercises are provided.

The diskettes are available for $30 each, postpaid, from Dr. Thomas F. Linde, KZØT, Twin Oaks Associates, Route 5, Box 37, Knoxville, IA 50138.

Spotlight on Software

Radio Shack. Let's begin our focus on software with some notes on programs for the Radio Shack Color Computer, known to its many friends and supporters as the CoCo. From Vern Epp, VE7ABK, comes word of two commercial TVRO-oriented programs with possible ham applications. One is the Satellite Utility, which provides a number of useful calculations for one selling, constructing, or designing TVRO systems. The $34.95 (US funds) program is designed so that it can be changed when new satellites are put up. A Solar Outages program, priced at

317 Poplar Drive, Millbrook, AL 36054

$11.95 US, allows you to determine the days on which a solar outage occurs from any location on the earth. It also calculates the length of the outage and other important information.

By the time this column appears, the programs should also be available for the Tandy 1000 and 2000, Radio Shack Model 4, and IBM-PC (and its clones), though at somewhat higher prices. For more information, contact Vern Epp, VE7ABK, at Callmark Computing, Box 371, Nelson, BC, Canada V1L 5R2.

For the TRS-80 Model 100 Portable Computer with at least 16K RAM comes word of the Morse Code Tutor. This is a menu-driven program which teaches Morse Code and helps to increase receiving speed to as much as 30 wpm. The program can be used as a "Morse code typewriter," with the code sounds generated being heard through the computer's built-in speaker. Too, you can use the computer as a code-practice oscillator, using the **CODE** key on the keyboard instead of a regular telegraph key. Of course, a big "plus" with the Model 100 is that you can easily tote it with you to use spare minutes throughout the day, or while traveling, to work up your code proficiency.

Contact Structured Software Services, 9233 N. E. 269th St., Battle Ground, WA 98604 for more information on the program, which is priced at $17 plus $2 postage and handling.

Mike Stone, WB0QCD, of QCD Marketing Services, P.O. Box N, Lowden, IA 52255, offers several specialized, menu-driven communications packages for the CoCo. Available for $24.95 on cassette, or $29.95 on disk, are software utility packages for amateur TV (ATV), satellite, radioteletype, SlowScan, and Facsimile applications. An additional collection, consisting of some 25 basic amateur radio and electronics utilities, is also offered. A program description guide for these programs can be had for the price of an SASE. Many *CQ* readers will recognize Mike as the editor and publisher of "Spec-Com"™, formerly *A-5 Amateur Television Magazine.*

Atari. For the serious circuit designer and electronics engineer, KAZNET may be of interest. According to Kazunari Honjo, AD4H, the program is the first AC circuit-analysis program published for "under $1000" home computers. At $195, the product is designed to be a professional tool for the electronic circuit designer or electronic hobbyist. The program performs frequency response analysis of two-part linear circuits with up to 20 passive, active, and transmission-line components. A very sophisticated package, input data are entered from either the keyboard or a disk file; the analysis results are presented in tabulated form on the video screen, and output may be directed to printer or disk.

The program requires an Atari with minimum 48K RAM, compatible printer and disk drive, and Atari Microsoft BASIC II. For more details, contact Kazunari Honjo, AD4H, 1917 W. Tuliptree Drive, S. E., Huntsville, AL 35803.

Big Blue. For the IBM-PC user, Omega Concepts has introduced Station Master/Advanced, an interactive software logging system to provide the user with a complete "station log management" capability. The program is menu-driven, and it prompts the user for all required input. Logging operations are grouped into five major menus: active log management, entry input and maintenance, log inquiries, log reports, and utilities.

With this system several concurrent logs may be managed, and messages are displayed to indicate significant events and error conditions. Once entered, log entries may be edited or deleted as required, and queried in several ways. The results are displayed on the video screen, while a separate facility allows one to print out a variety of reports. QSL card tracking is also supported.

The program is designed to run on an IBM-PC, XT, or PCjr, though with several minimum hardware and software requirements in terms of user RAM, color monitor/graphics support cards, printer compatibility, DOS versions, and BASIC used. For specific details on the program, which is priced at $79, contact Terence L. Jones, KB8OA, Omega Concepts, Inc., P.O. Box 615, Troy, OH 45373-0615.

Andrew Modla, N3EGH, offers the International Morse Code Practice Programs diskette for the IBM-PC, XT, PCjr, and compatibles. This disk contains three programs designed to help students pass the FCC/VEC code exams.

The three programs offered include one that sends random code that you identify by pressing the correct key; another that sends random code continuously; and a third that sends code from a text file. All of the programs permit you to adjust the speed and tone of the code sent. The disk also contains four text files to help with your practice. Full user documentation is provided on the disk in the form of a text file. The package, which requires DOS 1.1 or higher, is $10 postpaid from Andrew Modla, N3EGH, 5 Derby Place, Newton, PA 18940.

This must be the month of Morse code practice software! Brian R. Page, KB4CGU, offers a set of sophisticated code practice programs on disk for IBM-PC users. Brian's program has three sections. A beginner section teaches the code from scratch. Another section sends random characters and numbers, while the final section transmits common words and phrases. The user can customize the contents of the final section.

Those are the basic features, though some frills are offered as well. For example, the frequency of transmission automatically varies to keep the student from developing an ear for just one tone. Also,

the speed of transmission and the spacing between characters may be independently varied. Finally, the speed, in words-per-minute, is displayed on the screen, along with the characters transmitted.

The program is written in IBM Advanced BASIC, and KB4CGU is willing to share it with others under the "user supported software" concept. The disk is available for $5, to cover costs, from Brian R. Page, KB4CGU, 3324 Timbercreek Drive, Lawrenceville, GA 30245.

Commodore 64. Not to slight our C-64 enthusiasts, we have several software packages of interest this month, the first being Dave Oliver, W9ODK's Frequency Control Program for the ICOM 720 and Commodore 64 duo. This program, which should be of interest to both the ham and the SWL, provides computer control of the 720 by the C-64 to significantly expand the transceiver's usefulness. It provides keyboard entry of frequency and mode, and variable-rate scanning with or without band limits.

The menu-driven program allows up to 32 memories to be filled sequentially while the program is in operation. An additional 32 memories are a permanent part of the program and may be modified by the user. Any number of these 64 memories may be scanned in any desired sequence. Each memory contains mode information, and a scan of all memories (in any desired mode) may be carried out. The program contains a built-in list of frequency allocations for the major HF ham bands, listings of frequencies and times of English language broadcasts of worldwide shortwave stations, and considerable space to add additional information of whatever type desired.

When the program is in use, most of the ICOM's front-panel controls retain their usual functions, as the program generally adds new capabilities rather than replacing the original ones. No interface is required, just a cable with the appropriate connectors to tie the User I/O port of the computer to the accessory socket of the transceiver.

The program is available on cassette or disk ($14.75 and $16.75, respectively, postpaid). Contact David L. Oliver, W9ODK, Rt. 2, Box 75A, Shevlin, WI 56676 for more information.

Fritz Reuning, K4OAQ, offers Comkey for the Commodore 64. According to Fritz, the inexpensive program effectively turns the C-64 into a sophisticated memory keyer. The program, plus an inexpensive transistor switch and your transmitter, are all that are needed to put the C-64 on the air.

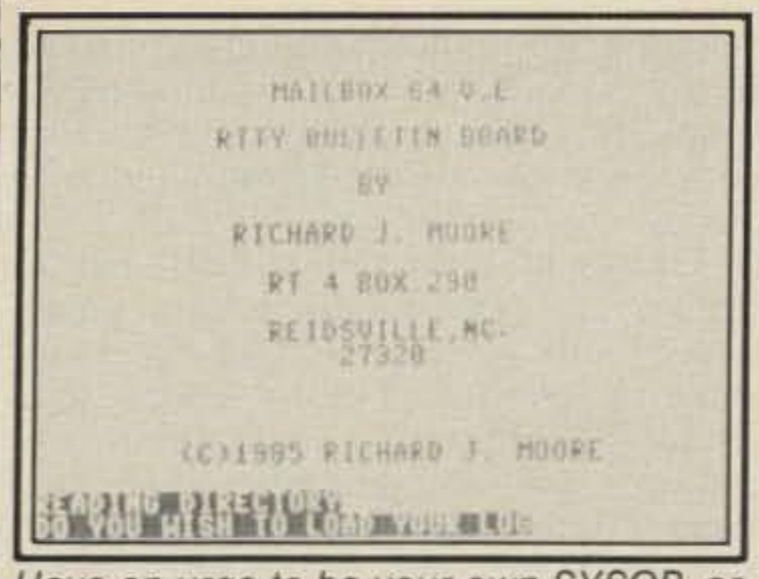
Comkey is a CW program that features two major operating modes—memory mode and keyboard mode. In the former mode, characters are stored in the memory buffer for either sending or loading a message area. In the latter mode, sending is done as characters are entered on the keyboard. The program includes a large buffer with sixteen 256-character message areas. In addition, the user has the ability to change and preset initial values of message areas, code speed, and code-speed increment so that they need not be reset every time the program is run.

The Comkey program is available for $15 on cassette, or $17 on disk, and includes an instruction and interfacing booklet. Write to Fritz Reuning, K4OAQ, 120 Elk Rd., Bristol, TN 37620.

Without a doubt, so-called electronic mailboxes, or MSO (message storage option or operations) systems, form one of the leading edges of amateur radio new technology. Hundreds, if not thousands, of hams have discovered the convenience of sending and retrieving message traffic, computer programs, and greetings via computerized bulletin boards. Several suppliers provide the MSO software needed to work such computerized magic.

Several MSO packages are available for the Commodore 64. One of these is Richard J. Moore, WD4NCN's Mailbox 64, to which we briefly alluded in last April's column. Mailbox 64 is a full-featured, disk-based radio bulletin board system (RBBS) which allows you to set up what is essentially the on-the-air equivalent of the popular landline bulletin-board system.

Operating at 110-Baud ASCII, the soft-



Have an urge to be your own SYSOP, or "System Operator"? Shown here is the title screen from Mailbox 64, a comprehensive bulletin-board system for the Commodore 64 computer. System is offered by Richard J. Moore, WD4NCN. (W8FX photo)

ware package incorporates many advanced features, including 20 different user commands and a low-resolution graphics mode which allows the transmission of graphics characters and color to users with a Commodore 64 computer. The package interfaces via the User I/O port of the Commodore 64, and it is compatible with most popular terminal unit (TU) interfaces, such as those sold by Kantronics, AEA, and MFJ. At least one disk drive and a printer are required for operation.

Richard offers the program and full support for $30, and this price includes free program updates as they become available. For details contact Richard J. Moore, WD4NCN, Rt. 4, Box 290, Reidsville, NC 27320.

Obviously, the idea of on-the-air bulletin boards is catching on, as Richard sent me a list of some 128 Mailbox 64 SYSOPS (system operators). By the time this appears in print, many more undoubtedly should have been added to this list.

While we're looking at RTTY software for the Commodore 64, let's also make note of the RCP Terminal Unit/Software System developed by Mountain Computer Accessories. According to Brian D. Martin, President, MCA has developed an integrated hardware/software package to help answer the oft-heard complaint that a terminal unit is only as good as the software that goes with it.

The menu-drive software program enables both RTTY and CW transmission and reception, as well as code practice, and it boasts a flexible configuration set-up program. One special, valuable feature is that the user can toggle between the regular 40-column and a special 80-column display (the Commodore 64 is basically a 40-column machine).

The companion RCP-1 TU hardware, which is powered by the C-64, is primarily devoted to the proper filtering and detection of mark and space tones. Interestingly, the RCP-1 does not have an internal RTTY tone generator. Rather, it makes use of the "SID chip" within the C-64, which is not only quite stable, but is also programmable through the software provided. This feature allows you to quickly change your transmit tones without requiring adjustment of the TU.

Details on the RCP system are available from Mountain Computer Accessories, Inc., P.O. Box 3280, Idaho Springs, CO 80452.

From the Mailbag

Mail on the ever-popular G5RV antenna, featured in several previous columns, keeps pouring in, and the mail is close to 100% favorable. Wrote Chuck Chandler, KA1KDL:

"Since New England winters are definitely not good antenna weather, I put up a G5RV as a quick-and-dirty all-band antenna. The information was drawn from the June 1977 *Ham Radio Horizons*, and is identical to the version you presented for coaxial feed with two exceptions. First, the length of 300 ohm twinlead is given as 29 feet, 6 inches. Second, the length of coax is given as 68 feet, minimum.

"How did it work? Well, it is up as a flattop at but 15 feet and is not used with a Transmatch. In about 2½ months of casual operation [on 40 and 80 meters] I have worked 25 states . . . Fifteen and 10 meters have not been used as much, due to poor conditions, but the performance seems to be satisfactory. Plans for warmer weather include more height, SWR adjustment, and installation of an antenna tuner. As installed, the SWR is currently in the area of 2:1 (worse on the Novice and Technician segments). Low-angle signals are about 1 to 2 S-units lower [on the G5RV] than on dipoles on the four bands [due to the low height of the G5RV]."

Chuck is not disappointed in the G5RV's performance, and he concludes: "If anyone were considering the G5RV, I would recommend the use of a tuner very strongly. The G5RV is not a miracle wire that does everything well, but it does radiate a decent signal, is easy to build and erect, and is small enough for almost any lot . . . My experience is rather atypical as most hams will choose more height . . . I have enjoyed the antenna, and believe it is a valid limited-space antenna."

We certainly agree with Chuck's assessment, and so do many other amateurs. Writes longtime *CQ* reader and correspondent Al LaPlaca, W2WW:

"Concerning the G5RV and my love affair with it, I first used it when I was living in Hartford as W1GRE. It was all of 14 feet high, but it tore up the low end of the 40 CW. I used to work VKs on the long path during the late afternoons while using on-

Radioteletype is undoubtedly one of the specialized communications modes most affected by the so-called "computer revolution." Mechanical terminals were once king in the hamshack, but today the typical terminal is actually a personal computer coupled with the appropriate interface and software—and many, many pounds lighter than this heavyweight! (W8FX photo)

ly 150 watts, and worked a PY8 one night while running only 3 watts. It worked fine on both 6 and 2 meters with appropriate tuners.

"Years later, at my present QTH [on Long Island, NY], it put me on 30 meters a couple of days after the band was opened to us, and it worked beautifully. The Ultimate Transmatch can tune it in the HF range, and I have done a fair amount of SWL broadcast listening using it with my Collins R-390A. The present configuration of my G5RV is as an inverted-Vee with the apex at 14 feet and the ends at about 12 feet. Perhaps the highest praise I can bestow upon it is this: it's my only HF antenna!"

Al also commented that, as an owner of both a Franklin Ace 1000 "Apple clone" and an Apple IIe computer, he's surprised that the published AppleSoft BASIC programs in the amateur press don't seem to be in proportion to the number of Apples he knows to be in hamshacks, and can't fathom the reason for this. We don't know the reason either, but hopefully we'll see more Apple (and possibly Macintosh) oriented articles in *CQ* in the future. Al also mentions that he has come out with a commercial disk of amateur utilities, primarily various antenna programs. For more information on these programs' availability, contact Al at Box 233, Centereach, NY 11720.

"Oops" Department: Back in the May issue we printed two short utility programs for the Commodore 64 used to convert program to sequential files, and vice-versa, to facilitate over-the-air transmissions and reception of programs and data. These were submitted by Mel Cook, WB7PGA. The programs work OK, but as Mel explains:

"It's always nice to see your name in print. However, this time it is a bit embarrassing. When I opened my copy of *CQ*, I immediately noticed that there were a lot of 'cursor lefts' (a Commodore control symbol) where there should have been 'cursor rights.' In fact, all of the cursor movements should have been 'down and right.' I must have been looking in the mirror when I wrote the letter to you . . . With the cursor lefts, the programs will both work but the screen looks funny, as the box containing the character count is in the upper right region of the screen, instead of in the center where it should have been. Most people who work with the programs will probably notice the mistake and correct it. However, for us who are a bit slow, maybe you could print an 'oops' statement."

No problem, Mel. I noticed the odd screen display, but thought little of it—and anyway, the programs work fine.

Amateur Radio Software Sources

In several previous issues, beginning in October 1983, we collected and presented a number of "amateur radio software sources" for the various personal and home computers, updating the listings as we went along. We've now consolidated our listings (using a computer database, of course!) and are pleased to present the complete list, organized by type of computer(s) supported. Fig. 1 shows the consolidated listing.

Please consider the listing as a *guide* to the various sources of amateur radio software, not as a definitive source listing. Realize, too, that the listing was prepared several months prior to publication of this column, so some new sources may not be shown; have mercy on us if, God forbid, we left someone out! Also, bear in mind that amateur software is still largely in the highly volatile "cottage industry" stage, so some sources we have listed may no longer be marketing their software.

Frankly, it's a monumental job keeping up with the individuals and firms we've shown here. While we would like to make the listing even more useful, it's too big a task to indicate exactly what types of ham software are produced by each source, or to list specific software titles. We suggest that you write to the firms listed which support your computer system, and/or peruse the classified ad sections

Fig. 1– Amateur radio software sources.

COMPUTER	NAME OF INDIVIDUAL OR FIRM	ADDRESS	CITY - STATE - ZIP
APPLE	A. B. BUSCAGLIA - K2NV	2497 W. RIVER RD.	GRAND ISLAND NY 10472
APPLE	ANTECH	PO BOX 8964	FT. COLLINS CO 80525
APPLE	BOB JACKSON	BOX 57304	WEBSTER TX 77598
APPLE	C .H. GALFO - WB4JMD	6524 CAMINO VERDE	SAN JOSE CA 95119
APPLE	COTEC	13462 HAMMONS AVE.	SARATOGA CA 95070
APPLE	DX ENTERPRISES	5861 BRIDLE WAY	SAN JOSE CA 95123
APPLE	JACK L. SCHULTZ - W266E	2 HUXLEY DRIVE	HUNTINGTON NY 11743
APPLE	K5HI	2215 GOLDSMITH	HOUSTON TX 77030
APPLE	KA1AWH	POB 2015	PEABODY MA 01960
APPLE	KB8VV	1226 WINGHAVEN	MAUMEE OH 43537
APPLE	LEIF NIELSEN - LA8DY	GEITERASEN 16	4630 SOEGNE - NORWAY
APPLE	RCIS INC.	2701-C W. 15TH ST. SUITE 228	PLANO TX 75075
APPLE	SMITH SOFTWARE SYSTEMS	3767 COLD SPRING CREAMERY RD.	DOYLESTOWN PA 18901
APPLE	TWIN OAKS ASSOCIATES	RT. 5 BOX 37	KNOXVILLE IA 50138
APPLE	W. H. NAIL COMPANY	275 LODGEVIEW DRIVE	OROVILLE CA 95965
APPLE/COMMODORE	SONNET SOFTWARE	4397 LUNA COURSE	LIVERPOOL NY 13088
APPLE/RADIO SHACK	COMPUTER APPLICATIONS	3628-A COURT	OXNARD CA 93033
ATARI	BILL POTORTI	912 PLUMAS ST.	RENO NV 89509
ATARI	DAVID FLEMING - N4FIU	RT 2 - GRANITE ACRES	WYTHEVILLE VA 24142
ATARI	KAZUNARI HONJO - AD4H	1917 W. TULIPTREE DR.	HUNTSVILLE AL 35803
ATARI	R. SIMPSON - WA2PYX	62 WESLEYAN DRIVE	HAMILTON SQUARE NJ 08690
COMM/RADIO SHACK	ULTRA HAM SOFTWARE	PO BOX 115	MACEDONIA OH 44056
COMMODORE	AC3L SOFTWARE	PO BOX 7	NEW DERRY PA 15671
COMMODORE	ALBERT COYA - N4AL	1710 S. W. 83RD COURT	MIAMI FL 33155
COMMODORE	BAKER ENTERPRISES	15 WINDSOR DRIVE	ATCO NJ 08004
COMMODORE	BILL GIEL - KD1O	524 VALLEY AVE.	YONKERS NY 10703
COMMODORE	CAGEN SOFTWARE	105 N. PLAZA TRAIL - SUITE 189	VIRGINIA BEACH VA 23452
COMMODORE	CLARKE SOFTWARE	PO BOX 2403	FALLS CHURCH VA 22042
COMMODORE	COMPUTERSTUFF	308-1/2 GREEN	YANKTON SD 57078
COMMODORE	CRUMTRONICS	P O BOX 6187	FT. WAYNE IN 46896
COMMODORE	DAVID L. OLIVER - W9ODK	RT 2 BOX 75A	SHEVLIN MN 56676
COMMODORE	DENNIS OLVER - N7BCU	22000 S. TONYA COURT	BEAVERCREEK OR 97004
COMMODORE	E. C. SOFTWARE - KO9T	622 N. ILLINOIS ST.	MONTICELLO IN 47960
COMMODORE	EAGLE SOFTWARE	7952 W. QUARTO DRIVE	LITTLETON CO 80123
COMMODORE	ELECTRONIC PUT-ONS	7805 N.E. 147TH AVE.	VANCOUVER WA 98662
COMMODORE	EUGENE MORGAN - WB7PLX	1311 CROSS ST.	OGDEN UT 84404
COMMODORE	FRITZ REUNING - K4OAQ	120 ELK ROAD	BRISTOL TN 37620
COMMODORE	HAM DATA COMPANY	3331 BYBROOK LANE	WOODBRIDGE VA 22192
COMMODORE	HAMLOG	PO BOX 308	ENGLEWOOD OH 45322
COMMODORE	HARV NELSON - KA9KUH	PO BOX 736	STEVENS POINT WI 54481
COMMODORE	HRA ELECTRONICS	PO BOX 571	HOODSPORT WA 98548
COMMODORE	HUFF ELECTRONICS	PO BOX 1112	SPRINGFIELD IL 62705
COMMODORE	JINI MICRO-SYSTEMS INC.	BOX 274 KINGSBRIDGE STA.	RIVERDALE NY 10463
COMMODORE	JOHN HENRY SOFTWARE	PO BOX 39021	CINCINNATI OH 45239
COMMODORE	KEN FLINT - N6GDQ	2018 SCOTT BLVD.	SANTA CLARA CA 95050
COMMODORE	MICROCOMPUTER BUSINESS APPL.	4045 W. MERCER	PHOENIX AZ 85029
COMMODORE	MICROENERGY SYSTEMS	PO BOX 5291	HIGH POINT NC 27262
COMMODORE	MICROFISH SOFTWARE PRODUCTS	PO BOX 902342	NORCROSS GA 30092
COMMODORE	MOUNTAIN COMPUTER ACCESSORIES INC.	PO BOX 3280	IDAHO SPRINGS CO 80452
COMMODORE	N1DCD	1024 WASHINGTON ST.	READING PA 19601
COMMODORE	NTH DIGIT SOLUTIONS	3243 ARLINGTON AVE. NO. 195	RIVERSIDE CA 92506
COMMODORE	POP SOFT AUSTRALIA	POB U-1911	6001 PERTH W. AUSTRALIA
COMMODORE	PRO-COM SOFTWARE	1450 OAK AVE.	LOS ALTOS CA 94022
COMMODORE	PROCAST	PO BOX 682	MILLERSVILLE MD 21108
COMMODORE	PUBLIC DOMAIN INC.	5025 S. RANGELINE ROAD	WEST MILTON OH 45383
COMMODORE	QSKY PUBLISHING (JIM GRUBBS - K9EI)	PO BOX 3042	SPRINGFIELD IL 62708
COMMODORE	R AND B SOFTWARE	PO BOX 81341	SAN DIEGO CA 92138
COMMODORE	R. F. TOLLI - KB4CSA	ROUTE 6 BOX 233	TALLAHASSEE FL 32304
COMMODORE	RICHARD J. MOORE - WD4NCN	ROUTE 4 - BOX 290	REIDSVILLE NC 27320
COMMODORE	RUSS SOFTWARE LTD.	PO BOX 378 NORTHWEST STA.	CHESAPEAKE VA 23322
COMMODORE	SCIENTIFIC INSTRUMENT CENTER INC.	134 GRAPHIC WAY	WESTERVILLE OH 43081
COMMODORE	SONDOR SOFTWARE	PO BOX 416	SARNIA ON CANADA N7T 7J2
COMMODORE	TALKTRONICS INC.	27341 EASTRIDGE DRIVE	EL TORO CA 92630
COMMODORE	TOM MEIXNER	CAMPUS BOX 293 5500 WABASH AVE.	TERRE HAUTE IN 47803
COMMODORE	TORONTO PET USERS GROUP (TPUG)	1912-A AVENUE ROAD SUITE 1	TORONTO ON CANADA M5M 4A1
COMMODORE	USEFUL SOFTWARE	PO BOX 115	LAKE ELMO MN 55042

mention of Dick Bash, KL7IHP, of San Leandro, California. Strangely, Bash and his Bash Educational Services is now out of the publishing business. He was "king of the hill" from 1980 to 1984 with his *Final Exam*—books that contained the exact questions and answers to all of the FCC's amateur radio operator tests. Bash also did very well with his license seminars that he held around the country. For $125.00 you could attend a one-day cram session that *guaranteed* you an upgrade amateur ticket! That's right—*guaranteed*. You could attend another session free if you failed. His pass rate was phenomenal! Almost no one failed.

Bash probably had as much to do with the FCC going out of the testing business as anyone. Government testing was beginning to become ineffective and wasteful of the taxpayer's money. Passing amateur exams became a case of having the right study material. In one of his editorials, Wayne Green, W1NSD/1, called Bash a very destructive force in amateur radio. The League refused his advertisements. The relationship between Bash and the FCC was very strained to say the least.

The Commission chose not to do anything to Bash since the exam questions and answers of another agency, the FAA, were also known and published. If government test answers were available to those who applied to fly airplanes, how could it be illegal to publish those which allowed one to operate a leisure radio set? Even the written portion of state driving tests was based on booklets with known questions and answers.

When the FCC turned over amateur testing to the amateur community, Bash went out of business. He said he had nothing to sell, since the League had indicated that they would be publishing all of the questions, answers, and distractors. He called it "quits" in March 1985, stating that "The current Volunteer Program prevents me from publishing a book that would be effective." He added that if he couldn't "serve . . . needs better than competition, then it is best not to create anything."

Which License Preparation Material?

First of all, you should know that 99% of all amateur radio operator tests administered by VE's use the ARRL's version of the test. I am only aware of one VEC that uses answers that are not the ARRL's. Gordon Girton, W6NLG, and his Sunnyvale (California) VEC group use true/false answers. You would expect that his pass rate would be higher than other VEC's, but such is not the case. It is pretty much in line with others.

All three major amateur radio operator license preparation publishers have FCC study manuals and code tapes. While we, the *W5YI Report*, distribute all of them, we feel that each publisher has his own strengths and weaknesses. Here are the *W5YI Report's* views on what we feel you need in the way of study material to become an amateur or to upgrade.

Study Manuals Covering Written Tests

AMECO: Their manuals are about 150 pages long and cover each question in the FCC pool by class of license. After the question is a list of the multiple choices and a short discussion as to why the answer selected is correct. You do not have to search through the front part of the book for the right answer. Cost is $2.95 for the Element 2 Novice manual; $4.95 each for the Element 3 Technician/General, Advanced, or Extra class manuals.

ARRL: Manuals are larger (about 250 pages) and have more material in them. The questions, answers, and distractors are the same whether from AMECO, the ARRL, or West Radio. While the answers are in the back of the book, you have to hunt through the front part of the book to find out why the answer is right. Obviously, the League wants you to read the entire book. Cost is $8.50 for Novice class (which includes a code tape); and $5.00 each for the Technician/General, Advanced, or Extra class manual.

West Radio: Has looseleaf FCC Test Guides. They not only tell you the correct answer, but also refer you to *another* book if you want documentation on why the answer is correct. About 100 pages. Cost: $9.95 for Novice class, $19.95 for the Tech/General, Advanced, or Extra class.

Manuals Covering the Part 97 Rules

No contest here! The League's *FCC Rule Book* is absolutely terrific! Everyone should have a copy of this book whether or not you intend to upgrade! It covers everything: Part 97, licensing and the new VE program, operating procedures, international rules, band plans, RACES, technical standards, and much more! Written by Rick Palm, K1CE, no one

Class	Written	Current FCC Test Version Released	Must be Used On/or Before
Novice	Element 2	July 1985	Feb. 1, 1986
Tech./General	Element 3	Nov. 1984	June 1, 1986
Advanced	Element 4A	March 1985	Oct. 1, 1985
Extra Class	Element 4B	April 1985	Nov. 1, 1986

Current versions of FCC tests.

should be without it! The current version (yellow cover) is updated to June 1985 and sells for $3.00.

Morse Code and Theory Tapes

Here is where West Radio is king! The single Novice tape (part of "Tune in the World") by the League is lacking. It just doesn't cover enough material, although it is inexpensive. The League does not offer code tapes at the (13 wpm) General or (20 wpm) Extra class level. AMECO's code tapes (at $4.95) and accompanying booklet are "fair."

West Radio has six C-90 stereo cassette code courses for the Novice, General, and Extra class levels . . . nine hours of listening! Cost is $39.95 per set and each comes in a plastic carrying case. West also has excellent Novice, Technician/General, Advanced, and Extra class theory courses on cassettes which are ideal for listening to over your car stereo while you drive to and from work. Each course covers every question in the current FCC question pool. (Two cassette theory course for: Novice $25.00; four cassettes each for Tech/General, Advanced, and Extra Class $39.95.)

Another super package from West Radio School is called "The Complete Novice" at $49.95. This popular course contains the complete (six cassette tape) Novice 5 wpm code and theory course, plus an assembled code practice oscillator and key, the ARRL "Tune in the World," the Ameco Novice Class Question and Answer book, and the "FCC Rule Book." Also included is a complete (sealed) Novice examiner's kit with a 5 wpm code test tape (with ten different tests), three different Element 2 written tests, and complete instructions on how to give a Novice examination.

Determining the Current FCC Tests

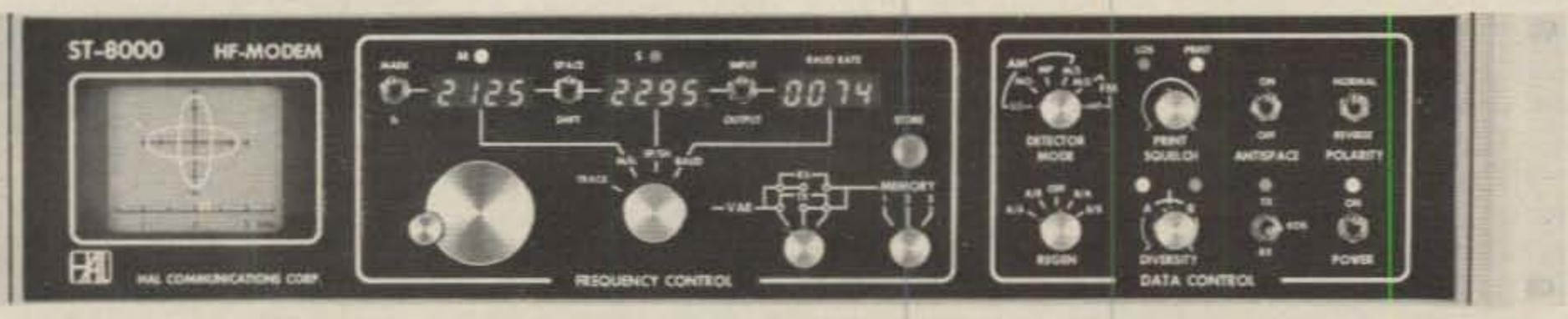
It is important that you get the correct study material. By correct, we mean the current version. The FCC revises the questions for each amateur radio operator license class annually on a staggered basis. The current versions are shown in Table I.

Sometimes the questions have massive revisions, as in the case of the most recent Element 3. Other times only a few questions are clarified. It is better to obtain the study material directly from the publisher if the amateur radio outlet you deal with does not keep up with the current test versions. Look at the manual's copyright date. *Be certain that it says 1985!*

The green-cover ARRL "Radio Amateur's License Manual," even though carrying a 1985 copyright date, is already out of date! You should ask the VE which test they will be administering if you plan on taking any amateur exams between the test release date and the mandatory implementation date six months away. The FCC has advised VEC's that they should tell applicants this information.

Addresses of license preparation publishers: AMECO Publishing Corporation, 220 E. Jericho Turnpike, Mineola, NY 10501; ARRL, 225 Main Street, Newington, CT 06111; West Radio School, 2414 College Drive, Costa Mesa, CA 92626. Or you can contact us, W5YI Report, P.O. Box #10101, Dallas, TX 75207 (see our advertisement elsewhere in this publication).

ST-8000
HF-MODEM



The ST-8000 HF Modem is a high-performance, fully adjustable modulator/demodulator for use in high-frequency radio data systems. The HF Modem offers no-compromise performance to assure optimum RTTY and CW operation under all signal conditions. The user-friendly front panel and internal microprocessor make it easy to take advantage of the outstanding flexibility of the ST-8000. In addition to the fully adjustable frequencies and baud rates, memories, diversity, regeneration, print squelch, CRT tuning indicator, and multiple AM or FM detectors put a whole range of advanced signal processing techniques at your finger-tips. Connect the HAL ST-8000 to the DS3100ASR or other TTY terminal and extend your digital communications capabilities.

- Tuneable from 500 to 4000 Hz in 1 Hz steps
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- 32 matched Mark and Space filter bandwidths
- Mark and Space 7-pole linear phase LP filters
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- RTTY shifts from 40 to 3500 Hz
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- Split or transceive RX/TX tone selection
- FM or AGC-controlled AM signal processing
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™ Infinite Resolution Diversity Control (IRDC), Spectra-Tune, Digital Multi-path Correction (DMPC), and Adaptive Threshold Detector (ATD) are trade marks of HAL Communications; patents pending.

Write or call for complete ST-8000 specifications. We think you will agree that it opens new frontiers in radio data communications. Contact the Government & Commercial Products Division for price and delivery information.

HAL Communications Corp.
Government & Commercial Products Division
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P.O. Box 365
Urbana, IL 61801-0365
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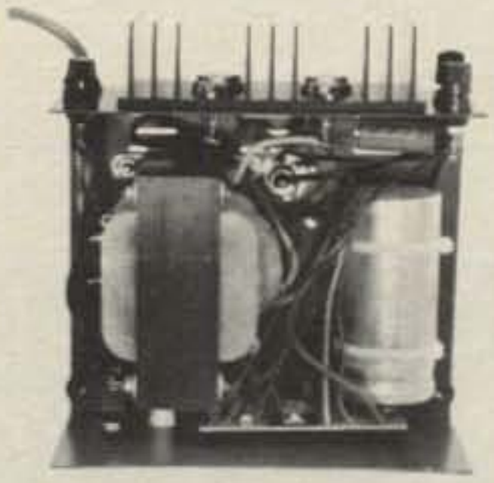

INSIDE VIEW – RS-12A

RS and VS SERIES

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output.
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- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105 - 125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

MODEL RM-35A

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

CIRCLE 112 ON READER SERVICE CARD

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Holiday Gifts Ideas for Amateurs

That festive season of cheerful goodwill and glad tidings is once again upon us, renewing the joys of both exchanging friendly gifts and graciously looking forward to the better times lying ahead. Thinking along those lines, we once again make our yearly sojourn to bring you holiday views of unique or possibly overlooked items guaranteed to warm the heart of any radio amateur. Since many of today's transceivers are prime examples of dreams-to-reality within themselves, our main focus this time will be toward goodies for complementing main setups or enjoying during times away from home base. We're sure you'll find this month's Holiday Special refreshingly different, and we wish all your season's dreams become reality this very year.

The items highlighted in this month's column are available directly from their manufacturers or via their national distributors . . . not from this author. If a particular gem catches your eye, check the ad sections of November and/or December issues of *CQ* for prices, ordering, etc. Remember also that early ordering is vital during this busy time of year. Now let's take an X-ray view deep inside Santa's bag and see what's in store gift-wise for enthusiastic amateurs. You can then pass a casual hint along to the family, or . . . .

Special Favors

Leading our galley of seasonal attractions is ABC Guild's unique line of classic tube desk lamps and accessories shown in Photo 1. These limited-edition lamps are true conversation pieces guaranteed to capture the fancy of every amateur, or anyone even remotely interested in electronics. The lamps are 17 inches high with an 8 inch tall by 9 inch wide shade and a 4 inch wide transparent acrylic base. The lamp's tubes are rare transmitting types from yesteryear which were collected, cleaned, and surface restored to practicaly new condition. Three types of tubes are being featured at this time: the Western Electric 357A, a 5J29, and an 808 transmitting triode. As the era of vacuum tubes continues fading on our present horizon, these historical prizes can only increase in value. Although somewhat difficult for vacuum-tube--reared amateurs to visualize, a number of today's electronic newcomers never experienced the warm beauty of tubes. What an unfortunate sheltered life!

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

Photo 1. ABC Guild's classic tube lamps are a fabulous addition to any station setup, and an ideal means of perpetuating collectible valves from the past. Each lamp comes with its own numbered certificate of history and authenticity.

I personally have one of these tube lamps in the radio room, and photographs (especially black and white) really can't depict their beauty. My only problem is deciding whether to leave it on the radio desk, put it in the den, or enjoy it on the office desk. Fortunately, ABC Guild also has that dilemma covered with an interesting variety of collectible desk ornaments and paperweights.

The desk accessories are genuine transmitting, RADAR, and special-purpose tubes of unique design which have also been restored to like-new condition and mounted on clear acrylic bases (see Photo 2). The "valves" look like they've just been unwrapped for use; even their numbers look new. Some of the unusual designs include "Coke bottle" (Eimac 327A), "doorknob" (W.E. 388A), "stepped pyramid" (2C42), and the "acorn" (VT128). They are all fairly inexpensive and very beautiful gems. All of the ABC Guild items are complemented with specific series numbers and certification papers outlining their history, manufacturer, and how/where used. ABC Guild's address is 107 Trumbull St., Box 213, Elizabeth, NJ 07206.

Everyone carries house and auto keys on a daily basis, and key fobs are available in early a million different styles. The majority of those items, however, are merely jewelry or trinkets lacking any relation to our exciting world of amateur radio. Filling that void is Murl Roger's unique key tags and name pins (see Photo 3). These items are expertly carved from a ½ inch square by 2 inch long piece of solid oak and finished with dark stain and clear lacquer, creating a key tag that's both durable and attractive. Several styles of key fobs are available to match personal preferences: call letters, given names, or mating names separated by a carved heart. Hamfest-type call-letter pins which can be worn on shirts or coats are also available in the same oak wood design, but are fitted with a rear clasp rather than a key ring hook, if desired. I've owned two for almost a year,

Photo 2. Desk accessory or paperweight items from ABC Guild feature unique-style tubes mounted on highly polished, clear bases.

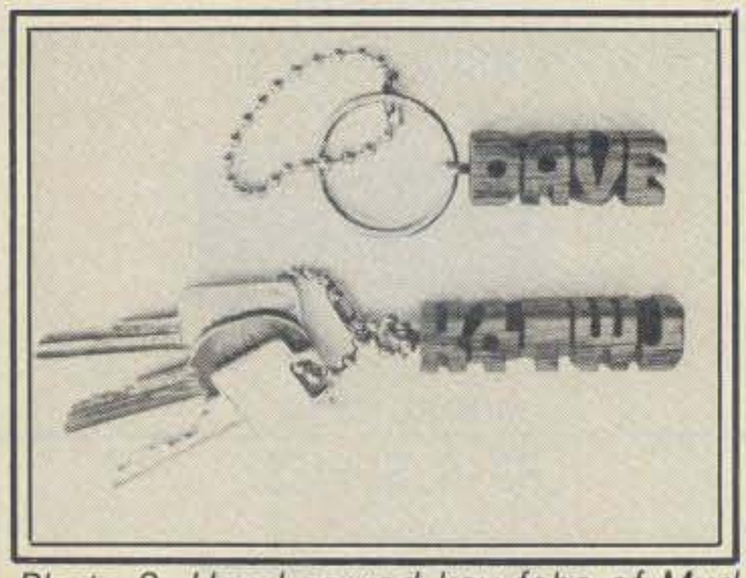

Photo 3. Hand-carved key fobs of Murl Rogers add a flair to any key chain.

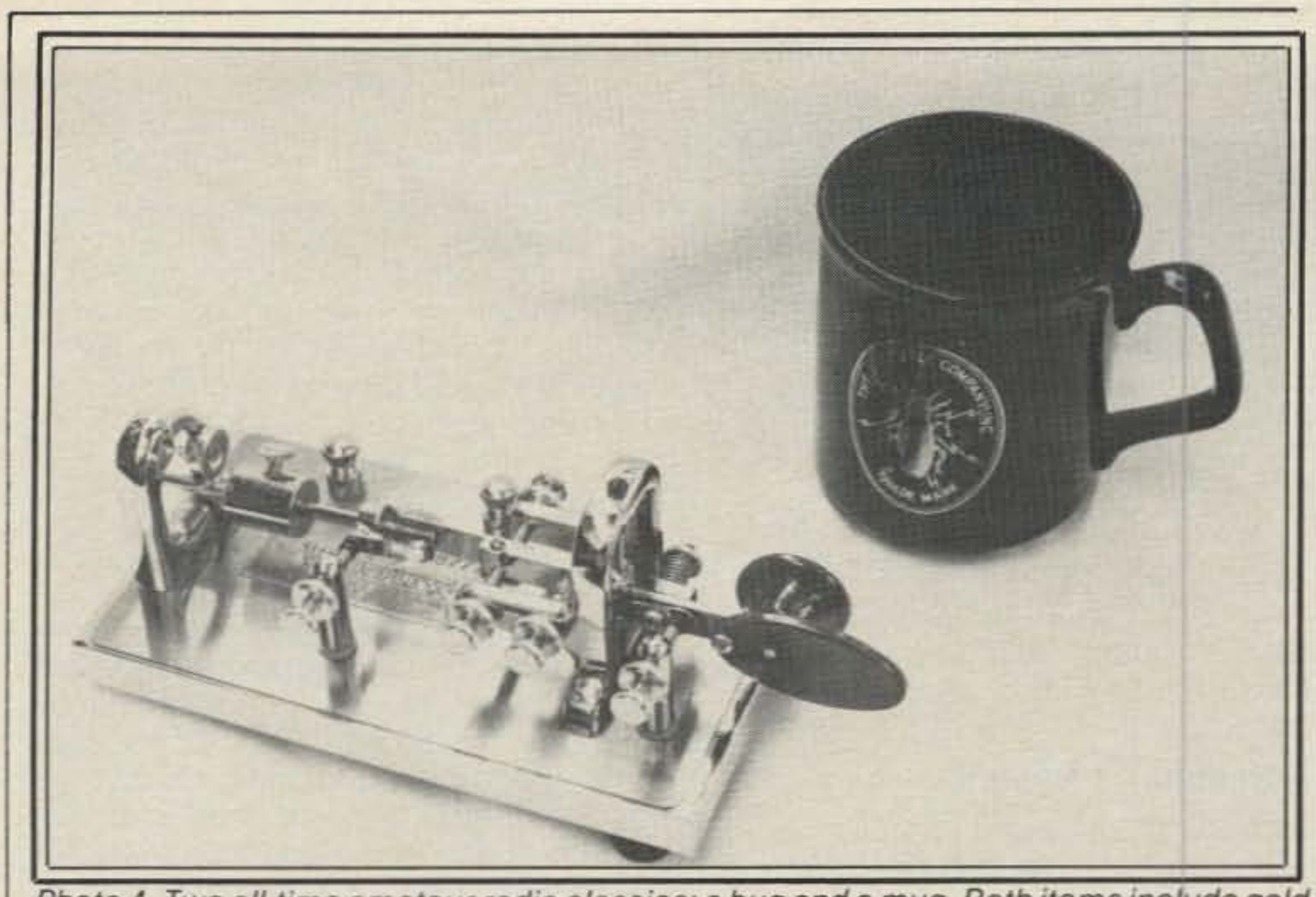

Photo 4. Two all-time amateur radio classics: a bug and a mug. Both items include gold touches for special appeal.

and they continue drawing interest because of their quality. Murl Rogers' address is 1625 Whitter Lane, New Castle, IN 47362. Check December *CQ* for prices, and order early to allow plenty of time for carving.

Station Goodies

Here are two classy gift items guaranteed to brighten the day of any radio amateur: a bug and a mug (see Photo 4). The bug is Vibroplex's top-of-the-line Presentation model semi-automatic key with 24-karat gold-plated base, chromium upper parts, jeweled movement, and red knobs. It's crafted like a fine Swiss watch and has an adjustable mainspring that can be extended or retracted to vary dit speeds from slow as a hand key to nearly as fast as a high-speed computerized CW setup. The mainspring is that flexible vibrating metal reed between the main paddle assembly and the long vibrating pendulum, which is weighted. The Presentation model uses set screws rather than rivets on that piece. Vibroplex can also engrave a call and/or title on this gold key's base, making it a personalized momento for either giving or receiving. If you've never experienced the pleasures of using a genuine bug, you've surely missed one of amateur radio's most classic treats. Dits are made automatically, while dashes are tapped out manually on this mechanical marvel. Once the key is adjusted to your own "fist" and positioned so your hand can curl around toward the paddle (like placing it almost sideways and parallel to a rig's front and directly in front of you), truly personalized Morse of whatever weight desired can be sent with ease. Naturally, this requires some off-the-air practicing, but that's half of the fun.

The coffee mug included in Photo 4 is almost a conversation piece in itself. It's made of English ironstone, it's glossy black in color, and the Vibroplex bug insignia is set in 22-karat gold. Surprisingly, it's generally in the same price category as nonamateur-related mugs. Answering inquiries about improved coffee flavor, we merely say the Vibroplex container is truly in good taste. Why settle for anything less!

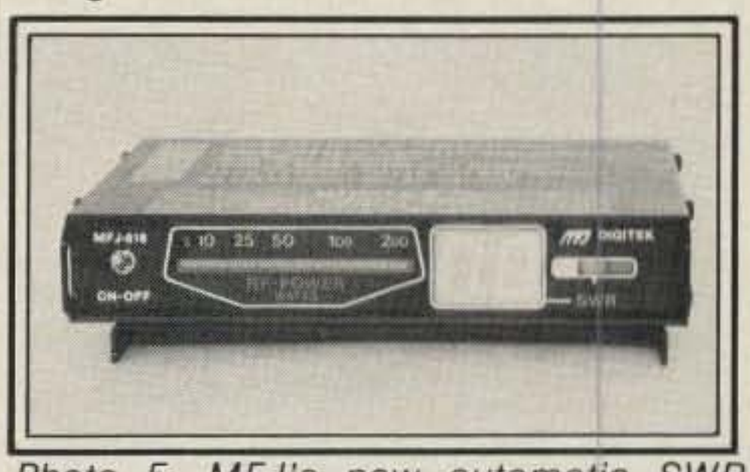

Photo 5. MFJ's new automatic SWR bridge and digital readout power meter is a beauty in any fixed or mobile setup.

If your fixed station or mobile setup lacks an effective way of measuring forward and reflected power, we have a seasonal idea worth considering. Check out MFJ Enterprises' new Model 818 peak-reading digital SWR and wattmeter (see Photo 5). There are several attractive features in this 1"H × 5½"W × 4½"D package. It reads instantaneous power up to 200 watts on a 12 LED bargraph display, directly indicates SWRs between 1:1 and 9:1 on a two-digit .6 inch LED readout, and includes a separate tricolor indicator for monitoring antenna match at a glance. Green indicates good, yellow means not very good, and red signifies a mismatch condition needing attention. Probably the most interesting aspect of this device is its fully automatic opera-

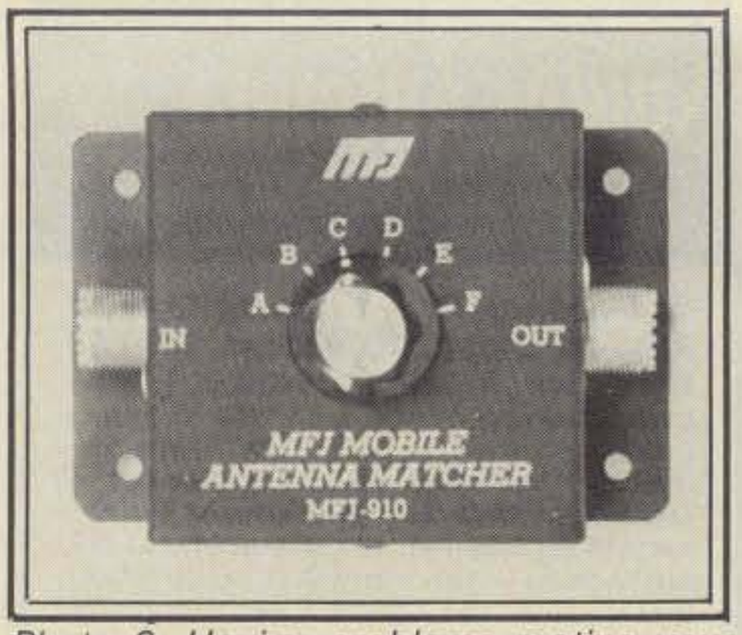

Photo 6. Having problems mating your solid state transceiver and mobile whip? An antenna matching network such as this MFJ unit provides the solution.

tion. There's no need to full-scale calibrate the unit or throw a switch to read SWR. Simply switch it on, and everything is calibrated automatically. The meter is useful from 1.8 to 30 MHz, coaxially connects to 50 ohm systems, and operates from an external 12 volt source or optional AC adapter. Not only is the meter's display colorful in a dimly lit home setup, it's also easy to read when mobiling at night . . . a long desired feature, for sure.

Another definitely appreciated item for HF mobilers is MFJ's new 910 whip antenna matcher (Photo 6). If you've ever had problems trying to deliver full output from today's solid state rigs into a mobile whip or "vacation vertical," you're a prime candidate for an impedance matchbox. Merely insert the matcher in the coax line near the whip (inside the trunk, for example), dial a good match, and bingo . . . full output and a cool running rig. Maybe this should be called a gift for your transceiver.

Photo 7. Here's the ultimate VHF/UHF all-mode scanning receiver: ICOM's new 25 MHz to 1.3 GHz, 99 memory, R7000. Unit even has optional remote control.

A Scanner's Delight

If you're interested in monitoring the various police, government, aircraft, special services, amateur, and hundreds of other activities in VHF and UHF bands, ICOM's new R7000 is the "last word" in a scanning receiver (see Photo 7). The unit provides continuous coverage of 25 to 1000 MHz and 1240 to 1300 MHz, plus it boasts 99 lithium-battery-retained memories that store frequency and mode information. What a rig! Spend three weeks listening on this receiver in the Miami area, and you'll surely be sleeping under your bed with at least two types of firearms by your side. Seriously, however, upper frequency allocations are alive with activity in metropolitan areas, and their use is becoming more common each day. Five years from now all scanners will tune this full spectrum.

The ICOM R7000 is a full-blown mix of scanner and communications receiver, and it's a dandy way to follow our new Phase III OSCAR satellites. Frequencies can be dial selected, entered directly on the front-panel keyboard, or the whole "kit and kaboodle" can be operated by its optional infrared remote control. New R7000s should be arriving at national dealers of ICOM gear by the time this column appears in print. Go for it!

Clever Stocking Stuffers

Magazines and books are always welcomed items in every amateur's repertoire, and their favorable returns continue long after they are given or received as gifts. Obviously, the best way to enjoy a holiday season and kick off the new year is with a subscription to *CQ*. Its collection of fascinating articles, advertisements of new gear, and long listing of used gear resemble a mini hamfest via mail each month. *CQ*'s sister publications, *Popular Communications* and *Modern Electronics*, are also worthy of investigation. *Pop'Comm* is an SWL or activity monitor's haven. There are features on foreign shortwave broadcasts, underworld radio, government communications, utility and mysterious "spy" transmissions, plus survivalist activity, TVRO information, and much more. Try it for a year and watch your knowledge of the HF and VHF spectrum mushroom. *Modern Electronics* is oriented more toward the electronic hobbyist or enthusiast. It's an interesting blend of new product studies (both vidio and video), special electronic items, and easily assembled home construction projects.

Interest in specialized amateur areas continues rating high popularity, and my own *RTTY Today* book is drawing widespread praise. (Thanks, gang. It's great to hear your kind words almost every time we flip on a rig.) Three more of my "easy-to-understand" books have also been published recently: *Introduction to SSTV, OSCAR 10 and Phase III Satellites*, and *Wire Antenna Handbook*. Another fascinating new book is Ade Weiss, W0RSP's *Joy of QRP*. All of the mentioned books and magazines are available directly from *CQ*'s Book Shop (check the ad section). Holiday orders will probably be massive, so get your requests in early.

Conclusion

That's our holiday views for this year, gang, and we hope one or two of our featured items crossed your particular areas of interest. If you're wondering why we didn't mention a particular new transceiver or talkie, its because we were aiming at possibly overlooked rather than common items. There are thousands of fascinating areas within our amateur world, and we want you to enjoy all of them!

73, Dave, K4TWJ

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DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

Another year has rushed by and the holiday season is upon us. Once again it is time to wish:

Merry Christmas and a Happy New Year!
Feliz Navidad!
Froliche Weinachten!
Joyeus Noel!
Buon Natale!
Ch'ing Chu Yeh Su Sheng Tan!
Kellemes Karacsonyt es Boldog Ujevet Kivanuk!
Hauskaa Joulua!
S. Rozhdestvom Khristovym!
Shinnen Omedeto!
Glaedelig Jull!
Nodlaig Mhaith Chugat!
Kull Am Wa Antum Bekir!
Wesolych Swoint!
Chanuakh Lesinchah!
St'Astne Vanoce!

to all DXers the world over. The staff of the *CQ* DX Department, Hugh, WA6AUD; Leo, W4KA; Norm, K6ZDL; Billy, N4UF; and yours truly, John, K4IIF, hope that 1986 will be a great DX year for you.

An Evening With Herb Becker

When we announced the election of Herb Becker, W6QD, to the DX Hall of Fame in the June 1985 issue, we promised you more on the start of WAZ, the beginning of the *CQ* World-Wide DX Contests, and the DX scene of the 1930s and 40s. As Herb was elected to the Hall for his pioneering efforts as a DX writer and for his efforts in initiating WAZ and the *CQ* contests, we felt there was no better source of information than the man himself, so in mid-July K4IIF was on a flight to Los Angeles.

Shortly after arrival, a call was placed to the W6QD QTH and Herb suggested a get-together over dinner. It was to be our first meeting, so we exchanged the usual formalities of color of suit and tie and agreed to be in front of the hotel elevator at 7:00. As might be expected from two contributing editors accustomed to meeting deadlines, we were both on time. Herb was a tall, erect figure with the bright gleam of eye and instant enthusiasm of a beginning DXer. Somehow we had expected that someone who wrote a DX column fully 50 years ago would seem old, but Herb did not.

Having been first licensed in 1921, Herb well remembers the fight between spark and CW which equalled in ferocity the later battle between AM and SSB. The early 1920s saw a definite swing away from spark to CW, but the spark diehards on the west coast would hook up with Cliff Dow, 6ZAC, on the island of Maui, a considerable achievement even though 6ZAC had a tube rig. In those days, the expression THWCW was widely used over the air. It stood for "To Hell With CW."

P.O. Box 205, Winter Haven, FL 33882

Dale D. Jones, K5MM, of Irving, Texas when he operated his GU5CIA station from Guernsey in the Channel Islands. During his first 5 months at GU5, Dale averaged 60 contacts per day. During his travels he has been W6GEN, W7CFJ, W7NQ, XE0GEN, second op at EP2SV and 9D5A, K5MM/YK, and many other calls as visiting operator.

Herb first came to prominence in 1933 when his station was featured in *Radio Magazine's* "Globe Girdlers" by Bud Bane, W6WB. At that time, he and Charlie Perrine, W6CUH, had pooled their efforts to build a transmitter utilizing part of two floors of his parent's beach house along the Pacific at Manhattan Beach. Some of the hams would say, "Give Herb a saw and hammer and he'd build a trans mitter." Later he gave up the hammer and saw, and his and XYL Alberta's new home featured a 5 × 5 foot opening in the wall with two steel panels each having a final amplifier with a pair of 4-400's. Their transmitter occupied the first floor of the beach house, while the operating position was upstairs. The RF section of the transmitter itself occupied a table 10 feet long and 2 feet wide and was 4 feet high. The power supplies were some distance away with power leads running under the floor. You built your own rig in those days, and putting it into a suitcase for a DXpedition was still far into the future.

The First DX Column

Our thoughts soon turned to the first DX column ever written for a monthly radio magazine. Known for his prowess as a DXer, Herb was invited to write a monthly column for *Radio Magazine* in October 1935, and his first effort appeared in the December 1935 issue. The first DX column in *QST* was written several months later by Herb's good friend Byron (By) Goodman, W6CAL/W1JPE/W1DX. Herb's column was entitled simply "DX," and his opening line was "What is this stuff . . . DX anyway?" He reported that 10 meters was hot and was drawing the gang away from 20 and 40 meters. The magazine quickly offered an award to anyone having a 28 MHz contact of over 2000 miles. In December 1935 Herb reported that W6WB had announced that he was getting out of amateur radio. *(Glad you came back, Bud. —K4IIF)*

The title of the column was soon expanded to "DX and Overseas News," but in October 1940, after the FCC had forbidden contacts with foreign stations as a result of the war, it was sardonically changed again to "X-DX and Overseas News" until October 1941, when it was discontinued entirely and not resumed again until the April 1946 issue of *CQ*. During the intervening years, Mr. Killian Lansingh, the owner of *Radio Magazine*, had sold to Sandy Cowan, who changed the name to *CQ* and set up shop in Brooklyn. Much of the DX in the 1946 and 1947 columns involved American GI's scattered around the globe and operating portable.

The Beginning of WAZ

Herb recalled that *Radio Magazine* introduced the WAZ Award in its February 1936 issue. However, DX historian Jim Maxwell, W6CF, later provided us with copies of the November 1934 and April 1935 issues of *R9 Magazine*, a predecessor of *Radio*, which carried announcements of WAZ accompanied by zone descriptions and maps almost identical to those in use today. It appears that the November 1934 issue of *R9* was the earliest publication of the WAZ concept. If any reader is aware of an earlier appearance, please give us the reference and copies of the original material if you have it.

The WAZ concept was to provide a more reliable yardstick to compare the relative performance of amateur stations. In the early days before World War I, DX was measured in terms of miles. However, by the early 1920s contacts of 1000 miles or more had become routine. With the advent of worldwide QSO's on the high-frequency bands, mileage became totally inadequate as a measure of a station's performance, and Worked All Continents ceased to be a challenge. Competing DXers began to boast of numbers of countries worked, but this also failed to suffice, as some parts of the world, Europe for example, contained

The WPX Program

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Mixed: 450 4X6CA, JA1WJ. 500 4X6CA, JA1WJ. 550 4X6CA, JA1WJ. 600 4X6CA, JA1WJ. 650 KA1SR, JA1WJ. 700 JA1WJ. 1100 N4IB. 1650 K9BG.

S.S.B.: 350 AC3T, 4X6CA. 400 AC3T, KS3F, 4X6CA, JG2MWA. 450 W0CON, AC3T, 4X6CA. 500 4X6CA. 550 4X6CA. 600 4X6CA. 800 W7KWI. 1850 W0YDB.

C.W.: 350 I8YRK. 400 I8YRK. 450 JH2TPI, I8YRK. 500 JH2TPI, I8YRK. 550 I8YRK. 600 I8YRK. 650 N4IB. 850 HA8UB. 1050 KA7T. 1650 N2AC. 1900 N6JV. 1950 WA2HZR.

10 meters:	4X6CA, KA7T, JA1WJ.
15 meters:	4X6CA, KA7T, JA1-20784.
20 meters:	KA7T.
40 meters:	I8YRK, KA7T.
80 meters:	KA7T.
160 meters:	KA7T.
Asia:	4X6CA, JA1WJ.
No. America:	KQ8T, JA1WJ.
Europe:	KQ8T, 4X6CA, JA1WT.
Oceania:	N4IB, JA1WJ, JG2MWA, KA7T.

VPX Endorsements: JA1-20784

Award of Excellence Holders: N4MM, W4CRW, K5UR, K6XP, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, YU2DX, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YZ/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG.

Award of Excellence Holders with 160 meter endorsement: W4CRW, N4MM, K5UR, OK1MP, W8CNL, W1JR, W5UR, W8RSW, W8ILC, W1BWS, G4BUE, LU3YL/W4, VE7WJ, W9NUF, N4NX, SM0DJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG.

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.

many nearby countries which could be worked on almost any band, while others such as Australia and New Zealand had few neighbors. Accordingly, the zone system was devised as the fairest way to compare the performance of stations devoted to DX. To Work All Zones, it would be necessary for an amateur to transmit his signal into each discreet part of the world.

The First WAZ Winners

A measure of the strictness of WAZ as a DX yardstick was attested to by the fact that only three amateur stations in the entire world qualified for the award during the 4½ years the system was used prior to World War II. These were ON4AU, G2ZQ, and J5CC. It is interesting to note that the very first WAZ winner, ON4AU, was from the same country (Belgium) as ON4UN, the first amateur to attain 5-Band WAZ. (Is the propagation that much better from Belgium, John?) The October 1940 WAZ Honor Roll showed

From left to right at the ITU in Geneva are Ted Robinson, F8RU, vice president and long-time operator of 4U1ITU; Manuel G. DeLera, XE1XF, of Mexico City; and Francisco de la Fuente, EA2ADO, President. The 4U1ITU station has provided a lot of excitement for DXers for over 20 years. (Photo via XE1XF)

many calls at the 39 zone level which are still prominent in amateur radio circles. These included W8CRA, W2BHW, W8BTI, *W2GT*, W5KC, W1CH, and W6QD himself. Membership in the pre-World War II Honor Roll required the confirmation of 30 zones.

After the wartime interruption, WAZ was resumed in 1947, and you know the rest. In a few years the scope was broadened to include both phone and CW/phone certificates, and in the 1970s we added the single-band WAZ awards and most recently the 5-Band WAZ.

The WAZ Program

10 Meter Phone

302 ..... LZ1HA

15 Meter Phone

223 ..... JA7LMZ 224 ..... LZ1HA

20 Meter Phone

544 ..... A92P

40 Meter Phone

33 ..... LZ1HA

80 Meter Phone

33 ..... LZ1HA

All Band WAZ

S.S.B.

2978 ..... YU4CA 2981 ..... NW5K
2979 ..... W5IYR 2982 ..... VY1CW
2980 ..... I8IXO

C.W. and Phone

5903 ..... G4YMC 5907 ..... G4SDJ
5904 ..... DJ2WV 5908 ..... IK2AMR
5905 ..... JA1LKJ 5909 ..... LA9SN
5906 ..... I0ZUT

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.

5 Band WAZ

Standings as of September 1, 1985

All 200 zones worked:

1. ON4UN	36. OH6JW	71. W9ZR
2. K4MQG	37. OK1AWZ	72. W1NG
3. SM4CAN	38. IV3PRK	73. VK9NS
4. AA6AA	39. DJ6RX	74. N4KG
5. W8AH	40. OH3YI	75. YU7DX
6. W6KUT	41. I4RYC	76. DL8MAG
7. EA8AK	42. ZL1BIL	77. OK3DG
8. LA7JO	43. I4EAT	78. ZL1BOQ
9. EA3SF	44. ZL1BQD	79. EA9IE
10. OH1XX	45. TG9NX	80. DL7HZ
11. EA8OZ	46. XE1J	81. DJ9RQ
12. W0SD	47. F5VU	82. EA5SP
13. K0ZZ	48. W3AP	83. EA2IA
14. ON6OS	49. YO3AC	84. SP3BQD
15. OK3TCA	50. K3TW	85. LZ1NG
16. K6SSS	51. XE1OX	86. N4JF
17. ZL3GQ	52. VE7IG	87. CT2AK
18. OK3CGP	53. OK1ADM	88. HB9CIP
19. SM0AJU	54. CT1FL	89. OK1MG
20. OZ3PZ	55. WA1AER	90. CT4BD
21. I3MAU	56. N4RR	91. VK6HD
22. I2ZGC	57. UW0MF	92. EA6ET
23. 4Z4DX	58. W4DR	93. VK3QI
24. N4KE	59. OK1MP	94. LZ2DF
25. K5UR	60. W1NW	95. ON4QX
26. K9AJ	61. OE1ZJ	96. SM0DJC
27. SM3EVR	62. HB9AHL	97. CT3BM
28. LA5YJ	63. HB9AMO	98. K2TQC
29. DL3RK	64. LA6OT	99. EA8XS
30. N4WJ	65. UR2QD	100. HA9RE
31. G3MCS	66. UK2RDX	101. SM4CTT
32. SM5AQD	67. ZS5LB	102. A71AD
33. W0MLY	68. F6DZU	103. LZ2CC
34. I0RIZ	69. DL4YAH	104. SM5CLE
35. ON5NT	70. LA7ZO	105. LZ1HA

The top 12 contenders for 5 Band WAZ are:

1. DK5AD, 199	7. LA9GV, 198
2. JA3EMU, 199	8. W6GO, 198
3. ZL1BO, 199	9. W4CEB, 198
4. N4WW, 199	10. W2YY, 198
5. K6YRA, 199	11. SM5AKT, 198
6. W8UVZ, 199	12. G3GIQ, 198

338 Stations have attained the 150 zone level

About all that's left is to have a 160 Meter WAZ. How about it W1BB and company, is it possible?

Beginning the WW DX Contests

The roots of the *CQ* World-Wide DX Contests go much deeper than I realized. The contests were actually conceived prior to World War II.

The rules for the first contest were announced in the November 1939 issue of *Radio* with the acknowledgement that activity would doubtless be reduced by wartime restrictions which had resulted in the suspension of amateur radio activity by many countries. U.S. amateurs were cautioned to observe strict neutrality and confine their contacts to an exchange of contest serial numbers. Conversation regarding the war was strongly discouraged. It was pointed out that serious contesters would not have time to take part in political discussions, and therefore, under the circumstances, contest operations would be preferable to ordinary QSO's which might generate indiscrete remarks. However, the contest planned for the fall of 1940 was ultimately suspended by an order from the FCC banning all contacts with foreign stations, and as a result the first *CQ* World-Wide Contest did not take place until 1948.

Antonin Pokorny, OK2PEX, earned 80 Meter CW Single Band WAZ #3 and 5-Band WAZ #269 using only 75 watts to a 2-element beam and a long-wire antenna. This is a remarkable DXing accomplishment. PK2PEX is a member of the Northern California DX Foundation.

The original 1939 rules were very similar to those in use today. There was one multiplier for each zone worked and one multiplier for each country worked on each band. Contest activity was confined to the 7, 14, and 28 MHz bands with divisions for CW and phone. Each division was further divided into a "one operator section" and a "more than one operator section." It was a weekend affair, November 25–27 and December 2–4. Both modes were to be used each weekend, and it was not intended to have separate phone and CW weekends. The contest exchange was the signal report plus a contact number, as opposed to the signal report and zone system we use today.

When the first contest was finally held in the fall of 1948, it was an instant success with approximately 900 entries.

The Pre-War Advisory Committee

Amateurs who made up the equivalent of today's *CQ* DX Award's Advisory Committee included Herb Becker, W6QD; Andrew Elsner, W6ENV; Ed Hayes, W6SA (now W7SA); Guy Dennis, W6DI; George Sinclair, W6GAL; and, of course the editor, Larry LeKashman, W2IOP.

Thanks, Herb, for sharing your reminisences with me. I hope this will be the first of many visits.

New and Special Prefixes For Your WPX Award

CG9: This was a special Canadian prefix used in conjunction with the Canada Games in St. John, New Brunswick.

CH5: This was another special Canadian prefix used in this instance by stations in Saskatchewan to celebrate the centennial of the Riel Rebellion. QSL to the VE5 callsign suffix worked—for example, CH5AA = VE5AA.

CR9: CR9SI was QRV from Selvagens Island, which counts as the Madeira Islands for country awards. QSL to CT3BD

DV: DV is a new prefix for the Philippines.

JY50: This very special prefix was used by Jordanian stations from November 7–21, 1985 in celebration of the 50th birthday of King Hussein, JY1. A special award is available to European stations who make 10 QSO's. Other areas of the world are eligible with 5 QSO's. Send log data and $5.00 or 10 International Reply Coupons to the Royal Jordanian Amateur Radio Society, Box 2353, Amman, Jordan.

OT: The OT prefix was used in mid-1985 by Belgian amateurs to celebrate the 150th anniversary of the Belgian Railways.

RP7, RP9, UP7, RP2, and RP0: These were Lithuanian prefixes.

SW3: A special Greek prefix to mark the founding of Thessalonika 2300 years ago. It will be be use through December 31, 1985.

T4: T4 is a new prefix in use by Cuban stations to mark International Youth Year. T42AL was CO2AL.

VA: The VA prefix was used by all operators on Cape Breton Island from July 22 through August 11, 1985 to celebrate the bicentennial of Sydney, Nova Scotia.

VI: VI is being used on an optional basis from June 1 through December 31, 1985 by Australian amateurs to celebrate the 75th anniversary of the Wireless Institute of Australia.

VX6: Another of the special Canadian prefixes, VX6 commemorated the cen-

Here are W3-land's top QSL Managers. Left to right are Ruthanna Pearson, WB3CQN; Joe Arcure, Jr., W3HNK; and Mary Ann Crider, WA3HUP. Joe was elected to the DX Hall of Fame as a result of his fine record as a QSL Manager. Mary Ann was the first ever to win the WPNX Award. (Photo via W3HNK)

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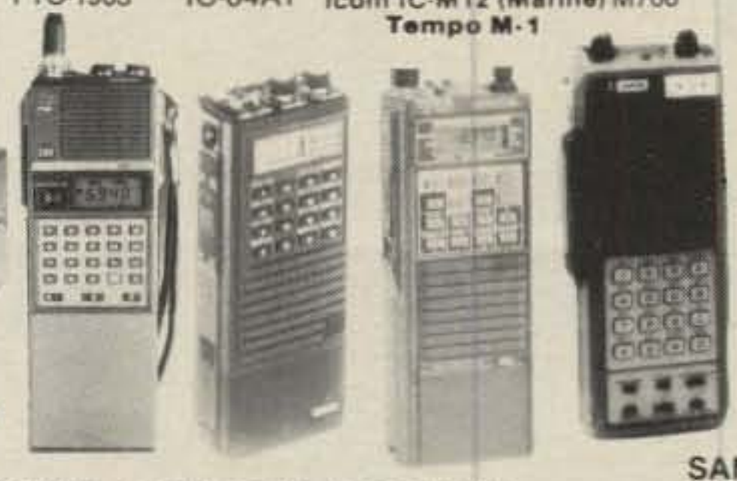
FTC-1903	IC-04AT	Icom IC-M12 (Marine) M700
		Tempo M-1



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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

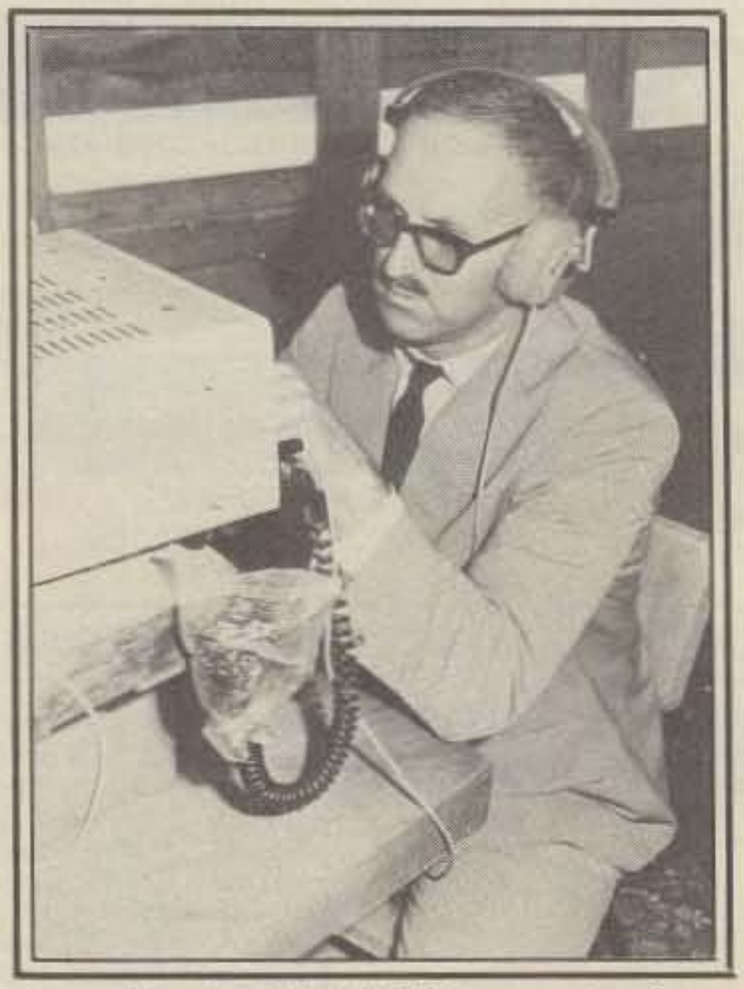
2777	F9RM	1798	YU1DZ	1464	EA2IA	1171	WB8ZRL	905	W@JIE
2740	YU2DX	1798	YU7BPQ	1445	W9NUF	1164	CT1LN	904	W3GXK
2507	K2VV	1758	N2AC	1432	YU7KV	1156	W7CB	876	VE2PD
2498	W2NC	1683	I2PHN	1421	K6ZDL	1154	G4FAM	858	K7CU
2423	K6JG	1657	I8YRK	1391	PY4OD	1135	YU2CQ	856	DF6EX
2354	K6XP	1655	SM7TV	1350	K8LJG	1126	YU4YA	851	JH8NYK
2284	VE3XN	1649	YU7AW	1338	SM6DHU	1094	N4IB	841	I@AOF
2160	N4MM	1640	W8CNL	1328	N6JM	1048	WD9IIC	828	NE6I
2126	W4BQY	1633	K9BG	1320	WA8YTM	1018	N2AIF	827	PY1DFF
2068	W9DWQ	1589	I3ZKD	1300	N5TV	1012	N8BJQ	800	KO2Q
2048	N4NO	1584	W@SFU	1268	IS@LYN	980	K2POF	752	JH4UVU
1914	N6JV	1581	I6SF	1258	DK5AD	952	W6YMH	745	KX1A
1897	N9AF	1536	W1NG	1250	N4NX	947	WD4RAF	722	K8HF
1889	N6CW	1530	K7NN	1240	KL7AF	926	VE5ADA	634	N3KR
1889	YU2TW	1500	KF2O	1229	I2MQP	914	AI8S	630	WI4K
1868	N4UU	1477	IN3ANE	1224	LA7JO	913	AI6Z	611	JO1BMV
1825	K5UR	1472	WA1JMP	1194	YU7AJD	910	YU1SZ	605	W9PWM

S.S.B.

2710	F9RM	1558	K5UR	1176	WA4OIB	1035	I4LCK	858	VE2PD
2273	I@ZV	1557	PA@SNG	1167	W1NG	1033	N2AC	838	W@ULU
2120	K6JG	1556	YU7BCD	1155	G4CHP	1029	EA2IA	810	CT1BY
2093	K6XP	1538	W9DWQ	1144	W2NC	1000	WB8ZRL	761	WB6SRK
2060	ZL3NS	1528	N4NO	1136	ZP5RS	994	KL7AF	755	WO4L
2029	I@AMU	1476	W4BQY	1131	W2CC	993	HI8GB	736	K3IXD
2015	K2POA	1376	N2SS	1117	W9NUF	954	KC8YM	706	K8ZZU
1966	K2VV	1374	WA4QMQ	1103	W3ARK	948	XE1XF	688	W6YMH
1944	N4MM	1340	VE1YX	1100	N5TV	948	KK@L	683	K9BQL
1764	I8YRK	1310	CT4NH	1099	N6FX	937	K8LJG	655	EA8AKN
1759	I4ZSQ	1292	WF4V	1094	KC4OV	925	K5RPC	649	KK5P
1739	CT1UA	1269	I6NOA	1085	ZP5JCY	902	N4IB	621	AG2K
1704	W@YDB	1257	CT1FL	1081	XE1OX	901	PY4VX	619	CT1BWY
1631	OZ5EV	1249	KF2O	1080	TG9GI	895	WA2FKF	617	N2AIF
1605	I6ZJC	1230	I2MQP	1048	I8KCI	883	CT4UW	600	W7KWI
1605	I8KDB	1223	PY3BXW	1044	AC2J	868	PY4OD	600	KC2FC
1600	WD8MGQ								

C.W.

2272	W2NC	1557	N2AC	1148	EA2IA	963	K8LJG	767	WD9IIC
1911	WA2HZR	1532	VE7CNE	1133	JE1JKL	919	AK9Z	755	N4NX
1898	N6JV	1492	N4MM	1133	I2DMK	897	KL7AF	655	SM5DAC
1838	K6JG	1442	K5UR	1123	I1YRL	888	DJ1YH	654	W@JIE
1834	K2VV	1383	VO1AW	1111	PY4OD	874	K2POF	645	PA3CKO
1809	W8KPL	1355	I6SF	1107	JA1KRU	852	I7PXV	644	N4IB
1785	N4NO	1294	K9QVB	1077	W9NUF	827	NN4Q	629	W6YMH
1745	K6XP	1286	YU3NP	1043	KA7T	813	N2AIF	616	VE1ACK
1744	W9DWQ	1285	W4WJ	1011	W1NG	801	JH1VRQ	615	KQ8J
1739	W3ARK	1244	N4YB	1000	N5TV	797	AK2H	605	LA7JO
1650	W4BQY	1182	K6ZDL	999	KF2O	790	YU2CQ	601	F6HKD
1645	G2GM	1163	N6FX	970	IT9VDQ	771	G4FAM	600	VE4AEX
1635	DL1QT								



Jorge Vrsalovich, LU7XP, operates from Tierra del Fuego on the southern tip of South America near Cape Horn. His rig is a Yaesu 101B and an FL2000B to a 3-element beam. Jorge has a high country score on CW.

tennial of Lethbridge, Alberta, Canada. It was used from July 14–27, 1985 only.

ZM: New Zealand amateurs have the option of using ZM during the period October 1 through December 31, 1985 to publicize the Sixth IARU, Region 3 Conference in Auckland from November 13–17, 1985.

ZV2: Brazilian amateurs used ZV2 from June 30 to July 6, 1985 to mark Fire Prevention Week in Brazil.

8J1: 8J1XPO operated from the Tsukuba Science EXPO '85 in the Shueisha Pavillian, Iberaki, Japan.

"DX REPORT" Ceases Publication

Alan Leith, VE3FRA/VE1AL, in August announced that after 120 issues he will no longer be publishing *DX REPORT* due to the pressure of job-related duties. Alan's bulletin will be missed. He was always prompt, timely, and accurate. Readers are receiving an appropriate number of issues of *QRZ DX* to cover the balance of their subscriptions.

Club Officers

The *Greater Milwaukee DX Associa-*

CQ DX Awards Program

S.S.B.

1432	YC0DPO	1435	G4VOE
1433	OH6LX	1436	W2HG
1434	G4FAM		

C.W.

646	JN1GIV	647	KQ9W

S.S.B. Endorsements

310	KS2I/316	300	VK3JF/306
310	F9RM/316	300	KB8KW/305
310	DJ9ZB/316	300	W6SN/304
310	I0AMU/316	300	WD8MGQ/303
310	KD8VM/316	300	WA4DAN/302
310	K6WR/316	300	NJ2C/302
310	ZL3NS/315	300	W6NLG/301
310	I4ZSQ/315	300	W4UNP/301
310	W4DPS/315	275	YU7KV/296
310	W2SUA/314	275	KQ9W/295
310	OZ5EV/314	275	K7LAY/295
310	OZ8BZ/313	275	W6BCQ/292
310	TI2HP/313	275	K4LR/286
310	K5OVC/313	275	KE4HX/285
310	N7RO/312	275	VE3DLR/284
310	YU1DZ/311	275	G4FAM/280
310	N6OC/310	250	WB4VQO/252
300	G4CHP/307	250	WB5RQM/250
28 MHz	K2JF	150	YC0DPO/151
3.5/7 MHz	K2JF	150	W3IJT/150

C.W. Endorsements

310	W6PT/316	275	WA4DAN/278
300	SM6CST/304	250	KQ9W/270
275	WA4JTI/290	200	DJ1TH/224
275	W0HZ/283	200	DJ3LR/204
275	W6YQ/279		

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.

tion's new officers are Noll Amidzich, W9RN, President; Dave Schmocker, KJ9I, Vice President; and Syl Janczak, WD9JKZ, Secretary-Treasurer.

Here and There

Chad: If everything went according to plan and Larry's license was extended, N7DF/TT8 should be activating Chad on 160 meters. QSL via K0HGW.

Chatham Island: At presstime ZL7AA was active on the lower frequency bands after 1000 GMT; 3795 kHz was a popular frequency. QSL to Box 71, Chatham Island, New Zealand.

China: BY4AOM is a club station in Shanghai for older amateurs who once held "C" calls. QSL to P.O. Box 205, Shanghai, China.

Christmas Island: VK9XJ and VK9XZ have been reported on 20 meter SSB at early morning time on the east coast, 1140–1340 GMT. QSL in care of Box 99, Christmas Island, Australia.

Cyprus: 5B4 and ZC4 stations meet Mondays at 1700 GMT in the Aphrodite Net on 28500 kHz.

Djibouti: From 2300–0200 GNT J28EI can be heard on 7003 or 7025 kHz CW. QSL to FC1JEN.

Dodecanese Islands: John, SV0DX, should be on the air for another year. Listen on 20 meter SSB around 1800 GMT. QSL to W4FA.

Easter Island: The death of Father Dave Reddy, CE0AE, leaves Easter Island more difficult to find, but CE0ZIJ has been heard between 0230 and 0400 GMT on 7124, 7188, and 7205 kHz. QSL's go to P.O. Box 1, Easter Island, Chile.

Heard Island: Jim, P29JS, advises that there may be another scientific expedition to Heard Island during the antarctic summer, January through March 1986. If so, he and XYL, Kirsti, hope to be aboard and put this rare island on the air again.

Kazakh: RL8PPY has a strong signal on 40 meter CW after 2300 GMT.

Kermadec Island: From October 1 through December 31, 1985, Chris, ZL7OY, will be active as ZM8OY.

Korea, YL: Those looking for YL contacts should listen for Linda, HL9TX, near 14200–210 at 1200–1300 GMT.

Market Reef: OJ0 calls are no longer being issued. Finnish DXers operated earlier this year from Market Reef using the call OH0MA.

Mali: Diane, TZ6FS, was reported on 14215 at 1450 and 1950 GMT and on 14200 at 2340 GMT. She may be the first YL to operate from Mali.

Mozambique: Chuck, AB4Y/C9, was active on 20 meter SSB at presstime. QSL to WM4N.

Papua/New Guinea: P29FJ can frequently be found Tuesdays at 1200 GMT on 14050–060 kHz CW.

Russia: An excellent list of Russian prefixes and oblasts is available from Garth A. Hamilton, VE3HO, P.O. Box 1156, Fonthill, Ontario L0S 7E0 Canada for $1.00 to U.S. and Canadian addresses. For addresses outside the U.S. and Canada send $1.50 or 6 IRC's.

Sao Tome: S92LB prefers SSB. Good times and frequencies are 21300 at 1900–2000 GMT and 14180–185 at 2000 GMT. He is ex-CR5LB/S9RLB. QSL to L.S. Bairad, Box 147, Sao Tome.

Taiwan: Tim, BV2B, has been active on SSB. He can often be heard in the W7PHO net on 14227 kHz at 1500 GMT.

Thailand: HS1SD is said to be the only active Thai native ham at the present time. He is a government official. Listen on 14 MHz SSB, near 14210, at 2300 GMT.

Wake Island: Tom, AH9AC, frequently operates on 14195 kHz SSB and can be heard evenings from 0400 GMT.

West Malaysia: 9M2AB has a strong signal and takes part in the W7PHO family hour on 14227 kHz at 1530 GMT. QSL to N4FFN.

Willis Island: Kim, VK9ZB, is a recent operator on Willis. He will probably leave at the end of 1985, so best work him while you can. He has been reported on 7085 kHz from 1000 GMT daily and on weekends around 14180 at 0500 GMT. QSL to VK6YL.

Zambia on 160 meters: Listen for 9J2JN near 1835 kHz at 0000 GMT. QSLs go to KB2ZP.

Acknowledgements

This column would be difficult without the assistance of the following sources who regularly send DX information to Winter Haven: *Carolina DX Association Bulletin* (W4WMQ), *DX'ers Magazine* (W4BPD), *DX-NL* (DL3RK), *DX News-Sheet* (G4DYO), *DXPRESS* (PA0GAM), *HIDXA Newsletter* (P29JS), *International DX Association Newsletter* (W4FRU), *Long Island DX Bulletin* (W2IYX), *Long Skip* (VE3XN), *National Contest Journal* (K5ZD & K8CC), *Northern California DX Club's The DXer, Northern California DX Foundation's Newsletter* (W6ISQ), *QRZ DX* (W5KNE), *Southern California DX Club Bulletin* (W6ABW), and *Western Washington DX Club's Totem Tabloid* (K7ZR).

73, John, K4IIF

QSL Information

Please send information regarding QSL managers for active DX stations, and addresses of active DX stations not listed in the Callbook, to K4IIF, P.O. Box 205, Winter Haven, FL 33882.

A4XJQ to P.O. Box 1074, Seeb International Airport, Oman
A71AD to P.O. Box 4747, Doha, Qatar
AH9AC to W1ISD
BY1PK to P.O. Box 6106, Beijing, P.R.C. (Peoples Republic of China)
BY1QH to P.O. Box 2654, Beijing, P.R.C.
BY1SK to P.O. Box 2916, Beijing, P.R.C.
BY4AA to P.O. Box 205, Shanghai, P.R.C.
BY5RA to P.O. Box 730, Fouzou, P.R.C.
BY5RF to P.O. Box 209, Fouzou, P.R.C.
BY8AA to P.O. Box 607, Chengdu, P.R.C.
BY8AC to P.O. Box 607, Chengdu, P.R.C.
BY8AA to P.O. Box 202, Wulumuqi, P.R.C.
C30BAN to F6BII
C30BBW to DK9FE
CE3FIP to LU8DPM
CR9BB to CT1ABQ
EJ2B to ON5KL
FM4DP to F6FNU
HS0IYY to JA8ATG
HZ1FM to DJ9ZB
HZ1HZ to N7RO
J28DM to F6GUY
J28EI to FC1JEN
J37AH to W2GHK
J39CM to WB2LCH
J3ABG to WA4WTG
J4ATC to W1BFA
J6LB to KO2A
J73AH to W2GHK
J73D to W2OB
J73LC to KF4IL
J87BS to KE5KK
J87GL to K0GVB
J87J to K4UEE
J87VV to KB9AW
J99A to TI2BR
JY5ZM to WA3HUP
JY9CL to G3MUL
KC4AA to K9AUB
KC6HA, KC6JA, and KC7UU to K6EDV
KG4AW to KA4TAY
K9VV/KH2 to W4FLA
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KH6XX to W3HNK
KP4USN to KA4YUX
K5LZO/KP5 and NR5M/KP5 to K5LZO
LJ2C to LA5KV
LY4L to UA4LM
OD5PA to P.O. Box 166373, Beirut, Lebanon
OY5J to WA3HUP
P29KJ to VK9NL
P46S to K3UOC
PJ2FR to N6KT
PJ4CR to WB2LCH
PJ8UQ and PJ8UZ to W3HNK
PY0FN to PY7ZZ
PZ5ES to N8DE
S0HZR to WA2HZR
ST2SS to YU2GX
SU1ER to W4ZWE
SV0AA to N2OO
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TR8IG to N6CW
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VP2MO to WB2LCH
VP2VAA to NP2AB
VP9BO to N1AFC
VQ9RA to WD0GWQ
VR6BR to KA9W
VU2YOU to N3US
XE1IF to XE1XF
YS1UL to WA0JYJ
ZC4CN to G3SNN
ZC4CZ to G4MGO
ZC4MR to G4ZZN
ZC4RN to G3EMY
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ZS3E to K8EFS
3C1BC to K4PHE
3C1YL to N4NX
4S7VK to DJ9ZB
4V2C to NQ4I
5J0LR to HK1QO
5R8AL to WA4VDE
5T5CCJ to W4BAA
5W1EJ to W0WP
5Z4PI to WA2RUD
7P8CI to KA2CDE
8P6CB to N8DCJ
8Q7BL to JA2BL
8Q7GW to W9GW
9D5A to K6KM
9Y4NP to W3HNK

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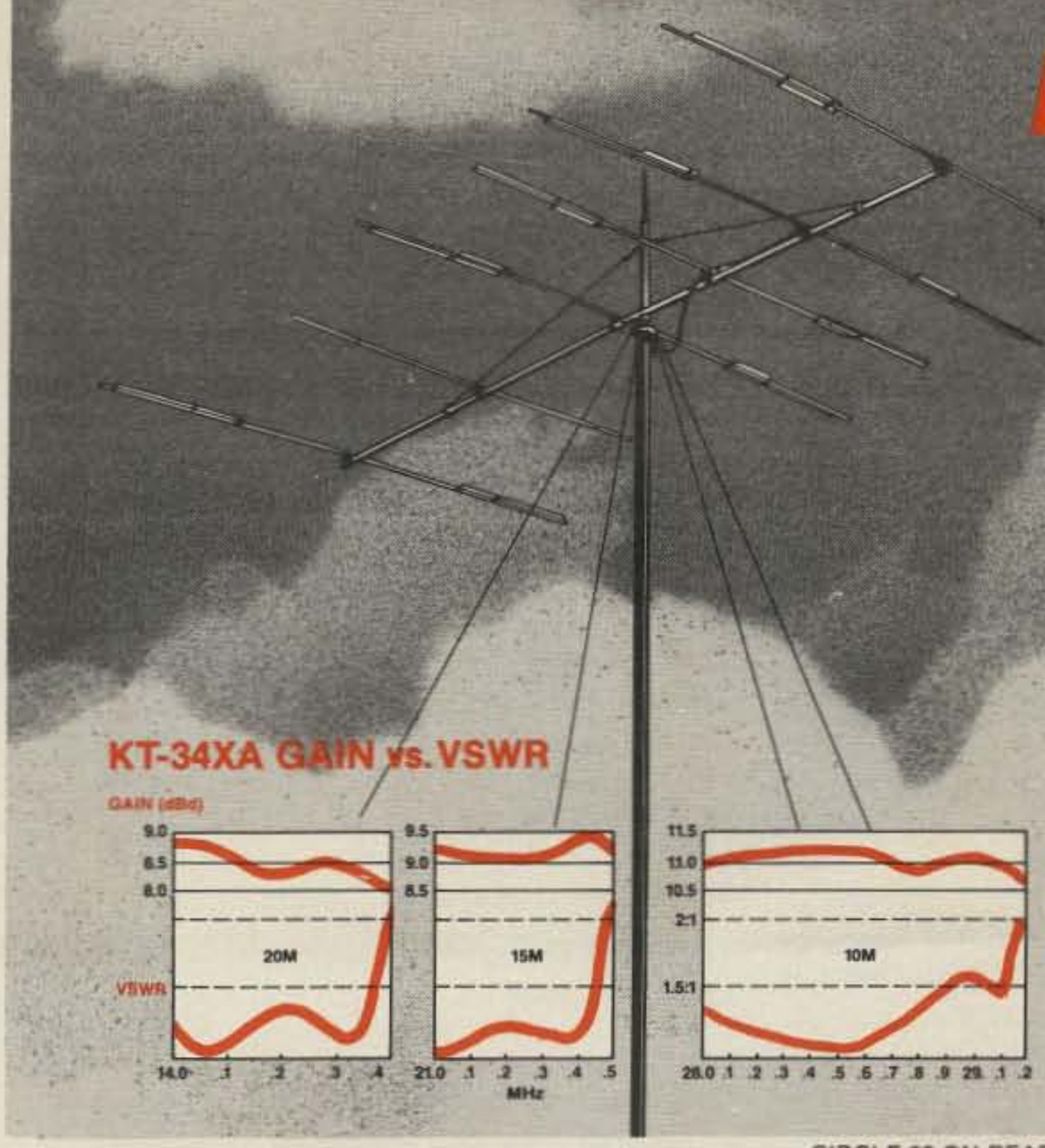

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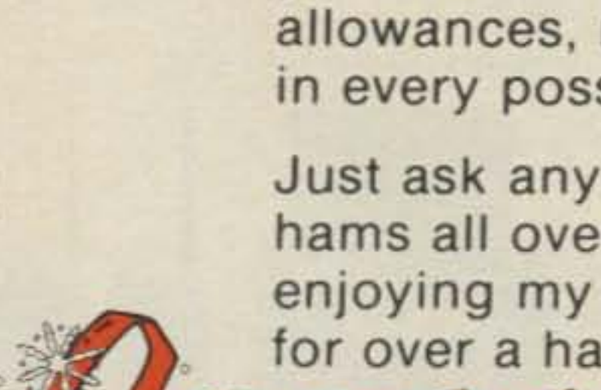

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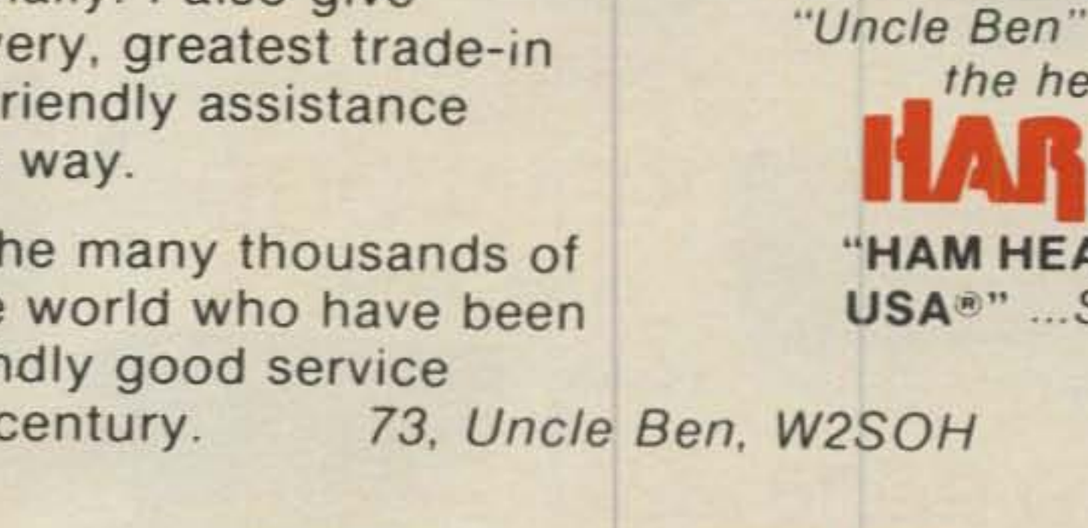

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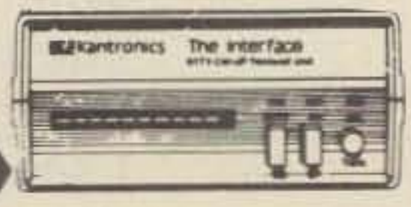

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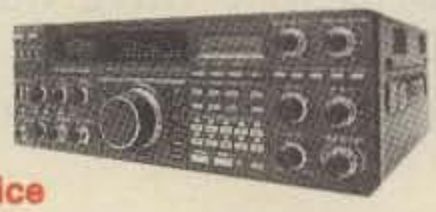

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RG174/U min. 50 Ω mil spec	10¢/ft.
RG213 noncontaminating 96% shield mil spec	36¢/ft.
RG214/U double silver shield 50 ohm	$1.65/ft.
RG214/U tinned copper	65¢/ft.
RG217/U double shield 500 5/8" OD	85¢/ft.

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RG58U 95% shield	10¢/ft.
RG59/U 100% foil shield TV type	10¢/ft.
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W8ZXH

CIRCLE 26 ON READER SERVICE CARD

Awards

a monthly feature by
DOROTHY H. JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month as told by Bob is:

Frank (Bob) Swanlund, W0WYX

(Note: Although this space is often occupied by the story of someone who has completed All Counties, we think Bob's adventures are so interesting that his story should be shared with everyone.)

"I spent eleven years of my life-span as Chief Engineer of Communications for the Colorado Highway Patrol. With the help of many people I designed and built the whole 'works.' Then one day in April of 1960 I resigned, and Margaret and I moved to the top of Squaw Mountain, 11,500 feet above sea level. We built and owned the buildings up there 21 years prior to our move. We were Fire Lookouts on Squaw Mountain and built the 'House of Radio Laboratory' atop the lofty peak.

"The living room in our home was crowded with all sorts of radio equipment. Through this equipment and the giant towers outside went messages of the State Highway Department, the Forest Service, the Public Service Company, the FBI and the Secret Service, and REA. In my 'spare' time I operated on the amateur radio bands.

"We—my wife, Margaret, and I—lived in comfort the year round. We made friends with the birds and little creatures that live on the mountain. We fed the birds and small animals and enjoyed their antics as they ate our offerings of grain and leftover bread from our table. Our house had huge glass windows that seemed to peer out at eternity.

"One fine spring day we had an especially vicious storm. A wind raging at 120 miles an hour smashed the fire lookout on the peak and knocked down everyone of the radio towers that kept us in touch with the rest of the world. I happened to be in Idaho Springs when this disaster happened, and Margaret was up there alone when I got the first report of the damaging wind.

"I wasn't too worried about Margaret because she was well experienced in the outdoors. But you may be sure I started in the Jeep as soon as I could, bucking the wind all the way. When I got up there the wind had ripped off the top of the fire lookout. Through the use of cable Margaret had almost saved it. But she was just a few minutes late. It was slightly broken and bent, some on the ground, some teetering. It was almost as if our mountain had been bombed. But eventually we made all the necessary repairs.

333 South Lincoln Ave., Mundelein, IL 60060

Bob Swanlund, W0WYX, with antenna designed for police radio system. On Squaw Mountain, Colorado, 1969.

Home of Bob, W0WYX, with antenna farm in the background.

Amateur radio corner of the "Radio Laboratory" operated by W0WYX atop Squaw Mountain, Colorado.

Present operating position for W0WYX, Cedaridge, Colorado.

"We had four lead pipes driven into the rock, now cut off even with the rock. This had been the base of a powerful telescope. It was used by a research group from the University of Denver who came to study and measure the dust on the moon. The observations of the American astronauts were exactly the same as those recorded by the university group. Isn't it interesting that this should happen on my Squaw Mountain?

"We used to have a 100 watt AM station that I built to operate on 160, 80, 40, 20, 10, and 6 meters. It was used most of the time as a rather unique repeater on the 10 meter band at 29.624 while receiving on 28.504, 145.08, and 50.600. We had Sunday morning check-ins from 80 to 120 stations from as far away as 110 miles on the 2 and 6 meter bands. We had stations from all over the world on 10 meters. One of them was from England. I don't think he missed more than 5 Sundays in the 10 years the repeater was in operation. I controlled the whole works manually. Yes, I had several conversations with the Federal Communications Commission on this idea.

Frank, G4HBI, Bill, KM4W, and Eddie, G4KHG, all County Hunters, near Manchester, England. Bill's home QTH is Manchester, Tennessee.

Special Honor Roll
Tim McLaughlin, N9DEH
All Counties #498, 8-28-85

Special Endorsement
Bob Robertson, N5QQ
All Counties #357, 1-11-82
Endorsed All 2× CW, 8-7-85

USA-CA Honor Roll

3000		1500		500	
WD4RAF	528	W9MYY	724	KC2QI	2050
N9DEH	529	N9DEH	725	HC1OT	2051
KA2CNG	530			W9MYY	2052
		1000		YU7GMN	2053
2500		YU7GMN	888	NF8K	2054
N9DEH	591	W9MYY	889	N9DEH	2055
		NF8K	890		
2000		WD9GYX	891		
W9MYY	647	N9DEH	892		
N9DEH	648				

"We ended up with four 2 meter and four 450 MHz repeaters in the building with 34/94 still in operation. We had 19 agencies' repeaters in the building.

"After 21 years we sold the property on Squaw Mountain and moved to Boulder.

"We now live in Cedaredge, Colorado in the cedar and sage country. We are at the southwest foot of the largest flat-topped mountain in all the world (so the book says!). More than 300 lakes are on top or near the top of this mesa. I'm not a fisherman, but those who are tell me it is a great place to fish. We are 15 miles from all this by highway 65 northbound. The snow is deep in the spruce and pine forests until very late in the spring.

"I take time out to listen for counties I need, enjoy my surroundings, and after 49 years still enjoy the wonderful hobby of amateur radio.

"Happy Holidays to everyone, and I'll see you on the bands as more and more of us continue the hunt for that elusive county number 3076! 73, Bob, W0WYX, still working for All Counties"

Awards Issued

Tim McLaughlin, N9DEH, finished them all and claimed USA-CA 500 #2055, USA-CA 1000 #892, USA-CA 1500 #725, USA-CA 2000 #648, USA-CA 2500 #591, USA-CA 3000 #529, and All Counties #498. All awards were dated 8-28-85, endorsed Mixed.

Bob Robertson, N5QQ, All Counties #357, 1-1-82, added the endorsement for All 2×CW. Date of endorsement is 8-7-85.

Fred L. Van Aalst, WD4RAF, sent for USA-CA 3000 #528, Mixed, 8-17-85.

John F. Kray, KA2CNG, qualified for USA-CA 3000 #530, Mixed, 8-30-85.

Walter J. Zyck, W9MYY, won USA-CA 500 #2052, USA-CA 1000 #889, USA-CA 1500 #724, and USA-CA 2000 #648, all 2×CW, dated 8-20-85.

Radio Club "MAZSLYA," YU7GMN, qualified for USA-CA 500 #2053 and USA-CA 1000 #888, Mixed, dated 8-20-85.

Michael L. Davis, NF8K, sent for USA-CA 500 #2054 and USA-CA 1000 #890, All 20M, Mobile, SSB, dated 8-24-85.

Bill Walters, WD9GYX, qualified for USA-CA 1000 #891, Mixed, 8-27-85.

USA-CA 500 certificates went to:

Harry M. Martin, KC2QI, #2050, All SSB, 8-10-85.

Pedro Katz, HC1OT, #2051, Mixed 8-14-85. This is #1 to Ecuador.

Walter J. Zyck, W9MYY, #2052, all 2×CW, 8-20-85.

Radio Club "MAZSLYA," YU7GMN, #2053, Mixed, 8-20-85.

Michael L. Davis, NF8K, #2054, All 20 M, Mobile, SSB, 8-24-85.

Tim McLaughlin, N9DEH, #2055, Mixed, 8-28-85.

Awards Available

New Cagou DX Award from New Caledonia. The New Caledonia Amateur Radio Association is pleased to announce the new "Diplom Cagou." This award is an attractive multicolored certificate measuring 21×30 cm, featuring a map of the New Caledonia Islands and a drawing of the *cagou*, New Caledonia's unique bird.

The award is available to all amateurs having made six contacts with FK stations on any band since January 1, 1972, date that the first "Diplome Cagou" was printed in black on white. SWL's may also apply with six reception reports. No QSL cards are required, only log extracts. Fee

The New Diplome "Cagou," sponsored by the Amateur Radio Association of New Caledonia.

to accompany the application is 12 IRCs, which covers the award and airmail postage. The award will be delivered about 15 days after receipt of the application. Send application and fee to: ARANC, Award Manager, P.O. Box 3956, Noumea, New Caledonia.

Certificate "Le Bleuet." Le Bleuet award is obtained by working five amateur radio stations in Sagueny-Lac St-Jean. To know if you are in the right part of Quebec, ask the operator if he is a Blueberry. That is the name we call people living in that area. All bands and all modes are accepted. Send application with log information on the stations worked to VE2AUF, Marc Bedard, 265 Ste-Emile, Chicoutimi-Nord (Qc), Canada G7G 2L1, plus $2.00 US for postage and handling. No checks, IRCs, or stamps, please.

"Le Bleuet" Award, for contacting the required number of stations at Saguenay-Lac St-Jean.

National Parks 100 Award in celebration of the centennial year for Canadian National Parks.

This award is supported by the Saguenay-Lac St-Jean Radio Amateur Club (RASL) VE2CRS (C.P. 361, Chicoutimi-Nord Qc, Canada G7G 3W5), which has about 100 members. The area is well known in Quebec Province for its blueberries. It is often said that the blueberries are so big that only one is needed to cook a blueberry pie! Lac St-Jean is also famous for fishing "ouananiche," which is a soft-water salmon.

For the traveler, the club operates a network of four permanently linked repeaters to cover all the area from Dolbeau to Ville de La Baie: VE2RCR (146.94 – MHz) in Alma, VE2RCC (147.12 + MHz) in Chicoutimi, VE2RCD (146.70 – MHz) in Dolbeau, VE2RCP (146.97 – MHz) in Mont Apica in the Laurentide Park. Each day at 18:30 local time there is a net on these frequencies.

National Parks 100 Award. To help publicize the 100th anniversary of Parks Canada, CRRL is sponsoring a National Parks 100 Award. The idea is to earn 100 points by working Canadian stations during this anniversary year (1985). For Canadian stations, contacts with most Canadian stations count for 1 point; contacts with Canadian stations using special prefixes count for 5 points; contacts with Canadian stations operating from Parks Canada sites count for 10 points. For U.S. and DX stations, points are doubled. To receive the award, send a copy of your log, certified by two other amateurs, to CRRL National Parks Awards Manager, Garry Hammond, VE3XN, 5 McLaren Avenue, Listowel, Ontario N4W 3K1. Please include a donation of $1 or 3 IRC's to help pay for the cost of printing and mailing the award.

The Radio Club de Costa Rica offers the TTI Award for two-way contacts with at least seven different call districts of Costa Rica.

TTI Award. The Awards Manager of the Radio Club of Costa Rica (RCCR) is announcing the availability of the TTI Award. The requirements are two-way QSO's, any mode, with seven of the eight call areas of Costa Rica. The call areas of Costa Rica are TI2, San Jose; TI3, Cartago; TI4, Heredia; TI5, Alajuala; TI6, Limon; TI7, Guanacaste; TI8, Punarenas; and TI9, Isla del Coco. However, QSO with the official club station of RCCR (TI0RC and TE3RC during the year 1983) can replace one call area.

Send verified GCR—list of QSL cards—to the awards manager of RCCR. The fee is 10 IRC's or $4.00 US. Send application and fee to Bengt Hallden, TI4BGA, Diploma Manager of RCCR, Apdo. Postal No. 999, Heredia - 3000, Costa Rica.

Notes

Happy Holidays and Good Hunting to you and yours! We will see you next month.

73, Dorothy, WB9RCY

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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Bulletin

Since this issue of *CQ* should reach most subscribers before the *CQ* WW DX CW Contest weekend of November 23¢ 24, here is an updated day-to-day forecast for the contest. High Normal conditions are still forecast for the contest period, with the possibility that they may climb to Above Normal to some areas of the world on November 23. It looks like a good weekend for the CW section. See the Last Minute Forecast appearing in this month's column for day-to-day conditions expected during the rest of the month of November.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for December 1985

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 23, 25	A	A	B	C
High Normal: 4, 10, 18-19, 22, 24, 28	A	B	C	C-D
Low Normal: 1-2, 5, 8-9, 11-13, 16-17, 20-21, 26-27, 29	A-B	B-C	C-D	D-E
Below Normal: 3, 6-7, 15, 30-31	B-C	C-D	D-E	E
Disturbed: 14	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. **Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.**
2. **With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-good (B-C) on December 1st and 2nd, fair-to-poor (C-D) on the 3rd, good (B) on the 4th, fair-to-good (B-C) on the 5th, etc.**

The present sunspot cycle, the 21st since observations began on a regular basis in 1749, declined more rapidly during 1985 than was originally expected. Its end is now in sight, and it may occur as soon as October 1986.

The solar cycle is measured by a *smoothed sunspot number*. This value smooths out fluctuations by averaging monthly mean values over a 12-month period. The latest smooth sunspot number therefore is always six months behind the latest monthly mean number. The Royal Observatory of Belgium is the world's official keeper of solar records, which are amassed by a worldwide network of scientific observatories. The Belgium Observatory reported a mean monthly sunspot number of 10 for August 1985. Daily observations varied between a high of 35 on August 1 and a low of 0, which occurred on 9 days during August. This mean level results in a smoothed sunspot number of 20, centered on February 1985.

Solar activity during 1985 was expected to begin with a smoothed sunspot number of 38 and decline to 26 by year's end (see page 112, *CQ*, December 1984). Instead, 1985 began with a count of 21, and it is estimated to have declined to 12 by December.

Table I lists the smoothed sunspot numbers to date for the present cycle, and a prediction for the remainder of the cycle. This data is provided by the National Geophysical Data Center, Boulder, Colorado. Fig. 1 depicts the same data in graphic form.

Cycle 21 began in June 1976 with a smoothed sunspot number of 12. The cycle rose to a maximum of 165 during December 1979, making it the second highest cycle on record. Cycle 19 holds the record as the most intense cycle, having reached an unprecedented peak of 201 during March 1958.

Since December 1979 Cycle 21 has been on the decline. Statistically, based on the 20 previously recorded cycles, it takes an average of 6.8 years to decline from peak to minimum intensity. This would place the minimum for cycle 21 at October 1986. This would make the length of Cycle 21 as 10.3 years, which would be somewhat shorter than the average cycle duration of 10.9 years.

It looks fairly certain that 1986 will go into the scientific record books as the year in which sunspot Cycle 21 came to an end and Cycle 22 began.

Because of the direct relationship between solar activity and the strength of the ionosphere, HF propagation conditions throughout 1986 will continue to be typical for minimal solar activity. Few *F*-layer openings are expected on *10* meters, with considerably reduced openings on *15* and *20* meters. On the other hand, conditions are expected to improve somewhat on *40, 80,* and *160* meters.

December Conditions

Twenty meters should continue to be the best band for worldwide DX during December. The band should open on most days just after sunrise and remain open until an hour or two after sunset. Signals should peak towards Europe and the east about noon; towards Africa during the early afternoon; towards South America during the late afternoon; towards the Pacific area and Australasia during the early evenings; and towards Antarctica a bit later in the evening. When conditions are high or above normal, the band may remain open for DX until as late as midnight. Even though we're near the bottom of the present sunspot cycle, look for some fairly good DX openings on *15* meters when conditions are high or above normal. Check for openings towards Europe, Africa, and the east before noon; towards South America during the early afternoon; and towards the Pacific and Australasia during the late afternoon. Although not likely to happen very often, look for some *10* meter DX openings when conditions are

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1976	—	—	—	—	—	12	13	14	14	13	14	15
1977	17	18	20	22	24	26	29	33	39	46	52	57
1978	61	65	70	77	83	89	97	104	108	111	113	118
1979	124	131	137	141	147	153	155	155	156	158	162	165*
1980	164	163	161	159	156	155	153	150	150	150	148	143
1981	140	142	143	143	143	142	140	141	143	142	139	138
1982	137	133	129	124	120	117	115	109	101	96	95	95
1983	93	90	86	82	71	71	66	66	68	68	67	64
1984	60	56	53	50	48	47	44	40	34	29	25	22
1985	21	20	(19)	(18)	(17)	(17)	(16)	(16)	(15)	(14)	(12)	(12)
1986	(11)	(11)	(10)	(10)	(9)	(9)	(8)	(7)	(7)	(7)**	(8)	(8)
1987	(14)	(13)	(13)	(12)	(11)	(10)	—	—	—	—	—	—

** Maximum value.*
( ) Predicted values.
*** Expected end of solar Cycle 21 (October 1986).*

Table I– Progress of Cycle 21. (From National Geophysical Data Center, Boulder, CO)

11307 Clara Street, Silver Spring, MD 20902

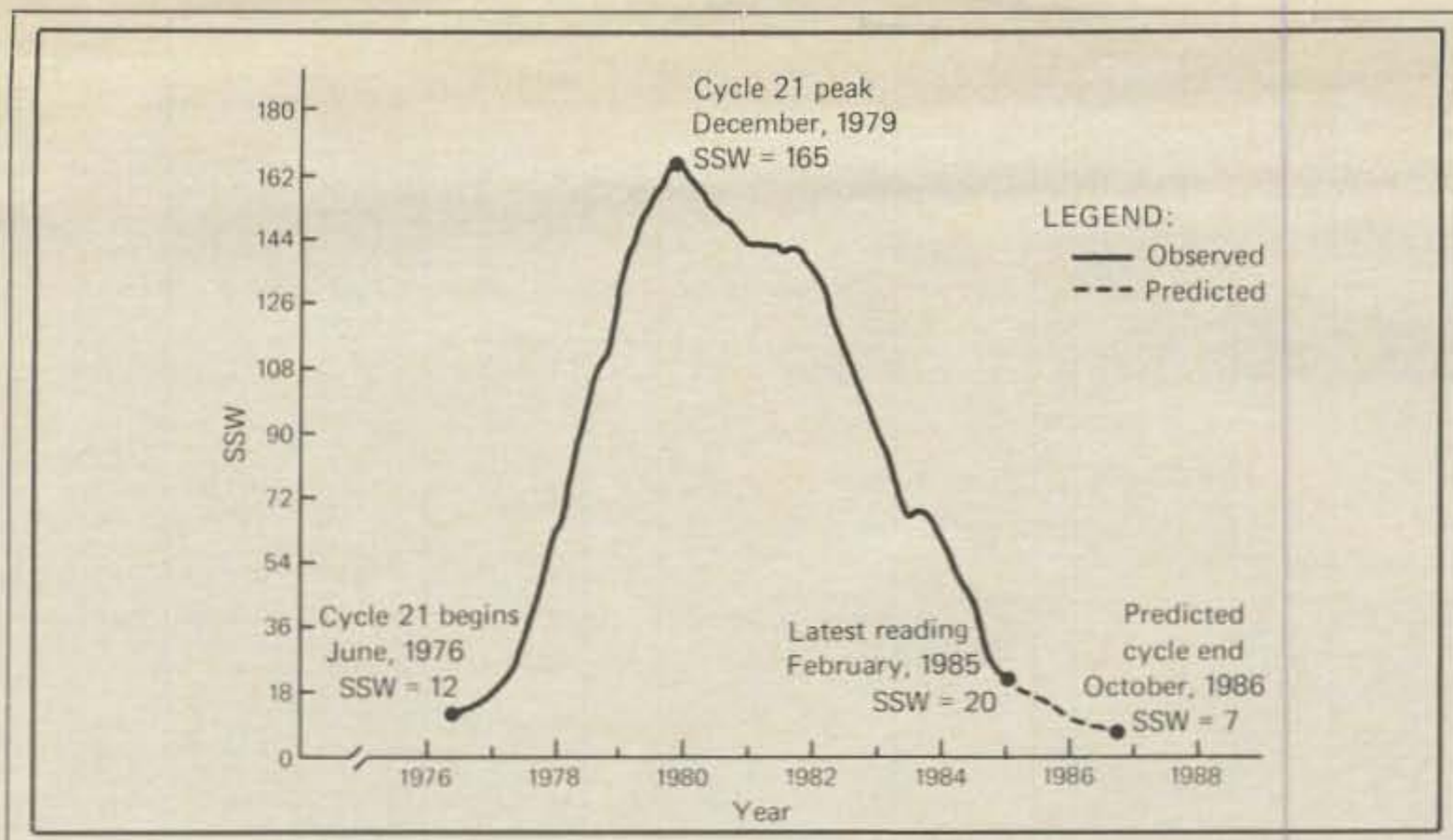

Fig. 1– Smoothed sunspot numbers to date for Cycle 21 in graphic form.

high or above normal. Best bet is for openings towards South America during the early afternoon, although the band may also open briefly towards Africa from the eastern half of the country and towards the Pacific and Australasia from the western half.

With the hours of darkness at a maximum in the northern hemisphere, and static levels at seasonally low values, a considerable improvement is expected in DX propagation during the hours of darkness on the *40*, *80*, and *160* meter bands. *Forty* should open for DX during the early afternoon, with the first signals coming from Europe. After sundown the band should open to Africa and to South America. Signals from the Pacific area, the Far East, and Australasia should peak just before sunrise, but the band may remain open for an hour or two later. Fairly good DX is also expected on *80* meters between sundown and sunrise. Signals from Europe, Africa, and the east should peak before midnight; signals from South America should be in for most of the hours of darkness; signals from Australasia and the Pacific area should peak just before sunrise. There will be many nights during December when *80* meters will be the best band for DX propagation. Check both *40* and *80* meters for long-path openings during sunrise and sunset periods.

December should be an active month for 160 meter DXers, with the ARRL 160 Meter Contest scheduled for December 7–9. Expect fairly good conditions on this band, probably better than they have been during the past 10 years. Conditions on *160* meters are generally at their best during periods of very low solar activity. Look for openings towards Europe and the east as early as 8 p.m. in the EST time zone, with the band remaining open until 2 a.m. Check for European openings in the CST time zone between 8 p.m. and 1 a.m.; from 8 p.m. to midnight in the MST zone, and to 11 p.m. in PST zone. Some openings towards the south, especially to the Caribbean area, should be possible from about 10 p.m. to 2 a.m. in all time zones, and possibly right up until local sunrise. Openings towards the Pacific and Australasia favor west coast stations, but it will be worth looking for these openings in all time zones between 4 a.m. and sunrise. A good rule to remember about *160* meter DX openings is that conditions tend to peak about the time that the sun rises at the *easternmost* terminal of a DX path, or during the night-to-day "grayline" period.

VHF Ionospheric Openings

Quite a bit of meteor shower activity is expected during December. *Geminids*, a major meteor shower, should take place between December 4 and 16. It is expected to peak with a meteor rate of about one a minute on December 13. This should permit some fairly good meteor-type openings on *10*, *6*, and *2* meters. A second, but less intense shower period is expected later in the month, called *Ursids*. This shower should take place between December 17 and 24, peaking on the 22nd with a meteor rate of about 15 an hour.

A secondary seasonal peak in sporadic-*E* propagation usually takes place during December (the major peak is during the summer months). This should result in occasional short-skip openings on *10* and *6* meters as short as a few hundred miles and as long as 1400 miles.

Some auroral-type VHF ionospheric openings are also likely to occur during December, especially when ionospheric conditions on the HF bands are Below Normal or Disturbed. Be sure to check the Last Minute Forecast at the beginning of this column for those days that are forecast to be in these categories during the month.

During years of high solar activity, *F*-layer DX propagation on 6 meters was often possible to many areas of the world

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart approprate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left-hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *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.

December 15, 1985-February 15, 1986
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	09-11 (1)** 08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (4) 12-13 (3) 13-14 (2) 14-15 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-01 (2) 01-03 (3) 03-04 (2) 04-05 (1)	17-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 20-00 (1)* 00-02 (2)* 02-03 (1)*
Northern Europe & European USSR	08-10 (1)	06-07 (1) 07-11 (2) 11-12 (1)	15-17 (1) 17-19 (2) 19-01 (1) 01-02 (2) 02-03 (1)	17-19 (1) 19-01 (2) 01-03 (1) 21-00 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-14 (2) 14-15 (1)	17-19 (1) 19-21 (2) 21-00 (1) 00-01 (2) 01-02 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
Western Africa	10-12 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-23 (2) 23-02 (1) 02-03 (2) 03-04 (1)	19-22 (1) 22-01 (2) 01-03 (1) 22-01 (1)*
Eastern & Central Africa	08-11 (1) 11-13 (2) 13-14 (1)	07-13 (1) 13-16 (2) 16-18 (1)	18-20 (1) 20-23 (2) 23-01 (1)	19-00 (1)
Southern Africa	10-13 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	18-20 (1) 20-22 (1) 22-00 (1) 22-00 (1)	19-22 (1)
Central & South Asia	16-18 (1)	07-10 (1) 19-21 (1)	06-08 (1) 18-22 (1)	06-07 (1) 18-20 (1)
Southeast Asia	16-18 (1)	07-10 (1) 17-20 (1)	06-08 (1) 18-21 (1)	06-07 (1) 18-20 (1)
Far East	16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	05-08 (1) 17-18 (1)	05-08 (1) 17-18 (1)
South Pacific & New Zealand	13-15 (1)** 12-14 (1) 14-17 (2) 17-18 (1)	05-07 (1) 07-10 (2) 10-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1)	04-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*

Australasia	14-16 (1)** 12-15 (1) 15-17 (2) 17-18 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-16 (1) 16-19 (2) 19-21 (1)	03-05 (1) 05-08 (2) 08-09 (1) 17-19 (1)	05-06 (1) 06-07 (2) 07-08 (1) 17-18 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-15 (1)** 08-09 (1) 09-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (3) 08-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (2) 19-20 (1) 01-03 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-03 (2) 03-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1) 21-03 (1)* 03-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-15 (1)** 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-10 (1) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	19-21 (1) 21-02 (2) 02-05 (1) 05-06 (2) 06-07 (1)	21-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
McMurdo Sound, Antarctica	15-17 (1)	07-09 (1) 17-18 (1) 18-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	09-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	15-17 (1) 17-19 (2) 19-12 (3) 23-01 (2) 01-02 (1)	17-19 (1) 19-00 (2) 00-01 (1) 20-01 (1)*
Northern & Central Europe & European USSR	08-11 (1)	07-08 (1) 08-11 (2) 11-12 (1)	16-18 (1) 18-19 (2) 19-22 (1) 22-00 (2) 00-01 (1)	18-00 (1) 20-00 (1)*
Eastern Mediterranean & Middle East	08-11 (1)	07-09 (1) 09-12 (2) 12-14 (1) 22-00 (1)	17-19 (1) 19-22 (2) 22-23 (1)	19-22 (1)
Western Africa	09-12 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	17-20 (1) 20-23 (2) 23-01 (1)	19-22 (1) 22-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	09-12 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-17 (1)	18-19 (1) 19-21 (2) 21-23 (1)	19-22 (1)
Southern Africa	10-12 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-18 (1) 22-00 (1)	18-19 (1) 19-21 (2) 21-23 (1)	19-22 (1)
Central & South Asia	17-19 (1)	07-10 (1) 19-21 (1)	06-08 (1) 18-21 (1)	06-07 (1) 18-20 (1)
Southeast Asia	17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 17-20 (1)	06-08 (1) 17-19 (1)	06-07 (1) 17-19 (1)
Far East	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-20 (1)	01-03 (1) 03-07 (2) 07-08 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
South Pacific & New Zealand	12-16 (1)** 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-11 (2) 11-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-09 (1)	00-01 (1) 01-06 (2) 06-08 (1) 03-07 (1)*
Australasia	14-17 (1)** 11-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-11 (2) 11-18 (1) 18-20 (2) 20-21 (1)	01-03 (1) 03-07 (3) 07-08 (2) 08-09 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Caribbean, Central America and Northern Countries of South America	10-15 (1)** 08-09 (1) 09-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (1)	06-07 (1) 07-10 (3) 10-14 (2) 14-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-21 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-04 (2) 04-06 (3) 06-07 (1)	19-21 (1) 21-05 (2) 05-06 (1) 23-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-15 (1)* 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	19-21 (1) 21-02 (2) 02-04 (1) 04-06 (2) 06-07 (1)	21-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	15-17 (1)	07-08 (1) 08-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

Time Zone: PST (24-Hour Time) WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	08-10 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	17-21 (1) 21-23 (2) 23-01 (1)	18-20 (1) 20-22 (2) 22-23 (1) 19-22 (1)*
Northern & Central Europe & European USSR	08-10 (1)	06-07 (1) 07-10 (2) 10-12 (1) 23-01 (1)	17-00 (1)	19-22 (1) 19-21 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	07-10 (1) 10-12 (2) 12-13 (1) 21-23 (1)	06-08 (1) 18-22 (2)	06-08 (1) 18-21 (1)
Western Africa	09-11 (1)** 08-09 (1) 09-12 (2) 12-13 (1)	07-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	18-23 (1)	19-22 (1)
Eastern & Central Africa	09-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	06-08 (1) 18-22 (1)	06-08 (1) 18-21 (1)
Southern Africa	08-10 (1) 10-12 (2) 12-14 (1)	09-13 (1) 13-16 (2) 16-18 (1) 23-01 (1)	18-21 (1)	18-20 (1)
Central & South Asia	17-19 (1)	08-10 (1) 17-18 (1) 18-19 (2) 19-20 (1)	05-08 (1) 17-19 (1)	05-07 (1)
Southeast Asia	14-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 13-16 (1) 16-18 (2) 18-20 (1)	01-04 (1) 04-07 (2) 07-09 (1)	04-07 (1)
Far East	14-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 13-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	22-00 (1) 00-02 (2) 02-06 (3) 06-08 (2) 08-10 (1)	23-01 (1) 01-06 (2) 06-08 (1) 01-06 (1)*
South Pacific & New Zealand	14-16 (1)** 11-13 (1) 13-14 (2) 14-16 (3) 16-18 (2) 18-19 (1)	07-08 (1) 08-13 (2) 13-15 (1) 15-16 (2) 16-18 (4) 18-19 (2) 19-21 (1)	20-22 (1) 22-00 (2) 00-07 (3) 07-08 (2) 08-09 (1)	00-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
Australasia	14-16 (1)** 12-13 (1) 13-15 (2) 15-17 (3) 17-18 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	01-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1)	03-05 (1) 05-06 (2) 06-08 (1) 04-07 (1)*
Caribbean, Central America and Northern Countries of South America	11-14 (1)** 08-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (3) 09-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-00 (1) 00-02 (2) 02-03 (1)	18-20 (1) 20-21 (2) 21-23 (3) 23-01 (2) 01-03 (3) 03-04 (2) 04-05 (1)	19-21 (1) 21-03 (2) 03-04 (1) 21-03 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-14 (1)** 08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (2) 18-21 (1)	19-21 (1) 21-00 (2) 00-02 (1) 02-04 (2) 04-06 (1)	22-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	14-16 (1)	07-08 (1) 08-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1) 21-23 (2) 23-01 (1)	21-00 (1) 00-02 (2) 02-05 (1)	*Nil*

*Indicates best time for 160 meter openings.
**Indicates best time for 10 meter openings.

during December. With the present cycle near minimum, this will not be the case this December. For the very patient, however, a transequatorial scatter or *TE*-opening may be possible on 6 meters between the southern half of the USA and South America. Openings, if any, will likely be few and far between, and will be distorted by flutter fading. The best time to try for a *TE*-opening is between 8 and 11 p.m.

This month's column contains DX Propagation Charts valid through February 1986. Note that the "band" column headings have been changed this month to reflect the changes in propagation conditions expected during the present minimal solar period. Short-Skip Propagation Charts for use during December appeared in last month's column.

The Editor of this column would like to take this opportunity to extend his warmest greetings for the Holiday Season to everyone, everywhere. Good wishes for peace, good health, and good propagation during 1986, despite declining sunspot activity.

73, George, W3ASK

Copy Worldwide Short-wave Radio Signals on Your Computer

Remember the fun of tuning in all those foreign broadcast stations on the short-wave radio? Remember those mysterious sounding coded tone signals that baffled you? Well, most of those beeps & squeals are really digital data transmissions using radioteletype or Morse code. The signals are coming in from weather stations, news services, ships & ham radio operators all over the world. Our short-wave listener cartridge, the "SWL", will bring that data from your radio right to the video screen. You'll see the actual text as it's being sent from those far away transmitters.

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VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

More Contest Stuff

I hope you're not too tired of hearing about the *CQ* World-Wide VHF WPX Contest, but a lot has happened since our last column was prepared, and I thought you might like to hear just a few more exciting details.

In the November column we stated that the SCORE multi-operator group, NV6O/2, had the highest scoring log received to date. That was true at the time the manuscript was written, but I'm very happy to say that we've received many more high-scoring logs since that time. The biggest thrill for me was reviewing the log of F6KAW/P. This group of 9 Frenchmen made 1347 QSO's with 158 different prefixes for a total score of 212,826 points. They worked 87 grid squares (grids in central Europe are about the same size as they are here in the northern U.S.) in 19 DXCC countries, making several contacts of over 1000 km (621 miles). The interesting part is, they did all this on *2 meters!* The F6KAW/P multi-op, single-band entry is surely a world-class effort, and I'd like to take this advance opportunity to congratulate the operators of this station.

The full contest results write-up is being prepared as you read this, and we'll publish the standings in the spring of 1986. Since the contest was in July, many wonder what takes so long to publish the results. Well, we had to wait until September 30 for overseas logs to arrive. Then we had to segregate the logs by origin and mail them out to the members of our Contest Committee, who pour over each log, checking for duplicate QSO's, scoring errors, and other potential problems. We then had to gather up all the logs with corrections and comments from the committee members, determine categories of competition, and compile standings in each category. Next we had to contact trophy sponsors to notify them of the competitive categories for which trophies would be awarded, and sort out who would sponsor which trophy. We also had to design an award certificate and order the proper quantity to be printed, write up the contest results manuscript, order trophies and engraving, etc. Add to this the two-month lead time required for publication, and we use up a lot of time. Administration of a W/VE-only contest would take a bit less time and effort, and having a full-time paid staff doing the work would speed things up, too. However, we rely entirely on unpaid volunteers and must be thankful for their efforts at any rate.

The good news is that as of this writing (mid-September) we have received nearly 400 VHF WPX logs. It appears the contest was a resounding success with every chance of becoming the world's most popular VHF operating event.

24 Louis Dr., Budd Lake, NJ 07828

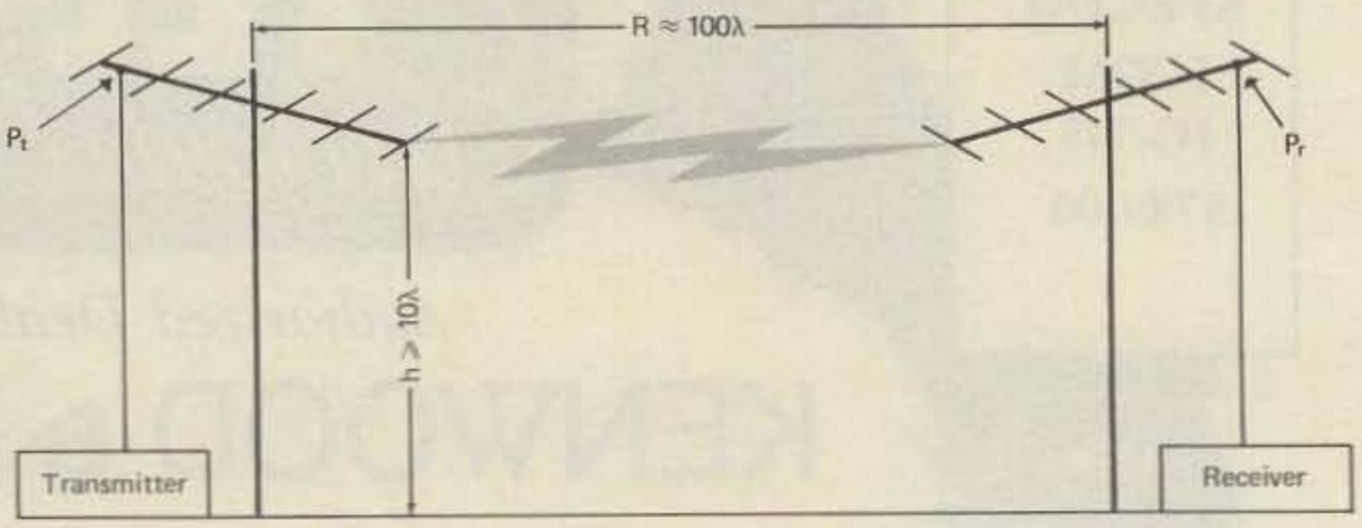
Measuring Antenna Gain: Anyone Can Do It

Well, maybe not *anyone*, and maybe not at any frequency, but at UHF and SHF (super-high frequencies) measurement of antenna gain becomes reasonably easy for anyone with a quarter-acre of property, inexpensive and obtainable test equipment, and two identical antennas.

Because I recently received an evaluation sample of the new F9FT "Tonna" 55-element 23 cm Yagi (as mentioned in the November column) and wanted some way to quantitatively assess performance, I began searching through my old college textbooks on microwave measurement techniques, looking for a simple way to measure antenna gain at 1296 MHz without going to a commercial antenna range. No problem. All I needed was either a 1296 MHz antenna of the precisely known gain, or two identical antennas. Using a formula taken from the M.I.T. Radiation Laboratory Series books, I could make a simple backyard measurement, plug in a few numbers, and derive antenna gain with some reasonable accuracy. I didn't have an antenna of known gain, but I did have access to a pair of identical antennas. KT2B had also received an evaluation unit from The VHF Shop in Mountaintop, PA, and we could set up a test range in my backyard.

Using the setup shown in fig. 1, we could check antenna performance quite easily. We needed only a pair of 10 foot masts and supporting tripods, a 1 watt (precisely measured at the feedpoint) signal source, and a microwave power meter capable of measuring in the 1 milli-

Fig. 1– A method of checking antenna performance.



If the two antennas are identical, gain can be calculated as follows:

$$G^2 = \left(\frac{4\pi R}{\lambda}\right)^2 \frac{P_r^*}{P_t}, \text{ or } G = \frac{4\pi R}{\lambda}\sqrt{\frac{P_r}{P_t}}$$

where:

G = Gain expressed arithmetically (not in dB)
λ = Free-space wavelength in units
R = Range of separation of the antennas in same units as λ

Example:

Antenna calculation based on measurements described in the text

λ = 23cm
R = 100λ = 2300cm
P_t = 1w. (+30dBm)
P_r = 1mw. (0dBm)

$$G = \frac{4\pi R}{\lambda}\sqrt{\frac{P_r}{P_t}} = \frac{28902.628}{23}\sqrt{.001} = 39.738$$

G = 39.738 (for both antennas)
G = .5 (39.738) = 19.869 (for one antenna)
G in dB = $10 \log_{10}$ 19.869 = 12.98 dB (each antenna)

NOTE:

"Technique of Microwave Measurements", M.I.T. Radiation Laboratory series, McGraw-Hill Co., New york, 1948.

watt range with real precision. Normally, to measure antenna performance one would need a clear area of several wavelengths around and below the antenna under test. At 20 meters this would mean a 200 foot unguyed tower and a few acres of test range. A similar arrangement for 23 cm could be achieved with an 8 foot mast and a clearing of 75 foot radius. In fact, 75 feet is about 100 wavelengths at 1296 MHz!

The formula shown in fig. 1 derives total gain for the two antennas under test; the gain is expressed mathematically, not in dB. To find the gain of just one of the antennas, you must subtract the gain of the other. Using two identical antennas makes this easy, as you can simply divide the total gain by two to find the gain of each antenna. Multiplying the gain number by ten times its log yields the gain in dB.

If you run through this calculation, you'll begin to understand why we can only increase antenna system gain by 3 dB when we double the size (aperture, number of elements, etc.) of the system. We should all know by now that stacking a pair of 13 dB gain antennas does not yield 26 dB, but yields a maximum theoretical total gain of 16 dB. But doesn't the antenna gain *double* when we increase the antenna system two-fold? Yes, it does. But double the gain is 3 dB more, since the log of 2 is .30 and expression in dB is a log function.

In the example shown, the **Pt** (transmit signal power) is +30 dBm, or 1 watt, and the **Pr** (received signal power) is 0 dBm, or 1 milliwatt. Using the formula, the total antenna gain, **G**, in the case shown is about 39.738. One of the antennas would have half that gain, or 19.869. Expressed in dB, this would be about 13 dB gain per antenna (10 log 19.869 = 12.98).

How well does this system work? I'll let you know next month, after we actually set up our backyard test range and make some measurements. I intend to measure the 55-element F9FT 23 cm antennas, *and* a pair of reference dipoles without passive elements, to have a "0 dB gain" reference point.

Product Review: The SSB Electronic LT23S 1296 MHz Transceiver

Any active weak-signal VHF enthusiast knows of, or is using, linear transverters which convert lower-frequency equipment for transmission and reception in the VHF/UHF region by a simple heterodyne process. Many of us already use transverters to derive our signals at 50, 144, 220, or 432 MHz. A linear transverter allows us to maintain all or most of the qualities inherent in the design of our lower-frequency equipment and simply moves the frequency of operation to a different band. While there are commercial "multimode" transceivers available for

The SSB Electronic LT23S linear transverter for 1296 MHz.

the 50, 144, and 432 MHz bands, there is nothing of the sort commonly offered for 220 or 1296 MHz (although ICOM has recently introduced the IC1271A for 23 cm); thus, these two bands are populated almost entirely by users of transverters.

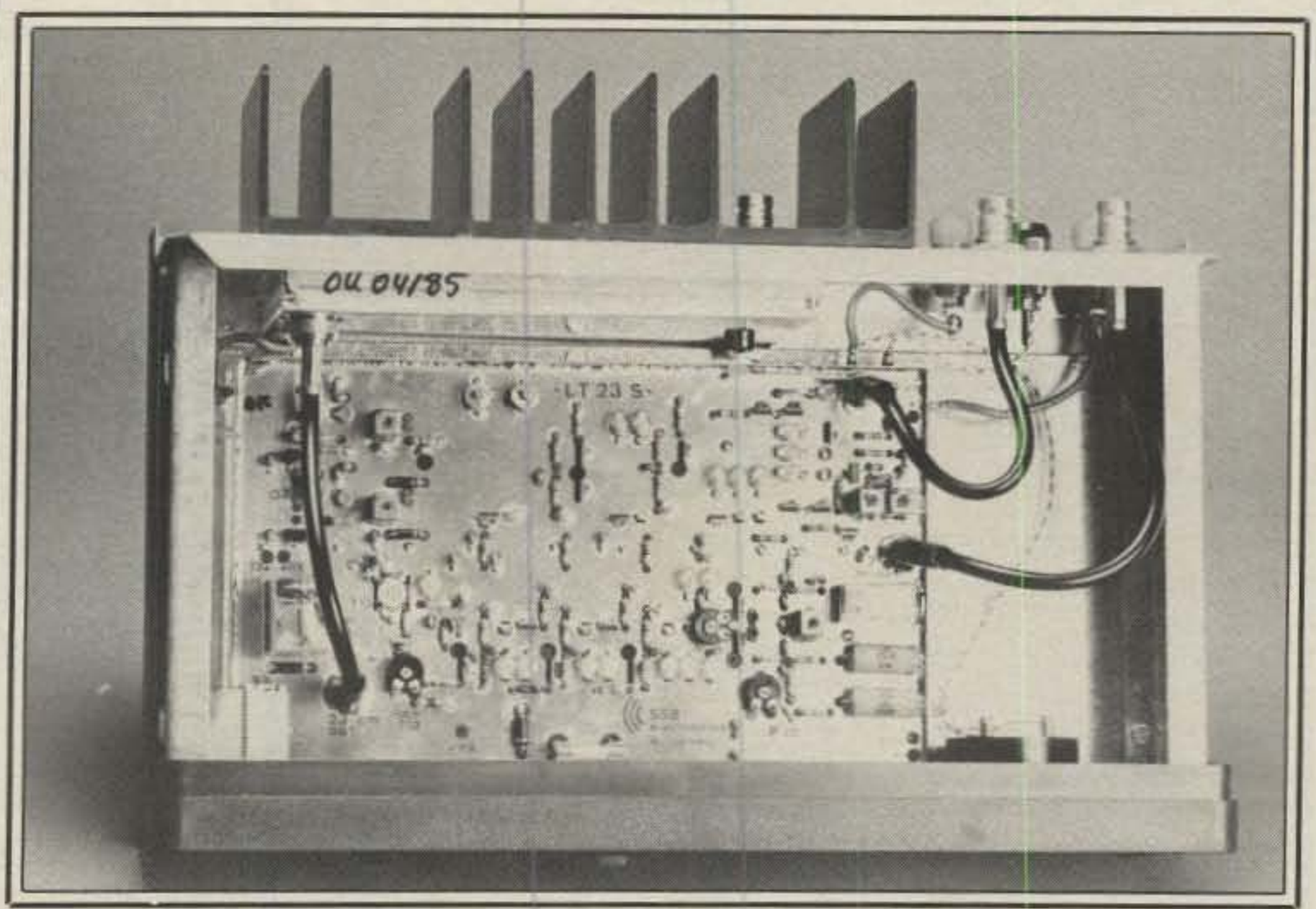
Some of the very highest quality VHF/UHF equipment in the world comes from western Europe, the hotbed of UHF and microwave amateur activity. Many European amateurs are equipped for 23 cm, 13 cm, and higher frequency bands with sophisticated stations that would be the envy of American enthusiasts. Why this is so remains something of a mystery to me; possibly many Europeans lack the property required for a competitive HF antenna system, or maybe some folks dislike the apparent necessity to speak English for HF band DXing. Whatever the cause, the Europeans are miles ahead of us in their UHF and microwave work. SSB Electronic, of Iserlohn, West Germany, is one of Europe's leading UHF/SHF equipment manufacturers, and I was pleased to have the opportunity to review their model LT23S linear transverter.

The review unit had a 144 MHz IF, although a 28 MHz IF version is available. The LT23S is small, measuring just 14" × 4" × 10" (H × W × D) and weighing 5.5 lbs, but the unit delivers a lot of performance for its diminutive size. The manufacturer rates the LT23S as follows:

Drive power required (TX): 0.1 to 10 watts
TX output power: 10 watts
Noise figure (RX): 1.8 dB
Conversion gain (RX): 18 dB
Current drain (RX): 200 mA
Current drain (TX): 2.5 amps

My intention was to confirm or deny these ratings by laboratory measurement, and to use the rig on the air to form-

Inside top view of the SSB Electronic LT23S linear transverter for 1296 MHz. The xmtr power amplifier and metering circuit are housed in the shielded compartment bolted to the heatsink.



ulat an opinion about its operational worthiness. My first impression of the LT23S was excellent. It is a well-built, professional-looking piece of equipment that represents a departure from the "black box" look of the famous Microwave Modules gear from England. The LT23S has panel switches and indicators, an output meter (!), is covered by a pleasing two-tone (green) wraparound cabinet, has a large heatsink for the dual-transistor TX power amplifier, and even features relay keying terminals for easy connection of an outboard 23 cm T/R relay. The little "black boxes" from the U.K. offer none of these amenities. The LT23S also has a second L.O. crystal socket and panel switch to allow handy frequency range switching, a bonus for prospective satellite enthusiasts. Internally, construction is top-notch and offers the appearance of a piece of commercial lab equipment; the "amateur" look is thankfully absent.

The LT23S is interconnected with the station transceiver by just two cables: a 50 ohm coaxial line to the 144 MHz TX/RX "antenna" port, and a TX keying line which provides a contact closure to ground on transmit. The transverter is capable of direct connection to a 10 watt exciter at the IF, so many 2 meter "multimode" transceivers can be routed to the unit's "144 MHz IN/OUT" jack without the need for a special "transverter" connection. If your 2 meter exciter exceeds 10 watts output, however, you may need to reduce this somehow without adding a 50 ohm attenuator in the 144 MHz TX/RX line. Doing so could reduce receiver sensitivity, since the same coaxial IF connection serves for the TX *and* RX modes.

It is nice that the SSB Electronic people thought to arrange the keyed relay line to provide DC output on *receive*, rather than transmit, thus allowing the use of a sensitive mast-mounted preamplifier which is switched in line on receive by the same polarity logic. In fact, the English translation of the LT23S operating instructions recommends that the 23 cm coaxial T/R changeover relay be installed at the antenna, rather than in the shack, to make the addition of a low-noise RX preamplifier easier. This system requires the use of two coaxial feeder cables, but the RX feedline can be inexpensive RG213/U if a low-noise masthead preamp is employed.

How does it perform? Very well, in my opinion. The only "problems," if you can call them that, I experienced in my two-week tryout of the LT23S were crystal oscillator drift and slightly lower than rated transmitter output power. My test unit drifted about 100 Hz per minute from a cold start, and this drift continued for several minutes as the unit warmed up. As the only frequency-determining element in the transverter is the L.O. crystal (at 95.83333 MHz), I assume the drift was caused by that device. Changing the crystal to a high-quality unit from a reputable U.S. manufacturer like International Crystal Manufacturing Co. (Oklahoma City, OK), or possibly rebiasing the oscillator stage, would have likely solved the problem. I understand that shorting out the "unused" crystal pins (for the alternate xtal, not supplied) helps stabilize the oscillator, but I'm not certain why. In any case, this was a minor annoyance which should be easily resolved.

The low output power was similarly a minor problem, in that although the review unit did not make "spec" (10 watts output), it came close enough for amateur work. The test unit produced 8.2 watts maximum output (at 14.0 VDC supply voltage), and this is only 0.86 dB below the rated level, so I didn't worry about it. When the transverter was delivering 8.2 watts output to my Bird "Thruline" wattmeter and microwave termination, its panel meter was indicating 10 watts, making for a 0.86 dB error in reading. While I used a zero-length interconnect (coaxial adapter, no cable) from the LT23S output port to my Bird coupler, the transverter uses small-diameter interconnect cables internally, and these may have some loss.

I wanted to measure the transverter's bandwidth (frequency response) and 1 dB compression point of the RX section,

but lack of adequate test equipment prohibited these measurements. I did set up to measure the 1 dB compression point, but when the converter reached +3.7 dBm output (at 144 MHz; −20.3 dBm at 1296 MHz), it was still totally linear and I was out of power from my signal source, a Boonton Electronics model 102F signal generator with external frequency doubler. So, I can state the receive converter is linear to at least +3.7 dBm output, but I'm unsure how much further this can be pushed.

The problem I had making accurate (±0.10 dB) frequency response measurements was related to "ripples" in the measurement system at this frequency. Taking accurate performance data at 23 cm isn't easy, and requires all cables and terminations to be "flat" (50 ohms, resistive). I didn't have the luxury of perfectly matched input/output terminations and didn't have the time to arrange for proper matching, so I discarded my recorded data as innaccurate. I can state that SSB Electronic recommends factory realignment if the frequency range is to be changed more than a few MHz, as would be required for bandswitching between terrestrial (1296 MHz) and satellite (1269 MHz) work.

I did measure current drain as 180 mA on receive, 350 mA quiescent, and 2.3 amps key-down on transmit, all at 14.0 volts. I measured receive converter gain as 24 dB at 1296 MHz. This is 6 dB above the manufacturer's spec. I also measured noise figure using a gas-discharge noise source on a Hewlett Packard model 340 automatic noise figure meter, and a series of successive measurements yielded a mean noise figure of 2.0 dB. This is "quiet" enough for most 23 cm work, if a low-loss feedline or masthead preamplifier is employed.

Using the LT23S for recent "activity night" (Thursday) operations, I made six QSO's in about one hour and received excellent reports from all those contacted. The oscillator drift discussed earlier was not a problem during brief QSO's, and many 23 cm stations suffer frequency drift, hum, chirpy keying, and a variety of maladies commonly found on the microwave bands. Actually, the LT23S is probably one of the best-working pieces of gear available for 23 cm, and a couple of stations contacted reported my frequency drift by apologetically commenting that the drift might be on *their* end! I knew that wasn't the case, however, as my 2 meter IF system was crystal-controlled with a 12 MHz TCXO, and I carefully monitored my 144 MHz signal with a frequency counter to determine it was stable to within 10 Hz during the whole operating period.

In all, I'd recommend the LT23S to anyone serious about 1296 MHz work. It performs well, seems dependable, and is more easily interfaced to the station than most transverters would be. The unit's suggested retail price is $650 U.S., and discounts may be available. Contact the U.S. importer, The VHF Shop, P.O. Box 349, Mountaintop, PA 18707 for further information.

P.S.: Contacting the manufacturer at Karl-Arnold Strasse 23, D-5860 Iserlohn, W. Germany, will result in receiving German-language information and the recommendation that you contact their U.S. importer.

Future equipment reviews will include two masthead (lower-mounted) GaAsFET preamplifiers: the muTek Ltd. GFBA144e and the SSB Electronic MV144S. These are kilowatt-rated T/R switching low-noise preamps for 2 meters, and the tests yielded interesting results. We'll have a report on the new F9FT 55-element 23 cm Yagi in the January column, which will also include some VHF contesting tips. Don't let your *CQ* subscription expire!

Write On

I get lots of mail, but always look forward to more. *Please* write, either to *CQ* or to my home address, with interesting tidbits pertaining to VHF/UHF work. Let me know what you're using on the air and how it's working; unusual DX worked; contest activities; antenna details . . . anything! We want this to be an interesting column, with something for everyone.

If you want to receive some interesting VHF/UHF news, try a subscription to *DUBUS*, a German publication available in the U.S. through the efforts of H.R. Landes, KA0HPK, P.O. Box 270, W. Terre Haute, IN 47885. *DUBUS* is an acronym for "DX Ueberreichweiten Bau von Geraten UHF SHF." Anyone who speaks technical German might want to let me know what that means. In any case, most of the interesting information contained in *DUBUS* is written in both German and English, and the publication is clearly dedicated to UHF/SHF equipment, operation, and news. The spring 1985 issue contained items such as a 2 kW power amplifier design for 144 MHz using parallel 3CX800A7's and a 144/432 MHz duoband SSB/CW transceiver design! Talk about ambitious projects.

Another interesting publication is the *Southeastern VHF Society and East Coast 70 cm NET Newsletter*, by Charles Osborne, WD4MBK. For a 4-issue subscription, send $5 to WD4MBK at 1427 Robin Hill Drive, Norcross, GA 30093. The summer 1985 edition of the newsletter contained a UHF directory of east-coast stations active on 220 MHz and above, a 10 GHz GaAsFET preamp design, operating news, and all kinds of neat stuff.

That's about all for now. Spruce up your station for the January VHF Sweepstakes. It's later than you think!

73, Steve, WB2WIK

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Most of you who participated in our World-Wide DX Phone Contest in October no doubt will have sent in your logs by the time you read this month's column. However, if you still have not submitted it, make sure you send it to the *CQ* office and not to the individual Contest Directors. Their addresses was inadvertently given in October's *QST* Contest Corral as a mailing point for World-Wide Contest logs. That route was phased out in last year's contest. Larry, N6AR, was in the process of moving to Florida at that time, and Bob, K3EST, was also anticipating a move. Therefore, it would be advisable to submit a duplicate log to *CQ* if you have already sent your phone log to N6AR. The same advise will apply for CW logs sent to K3EST. However, those are not due until January 15th, so that should not pose any problem.

Again repeating: All World Wide Contest logs go directly to *CQ* World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801. The phone deadline was December 1st, and the CW deadline is January 15th. Make sure to indicate phone or CW on the envelope.

Heeding my remarks in last month's column, I have already received the first announcement of a Contest Expedition. This one is for the WPX CW Contest in May. Alex Kasevich, W1CDC (now living in Florida), and Rick Casey, AB1U, are going to activate Alex's Montserrat station, VP2MM, in a multi-single operation.

There is still time for WPX Contest Expedition announcements: SSB March 29– 30 and CW May 24–25. It's too late for the 160 Meter Contests, but send them along anyway and I'll make sure the information is forwarded to many DX bulletins and overseas magazines and clubs.

Deadline for the March issue is December 15th and January 15th for the April issue.

Very best wishes for the coming Holidays, Christmas, and New Years. In the excitement of preparation and celebration, don't forget to check the expiration date of your license.

73 for this time, Frank, W1WY

Calendar of Events

	Dec.	2	SWOT 2 Meter QSO Party
	Dec.	6-8	ARRL 160 M CW Contest
	Dec.	7-8	TOPS 3.5 MHz CW Contest
	Dec.	7-8	Telco. Pioneers QSO Party
†	Dec.	7-8	Spanish CW DX Contest
	Dec.	14-15	ARRL 10 Meter Contest
	Dec.	26-31	G-QRP Club CW Activity
	Dec.	29	Canada Day Contest
	Jan.	1	AGCW Happy New Year Pty
	Jn.1-	De.31	U.B.A. SWL Competition
	Jan.	11-12	Mich. QRP Club CW Contest
	Jan.	18	AGCW-DL QRP Contest
	Jan.	18-19	Hungarian DX Contest
	Jan.	18-19	White Rose SWL Contest
	Jan.	**24-26**	**CQ WW 160 Meter CW Contest**
	Jan.	25-26	French Contest
	Feb.	1	AGCW-DL Straight Key Pty
	Feb.	8-9	QCWA CW QSO Party
	Feb.	8-9	YL-ISSB Phone QSO Party
	Feb.	8-9	Dutch "PACC" Contest
	Feb.	**21-23**	**CQ WW 160 Meter SSB Contest**
	Mar.	8-9	QCWA Phone QSO Party
	Mar.	15-16	YL-ISSB CW QSO Party
	Mar.	**29-30**	**CQ WW WPX SSB Contest**

† *Not official.*

SWOT 2 Meter QSO Party

7 to 11 p.m. Local Time, Mon., Dec. 2

The Side Winders on Two are sponsoring this QSO Party. Activity will be from 144.0 to 144.3 MHz, SSB or CW, no repeater contacts permitted.

Exchange: Call sign, SWOT number, and grid square locaters.

Scoring: Contacts with SWOT members 3 points, and non-members 1 point. Final score, total QSO points times total grid squares worked.

Awards: Certificates to high scorers in each state. Each entry will be given a chance in the drawing of a Bencher keyer paddle.

Mailing deadline for entries is January 1st to: Jerome Doerrie, K5IS, Rt. 2 Box 72, Booker, TX 79005.

ARRL 160 Meter C.W. Contest

2200Z Fri. to 1600Z Sun, Dec. 6–8

This is the 16th year for this top-band activity. Exchanges will be between stateside and VE and DX stations. DX to DX contacts, however, are not permitted.

Classes: Single operator and multi-operator.

Exchange: RST and your ARRL section; country for DX and ITU region for maritime mobiles.

Scoring: Contacts between stations in ARRL sections count 2 points, with DX stations 5 points.

Multiplier: Determined by the number of ARRL sections plus VE8/VY1 (maximum of 74) and DX countries worked (for W/VE participants). (DX use ARRL sections only.)

Final Score: Total QSO points times the ARRL section and DX multiplier.

Awards: Certificates to the top-scoring single operator station in each section and DX country, and to the top-scoring multi-operator station in each ARRL division and continent.

The ARRL 160 band plan requires that W/VE stations transmit only in the 1800–1825 and 1830–1850 kHz segments, keeping the "DX Window" (1825–1830 kHz) clear for DX stations. They will indicate where they will be listening for cross-frequency contacts.

The usual grounds for disqualification—violation of rules, excessive duplicate contacts, etc.—will prevail.

Logs with more than 200 QSOs must include dupe sheets. A large s.a.s.e. to the ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no later than January 4th and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

TOPS Activity Contest 3.5 MHz C.W.

1800Z Sat. to 1800Z Sun., Dec. 7–8

TOPS is an international club for c.w. enthusiasts founded in Great Britain in 1946. Their objective is to encourage c.w. operation on the top bands.

Classes: Single operator, multi-operator, and QRP (5 watts or less input).

Single operator stations must take one break of 7 hours during the contest period; multi-operators can operate the full 24 hours.

Exchange: RST plus a three-figure QSO number starting with 001. TOPS members will also include their membership number.

Scoring: QSO's within own country, 1 point, in own continent 2 points, with other continents 6 points. Work a TOPS member and get 2 bonus points (members get 3 points).

Each call area in W, VE, VK, PY, U, and JA will count as a separate country for scoring. The multiplier is determined by prefixes worked (same as *CQ* WPX Contest).

Final Score: Total QSO points times the total number of prefixes worked.

Frequencies: Operation will be between 3500–3585 MHz, with the lowest 12 kHz reserved for out-of-continent DX contacts only. (When sending CQ send TAC, not Test.)

Awards: At least 15 certificates will be awarded based on the top scores in each class.

Logs must be received no later than

14 Sherwood Road, Stamford, CT 06905

If you worked KV4AM in any of the coming contests, don't take the extra point credit for a Virgin Island contact. Mac is no longer located in St. Croix, but has retired to Florida and plans to do some stateside contesting. Too bad he did not take advantage of his KV4 call when he was in the Islands.

January 31st and go to: Bertil Arting, SM3VE, Bergesvegen 26, S-823 00 Kilafors, Sweden.

Telco. Pioneers QSO Party

1900Z Sat. to 0500Z Mon., Dec. 7–8

This is the 21st annual party organized by the Telephone Pioneers of the U.S. and Canada. This year's party is again being sponsored by the John D. Burlie Chapter #89 of Columbus, Ohio.

Members may be contacted on each band and each mode if they are in different chapters, but only one contact is permitted between stations in the same chapter.

Exchange: QSO no. and chapter number (ITPA chapters, name only).

Scoring: One point per QSO on each band and mode, and one multiplier for each different chapter worked. Chapters are counted once only. There are 98 TPA and 10 ITPA chapters.

A bonus of 5 points will be granted for each Novice/Tech. worked, provided this is clearly indicated at the top of your first log sheet.

Frequencies: Phone—3830, 3930, 7275, 14285, 21375, 28705. CW—3575, 7038, 14075, 21075, 28075. Plus or minus 20 kHz. Also UHF 50–54, and Novice/Tech., and RTTY bands.

Awards: None were mentioned, but there probably are awards for high-scoring individual stations and clubs. Log sheets may be obtained from your Radio Club Coordinator or Administrator. Mailing deadline for all entries is January 15th, and they go to: John D. Burlie Chapter #89, Att: Ted Phelps, W8TP, 6200 East Broad Street, Columbus, OH 43213.

Spanish CW DX Contest

1600Z Sat. to 1600Z Sun., Dec. 7–8

It's the world working the Espanoles on CW. Only single operator operation is permitted, all bands 3.5 through 28 MHz.

Exchange: RST plus a three-figure QSO number starting with 001.

Scoring: Contacts between EA stations and the following prefixes are worth 3 points: DU, CE, CM/CO, CP, CX, HC, HI, HK, HP, HR, KP4, LU, OA, PY, TG, TI, XE, YN, YS, YV, ZP, or equivalent prefixes.

Between EA and all other non-Hispano and non-European countries, 2 points.

Between EA and Europeans, 1 point (WAE boundaries).

Multiplier: For EA, each DXCC country worked on each band. All others use EA call districts worked on each band.

Final Score: Total QSO points from all bands times the multiplier from each band.

Awards: Gold, Silver, and Bronze medals to the first 3 places, phone and CW, in Spain and to overseas winners. Certificates to first-place winners in each country. A minimum of 100 points is required to qualify.

Include a summary sheet with your log showing the scoring and other pertinent information, the usual signed declaration that rules and regulations have been observed, and your name and address in block letters.

Your entry must be postmarked no later than February 15th to: U.R.E. International Contest, P.O. Box 220, Madrid, Spain.

ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 14–15

This is the 13th annual 10 Meter Contest organized by the ARRL.

It's a worldwide activity in which DX stations are permitted to work other DX stations. You are not limited to working W/K's and VE's only.

The same station may be worked once on phone and again on CW; no cross-mode, however. A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations.

Categories: Single operator, mixed mode, phone only or CW only. Multi-operator mixed mode only.

Exchange: W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2, KP4, etc.) send RS(T) and QSO number starting with 001. Maritime mobiles send RS(T) and ITU region. Novice and Tech. stations must identify /N or /T.

Scoring: Phone QSOs are worth 2 points, CW 4 points, and Novice 8 points.

Multiplier: Fifty U.S. states, VE call areas, DX countries, and ITU regions.

Final Score: Total QSO points times the state, province, DX country, and ITU region multiplier.

Awards: Certificates to the top single operator in each category for each ARRL section and DX country, and to the top multi-operator station in each ARRL division and each continent.

Indicate the multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSO's.

The usual disqualification criteria will be observed. A large SASE will get you log and instruction forms. Mailing deadline for all entries is January 18th to: ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, CT 06111.

Canada Contest

0000Z to 2400Z Sun., Dec. 29

Again sponsored by the Canadian Amateur Radio Federation, this contest follows the same pattern as the Canada Day Contest last July.

Activity will be on all bands, 2 through 160 meters, phone and c.w. Single operator, single and all band, multi-operator all band only.

The same station may be worked on each band and each mode for QSO and multiplier credit.

Exchange: RS(T) and QSO number starting with 001, and province.

Scoring: 10 points for each contact with Canada, 4 points if with others, and 20 bonus points for each contact with any CARF official news station using the suffix TCA or VCA.

Multiplier: Number of VE provinces/territories worked on each band and mode. Total of 26—13 on CW and 13 on phone. Contacts with stations outside of Canada count for QSO points no multiplier.

Frequencies: 1810, 1840, 3525, 3775, 7025, 7070, 7155, 14025, 14150, 21025, 21250, 28025, 28500, 50040, 50110, 144090, 146520.

Awards: Certificates to the top-scoring entries in each class, in each VE prov./terr., U.S. call area, and DX country. Trophies to single operator, all band, and multi-operator winners.

Include a summary sheet with your log showing the scoring, etc., and a dupe sheet. Official log forms are available.

Mailing deadline is January 31st to: CARF Contest, c/o N. Waltho, VE6VW, Box 1890, Morinville, AB, T0G 1P0 Canada.

G-QRP Club CW Activity

Dec. 26–31, 1985

This is the last of the G-QRP Club activities for 1985. The following are daily times and frequencies that will be used.

0900 to 1100Z—14060/21060/28060
1100 to 1300Z—3560/7030
1300 to 1400Z—10106
1400 to 1700Z—14060/21060/28060
1700 to 1900Z—3560/7030
1900 to 2100Z—14060
2100 to 2300Z—3560/7030

This is not a contest, but QRPers are invited to report their participation to Christopher J. Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW England.

The Club boasts a roster of around 3000 members in 60 countries. Details for membership in the G-QRP Club can be obtained from Fred Garratt, G4HOM, 47 Tilsnead Close, Bruics Heath, Birmingham, B14 5LT England.

AGCW-DL Happy New Year Party

0900Z to 1200Z January 1st

This seems to be a European activity only, but will report it here for your information. As the club's name implies, it's a CW affair, single operator only.

Classes: (1) Maximum input of 500 watts; (2) 100 watts; (3) 10 watts; (4) SWL (both calls must be reported).

Exchange: RST plus QSO number. AGCW members will include their membership number.

Scoring: One point per QSO multiplied by the number of AGCW members contacted on each band.

Frequency: Three bands only—3530–3580, 7010–7040, 14010–14100.

Send your report by January 31st to: Fritz Bach jun., DK1OU, Eichendorffstrasse 15, D-4787 Gesenke, West Germany.

U.B.A. SWL Competition

January 1 to December 31, 1986

We often hear from SWL's complaining that very little coverage is given to their hobby. This one should keep them busy for the whole of 1986.

There are four categories: Single operator, Phone, CW and RTTY, and all modes for clubs and multi-operator.

Use all 5 bands, 3.5–28 MHz.

There will be certificates and trophies for winners in all categories and areas.

The U.B.A. requires that you use their special log forms. Your requests for more detailed information and log forms should be directed to the Contest Manager, Marc Domen, ONL 6945, Gebr. Blommestraat 14, Borgerhout, B - 2200 Antwerpen, Belgium. Include 3 IRC's if in Europe; 4 IRC's for all other areas.

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HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

CB-TO-10M CONVERSIONS: FM kits, frequency modification hardware, books, plans, high-performance CB accessories. Free catalog. CBCI, Box 31500CQ, Phoenix, AZ 85046 (602-996-8700).

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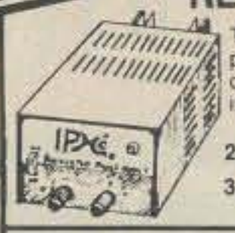

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C64 SOFTWARE: Send SASE for list. P.O. Box 387, Chillicothe, OH 45601.

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UNIVERSITY HAM CLUB needs QST from 1980, CQ from 1976, oldies, selected HR & 73. Tax deductible! Bob May, ETSU ARC, Box 19060A, Johnson City, TN 37614.

FIND OUT what else you can hear on general-coverage transceivers/receivers. Join a radio listening club. Complete information on major North American clubs and sample Newsletter $1.00. ANARC, 1500 Bunbury Drive, Whittier, CA 90601.

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HAM TRADER YELLOW SHEETS, in our 24th year. BUY, SWAP, SELL Ham Radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $10.00 for one year (24 issues). P.O. Box 356, Wheaton, IL 60189.

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CIRCLE 19 ON READER SERVICE CARD

COMPUTER PROGRAMS for C-64. Menu driven logs for BCL/SWL. Update formats, QSL records, other. Disk or tape. Screen/printer. Send SASE for info & sample. W3GMG, P.O. Box 5624, Baltimore, MD 21210.

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TELL THE WORLD what you would really rather be doing! "I'd Rather Be DX'ing" bumper sticker with "Amateur Radio" written down the sides. Send $2.00 plus $.50 postage to Dan Jordan, P.O. Box 6349, Evansville, IN 47712.

SELLING: SWAN CYGNET 270, ideal go anywhere rig, 12V 120V built in, $200 or best offer. KENWOOD TS520S, $300 or best offer. New York 516-285-5196.

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HELLO RADIO AMATEURS. Thank you so much for all of your inquiries, purchases that have been made in selling three generations of amateur radio equipment. There is still more. Brand new Ameritron Linears AL-80 3-500Z $577.00, AL84 4X6JM6 $370.00, AL1200 3CX 1200A $1,300.00, RCS8 Coax Switch $100.00, ATR8B 300 watt Antenna Tuner $80.00, ATR-10 1kw Tuner $230.00, ATR-15 1.5kw Antenna Tuner $268.00, Drake MN75 $75.00 Antenna Tuner 200 watt. Henry Console Linear Model 2K Classic $1000.00. All FOB NY U.S.A. I will export anywhere in the free world to the foreign hams. All inquiries answered. Please write. Mark, P.O. Box 0280, Baldwin, NY U.S.A. 11510.

NEED CASH? Junk piling up in the shack? Let me know what it is and what you want. I pay shipping! KA9CAQ, P.O. Box 6349, Evansville, IN 47712.

ARMY FIELD RADIOS: CPRC-26 Infantry Manpack Radio, compact, transmits-receives 46–54 MHz FM, 6 channels, with battery box, antenna, crystal, handset: $22.50 apiece, $42.50/pair, good condition. PRC-9 Backpack Radio, factory mint, transmits-receives 28–39 MHz FM continuous tuning: $52.50 apiece, $77.50 with good condition battery box, antenna, handset. PRC-510 Backpack Radio (Canadian version of American PRC-10), transmits-receives 38–55 MHz FM continuous tuning, with battery box, antenna, handset: $39.50 apiece, $77.50/pair, good condition. R-390A Communications Receiver, .5–32 MHz AM-CW-SSB, shortwave, amateur, military frequencies: $175 good condition. R-108 Military Vehicle/Field Receiver, 20–28 MHz FM: $27.50 mint. 45 Day Replacement Guarantee. Add $9.50 shipping-handling. Baytronics, Dept. CQ, Box 591, Sandusky, OH 44870.

ROSS $$$$ USED December SPECIALS: KENWOOD TS-130S $419.00, TS-820S $459.90, TS-180S/DFC $409.90, TS-530S $479.90, TS-700SP $439.90, TS-520 $379.90, YAESU FT-980 $1049.90, FT-301D $369.90, FT-620B $279.00. ICOM IC-490 $399.90, IC-730 $469.90, IC-701 $369.90. Send SASE for used list. 200 + USED, 7,500 + NEW ham items. MENTION AD. Prices cash, FOB Preston. Closing 2:00 Saturdays & Mondays. ROSS DISTRIBUTING, 78 South State, Preston, Idaho 83263 (208-852-0830).

THINK of us as your personal Tiny Tim and make like Mr. Scrooge on Christmas morning. But don't send a goose, just your unwanted gear. Contact WB2JKJ and the Crew at Junior High School 22 on Manhattan's Lower East Side and wake up smiling December 25th.

WE PRE-TEST!!! ICOM ICR-71A $659.50, Kenwood R-2000 $489.50, R-1000 $399.50, Sony 2002 $224.50, Sony 2010 $279.50, Bearcat DX-1000 $449.50, Regency MX-7000 $449.50, HX-1000 $224.50, HX-2000 $289.50, BC-50XL, BC-100XL, BC-145XL, BC-175XL, BC-210XW, BC-800XLT IN STOCK!! Video Recorders, Coax, Antennas, MFJ, Panasonic, MORE!! FREE UPS SHIPPING & INSURANCE TO 48 STATES. 25 Page Picture Catalog $1.00 (REFUNDABLE). GALAXY ELECTRONICS, Box 1202, 67 Eber Ave., Akron, Ohio 44309 (216-376-2402) 9–5 pm EST.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath and all others. Six ½" digits in a 5" wide by 1¼" high metal cabinet. Send $1.00 for information. Please be specific. GRAND SYSTEMS, Dep't. D, P.O. Box 3377, Blaine, WA 98230. Canadians VE7LB.

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JUST IN TIME FOR CHRISTMAS: Estate sale still going on. Signal One Milspec 1030, CX11A, JIL SX400 Scanner new, Yaesu FRG8800, FRG9600 New FT980, FT902DM, Kenwood TS930S Speaker Microphone, etc. Collins 75A4 KSW1 mint restored btr than new. Factory sealed cartons Drake C Line T4XC, R4C, AC4, MS4 FS4. Signal CX7 CX7A, B, etc. Factory sealed carton Collins KWM380, new National NCX1000 transceiver 1kw SSB, HRO500 LF-10 Preselector. Henry 4K Ultra Linear & much much more. I will send U a list. Export inquiries welcomed. Pls write Mark, P.O. Box 0280, Baldwin, NY U.S.A. 11510

HAMS: Use your technical knowledge—get into technical writing. Informative Report $2. Roger Moody, WA3NFW, 7525 Riverdale Rd., New Carrollton, MD 20784.

WANTED: Clipperton L, GLA1000A or B, LA1000A or B, AL80, AL84, EA160M, Ameco pclp. Fred, Box 706, Orange City, FL 32763.

CIRCLE 49 ON READER SERVICE CARD

PRINTED CIRCUIT BOARDS: TORCCC Electronics will print any schematic, 6" by 9" maximum, on a circuit board, or design any Electronic Circuit, according to your specifications (must fit on a 3" by 4" PC board). Either service $1.25. (For larger circuits, add $1.10 per additional 50 square inches, per service.) Also, TORCCC will design, from your specifications, a schematic and print it on a circuit board for $2.50. Mail circuit specifications or schematic(s) and a check to: TORCCC, 2161 North California, Chicago, IL 60647.

COAXIAL-DIPOLE-ANTENNAS: Any Band. SASE to C.E.B. Services, 198 Old Milligan Road, Crestview, FL 32536.

BLACK DACRON® POLYESTER ROPE: Send us your name, address, call letters and $1.00 and we'll send you samples of our new easy-knotting, easy-cutting, UV-protected, high abrasion resistant 3/16" rope and all necessary ordering information. $1.00 credit on your first order! SYNTHETIC TEXTILES, INC., 2472 Eastman Avenue, Building 21-22, Ventura, CA 93003 (805-658-7903).

MERRY CHRISTMAS fellow DXers de WB8OWM/QRPp

FOR SALE: Retired amateur/engineer seeking a good home and appreciative owner for the following classic equipment: National NC-98 and National-125 Receivers, in like new cabinets and mechanical condition. Some electrical capacitor renewals likely required due to age, one matching NC loudspeaker. Also one rack mounting Wilcox type CW-3 fixed frequency receiver, 10.7 MHz input, also one BC-45(?) low frequency receiver 190 to 550 kHz with 85 kHz IF. Also several low frequency tube receivers, homebrew, designed for battery operation. Original manuals for all the commercially built sets listed above and complete spare tubes for everything. All reasonably priced. Good stock parts, coils, condensers, etc., clean, for classic and antique receivers plus few transmitting tubes and parts. Write for details, schematics to George Roberts, 500 West Leeland Hgts. Blvd., Lehigh Acres, FL 33936, or call 813-369-6724 anytime

FREE 3 month subscription. Send callsign to Westlink Report-C12, 28221 Stanley Court, Canyon Country, CA 91351. New only!

NOVICE RADIO OUTLET New and used equipment dealer! Special attention beginners! *December Special!* SPI-RO Five Band Trap Dipole $62.95, free shipping U.S.A. 919-286-7927. 1604 Delaware Ave., Durham, NC 27705.

SELL: Eimac 4E27A/5-125B FM station pulls, good condition, $12 ea. Plastic package sealing tape, four 165'2" rolls $5. Both postpaid. Lisaius, 116 Orton, W. Caldwell, NJ 07006 (201-226-7943).

ESTATE SALE: Dentron amateur radio equipment from the new Dentron Radio Co. called Coilco Corp. I have one each of the following: QRO Linear 4X572Bs 2kw $660.00, GLA 1000C 4X6LO6 tubes 1kw $375.00, GLT1000C Antenna Tuner 1kw $149.00, MLT2500 2kw Tuner the best $330.00, Antenna Doublet $29.00, big Dummy Load with oil $25.00, QRV-1 transceiver $208.00. Factory sealed cartons or come with original carton tubes burnt in only. All FOB NY U.S.A. Will export. Mark, P.O. Box 0280, Baldwin, NY 11510.

ROSS $$$$ NEW SPECIALS (December only): 1985 CALLBOOK US or Foreign $9.90. ROBOT 1200C (demo) $999.90. ICOM IC-735 $729.90, IC-04AT $277.70, IC-745 $768.90, IC-490A $509.90, IC-751 $1129.90. KENWOOD TS-940S/WAT $1699.90, TH-21AT $194.90, TR-3500 $244.90, TR-7950 $356.90, TS-430S $689.90, TM-211A $313.90, TR-8400 $349.90, TW-4000A $494.90, TS-660 $729.90. YAESU FT-720RVH $249.90, FT-757GX $698.50, FRG-7700 $369.90, FRG-8800 $589.90, FT-980 $1386.90, FT-230RT $279.90. L.T.O. MENTION AD. Prices cash, FOB Preston. All MAJOR LINES (6500 + items), write or call for personal price quote. Closing 2:00 on Saturdays & Mondays. ROSS DISTRIBUTING, 78 South State, Preston, Idaho 83263 (208-852-0830).

CIE Electronic Technician Course $50, RCA voltohmyst VTVM $20, Johnson 6 & 2 linear $50, VHF weather rec. $15, WWV Receiver $35. K6KZT, 2255 Alexander, Los Osos, CA 93402.

SALE: HQ-170A-VHF 160 to 2 meters $155. Viking 11 AM CW Transmitter with 122 VFO $145, plus shipping. W2WQV, 164 Jefferson Ave., Fairport, NY 14450.

COMMODORE 64: Available 2000 + programs, the best. To exchange or sell at low cost. For the BIG LIST send large SAE, $3.00 or 8 IRCs (and your list) to: Alex, I6NOA, P.O. Box 90, Chieti,66100,Italy.

FOR VIC-20: Intro. to BASIC (2 books, 4 cassettes), Mapping the VIC, Mastering the VIC-20 (books). HESMON Assembly Monitor cartridge. Call 607-775-4006 evenings.

WANTED: VIBROPLEX Bug Key second-hand, any model. Write stating details and price to EI8DL, John Moran, 1 Connolly Crescent, Longford, Ireland.

MONITOR SCOPE, Heath Model SB-610. Complete with manual. All in A-1 condx, $55 plus $5 shipping. W4NXH, 1800 Neva Dr., Largo, FL 33540.

KENWOOD TR2200A 2m transceiver includes nicads, charger, power cords, case, and more. Excellent condition! $75.00. D. Mollan, WB7FDE, 7805 NE 147th Ave., Vancouver, WA 98662.

ICOM IC-720A, PS-20, CW filter, mike, manual. Mint, $695. KA7BMB 602-298-4820.

ADMIRAL CARTRIVISION video tape recorder system. Good for parts. New belt. Very reasonable price. Clarence Wilken, 40 N. Bailey, Freeport, IL 61032.

Attention ORTHODONTISTS!! If you are a licensed ham and also an orthodontist by profession, please send name and call. Am developing list. Dr. Paul Supan, WB4JCY, EDC Orthodontics Dept., 625 Elmwood Ave., Rochester, NY 14620.

SWAN Model 270B Transceiver w/VX-2 vox. Excellent condition, best offer, will ship. K3AQR, 904 68th Ave. West, Bradenton, FL 33507.

COLLINS 62S-1 6 and 2 meter transverter w/manual. Excellent condition. $550. Prefer local sale. K2MGA, (516) 681-2922.

DRAKE TR-4, N/B, RV-4, AC-4, mike, manuals. Ex. Cond. $395.00 comp. New spare tubes $50, mobile console $50, DC-4 $50. Take all for $495. Ralph Formica, WA2EBS, 516-221-2404.

RADIO ARCHIVES "novice" newsletter. Sample $1. Arnold Timm, KA0TPZ, 2308 Garfield #304, Minneapolis, MN 55405.

HEATH HW 100 TRANSCEIVER, A-1 condition, $175. Lafayette receiver 80 to 6 meters $40. Heath DX-60-B xmitter $40. Phone 419-784-4349, Defiance, OH 43512, KA8SMR.

WANTED: Pre-1935 bugs, pre-1920 wireless keys, and pre-1900 landline telegraph. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

MILLEN High Voltage Connectors #37001. Red or Black. New. $3.50 each postpaid. Ralph, KA1FAA, 16 Hansom Rd., Andover, MA 01810.

NATIONAL HRO-60 w/one coil, $75. NC300, $75. SWAN-250/AC/SPKR, $200. All in great condx. John Lee, K6YK, Callbook Ad or 209-462-7391.

WANTED: Power supply for Pierson Electronics Model KT-81 Professional Communications rcvr. Also need power transformer for Hallicraters HT-37. KA8GEF, 216-883-0914 collect.

QST magazines, 271 of them about 200 lbs. 1930, 1933 through 1940 solid, 1952 through 1965 solid. Best offer for the whole works only. W2LTJ.

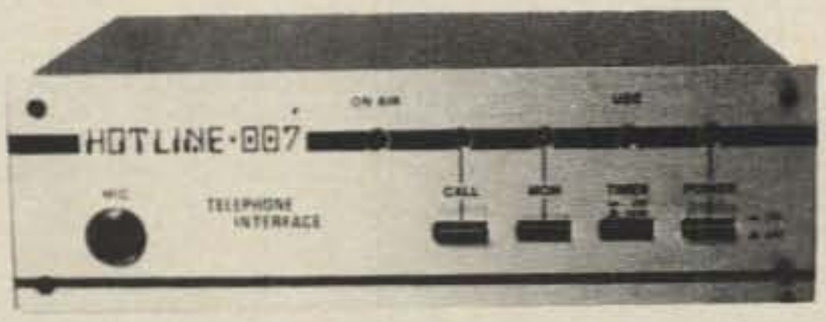
NATIONAL RADIO COMPANY equipment manuals. Most are original printing issues. Send SASE for price list. Also NCL-2000 factory parts. Maximilian J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

ROBOT Model 70 Slow Scan Camera and 80 monitor, Mint, $125. SBE SB-144 12 Ch. 2 Meter XCVR, $55. Jerry Hanna, K9TRX, 405 61 St., Clarendon Hills, IL 60514 (312-325-0973).

ALL MODE MOBILE TELEPHONE INTERFACE

FM - AM - SSB ± 50 Hz.

Automatic Vox Phone Patch System



OPTIONAL:

DTMF TELEPHONE TYPE SPEAKER/ MICROPHONE

HOTLINE-007 is a fully automatic simplex telephone interconnect. Operates through any base transceiver with FM-AM-Squelched SideBand mode. No modifications to the transceiver, just connect to the external speaker, microphone and phone line. VOX operation both transmit and receive. Selectable tone or rotary dialing. Repeater pickup operational also.

* Programmable access code 3 or 5 digits.
* Adjustable VOX both tranceiver and phone line, digital processing delay (BBD)
* Will not transmit when frequency is busy, 7 second clear time
* Programmable CW ID
* Adjustable microphone and line gain, no lost words.
* Microphone jack for continued base operation, no need to change.
* 3 or 12 minute timer
* Dial restrict switch
* Ringback (reverse patch)
* Accepts speed dialing
* Operates on 115/220 VAC, 12 VDC

NO EXTRAS TO PURCHASE FOR OPERATION, TRANSCEIVER AND PHONE LINE CONNECT TIME 30 MINUTES.

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ALINCO ELECTRONICS

ALINCO ANNOUNCES THE PERFECT MATCH FOR MEDIUM SIZE ANTENNA SYSTEMS.

ALINCO ROOF MOUNTED TOWERS

THE NEW ALINCO TOWERS ARE IDEAL FOR MOUNTING:

- Light-Weight Beams
- VHF UHF Antennas
- Oscar Antenna Systems

ETS-120
$67.00

ETS-150
$79.00

ETS-180
$95.00

ETS-210
$107.00

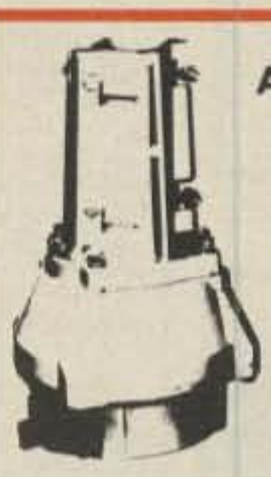
- Four models from 3½' for roof mounted verticals to 6½' for beam antennas
- Guy points when added support is required
- No rivets - all steel bolts
- All towers have four legs for easy mounting. Along with ALINCO's unique dual wall construction for unparalleled strength
- Easy installation
- Rotor mounts inside the ALINCO Tower with provisions for top mounted thrust bearing
- Light-weight aluminum construction for easy installation and durability

MODEL	ETS-120	ETS-150	ETS-180	ETS-210
Base For Bearing (Top)	6"	6"	6"	6"
Max. Opening Width (leg)	1'10"	2'3"	2'7"	2'10"
Actual Height	3'10"	4'7"	5'7"	6'6"
Angle	80°	77°	80°	80°
Legs	Rubber Fixed Step	Adjustable Step	Adjustable Step	Adjustable Step
Weight	12 lb.	16 lb.	22 lb.	28 lb.

CONSTRUCTION OF LEGS

Contact your nearest dealer or Call Alinco for the location closest to you.

ALINCO MODEL AAZ-7 ROTATOR



ROTATOR MODEL AAZ-7 $121.00

THRUST BEARING MODEL AAZ-7A

$ 36.00

FEATURES

- Wind load 8.5 sq. ft. with thrust bearing.
- Accepts mast from 1½" to 2" in Diameter.
- A stabilized power source built-in the circuits and an industrial sized direction finder with two scales (S—W—N—E—S and 0° to 360°) makes for accurate and easy antenna directioning.
- Tempered mold and die cast gears reduce noise and increase durability.
- Complete water-proofing prevents winter freeze-up.
- The melamin-coated die cast aluminum housing, reinforced at all stress points, prevent rusting and lengthen the lifetime.
- Transformer reduces input voltage to a safe 24 V.A.C. so that an economical 6-core cable can be used.
- Terminal board cable connections can be done easily with a screw driver.

MAST CLAMP MODEL AAZ-7B

$ 22.00

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Facsimile (702) 359-1424

ROBOT 800 RTTY/CW terminal with 9" SANYO monitor, $300. AZDEN PCS 4800, 10 mtr. FM, $150. All mint. N2BFL (212) 873-9659, ship COD.

WANTED: Ham radio programs for Atari 800 XL (or 400 & 800) computer, especially WAS, DXCC, log-book, and counties lists. Bob Hinshaw, WD6L, 1531 Merion St., Ontario, CA 91761-7248.

WANTED: TEN-TEC amplifier or other amplifier for TEN-TEC ARGONAUT XCVR. Joe Bedlovies, 241 Dover St., Bridgeport, CT 06610.

WANTED: 3 sections Rohn 25G tower, Rotor plate AS25G, 5v @ 29a fil xfmr, 2 tube sockets 4-400A's. Con Helber, KØRAX, Star Rte 1, Box 96, Middle Brook, MO 63656.

WANTED: Pre-1937 radios, crystal sets, spark gap xmtrs, tubes. State condition and price. Howard Stone, HCR-3 Box 418, Deer River, MN 56636.

FOR SALE: Swan 500C and Stancor ST-202-A. Both look and work FB. $350.00 each plus UPS. W8LQJ 419-223-5506.

ICOM IC-22, 10 watt 2 meter FM, 20 channels, with Pipo 16 key TT pad $105. Ten-Tec 250 Hz CW filter No. 219 for Omni/Argosy $20. C. Bright, 4115 Buckley Ridge Ct., St. Louis, MO 63125.

SELL: Ten-Tec Argonaut 509 with 206 calibrator, 208 CW filter, mike, key, and 4BTV antenna. $300.00 or trade for 440 HT. W6CPE 707-255-5522.

WANTED: Any information (schematic, manual, etc.) on the Pierson Electronics KT-81 Professional Communications rcvr and/or its power supply. KA8GEF.

FOR SALE: 3-500Z pr/$160, 4-125A pr/$85, 812A/$15, 813/$30, 807/$6, more. Heath SB600/$39, SASE list. Joe Bedlovies, 241 Dover Street, Bridgeport, CT 06610.

MINT SILENTYPE APPLE Printer $150. National NC300 $75. Heath HW2036A 2 meter XCVR $175, W/PS $215. KCØUM.

WANTED: Drake L-7, Astron RS-35M or VS-35M, 3219 and 215WB Boomers, KLM PA 15-160BL. Rohn 25G tower sections. KØMK 218-865-6541.

120' GUYED STEEL TOWER. 20' sections, 18" square. Very strong and very heavy. Each section, $150, whole tower, $700. Want mint only 51S1. T.N. Colbert, WA8MLV, 13609 Colony Lane, Burton, OH 44021.

MOTOROLA WWV Monitor Receiver $35, R.F. Signal Generator AM/FM 80 kc to 60 mc $35, RCA Voltohymst VTVM $20, SASE for large list. K6KZT, 2255 Alexander, Los Osos, CA 93402.

FOR SALE: EPSON MX-80 F/T printer with Graftrax plus and manual print control commands (MXPLUS), $290 shipping prepaid. W. Shevtchuk, WB2VJF, 1 Lois Ave., Clifton, NJ 07014, phone 201-471-3798.

WANTED: Copy of manual for Regency HR212 2 mtr. transceiver. James Lee, WB4GWX, 5004 Ridge View Court, Fort Worth, TX 76118.

MOTOROLA MOTRAC U43-HHT-3100E, VHF-Highband with private-line. Excellent condition and includes all accessories. $150.00. Contact KA2OTW, Box 91, Huntington Station, NY 11746.

HEATH GR-54 Shortwave Receiver, 300 kHz to 30 MHz, $50. R.T. Yerian, KE4YC, 108 Woodgrove Lane, Cary, NC 27511, phone (919) 851-7054.

DRAKE TR-4, recently overhauled, with new set of finals and microphone, works great, $320 postpaid. Dave, WD4NSF, 904-268-2953.

WANTED: Manual and schematic for Bay State Electronics Signal Generator Model SG-132. WA9SLT, 733 Ridge Circle, Streamwood, IL 60103.

WANTED: AN/URA-17A rack support brackets and YAESU FR-101 (SD) or D receiver. C.T. Huth, 130 Hunter St., Tiffin, OH 44883.

HAVE AM CAPABILITY? Join SPAM (Society for Promotion AM). Membership is free. For free info send s.a.s.e. to F.A. Dunlap (SPAM), 14113 Stoneshire, Houston, TX 77060.

SHACK CLEARANCE: 30 years of parts and equipment collection, power supplies, VHF-HF gear, tubes, transistors, new, and used. Very cheap or trade. N6DBH, Varouj (209) 255-8967 days and weekends, (209) 485-2643 week nights.

FOR SALE: Model HB4ONL2 TET 40M MONOBAND Beam 2 element. You pick up. Call 1-219-278-7808 in the evenings after 4:00. KA9EWB, Ken Wolfe, Box 134, Buffalo, IN 47925.

SELL: Heathkit DX-60 xmitter $75, HG-108 VFO $35, Lafayette HA500 recvr. $35. All plus shipping. J. Schlegel, KA8SMR, Ph. 419-784-4349, Defiance, Ohio 43512.

WANTED: Yaesu FV-101B VFO, YO-100 Monitor Scope, FTV-250 2M Tranverter in good condition. Call Bob, KB1LN, (401) 364-6375.

FOR SALE: Kenwood TS-520SE with Fox-Tango Corp. 2100 Hz cascade filter kit and YG-3395C 500 Hz filter, AT-200 tuner, SP-520 speaker, and Shure 444 desk microphone. Complete package: $550.00. Mint. Ted Ayres, KAØFXH, (303) 779-8553.

HELP! To keep in touch with my family, a Venezuelan student needs donation of equipment. CB's with SSB are also accepted. R. Lopez, YV1DWO, 1409 Oak St., Melbourne, FL 32901.

WANTED: 3 sections Rohn 25G tower, rotor plate AS25G, 5v @ 29a fil. xfmr, 4-400 tube sockets. Con Helber, Star Rte 1, Box 96, Middle Brook, MO 63656.

DRAKE COLLECTORS! Absolutely perfect R-4B, a true museum piece, works perfectly and not any corrosion on chassis, TRULY SUPER MINT $225.00. SPR-4 in excellent condition with no decals ever pasted on crystal select dial, original decal set comes with it, $225.00. Another R-4B in excellent condition, $185.00. U-Ship. Tom Sessions, K4RV, Rt. 7 Box 168, Lexington, SC 29072. SASE for complete gear list.

MINI PRODUCTS B24 MINIBEAM, new, never out of box, $68. Drake AA-10 2 meter amp $33. Half-size 80 meter dipole $25. I ship. Charles Bright, 4115 Buckley Ridge Ct., St. Louis, MO 63125.

FOR SALE: TET ROOF TOWER, never used. Four sections 12" square plus base = 33 ft. high. Extra strength anti-corrosive aluminum weighs only one third of equiv. steel structure. Incl. working top step, HD thrust bearing, SS hardware. US $750 or nearest offer. You pay shipping. VE7EHD 604-265-3175.

HEATH DX60 and HG10B VFO, $75. Remington SR101 ball-type typewriter $150. Phone 419-784-4349, KA8SMR.

TECHNICAL MATERIAL CORP. GPR90 receiver, GSB1 sideband slicer, speaker manuals, mint $250. Phone (203) 426-8041.

WANTED TO TRADE OR BUY: I want any CB Sams, state price and condx. I also have some I am willing to trade for CB Sams. I have AR204, 105, 103, 102, 99, MHF69, 68, 59, TSM145, 133, 48, and TR39 and 13. Send to WA4SAC, 733 Handy Ct., Owensboro, KY 42301.

WANTED: Any CB techs to share solutions to dogs thru correspondence. WA4SAC, Jack Wilson, 733 Handy Ct., Owensboro, KY 42301.

WANTED: I want any Scanner Sams. State price and condx. Also any used test equipment. State price and condx. WA4SAC, Jack Wilson, 733 Handy Ct., Owensboro, KY 42301.

RADIO ARCHIVES "Novice" newsletter. Passive & regen rcvrs $1. 2308 Garfield #304, Minneapolis, MN 55405.

WANTED: Alpha 76 or Kenwood TL-922, ICOM 551D, Astron RS-35M. Sell: Rohn 25G House bracket $10; Eico 667 tube tester $75. KØMK 218-865-6541.

WANTED: Three sections Rohn 25G tower, rotor plate AS25G, & Heath Cantenna. Con Helber, KØRAX, Star Route, Middle Brook, MO 63656.

RADIO ARCHIVES Novice newsletter. Featuring "fun" amentals. $1. Electronic Avocations, 2308 Garfield #304, Minneapolis, MN 55405.

CLANDESTINE CONFIDENTIAL NEWSLETTER: Latest info on secret broadcasters. Six issues $10.00, $13 foreign, US funds only. RR4 Box 110, Lake Geneva, WI 53147.

SBE-450 TRANSCEIVER $75, Hallicrafters S-120 Receiver $45, Power Supply 12 VDC Regulated 20 Amp $45. K6KZT, 2255 Alexander, Los Osos, CA 93402.

WANTED: Used Dr. DX at a reasonable price. KE6WC, P.O. Box 3, Garberville, CA 95440.

120' GUYED STEEL TOWER. 18" square welded construction in 20' sections. Each section, $150. Whole tower, $700. Tim Colbert, WA8MLV, Burton, OH 44021.

AMATEUR RADIO needs your help. Please support our radio program through donation of old equipment, cassettes, etc. G. Skloot, c/o Junior High School 180, 320 Beach 104 Street, Rockaway Park, NY 11694.

A4

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A4, with wideband performance, easy installation, 4 band operation and moderate price will give you more enjoyment and satisfaction from your hobby. You'll like the 40 meter operating possibilities with the A744 add-on kit.

A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

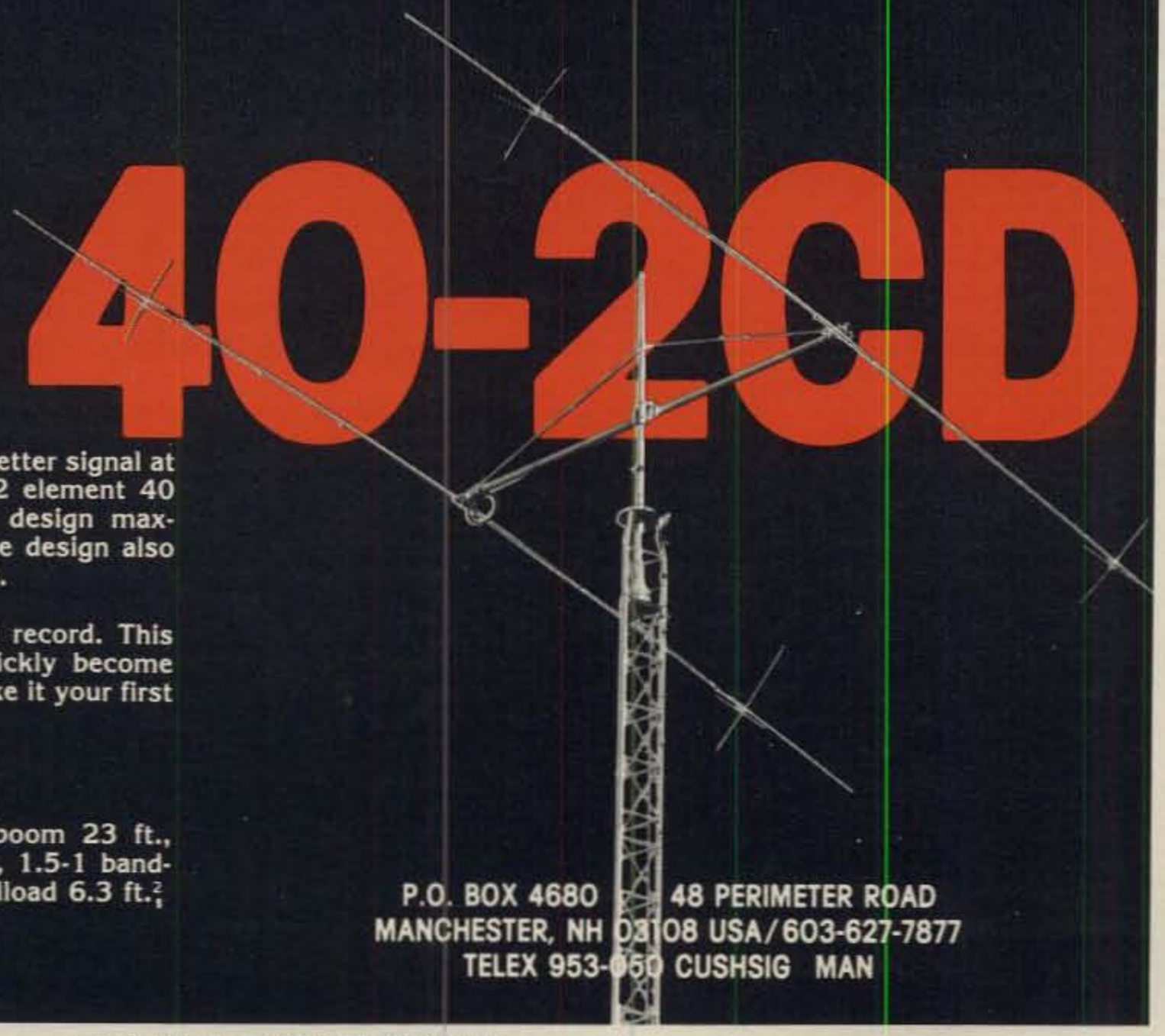
MODEL A4 10, 15, 20 METERS

MODEL A744 40 METER ADD ON KIT

SPECIFICATIONS **F/B ratio 25 dB, SWR 1.2-1 bandwidth 500 + KHz, boom 18 ft., longest element 32 ft., wind area 5.5 ft.², turn radius 18.4 ft., weight 37 lbs. Excellent gain.**

MORE CONTACTS, MORE SATISFACTION WITH *CUSHCRAFT BEAMS*

40-2CD



More contacts, less interference and a better signal at the receiving end are yours with this 2 element 40 meter Skywalker Yagi. The computer design maximizes gain and reduces side lobes. The design also gives low SWR with excellent bandwidth.

Holder of the North American contact record. This compact two element antenna has quickly become "the most wanted" 40 meter beam. Make it your first choice.

MODEL 40-2CD 40 METERS

SPECIFICATIONS **F/B ratio 20 dB, boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.**

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TELEX 953-050 CUSHSIG MAN

HEWLETT-PACKARD Model 606A Signal Generator, 50 kHz-65 MHz, for communication equip. servicing. $165 or trade for linear amplifier parts, vacuum capacitors/relays. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

WANTED: Any accessories for Kenwood TS520. Also run a slow net on 7.116 Mon. nights 0100–0200 UTC. If anyone wants to help feel free to write. Do we also need one on 15 mtrs? KA5VCH, Tony E. Byrum, 2009 W. 5, Ottumwa, IA 52501.

FOR SALE: Johnson 6N2 Transmitter, Heath OM-2 Scope, LM-15 Freq Meter, Heath MT-1 Transmitter, General Radio Strob, Millen R-9er. Wanted: ICOM IC-3A, IC-4A. Mike Ludkiewicz, 143 Richmond Road, Ludlow, MA 01056.

DRAKE LINE SALE: Showroom condition TR-4 w/NB, RV-4, AC-4, MS-4, MFJ CW filter, EV 638 mike, cables, covers. $450 and you're on the way to WAZ! KA1BFV, 31 Duane Ln., Burlington, CT 06013.

HELP: Need schematic for Knight 2 meter Transceiver Model No. TR-108. Will pay for copy. Phone (209) 626-4219. KB6JDT, Donald M. Cox, 318 Park Blvd., Orange Cove, CA 93646.

WANTED: Manuals or photocopies of manuals for Heathkit T-4 Signal Tracer and CT-1 Capaci-Tester. John, WB8IPG, 183 Tacoma, Troy, MI 48084. Phone 313-362-2706.

NCL-2000 PRODUCTION PARTS. SASE for special price list and/or list of National Radio manuals. Max J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

HRO7, Classic Receiver, coils for LW to 30 MHz, matching spkr., power supply manual, immaculate (203) 426-8041.

FOR SALE: Heath HW-101 complete station, great first station, reasonably priced with manuals, $295. Bill, WA2RHA, (609) 587-9577.

FOR SALE: 75S3-B, 32S3, 516F2, 312B4, $795. KWM2, 516F2 (R/E), $750. H-P 608-B, $95. 30S1, $1500. J.W. Craig, 32 Birchwood Dr., Rye, NH 03870.

WANTED: YAESU FV-101B VFO, YO-100 Monitor Scope, FTV-250 2M Tranverter in good condition. Call Bob, KB1LN, (401) 364-6375.

WANTED: ARRL Antenna Manuals Vol. 2 to 5, Hints and Kinks Vol. 1, 3 to 6 & 8, Handbook 1930. State price. Hank Schultz, KA3GXP, 610 Young Road, Apt. 1, Erie, PA 16509-3151.

WANT: DG-1 (Digital Display Unit) for TS-820S. I will pay shipment. T. Matsumura, SIL P.O. Box 54, Jayapura, Irian Jaya, INDONESIA.

HICKOCK Oscilloscope Mod 770 needs power transformer, $25. James Biddle Megger Mod 51159, $425. Riders Troubleshooting Manuals Vol. 1, 1 thru 5 abridged, 6 thru 22, nice set, $125. Ballantine AC Voltmeter Mod 300, $20. TE7-01 Omega Antenna Noise Bridge (new), $35. DK60 Dow Key RF Coax Relay 115V coil, $10. Cushcraft Blitz Bug lightning arrestor for coax cable, $4. U pay shipping. T.K. Brown, Rt. 1 Box 225, Forksville, PA 18616.

CHINESE TELEGRAPH or wireless key wanted for a private collection. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

WANTED: YAESU TC-2 converter, XF10.8HS filter unit, and ICOM SP-2 speaker. C.T. Huth, 130 Hunter St., Tiffin, OH 44883.

HIGH VOLTAGE CONNECTORS Millen #37001, red or black, $3.30 each postpaid. Ralph Jannini, KA1FAA, 16 Hansom Rd., Andover, MA 01810.

Please send all reader inquiries directly.

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(513) 874-3100

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The IC-751 is the most advanced transceiver available today. It's a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver AND a full-featured all mode solid-state ham band transmitter. The IC-751 also covers the new WARC bands, MARS frequencies, and is AMTOR compatible.

Important Standard Features. Compare these important standard features in this "top of the line" base station:

- 100KHz - 30MHz Receiver
- 105dB dynamic range
- QSK — full break-in CW (nominal speed 20WPM)
- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanker
- RIT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power

Options. IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-6dB (KHz) Width
STANDARD FILTERS			
AM Ceramic	CFW 455 IT	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	9M15A	9011.5	15 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

Operating From 12V, the IC-751 is also available with an optional internal AC power supply, the IC-PS35...for the winning edge in field day competition.


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The IC-751 provides superior performance for all amateur radio operators...from novice to extra class. See the IC-751 at your local ICOM dealer.

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