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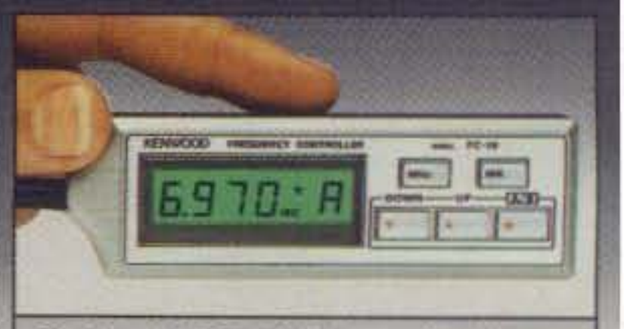

Optional FC-10 frequency controller
May be easily connected to the TM-201A or TM-401A. Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel). A green, easy-to-read, back-lighted LCD display indicates transmit/receive frequencies, memory channel number, ALERT, and SCAN (with blinking MHz decimal). Size: 4.4 (112)W x 1.4 (35)H x 0.9 (22)D, inch(mm). Weight: 3.5 oz. (100 g).

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Ultra-compact and lightweight, priority, memory and band scan, 25 watts/TM-201A & 12 watts/TM-401A.

The KENWOOD TM-201A 2- meter and TM-401A 70-cm FM mobile transceivers are the smallest and lightest units available, allowing maximum flexibility in automotive installation.

TM-201A/TM-401A FEATURES:

- **Ultra compact and lightweight**
  Measures 5.6 (141)W x 1.6 (39.5)H x 7.2 (183)D, inch(mm), weighs 2.8 lbs., (1.25 kg.).
- **25-watt output, with HI/LO power switch**
  Produces a powerful 25 watts RF output from a surprisingly compact design (TM-201A).
- **Dual digital VFO's built-in**
- **5 memories plus "COM" channel, with lithium battery back-up (est. 5 yr. life)**
- **Memory scan/programmable band scan**
- **Priority alert scan**
- **Highly visible yellow LED frequency display**
- **High performance receive/transmit**
  GaAs FET RF amplifier for high sensitivity with wide dynamic range. Transmit modulation characteristics selected for best sound and minimum distortion.
- **External high quality speaker supplied** (No internal speaker)
- **16-key autopatch UP/DOWN microphone**
- **Repeater offset switch (±600-kHz/TM-201A; ±5 MHz/TM-401A; and simplex) and reverse switch**
- **Audible "BEEPER" confirms operation**
- **Easy-to-install mobile mount**

TM-201A/TM-401A accessories:

- **TU-3** programmable two-frequency CTCSS encoder
- **KPS-7A** fixed station power supply

TW-4000A

FM "Dual-Bander"... 2-m & 70-cm in single compact package, LCD, 25 W, optional voice synthesizer.

KENWOOD's TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2-m and 70-cm FM functions in a single compact package.

TW-4000A FEATURES:

- **2-m and 70-cm FM in a Compact Package**
  Covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70-cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).
- **Large, Easy-to-Read LCD Display**
- **25 Watts RF Power on 2-m/70-cm.**
- **Opt. "Voice Synthesizer Unit"**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**
- **10 Memories with Offset Recall and Lithium Battery Backup**
- **Programmable Memory Scan**
- **Band Scan in Selected 1-MHz Segments**
- **Priority Watch Function**
- **Common Channel Scan**
- **Dual Digital VFO's**
- **16-Key Autopatch UP/DOWN Microphone**
- **Repeater Reverse Switch**
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  GaAs FET RF amplifiers on both 2-m and 70-cm, high performance MCF's in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
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- **"BEEPER" sounds through speaker.**
- **Easy-to-Install mobile mount**

TW-4000A accessories:

- **VS-1** voice synthesizer
- **TU-4C** programmable two-frequency CTCSS encoder
- **KPS-7A** fixed station power supply
- **SP-40** compact mobile speaker
- **SP-50** high quality mobile speaker
- **MA-4000** dual-band mobile antenna with duplexor

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
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R-600

"Now hear this"...digital display, easy tuning

The R-600 is an affordably priced, high performance general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands. Use of PLL synthesized circuitry provides maximum ease of operation.

R-600 FEATURES:

- 150 kHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 kHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filter for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control. • Front mounted speaker.
- "S" meter, with 1 to 5 SINPO "S" scale, plus standard scale.
- Coaxial and wire antenna terminals.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation, using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

Optional accessories for R-600 and R-1000:

- DCK-1 DC Cable kit. • SP-100 External Speaker.
- HS-6, HS-5, HS-4 Headphones.
- HC-10 Digital World Clock.

R-1000

High performance, easy tuning, digital display

The R-1000 high performance communications receiver covers 200 kHz to 30 MHz in 30 bands. An up-conversion PLL synthesized circuit provides improved sensitivity, selectivity, and stability.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock/timer.
- RF step attenuator.
- Three IF filters for optimum AM, SSB, CW.
- Effective noise blanker. • Tone control.
- Built-in 4-inch speaker. • Dimmer switch.
- Wire and coax antenna terminals.
- Voltage selector for 100, 120, 220, and 240 VAC. Operates on 13.8 VDC with optional DCK-1 kit.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Four memories and digital display. (Also operates with TS-120S, TS530S, and TS-830S.)

TS-130SE

"Small talk"...IF shift, Processor, N/W switch, affordable.

A compact, all solid-state HF SSB/CW transceiver for mobile or fixed base station, covering 3.5 to 29.7 MHz.

TS-130SE FEATURES:

- 80-10 meters including the new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- TS-130SE runs 200 W PEP/160 W DC input on 80-15 meters, 160 W PEP/140 W DC on 12 and 10 meters. TS-130V version at 25 W PEP/20 W DC, all bands, also available.
- Digital display, built-in.
- IF shift circuit.
- Speech Processor, built in.
- Narrow/wide filter selection on CW and SSB with optional filters.
- Automatic SSB mode selection (LSB on 40 meters and below, USB on 30 meters and up). SSB reverse switch provided.
- RF attenuator, built-in.
- Effective noise blanker.
- Final amplifier protection circuit assures maximum reliability. Output power is reduced if abnormal operating conditions occur. For very severe operations, optional cooling fan, FA-4, is available.
- Dimensions: 3-3/4 H x 9-1/2 W x 11-9/16 D (inches). Weight: 12.3 lbs.
- Other features: VOX, CW semi break-in with sidetone, one fixed channel, and 25 kHz marker.

Optional accessories:

- PS-30 matching power supply (TS-130SE).
- KPS-21 power supply (TS-130SE).
- PS-20 power supply (TS-130V).
- SP-120 external speaker.
- VFO-120 remote VFO.
- FA-4 fan unit (TS-130SE).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 antenna tuner.
- MB-100 mobile mounting bracket.

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CQ The Radio Amateur's Journal

ON THE COVER: This "Command Post" is the Dade County, Florida Radio Club's station, W4NVU. Shown operating the station are (foreground) Joel Kandel, KI4T, and in the background Sandi Parker, KF4MI, and Leo Toussaint, KC4DE. Photo by Larry Mulvehill, WB2ZPI.

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Zero Bias AN EDITORIAL

Think March. It's the March issue, and when I sit down to write an editorial that will be in your hands about three months from now, I've got to psyche myself into thinking about what will be important in March. One topic that's always good is antennas. We all like to talk about antennas. However, as I look out of my office window, high (that's about four stories high) above downtown Hicksville, all I see is mounds of snow. We're digging out of the latest snow storm and the accumulation is sizable this year.

While there's not much actual antenna construction going on in this area right now (Dick did tell me that he put up a vertical last weekend), there has been a lot of antenna talk going on. Maybe it's cabin fever or the dream of spring, but it even translates into the articles I receive during the winter. Traditionally I receive more antenna articles during the winter, so if amateurs are not actually working on antennas, they're writing about them.

Two new antennas that will be going up come spring will belong to two *CQ* staffers from our Advertising Department. Both are graduates from courses given by local radio clubs. Arnie Sposato, a graduate of the course given by the Larkfield Radio Club, received the call KA2TYA, and Herb Pressman graduated from a similar course given by The Hall of Science Radio Club. Herb's still waiting out his call, which should arrive any day now. We're very proud of Herb and Arnie and congratulate them on their efforts. Of course, this means that the rest of us at *CQ* will have to fight them off at hamfest fleamarkets for first crack at the goodies. You win some and you lose some.

Another reason for me to be thinking of antennas is that the next issue (April) is an Antenna Special. I've been gathering a bunch of short articles with sort of a hints and kinks flavor. There are a lot of you out there who have come up with some very clever ideas when it comes to antennas.

Travels With CQ

The official traveling season got underway about a week ago. Lew McCoy, W1ICP, and his wife, Martha, set up the *CQ* booth at the annual SAROC Convention in Las Vegas. This show annually attracts about 1000 to 1500 amateurs. I checked with Lew today and got the report. While I'm sure that most amateurs who attend this event are seriously concerned about amateur radio and the state of the art, there are probably one or two who do slip away to take part in the less technical, though more costly, attractions Las Vegas offers.

Lew had a chance to talk with Carl Smith, W0BJW, the interim President of the ARRL, and it appears that Carl has had a change of mind and will run for President after all. I believe that the elections will be held this month. At this writing I am not sure of the slate of candidates for President other than Carl.

With all there was to see and do, Lew and Martha did a yeoman's job and signed up a lot of new *CQ* subscribers. Welcome aboard!

Next week Dick and I leave snowy New York for snowy Chicago, weather permitting, and set up shop at the Wheaton Community Radio Amateurs Hamfest. I've heard a lot about this one over the years (really great fleamarket), and I am looking forward to finally getting there. Dick and I have been making lists of goodies to look for at this one-day fiesta.

The following weekend we will be heading south to Miami. Jack will be bringing his wife, Ruth, to this one, and they both will be leaving after the hamfest for a vacation on St. Lucia. That translates into Ruth sightseeing and enjoying the warmth and hospitality of the island and its people while soaking up sun and eating the local delicacies. Jack, on the other hand, will set up a rig in the hotel room, string an antenna, and work DX (he already has a call). Jack has operated from most of the islands in the Caribbean by now. However, if you need St. Lucia, stand by on the week after the Miami bash.

I'm not sure if Jack will be back in time, but the rest of us should be at the big local show in mid-February. The LIMARC Indoor Hamfair '84, while not nearly as big as their outdoor event, draws a sizable crowd. It's a good chance to shake the winter doldrums and get out of the basement, attic, or wherever the locals keep their shacks and mingle with fellow amateurs on a real-time basis.

Words

As amateurs we've gotten used to adopting all sorts of jargon, and now we have a new word (?) to add to the English lexicon: time-shift. Time-shift became popular this week when the courts were deciding the videotape/copyright issue. As opposed to real-time (now), time-shift (later) brings a host of important, official possibilities to amateur radio. You could stretch it to "I'll time-shift you in the log, OM" or you could time-shift the tapes made by Dr. Owen Garriott, W5LFL, if you weren't home to listen to the actual QSOs. Actually, if you think about it, amateurs were ahead of the courts when they demonstrated the principle of time-shift on RTTY. The RTTY Mailbox® concept is an example of time-shifting. The only thing we now have to add is Captain Kirk's time-warp.

73, Alan, K2EEK

Recently Mr. Boixareu of Boixareu Editores, the Publisher of our Spanish edition of CQ, came to this country and paid us a visit. He was kind enough to hand-carry this autographed photo of His Royal Highness, King Juan Carlos (EA0JC) of Spain. As you can see, EA0JC sends his best wishes to us at CQ and to you, our readers. The picture will be displayed proudly.

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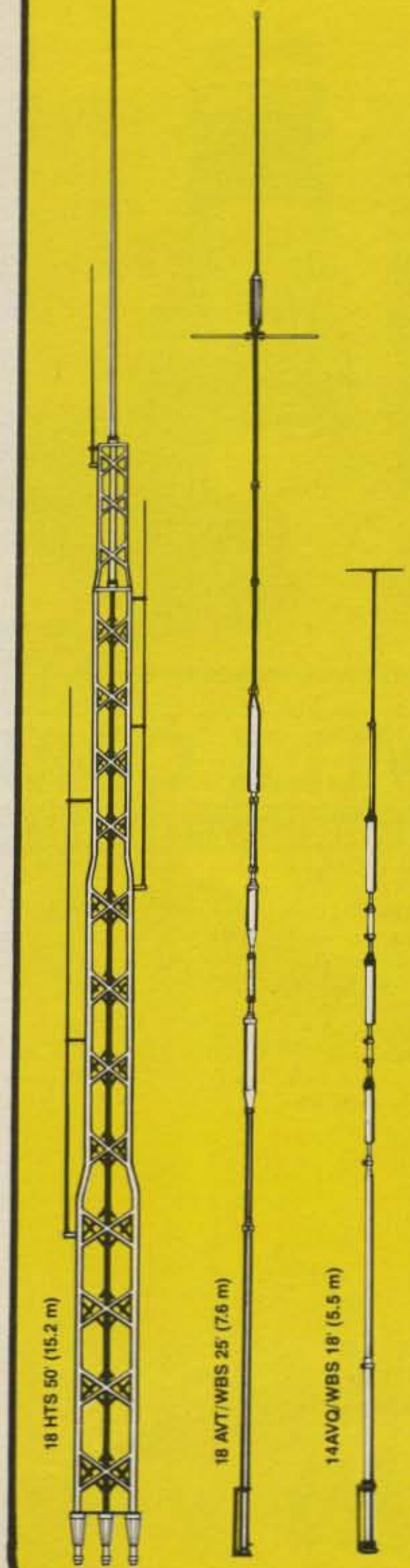

18AVT/WBS (80-10 meters) The most successful vertical antenna of all and for good reasons. Broadband performance covers the 40, 20, 15 and 10 meter bands in their entirety. Automatic 5 band switching is accomplished by mechanically superior, highly efficient factory tuned Hy-Q traps with large coils 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. WARC kits to be available.

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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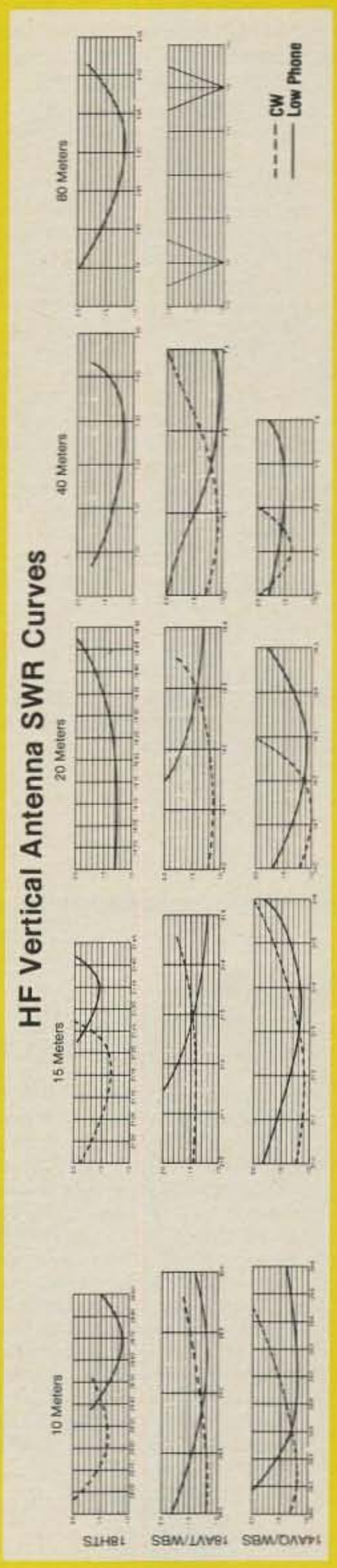

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- New chrome front with soft pearl gray cabinet for today's auto decor.
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220 MHz—FM-4033

The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the user. The KDK '33' series provides excellent readability in any lighting condition for the operating frequency and the memory channel in use. Warm orange background LCD displays improve readability by providing easy-on-the-eyes contrast.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall from memory of the desired repeater offset, the FM-2033 provides relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end-of-memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142–149.995 MHz to operate in balance with most repeaters and provide quieting for simplex operations. MARS (Navy too!) and CAP frequencies are also accommodated even with their unusual repeater splits.

You want convenience, reliability and easy operation for your mobile station and a tough-to-beat dollar value, right? Then check out the FM-2033 at your local dealer TODAY or send QSL for specifications. We think you will want one for yourself.

Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

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THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

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Our Readers Say:

In Praise of the Callbook

Editor, *CQ:*

Just a note to tell you how much I have enjoyed your writing in *CQ* magazine. In the December 1983 issue you had an article on the publisher of *The Radio Amateur Callbook* and the system that he uses to publish the *Callbook* for all of us. Of course, I agree wholeheartedly that his services to the ham fraternity are indispensable. It is a fine article and I enjoyed it very much, maybe because it was off the "beaten track," but mostly because I had never questioned the how or why of the *Callbook*'s existence but took it for granted. What a mess we all would be in if it weren't for this service.

Last, if I didn't like *CQ* I would not be a subscriber. I do enjoy the coverage that you people give to the various aspects of ham radio, and I fully intend to stay with you. Incidentally, I am such a ham radio nut that I also subscribe to *QST* and *73*.

In closing, may I say that I have never enjoyed a hobby as much as I have amateur radio, and to this day I operate in complete amazement that it really works. Thanks again for you and your staff's efforts in putting out a truly fine publication.

Jack Golden, KK2W
Portville, NY

Antenna Bridge Correction

Editor, *CQ:*

It was a pleasure to see my article on the antenna bridge in the January 1984 *CQ* ("Build Your Own Antenna Bridge" p. 34). However, there was an error and an omission in the legend of the schematic. L4 should have stated No. 24 enameled wire, and L6 was omitted (L6 = 10 turns, No. 20 enameled wire).

Richard E. James, W4DQU
Birmingham, AL

Wouldn't Part With "S" Line

Editor, *CQ:*

I know that there are thousands of radio amateurs out there who, like myself, use Collins "S" line equipment and wouldn't part with it for the world.

I have a hair-brained idea regarding the "S" line which just might work. I would like to put out a call for modifications, hints and kinks, or any other bits of information on this equipment which will make it perform better. I'm sure that many hams have ideas regarding this equipment which they would gladly share with their fellow hams.

Because of this, I would appreciate it if you would pass this information along to your readers. I would be very happy to act as a clearing house for this kind of information. To anyone who sends me information, I will send a complete computer printout of all the information that I receive. I have an ulterior motive, of course, and that is to keep my own "S" line running better and longer!

Joseph T. Adinolf, WB6ZWS
Ojai, CA

Do We Really Need All Those Bells and Whistles?

Editor, *CQ:*

After reading all about this fancy and sophisticated equipment advertised in *CQ* last year (as a subscriber) I get the impression what a hayday the manufacturers are having with the ham fraternity.

Take, for example, the $2000 transceiver. With something like 35 knobs, dials, switches, and whatever else to arrange before I get the final results, this I view as a lot of toy. I have to spend several minutes to get going. Then again, I may set a dial or two, press several buttons (then having to decide which other I need), only to forget later which ones I used and for what purpose.

Hams have been getting along with simpler equipment for a long time but with improvements along the way. But today's improvements have gone to the ridiculous. Modern technology may have eye appeal, but does a ham really need to go to this extent for the number of hours per year he uses the equipment (250?)?

As for *CQ* magazine, it is tops (I occasionally buy a few others off the newsstand just to see what they're up to). Keep up the good work in putting out the right kind of subjects that interest most hams.

E. Kopulos, VE1CGT
St. George, N.B., Canada

"QSL" For The Handicapped

Editor, *CQ:*

I am pleased to report that "QSL," readings of amateur radio articles from your publication, has been received very well by our listenership. QSL has been expanded to a two hour broadcast instead of the originally conceived hour broadcast.

This program is now being offered to over 100 radio reading services nationwide serving over 125,000 print-handicapped individuals. A new publicity campaign has been designed in order to sell the show's content to even more radio reading services. A copy of our campaign literature will be forwarded to you.

The success of this program would not, however, be possible without your support. Therefore, again I ask that you consider the possibility of continuing to supply this service with a free subscription of your publication.

Once again, on behalf of those of us who depend on these readings of amateur radio, I thank you for your support.

Steven C. Terry, WB4IZC
Station Manager, WTTL
Memphis, TN

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● **Dayton Hamvention Adds New Award** - The Dayton Hamvention is adding another award this year. The award will be given for technical excellence. It will go to an individual making a significant contribution to amateur radio in the technical field. Anyone wishing to nominate a candidate for this or any of the other awards, please mail information to: Awards Committee, Dayton Hamvention, Box 44, Dayton, Ohio 45401. The nomination should provide as much information as possible about the individual, emphasizing the accomplishments justifying the award. Closing date for the nominations is April 1, 1984.

● **Jefferson Barracks ARC Auction** - On Friday night March 9, the Jefferson Barracks ARC will hold their 24th annual Amateur Radio Auction at the new St. Louis Firefighters Hall, 5856 Gravois at Christy in south St. Louis City. The auction is attended by 800 to 1000 people each year. For more information, contact Jefferson Barracks ARC, c/o Carl H. Hohenberger, WBØBZP, 5266 Parker Ave., St. Louis, MO 63139.

● **Shore Points ARC Springfest '84** - Springfest '84 will be held Saturday, March 10 from 9 am to 4 pm at the Atlantic County 4-H Center, Egg Harbor City, NJ (approximately 15 miles west of Atlantic City). There will be 8000 square feet of heated indoor selling space (covered tailgating available weather permitting). Sellers $5 per space (bring own table); buyers $2.50 in advance, $3 day of hamfest. For more information, write to SPARC, P.O. Box 142, Absecon, NJ 08201.

● **Martinsville Hamfest** - Sponsored by the Morgan County Repeater Association Club, the Martinsville Hamfest will be held on March 11 at the Indiana State Fairgrounds Pavilion Building in Indianapolis, IN. Admission will be $4.00 at the door. Premium table $30.00; fleamarket table $8.00; fleamarket space without table $1.00. All tables must be reserved in advance. Talk-in on 147.21 and 146.52 Simplex. For table reservations or information, contact Aileen Scales, KC9YA, 3142 Market Place, Bloomington, IN 47401.

● **Randolph ARA 5th Hamfest** - The Randolph ARA's 5th Hamfest will be Sunday, March 11th from 8 am to 5 pm in the Winchester National Guard Armory, Winchester, IN. Dealers, fleamarket, prizes, food and drink and programs all inside. Ticket donation is $3.00, under 12 years free. Table space (by reservation only) $5.00 with table, $2.50 without. Talk-in on 147.90/30, 224.90/223.30, and 146.50. For reservations and information contact RARA, Box 203, Winchester, IN 47390, or Jake Life, W9VJX, tel. 317-584-9361.

● **Annual Interstate Repeater Society Flea Market** - This event will be held on March 17 at the Hudson, New Hampshire Lions Club. Doors open at 8 am, Fleamarket 9 am to 4 pm. Admission is $1.00; $7.00 per table. Talk-in on 146.85 and 146.52. Contact WA1NYS by phone 603-882-6859, or write to Interstate Repeater Society, P.O. Box 693, Derry, NH 03038.

● **St. Patrick's Swapfest** - The Midland ARC will hold its annual St. Patrick's Swapfest on Saturday, March 17 from 10 am to 6 pm and Sunday, March 18 from 8 am to 2:30 pm at the Midland County Exhibit Building, east of Midland on Highway 80 on the north side. Prizes, refreshments. Preregistration is $5; $6 at the door; tables are $6 per table. Talk-in on 16/76 and 33/93. For information and reservations, contact Midland ARC, P.O. Box 4401, Midland, TX 79704.

● **Fifth Annual Lake County Hamfest and Computer Fest** - The Lake County ARC will present their Fifth Annual Lake County Hamfest and Computer Fest on Sunday, March 25 at Madison High School, Madison, Ohio. Doors open for exhibitors at 5:30 am and for the public at 8 am. Admission is $3.00 in advance and $3.50 at the door. Table and display space is $5.00 for 6-foot table, $6.50 for 8-foot table. Check-in and talk-in on 147.81/.21. Information and reservations are available by sending s.a.s.e. to Lake County Hamfest Committee, P.O. Box 150, Mentor, OH 44061, telephone (216) 953-9784.

● **4th Annual OARC Auction** - The Oshkosh ARC will sponsor the 4th Annual OARC Auction on March 25 at the Winro Hall, Omro, Wisconsin from 11 am to 4 pm. Auction items must have a $15 minimum value, and OARC charges 10% commission on sales. Tickets $3 at the door, $2 in advance. Send $2 per ticket and s.a.s.e. to Tickets, K9WWW, 1646 Michigan, Oshkosh, WI 54901.

● **Walla Walla Valley ARC Swapfest** - The Walla Walla Valley ARC will hold its annual Swapfest on Sunday, March 25 at the Milton-Freewater Oregon Community Building. Opens 8 am, radio and electronic gear only. Tables $5.00. For information and table reservations, contact W7DP, P.O. Box 321, Walla Walla, WA 99362.

● **LAMARSFEST 1984** - This event will take place on Sunday, March 25 starting at 8 am at the Lake County Fairgrounds, Grayslake, Illinois. Tables $5.00; tickets $2 in advance, $3 at the door. Talk-in on 147.63/03 or 146.94 simplex. For tickets, table reservations, and information, contact LAMARS, P.O. Box 751, Libertyville, IL 60048.

● **Delaware Valley Radio Association Fleamarket and Computer Show** - This event will take place on Sunday, April 1 from 8 am to 4 pm at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton, NJ. Advance registration $2.50, or $3.00 at the door. Indoor and outdoor flea market area, commercial dealers, door prizes. Talk-in on 146.52 and 146.07-.67. For advanced tickets and space reservations write to KB2ZY, 140 Susan Drive, Trenton, NJ 08638 (s.a.s.e.).

● **DEC Members Active From Luxembourg** - From April 5 1800 GMT until April 8 2400 GMT some members of the DEC (Dordtse Electronica Club) will be active from Luxembourg (LX) on all bands, including WARC and the 160 meter band. QTH is Bech. Members of the party are PAØBOE, TUK/VDO; PA2FAS; PA3ATA/AWW/CLS/CQR/CQU/CZW; and 6 newly licensed persons who expect their calls in March. They will all sign /LX. QSL via P.O. Box 523, Dordrecht, the Netherlands, or via the bureau.

● **Rochester, MN Area Hamfest** - The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the 7th annual Rochester (Minnesota) Area Hamfest on Saturday, April 7. Doors will open at 8:30 am at John Adams Junior High School, Rochester, Minnesota. There will be a large indoor fleamarket for radio and electronic items, prize raffles, and refreshments. Talk-in on 146.22/82 MHz. For further information, contact RARC, c/o WBØYEE, 2253 Nordic Ct. N.W., Rochester, MN 55901.

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Raymond A. Kowalski, Chief, Special Services Division, Private Radio Bureau, FCC.

Raymond A. Kowalski is the Chief of the Private Radio Bureau's Special Services Division. This division administers a wide variety of Private Radio services, including Aviation, Marine, Amateur, General Mobile, and Citizens.

Mr. Kowalski is an attorney, admitted to practice before the Supreme Court of the United States and before the Courts of the State of Virginia. His professional career has been entirely with the FCC. Since 1968, he has held a succession of staff, supervisory, and management positions in the Broadcast (now Mass Media) and Private Radio Bureaus.

Most recently, Mr. Kowalski served as Chief of the Private Radio Bureau's Compliance Division. In the two years he held that post, he directed nearly 3,000 license revocation proceedings against Private Radio Bureau licensees. Of the licenses revoked, nearly 1,000 were citizens band operators and 40 were amateur radio operators. Many cases were contested through the evidentiary hearing process. Under Mr. Kowalski's guidance, Division attorneys won 37 of the decisions handed down in these cases, losing only 2.

Mr. Kowalski is a graduate of St. Bonaventure University and of the George Washington University Law School. During his 15 years with the FCC he has received several honors and awards. In 1983 his performance as Chief of the Special Services Division merited him the highest possible rating under the government's merit pay system. He also received an Outstanding Performance rating in 1981. He was selected in 1981 as an FCC candidate for the Senior Executive Service. In 1979, he received a quality within-grade raise. He has received extensive training in leadership, management, and public administration at the government's Federal Executive Institute.

Mr. Kowalski, 38, lives with his wife, Jean Ann, and three children, Jennifer 12, Jason 9, and Amanda 4, in Vienna, Virginia. He is a native of Rochester, New York. His hobbies are golf and photography.

A CQ Exclusive Interview:

Raymond A. Kowalski, Esq.

Chief, Special Services Division Private Radio Bureau, FCC

BY THEODORE J. COHEN*, N4XX

*Media-Tech®, 8603 Conover Place, Alexandria, VA 22308

The staff of the Personal Radio Branch pores over the volumes of comments in the "No code" docket. Standing: John B. Johnston, W3BE. Seated from left: John Small, Maurice J. DePont, and John J. Borkowski.

CQ: Ray, tell us a little about the Special Services Division. What role does it play within the Private Radio Bureau?

Kowalski: The Private Radio Bureau was reorganized in 1982. That is when the Special Services Division was created. Understand that the Private Radio Bureau has two main constituencies: land mobile licensees—and by that I mean those regulated under Part 90 of the FCC's rules—and all other users of private communications. The Bureau's Land Mobile and Microwave Division administers the former, and the Special Services Division administers the latter. I guess you could call us the "all other" division! Our name, "Special Services," derives from the fact that the radio services we administer are not easily grouped under one heading. What would *you* call a division that administers Amateur Radio, land and shipboard maritime stations, aviation radio, General Mobile, Citizens Band, and Radio Control Services, not to mention public-fixed stations in Alaska? There's even a possibility of adding another service to this list . . . the Personal Radio Communications Service, which is currently under consideration by the Commission in General Docket No. 83-26.

CQ: Exactly what do you mean when you use the term "administer"?

Kowalski: When I say we "administer" these services, I have in mind everything you can think of except issuance of the actual licenses—that, of course, is done in our Licensing Division in Gettysburg, Pennsylvania. Mostly we write the rules for these services, usually in response to petitions we receive. We answer thousands of mail and telephone inquiries each year. We interpret the rules, set policy, and coordinate with other bureaus and agencies on matters that affect our services. We even participate in international meetings when topics related to our services are being discussed. The Division is the place where real experts in each of the services I mentioned do their work each day. We do a lot, and the remarkable thing is that the whole group, including clerical support, numbers only 26 people!

CQ: How is the Division structured? That is, how many branches does it have, and what roles do they play?

Kowalski: We divide the work among three branches: the Personal Radio Branch, the Aviation and Marine Branch, and the Compliance Branch. The Personal Radio Branch is the one that would most interest your readers because that's where the amateur radio action is. This branch is also responsible for General Mobile, Citizens Band, and Radio Control. The Aviation and Marine Branch is self-explanatory. The principal role of each of these branches is rulemaking for their respective services.

The Compliance Branch, in a sense, services the other two branches. You know, our rulemaking branches can write rules until the world runs out of paper, but if they're not obeyed, all those trees will have died in vain! That's where the Compliance Branch comes in. Working very closely with the Field Operations Bureau and its monitoring stations, the Compliance Branch endeavors to make sure that people are obeying the rules. That's where sanctions originate—sanctions such as fines, suspensions of operating privileges, and license revocations.

CQ: Could you tell us a little about each branch and its chief?

"When it comes to deregulation, the amateurs are 180 degrees out of phase with our other licensees. Amateurs come in saying: 'Regulate us! Regulate us!'"

Kowalski: Certainly. The Personal Radio Branch is headed by John B. Johnston, W3BE. "Johnny," as he's known to hams all over the country, is one of those experts I spoke of earlier. Perhaps no one knows all there is to know about amateur radio, but I believe that Johnny comes close. And if you follow our notices of proposed rulemaking closely, you'll recognize the names of the branch's professional staff who are always listed as persons to contact for more information: Maurice J. DePont, John J. Borkowski, and John Small.

The Aviation and Marine Branch is run by Chuck Fisher and his deputy, Robert H. McNamara. Chuck is an engineer and Bob is a lawyer, a combination we have found works quite well in this esoteric field.

Carol F. Foelak is the Chief of the Compliance Branch. She is a tenacious lawyer, and one I urge your readers to avoid, at least on official business!

The three branch chiefs report to me and my deputy, Roger Madden. We, in turn, report to the Bureau Chief, Robert S. Foosaner, and his deputy, Michael T.N. Fitch.

CQ: One of the hallmarks of FCC Chairman Fowler's program has been to "unregulate" the various telecommunication services in this country. What has been the effect of this program on the Amateur service?

Kowalski: When it comes to deregulation, the amateurs are 180° out of phase with our other licensees. Amateurs come in saying: "Regulate us! Regulate us!" I think the overwhelming opposition to the attempt at a plain-language rewrite of the amateur rules was a good example of this. I think the Commission now has the message that it ought not to apply to amateur radio concepts that work well in other areas of telecommunications. It's fine to let the "unseen hand" work its will in a marketplace environment. But in amateur radio, marketplace forces are not at work. Thus, the control mechanism must be something else, and that something else is government regulation. Having seen that full-blown deregulation does not apply to amateur radio, the Commission's efforts in this area have been confined to eliminating the unnecessary regulations, the unused reports, and the outdated requirements. Elimination of the logging rules is a good example of this process.

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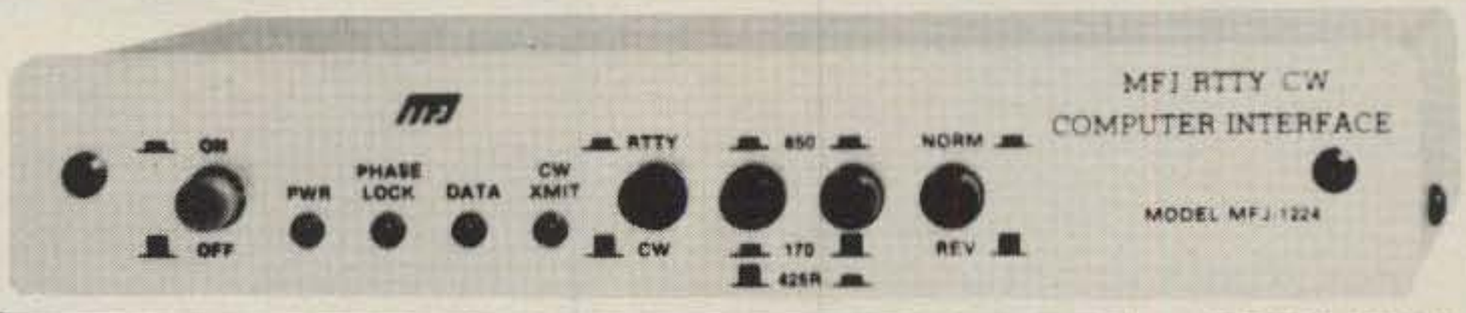

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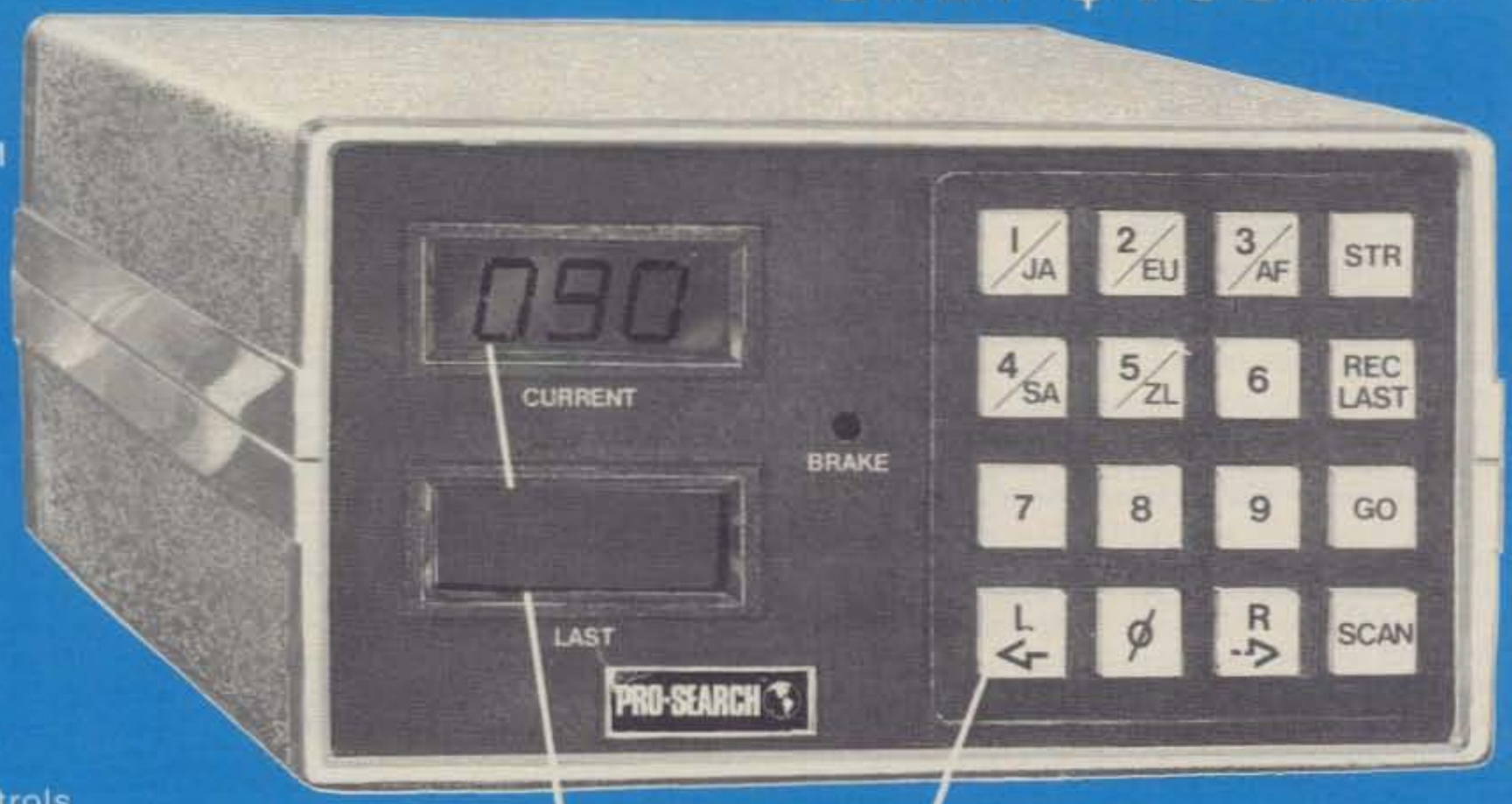

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CQ: Do you think that the Commission has gone too far in "unregulating" the Amateur service? Or is the framework still in place to ensure that the Amateur service remains viable in the years ahead?
Kowalski: From my perspective, the Commission has not gone too far. Compared to what has been done—or undone—in other areas, amateur radio has been only slightly deregulated. All of the changes made to date have trimmed amateur radio of some needless bureaucratic baggage. I am confident that this will work to the service's advantage in the future.

CQ: Is the Commission contemplating further "unregulation" for the Amateur service? If so, in what areas?
Kowalski: Not to my knowledge. And if anyone would know, I would! Now that the "no-code" matter is behind us, we have plenty to keep us busy . . . for example, implementation of the WARC-79 frequencies. Although we are constantly reviewing our rules in search of needless regulations, and although we try to write new rules with a minimum of regulation, I would say that deregulation, as a project in itself, has stabilized.

CQ: One area where significant changes are taking place pertains to amateur examinations. Some people feel that the examination process has been so fractured by the Volunteer Examination Program that it will be difficult for newcomers to enter the service. Others believe that the examinations will now be so variable in nature that an amateur license would no longer represent a given level of capability. What are your thoughts on this?
Kowalski: Let me preface my remarks by saying that regardless of anyone's predictions about it, the Volunteer Examination Program is the way of the future. It's no longer open to debate; we're committed to it. The Field Operations Bureau has already published its schedule of examinations for 1984: sessions in February, May, August, and November. That's it! And even this schedule could shrink. As leases for FCC office space in field offices around the country come up for renewal, they are being renegotiated *without* space for examination rooms. So you can see why the Volunteer Examination Program is vital. Soon it will be the "only game in town." Without it, there would be no game at all.

I have heard comments from people who want to get an FCC-examined license, as though these were the last of the *bona fide* licenses. That's nonsense. Under the Volunteer Examination rules we've just published, the FCC will continue to make up the tests. The volunteers will just administer them. So, *there will be uniformity in the requirements*. Also, it will be easier for people to become amateurs, from the standpoint of examination opportunities. The FCC is down to four exams per year. I expect the Volunteer Examination Program to afford many more test opportunities than that.

"The Volunteer Examination Program is vital. Soon it will be the 'only game in town.'"

I think, too, that the new program will make it much more difficult for *unqualified* persons to become hams. Since the exam questions will change frequently, it will be very difficult to pass if you've done nothing more to prepare than study old examinations.

"Under the Volunteer Examination rules we've just published, the FCC will continue to make up the tests, (and) there will be uniformity in the (license) requirements."

CQ: Do you believe that new amateurs will value their licenses as much as those who "sat their exams before the Commission" now that the exams will be given by volunteers and not by Commission employees?
Kowalski: Of course they will! They will be taking examinations from three licensed amateur radio operators, each holding a license no lower than Advanced Class. At present, FCC examinations are administered by clerical personnel. If they are hams, it's only by coincidence. And let's face it, Ted, those Commission exams have been widely compromised. So I think a case could be made that those who obtain their licenses via the volunteer route will value them every bit as much as those who got them at an FCC exam.

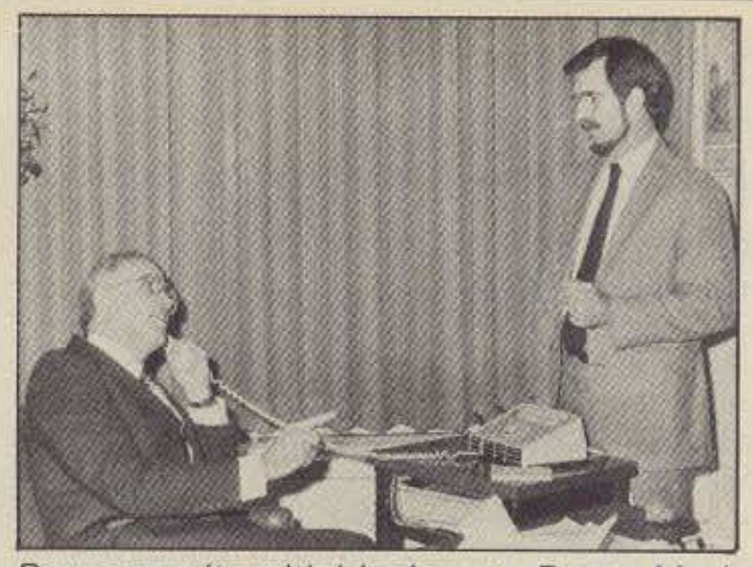
CQ: Ray, what are some of the problems you see on the horizon for the Volunteer Examination Program? For example, is there concern within the Commission that the ARRL will eventually dominate the licensing process, thereby putting its competitors in the publishing field at a disadvantage?
Kowalski: The problems we are concerned about are the practical ones relating to implementation. There is no concern about the role of the ARRL. As we talk, the ARRL has not applied to become a Volunteer Examiner Coordinator (or "VEC"). But assuming they do apply, there's plenty of room for more than one VEC. And because VEC's may be regional and not necessarily national, there is likely to be a lot of competition for the ARRL, at least in certain parts of the country. You know, there's a new law which allows volunteers and VEC's to be reimbursed for their out-of-pocket expenses in carrying out this program. This is a great equalizer. If you assume that the ARRL has unlimited funds—and the people in Newington assure me that this is not the case—then there might be cause for concern that the ARRL is the only organization that has the necessary resources to participate in this program. However, since all VEC's—whether national or regional, large or small—can now recoupe their expenses, the specter of a dominant ARRL shrinks to insignificance. It's simply nothing to worry about. The real worries have to do with the logistics of making all this happen with as smooth a transition as possible.

CQ: When do you think the new rules allowing reimbursement will take effect?
Kowalski: Probably not until late spring or early summer. We're going to go through the rulemaking process on this, and even with minimum time limits for comments, it will take several months to resolve the matter. The important thing to remember is that VEC's need not wait for these rules to begin giving exams. The program is in effect now, and all the new rules will do is permit reimbursement of their actual, out-of-pocket expenses.

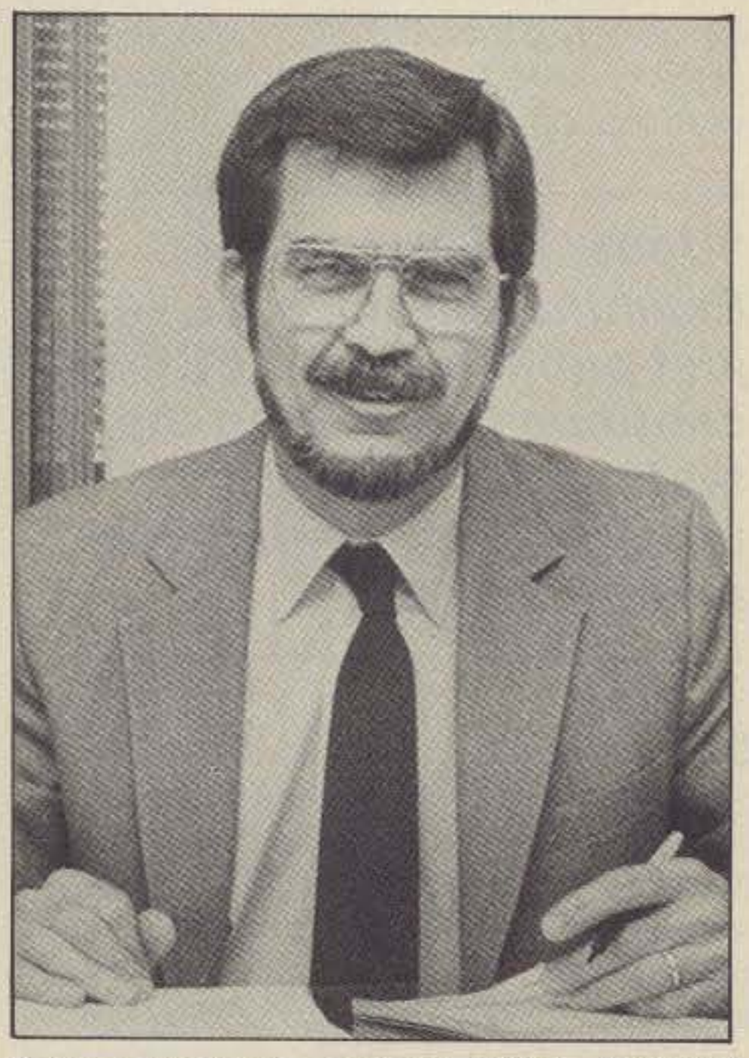
CQ: Have you been able to assemble all of the material you need for exam questions, or are you still seeking help in this matter from the amateur community? If you are seeking help from amateurs, how can they help?
Kowalski: Throughout the program we will be seeking help from the amateur community. It's important to remember that this is *their* program, to make of it what they will. At present, we've assembled and published the questions for the General Class examination. We still need questions for the Advanced and Extra Class examinations. However, even when these sets of questions are complete, we will need still more questions to keep the exams current, to replace the poorer questions, and to keep down the probability of compromise. So if your readers want to help, they can do so by sending their questions to the Personal Radio Branch, Private Radio Bureau, FCC, Washington, D.C. 20554.

"We still need questions for the Advanced and Extra Class examinations."

CQ: Ray, you've been seeking the opinions of amateurs in a number of areas. In fact, you've been trying to initiate a "dialogue" with the community on the subject of net operations and on a net's "rights and obligations." Could you say a few words about this?
Kowalski: I'm always hesitant to begin a discussion of rule violations for fear of



Ray consults with his deputy, Roger Madden, during a telephone conversation.



Roger Madden, Deputy Chief, Special Services Division, Private Radio Bureau.

giving the impression that violations are a big problem in amateur radio. They are not. Amateur radio remains the most self-policing service the Commission has. Nevertheless, there are some violations, and we have to deal with them.

Malicious interference is the single, most pressing rule violation we see. My concern about nets stems from the fact that operators who do not like nets tend to maliciously interfere with net operations. Nets, on the other hand, tend to retaliate in kind. Consequently, I believe that malicious interference is *not* the problem. It is the *symptom* of the real problem: namely, a conflict between the rights of nets and the rights of individuals. And this is the worst kind of problem you can have because both sides think they're right. The nets rely on the fact that once they have put the frequency into use, the rules permit them to use it indefinitely without interruption. The individuals, however, do not see it that way. They see these frequencies in use by some nets all day, every day, to the point where they have, in effect, appropriated their own frequency. And we all know that that is not permitted in amateur radio. So they fight each other. Each side calls the local field office and complains, and first thing you know, they have Washington's attention.

Now, my idea, Ted, is to cure the symptom by treating the disease—that is, by resolving the conflict in these points of view. The question is, who's right? That's the basis of the dialog I'm trying to start. I don't pretend to know the answer. I'm not even sure that my idea of where the problem lies is accurate. I'd really like to hear what the amateurs themselves think.

CQ: What are some of the Commission's concerns regarding amateur net operations?

Kowalski: Besides the interference problem, which is not necessarily strictly a net problem, I think there are some abuses in net operations. People have told me that nets serve a spectrum-efficiency function by concentrating a large number of operators on one frequency. However, my experience is that this is not entirely accurate. One frequency sometimes becomes one subband. Some nets seek to stake out several kiloHertz on either side of a center frequency. I regard that as an abuse. It's also an abuse when the "net frequency" is apparently quiet, but if anyone tries to use it for non-net operations, some net member shows up to remind the interloper that this frequency is the "net frequency." I'm especially troubled when all of these abuses are perpetrated to foster what I think is still another inappropriate use of amateur frequencies—phone patching. Now, I'm not talking about emergency phone patches, or even so-called "health and welfare traffic." I'm talking about a guy in his home in Long Beach, California running a phone patch for a guy in his home in San Diego, California, when all they're doing is avoiding long-distance toll charges. Worse, still, is the case where the guy in Long Beach is running a patch for a guy in Pasadena to avoid message-unit charges. Is this spectrum efficiency? Is this advancement of the radio art? Not by any stretch of the imagination.

CQ: But is it illegal?

Kowalski: No, it's not illegal. But it does lead to interference wars. That's why I'm concerned.

CQ: The Commission has taken the position that in cases involving co-channel interference on 2 meter repeater channels, the "coordinated" repeater is legimately entitled to the use of the channels. Do you envision that h.f. nets might eventually be given priority on certain frequencies by virtue of their regular and extended use of these frequencies?

Kowalski: The difference between repeaters and h.f. nets, Ted, is that repeaters require an investment in specialized equipment which can be used for nothing else. Recognizing this, the hams have set up coordinating bodies, all voluntarily. By and large they do a good job, and the

Commission has properly done what it had to do to support these efforts of cooperative amateurs. H.f. nets have no similarly compelling circumstances. They can move. So I don't see nets being given any priority on this score.

By the way, there are several dimensions in which spectrum can be shared. One of those is time. It's been my experience that the problem nets are not the ones that meet regularly *for a short time.* Rather, it's the ones that are always on, for as long as the band is open. So perhaps the key would be provided by answering the question: "How long is too long?"

Keep in mind that giving priority to any operator would be controversial in itself. I would not want your readers to think that we're considering this at this time. I'll let them tell me whether or not to pursue it.

"I'm especially troubled (by) what I think is an inappropriate use of amateur frequencies—phone patching."

CQ: The use of amateur radio for business purposes continues to raise questions in the amateur community. But isn't this just a part of a larger problem . . . that is, the use of amateur radio in applications beyond the service's scope and purpose? I'm referring here to the retransmission of space communications and weather bulletins, to providing additional communication links for routine police business, and so forth.

Kowalski: I think you've got it right! Amateurs are forever coming up with something to put on the radio. I know amateurs dislike comparisons to Citizens Band operators, but every time I get one of these requests, I'm reminded of the CB operator who keys the mic when his favorite song comes on the broadcast radio. He seems to think everyone wants to hear it. That's the case with every example you've just mentioned. They can all be handled by their own radio services, but somebody thinks they need wider exposure.

Now don't get the impression that we're too willing to oversimplify the problem. The more serious requests for retransmission waivers or business-use waivers require a balance between the proper uses of ham radio and its historic contributions to the public well-being especially in the emergency and public safety areas. Nevertheless, we keep returning to the fact that these endeavors have their own radio services.

CQ: Isn't the Amateur service jeopardizing its frequency allocations by providing services already provided by other telecommunications services? Couldn't these other telecommunications services make claims to our frequencies if we persist in duplicating their classes of service?

John B. Johnston, W3BE, Chief of the Special Services Division's Personal Radio Branch.

Kowalski: Exactly right! Amateurs must keep in mind that every time their frequencies are used to duplicate other services, spectrum planners begin to think that one of the services is not necessary. I find it ironic that most of the requests my division gets from hams in this regard relate to someone's desire to supplement the activities of public safety organizations. Yet in our Land Mobile division, the public safety interests are the most aggressive advocates for additional spectrum. Amateur radio has long prided itself on its vigilance in protecting its spectrum. I would expect to see some tension between these two interests, but there hasn't been any to date.

CQ: A recent case before the FCC involved an ex-amateur who continued to operate a transmitter without a license and who used obscene language. While there was insufficient evidence to convict him on the obscene language charge (he was convicted on the unlicensed transmitter charge), the case was widely heralded as a test of First Amendment rights ("Freedom of Speech"). What is the Commission's official position on the transmission of obscene language?

Kowalski: Let me give you the "trick" answer first, Ted. The Commission is foursquare against the transmission of obscene language. The trick, of course, is that this encompasses only the legal definition of "obscene"; that is, something that appeals to the prurient interest. The Commission officially espouses the "print model" of regulation. If the content would be illegal for a newspaper to print, then it would be illegal for a licensee to transmit. That's the Commission's official position.

"The Commission officially espouses the 'print model' of regulation (for obscene language). If the content would be illegal for a newspaper to print, then it would be illegal for a licensee to transmit."

Now let me tell you my own personal views. We all know the kind of content we're talking about, and it has no place in amateur radio. I don't care what label you put on it—obscene, indecent—it doesn't matter. The case you mentioned was a travesty. The operator involved had had his license revoked for cause. He was unlicensed at the time he transmitted absolute filth on amateur frequencies. Whatever First Amendment rights apply to amateur radio, I can't believe they applied in this case. I can't believe there are any Constitutional protections for illegal operation. Fortunately, the case is not a binding precedent because the Court limited its applicability.

As you probably know, another obscene language case is pending before the Commission on an appeal filed by the Private Radio Bureau. If the Commission permits oral argument, I intend to argue it myself.

"Another obscene language case is pending before the Commission on an appeal filed by the Private Radio Bureau. If the Commission permits oral argument, I intend to argue it myself."

CQ: With reference to the phone calls and mail you get, what areas are uppermost in amateurs' minds these days?

Kowalski: There is no one single subject. There is a common denominator, however. They all want to do something just a little bit different than everyone else in amateur radio.

CQ: People within the Commission tell me that amateurs are overly concerned with their call signs. Do you find this to be the case?

Kowalski: Absolutely. And it mystifies me, because call signs are assigned to stations, *not* operators. Nevertheless, I've come to accept the fact that call signs are of overriding importance to amateurs. If nearly half a million taxpayers want to spend their money having my staff sort out their ideas for new wrinkles on an old system, who am I to fight it?

CQ: With reference to the Amateur service, what do you perceive to be the biggest problems facing your Division today?

Kowalski: Human resources. Our staff is down to what I think is the absolute minimum, and yet I fear that pressure will soon be building for further reductions. Amateur radio places considerable rulemaking demands on us, to the point where there is little time left to do anything else. Yet, we must also bring the Volunteer Examiner Program on line, with all that that entails. I'm not sure how we're going to be able to do it.

CQ: What do you believe to be the biggest problems facing the Amateur service?

Kowalski: Fortunately, nothing I could mention rises to the level of serious crisis. For the long term, I think there will be unrelenting pressures on amateur frequencies. Not only will gains be difficult, but much energy will have to be devoted to preventing losses. For the nearer term, I see the implementation of the Volunteer Examination Program as amateur radio's most urgent need. If amateur radio is to remain vital—alive—there has to be movement . . . there has to be a constant influx of new operators and an upgrading of the old ones. This directly ties back to the examination process, which will soon be in the hands of the amateurs themselves. They must be made to understand that the future of amateur radio is directly linked to the success of the Volunteer Examination Program.

CQ: What changes, if any, have taken place in the Private Radio Bureau, in general, and your Division, in particular, as a result of Bob Foosaner becoming the Bureau's chief?

Kowalski: There have been no substantive changes either in the Bureau or in my Division. Keep in mind that Bob was the former Bureau Chief's deputy, and they thought pretty much alike on amateur issues. Of course, each Bureau Chief has his own style, and we've had to adjust to that. If anything, I think Bob tends to focus on the larger issues, leaving more of the detail work to the Division. And that's probably as it should be.

Carol Fox Foelak, Chief, Compliance Branch, Special Services Division.

CQ: How would you characterize the Bureau's opinion of, and relationship with, the amateur community today?

Kowalski: I think the Bureau's relationship with the amateur community is quite good. Amateur radio has within it a representation of many diverse interests. Sometimes these interests are opposed to one another. So, it is not accurate to say that everybody loves everything we do. On the other hand, I don't think anybody can say we don't at least listen to what they have to say. Reaching decisions requires a balancing of competing interests. As a result, people seldom get *everything* they want. But they get enough to make them realize that the process is working. Therefore, I think we have a good working relationship with the amateur community.

"The future of amateur radio is directly linked to the success of the Volunteer Examination Program."

CQ: Ray, Washington is, by definition, a political city. How do you and your staff "survive" the various political winds that blow from Capitol Hill and the White House to the Commission (and back again), especially after there's been a change in administration?

Kowalski: The process which I just spoke of is a political one, and is one which few people outside of Washington understand. I separate government employees into two types of workers: political types and career professionals. The political types are those who are elected by the public or those who owe their appointment directly to elected officials. The career professionals are those who are hired for their substantive knowledge or professional skills. The career professionals are the ones who are the experts in the field, whether it be amateur radio or something else. I'd compare them to a flywheel. They provide inertia or constancy in government service. They handle the routine events, keeping the machine of government chugging. When something new arises, the career professionals advise the political types on the merits of the matter. It is then up to the political types to make decisions. In fact, making decisions is their principal function. And the constituency which placed them where they are can expect them to make those decisions in the particular way which will advance their interests. Understand that there's nothing bad about this. When the voting public gets tired of the way these decisions are made, they elect new political types. It's the American process of government.

My staff and I are career professionals. Political types come and go; we remain. When the signals change, our obligation is to carry out the new orders. Survival in this political setting often becomes a question of whether you, as a professional, can in good conscience carry out the new directions. If you cannot, you have an obligation to move on. I hope that your readers will understand the distinction and perhaps have a better appreciation of the bureaucrats!

CQ: Any other areas we should touch upon?

Kowalski: No, I think we've covered quite a bit. I sincerely appreciate the opportunity to share my views with you and to acquaint your readers with a staff that is working very hard for them in Washington.

CQ:Ray, I think everyone has learned alot today. Thanks for being with us! CQ

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An Operational Facelift For The Heath HW-100 (And HW-101)

BY DAVE J. CROCKETT*, WB4DFW

My shopworn Heath HW-100 has escaped the fate of being relegated to a dusty closet shelf even in the face of the highly attractive "bells and whistles" which grace the newer transceivers. My Heathkit is still in service, for the large part, because of the ease with which some of the features of the new rigs can be incorporated into the original Benton Harbor circuitry. In addition, most of the more popular changes are not expensive to make.

**207 Gardenia Drive, Greenville, SC 29611*

R.I.T.

It is almost a necessity these days, what with overprocessed audio and nonstandard c.w. offsets, to be able to slide around one's receive frequency independently of the transmitter. Enter the R.I.T. (**R**eceiver **I**ncremental **T**uning) control found on almost every new rig. There are a number of R.I.T. circuits for the HW-100/101 around. However, few are as simple and inexpensive as the one I designed for my transceiver (see fig. 1).

Using a single 4011 quad nand gate CMOS chip, available at any Radio Shack store, this circuit requires only a dozen or so other common parts to make it operational. It costs less than $10.00 to build and allows the receiver to be offset approximately ±2 kHz from the transmit frequency.

Borrowing a small amount of power from the transceiver v.f.o., this neat trick is accomplished by applying an adjustable reverse bias voltage to a garden-variety silicon rectifier. The rectifier re-

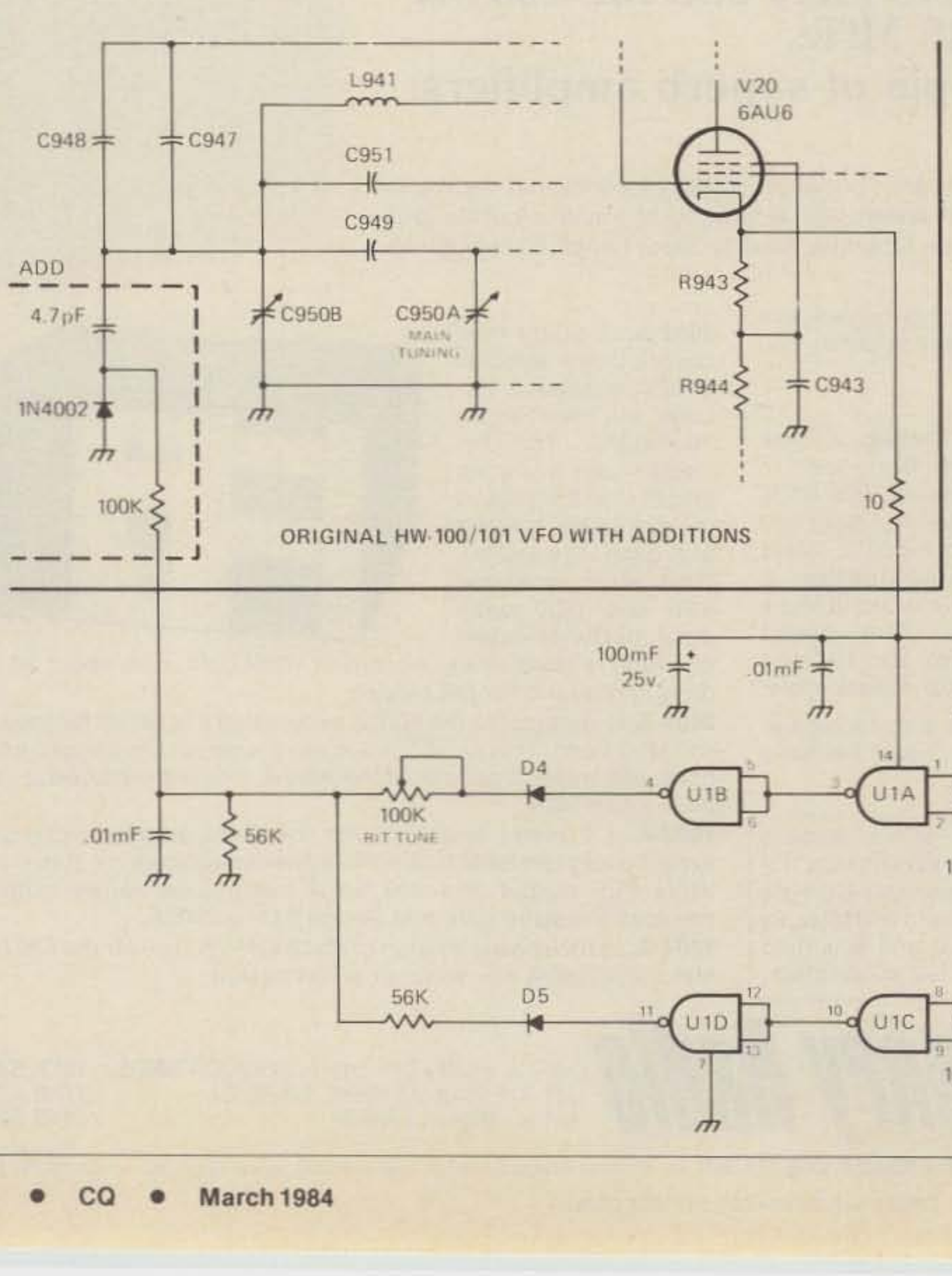


Fig. 1- Adding R.I.T. to the HW-100.

NOTES:

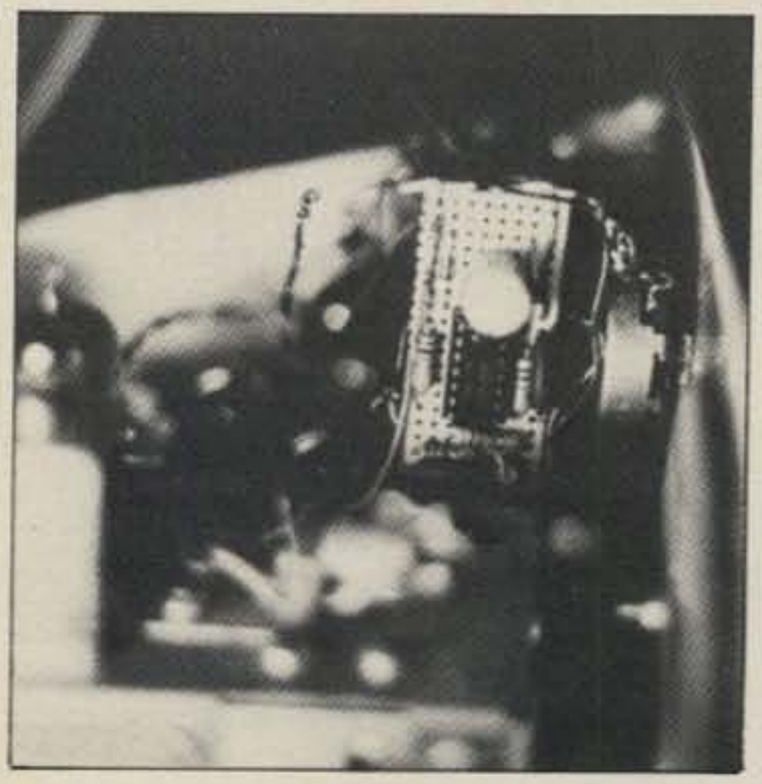
1. U1 is 4011 quad nand gate CMOS. **HANDLE WITH CARE!!!**
2. D1 – D5 are 1N914.
3. Except where noted, all resistors are ½w., 10% tol.
4. All decimal value capacitors are disc ceramic rated 100v. or better.
5. **INSTALLATION OF RIT WILL REQUIRE REMOVAL OF VFO SUBASSEMBLY AS DESCRIBED IN OWNERS MANUAL.**
6. VFO will require minor realignment after circuit installation.
7. RIT range is approximately ±2KHz.

sponds by acting like a small variable capacitor, the capacitance arising at the diode's p-n junction.

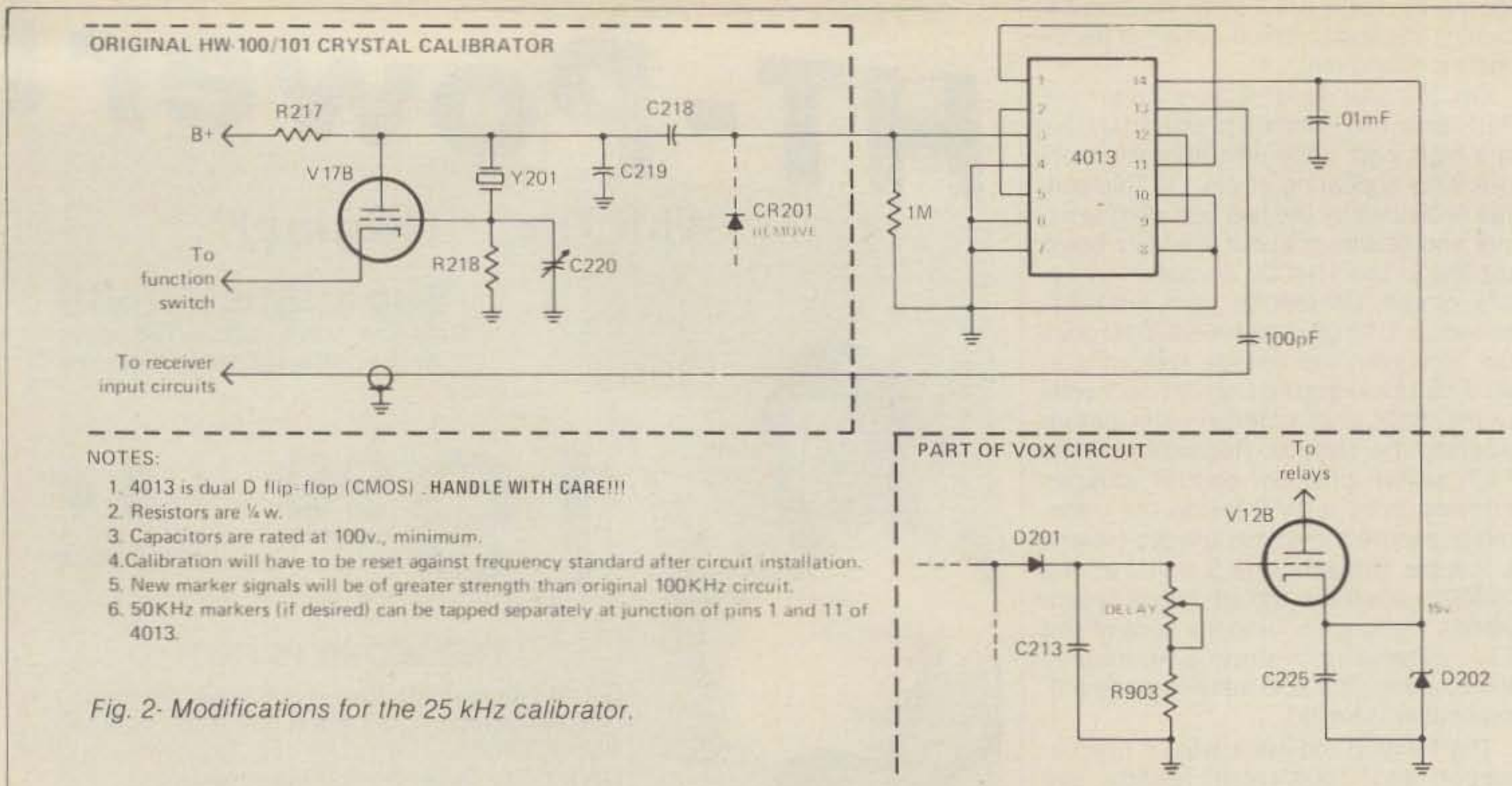
On transmit (and receive when the R.I.T. switch is in the off position), U1D is in a high logic state with approximately +9 volts appearing at pin 11. This voltage is divided by the two 56K ohm resistors and results in about 4.5 volts being applied to the 1N4002 across the v.f.o. tank circuit. On receive, with the R.I.T. turned on, U1B goes high while U1D goes low. However, the voltage appearing at pin 4 can be adjusted from 8.5 to 3 volts by the 100K ohm potentiometer before reaching the 1N4002. Regardless of the R.I.T. switch position, control voltages obtained from relay 2 inside the transceiver ensure the circuit always returns to center frequency (4.5 volts to the 1N4002) when the transmitter is keyed. Diodes 1 through 5 keep the control and R.I.T. voltages from straying where they don't belong. The LED advises when the transmitter is keyed.

The 1N4002 and associated 4.7 pF capacitor and 100K ohm resistor are mounted on a small terminal strip inside the v.f.o. subassembly of the HW-100/101. The R.I.T. tune control, on-off switch, and LED are installed on the front panel of the transceiver. The remaining components are assembled on perfboard, which is at-

R.I.T. controls and a.g.c. select switch.



R.I.T. circuit is mounted on the far side of the v.f.o. The internal connections to the v.f.o. pass through small spaces in the chassis.



NOTES:

1. 4013 is dual D flip-flop (CMOS) .**HANDLE WITH CARE!!!**
2. Resistors are ¼ w.
3. Capacitors are rated at 100v., minimum.
4. Calibration will have to be reset against frequency standard after circuit installation.
5. New marker signals will be of greater strength than original 100KHz circuit.
6. 50KHz markers (if desired) can be tapped separately at junction of pins 1 and 11 of 4013.

Fig. 2- Modifications for the 25 kHz calibrator.

tached to the side of the v.f.o. subassembly with one of the original self-tapping screws found there.

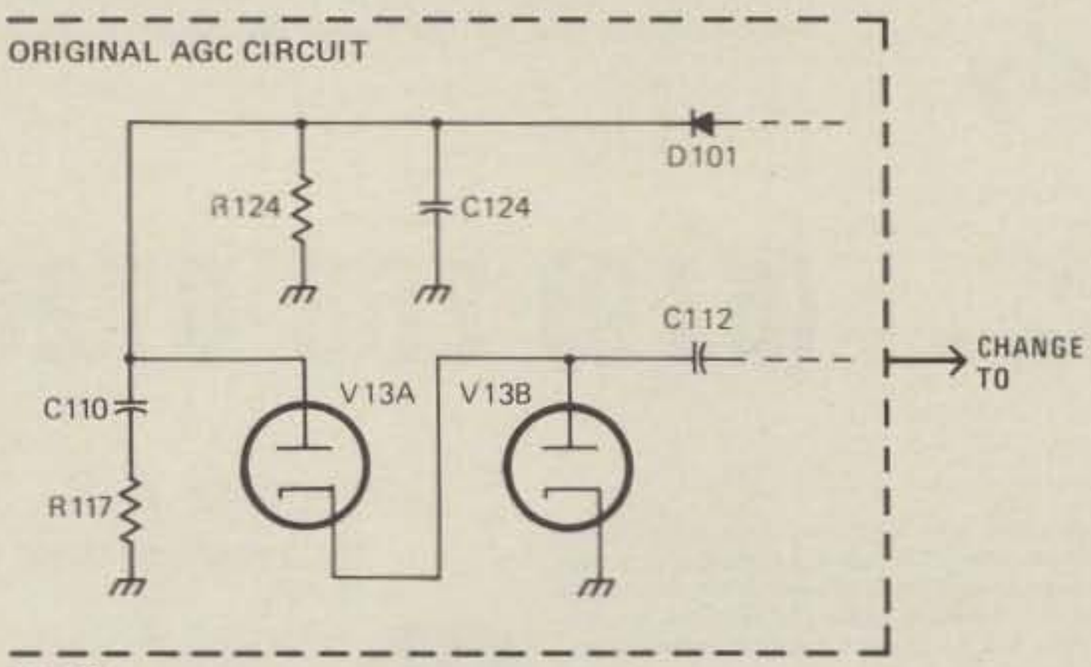
The 25 kHz Calibrator Divider

Digital frequency displays and one-tenth kiloHertz v.f.o. resolution are spiffy. In most cases, however, as long as one knows where the band and subband edges are, precise frequency measurement is more of a luxury than a necessity. The original 100 kHz crystal calibrator in the HW-100/101 is fine for pinpointing the lower band edges, but not much more. Here we discover the genesis of the 25 kHz marker generators so common in most of the new rigs. But with an investment of under $2.00, the original calibrator cicuit can be modified to put out license rescuing 25 kHz marker signals. As a bonus we find the new markers are substantially stronger on the higher bands than they were with the modified circuit.

The 25 kHz divider is attached to the final cage.

This circuit, fig. 2, uses a 4013 dual D-type CMOS flip-flop chip which is wired in a divide-by-four configuration. Normally such dividers require their input signal be preconditioned into something approaching a square wave in order to operate properly. Fortunately, the output of the original calibrator is sufficiently squared off to drive the divider without need of preconditioning, a circumstance not unusual among most tube-type calibrators. The HW-100/101 even provides a convenient source of + 15 volts to power the divider. The voltage is appropriated, without harm, from the zener diode in the cathode circuit of nearby V12B.

As was the case with the R.I.T., perfboard construction can be used for the 25 kHz divider. The circuit, hardly larger than a postage stamp, can be glued to the side of the final amplifier cage. It is advisable to recheck the accuracy of the calibrator against a known frequency standard such as WWV after installing the divider circuit.



NOTES:

1. New capacitor rated as 50v. or better.
2. Switch is panel mounted microminiature SPST.
3. C110 can be relocated to a small terminal strip mounted under i-f circuit board.

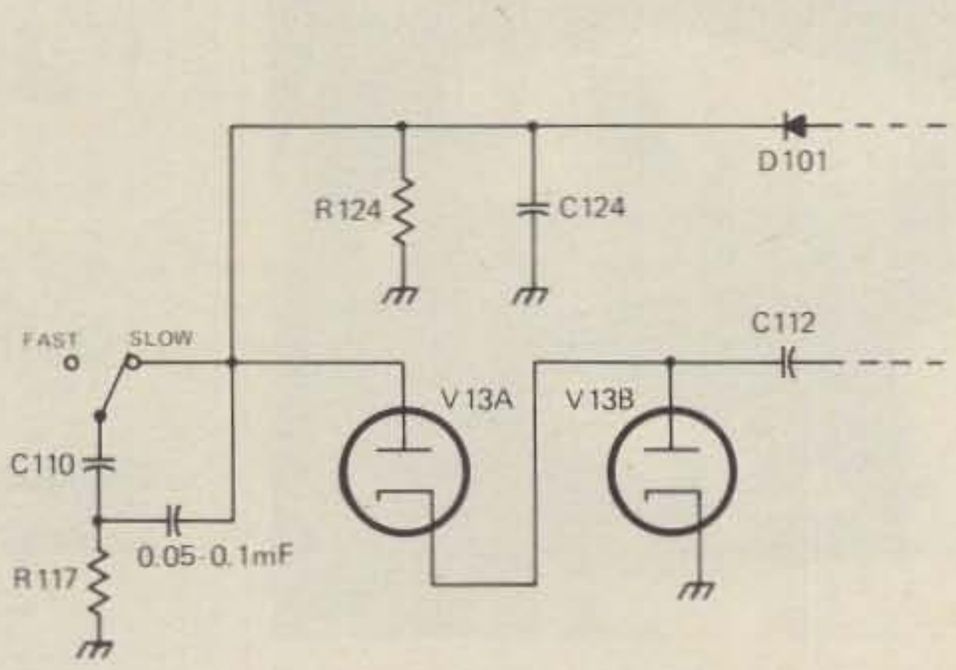


Fig. 3- Selectable a.g.c. recovery time modification for the HW-100/101.

Selectable AGC Recovery Time

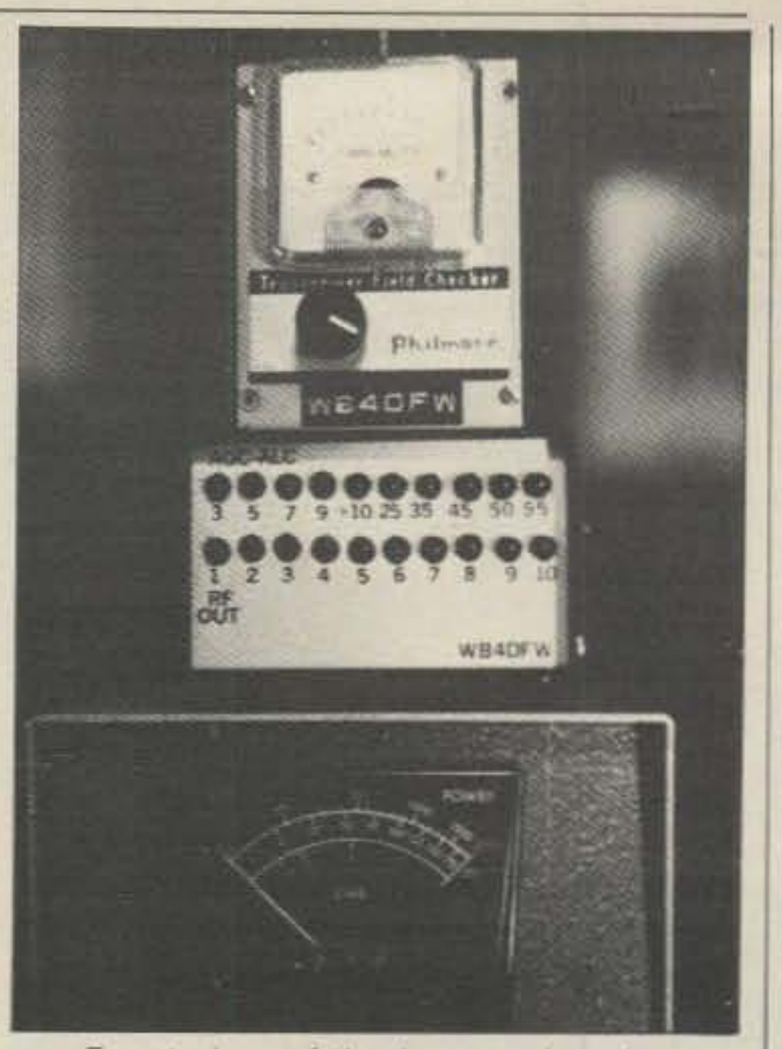
Under certain conditions of signal propagation, and quite often on c.w., it is convenient to be able to reduce the recovery time of the receiver automatic gain control circuit. This option can be incorporated into the HW-100/101 with one capacitor and an s.p.s.t. switch (fig. 3).

Possibly the most difficult part of this modification is locating and removing C110 from the transceiver i.f. circuit board. Replace this capacitor with one of a smaller value. Anything from 0.05 uF to 0.1 uF will do. The switch is then used to parallel the original C110 with the new capacitor or remove it from the circuit entirely. The original C110 can be relocated to a small terminal strip mounted under the i.f. circuit board and wired to a front-panel-mounted switch through a convenient hole in the chassis.

LED Bargraph S-meter

This circuit, if the truth be known, is a bit of a frivolity inspired by similar devices in some 2 meter rigs. Still, it provides a good introduction to a fascinating chip which is also being carried by Radio Shack for just under $5.00. It is most entertaining to watch in operation, especially in the company of non-amateurs.

Mounted in a small external cabinet, this circuit (fig. 4) is connected to the HW-100/101 in such a way as to monitor directly the a.g.c. (and transmit a.l.c.)



Front view of the bargraph unit.

voltage applied to the grid of V3. The LM3914N is designed to monitor a positive-going voltage referenced against ground and to display the voltage changes in linear 10 percent increments. However, the a.g.c./a.l.c. voltage in the transceiver is negative-going and, as such, requires that the entire bargraph circuit be isolated from chassis ground except where the shielded cable junctions at R102 of the HW-100/101. This re-

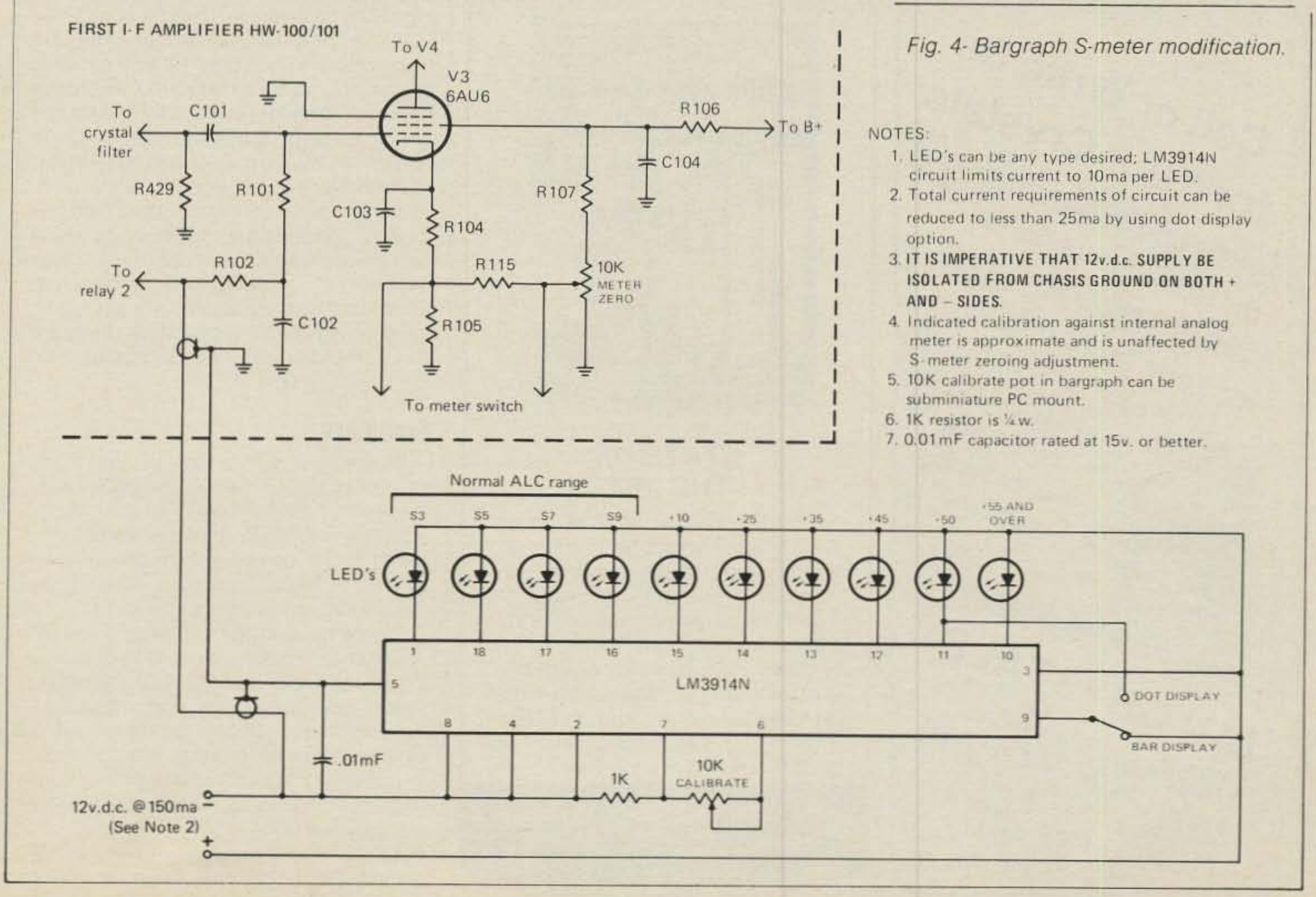
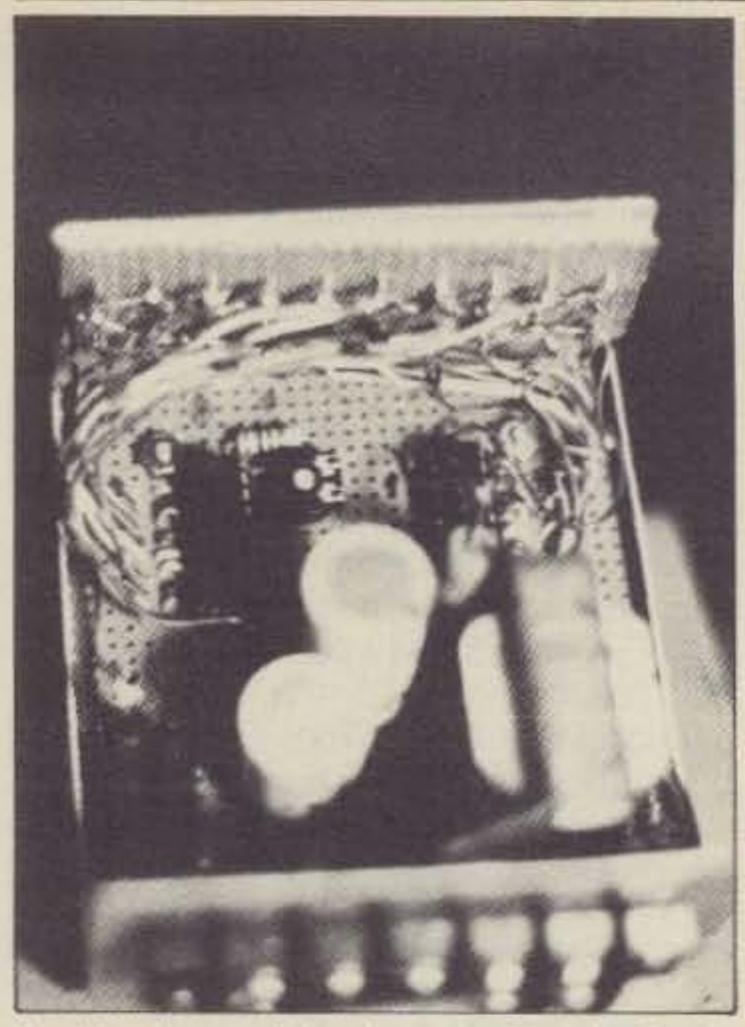


Fig. 4- Bargraph S-meter modification.

NOTES:

1. LED's can be any type desired; LM3914N circuit limits current to 10ma per LED.
2. Total current requirements of circuit can be reduced to less than 25ma by using dot display option.
3. **IT IS IMPERATIVE THAT 12v.d.c. SUPPLY BE ISOLATED FROM CHASIS GROUND ON BOTH + AND − SIDES.**
4. Indicated calibration against internal analog meter is approximate and is unaffected by S-meter zeroing adjustment.
5. 10K calibrate pot in bargraph can be subminiature PC mount.
6. 1K resistor is ¼ w.
7. 0.01 mF capacitor rated at 15v. or better.



Inside view of the bargraph unit. Some components visible were not used in the final design.

quirement also applies to the bargraph power supply.

Because of the current requirement of the LED's, roughly 10 milliamps each, an a.c.-powered supply is recommended for this circuit. This becomes a practical necessity if the bar display mode (all LED's firing sequentially) is chosen over dot display mode (a maximum of two LED's firing at any given time). The 10K ohm "calibrate" control is used to make the unit track with the transceiver's internal analog meter, and once calibrated should not need adjustment. Use of the bargraph circuit does not disturb the normal operation of the analog meter, and adjustment of the meter zeroing control in the transceiver has no impact on the bargraph calibration. Again, as a matter of personal preference, perfboard construction was utilized in this project. In the unit pictured, as space was available, a companion bargraph of identical design was installed which monitors relative r.f. output from the transceiver.

Summary

These are but a few of the many changes my HW-100 has undergone over the years, and I feel sure that they can be adapted easily to other vintage rigs. Some were developed in consultation with other Heathkit owners; others grew out of personal whims.

I have no delusions, though. The HW-100/101 cannot be expected to match all the specifications of some of the newer transceivers on the market without expensive and extensive circuit revisions. However, these modest modifications and revisions do make the rig more competitive from an operational standpoint. A quick look at prices today suggests that's not too shabby. CQ

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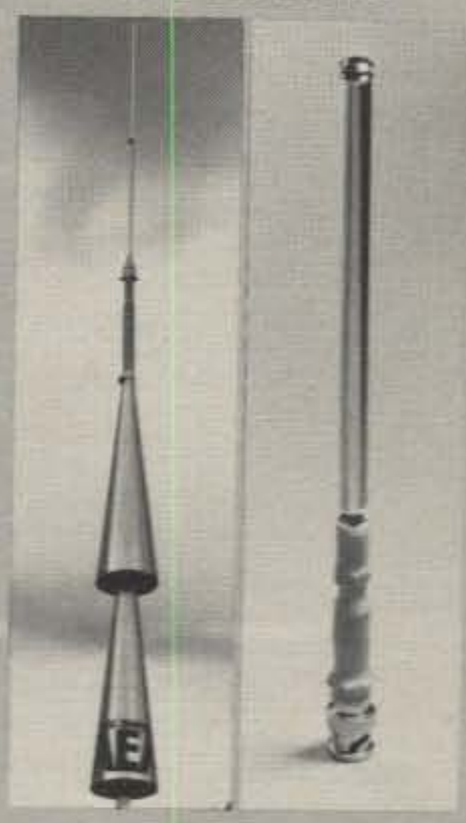

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12/07/83

Here's a good way to get in some code practice and promote amateur radio at the same time. You don't have to be a crack c.w. operator to handle traffic.

Slow-Speed Nets Provide New Directions

BY BRADLEY WELLS*, KR7L

At one time or another many of us reach a hiatus in our amateur radio careers, and firing up the rig seems to lack purpose or direction. Others have drifted into specialized areas and have lost sight of the other aspects of our hobby. For some the thrill of instantly communicating across states or continents has paled, and the specter of another name-rig-weather QSO keeps us off the air. However, there is a specialty in amateur radio that can bring back the old excitement, broaden our horizons, and start us in new directions.

Handling traffic is one of the oldest and most enduring aspects of our hobby. It can and does provide a direction and reward found nowhere else. It is the most visible form of amateur radio and has done more for our public image than any other operating specialty. For most citizens it is the *only* positive contact with amateur radio operators and their hobby.

The problem for most of us is where to start and how to painlessly acquire a working knowledge of this specialty. This is the purpose for and reason behind slow-speed nets. In addition to providing a public service, they function as a training ground for neophyte traffic handlers. The primary purpose of these nets is to teach the correct procedures for handling formal, written traffic. Lest the term "formal, written traffic" scare you off, understand it is only a method of writing out messages you will receive.

Slow-speed nets typically operate at speeds of 10–13 w.p.m. and on a frequency in the 80 meter Novice band. Thus, these nets are available to all amateurs regardless of license. The membership of a typical net consists of one third Extra, one third Advanced or General, and one third Novice or Technician class.

The geographic area covered by these nets is normally a single state, but this will vary depending upon the population of the service area. Slow-speed nets have ties with both section and region nets to facilitate the routing of traffic.

*5053 37th Ave. SW, Seattle, WA 98126

Slow-speed nets, like other traffic nets, follow a set routine for each and every session. At the appointed time, the **NCS** (**N**et **C**ontrol **S**tation) begins the session with a preamble. A preamble is nothing more than a short statement of the net function designed to attract new members and to let everyone zero beat on the correct frequency. A cardinal rule of net operation is that the NCS establishes the exact net frequency, and while the net is in session, he is the absolute boss.

A typical preamble goes thus: WCN WCN DE K7NCS WEST COAST SLOW SPEED NET MEETS ON 3702 KHZ AT 0300 UTC X WCN IS A TRAINING NET IN THE PROPER HANDLING OF MESSAGES AND NET PROCEDURES X ALL ARE WELCOME TO CHECK INTO WCN DE K7NCS PSE QNZ QND AR. One of the first things you have to learn is some special Q signals. There are 26 QN signals that are reserved for net use. For example, QNZ means "zero beat my signal." Remember that the NCS is a busy person and doesn't have time to tune around looking for people who are not on his frequency. QND means "the net is directed," and if you have a question or traffic to list, your transmissions must be directed to the NCS. The time for chatter is over until QNF (the net is free).

With these preliminaries out of the way, the NCS will send "ANY QNC?" QNC means "I have a message for all net members." This is the time when the net manager may pass information to the members on the finer points of handling traffic. Next, the NCS will send "ANY RN7 QTC?" This is his call for traffic destined for areas not covered by the net. Those members with out-of-area traffic will check in at this time. A typical check-in would be "DE KR7L QTC 1 CALIFORNIA 2 FLORIDA AR," indicating that KR7L has one message for a destination in California and two bound for Florida. The NCS will acknowledge and have the station stand by until all traffic is listed. He would then come back with something like "KR7L QNY DN TEN FLORIDA WB7ABC AR." This means that KR7L is to drop down 10 kHz and pass his Florida traffic to WB7ABC, who is going to the regional net later that evening. Note that "DN TEN" means down approximately 10 kHz, and that WB7ABC, the receiving station, establishes the exact frequency. The NCS will clear all out-of-area traffic in this fashion by pairing stations above and below the net frequency.

The NCS then will transmit "ANY WCN QTC?" At this time, stations with traffic bound for destinations within the net's service area will check in. As with the out-of-area traffic, the NCS will pair up stations off frequency to pass their messages.

After these functions are underway, the NCS may send "QNA" and begin a roll-call off the membership roster. This is to determine which members are present with no traffic to list. If there is still local traffic to be handled, the NCS may ask these stations, as they check in, to receive it. This expedites the flow of messages and helps to involve all members in the operation of the net.

With members checked in and messages flowing smoothly, the NCS will then send "QNI QTC?" (report into the net and list your traffic). It's at this point that all non-member stations, including yourself, check in. As with all other things in traffic, there is a correct procedure for doing this. Attract the attention of the NCS by sending one letter, such as "M." The NCS will then send the same letter. This is your cue to check in, and you transmit "DE (YOUR CALL) GE QRU AR," meaning "Good evening—I have no traffic." The NCS will acknowledge your QNI, and if you're new to the net, he will ask for your name and location. Receiving this, he will send "WELCOME TO THE NET AND PSE QNI OFTEN." He then picks up the other check-ins.

When all station have checked into the net, the NCS will send "ALL QRU STNS MAY QNX AT WILL." You are then free to leave the net if you have no traffic to send or receive. Stations leaving at this time will acknowledge with a simple GE (Good Evening). Remember that once you check in, even without traffic, you are not

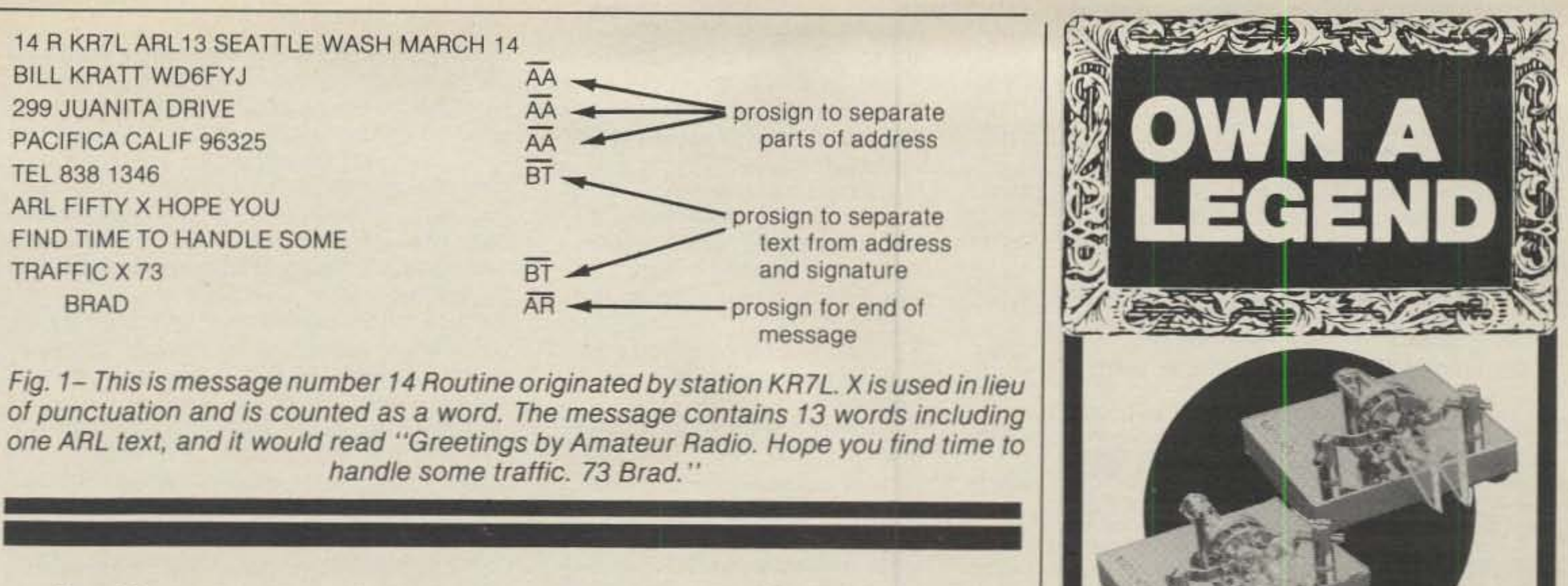


Fig. 1– This is message number 14 Routine originated by station KR7L. X is used in lieu of punctuation and is counted as a word. The message contains 13 words including one ARL text, and it would read "Greetings by Amateur Radio. Hope you find time to handle some traffic. 73 Brad."

Name/Area	Freq. (kHz)	Time (UTC)
Adair Co. Emergency Net (MO)	3712	0000 MWF
Alabama Emergency Net "D"	3725	0100 Daily
Albany Traffic & Emergency Net (NY)	3737	0100 M–F
All Florida Slow-Speed CW Net	3715	0100 Daily
Carolinas Slow Net (NC/SC)	3715	2300 Daily
Colorado-Wyoming Net	3715	0230 Daily
Early Bird Net (Eastern U.S.)	3715	1100 Daily
Eastern Mass. Rhode Island Slow-Speed Net	3715	0130 Daily
Hit And Bounce Slow Net (Eastern U.S.)	3715	1230 Daily
Illinois Training Net	3705	0100 Daily
Indiana Code Net	3708	0015 Daily
Iowa Code Net	3715	0100 T Th Sat
Kansas Slow-Speed Traffic Net	3735	0130 MWF
Louisiana Slow-Speed Net	3703	0130 Daily
Metropolitan ARC (ARK)	3743	0300 Sun.
Michigan Novice Net	3722	0100/2230 Daily
Mississippi Slow Net	3733	0100 Tues.–Sat.
Nebraska Novice Net	3733	0100 Daily
New England Novice Net	3720	2315 Daily
New York Long Island Slow Net	3710	0030 Daily
North Dakota Slow Net	7145	2300 Sat.
Ohio Novice Net	3708	2330 Daily
Santa Barbara Section Net (CA)	3720	0330 Fri. & Sun.
Tennessee Slow CW Net	3710	0000 Daily
Texas Slow-Speed CW Net	3745	0200 Daily
Utah Code Net	3710	0230 Daily
Virginia Slow Net	3705	2330 Daily
West Coast Slow-Speed Net (WA/OR/ID/MT)	3702	0300 Daily
West Indies Net Slow	3710	2300 Daily
West Virginia Novice Net	3730	2315 Daily
Wisconsin Novice Net	3723	0000 Daily
Wyoming Traffic Net	3720	0300 Daily

Fig. 2– A basic list of slow-speed nets. Check into the net in your state or the one closest to you. This will maximize your potential for handling traffic.

free to leave until you are directed to do so by the NCS. The aforementioned net procedure is followed by the West Coast Slow-Speed Net, and the other nets follow a similar procedure.

After checking in a few times, you may want to send a message. The standard message format is shown in fig. 1. Limit your message text to a maximum of 25 words. Use ARL texts whenever possible to save words. Remember, too, that speed of transmission is far less important than accuracy, so send clearly and correctly.

If you check in on a regular basis, you will be asked to receive traffic for delivery in your area. When this happens, give a simple yes or no answer. If it's no, don't give any explanation, as this only ties up the net and delays the NCS in finding a receiving station. If you elect to take the traffic, remember when you QNY, it is the receiving station (you) who establishes the exact frequency and calls the station transmitting the message. After you have received the message, do not be afraid to ask for fills if you missed something. The important thing is to get it all and get is correctly. A message is no good to anyone if words are garbled or parts are missing.

The real payoff in traffic handling is delivery. This is the function that provides good public relations for amateur radio.

QNA*	Answer in prearranged order.
QNB*	Act as relay Between . . . and . . .
QNC	All net stations Copy. I have a message for all net stations.
QND*	Net is Directed (controlled by net control station).
QNE*	Entire net please stand by.
QNF	Net is Free (not controlled).
QNG	Take over as net control station.
QNH	Your net frequency is High.
QNI	Net stations report in.* I am reporting into the net.
QNJ	Can you copy me? Can you copy . .?
QNK*	Transmit messages for . . . to . . .
QNL	Your net frequency is Low.
QNM*	You are QRMing the net. Please stand by.
QNN	Net control station is . . .* What station has net control?
QNO	Station is leaving the net.
QNP	Unable to copy you (or . . .).
QNQ*	Move frequency to . . . and wait for . . . to finish handling traffic. Then send him traffic for . . . .
QNR*	Answer . . . and Relay (or Receive) traffic.
QNS	Following Stations are in the net.* (Follow with list.) Request list of stations in the net.
QNT	Leaving net Temporarily (or for . . . minutes).
QNU*	The net has traffic for YOU. Stand by.
QNV*	Establish contact with . . . on this frequency. If successful, move to . . . and send him traffic for . . . .
QNW	How do I route messages for . . .?
QNX	You are excused from the net.* Request to be excused from the net.
QNY*	Shift to another frequency (or to . . . kc.) to clear traffic with . . . .
QNZ	Zero beat your signal with mine.

*For use only by Net Control Station.

Notes on the Use of QN Signals

1. The QN signals listed above are special ARRL signals for use in amateur c.w. nets only. Other meanings which may be used in other services do not apply.

2. Some QN signals are for use by net control stations only; these are marked with an asterisk(*). Others have slightly different meanings when used by the NCS and net stations; in this case, the meaning when used by the NCS is marked with an asterisk(*).

3. Some QN signals have two meanings, the difference depending on how or by whom used. Examples: (a) QNC, when used as a preface to transmission of a message, carries its first meaning; when used by a station reporting into the net (e.g., W9NCS DE W9NET QNI QNC), it carries its second meaning. (b) QNI, when used by the NCS, is a request for stations to report in; when used by a net station, it means that this station is reporting in. (c) QNJ, when used alone, carries its first meaning; when followed by a call, it carries the second meaning.

4. QN signals are never followed by a question mark, even though the meaning may be interrogatory.

5. Do not use QN signals on phone nets. Say it with words.

6. Use QN signals in nets only. They are not for use in casual amateur conversation.

7. Make frequent use of standard international "Q" signals in traffic nets for meanings not covered by QN signals. Examples: QRU, QRV, QSV, QTA, QTB, QTX, etc.

Fig. 3– A list of QN signals established by the ARRL for Net use. Copies are available from the ARRL Communications Department.

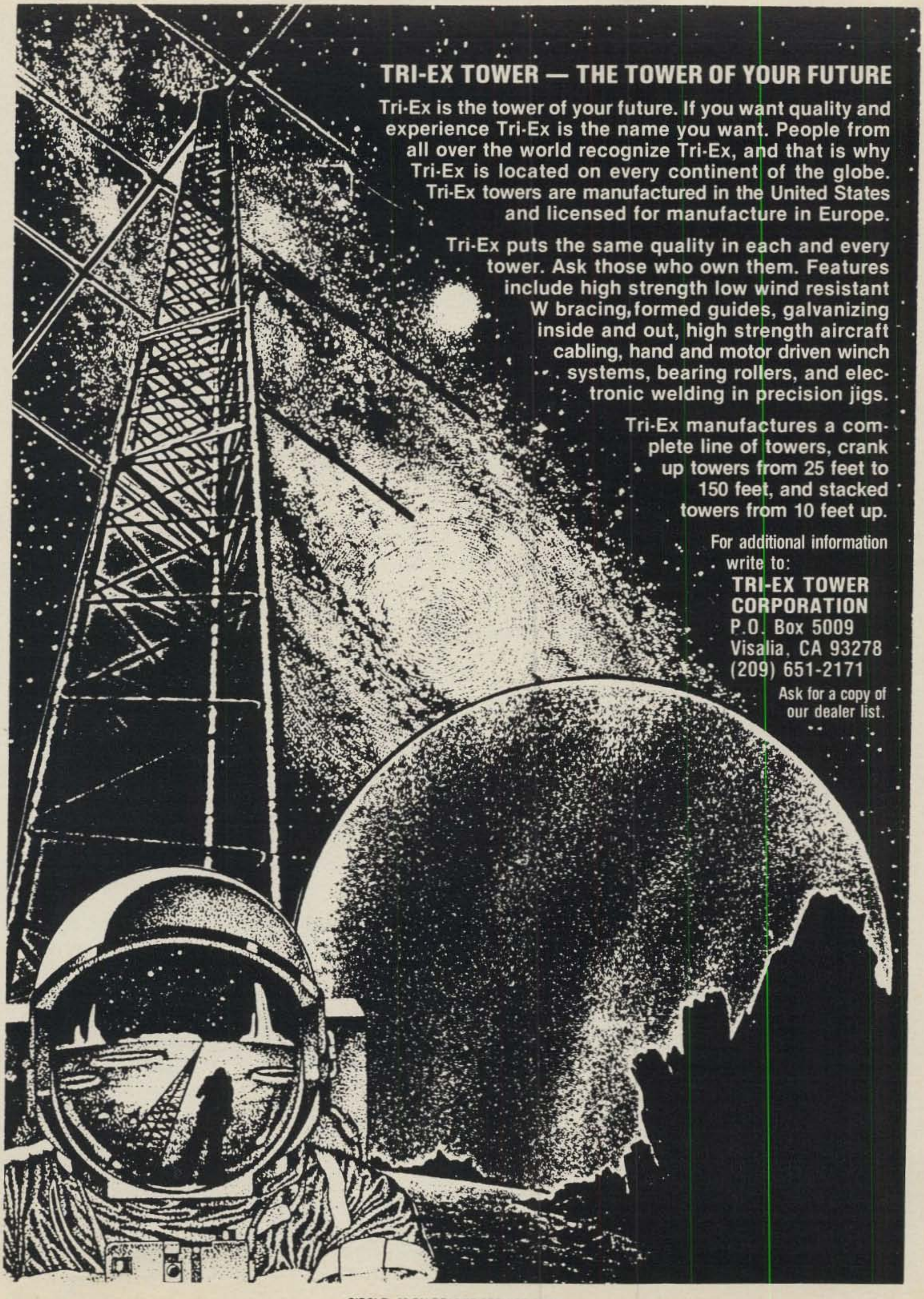
Most of your deliveries will be by telephone. When calling, introduce yourself as an amateur radio operator and state that you have a radiogram for that person. After reading the message, offer to originate a reply and explain that this is a free public service of amateur radio. Occasionally, you will be unable to call the person for whom the message is intended. In this case, copy the message onto an ARRL radiogram form and mail it or deliver it personally. Make every effort to deliver the message in a timely fashion. If I am unable to telephone, I find personal delivery most satisfying, since it provides the opportunity to originate a reply. If you are unable to deliver the message, don't throw it in the wastebasket. Send a message to the originating station advising the reason for non-delivery.

The equipment required to handle traffic is minimal. All that is needed is your rig, a good antenna, pencils, paper, and the willingness to involve yourself. The time required can be as much or as little as you want to make it. Check into the net at least once a week. This will require only 30 minutes of your time every 7 days. If possible, try to check in on the same day each week. As you become more proficient, you may become more involved and start checking into other traffic nets.

Those of you who are contesters or chase DX already possess many attributes of a good traffic handler. You have the learned ability to work stations in spite of QRM or QRN and have a better than average c.w. ability. In addition, you have invested heavily in superior equipment and antennas that maximize your signal.

Since this article is intended only to get you started, you will want to acquire more information. Three publications should be in your library: *Operating An Amateur Station, Net Directory,* and *Public Service Communications.* Send a large s.a.s.e. for each to the American Radio Relay League. In addition, request CD Forms 3 and 218, which list standard ARL texts and QN signals.

So, if lethargy has settled into your keyer or you're growing tired of weather-report QSO's or have nothing to do between contests, consider joining a slow-speed net. You will be involved in one of the most satisfying facets of our hobby, and one which you can share with your family, friends, and community.



CIRCLE 29 ON READER SERVICE CARD

CQ World-Wide WPX/S.S.B. Contest All-Time Records

BY STEVE BOLIA, N8BJQ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be updated and published annually. The method of computing final scores has changed several times since 1957. Data following the calls below are: year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	VE3MFT('81)	84,906	89
3.5	4M3AZC('80)	852,548	262
7.0	FM7CD('83)	2,312,968	412
14	ZY5EG('83)	3,869,828	596
21	HC9A('81)	6,025,770	615
28	ZZ5EG('81)	4,868,780	581
AB	PJ2FR('83)	7,484,994	594

Multi-Operator Single Xmtr.

	VP2EC('83)	15,238,880	820

Multi-Operator Multi-Xmtr.

	NP4A('82)	24,065,600	890

U.S.A. RECORD HOLDERS

Single Operator

1.8	W8LRL('83)	30,654	131
3.5	KI6P('83)	524,356	307
7.0	N6RO('82)	881,886	309
14	K8NA('82)	2,252,688	568
21	AI7B('82)	4,151,232	576
28	N5AU('82)	3,094,249	571
AB	AB0I('82)	4,107,378	578
QRPp	W8ILC('82)	1,044,012	459

Multi-Op Single Xmtr.

	KJ9W('82)	6,168,450	697

Multi-Op Multi-Xmtr.

	AI6V('81)	12,529,608	728

CLUB RECORD
YU DX Club ('81) 41,003,768

WPX (Prefix) RECORD
NP4A('82) 890

QRPp RECORD
W8ILC('82) 1,044,012

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	No Entrant		
3.5	CT3BD('80)	181,412	133
7.0	SM0GMG/CT3('82)	1,021,592	286
14	CN8CY('83)	1,742,569	449
21	EL2AV('81)	4,617,530	557
28	CN8CY('82)	2,947,811	487
AB	CN8CO('83)	3,639,360	544

ASIA

1.8	RA9AKM('83)	7,150	25
3.5	4X4DK('71)	478,950	155
7.0	JA2BAY('82)	611,544	249
14	4X4UH('82)	2,288,646	477
21	4X0U('81)	2,823,916	514
28	4X4UH('80)	2,718,760	440
AB	4X1X('82)	3,932,586	529

EUROPE

1.8	LZ2RF('83)	78,260	70
3.5	DJ4PT('81)	745,216	328
7.0	DJ4PT('82)	1,692,480	410
14	4N3ZV('81)	3,586,240	560
21	OH0BH('83)	3,977,684	501
28	YU3MY('80)	3,530,016	412
AB	Y24UK('82)	6,285,436	586

Multi-Op Single Xmtr.

AF	CT3/OH2BC('78)	4,377,450	385
AS	UK9AAN('80)	11,152,020	660
EU	9A1ONU('80)	13,362,486	723
NA	VP2EC('83)	15,238,880	820
OC	AH2E('81)	8,021,376	528
SA	ZY5EG('82)	8,005,824	556

NORTH AMERICA

1.8	VE3MFT('81)	84,906	89
3.5	K0CS/VP9('82)	679,098	259
7.0	FM7CD('83)	2,312,968	412
14	KP4BZ('83)	2,803,784	584
21	AI7B('82)	4,151,232	576
28	FG0DYM/FS7('80)	3,304,752	484
AB	VP2MRA('83)	5,511,352	616

OCEANIA

1.8	T32AF('83)	16,872	37
3.5	KH6XX('78)	305,080	115
7.0	VK3AKK('82)	380,380	190
14	VR3AH('79)	3,526,153	437
21	VK4QK('80)	2,592,216	396
28	KB7IJ/KH2('82)	4,743,144	504
AB	KH6XX('82)	6,242,967	531

SOUTH AMERICA

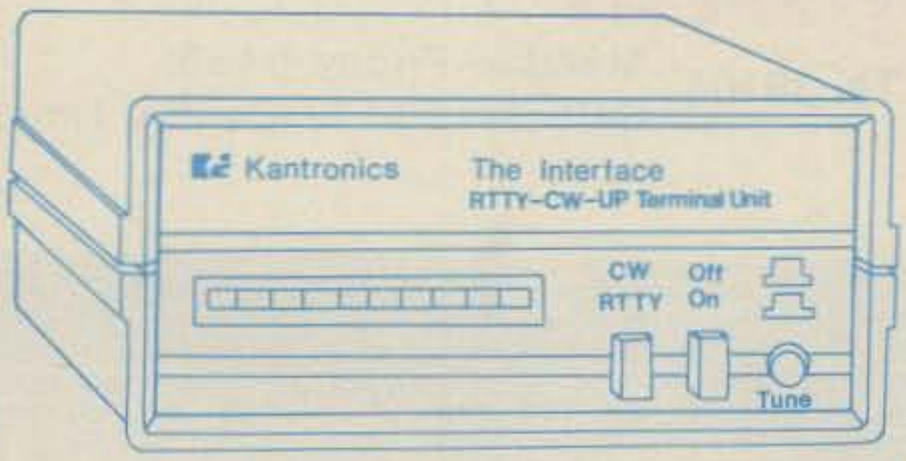
1.8	YV2IF('83)	27,768	52
3.5	4M3AZC('80)	852,548	262
7.0	YY3BQS('83)	1,664,096	323
14	ZY5EG('83)	3,869,828	596
21	HC9A('81)	6,025,770	615
28	ZZ5EG('81)	4,868,780	581
AB	PJ2FR('83)	7,484,994	594

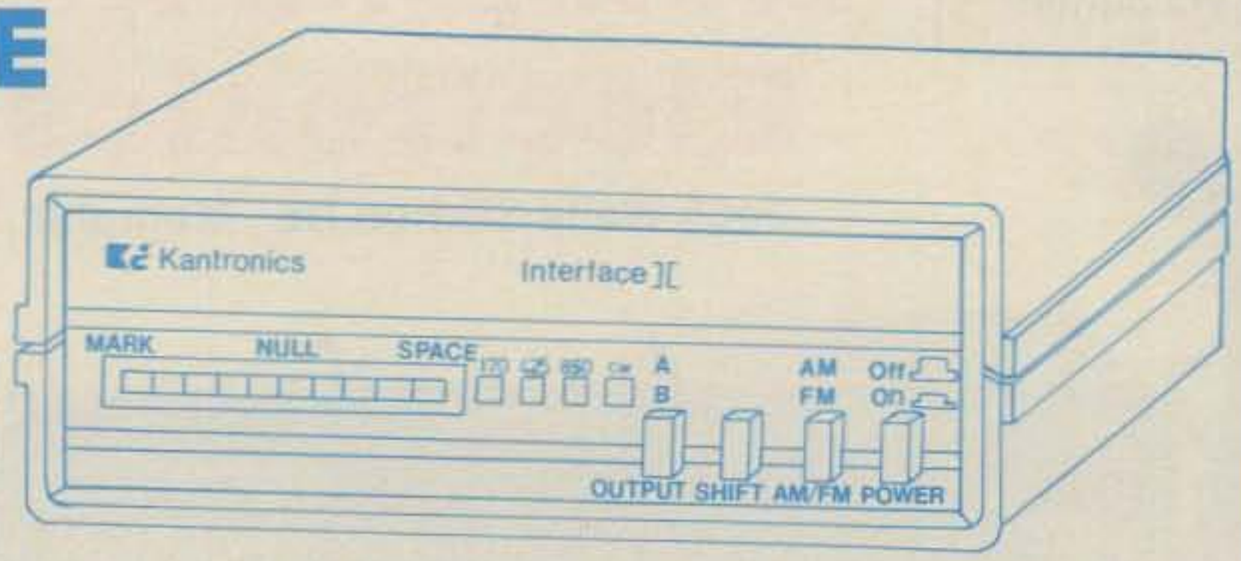
Multi-Op Multi-Xmtr.

AF	9E3USA('69)	2,398,192	296
AS	UK9AAN('78)	10,702,776	532
EU	YT0R('81)	14,378,996	778
NA	NP4A('82)	24,065,600	890
OC	KH6XX('81)	19,345,473	669
SA	ZZ5CA('80)	12,545,616	664

Blueprint for Success

THE INTERFACE





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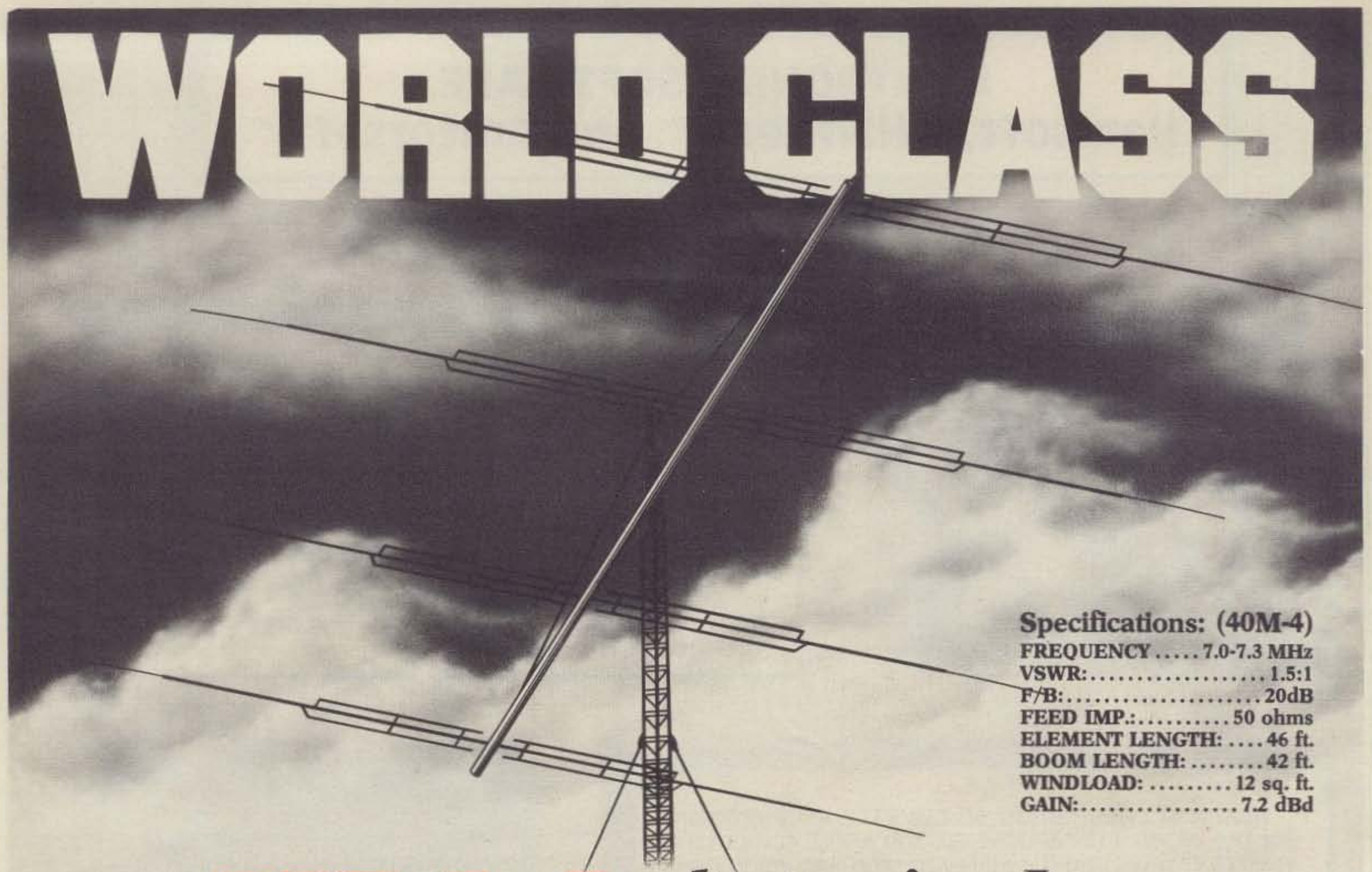

Specifications: (40M-4)
FREQUENCY ..... 7.0-7.3 MHz
VSWR: 1.5:1
F/B: 20dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 46 ft.
BOOM LENGTH: ..... 42 ft.
WINDLOAD: ..... 12 sq. ft.
GAIN: ..... 7.2 dBd

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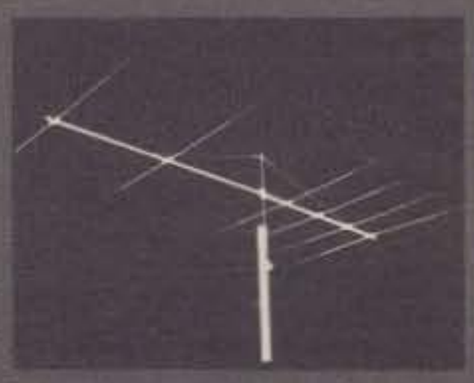
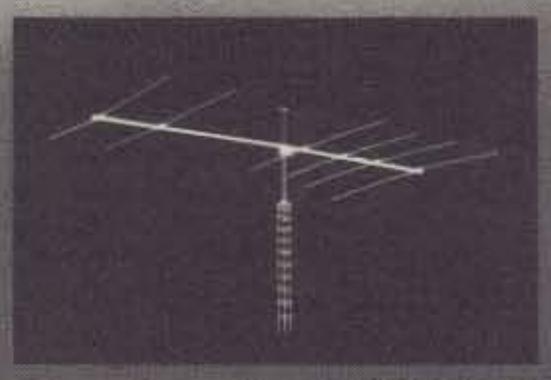
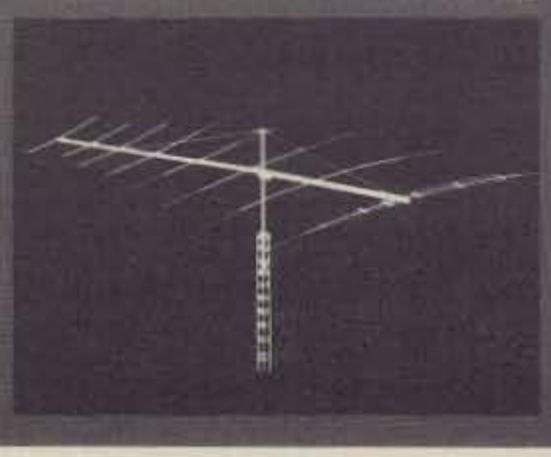


Specifications: (20M-6)
BANDWIDTH: ... 13.9-14.4 MHz
VSWR: 1.5:1
F/B ..... 35 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 37 ft.
BOOM LENGTH: ..... 57 ft.
WINDLOAD: ..... 12.8 sq. ft.
GAIN: ..... 11 dBd



Specifications: (30M-3)
BANDWIDTH: ... 10.1-10.150 MHz
VSWR: 1.5:1
F/B ..... 20 dB
FEED IMP.: ... 50 ohms unbal.
ELEMENT LENGTH: .... 35'6"
BOOM LENGTH: ..... 24'3"
WINDLOAD: ..... 7 sq. ft.
GAIN: ..... 7.0 dB



Specifications: (15M-6)
BANDWIDTH: ... 21.0-21.5 MHz
VSWR: 1.5:1
F/B: ..... 30 dB
FEED IMP.: ..... 50 ohms
ELEMENT LENGTH: .... 25 ft.
BOOM LENGTH: ..... 36 ft.
WINDLOAD: ..... 8.5 sq. ft.
GAIN: ..... 10.5 dBd

Specifications: (7.2/10-30-7LPA)
BANDWIDTH: ..7.2/10-30 MHz
VSWR: ..... 2:1 typical
F/B: 10/15
FEED IMP.: .... 50 ohm unbal.
ELEMENT LENGTH: .... 46 ft.
BOOM LENGTH ..... 42 ft.
WINDLOAD: ..... 12 sq. ft.
GAIN ..... 3/7 dBd typical

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Expedition Trophy winner KC6SZ. Left to right are Yuzoh, JH6SOR; Toshiyuki, JA6VZB; and Taisuke, JR6IQI.

Long-time WPX contester Rich Blaney, KB7IJ/KH2, relaxing after his fine 7 MHz effort. Rich gave many a new country and was number one in Oceania.

First-time WPXer and number two in Oceania on 21 MHz, Moeljo Soehendro, YB2CR.

RESULTS OF THE 1983 CQ WORLD WIDE WPX S.S.B. CONTEST

BY STEVE BOLIA*, N8BJQ

A preview of things to come, perhaps. The 1983 *CQ* WPX S.S.B. Contest seems to signal the start of a downward trend in propagation. During the weekend conditions went from poor early on in the contest to excellent on Sunday. Fifteen meters was the band to be on, with excellent openings to all parts of the world on Sunday. Ten meters was down from last year, but the patient operator still found some much needed prefix multipliers and DX QSO's. Proper choice of operating time was very important for the single ops, as those who used up their 30 hours early missed the super conditions on Sunday. As the sunspot cycle continues going downhill, the 30-hour rule will be more important, as will the extra point credit for working on the low bands.

In spite of the less than favorable conditions for part of the weekend, some outstanding scores were turned in. Rich, N6KT, operated PJ2FR to number one among the single ops and shattered the previous world record by over a million points. Three other world records were set, with Michel, FM7CD, becoming the first to go over 2 million points on 7 MHz, and PY5EG using his special ZY5 prefix to take the world 14 MHz record. After falling short last year, Gordon, N5AU, and Ray, KC5EA, operated VP2EC to the new multi-single record, and they are the first multi-single station over 15 million points. Congratulations to all.

In the U.S., Wally, W8LRL, just edged out Joe, WA2SPL, for the USA 160 record, and N6RO operated KI6P to a new 3.5 MHz record, breaking the oldest USA record. Proving that you don't need a fancy prefix to do well, John, K2VV, lead the USA single ops, beating out KC1F and KR0Y. K5GN borrowed NA5R's station and took home the 28 MHz USA crown, squeezing out over a million points on a band many gave up on. KC2X survived a blown rig to capture USA 21 MHz honors, with AI7B leading the way on 14 MHz. In one of the closest sections, KR2Q just edged out K9MWM/0 by less than 4000 points for 7 MHz honors. QRPer W8ILC took the top all-band honors with KI9A, W6CN, and KH6CP/3 taking 28, 21, and 14 MHz, respectively. For the second year in a row, Gordon's station, N5AU, was a winner in Gordon's absence, this year as the top multi-single entry followed by the Harvey Mudd College group of AJ6O. NA8V used his new call to capture the multi-multi section with AB0I taking second place.

Around the world, YZ1EXY captured the world multi-multi category followed closely by the two Alaska super-stations, KL7RA and KL7IRT, with GB4ANT in close pursuit. Ralf, CE6EZ, proved that 10 meters was not completely dead by running up over 4 million points and easily capturing world 28 MHz honors. OH0BH operated by OH2BH outdistanced all challengers to finish number one on 21 MHz with a new European record. IO3MAU took world 3.5 MHz honors, as did LZ2RF on 160. G4GIR, also known as the QSL manager for 9K2BE, was the world QRPp champion.

In the trivia section, Garry, VE3GCO, operated from two different continents during the contest. Garry was G4/VE3GCO during the early part of the contest and flew home in time to get on the last couple of hours from his home QTH. That's dedication!

This year's Contest Expedition trophy was won by the operators of KC6SZ (JA6VZB, JH6SOR, and JR6IQI), who put the Western Caroline Islands on for the contest. Also thanks to all those who went on expeditions and put in the extra effort to obtain special prefixes for the contest. Ops 4C5AZ, XF0MDX, 3A3WPX, P42J, GU5EOO, and GU5BLG are some who helped to make the contest a success.

Special mention goes to T32AF and YV2IF for putting in the time and effort to put their countries on 160. This was the first year for 160 activity from both South America and Oceania. Now if we could only get some African 160 activity.

Over 100 DX countries participated with well over 1000 prefixes recorded. US multi-multi leader NA8V worked 829 prefixes, with PA2TMS leading the single ops with 670 worked. With the influx of new callsigns around the world, working 1000 prefixes should be possible soon. Please remember to read the rules con-

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cerning prefixes. Many scores were adjusted for taking prefixes more than once or not counting prefixes correctly. Also, the Y's, such as Y23, Y24, and Y25, are separate prefixes, but UK2R, UK2B, UK2G, etc., are not. Although not an FCC rule, remember that if you are operating outside of your normal call area, you are required to sign portable for the contest.

In the odds and ends department, KH6CP/3 was located in Pennsylvania. We are still looking for trophy donors for the S.S.B. and C.W. contests. If you are interested, drop me a line. The updated records are found elsewhere in this issue. KC4AAA was in the contest, but since there is no mail service during their winter, no logs could be sent out.

Many thanks go to previous WPX Contest Director W8IMZ for his invaluable help and guidance. I hope to be able to do as good a job as Bernie has with the WPX Contest. Bernie will still be involved with checking logs and giving advice and assistance. Also thanks to Ron Moorefield, W8ILC, for his help with the log checking. Thanks to my mailmen, who couldn't understand where all the mail came from, but were glad to see it stop. Last but not least, thanks to my XYL, Barb, who puts up with all this.

Next year's contest will be 24 and 25 March 1984. Hope to work you then!

73, Steve, N8BJQ

Random Comments

"My thanks to K4VX for the use of his aluminum . . . *KRØY*. Wish my QSO rates were as high as my TVI complaints . . . *NØBSH*. Biggest thrill was working S79WHW. Had tried three times before the contest to work him . . . *WBØYJT*. Excellent 15 meter opening to Europe on Sunday . . . *AKØM*. First night was a fizzle, but the second night worked three new countries on 40 meters . . . *KAØIQR*. I guess the 10 meter single op guys didn't have much trouble complying with the 18-hour off rule . . . *KQ9L*. Had to stop to go house hunting. Sold this one—have 6 weeks to find new one . . . *KA9JDW*. Lots of weird prefixes . . . *AJ9U*. I had to work almost everyone on back scatter on 10 meters . . . *KK9A*. My first WPX. Had fun . . . *KC9FC*. Despite a lousy antenna and deafening static crashes, I managed to pick up six new countries on 40 meters (up to 76 now) . . . *KB9AW*. Having a pile-up on me for a change instead of someone else. I'll be back in 1984 . . . *KS9U*. Condx never opened to Europe or Asia for Midwest. Disgusting . . . *KE9U*.

"First really good JA run on 15 meters in a contest . . . *N8II*. Sure wish you would change the date of this contest. It falls on my kid's birthday. Have to quit early . . . *KZ8Y*. I am on a new DXer. Biggest thrill was having three new ones call me!! That put me over 100 worked . . . *N8BTU*. Great contest. Would love to have time to operate more than half the contest someday . . . *AI8S*. Really enjoyed WPX contest. Best one I've worked yet. Can't wait till next year . . . *KA8HDR*. Loved it this year. Had trouble finding W/K calls with all the "new" calls . . . *K8DD*. First WPX. Had lots of fun. Conditions not too good, so I want to thank you all for your patience . . . *KU8V*. Can't believe my upstairs neighbor (TVI) left for the entire

Number one on 14 MHz and the new world record holder, Atilano, ZY5EG.

weekend. Hurrah . . . *WA8YTM*. In spite of QRN, the contest was very enjoyable as always. Thanks to all . . . *W8LRL*. Enjoy picking up multipliers, even though DX stations have gone to bed. Keep the 30-hour single op limit. Great Contest . . . *N7RO*. VK and H44 on 40 using only a vertical and barefoot . . . *KC7QY*.

"Just as hard to work out with 50 watts out and whip antennas as with 2 watts out QRPp and 5 el. Yagi . . . *W6YVK/7*. Poor propagation, but still lots of good DX—ZD9, 6W8 . . . *WB7FDQ*. Condx not very good in Arizona on 15m Saturday . . . *KC7V*. My first WPX. Enjoyed every contact . . . *WA7QXH*. Bad condx on 20m on Fri. eve. & Sat. morn. plus rain static killed record attempt . . . *AI7B*. Couldn't even hear the 40m JA stations the boys to the south were running . . . *K7UR*. Terrific conditions to Europe on 15 meters Sunday morning . . . *K6HNZ*. Friday evening was terrible, but Saturday was like someone turned the big switch and said "Let's Contest" . . . *NE6I*. Always a great contest, no matter what conditions are . . . *WB6JMS*. Antenna heading depended entirely on wind direction . . . *W6OKK*. Could only work JA's on backscatter over South Pole first evening . . . *K6SVL*. First contest entered. Lots of fun. Wish I could have spent more time operating . . . *KD6OH*. Excellent condx on 80m to Japan, So. Pacific; very poor to Europe. Good activity both nites . . . *KI6P (op. N6RO)*. Thank goodness I had a computer to work out prefixes, etc. . . . *KC5CP*.

"I had better hire a bass voice! Happened again: "Can the YL come back please?" Hi! . . . *KX5U*. 15 meters started off in terrible shape,

The operating crew of multi-single station HH2WW. Left to right are Chris, NX4N; Austin, N4WW; Michael, KD4FX; and Daniel, N4SA.

but had a great time ragchewing with the locals—Hi! Had a great time in an excellent contest . . . *KV5Q*. When contest was over, I discovered why I couldn't get out—antenna lead broken! . . . *W5RIT*. My first single op phone contest. I think the new call helped. I didn't understand the TT8/DJ5RT call, and I think he regretted calling me . . . *WI4R*. Worked 8Q7AZ. He was calling CQ and nobody was answering him . . . *KCØC/4*. No! I am not in Antarctica . . . *KC4GR*. Picked up 35 new prefixes for my WPX Awards . . . *N4MM*. Very poor conditions. We're definitely on a down slope of sun spot cycle—less than half of last year's score . . . *W4WKQ*. My first WPX. Very enjoyable. Lost 8 hours Sunday due to local thunderstorm . . . *WA4MOJ*. My "rare" prefix attracted no attention . . . *WK4F*. Ten meters was great. Four beams for 10 meters and score was still over 1 million less than last year! . . . *NU4Y*. Finally bagged that JT1 . . . *NO4J*.

"My first try at WPX. Enjoyed what time I had to operate. Will be back next year . . . *NZ4B*. I can't count. I need an AEA Keyer! . . . *N3BJ*. Great propagation the last two hours. The rest was the pitts . . . *WB3DNA*. Worked three new countries; band finally opened to Europe on Sunday, then S-9 snow static near wiped it out for a while . . . *N3AZS*. Just as much fun as last year, but not as big a score. Six new DX to my 40m list . . . *KB3PD*. My CQ's answered by 5N6 and TR8 one minute apart. Not used to being "DX" . . . *KF2O*. With the rash of new prefixes on the air these days, this contest is getting wilder and wilder . . . *WB2QEU*. Worked harder this year for less points. What's gonna happen next year? . . . *KS2M*. Even with no JA opening on Friday night, I worked more JA's this contest than any other I've been in. My rig, apparently overwhelmed at the rate at which it was being used to contact its homeland, couldn't take the pressure and blew up. It cost me 2:28 hours of operating time that night, not to mention $234.84 . . . *KC2X*.

"Condx terrible. Sunday fair. Worked 8Q7AZ through Europeans for a new one . . . *WB2RNT*. Enjoyed being a new prefix for several competitors . . . *KQ2O*. ZB2GR not worked before the contest . . . *KA1EKR*. Next year it's buy, beg, borrow, or steal an amp to make it over the "big guns" . . . *KE1E*. WAC in QRP and 47 countries worked. I have now 95 wkd and 39 cfm in QRP . . . *EA2SN*. Happiness is working CEØAE on Easter Island . . . *VE3MNK*. Near blackout conditions on Friday night. Tuff on QRP! . . . *W9PNE*. College + Contests = fun + poor score . . . *AD2Y*. First WPX with QRP. Score not much different from with 2kw PEP! . . . *W6CN*. What happened to the fabled late-night 10 meter openings? I called CQ for hours, turned the beam to all beam headings, and wound up working two locals after midnight! . . . *KI9A*. High tide carried away the antenna the night before the contest. Had to rescue it from the surf . . . *C6ABA*. Kept our Chinese food warm in the middle of the night on linear power supply . . . *XO7UBC*. Sure missed 10m this year. Thank you *CQ* for the best in contesting . . . *VE6OU*.

"Everybody had a ball with contesting from Haiti. Special thanks to HH2B for use of station and HH2VP for hospitality . . . *HH2WW*. If only stateside would listen their frequency on 40 meters . . . *WL7E*. Operated from Point Barrow, Alaska—northernmost ham station in USA . . . *KL7Y*. Only my second contest. Maybe I'll do better next year . . . *VO1CV*. Woke up Sat. morning to find propagation had returned

TROPHY WINNERS

SINGLE OPERATOR - ALL BAND

WORLD - North Florida DX Assn. Trophy. Won by: **Station PJ2FR; op. Rich Smith, N6KT.**
U.S.A. - Bob Epstein, K8IA Trophy. Won by: **John Yodis, K2VV.**
CANADA - Garth Hamilton, VE2VY Trophy. Won by: **Maxwell Stagg, VO1CV.**
CARIB./C.A. - Ray Alea, KC4OV Trophy. Won by: **Station VP2MRA; op. Douglas Renwick, VE5RA.**
EUROPE - Bernie Welch, W8IMZ Trophy. Won by: **Station GB4DX; op. Chris Pedder, G3VBL.**
JAPAN - Palm Garden Radio Club Trophy. Won by: **Toshirou Ogino, JI1QPU.**
SOUTH AMERICA - Ron Moorefield, W8ILC Trophy. Won by: **Alberto Liavia, 4M3AZC.**
WORLD QRPp - Dayton Amateur Radio Assn. Trophy. Won by: **I.C. Frith, G4GIR.**

SINGLE OPERATOR - SINGLE BAND

WORLD - John N. Reichert, N4RV Trophy. Won by: **Ralf Ulricksen, CE6EZ.**
U.S.A. - Richardson Wireless Klub Trophy. Joe Johnson, W5QBM Memorial. Won by: **Stephan Sacco Jr., KC2X.**
U.S.A. 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Douglas Zwiebel, KR2Q.**
U.S.A. 21 MHz - Ted Pauck, Jr., K8NA Trophy. Won by: **William D. Johnson, KV8Q.**
CANADA - Gene Krehbiel, VE7KB Trophy. Won by: **James Bearman, VE5DX (7 MHz).**
EUROPE - Myron E. Crofoot, WB4VQO Trophy. Won by: **Jan E. Holm, SM2EKM (21 MHz).**
JAPAN - Ken Ruddock, K6HNZ Trophy. Won by: **Ichizo Kitade, JA2APA (21 MHz).**
WORLD 21 MHz - Lee Wical, KH6BZF Trophy. Won by: **Martti Laine, OH8BH.**
WORLD 7 MHz - William Diggins, WA8LXJ Trophy. Won by: **Michel Brunelle, FM7CD.**
WORLD - 1.8 MHz - Arch Doty, Jr., K8CFU/4 Trophy. Won by: **Kosta Kozarev, LZ2RF.**

MULTI-OPERATOR SINGLE TRANSMITTER

WORLD - Mike Badolato, W5MYA Trophy. Won by: **Station HH2WW; oprs. KD4FX, N4SA, N4WW, NX4N.**

MULTI-OPERATOR MULTI-TRANSMITTER

WORLD - Henry Thel, VE7WJ Trophy. Won by: **Station YZ1EXY; oprs. YU1PKC, YU3TCA, YU1UU, YU1OYA, YU1EW, YU1PAW, YU1PKB, YU1FW, YU1RL, Lily, Dragan, Mira.**
U.S.A. - Burt Curwen, KL7IRT Trophy. Won by: **Station NA8V; oprs. AD8R, AJ8K, K8CC, K8GL, K8LX, K8MU, K8QKY, NA8V, W8LVN, W8TA, W8UA, WA8YVR.**

CONTEST EXPEDITION

WORLD - Northern Ohio DX Assn. Trophy. Won by: **Station KC6SZ; oprs. JA6VZB, JH6SOR, JR6IQI.**

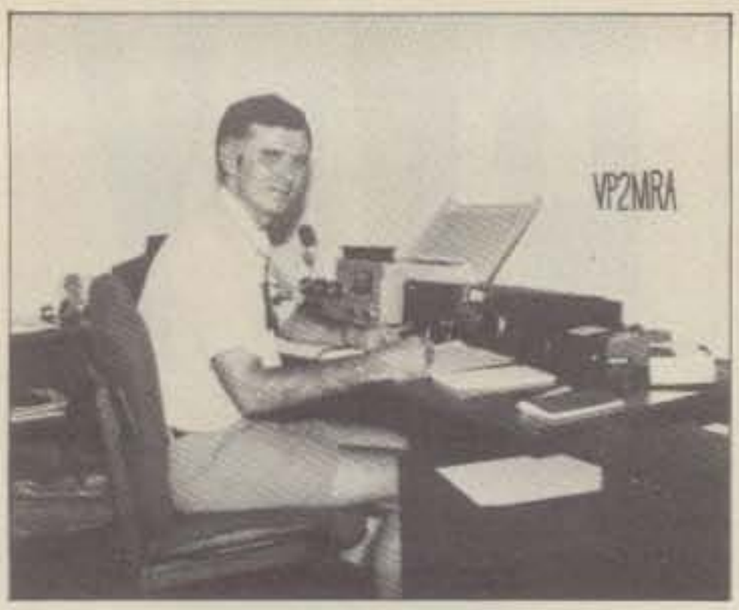
(The WORLD Club Competition Trophy and the **U.S.A. Club Competition** Trophy winners will be announced with the C.W. results, as each is a combined S.S.B. & C.W. award.)

. . . *VE4CCC*. Last year 800-plus DX QSO's on 10 meters. This year 110! What happened? . . . *VE3KOY*. My first ever contest. Had a ball, even got 8 new countries. Hi! . . . *VE6BBP*. Forty meters is alive and well . . . *VE5DX*. Guantanamo Bay stations have International Phone Band privileges. I really appreciate the number of VE's who broke in to tell me that I was in the Canadian phone band. Several stateside stations took the risk, too . . . *KG4CD*. Nothing funny here. QTH in a valley ringed by mountains. No propagation anywhere . . . *K3UOC/PJ6*. Worst conditions I have known for this contest . . . *VK3SM*. Condx down here were very poor . . . *ZL1AXB*. The broadcast stations always follow me! Maybe I am a good BCL? . . . *YB2BOT*. A great thrill working alot of old friends . . . *KH6BZF*.

"My first contest. A bit confused at first, but thoroughly enjoyed it. Wish I had more time to operate, but contest time cut short by family affairs that weekend . . . *DU1TV*. It was fun . . . *YB1BG*. Condx on Saturday were pretty miserable . . . *VK6JS*. First time to make 1M! Great . . . *DU1CPL*. Couldn't believe how bad bands were. Sure felt like VK as hardest hit by flare. Happy to work so many QSO's anyway . . . VK2WU. Very poor propagation . . . *J28DM*. Last contest for me as CN8CO. Will be going to Egypt, so hope I can put W3EMH/SU on from CAiro next year. QSL Mgr. is WB3KGY . . . *CN8CO*. Working A22 at last. Very good contest and exceptional condx on all bands. Some nice rare stuff on this year! Thanks for nice contest fellas. P.S.: 10m still lives! . . . *ZS6XD*. Those stories about linears breaking down during a contest are true . . . *ZS6BRZ*. No luck with low power and a dipole . . . *W3KHQ/ZS*. I will start to be a prefix hunter . . . *LU1ABT*. Sorry, I was a little bit sick on my contest. Next year will be better . . . *4M3AZC*.

"Thanks for all the nice new state-side prefixes that made the bulk of my score. The large number of available multipliers makes this contest one of the most fascinating . . . *CE6EZ*. Poor band conditions. Nice to see so many prefixes . . . *LU2X*. The operators were all novices and it was their first contest in order to gain experience . . . *LU4AA*. I'm only 17 years old so I'll keep trying. First hours were terrible: we couldn't hear a sound on 14 MHz . . . *CQ1BKW*. It's a beautiful contest thanks to the rare prefixes . . . *EA1CIM*. Very bad conditions on 28 MHz this weekend up here in the northern part of Sweden . . . *SM2NTU*. Sunday conditions very good! Even struggling with very low and inefficient antennas was able to work some interesting prefixes . . . *G3TXF*. March 26 in Cambridge, England on a holiday. Tks to G3XTT and G3ZAY for great hospitality. March 27 I went home and spent last hour of contest on from VE3GCO . . . *G4/VE3GCO*. Working CR9 on 10m and XO7WJ on 40m . . . *PA2TMS*.

"I'm a 22-year-old medical student who likes electronics, contests, DXing, and computers, as well as building antennas and practicing Judo . . . *IO6NOA*. Pleased to work Russian Antarctica plus two new countries for me.



Doug Renwick, VE5RA, operated station VP2MRA to the new North American S/O AB record and number three in the world.

G4/VE3GCO, Garry, operating from the shack of G3XTT. Garry made it home in time to get in a couple of hours from his home QTH as well. Maybe next year Garry will try for three continents in one weekend!

Disappointed at poor conditions on 28 MHz . . . *GM4GPN*. Bad start of contest because of poor condx. Sunday fairly good . . . *DL8PC*. Nice contest. Thank you! . . . *OH6CS*. Nice condx to Japan. However, vy few stations from the USA. All in all a nice contest . . . *OH2BUU*. Where were the W's?! Poor conditions to USA, but I made my own record. JA condition very good and many VK's rescued the contest. Found "Indian English" very good in contests. Age 22, licensed in 1978. Thaks and 73! . . . *OH3RF*. Next time I'll have a directive antenna! Stateside was not enough looking to EU frequencies. They did come FB, but not one QSO to USA. Anyway it was a FB contest. Tnx . . . *OH3WS*. My first entry for *CQ* WW WPX S.S.B. contest, but not the last. See you in the coming years with more success . . . *YU2OO*. Hope to be better next year! Lot of fun! Forty is the band! . . . *LZ3B (op. LZ1JY)*.

"Bad condx. Ten meters opened first to US Sunday evening 1300Z, but very weak signals hr. Best ears: K4CG. Best signal: NA5R was 59 from 1630–1930 and most of the time only audible U.S. stn! Best DX: JT1AO, 4S7RR, P29NPL, 5H3BH, D44BC (TT8/DJ5RT outside of contest) . . . *OZ1FTE*. Thanks for nice contest in bad conditions . . . *OK3LZ*. I got new country—5Z4. Only a few contacts through TVI . . . *OK1DVK*. The paperwork has probably spoiled the enjoyment of contesting. Anyway, we still believe that the WPX is the best contest of the year . . . *IZ4ARI*. This is a special-event station representing the 35th anniversary of the foundation of the Hungarian Technical Sport Association . . . *HG35HA*. Very poor propagation between USA and HB9 the first day. We had more chance with JA's. The second day it was better . . . *HB9CIP*. Forty meters closed the first night across Atlantic Ocean, good signals on 15 meters with the Far East. Ten meters only opened for 5–6 hours during all the contest . . . *IY4FGM*. Great fun was had by all the club members who took part—a few mistakes but nothing terminal! CU AGN in '84! . . . *G3AHD/A*.

"This was our first time in this contest. I like it very much, so until next year . . . *PA3CPG/A*. Propagation on first day on 21 MHz relatively poor. In fact, no propagation to N. America. Second day picked up. Enjoyed the contest . . . *8Q7AZ*. Thanks for the good contest! . . . *JH3GRE*. I got 7 countries for DXCC in this contest. Very good contest . . . *JA@VHI*. This is first DX contest for me . . . *JF2XHR*. My working condition is poor, but I'm glad that I could contact with some rare DX stations . . . *JH@WGN*. I was disappointed that the propagation between Japan and North America was the worst. My fun is to work with US stations . . . *JA1CQT*. To my great sorrow, I couldn't contact HZ1AB and TT8AD . . . *JF2LEX*. Daffodils on the bank are out in the spring wind. Good luck in the Contest! . . . *JN1QWG*. Last year I operated this contest from KN6M, this year I operated from home. It's fun . . . *JH3DPB*."

STATION OPERATORS

MULTI-OPERATOR SINGLE TRANSMITTER

N5AU: K5ZD, KM5X, K5MR, K5FUV, WB5VZL. **AJ6O** & N5FA, AA6RX, WA6OTU, KE6EL. **KW8N** & N8ATR, N8DMM, KC8MK, KC8XK, W8CAR, N8EDE, N8DCJ, WD8IJP, KA8KPS, N8DIU, KV8M. **KB1H** & K9ZO, K1AS. **AK6A** & N6ADI, N6VR, WB6TNB, KB6PE, KA6VOY, KA7EST. **N3GB** & WB3JRU. **KK5I** & N5CG, N5MF, K7CW, KD5BJ. **KR9A** & KC9YD, AI9F. **KB2MG** & KA2MNJ, KC2RG, WA2UYY, KA2DLE, N2AZM, KA2MYJ, KA2IFM. **NS6G** & KA6LAF, AA6T. **W2AZO** & N2ECD. **W7DG** & Club. **KM@P** & KM@R, W@HBH. **KB8UF** & N8CNT. **KK2E** & N2CMO, KA2MDZ, KK2P, WB2ENW, WB2QEL, WA2URT, K2NQ, WB2RYU, KA2BPD, N2DMO. **KD8AX** & KD8BB, N8ECH, KC8GV. **W9JOO** & WA9PKL, KA9HYH. **NC6H** & N7NR, ND6U, KA6FBI. **KS9O** & KA9DVY, KA9HHC, KC9XM, N9BZR, WA9RSD, WD9AWN. **KM1P** & KA2AJZ. **AC@E** & XYL, KA@CFI, N@CPC. **KB7B:** K7LXC, K7HBN, KC7RN. **VP2EC:** N5AU, KC5EA. **HH2WW:** NX4N, N4SA, KD4FX, N4WW. **VE1DXA:** VE1AI, VE1AIH, VE1CEG, VE1MX, VE1YX. **VE6OU** & VE6WO. **XF@MDX:** XE1LCH, XE1MMD, XE1OX, XE1VIC. **VE2UMS:** VE2PD, VE2DRN, VE2FTU, VE2GFS, VE2GDZ, VE2GFH, VE2FKD. **VE6CAW** & VE6CCO, VE6CQG.

C6ABA & N7DF. **XO7UBC:** VE7DES, VE7CXG, VE7CMK, VE7ACY, VE7FJE, VE7CXN. **WL7K** & KL7BV, KL7WF, KL7RS, N7CR. **JG1ZUY:** JG1ILF, JG1IMM, JI1QOI, JA6-9330. **JY8KG** & JY8QL, JY4TJ, JY5MB. **JA1YNE:** JA1CG, JA1VNA, JR1QQG, JF1OKX, JE1KBG, JA2UGX, JR2BJE, JA4WWO, JA5QEY, JA6QJG. **JA1YFG:** JL1OLH, JH4CQO, JI1JMH, JN1RNX, JK1VCZ. **JA7YBJ/7:** JR7EFI, JR7MPT, JE7HEG. **JH3YJM:** JA3BAG, JA3XGF, JR3EOI, JF3NKA. **JA6YDH:** JR6GHN, JR6PKJ, JR6KDI, JR6QHK, JR6QPB, JE6PSL, JE6VFJ. **JA@YCR:** JH@NOS, JH@NLB. **JA@YCV:** JH@WGN, JH@NZN. **JA3YCT:** JJ3QXW, JK3FXK, JK3JTJ. **IZ4ARI:** I1YUM, I4EAT, I4JBJ, I4JMY, I4KDJ, I4VSC, I4YNO, I4YSS, I4ZNN. **IK5BAF** & I5SDG, I5MXX, I5MPN, I5MPK, I5NPH. **TO@FF:** F6CTT, F6BDN, F6EPY, F6HRP, F6IIR, F1DDA. **HG5A:** HA5FM, HA5FN, HA5GF, HA5OM, HA5UA, HA5ML, HA5WE, HA7SU. **HG35HA:** HA6ND, HA6NN, HA6NF, HA6NQ, HA6OQ, HA6NY, HA6ON. **HG6V:** Simon Laszlo, Suszter Laszlo, Varga Geza, Laki Lajos, Macsuga Gyozo, Makrai Istvan. **CT2FH** & CT2EO, CT2FA, CT2FK. **LZ5Z:** LZ2CJ, LZ2AB, LZ2KB, LZ2SC, LZ2WF, LZ2KK, LZ2DB, LZ2VP. **OH8AA:** OH8MA, OH8MV, OH8PF, OH8UT, OH1AYK, Esa, Pekka. **YT3M:** YU3TPZ, YU3TOR, YU3TFY.

SL@ZG: SM@AJU, SM@DJZ. **LG5LG:** G3UKS, G3SJK, G4JVG/SM@. **I09AF:** IT9AF, IT9WPO, IT9AUA, IT9UJU, IT9AJZ, IT9RYJ. **Y44ZI/P:** & Y21JI, Y44XI, Y24RK, Y26DI, Y31WI. **HG1Z:** Biczo, Fersztl, Borsai, Tarsdy, Gosztolai, Tiszalefiu. **DL@JK:** DK2XX, DK6FT, DK8ZL, DF2RK, DF2ZN, DL9FAX, DL1FBV. **Y33ZB** & Y33XB. **HB9CIP:** HB9ALM, HB9AUS, HB9BLQ, SWL's HB9MWD, HE9ASD. **!09KZW** & IT9HLO, IT9FXY, IT9PFV, IT9ZWG, SWL's Dino, Adulio & Giuseppe. **TO6KAW:** F6GWV, F6IFR, F6CWN, F6BBO, F6DZS, F6GIF, F6FLV, F6GDK, F6BPX, F6HMO. **YT3T:** YU3TUX, YU3EIJ, YU3DRW. **HG8U:** HA8UI, HA8UB, HA8GB, HG8VF, HA8ZB, HA8ZC. **G6CW:** Club Station. **IY4FGM:** I4UFH, I4TJE, I4IKW, I4UYL, IW4ANG. **SM7KIL** & SM7FJE. **Y54ZA:** Y54TA, Y54UA, Y54VA, Y45SA. **G3AHD/A:** G4JJE, G4LKH, G4CVZ, G6UTZ, G3WOH, G3YBH.

OH2BAH & OH2FR, OH2BAO. **GB2WPX:** G4EOF, G4GEE, G4IAQ, G4IAR, G4JCH, G4JOH, G4NPX, G6ELH, G6NCH. **Y27FN** & Y45RN. **ED6MDX:** EA6MQ, EA6MR, EA6JW, EA6KZ, EA6JZ. **DA2ER** & DL2GA. **EI7DJ:** EI8AU, EI8DK, EI6AK, EI3BK, EI8EI, EI6BA, EI3EC, EI1CS. **SM6CVT** & SM6LGW, SM6LRR. **HA7KSR:** HA7PQ, HA7SH, HA7PL, HA7SQ, HA5OV, HA7UG. **OK1KUR:** Club Station. **DL@RC/A:** DF3KJ, DL9KAH, DL1KBB, DL5KAT, DL2QB, DL4KE, DL8KAU. **LA4O:** LA6EV, LA8UU, LA@BS, LA9HW. **TO8WE** & F6KSW. **ED3SCB:** EA3BOW, EA3BOX, EA3CVA, EA3DDU, EA3CWQ. **DK3QJ** & DL5MBY. **OK3KFF:** OK3CQW, OK3CPN, OK3CNC. **HA@KDA:** Szabo, Hernyak, Gergely, Kover, Balogh, Jonas. **YU2CBM:** YU2RTW, YU2OO, Rolando, Semsudin. **LA2Y:** LA6SCA, LA3FX, LA6WCA, LA4MY, LA1HZ. **OK3KJF:** Club Station. **4N@ATC:** YU2FM, YU2LEL, Dumanic, Domacin, Zekic, Jukovic. **OK2KYC:** Club Station. **HA4KYH:** HA4XX, HA4YO, HA4YQ, HA4YK. **YO8KOD:** YO8CAR, YO2CHI, YO8DDP. **Y32ZK:** Y32VH, Y59YH, Y67VH.

SK6CM: SM6COZ, SM6EOI, SM6IHF, SM6NWL, SM6NWM, SM6OID. **LZ2KBA:** Nickola, Kiril, Veliko Nikolov, Veliko Tirnovo. **Y37ZB** & Y37WB, Y37SB. **YU2BST:** Ivan, Ratko, Nikola, Sinisa, Damir. **OZ5EDR:** OZ1BMA, OZ1CKG, OZ1EDE, OZ1EMW, OZ1ERY, OZ1EYZ, OZ1EZB, OZ2VB, OZ3QN, OZ9SN. **HA3KNA:** Antal, Jozsef, Janos, Laszlo. **OK3KRN:** Club Station. **YU7AJD:** YU7ORS, YU7MGL, Sasa. **OK3KAW:** Club Station. **PI1G0E** & Group. **ON6RM:** ON5CC, ON6XN, ON5SV, ON4XM. **OK1ONC:** Club Station. **HA5KHE:** Lajos, Imre. **OK1KIR:** Club Station. **HA5KFV:** HA5FA, HG5XW, HG5XF, HG5VZ, HG5XA. **DL@TS:** DF9OW, DG4FBG. **OH7AI:** OH7KA, OH7HM, OH7EU, OH7EY. **OK1KPA:** OK1ZL, OK1MHI. **PA3CPG/A** & PA3CPI.

OH2BIF & OH7CO. **YO8KGE/NT:** YO8CMB, YO8CMA. **YU4CBC:** Club Station. **OK1KFB:** Club Station. **LZ1KRB:** Stefan, Minko, Stefan. **OK1KMP:** Club Station. **OK3RMW:** Club Station. **OH3BU** & OH3BJ. **KC6SZ:** JA6VZB, JH6SOR, JR6IQI. **VK2WG:** VK2PMM, VK2DUS, VK2PQQ, VK2PNQ, VK2PLK. **LU4AA:** LU1ANG, LU2AAP, LU1AYC, LU1CLA. **ZY1NEZ:** PY1NEZ, PY1NEW. **PY4HH** & PY2NYS. **UK7PAL:** UL7PAE, UL7PBI, UL7PBY, UL7PCZ, UL7PEZ, UL7-023-158, UL7-023-434, UL7PAO. **UK9FER:** UA9FDW, UA9FAR, UA9FAL. **UK7LAA:** UL7LER, UL7LEN, UL7LDK, UL7LCA. **UK9CAE:** UA9-154-365, UA1TAC, UA9CPB. **UK9ADT:** UA9AKI, UA9ALP, UA9AOA, UA9-165-930. **EK9D/@:** UA9CJK, UA9COO. **UK9HAD:** E. Kiriushkin, I. Dorofeev, I. Poluektow, W. Wolf, L. Mukhin, A. Iwanow. **UK@SAZ:** UA@SCP, UA@SLM, UA@124-7. **UK9XAN:** UA9XEN, UA@-090-426, UA9-090-569.

UK@AAT: UA@ADF, UA-0-103-142, UA-0-103-257, UA-0-103-57. **UK8MMM:** Club Group. **UK9AEX:** UA9AAM, UA9BQ, RA9AMO. **UK9ADS:** Oleg Kravets, Alex Vydrenkov, Valery Vinakov. **UK@SAB:** UA@SMN, UA@-124-565, UA@-124-566, UA@-124-592, UA@-124-596. **UK9FFF:** Club Station. **UK9CAC:** Alex Revin, Konstantin Popov, Vadim Vorobjev. **UK9OAE:** Club Group. **UK2RDX:** UR2RRJ, UR2OD, UR2RRR, UR2RNA, UR2RNJ, UR2RNX. **UK4FAV:** UA4FBL, UA4FCM, UA4FDY, UA4FER. **UK2BBB:** UP2PX, UP2BAS, UP2BBB, UP2BKW, UP2-038-892, UP2-038-1053. **UK2PCR:** UP2BBT, UP2BDF, UP2BFI, UP2PAV, UP2BFN, RC2ICC, UP2-038-1541, UP2-038-1050, UP2-038-1600. **UK2PAP:** UP2OX, UP2PAQ, UP2BIL. **UK3ABO:** UA3AMB, UA9CBO, UA3APF, UA3-170-339, UA3-170-559. **UK6HCZ:** UW1FC, UA6HKP, UA6-1082527, UA6MJV. **UK4ABW:**

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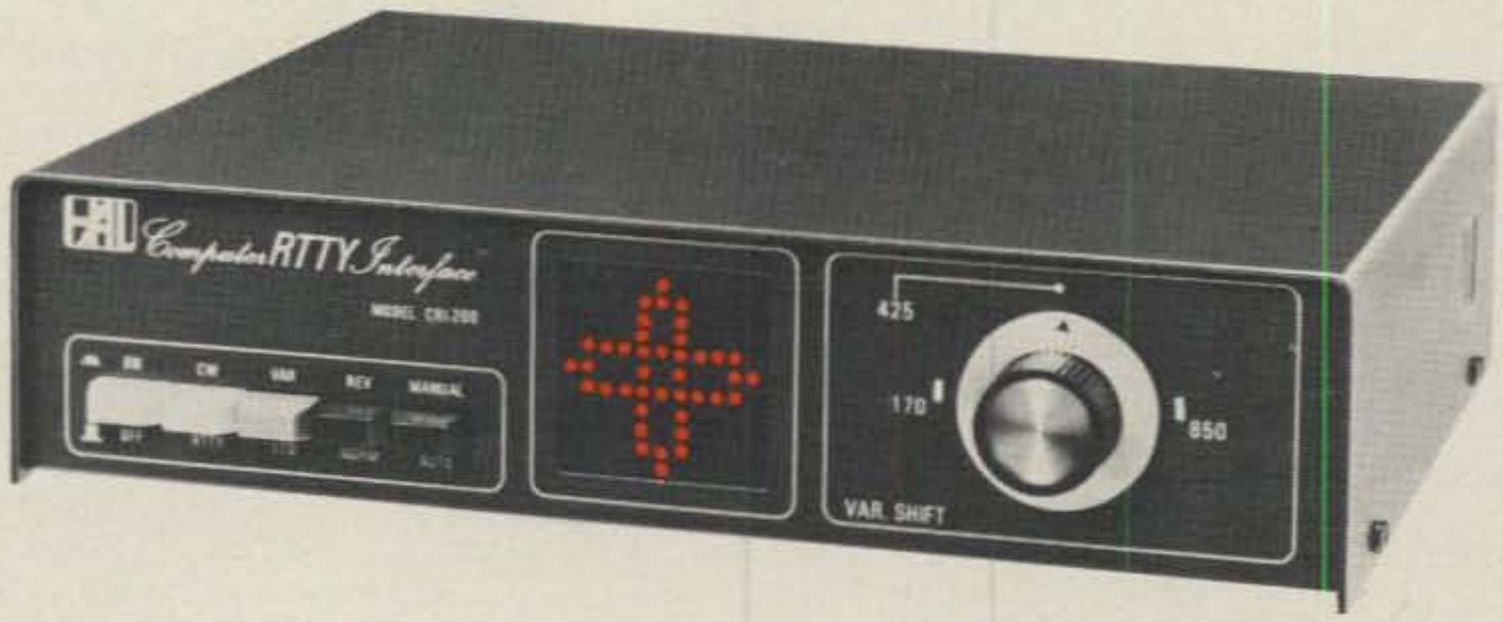

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- 800 Hz CW receive input filter (700–1000 Hz int. adj.)
- Plus or minus CW Key output to transmitter
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- AFSK transmit tones AND FSK output
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ALL BAND

K2VV	**3,262,460**	AI6V	1,851,147
KC1F	2,821,248	NE6I	1,847,408
KR0Y	2,705,728	KQ8M	1,805,859
N8II	2,585,061	KO8T	1,477,408
K6HNZ	1,904,430	K4CG	1,421,319

SINGLE BAND

28 MHz

NA5R	1,283,722
NU4Y	689,320
KT4W	503,084
WB7FDQ	418,440
K6SVL	308,460
NN6U	302,400

21 MHz

KC2X	**1,948,545**
KV0Q	**1,675,242**
AA5B	1,433,175
NO4J	866,866
KU8V	676,860
WB6FCR	649,876

14 MHz

AI7B	1,140,669
N4ZC	985,320
W8LU	841,563
KC0MB	313,966
WB7WQE	293,795
K3ND	126,800

7 MHz

KR2Q	**292,608**
K9MWM/0	288,864
K7UR	238,944
AG9S	221,844
KM3T	214,124
K8NA	212,544

3.8 MHz

KI6P	524,356
KJ9D	155,856
WA4FBH	100,536
N4OH	96,960
KU8E	93,248
KB5FU	92,876

1.8 MHz

W8LRL	30,654
WA2SPL	29,040
AA4MM	11,800
K1KNQ	6,466
WA9EYY	1,944
KA7AUH	1,040

QRPp

W8ILC	A	199,750	KI9A	28	8,791
W9PNE	A	60,006	W6CN	21	88,624
AD2Y	A	41,416	KH6CP/3	14	84,667

MULTI-OPERATOR SINGLE TRANSMITTER

N5AU	5,039,356	AK6A	1,765,808
AJ6O	3,224,276	N3GB	1,461,200
KW8N	2,554,375	KK5I	1,152,438
KB1H	1,804,377	KR9A	755,420

MULTI-TRANSMITTER

NA8V	**7,686,488**	K5LZO	2,754,040
AB0I	5,614,500	KC8XK	50,568

UA4-156-654, UA4ABS, UA4AIZ. **UK6LCB:** UA6-150-1070, UA6BEN, UA6AUN, UA6-150-1103. **UK4WAB:** B. Baranov, A. Enovtaev, N. Blinov, A. Klepawov. **UK3DBG:** I. Morozov, V. Brook, G. Voronin, A. Egorov. **UK2AAW:** UC2ACF, UC2AFE.

UK3GAF: UA3GDJ, UA3GEM, UA3GGQ, UA3-137-50. **UK3DBV:** UA3DFO, UA3-142-1762, UA3-142-1770. **UK6LAZ:** UA6LCQ, UA6LBE, RA6LAG, UA6-164-271. **UK4HBB:** UA4HFG, UA4HKQ, UA4-133-237. **UK5OAA:** Lilian Barbu, Pavel Terletschy, Vadim Kijsik, Bob Checir. **UK4CBL:** Serge Kondalov, Alex Usachov, Serge Evdokimov. **UK2ABC:** Igor Getmann, Roman Sologub, Wladimir Sheleg. **UK3YAM:** Alexander Belevantsev, Alexander Ilyushin, Valentin Kurkovsky. **UK5EGJ:** Alex Bojko, Nick Bojko, Oleg Kedrov. **UK5ICX:** Club Group. **UK1AAW:** UA1-169-2023, UA1-169-1843, UA1-169-2008. **UK3DAU:** UA3DRB, UA3DRC, UA3DJN. **UK2BCC:** UP2BHK, UP2BJK, UP2-038-1656. **UK3ABJ:** UA3AQA, RA3AMD, RA3ACR. **UK4WAP:** Vlad Kuznetsov, Rinat Sattarov, Dima Labygin, Azgar Zakirov. **UK6LWW:** Igor Sushchenko, Andrey Antonov, Alexandr Golzov. **UK3DBW:** Club Group. **UK2AAG:** UC2-009-756, UC2CFZ, UC2-009-490.

UK3DBF: Andrej Troitskij, Oleg Mahotkin, Vyacheslav Nechaev. **UK2AAP:** Jim Mancevich, Vlad Artushin, Max Slobodsky. **UK6HBK:** UA6-108-1703, UA6-108-1664, UA6-108-1620. **UK3TCJ:** UA3-122-1363, RA3TFO, UA3-122-1324. **UK3SAC:** Igor Golubev, Dmitry Moskalenko, Viktoriya Kravets, Trina Barrukova. **UK1OAP:** Club Station. **UK1NAP:** Nick Ivanchikwv, Alex Khatskevich, Serge Titov. **UK1OAZ:** Club Group. **UK5MCO:** UB5MRO, UB5-059-11. **UK2PAT:** UP2BCW, Vytas, **UK4HBU:** Club Station. **UK2RAQ:** V. Varjo, T. Suss, E. Liivrand. **UK4CAC:** RA4CKU, Pavel Vasenkin, Alexander Koraygin.

WORLD TOP SCORES SINGLE OPERATOR

ALL BAND

PJ2FR	**7,484,994**	I6FLD	4,028,847
4M3AZC	**5,529,968**	UF6CR	3,783,906
VP2MRA	**5,511,352**	CN8CO	3,639,360
GB4DX	**4,446,907**	**VO1CV**	**3,524,544**
H44R	4,299,160	9Y4VU	3,263,436
LU5FGG	4,275,847	**K2VV**	**3,262,460**
LU1BR	4,094,763	D44BC	3,253,068

SINGLE BAND

28 MHz

CE6EZ	**4,073,135**
LU8FEU	2,138,409
5B4MF	1,842,783
LU6EM	1,728,760
P42J	1,575,712
PY5BAB	1,286,680
NA5R	1,283,680

21 MHz

OH0BH	**3,977,684**
SM2EKM	**2,721,114**
KP4EQF	2,620,228
LZ9A	2,347,370
OH5BM	2,335,758
OH6AM	2,208,912
JA2APA	**2,142,075**

14 MHz

ZY5EG	3,869,828
YV3AGT	3,770,904
KP4BZ	2,803,784
ZL1AXB	2,463,521
VE3BMV	2,332,400
G3FXB	1,874,312
UA9YE	1,790,976

7 MHz

FM7CD	**2,312,968**
YY3BQS	1,664,096
CQ4NH	1,204,112
YU3EY	1,117,854
UP2NX	1,014,590
I5FCK	998,448
EA7EL	853,512

3.5 MHz

IO3MAU	640,038
VE3KZ	617,796
KI6P	524,356
HC1HC	500,192
YU4BR	424,850
NP4CC	406,386
DJ4PT	333,074

1.8 MHz

LZ2RF	**78,260**
YU3EF	56,316
W8LRL	30,654
WA2SPL	29,040
YV2IF	27,768
UB5PBA	24,396
VE3BBN	21,616

QRPp

G4GIR	**A**	**374,602**	KH6CP/3	14	84,667
YO3CD	A	258,309	JM1NKT	7	17,408
RA3DKE	28	38,000	OK3CRW	3.5	12,474
JE6FPX	21	260,634	EZ3ACO	1.8	1,064

MULTI-OPERATOR SINGLE TRANSMITTER

VP2EC	15,238,880	JG1ZUY	6,182,125
HH2WW	**11,394,404**	HG5A	5,703,390
IZ4ARI	7,598,490	HG35HA	5,491,863
VE1DXA	7,373,345	UK2RDX	5,370,444
IK5BAF	7,368,262	UK4FAV	5,331,408
TO0FF	6,738,620	UK2BBB	5,195,600
VE6OU	6,269,940	N5AU	5,039,356

MULTI-OPERATOR MULTI-TRANSMITTER

YZ1EXY	**10,406,975**	4N9YU	8,139,968
KL7RA	9,819,960	**NA8V**	**7,686,488**
KL7IRT	9,727,915	VK2WU	7,024,206
GB4ANT	9,671,269	XO7ZZZ	6,543,579
VE3PCA	8,207,872	JA9YBA	6,295,993

World leader on 28 MHz, Ralf, CE6EZ, uses a computer for duping and logging during the contest.

Long-time contester Alberto, YV3AZC, was second in the world among the single ops using his special call 4M3AZC.

UK3ABT: UA3-170-428, RA3ADR. **UK6APP**: Vlad Kljopov, Valery Dudkin, UA6ARX. **UK3XAB**: UA3-127-824, UA3-127-371, RA3XBS. **UK5IAM**: Club Group.

MULTI-OPERATOR MULTI-TRANSMITTER

YZ1EXY: YU1PKC, YU3TCA, YU1UU, YU1OYA, YU1EW, YU1PAW, YU1PKB, YU1FW, YU1RL, Lily, Dragan, Mira. **KL7RA** & KL7RN, AL7CQ, AL7CG, AL7AF, NL7V, NL7M. **KL7IRT** & AL7AS, AL7EN, AL7L, AL7Z, KL7B, KL7AZJ, KL7GL, KL7JIZ, KL7JJB, KL7IF. **GB4ANT**: G3LDI, G3XLL, G4BTY, G4JQL, G8HWD, G3MPN, G3VZT, G4SDP, G5CZM, G8VLL, G3JOC, G4BAH, G4DRS, G5CSU. **VE3PCA**: VE3KKB, VE3CRG, VE3JDO, VE3MHI, VE2ZP. **4N9YU**: YU4VQT, YU4WDN, YU4WPX, YU4YA, YU4SA, YU4CA, YU4WSF, YU4WEF, Dubo, Edin, Emil. **NA8V** & AD8R, AJ8K, K8CC, K8GL, K8LX, K8MU, K8QKY, W8LVN, W8TA, W8UA, WA8YVR. **VK2WU** & VK2CK, VK2NYA, VK2ECH, VK2PBU, VK2XDS. **XO7ZZZ**: VE7SK, VE7VX, VE7ENF, VE7DLO, VE7EOC, VE7EOQ, VE7EMX, VE7EPN, VE7CBJ, VY1DD, VE3EEW.

JA9YBA: JA9DZS, JA9LJI, JA9LNJ, JA9NFO, JA9QCE, JA9THK, JA9VBW, JH0CAZ. **AB0I** & W6FN/0, K0RWL, K0CS, K0BRO, K0VBU, K0UAA, W0JLC, KB0U, KB0WD, AB0W, KC0B, KM0L, Brian. **XO7WJ**: VE7WJ, W7EKM. **UK2FAA**: UA2FCW, UA2FCZ, UA2FEM, UA2FEW, RA2FDE, UA2FEL. **K5LZO** & K5IY, WB5RUS, WB0NFY. **VE2UN**: VE1BHA, VE1BCZ, VE3JKC, VE2EGH. **JA6YAI**: JR6BRT, JR6EZE, JR6GAG, JE6MQW, JE6UWI, JF6FQA. **ZY3ZZ**: PY3ZZ, PY3CDL, PY3CMC, PY5AJK. **JA7YDX**: JR7FYT, JR7GDU, JR7RPD, JR7RZM, JR7VUV, JR7UHG, JH7TYM, JE7FOP, JE7SEP, JH7LDN. **VK6NSD** & VK6NCW. **OZ5DD**: OZ6QV, OZ7TF, OZ1BCC, OZ6KH. **JA2YKD**: Club Station. **JA1YPP/JD1**: JF3PMM, JH4PAM, JH4RHF, JA8RUZ. **JH6YTX**: JE2OUY, JF6HDU. **KC8XK** & KW8N, N8ATR, N8DCJ, N8EDE, N8DMM. **JA6YGV**: JH6QCQ, JR6JHE, JR6LDI, JR3BME, JR8NOU.

CONTINENTAL LEADERS

	ASIA		AFRICA	
AB	UF6CR	3,783,906	CN8CO	3,639,360
28	5B4MF	1,842,783	EA8ZI	1,241,080
21	**JA2APA**	**2,142,075**	CN8EU	2,048,775
14	UA9YE	1,790,976	CN8CY	1,742,569
7	JA2BAY	551,304	No Entry	
3.5	UL7LCW	69,408	No Entry	
1.8	RA9AKM	7,150	No Entry	

	EUROPE		NORTH AMERICA	
AB	**GB4DX**	**4,446,907**	**VP2MRA**	**5,511,352**
28	YU7BCL	563,695	NA5R	1,283,722
21	**OH0BH**	**3,977,684**	KP4EQF	2,620,228
14	G3FXB	1,874,312	KP4BZ	2,803,784
7	CQ4NH	1,204,112	**FM7CD**	**2,312,968**
3.5	IO3MAU	640,038	VE3KZ	617,796
1.8	**LZ2RF**	**78,260**	W8LRL	30,654

	SOUTH AMERICA		OCEANIA	
AB	**PJ2FR**	**7,484,994**	H44R	4,299,160
28	**CE6EZ**	**4,073,135**	ZL1BIL	630,396
21	LU2X	921,060	YC0VM	1,571,359
14	ZY5EG	3,869,828	ZL1AXB	2,463,521
7	YY3BQS	1,664,096	KB7IJ/KH2	292,096
3.5	HC1HC	500,192	No Entry	
1.8	YV2IF	27,768	T32AF	16,872

	MULTI-SINGLE		MULTI-MULTI	
AS	JG1ZUY	6,182,125	JA9YBA	6,295,993
AF	No Entry		No Entry	
EU	IZ4ARI	7,598,490	**YZ1EXY**	**10,406,975**
NA	VP2EC	15,238,880	KL7RA	9,819,960
SA	LU4AA	2,627,566	ZY3ZZ	1,379,430
OC	**KC6SZ**	**4,544,340**	VK2WU	7,024,206

QRPp SECTION WORLDWIDE

G4GIR	A	374,602	538	314
YO3CD	A	258,309	473	243
W8ILC	A	199,750	364	250
PA0ATY	A	90,850	240	158
HA5KD/8	A	69,913	260	151
JA9XBW	A	67,727	218	131
W9PNE	A	60,006	203	146
AD2Y	A	41,416	163	124
N8CQA	"	31,411	144	101
EA2SN	A	30,240	137	120
DF4RD	A	27,702	148	114
WB9HRO/6	A	26,814	131	109
N3DCG	A	14,145	80	69
SM6HQK	A	11,005	98	71
KA9CEJ/M9	"	5,070	45	39
YO2CJX	"	3,952	62	38
N7NV	A	3,456	67	54
OH2BLU	A	2,752	46	32
Y25FN	A	2,584	45	34
		(Opr: Y79WN)		
PA0SMS	"	1,944	43	18
YO6DBL	"	1,500	29	25
N8AXA	"	1,060	20	20
SM3AGO	"	816	20	17
Y30CTL	"	140	10	10
PA0TV	"	75	5	5
RA3DKE	28	38,000	157	100
JI3BFG	28	37,692	164	108
AH6EK	28	11,610	80	54
KI9A	28	8,791	69	59
YO6KNI	28	7,568	62	44
VE3MNK	28	6,528	56	48
JH0ALB	"	3,944	50	34
I6YEF	28	3,816	51	36
VE2AEJ/3	"	2,970	39	33
RA2FDE	"	18	3	3
JE6FPX	21	260,634	465	242
JR6QFV	"	109,472	233	176
JK1QLH	"	101,703	233	167
W6CN	21	88,624	237	191
W6YMH	"	32,967	148	111
JA9CRI	"	29,682	111	102
JF1JLW	"	19,352	95	82
JF6GAS	"	18,486	102	78
SV1NK	21	15,575	125	89
UA9SHU	21	10,887	68	57
JK1PEC	"	9,639	77	63
KA5N	21	1,504	37	32
KH6CP/3	14	84,667	225	179
UB5DAG	14	41,285	163	115
G3FTQ	14	38,481	236	127
PA0NRD	14	16,652	147	92
JA1KFX	14	7,296	69	57
EA3DZG	14	4,968	61	54
JH3LCU/1	"	1,216	35	32
JM1NKT	7	17,408	91	68
IK8CHL	7	11,088	121	77
YO9CUF/3	7	6,200	62	50
JN1LSB	"	2,870	38	35
OK3CRW	3.5	12,474	104	63
UB5AAL	3.5	5,360	62	40
Y25MG	3.5	1,798	36	31
Y26VM	"	748	26	22
EZ3ACO	1.8	1,064	32	19

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

KC1F	A	2,821,248	1938	576
AK1B	A	866,802	1060	438
N1AU	"	466,088	596	287
N1AFC	"	179,154	453	269
KN1I	"	127,400	407	245
W1DYH	"	66,588	185	124
K1ZZJ	"	64,533	201	147
KA1EKR	"	49,560	169	118
KB1GN	"	19,698	112	98
KK1A	28	6,760	83	65
K1KJT	21	485,750	628	335
K1RM	"	314,960	482	248
KE1E	"	132,888	286	196
W1BK	"	35,155	169	79
AB1U	"	32,009	130	113
W1WY	"	6,528	48	48
WA1ORP	"	60	5	4
AA1M	7	15,660	99	87
WA1ZAM	3.8	38,376	343	164
K1KNQ	1.8	6,466	149	61
K2VV	A	3,262,460	2170	628
KF2O	A	936,840	867	444
N2SS	A	678,656	810	352
WB2QEU	"	239,954	414	286
WB2UMF	"	216,270	388	243
KS2M	"	150,780	314	210
KB2SE	"	93,147	253	183
W2FUI	"	52,003	174	133
KM2X	"	29,664	127	103
W2DW	"	19,600	115	98
K2QF	"	18,772	86	76
KT2D	"	18,527	123	97
N2AIF	"	8,712	55	44
WB2PXA	"	6,069	56	51
N2RS	"	2,050	31	25
W2NC	"	1,743	26	21
W2KZE	28	43,296	160	123
KC2X	21	1,948,545	1556	477
WB2RNT	"	245,526	402	302
W2FGY	"	107,672	238	172
WD2AEZ	"	1,196	29	26
KA2CIW	"	6	4	3
KR2Q	7	292,608	538	288
KQ2O	3.8	21,648	202	123
WA2SPL	1.8	29,040	401	121
KI3L	A	722,430	813	414
N3BJ	A	565,600	792	404
W3ICM	"	560,505	747	395
W3GM	"	465,535	614	329
WA3HUP	"	194,636	352	247
W3ARK	"	172,780	336	212
K3FN	"	141,550	280	190
WB3DNA	"	57,229	182	151
W3FQE	"	56,925	183	115
KC3EK	"	55,675	196	131
WB3CQN	"	16,725	75	75
KA3FWW	"	6,477	56	51
N3CYC	"	1,638	30	26
WA3JXW	"	558	20	18
N3DAY	28	284,240	543	304
N3AZS	"	84,194	246	178
N3CQM	"	53,290	214	146
WA3DMH	21	45,066	141	111
K3ND	14	126,800	268	200
KB3OQ	"	4,242	42	40
KM3T	7	214,124	634	269
K3GYD	"	141,520	290	232
W3BGN	"	76,752	247	164
KB3PD	"	73,850	255	175
K3SWZ	3.8	16,500	186	125
K4CG	A	1,421,319	1166	493
			(Opr: K7SV)	
AI2C/4	A	1,212,601	1117	481
WI4R	A	1,023,780	1027	452
KB0C/4	"	379,890	566	315
WI4K	"	254,520	460	280
KC4GR	"	200,618	362	242
WC4E	"	200,451	643	327
N4MM	"	164,850	303	210
W4UYC	"	154,732	312	202
W4WKQ	"	153,276	329	212
NF4F	"	115,988	340	214
KA3DTE/4	"	82,328	201	164
W4KMS	"	81,310	253	173
WB5YLT/4	"	54,510	199	158
NQ4I	"	50,112	276	174
WA4MOJ	"	48,360	171	130
WK4F	"	31,234	123	97
KD4PP	"	17,325	87	75
NU4Y	28	689,320	928	380
KT4W	"	503,084	751	346
N4BSN	"	81,212	207	158
WB4VQO	"	35,394	132	102
NO4J	21	866,866	1074	433
N4ZC	14	985,320	929	476
		(Opr: N5TR)		
K4XO	"	44,088	173	132
W4YN	"	4,068	42	36
WA4FBH	3.8	100,536	469	236
N4OH	3.8	96,960	522	240
KC4HN	"	10,000	116	100
NZ4B	"	1,938	56	51
AA4MM	1.8	11,800	262	100
N5DDO	A	877,329	1290	387
KA5W	A	792,570	1006	435
K5RX	"	569,220	682	358
KC5CP	"	172,799	463	253
WA5IYX	"	133,141	348	211
N5BMD	"	34,866	142	117
N5JJ	"	30,502	127	101
WB5LYT	"	29,382	142	118
KV5Y	"	22,227	101	93
W5EIJ	"	10,512	86	72
KV5F	"	6,764	90	76
KX5U	"	3,520	60	55
AK5R	"	1,254	39	33
NA5R	28	1,283,722	1347	473
			(Opr: K5GN)	
W5ASP	"	55,825	216	145
AA5B	21	1,433,175	1541	485
KV5Q	"	406,770	1053	390
K3VY/M5	"	12,070	109	85
W5RIT	"	119	8	7
W5FO	14	3,744	45	39
KB5FU	3.8	92,876	410	214
K6HNZ	A	1,904,430	1574	435
AI6V	A	1,851,147	1761	459
NE6I	A	1,847,408	1692	472
K6XO	"	417,276	632	346
WB6JMS	"	384,293	570	287
WA6ZQJ	"	178,605	449	245
WD6FLB	"	126,028	313	196
KS6H	"	93,420	270	180
WA6VNR	"	49,104	175	124
W6OKK	"	32,034	144	114
W6OVQ	"	14,964	66	58
N6JM	"	14,420	83	70
AA6EE	"	11,764	91	68
N6GAU	"	9,042	81	66
KF6AW	"	3,120	39	39
KA6UOB	"	990	28	27
W6BYH	"	900	17	15
K6SVL	28	308,460	749	291
NN6U	"	302,400	774	288
W6NXB	"	2,911	44	41
WB6FCR	21	649,876	910	323
N6HR	"	228,620	444	284
K6RU	"	46,512	162	136
KS6Q	"	1,394	40	34
KD6OH	7	552	29	23
KI6P	3.8	524,356	762	307
			(Opr: N6RO)	
N7TT	A	1,347,730	1361	439
N7RO	A	749,628	934	396
W7FP	A	614,856	1018	411
W7TWL	"	140,592	330	202
KC7QY	"	64,638	228	162
KU7A	"	32,121	193	129
W7GUR	"	24,843	120	91
W6YVK/7	"	12,240	102	90
W7JKA	"	11,033	66	59
W7RIR	"	3,876	40	38
K7RS	"	750	17	15
KD7EJ	"	34	17	17
WB7FDQ	28	418,440	1004	317
KC7GX	21	300,792	518	249
KC7V	"	34,320	183	143
WA7QXH	"	34,077	148	111
W7AYY	"	15,190	86	70
AI7B	14	1,140,669	1235	509
WB7WQE	"	293,795	459	335
K7UR	7	238,944	404	262
KI7M	"	164,616	470	228
KU7M	3.8	26,136	204	132
N7EA	"	24,056	153	124
K7GWK	"	6,944	82	56
KA7AUH	1.8	1,040	34	26
KG7D	"	928	39	29
N8II	A	2,585,061	1723	603
KQ8M	A	1,805,859	1523	561
KO8T	A	1,477,408	1312	548
KZ8Y	"	358,070	523	305
KV8Y	"	279,936	435	288
N8CXX	"	224,190	431	265
N8BTU	"	222,453	416	231
AI8S	"	169,104	428	271
W8UPH	"	152,292	334	196
W8FDN	"	124,845	280	205
K8CV	"	91,176	237	174
N8TN	"	87,042	251	178
KC8HJ	"	75,143	202	162
N8EKS	"	67,473	187	147
NA8W	"	66,400	232	166
KA8HDR	"	46,644	199	138
KW8M	"	44,100	192	140
W8VEN	"	25,875	139	115
K8DD	"	17,052	116	116
K8KUH	"	11,850	100	79
AC8W	"	6,566	78	67
N8DUH	"	2,700	54	45
WD8PAQ	28	25,872	128	112
W8QWI	"	20,880	99	87
KW8E	"	18,128	106	88
KB8DB	"	2,610	31	30
KU8V	21	676,860	745	389
KC8IZ	"	125,251	251	203
KB8WB	"	70,070	187	154
W8LU	14	841,563	796	439
K8NA	7	212,544	364	288
KC8JH	7	164,802	480	227
W8IMZ	"	60,114	148	129
W8UVZ	"	50,344	132	116

KB8IZ	"	42,042	202	143
N8LL	"	20,000	87	80
KU8E	**3.8**	**93,248**	**513**	**248**
N8BJQ	"	18,360	202	123
WA8YTM	"	15,960	229	140
W8LRL	**1.8**	**30,654**	**428**	**131**
KQ9L	**A**	**1,191,088**	**1102**	**464**
KS9K	**A**	**267,495**	**448**	**255**
KD9M	"	217,854	457	266
KE9Y	"	139,300	277	199
W9MP	"	126,948	310	213
WB9OBX	"	46,718	221	94
KA9JDW	"	13,530	77	66
AJ9U	"	10,560	91	80
K9VQK	"	2,541	40	33
KK9A	**28**	**66,248**	**316**	**182**
KC9FC	**21**	**87,892**	**217**	**172**
AG9S	**7**	**221,844**	**689**	**266**
KB9AW	"	43,318	138	121
KJ9D	**3.8**	**155,856**	**561**	**272**
KS9U	"	65,238	549	249
KE9U	"	61,061	449	215
WA9EYY	**1.8**	**1,944**	**97**	**54**
WA9TZE	"	488	24	21
KR0Y	**A**	**2,705,728**	**1904**	**631**
WA0TKJ	**A**	**1,001,784**	**1193**	**469**
WB0ISW	**A**	**304,128**	**525**	**288**
KJ0D	"	272,090	531	299
N0BSH	"	269,853	469	307
N0ZA	"	224,460	386	258
WB0YJT	"	219,573	535	279
KM0L	"	57,984	221	151
KB0V	"	54,120	171	123
W0OLL	"	53,594	186	127
WB8ZRL/0	"	40,071	149	111
AK0M	"	36,273	141	113
W0WUU	"	35,956	133	101
W0PPF	"	12,519	121	39
W0QAU	"	372	13	12
W0GW	"	96	6	6
WD0ASM	**28**	**163,540**	**502**	**221**
W0GOR	"	163,030	502	238
WA0ETC	"	101,195	270	185
W0IZV	"	17,933	95	79
K0VUA	"	5,733	50	39
KV0Q	**21**	**1,675,242**	**1487**	**486**
KV0K	"	534,128	880	304
KW0E	"	263,980	494	268
KC0MB	**14**	**313,966**	**901**	**358**
K9MWM/0	**7**	**288,864**	**427**	**272**
KA0IQR	"	60,320	197	145
W0JU	**3.8**	**9,476**	**118**	**103**

ALASKA

WL7E	**A**	**2,306,073**	**1964**	**447**
KL7Y	"	525,600	655	300
AL7H	"	221,328	461	212
NL7P	**21**	**560,329**	**970**	**209**
KL7AF	**3.8**	**56,210**	**161**	**73**

CANADA

VO1CV	**A**	**3,524,544**	**2450**	**576**
XO7IN	**A**	**2,533,073**	**2006**	**463**
VE7BSM	"	978,634	951	359
VE4RP	**A**	**749,652**	**782**	**358**
VE4CCC	"	564,788	714	322
VO1QU	"	259,557	408	241
XO7SZ	"	244,127	391	211
VE3EZU	**A**	**132,432**	**260**	**186**
VE3SV	"	51,975	147	135
VE1BQJ	**A**	**48,287**	**147**	**109**
VO1AW	"	8,928	56	48
VE3YV	"	4,797	51	41
VY1DV	**A**	**3,626**	**40**	**37**
XO7CXN	"	1,400	30	25
VE3KOY	**28**	**270,979**	**525**	**233**
XO7CQK	**28**	**89,032**	**354**	**124**
VE7COW	"	46,110	200	106
VE1BII	**21**	**108,476**	**241**	**188**
VE3BMV	**14**	**2,332,400**	**1629**	**560**
VE6BBP	**14**	**105,704**	**234**	**181**
VE3GCO	"	13,425	87	75
VE3MJM/VE8	"	**4,840**	**44**	**40**
VE5DX	**7**	**814,657**	**727**	**277**
VE3KZ	**3.8**	**617,796**	**595**	**262**
VE3BBN	**1.8**	**21,616**	**105**	**56**

CUBA

CO2HS	**A**	**466,932**	**632**	**233**

DOMINICAN REPUBLIC

HI8GB/6	**7**	**491,630**	**494**	**233**
WA0NZI/HI8	"	173,196	268	153

GUATEMALA

TG9GI	**21**	**1,644,732**	**1527**	**471**

GUANTANAMO BAY

KG4CD	**A**	**1,306,820**	**1334**	**362**

GREENLAND

OX3ZM	3.8	4,992	35	32

MARTINIQUE

FM7CD	**7**	**2,312,968**	**1219**	**412**

MEXICO

XE1LLS	**28**	**428,856**	**988**	**214**
4C5AZ	**14**	**239,122**	**500**	**221**
		(Opr: XE1AZ)		

MONTSERRAT

VP2MRA	**A**	**5,511,352**	**3805**	**616**
		(Opr: VE5RA)		
VP2MO	**1.8**	**8,190**	**58**	**35**

PUERTO RICO

KP4EQF	**21**	**2,620,228**	**2174**	**533**
KP4BZ	**14**	**2,803,784**	**1935**	**584**
NP4CC	**3.8**	**406,386**	**476**	**211**

SAINT LUCIA

KJ8G/J6L	**A**	**444,150**	**730**	**270**

SAINT MAARTEN

K2KTT/PJ7	**A**	**32,495**	**165**	**97**
K3UOC/PJ6	"	10,640	69	56

AFRICA

CANARY ISLANDS

EA8ZI	**28**	**1,241,080**	**1169**	**355**
EA8ADY	**21**	**45,753**	**151**	**101**
EA8RCT	14	12	2	2

CUETA & MELILLA

ED9IB	**A**	**1,177,050**	**863**	**350**

CAPE VERDE

D44BC	**A**	**3,253,068**	**1979**	**546**

DJIBOUTI

J28DM	**14**	**112,858**	**259**	**146**

KENYA

5Z4CM	**A**	**223,600**	**361**	**208**
		(Opr: K5AVX)		

LESOTHO

7P8CL	**A**	**17,460**	**100**	**60**

MOROCCO

CN8CO	**A**	**3,639,360**	**1944**	**544**
CN8EU	**21**	**2,048,775**	**1483**	**463**
CN8CY	**14**	**1,742,569**	**1296**	**449**

SOUTH AFRICA

ZS6XD	**A**	**1,701,700**	**1349**	**425**
ZS4SP	**A**	**1,604,022**	**1247**	**422**
ZS6BRZ	"	1,327,200	1103	400
ZS5IV	"	629,800	791	268
ZS6WB	"	49,910	137	115
W3KHQ/ZS	14	675	15	15

TANZANIA

5H3BH	**A**	**950,612**	**885**	**362**

ASIA

CYPRUS

5B4LP	**A**	**915,208**	**1114**	**277**
5B4MF	**28**	**1,842,783**	**1900**	**391**

ISRAEL

4X6FR	**A**	**2,430,619**	**1917**	**419**
4X6DK	**28**	**104,076**	**330**	**147**
4X6CA	**21**	**997,402**	**959**	**373**

JAPAN

JI1QPU	**A**	**3,037,986**	**1914**	**567**
JF1ZRQ	**A**	**2,122,794**	**1520**	**513**
		(Opr: JG3AIM)		
JH7DNQ	**A**	**1,635,200**	**1379**	**448**
JA0JHA	**A**	**1,582,632**	**1224**	**431**
JA1YXP	"	1,267,980	1124	420
		(Opr: JH4OWG)		
JA9JFO	"	485,408	598	308
JH3GRE	"	453,127	633	311
JH1KLN	"	238,773	422	213
JA0VHI	"	221,442	375	221
JF1EEK	"	220,143	409	231
JO1BMV	"	175,916	360	199
JE7JZC	"	166,044	321	202
JA9CWJ	"	165,300	316	190
JN1AFQ	"	148,735	317	197
JR6PGB	"	124,929	270	189
JA6AKV	"	111,210	240	165
JA6LYV	"	96,007	260	163
JA0CGJ	"	84,466	220	157
JA6IP	"	81,360	205	180
JF2IGP	"	76,806	228	153
JA1OHP	"	66,150	190	126
JA1ALX	"	65,424	166	141
JA1BUI	"	64,736	177	119
JA7VSO	"	38,160	146	106
JA6ABG	"	32,130	147	90
JA4HCK	"	31,525	146	97
JA6PL	"	26,344	103	89
JE7GRW	"	22,528	125	88
JG2THA	"	20,418	107	82
JR7XKN	"	19,758	119	89
JH4WBY	"	17,724	97	84
JH0XUP	"	16,632	98	72
JH0DSX	"	11,122	75	67
JR0DGM	"	8,904	80	56
JR4ISK	"	8,085	79	55
JA1AAV	"	8,003	60	53
JF2XHR	"	7,616	75	64
JH0WGN	"	7,488	59	52
JP1FZA	"	7,084	69	46
JE7OXJ	"	6,336	72	48
JH9JJD	"	3,264	36	32
JA6RHH	"	1,976	32	26
JE7SWJ	"	1,340	26	20
JG2SFL	"	1,160	31	29
JP1ITN	"	825	39	25
JA5EO	"	360	20	18
JE2SSX	"	250	11	10
JH3TXR	"	208	9	8
JJ1NUB	**28**	**734,580**	**883**	**330**
JA1SGX	**28**	**727,434**	**854**	**343**
JH0BBE	**28**	**301,048**	**589**	**242**
JM1TUY	"	176,022	406	198
JA6EFT	"	64,416	206	132
JA1CQT	"	53,816	183	124
JA1JGP	"	44,748	159	113
JR2NTC	"	37,962	154	111
JF2LEX	"	29,664	150	96
JH1UUT	"	21,084	109	84
JH7UJU	"	17,784	139	78
JK1FJW	"	15,300	82	68
JE1PJR	"	14,427	91	63
JH7QDM	"	14,016	104	64
JA1AAT	"	10,920	77	60
JR1OYL	"	10,830	74	57
JR7CDL	"	7,238	106	77
JA4AQR	"	5,676	49	44
JA2SAP/1	"	3,219	44	37
JH1CNN	"	2,295	55	45
JA0TPE	"	564	19	12
JA6GDD	"	533	15	13
JA6ADA	"	504	22	12
JK1LRH	"	12	2	2
JA2APA	**21**	**2,142,075**	**1521**	**507**
JK1OLT	**21**	**1,362,255**	**1081**	**461**
JR2XHT	**21**	**1,163,580**	**1003**	**430**
JH9GRM	**21**	**914,536**	**883**	**392**
JA7YAI	"	729,162	624	378
		(Opr: JK1CYV)		
JR3ISM	"	660,345	723	331
JA1HGY	"	551,140	604	340
JR4DFO	"	487,967	584	313
JA7YCQ	"	357,835	479	295
		(Opr: JR7MZC)		
JA2BNN	"	265,959	400	261
JH7UGG	"	256,194	380	258
JH5TEE	"	222,398	375	242
JA1DCO	"	190,152	324	228
JL1EJU	"	140,598	276	214
JR7OKK	"	104,400	242	180
JA7GYR	"	101,442	231	174
JH5EVO	"	92,910	244	163
JE7UCO	"	91,854	236	162
JH7NPF	"	78,792	200	147
JH8TDZ	"	75,682	205	158
JH7AJD	"	69,641	203	143
JH7JDB	"	66,990	171	145
JE7RDV	"	63,240	184	136
JH0NOS	"	60,918	307	213
JH5IRT	"	56,889	170	129
JR7PGL	"	53,193	161	119
JH0USD	"	52,890	163	123
JA7NZE	"	39,538	145	106
JH7MSB	"	34,155	153	115
JO1LDY	"	34,104	145	98
JF2AFJ	"	30,591	116	99
JN1QWG	"	27,621	124	99
JE7DOT	"	25,944	115	92
JH2XTV	"	22,185	103	85
JA0VBJ	"	22,052	107	74
JA5DFY	"	20,995	99	85
JA0BMS/1	"	19,671	100	79
JL1EJO	"	19,125	92	85
JN1AJU	"	15,300	98	75
JE6DML	"	11,163	68	61
JA9THA	"	9,504	72	54
JA9XWR	"	7,847	90	59
JH0SGG	"	7,497	55	49
JH6WIW	"	5,838	51	42
JN1TEO	"	5,612	54	46
JA1MXY	"	4,469	46	41
JA9JKL	"	4,033	40	37
JJ3RDH	"	3,939	43	39
JK3FXN	"	2,790	35	31
JR0FQM	"	2,145	41	33
JR4HTB	"	1,518	23	22
JH2KGZ	"	987	26	21
JA1AJA	"	918	23	17
JE2LDO	"	784	17	16
JN1RZU	"	774	18	18
JH0DBD/1	"	752	17	16
JM1GPV	"	190	10	10
JP1LRT	"	180	11	10
JH3DPB	**14**	**1,053,812**	**922**	**436**
JA4YFH	**14**	**753,768**	**829**	**342**
		(Opr: JF3GPS)		
JA1FKY	"	158,108	326	188
JR7AMZ	"	133,500	295	178
JR7BTI	"	45,235	163	109
JA3AOL	"	34,238	148	106
JA5CPO	"	15,750	99	75
JG1GGF	"	12,360	74	60
JA1IT	"	11,220	80	51
JA7UFZ	"	9,222	72	58
JA4CUU	"	2,106	31	26
JJ3SRU	"	1,440	31	30
JA2TKO	"	1,276	23	22
JH1FJK	"	1,188	22	22
JA4PA	"	672	24	12
JE1GZB	"	319	15	11
JA2BAY	**7**	**551,304**	**567**	**247**
JG3VKW	"	17,664	112	92
JA6BIF	"	14,070	73	67
JR7IVR/1	"	9,954	81	63
JA7HMZ	**3.5**	**11,424**	**74**	**56**

Luis, LU1BR, enroute to the number six score this year among the single ops.

A newcomer to contesting, Ricardo, CQ1BKW, was among the top scorers on 14 MHz.

The Australian 14 MHz band leader Ken McLachlan, VK3AH.

KOREA

HL5BGB	**A**	**210,563**	**639**	**193**
HL1ABR	"	106,134	610	114

KUWAIT

9K2BE	**28**	**877,184**	**978**	**308**
		(Opr: G4BWP)		

MALDIVES

8Q7AZ	**21**	**220,834**	**535**	**218**

MONGOLIA

JT1AO	**A**	**479,181**	**1603**	**211**
JT1BG	**21**	**24,225**	**122**	**95**

SAUDI ARABIA

HZ1HZ	**A**	**1,250,676**	**1025**	**441**

U.S.S.R.

ARMENIA

RG6GBW	**28**	**326,888**	**617**	**232**
UG6GDS	14	1,824	26	24

ASIATIC

UA9FAT	**A**	**1,107,510**	**1030**	**385**
UA9AED	**A**	**1,000,716**	**944**	**356**
UV9PP	"	65,121	207	147
UA9MR	"	52,416	257	117
RA9CQW	"	25,632	131	89
UA9AFG	"	23,556	106	78
UA9MBK	"	23,250	98	75
UA9CRR	"	16,353	79	69
UA9CMS	"	9,853	65	59
UA9FAR	"	8,533	63	53
UK9YAD	"	2,145	47	33
			(Opr: Alex)	
RA9FEC	"	168	9	8
UA9URZ	**28**	**340,374**	**1049**	**213**
UV9AX	**28**	**314,336**	**540**	**209**
RA9UAD	"	296,631	904	207
UA9UPG	"	68,880	391	120
UA9OGF	"	43,452	426	102
UA9XEQ	"	21,014	133	79
UA9FKM	"	20,750	110	83
UA9MBM	"	14,144	127	64
RA9CEM	"	585	15	15
UA9UUN	**21**	**367,808**	**1113**	**224**
UW9FD	"	241,557	510	219
UW9CL	"	14,472	76	67
UA9YE	**14**	**1,790,976**	**1308**	**512**
UA9ND	"	954,578	904	386
UA9AIB	"	15,067	84	61
UA9UGU	"	8,084	62	47
UV9DO	"	5,246	46	43
UA9OO	**3.5**	**14,976**	**72**	**39**
RA9AKM	**1.8**	**7,150**	**57**	**25**
UA0FCL	**A**	**501,054**	**1554**	**222**
UA0LDP	"	121,930	272	178
UA0CDM	"	29,645	316	77
UA0CCW	"	15,120	75	63
UA0CCO	"	2,457	33	27
UA0SGL	**28**	**190,320**	**632**	**183**
UA0QEP	"	35,793	215	97
UA0ZDD	"	13,167	201	57
UA0FEP	"	3,154	45	38
UA0KAJ	"	2,890	57	34
RA0CDM	"	799	17	17
UA0LFI	"	468	16	13
EK9C/0	**14**	**836,580**	**998**	**365**
		(Opr: UA9CDT)		
4K0A	"	72,278	188	142
		(Opr: Victor)		
UA0KBO	"	867	17	17
UA0CFX	"	290	11	10
UA0JDX	"	234	10	9
UA0QEZ	3.5	140	8	7

AZERBAIJAN

UD6DLL	**A**	**181,962**	**357**	**198**
UD6DER	"	108,618	200	129
UD6DJH	**21**	**434,565**	**641**	**261**
UD6BQ	"	197,392	405	208

GEORGIA

UF6CR	**A**	**3,783,906**	**2324**	**509**
UF6FFF	"	14,880	101	60

KAZAKH

UL7GAA	**28**	**75,746**	**427**	**121**
RL7PGO	"	45,261	225	107
UL7PEN	"	290	11	10
UL7QF	**21**	**1,257,544**	**1594**	**382**
UL7TAY	**14**	**40,740**	**162**	**105**
UL7LCW	**3.5**	**69,408**	**177**	**72**

KIRGHIZ

UM8MCY	**21**	**215,645**	**583**	**215**
UM8MDX	**14**	**1,111,552**	**1089**	**416**
UM8MAZ	**7**	**11,676**	**57**	**42**
EZ8MBW	1.8	168	6	6

TADZHIK

UJ8JLN	**28**	**10,718**	**86**	**46**

TURKOMAN

UH8EAA	**A**	**30,880**	**112**	**80**

UZBEK

UI8CAJ	**28**	**118,524**	**339**	**166**

EUROPE

ALAND ISLAND

OH0BH	**21**	**3,977,684**	**2774**	**524**
OH0BA	**14**	**1,373,631**	**1770**	**447**

AUSTRIA

OE9SLH	**A**	**140,080**	**304**	**206**
OE1DSA/3	**14**	**550,373**	**871**	**349**

AZORES

CQ2EF	**A**	**11,628**	**79**	**68**

BALEARIC ISLANDS

EA6GP	**A**	**257,040**	**566**	**252**
EA6EA	"	4,500	53	50
EA6LA	**21**	**7,192**	**68**	**58**
EA6OA	**14**	**34,432**	**182**	**128**

BEAR ISLAND

JW5VAA	A	684	18	18
JW1UW	14	550	18	11

BELGIUM

ON4XG	**A**	**131,224**	**308**	**188**
ON5FV	**21**	**74,340**	**251**	**140**

BULGARIA

LZ1RN	**A**	**19,812**	**97**	**78**
LZ1SE	"	216	14	12
LZ1KX	**28**	**16,860**	**103**	**60**
LZ9A	**21**	**2,347,370**	**1770**	**530**
			(Opr: LZ2CC)	
LZ7A	**14**	**1,604,655**	**1768**	**507**
LZ3B	**7**	**791,680**	**794**	**320**
			(Opr: LZ1JY)	
LZ2PP	**3.5**	**246,026**	**494**	**211**
LZ2RF	**1.8**	**78,260**	**498**	**70**

CRETE

KA2PFV/SV9	**A**	**174,640**	**564**	**236**

CZECHOSLOVAKIA

OK1ALW	**A**	**1,976,666**	**1639**	**443**
OK1ARI	**A**	**1,376,912**	**1378**	**376**
OK1MSN	**A**	**1,295,420**	**1143**	**487**
OK2RU	"	964,512	990	394
OK3LZ	"	513,604	697	332
OK2BTI	"	498,712	810	323
OK1AJN	"	470,611	639	323
OK1IQ	"	303,150	495	282
OK3PQ	"	294,669	514	261
OK2BVE	"	169,122	401	213
OK3CRH	"	141,120	385	192
OK2BSA	"	74,789	259	143
OK1AXB	"	52,245	212	129
OK1DHJ	"	34,866	184	117
OK3IA	"	30,987	150	99
OK1MIZ	"	22,826	164	101
OK2KVI	"	17,712	116	82
		(Opr: OK2SWD)		
OK1DVK	"	16,274	87	79
OK1DMA	"	14,022	89	82
OK2PBG	"	8,094	66	57
OK3TAJ	"	6,213	72	57
OK2KTE	"	2,240	38	28
		(Opr: OK2-23100)		
OK2SWD	"	60	6	6
OK3JW	**28**	**105,975**	**262**	**157**
OK1AD	"	38,739	149	111
OK1AVD	"	10,207	64	59
OK6DX	**21**	**1,529,673**	**1504**	**373**
OK3CEM	"	873,762	992	321
OK2SPS	"	53,760	163	120
OK1XC	"	45,980	152	121
OK3KEX	"	29,472	126	96
		(Opr: OK3-26928)		
OK1FV	**14**	**305,456**	**607**	**272**
OK3CUM	"	272,468	652	259
OK2ABU	"	179,515	487	223
OK2BQL	"	77,463	261	151
OK3CFS	"	62,060	255	145
OK1AUR	"	33,156	197	108
OK2PDC	"	26,900	186	100
OK2SGY	"	25,740	157	99
OK1JJB	"	19,812	139	78
OK2PDT	"	117	9	9
OK2BRJ	"	49	7	7
OK1TN	**7**	**440,622**	**705**	**273**
OK1AZI	"	54,450	201	121
OK2PDE	"	7,344	68	51
OK2QX	"	5,916	58	51
OK3KXR	**3.5**	**171,072**	**437**	**198**
		(Opr: OK3-27010)		
OK3YCL	"	113,544	334	171
OK2HI	"	65,604	216	154
OK1KZ	"	16,000	101	80
OK1VMA	"	6,660	74	45
OK1JDJ	"	4,386	52	43
OK2BBQ	"	2,088	37	29

DENMARK

OZ5EV	**A**	**665,184**	**712**	**338**
OZ4MD	**A**	**477,085**	**672**	**317**
OZ7JZ	"	113,208	384	106
OZ4RT	"	20,301	105	101
OZ9BR	"	16,188	103	71
OZ6EI	"	12,864	102	67
OZ1CFV	"	9,387	97	63
OZ1GMP	"	4,000	52	40
OZ1XV	"	3,248	47	28
OZ1ACB	"	1,512	26	24
OZ1FFG	"	1,290	37	30
OZ1BLZ	"	456	14	12
OZ1FTE	**28**	**47,570**	**172**	**134**
OZ2BM	"	525	15	15
OZ2PG	**21**	**159,856**	**330**	**206**
OZ1APA	"	9,720	67	60
OZ9TL	"	2,016	28	24
OZ1DTF	**14**	**554,364**	**870**	**348**
OZ3SK	"	276,789	523	257
OZ6XR	"	91,176	303	174
OZ8RB	"	17,610	105	81
OZ7GN	"	4	2	2
OZ1BUR	7	400	23	20
OZ6PP	"	40	5	4
OZ3ZK	**3.5**	**7,840**	**71**	**56**

ENGLAND

GB4DX	**A**	**4,446,907**	**2666**	**593**
		(Opr: G3VBL)		
G3XBY	**A**	**2,101,120**	**1586**	**490**
G3TXF	"	81,488	250	176
G4/VE3GCO	"	66,993	204	137
G4PIQ	"	49,476	197	133
G2AJB	"	17,978	101	101
G5EBA	"	9,920	79	62
G3JKY	**28**	**20,304**	**139**	**94**
G3MWZ	21	3,168	42	33
G3FXB	**14**	**1,874,312**	**1550**	**472**
G3YCP	"	64,906	286	166
G3ICG	"	4,284	54	34

FINLAND

OH6DX	**A**	**2,017,710**	**1688**	**470**
OH2BDN	**A**	**166,448**	**461**	**206**
OH5VA	"	129,115	450	217
OH2BJG	"	119,800	352	200
OH2BAD/1	"	83,000	215	166
OH6CS	"	59,064	193	138
OH7NW	"	57,375	227	135
OH1PS	"	27,027	108	91
OH6PX	"	21,658	110	91
OH1PY	"	19,620	105	60
OH7YF	"	13,500	84	75
OH9UW	"	4,988	70	58
OH1BV	"	2,498	98	75
OH5BM	**21**	**2,335,758**	**2041**	**426**
OH6AM	**21**	**2,208,912**	**1944**	**408**
		(Opr: OH6LK)		
OH2BUU	"	294,128	549	248
OH2BCD	"	19,656	102	78
OH6CK	"	11,830	85	65
OH3AA	**14**	**1,134,528**	**1218**	**456**
		(Opr: OH6DO)		
OH3RF	"	983,220	1223	420
OH2RF	"	179,465	504	251
OH6CD	"	11,360	116	80
OH3AC	"	1,188	24	18
		(Opr: OH3ST)		
OH3XZ	**7**	**438,470**	**577**	**269**
OH3WS	**3.5**	**145,920**	**366**	**192**
OH4PW	"	4,368	56	42
OH5NG	**1.8**	**1,100**	**25**	**22**

FRANCE

F9KP	**A**	**496,500**	**802**	**331**
F6EXQ	"	212,660	439	245
F5IN	"	39,104	200	94
F6CLM	"	8,664	90	57
F6BVB	**28**	**8,736**	**71**	**52**
TO6GYT	**21**	**1,861,020**	**1554**	**441**
F6BEE	"	635,400	763	300

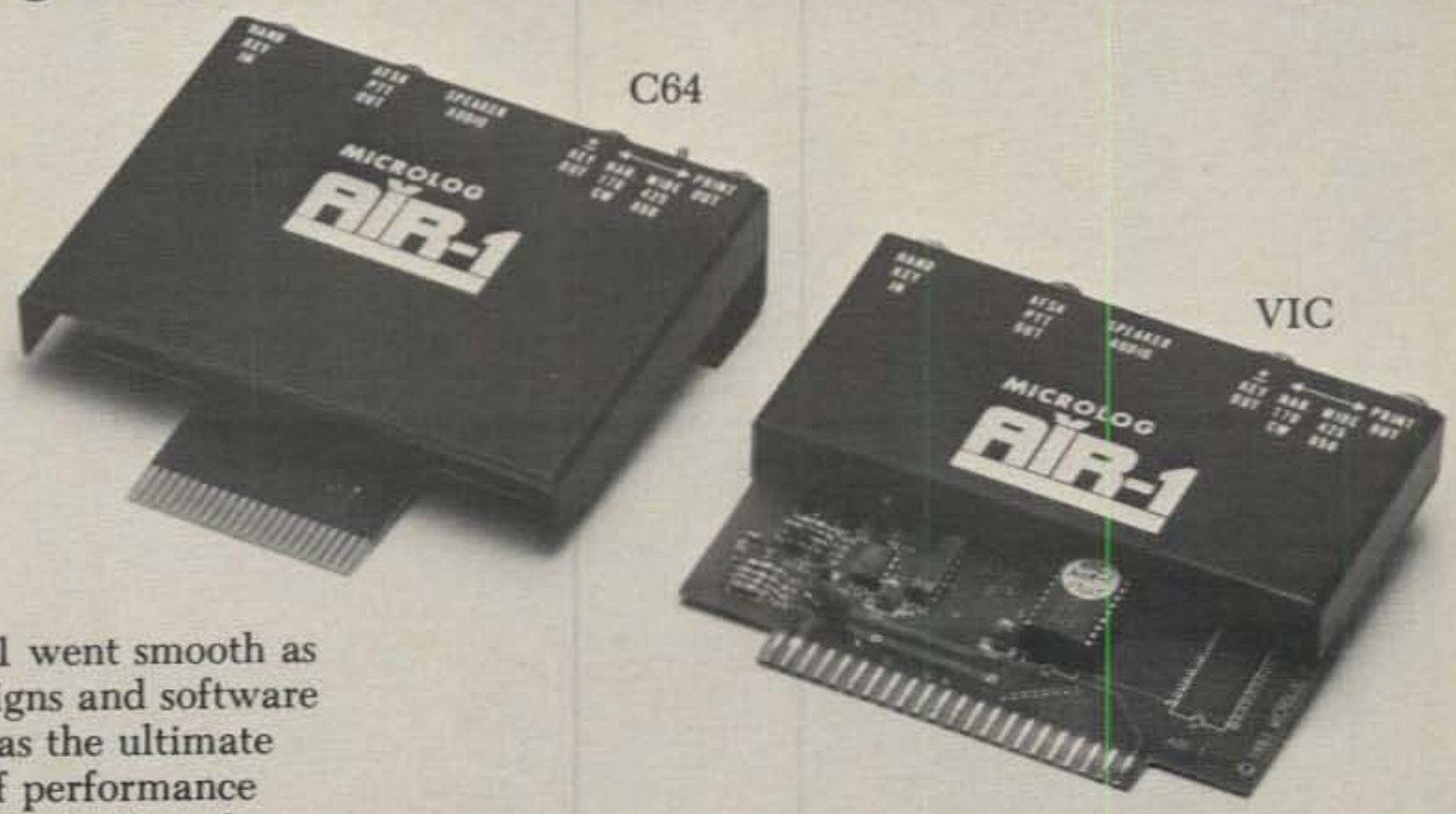
GERMANY (FRG)

DL8PC	**A**	**1,840,811**	**1478**	**499**
DL4NAC	**A**	**252,587**	**512**	**229**
DL7DW	"	186,408	361	216
DL3NBL	"	137,600	329	200
DL3SAX	"	126,063	290	203
DF2RG	"	84,271	222	163
DK8KC	"	70,380	227	138
DL2SAX	"	44,157	200	123
DL1ZAX	"	40,052	146	124
DL6RAI	"	37,816	139	116
DF7UC	"	34,500	172	115
DF6QI	"	28,600	163	88
DL7AHD	"	5,808	52	44
DL1AM	"	5,559	51	51
DK1FW	**28**	**264,684**	**444**	**274**
DJ6TK	"	882	20	18
DF9YY	**21**	**1,405,452**	**1457**	**346**
DKØWR	"	1,250,809	1139	391
		(Opr: DK5OC)		
DJ0BA	**14**	**231,697**	**410**	**223**
DL9LAI	"	22,704	183	86
DL3YAS	"	20,646	200	93
DL8AAE	**7**	**28,912**	**137**	**104**
DJ4PT	**3.5**	**333,074**	**688**	**259**
DF2IS	"	81,900	303	150
DH2FAW	"	63,756	246	138
DK8KW	1.8	2	1	1

GERMANY (GDR)

Y31PA	**A**	**1,429,458**	**1390**	**411**
Y30CDL	**A**	**1,129,545**	**1127**	**405**
Y22JJ	**A**	**869,526**	**871**	**402**
Y42QO	"	620,256	889	336
Y78XL	"	518,610	865	295
Y51UE	"	434,145	803	309
Y59UN	"	216,756	594	243
Y43VI	"	181,800	378	225
Y47XF	"	161,320	328	218
Y48ZA	"	157,680	370	219
Y37UF	"	134,890	435	205
Y36UE	"	126,278	388	206
Y53XF	"	120,065	309	185
Y44XF	"	99,395	246	193
Y51XO	"	83,887	262	149
Y38TI	"	74,240	272	160
Y34XF	"	70,376	250	152
Y22HF	"	68,310	200	138
Y58YA	"	64,240	240	146
Y22WD	"	63,206	201	143
Y30UFJ	"	55,096	214	142
Y71SH	"	54,758	240	131
Y43UM	"	46,107	256	141
Y30AJH	"	43,641	173	117
Y64YG	"	40,221	153	123
Y49RF	"	34,238	155	106
Y30AHB	"	31,350	156	110
Y79XN	"	30,935	212	115
Y41WM	"	30,900	174	103
Y33VL	"	28,658	126	89
Y42YG	"	21,160	152	92
Y32ZF	"	18,966	128	87
Y43TG	"	18,655	144	91
Y51YJ	"	18,183	112	87
Y24RN	"	16,188	95	76
Y47VM	"	15,708	114	77
Y47PF	"	15,120	99	72
Y35RK	"	14,608	119	83
Y38XL	"	14,454	100	73
Y49XN	"	13,528	97	76
Y21XC	"	11,534	99	73
Y57TH	"	11,286	90	66
Y51TG	"	10,295	92	71
Y33TA	"	9,324	74	63
Y32VJ	"	8,400	69	60
Y30AZB	"	8,236	85	58
Y35U8	"	8,127	68	63
Y26JD/A	"	7,636	58	46
Y38UF	"	6,279	62	39
Y56YV	"	5,977	53	43
Y43XE	"	5,734	59	47
Y44TN	"	4,068	42	36
Y35ZF	"	3,735	50	45
Y23NL	"	3,520	79	70
Y30RM	"	2,925	42	39
Y24PE	"	2,775	44	37
Y38ZB	"	2,088	33	29
Y22CC/A	"	2,028	30	26
Y64UL	"	1,947	39	33
Y49UH	"	1,792	40	28
Y38WI	"	1,536	33	32
Y27HL/A	"	1,323	28	27
Y62XG	"	1,320	29	24
Y26KI	"	819	23	21
Y75XN	"	462	14	14
Y22QQ	"	418	20	19
Y21QH/A	"	384	16	16
Y36XC	"	363	11	11
Y30GMN	"	324	13	12
Y24HF	"	168	9	8
Y24HJ	"	84	7	6
Y23ZF	"	80	6	5
Y49RO	**28**	**28,900**	**120**	**100**
Y76WN	"	1,725	31	23
Y53WL	"	1,575	32	21
Y25TO	"	324	12	12
Y23ZE/A	"	21	3	3
Y24GF/A	"	12	2	2
Y32UC	**21**	**233,671**	**476**	**181**
Y38YK	"	109,836	260	162
Y22TO	"	49,504	155	119
Y52WG	"	39,605	153	89
Y30UE	"	7,668	60	54
Y30FTL	"	4,070	52	37
Y53UN	"	598	16	13
Y25NL	"	36	4	3
Y57WG	**14**	**1,541,850**	**1490**	**475**
Y76VN	"	120,520	341	184
Y38YE	"	43,136	185	128
Y25HL	"	42,456	200	122
Y64UH	"	20,972	148	98
Y37RL	"	5,670	66	54
Y31RB	"	5,358	74	47
Y27VH	"	3,648	43	38
Y71WN	"	2,860	55	44
Y32QH	"	2,345	41	35
Y23YK	**7**	**31,600**	**168**	**100**
Y37XJ	"	23,496	120	89
Y52XF	"	6,498	68	57
Y32KE	**3.5**	**223,344**	**555**	**216**
Y67XL	"	192,552	494	226
Y32OC	"	110,500	400	170
Y28AL	"	104,896	369	176
Y30BXO/A	"	62,828	251	139
Y24YH	"	18,758	118	83
Y23EL	"	5,400	60	45
Y23XF	"	1,620	38	30
Y31WC	"	1,200	26	24
Y25DA	"	312	14	12
Y46WF	"	264	14	12
Y25SH	"	98	7	7

The Evolution of a Superior Terminal for RTTY and CW



AIR-1 Past

As an R & D project, the AIR-1 went smooth as silk. By using our proven TU designs and software that's been refined on units such as the ultimate ATR-6800, we obtained a level of performance only found in much more expensive dedicated systems. Compare it for yourself or ask an AIR-1 owner. They work great!

AIR-1 Present

Along with great performance, the AIR-1 boasts an impressive list of features, some of which are exclusive to Microlog.

- Computer enhanced detection means extensive use of software digital filtering techniques for noise and bandwidth that track the operating speed and code.
- Full speed RTTY 60 to 132 WPM, CW to 150 WPM, & 110/300 Baud ASCII.
- Choice of full or split-screen display with large type ahead text buffer and programmable memories.
- On screen tuning indicators mean you never have to take your eyes off the video for perfect copy tuning. RTTY "scope" cross hatch and "red-dot" signal acquisition monitor right on the screen.
- Keyword or manual control of VIC or Parallel printer and receive buffer storage.
- Convenient plug-in jacks for all connections.
- Single board design contains TU & ROM software that does not require external power.
- Full one year warranty.
- WRU, UNshift On Space, Word wrap-around, Test "Quick Brown Fox" & "RYRY" in ROM. Break buffer, Random Code generator, Hand-key input, Real-time clock, sturdy metal cover and more.

MICROLOG

INNOVATORS IN DIGITAL COMMUNICATION

The optional on-board 4 mode AMTOR includes these exciting extras:

- ARQ mode A (chirp), Time Diversity mode B (Selective & Collective Broadcast), and Listen (eavesdrop) for mode A.
- Word processor mode for full editing of transmit and receive text.
- The unprecedented ability to transmit BASIC programs over the air directly from memory!!! Just load your program normally by hand, disc or tape, jump to AIR-1 to establish communications, and type a special control command. The AIR-1 does the rest. All standard Commodore Basic and screen control commands are transmitted/received intact, just as you typed them, for immediate RUN/SAVE. Share BASIC programs with your friends around the world without tedious "two-step" re-typing or mailing fragile discs and tapes.

AIR-1 Future

There's room for expansion and adaptability with some really "neat stuff" planned for the AIR-1. But then, why tip off the competition? Now you understand how we live up to the title "Innovators in Digital Communications." The complete AIR-1 for VIC-20 or C-64 is $199 (with AMTOR, $279). See it at your local dealer or call Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland 20879. TELEPHONE (301) 258-8400, TELEX 908153.

CIRCLE 53 ON READER SERVICE CARD

GREECE

SV1JG	A	2,038,314	1995	498
SV1RP	14	37,264	218	136

GUERNSEY

GU5BLG	A	1,379,472	1472	464
		(Opr: DL4FF)		
GU5EDO	"	193,802	494	218
		(Opr: DK9ZL)		

HUNGARY

HA5KDB	A	1,924,637	1700	473
		(Opr: HA7UX)		
HA3HZ	"	452,565	536	339
HAØIT	"	300,776	600	262
HA3KHC	"	59,782	220	142
		(Opr: Nemeth Tibor)		
HG5XW	28	38,985	146	113
HAØHW	21	133,176	319	179
HA6NW	14	276,078	643	282
HA5RL	"	84,132	367	171
HA9RQ	"	52,780	272	140
HA8IE	3.5	316,000	583	250

IRELAND

EI4DW	A	134,524	330	199

ITALY

I5FLD	A	4,028,847	2418	591
IO6NOA	A	2,789,452	2002	556
IK4BHO	"	250,920	425	255
I4CSP	"	57,218	192	122
IV3GOW	28	56,388	205	111
IO8KPV	14	787,952	1121	407
I5FCK	7	998,448	831	366
IN3AHO	"	337,500	536	250
IO3MAU	3.5	640,038	911	311

MALTA

9H3AM	A	308,118	607	267
		(Opr: G3VLX)		

MONACO

3A3WPX	A	198,258	506	191
		(Opr: DJ9ZB)		

THE NETHERLANDS

PA2TMS	A	2,932,590	1801	670
PAØKDM	"	64,207	229	143
PA3ADG	"	56,118	210	141
PA2SWL	"	38,178	156	101
PAØCOR	"	22,950	110	85
PAØLIE	"	9,520	75	70
PA3CDC	"	3,434	39	34
PAØRWS	"	192	12	12
PA3CNY	14	1,287	35	33
PI1PT	7	4,104	56	38

NORWAY

LA2TO	A	94,392	297	184
LA2AD	A	41,527	186	131
LA1RN	"	30,736	158	113
LA9ML	"	18,549	118	81
LA1HCA	"	12,455	74	65
LA5JX	"	9,313	74	67
LA6BBA	"	6,292	63	52
LA2CBA	"	3,312	40	36
LA2GN	"	1,680	33	30
LA2EG	"	1,200	20	20
LA5TBA	"	902	24	22
LA7ZCA	"	363	11	11
LA1ML	"	96	6	6
LA9DI	21	122,850	261	182
LA2ACA	14	77,180	288	170
LA3WBA	"	3,959	47	37
LA9HW	7	510	17	15
LA5QK	3.5	17,098	103	83

PORTUGAL

CRØUA	A	1,451,375	1309	425
CR4GO	"	341,600	593	280
CR5AHU	"	74,481	305	183
CQ4EX	"	4,183	52	47
CT1AV	21	74,043	202	171
CQ1BKW	14	1,313,928	1677	474
CU1LM	"	5,096	70	56
CQ4NH	7	1,204,112	792	362
CT4KQ	3.5	147,223	290	173

ROMANIA

YO6KEA	A	509,593	747	301
		(Opr: YO6AWR)		
YO7AOT	A	299,260	707	260
YO5BRZ	"	204,972	508	228
YO9CBZ	"	120,700	397	170
YO6MD	"	117,623	386	187
YO8BSE	"	101,475	320	165
YO7APA	"	76,734	251	147
YO6BMQ	"	70,470	313	145
YO2BTW	"	65,260	273	130
YO8FR	"	57,572	223	148
YO8AEZ	"	40,474	214	118
YO2CJ	"	35,708	153	113
YO7DO	"	24,831	135	93
YO7COU	"	20,276	131	74
YO2CMI	"	17,280	102	80
YO2CEQ	28	11,001	77	57
YO4ATW	"	1,950	30	25
YO6AFP	21	72,562	257	142
YO9HT	"	49,660	191	130
YO3KBC	14	25,877	173	113
		(Opr: YO3BDP)		
YO3RU	7	288,666	411	237
YO2BKG/6	"	15,870	115	69
YO4CVS/3	"	2,838	37	33
YO4BXX	3.5	50,076	201	117
YO6KEB	"	42,336	198	112
		(Opr: YO6BQT)		
YO5BEU	"	27,224	186	83
YO4CAH	"	15,836	112	74
YO4BGK/GL	"	10,224	128	72
YO8CKT	"	7,548	79	51
YO5CVE	"	3,680	60	40
YO8CMB	"	2,852	33	31
YO2CBF	"	2,178	34	33
YO6BTY	"	2,100	40	30
YO4DCF	"	220	11	11

SCOTLAND

GM3RAO	A	446,688	584	297
GM4RFE	14	85,440	345	192
GM8SQ	"	2,080	35	32

SHETLAND ISLANDS

GM4GPN	A	378,884	651	316

SPAIN

EA1AGN	A	482,880	667	320
EA3NA	A	373,152	533	299
EA3CFZ	"	41,454	153	126
EA1CIM	"	23,940	137	105
EA7YS	"	9,180	59	45
EC4AWK	"	9,108	77	66
EA3AVX	"	6,496	62	58
EA3DWK	"	4,823	60	53
EA5BVG	"	1,650	31	30
EA3BSE	"	1,265	26	23
EA7CPW	28	370,230	635	246
EC5AYX	21	20,768	134	88
EA5CGU	"	1,848	32	28
EA3DFA	14	304,722	612	297
EA5CDE	"	14,220	106	90
EA7EL	7	853,512	641	318
EC4BHD	3.5	71,000	275	142
EA2IA	"	11,616	78	66

SWEDEN

SM5CMP	A	1,702,325	1548	457
SM5EQW	A	818,614	1028	397
SM6BGG	"	405,920	682	295
SMØBOS	"	95,023	265	167
SMØKNV	"	58,446	169	153
SK3HK	"	53,040	205	120
		(Opr: SM3DXC)		
SK7PP	"	51,480	207	130
		(Opr: SM7AIO)		
SM7TV	"	39,312	185	112
SM3LIV	"	30,847	162	109
SM5CSS	"	20,592	112	88
SMØCGO	"	15,580	117	76
SM4CMG	"	5,016	47	44
SM5BDV	"	4,664	55	44
SM6MSG	"	3,840	43	40
SMØCHA	"	2,201	31	31
SM7NJJ	"	1,679	25	23
SMØDRB	28	42,225	189	135
SM6MYF	"	20,832	126	84
SM6OEQ	"	5,760	72	40
SM5DUT	"	4,320	49	40
SM2NTU	"	3,774	49	37
SMØFM	"	1,248	28	24
SMØMC	"	637	19	17
SM2EKM	21	2,721,114	2111	486
SM2LWU	"	230,214	483	222
SM4DDY	"	78,315	249	115
SMØKV/Ø	"	74,360	251	104
SM4BTF	"	280	12	10
SMØLPO	14	203,832	642	228
SM2CEW	"	142,784	328	194
SM6JY	"	14,193	111	83
SM5GA	"	5,656	60	56

SWITZERLAND

HB9AON/P	A	77,600	222	160

YUGOSLAVIA

YU2CZA	A	283,146	524	246
YU3HAM	"	129,352	382	184
YU7SF	"	52,924	195	131
YU4DIJ	"	16,191	150	63
YU7AF	"	15,222	112	86
YU5RK	"	12,740	99	91
YU7NZR	"	12,596	80	67
YU1PJO	"	1,876	29	28
YU7BCL	28	563,695	765	277
		(Opr: YU7QDA)		
YU3FK	"	364,014	566	243
YU3TXU	"	302,750	507	250
YU2RGL	"	206,824	378	206
YU2SUM	"	31,396	130	94
YU2CB	"	1,640	28	20
YU7KMN	21	1,650,800	1543	400
		(Opr: YU7AL)		
YU1DW	"	1,570,821	1581	393
YU2OG	"	415,740	712	246
YT3A	14	1,512,477	1521	489
		(Opr: YU3TVI)		
YU3TWT	14	1,316,146	1270	446
YU1KQ	"	1,110,746	1333	442
YU2OM	"	119,119	277	187
YU2OO	"	5,292	75	54
YU7ORO	"	3,108	57	42
YU3EY	7	1,117,854	797	381
YU2SD	"	375,000	454	250
YU4BR	3.5	424,850	623	293
YU2ARS	"	237,074	514	226
		(Opr: YU2WV)		
YU3EF	1.8	56,316	215	114

U.S.S.R.

EUROPEAN

EM3A	A	2,425,994	2289	529
		(Opr: UW3HV)		
UA6XAN	A	636,944	924	366
UA3TN	"	211,679	454	247
UA6AJG	"	161,704	368	232
UW6LC	"	85,680	252	170
UZ3RV	"	43,296	196	132
UV3MM	"	42,120	169	117
UA3GEA	"	39,045	203	137
UA3DTD	"	36,772	159	116
UA4CO	"	31,684	148	89
UW4HN	"	31,488	142	123
UA3PBY	"	29,640	171	120
UA1DDP	"	28,792	140	118
UA3DIN	"	27,639	150	111
UA6AXT	"	26,751	147	111
UA6JAY	"	21,988	147	92
UA3DNK	"	18,876	116	78
UA4NAA	"	18,860	120	92
UA3AHA	"	16,245	107	95
UA4HJA	"	16,080	99	80
UA3PDA	"	14,151	133	89
UW1AE	"	14,080	111	88
UA3AGZ	"	8,844	76	67
UA4CDC	"	7,448	68	49
UA1TBP	"	5,320	54	40
RA3TET	"	5,264	58	47
UK6AJN	"	3,760	52	40
		(Opr RA6AMH)		
UA3XBB	"	3,071	38	37
UA1CE	"	1,161	30	27
UA6BJZ	"	98	8	7
UA4WWA	28	302,948	625	212
UA3TDK	28	283,338	458	243
UA6ARX	"	219,672	501	226
UA6LMT	"	152,222	373	166
UA3DAT	"	53,193	189	119
UA4CDL	"	49,704	186	109
RA3DAD	"	41,000	166	100
UA4NCI	"	19,758	105	74
UA3PGO	"	13,760	89	64
RA3DEX	"	13,064	90	71
UA3MDV	"	10,422	80	54
RA3DDU	"	9,843	69	51
UA3ACJ	"	7,800	63	52
UA3ONU	"	6,992	59	46
UA3TBK	"	4,725	50	45
UA3QEE	"	3,536	42	34
UA3TES	"	3,296	40	32
UA3DQS	"	3,116	45	38
UA4NDV	"	2,370	37	30
UA1AWO	21	341,977	570	281
UV3TO	21	239,625	502	225
UA4CZ	"	115,210	330	205
UA1CAQ	"	26,664	138	101
UA3TAM	"	9,792	89	72
UA4FDE	"	644	17	14
UA6ADC	14	956,571	1305	451
UV3DN	14	446,782	962	329
UA1AET	"	65,036	286	177
UA3VCC	"	47,895	192	155
UA6LLI	"	40,710	215	138
UA3DNV	"	2,432	48	38
UA3DGI	"	925	27	25
UV3FD	7	19,844	107	82
UA4PMK	3.5	62,000	227	124
UA4CED	"	42,800	184	100
UA3QMK	"	26,208	163	78
UA4CGZ	"	7,040	81	44
EZ4CBX	1.8	5,365	71	37
UA3DVS	"	704	25	16

BYELORUSSIA

UC2LBE	A	240	10	10
UC2WBL	21	130,288	383	136
UC2ABF	"	30,368	136	104
UC2OBP	14	290,418	743	291
UC2WAZ	"	40,296	180	146
UC2LBK	"	1,500	31	25

ESTONIA

UR2QI	A	1,622,277	1703	477
UR2RJS	"	8,556	68	62
UR2RKB	28	63,732	208	141
UR2RMZ	"	3,784	48	43
UR2TBG	14	706,860	1124	385
UR2QI	"	207	10	9
UR2RHF	7	80,325	235	153
UR2RMI	3.5	133,796	370	166
UR2REE	"	34,888	165	98

KALININGRAD

UA2FFC	A	312,390	755	270
UA2FBZ	"	20,880	112	90
UA2EC	14	225,071	577	259

KARELIAN

UA1NBF	7	128,250	326	171

LATVIA

UQ2GLW	A	14,256	94	72
UQ2GII	3.5	6,149	73	43
UQ2GDQ	1.8	12,760	97	58

LITHUANIA

UP2BBX	A	1,631,256	1560	444
UP2DM	A	563,914	792	299
UP2PBW	"	423,340	631	305
UP2BZ	"	292,110	631	273
UP2PBZ	"	67,474	315	183
UP2PBM	"	66,952	305	136
UP2BCD	"	39,936	201	128
UP2BBF	"	15,387	104	69
UP2PCK	"	12,432	106	74
UP2BDO	"	5,130	59	38
UP2OQ	28	7,392	63	56
UP2PCI	21	171,864	353	217
UP2ND	"	82,248	232	149
UP2AV	"	7,191	70	47
UP2OU	14	287,850	738	285
UP2PCB	"	44,589	180	167
UP2BV	"	5,871	65	57
UP2NX	7	1,014,590	963	355
UP2BEX	"	37,944	174	102
UP2BJO	3.5	49,506	230	111
RP2BFU	1.8	570	20	15

MOLDAVIA

UO5OGE	A	1,800	44	36
UO5OCL	3.5	45,000	209	100

UKRAINE

UB5FDF	A	2,680,576	2138	566
UB5LAN	A	823,253	969	401
UT5RY	"	331,992	604	261
UY5TE	"	206,938	541	214
UB5UBU	"	46,305	205	147
UB5IIQ	"	31,096	118	104
UB5UKT	"	19,120	100	80
UB5UCH	"	14,007	91	69
UB5VCK	"	13,266	76	66
UB5NAM	"	10,336	79	68
UB5NCF	"	9,250	87	74
UB5HEX	"	7,552	69	64
RB5IIU	"	5,814	63	38
UB5UYR	"	3,480	55	29
UB5IPP	28	31,562	142	86
UB5VAA	"	26,790	117	95
UB5UKV	"	19,803	101	69
RB5CCJ	"	13,908	84	61
UB5IDA	"	7,348	61	44
UB5UGD	"	3,605	39	35
UB5ICS	21	116,298	338	213
UB5MLP	"	28,320	142	120
UB5UGO	"	4,370	47	46
UY5VG	14	1,132,230	1501	438
UB5IX	"	37,942	189	122
UB5JBF	"	224	10	9
UB5IHF	7	149,520	337	128
UB5IFN	3.5	81,130	283	133
UB5EEP	"	16,236	113	66
UB5FDM	"	14,740	107	67
UB5AAQ	"	5,576	66	41
UB5PBA	1.8	24,396	321	57

OCEANIA

AUSTRALIA

VK4VU	A	2,667,560	1946	424
VK6ZX	A	700,220	778	314
VK5FF	A	525,825	588	285
VK2BQS	A	152,830	323	155
VK5NOD	"	97,152	270	128
VK5NLM	"	67,053	248	103
VK6JS	"	18,827	105	67
VK8KGA	A	13,664	87	56
VK3AH	14	167,580	331	180
VK1GM	14	84,816	204	152
VK3SM	"	29,664	112	103
VK1LF	"	264	13	11

FRENCH POLYNESIA

FO8HL	A	1,396,824	1658	286

GUAM

KB7IJ/KH2	7	292,096	416	128

HAWAII

KH6IJ	28	50,220	212	81
KH6BZF	21	791,229	915	291

INDONESIA

YB1BG	28	444,960	630	240
YBØACL	"	258,216	548	159
YCØVM	21	1,571,359	1803	293
YB2CR	"	1,357,056	1579	288
YB2BOT	7	27,966	84	59

KIRIBATI

T32AF	1.8	16,872	79	37

PHILIPPINES

DU1CPL	A	1,001,520	1295	260
DU1TV	28	172,692	540	108

NEW ZEALAND

ZL1AAS	A	1,628,946	1318	418
ZL4AS	"	486,540	646	265
ZL1IM	"	54,834	173	114
ZL1BIL	28	630,396	904	234
ZL1AXB	14	2,463,521	1715	493

NIUE

ZK2RS	14	1,324,348	1418	332

SOLOMON ISLANDS

H44R	A	4,299,160	3063	460

SOUTH AMERICA

ARGENTINA

LU5FGG	A	4,275,847	2704	521
LU1BR	A	4,094,763	2516	543
LU4MEE	"	2,723,220	1813	492
LU6QR	"	608	17	16
LU6QI	"	243	9	9
LU8FEU	28	2,138,409	1648	441
LU6EM	28	1,728,760	1326	440
LU1ABT	"	1,117,017	1278	297
LU2FAD	"	22,770	111	69
LU2X	21	921,060	1004	315
LU4DM	"	649,094	773	289
LU1MBB	14	37,596	168	78

BOLIVIA

CP6EL	28	1,109,955	1111	341

BRAZIL

PP2ZDD	A	2,275,280	1546	476
PYØZWM	A	2,133,075	1653	425
PY2FFW	"	34,353	121	99
PY1TIA	"	3,348	30	27
PY6AKE	"	3,333	36	33
PY6ABW	"	2,760	33	30
PY5BAB	28	1,286,680	1154	380
PT7AUI	"	187,416	348	186
PY3HMC	"	133,770	307	147
ZY10L	"	79,695	229	115
PY3CZR	21	54,264	169	119
ZY5EG	14	3,869,828	2212	596
PPØZAT	"	550,020	700	267
ZY1DFF	"	30,012	132	82
PY5IW	7	31,524	93	74
PY2FUP	"	2,016	23	21

CHILE

CE6EZ	28	4,073,135	2663	515
CE7BIY	"	123,372	447	92
CE3BYL	14	47,212	148	116
CE3EDJ	"	4,995	47	39
CE3DOF	7	59,096	127	83

COLUMBIA

HK3NBB	A	205,971	351	213
HK4DUM	14	593,856	735	288

ECUADOR

HC1HC	3.5	500,192	395	232

NETH. ANTILLES

PJ2FR	A	7,484,994	3633	594
		(Opr: N6KT)		
P42J	28	1,575,712	1629	328
		(Opr: W1BIH)		

PARAGUAY

ZP5LOB	A	29,016	116	93

TRINIDAD

9Y4VU	A	3,263,436	2075	451

VENEZUELA

4M3AZC	A	5,529,968	2602	599
YV4BOU	"	2,069,697	1382	469
YV3ADR	28	1,010,913	1092	317
YV3AGT	14	3,770,904	2378	564
YV7QP	"	227,808	348	226
YY3BQS	7	1,664,096	874	323
YV2IF	1.8	27,768	91	52

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

N5AU		5,039,356	2838	686
AJ6O		3,224,276	2196	577
KW8N		2,554,375	1876	625
KB1H		1,804,377	1529	573
AK6A		1,765,808	1493	508
N3GB		1,461,200	1303	520
KK5I		1,152,438	1354	483
KR9A		755,420	584	428
KB2MG		511,598	710	367
NS6G		395,850	852	350
W2AZO		388,401	512	299
W7DG		353,864	618	284
KM8P		350,168	508	296
KB8UF		345,895	603	331
KK2E		337,619	496	283
KD8AX		299,400	601	300
W9JOO		247,066	427	262
NC6H		243,270	393	255
KS9O		190,560	379	240
KM1P		86,430	254	215
ACØE		63,200	207	158
KB7B		47,121	211	139

NORTH AMERICA

VP2EC		15,238,880	6674	820

HH2WW	**11,394,404**	**5993**	**746**
VE1DXA	**7,373,345**	**3833**	**719**
VE6OU	**6,269,940**	**3273**	**683**
XF8MDX	**4,636,426**	**3441**	**554**
VE2UMS	**1,537,326**	**1226**	**441**
VE6CAW	1,269,050	1177	425
C6ABA	**1,056,390**	**1071**	**345**
XO7UBC	**436,560**	**712**	**214**
WL7K	**108,160**	**249**	**160**

ASIA

JG1ZUY	**6,182,125**	**3175**	**685**
JY8KG	**4,071,664**	**2611**	**496**
JA1YNE	2,105,946	1377	531
JA1YFG	1,585,333	1248	457
JA7YBJ/7	1,151,478	991	426
JH3YJM	1,125,065	1107	415
JA6YDH	365,037	517	271
JA8YCR	141,732	307	186
JA8YCV	36,900	151	123
JA3YCT	1,323	28	27

EUROPE

IZ4ARI	**7,598,490**	**3667**	**705**
IK5BAF	7,368,262	3870	638
TO8FF	**6,738,620**	**3428**	**758**
HG5A	**5,703,390**	**3382**	**630**
HG35HA	5,491,863	3407	643
HG6V	4,879,200	3030	642
CT2FH	**4,797,796**	**3203**	**614**
LZ5Z	**4,581,604**	**3191**	**652**
OH8AA	**4,139,586**	**2955**	**606**
YT3M	**3,846,948**	**2305**	**574**
SL8ZG	**3,365,781**	**2461**	**599**
LG5LG	**3,296,031**	**2227**	**633**
I09AF	**3,208,239**	**2480**	**579**
Y44ZI/P	**3,150,016**	**2076**	**593**
HG1Z	3,023,315	2148	565
DL8JK	**2,691,660**	**1939**	**565**
Y33ZB	2,683,368	2253	492
HB9CIP	**2,655,179**	**2033**	**499**
I09KZW	2,613,260	2115	529
TO6KAW	2,532,360	1842	564
YT3T	2,274,562	1840	502
HG8U	2,187,297	1802	489
G6CW	**2,015,384**	**1598**	**511**
IY4FGM	2,014,232	1788	487
SM7KIL	1,795,470	1541	485
Y54ZA	1,762,560	1646	480
G3AHD/A	1,729,328	1578	464
OH2BAH	1,444,748	1548	379
GB2WPX	1,400,084	1567	434
Y27FN	1,289,556	1403	452
ED6MDX	**1,289,528**	**1434**	**449**
DA2ER	1,249,115	1278	401
EI7DJ	**1,243,880**	**1172**	**440**
SM6CVT	1,213,912	1260	409
HA7KSR	1,164,660	1319	420
OK1KUR	**951,490**	**1023**	**386**
DL8RC/A	896,154	1049	399
LA4O	894,200	1148	425
TO8WE	771,490	1128	358
ED3SCB	**765,320**	**1067**	**380**
DK3QJ	761,112	945	372
OK3KFF	648,196	890	347
HA8KDA	577,296	899	342
YU2CBM	491,069	737	311
LA2Y	469,800	845	324
OK3KJF	456,536	761	298
4N8ATC	429,680	648	328
OK2KYC	384,385	635	295
HA4KYH	336,192	572	272
YO8KOD	**292,556**	**540**	**248**
Y32ZK	281,358	549	261
SK6CM	265,590	723	234
LZ2KBA	264,720	522	240
Y37ZB	251,750	542	250
YU2BST	244,020	427	249
OZ5EDR	**233,600**	**479**	**250**
HA3KNA	226,331	518	217
OK3KRN	182,000	502	208
YU7AJD	168,100	385	205
OK3KAW	160,474	379	206
PI1GOE	**152,428**	**345**	**212**
ON6RM	**143,059**	**353**	**191**
OK1ONC	119,968	372	163
HA5KHE	111,931	340	173
OK1KIR	90,528	281	164
HA5KFV	67,620	272	147
DL8TS	48,434	184	122
OH7AI	45,513	190	117
OK1KPA	43,306	164	118
PA3CPG/A	37,468	201	116
OH2BIF	34,452	195	116
YO8KGE/NT	31,411	159	101
YU4CBC	18,531	142	87
OK1KFB	12,780	102	71
LZ1KRB	12,558	79	69
OK1KMP	11,725	109	67
OK3RMW	6,672	74	48
OH3BU	1,587	34	23

OCEANIA

KC6SZ	**4,544,340**	**3982**	**345**
VK2WG/2	**498,104**	**699**	**232**

SOUTH AMERICA

LU4AA	**2,627,566**	**1871**	**478**
ZY1NEZ	**2,533,232**	**1747**	**494**
PY4HH	26,361	104	87

U.S.S.R.
CLUB STATIONS
ASIA

UK7PAL	**4,866,090**	**3344**	**570**
UK9FER	**3,385,800**	**2130**	**475**
UK7LAA	2,982,944	2268	496
UK9CAE	2,813,399	1795	487
UK9ADT	1,937,239	1406	443
EK9D/8	**1,206,880**	**1902**	**380**
UK9HAD	957,125	1591	325
UK8SAZ	639,180	1570	268
UK9XAN	591,162	730	318
UK8AAT	321,804	517	252
UK8MMM	**196,606**	**455**	**197**
UK9AEX	181,454	362	182
UK9ADS	57,660	235	124
UK8SAB	35,844	237	103
UK9FFF	6,493	50	43
UK9CAC	5,092	48	38
UK9OAE	507	15	13

EUROPE

UK2RDX	**5,370,444**	**3177**	**619**
UK4FAV	**5,331,408**	**3408**	**654**
UK2BBB	**5,195,600**	**3067**	**620**
UK2PCR	3,749,141	2618	569
UK2PAP	2,814,282	2133	541
UK3ABO	2,742,240	2217	580
UK6HCZ	1,489,440	1628	435
UK4ABW	1,356,992	1537	466
UK6LCB	1,321,026	1491	443
UK4WAB	1,264,692	1488	429
UK3DBG	971,931	1373	381
UK2AAW	**837,906**	**1118**	**359**
UK3GAF	779,720	1135	386
UK3DBV	763,232	1094	391
UK6LAZ	747,579	1049	367
UK4HBB	711,346	1087	358
UK5OAA	**702,325**	**1188**	**325**
UK4CBL	515,732	956	326
UK2ABC	493,443	916	327
UK3YAM	485,870	606	385
UK5EGJ	**408,776**	**719**	**296**
UK5ICX	372,104	525	241
UK1AAW	371,800	861	275
UK3DAU	370,500	610	300
UK2BCC	335,146	672	259
UK3ABJ	307,648	665	253
UK4WAP	257,040	532	240
UK6LWW	201,880	547	280
UK3DBW	199,836	486	234
UK2AAG	192,000	582	192
UK3DBF	172,530	510	213
UK2AAP	118,312	397	184
UK6HBK	104,000	310	200
UK3TCJ	85,778	354	154
UK3SAC	83,997	302	153
UK1OAP	74,024	222	152
UK1NAP	**67,580**	**271**	**155**
UK1OAZ	41,580	206	132
UK5MCO	37,024	167	89
UK2PAT	25,338	155	82
UK4HBU	20,140	149	106
UK2RAQ	17,100	111	90
UK4CAC	14,651	112	91
UK3ABT	13,940	133	85
UK6APP	7,208	61	53
UK3XAB	5,141	68	53
UK5IAM	4,524	51	39

MULTI-OPERATOR
MULTI-TRANSMITTER

YZ1EXY	**10,406,975**	**5248**	**799**
KL7RA	**9,819,960**	**4855**	**730**
KL7IRT	9,727,915	4469	695
GB4ANT	**9,671,269**	**5124**	**719**
VE3PCA	**8,207,872**	**3750**	**736**
4N9YU	8,139,968	4573	772
NA8V	**7,686,488**	**4242**	**829**
VK2WU	**7,024,206**	**3458**	**609**
XO7ZZZ	**6,543,579**	**3879**	**673**
JA9YBA	**6,295,993**	**3410**	**671**
AB8I	**5,614,500**	**3931**	**788**
XO7WJ	4,087,600	2618	550
UK2FAA	**2,823,278**	**2085**	**542**
K5LZO	**2,754,040**	**2138**	**620**
VE2UN	**1,990,020**	**1374**	**510**
JA6YAI	1,946,161	1566	484
ZY3ZZ	**1,379,430**	**1174**	**390**
JA7YDX	571,059	759	321
VK6NSD	**264,216**	**851**	**109**
OZ5DD	**247,650**	**529**	**254**
JA2YKD	113,505	285	161
JA1YPP/JD1	**72,468**	**577**	**99**
JH6YTX	57,684	170	132
KC8XK	50,568	201	147
JA6YGV	49,184	164	116

CHECK LOGS: The following logs were used for cross-checking. Check logs and SWL logs are always appreciated. Thank you.
AA2Z, AG0S, CQ1BY, CQ2FE, CT4EX, EA5CTP, JA7YAA, K1LL, K6FM, K6SGS, KA0NNF, KA6HTC, KK0L, LA3HX, LA7NY, LA9PW, LA9WCA, N6UW, OH3BI, RA3DQP, RJ8JCF, SM2DYS, SM6MIS, UA1MU, UA3TAG, UA4CGZ, UA4HCN, UA6ALT, UA9YFG, UB5IMD, UB5MMG, UB5UKO, UK0AAB, UK1ZBB, UK3DBE, UK4SAM, UK4WAC, UK5LBJ, UK5OAR, UK8MAF, UK9HTT, UK9UBM, UK9UDD, UK9UFF, UL7LBM, UN1CC, W8FFN, W9LT, Y2-13114/E, Y23EK, Y32RL, Y37SJ, Y43ZK, Y46MF, Y47YM, Y51YF, Y57ZD, Y68WG, Y85XL, ZY1BFZ.

CQ REVIEWS:

The Mirage (KLM) H.F./V.H.F. Wattmeter/S.W.R. Units

BY JOHN J. SCHULTZ*, W4FA

The MP1 and MP2 are pretty much look-alikes except for the power scales. They have been nicely chosen to accommodate the types of power output levels normally used on either h.f. or v.h.f. transmitters.

The Mirage Communications Equipment, Inc. Models MP1 and MP2 Wattmeter/S.W.R. instruments do not represent any dramatically new approach to the measurement of the parameters involved, but they do represent a very well thought out practical execution of instruments that are easy to use and provide a very clear and balanced scale display and an accuracy very unusual for their price class.

The MP1 is designed for use on the h.f. (2–30 MHz) bands, and its specifications are shown in Table I. The MP2 is the v.h.f. (50–200 MHz) equivalent of the MP1, and its specifications are shown in Table II. There are some electrical differences between the units as shown in the tables, although the instruments are generally the same in physical makeup.

Both instruments are housed in metal cabinets measuring about 4½" × 4½" × 5½" and having a combination brown and light olive-green finish. The meter movements are particularly large and easy to read, with the top scale on the meter scale having a curved length of about 3½ inches. The front-panel controls consist of a power range selector switch (simultaneously serving as an on/off switch for the internal electronics), a slide switch for peak or average power readings, a slide switch for forward or reverse power readings, and a rotary control which sets the instrument for power or s.w.r. calibration/readout.

The power scales on the meter movements differ a bit in that the h.f. model has full-scale readings of 25, 200, or 2000 watts, while the v.h.f. model has full-scale readings of 50, 500, or 1500 watts. These scale dimensions were apparently very well conceived. For instance, on the MP1 the 25 watt scale covers from 0–5 watts over about ⅓ of the scale length and 0–10 watts over about ⅝ of the scale length. Therefore, the QRP enthusiast can set a transmitter's output level quite accurately over a 0–10 watt range in at least ½ watt increments. The 0–200 watt scale covers from 0–100 watts over slightly more than ⅔ of the scale length, making it ideal for use with the usual 100 watt output h.f. transceiver. The 0–2000 watt scale has 500 watts at center scale and 1000 watts at ⅔ scale, which is ideal for use with the usual 1 kw or 2 kw PEP input linear amplifier.

In a similar manner the MP2 scales are dimensioned for the power levels usually found on the v.h.f. bands. The 0–50 watt scale accommodates the usual hand-held transceiver outputs with an emphasis towards the lower power levels. The 0–500 watt scale generally is useful for medium power base and mobile amplifier output levels, and the 0–1500 watt scale obviously is useful for monitoring the output of very high power v.h.f. amplifiers.

Looking inside the MP1 or MP2, one will find some very nice construction features. Both units have an internally mounted transmission line coupler unit which uses SO-239 in/out connectors and which is housed in a separately shielded enclosure. The transmission line coupler unit can be left in the main enclosure or unscrewed and remotely positioned up to about 4 feet away (e.g., directly at a transceiver's output terminals). A PC board mounted in the main enclosure contains the electronics used to drive the meter movement and is powered either by an internally mounted 9 volt battery or from an external 9–12 v.d.c.

*c/o CQ Magazine

Frequency Range:	2–30 MHz
Line Impedance:	50 ohms resistive
Functions:	Power—Forward/Reverse, Peak/Average, S.W.R.
Power Range:	25, 200, and 2000 watts (±5% r.f. calibration + 1% meter)
Power Capability:	1000 watts continuous, 2000 watts intermittent
S.W.R. Sensitivity:	1 to 2 watts
D.C. Power Requirement:	9 v.d.c. internal battery or optional a.c. adaptor
Size:	5.75"H × 4.5"W × 5.75"D

Table I– Specifications for the MP1 unit.

Frequency Range:	50–200 MHz (calibrated at 145 MHz)
Line Impedance:	50 ohms resistive
Functions:	Power—Forward/Reverse
Power Range:	50, 500, and 1500 watts (±5% r.f. calibration + 1% meter)
Power Capability:	1000 watts continuous, 1500 watts intermittent
S.W.R. Sensitivity:	1 to 2 watts
D.C. Power Requirement:	9 v.d.c. internal battery or optional a.c. adaptor
Size:	5.75"H × 4.5"W × 5.75"D

Installation: The MP2 coupler has two SO-239 coax connectors marked Input and Output. The radio is connected to the input connector, and the load, or antenna, is connected to the Output connector.

Table II– Specifications for the MP2 unit.

source (a jack is provided for the connection of the external power source). The current drain from the 9 volt battery is an extremely low 0.5 ma. For the price range of the instruments, the construction is impressive from several viewpoints. The main enclosure is heavy; the PC board uses quality components; soldering is very neat; mechanical fastenings are excellent (e.g., each SO-239 is fastened by four screws!); etc.

The electrical circuitry of the MP1 is shown in fig. 1 and that of the MP2 in fig. 2. They are generally similar except for some differences in the transmission line coupler units and in the range calibration potentiometer values. The heart of the circuitry for both units revolves around an LM358 IC. Half of the IC is used as a voltage amplifier to drive the meter, and the other half is used as a voltage comparator to sense when the battery voltage falls below 6.75 volts. When the latter takes place, the voltage comparator output activates an LM3901 IC, which in turn flashes a front-panel-mounted "low batt" LED. Unfortunately, there is no LED or other device to indicate that the instrument has been turned on. Because of the extremely low battery drain, the unit can be left on for days at a time without seriously affecting battery life, but the lack of some sort of "on" type indicator must remain an extremely slight disadvantage. I would be the first to admit that I myself can't suggest any suitable circuitry for an "on" type indicator that would not excessively drain the battery.

Operation of either the MP1 or MP2 is extremely straightforward. The range switch is set as desired, and then the slide switches are used to choose either peak or average power readings and either forward or reverse power readings. No calibration is required for power readings. For instance, if the MP1 is set on the 200 watt range, the instrument will display forward or reverse power within that power

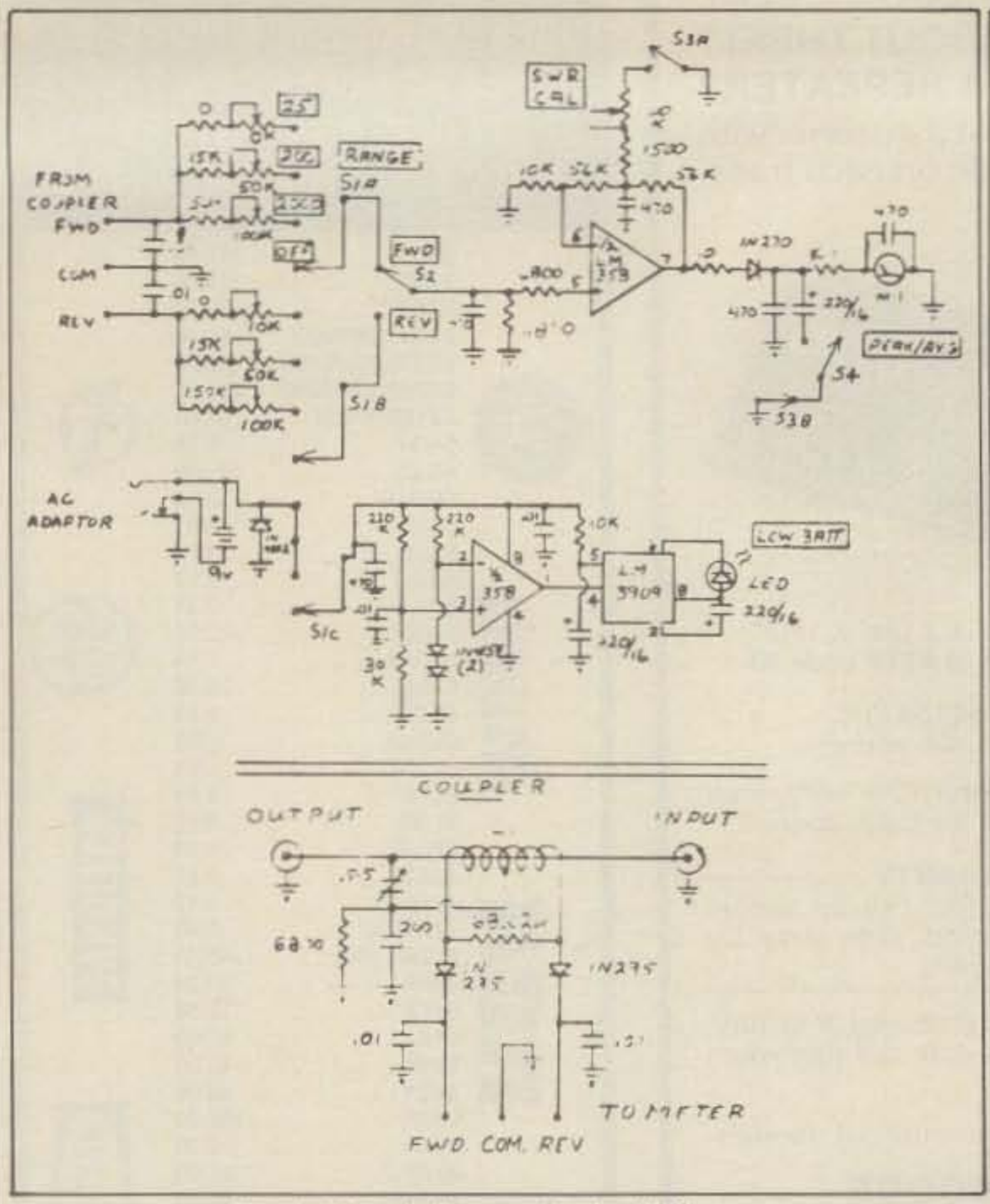


Fig. 1– Circuit diagram for the MP1.

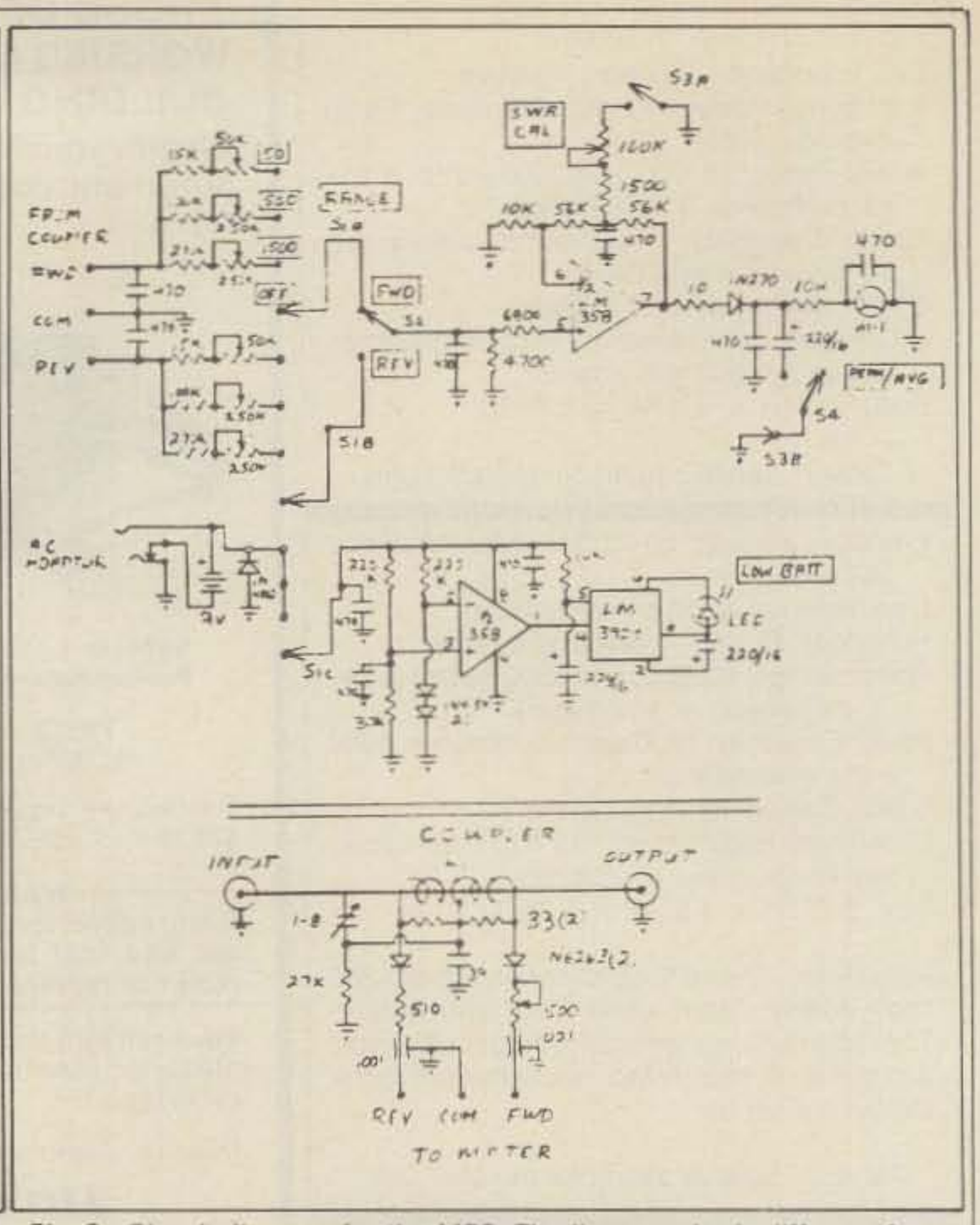
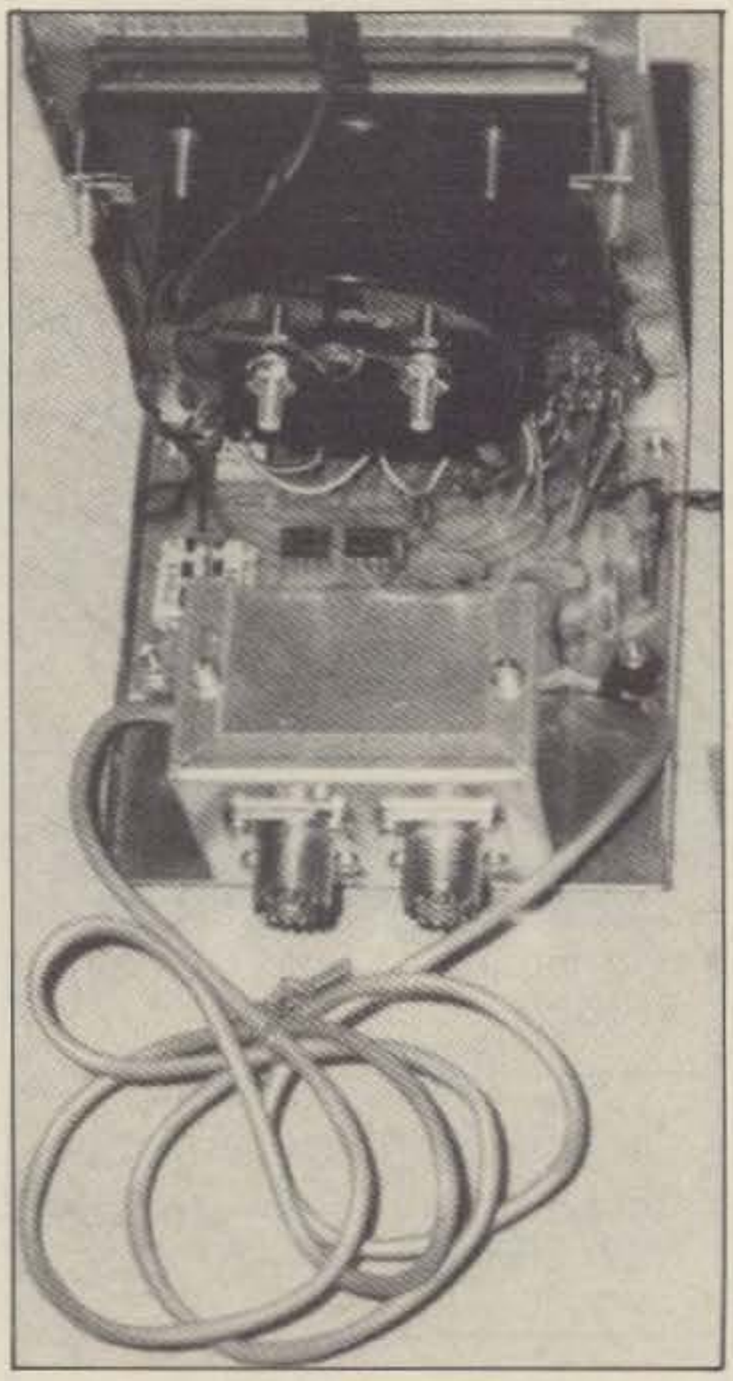


Fig. 2– Circuit diagram for the MP2. The line coupler is different from the MP1, since it is tailored for the v.h.f. range.



A look inside either of the units reveals very neat construction. The line coupling unit with the two SO-239 connectors can either be left in the main enclosure or taken out and remotely located.

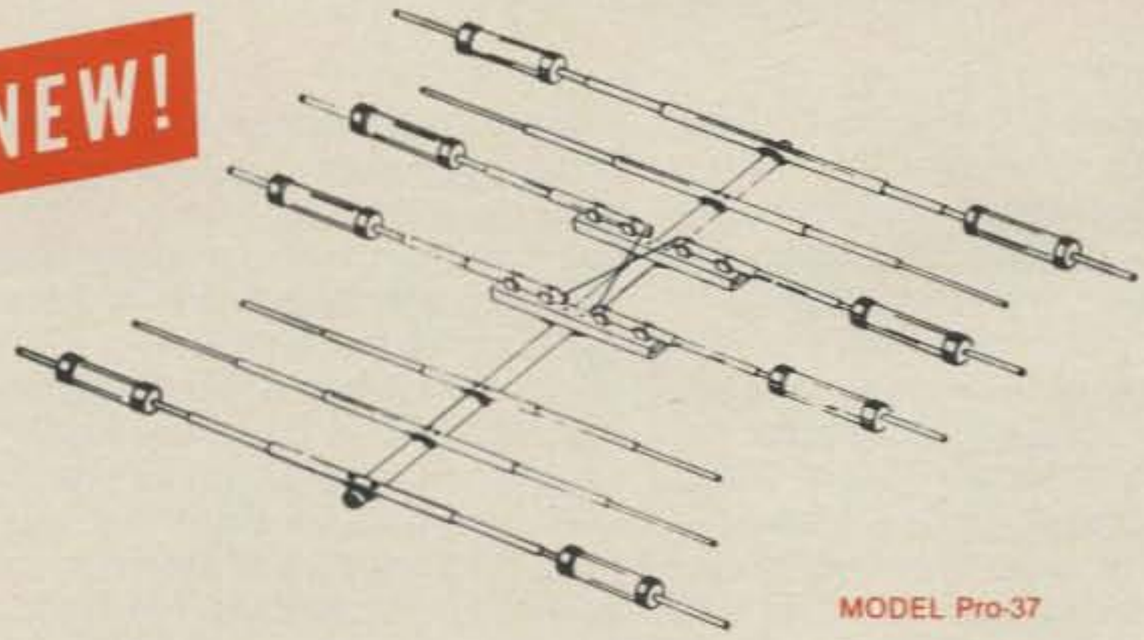
range, depending upon how the forward/reverse slide switch is set, and power either in the peak or average power mode, depending upon how the peak/average slide switch is set. For most practical applications one probably will never use the s.w.r. features of the meters except as a curiosity type thing. Actual s.w.r. can be measured, but to do so requires that the meter be set to read forward power (on any range), the **SWL CAL** control be set for a full-scale reading, and then the forward/reverse slide switch be set to reverse to read s.w.r. directly on the s.w.r. meter scale. In most practical applications one would probably use the reverse power meter reading to set an antenna tuner and then forward power reading (particularly in the peak-reading mode on s.s.b.) to verify that a transceiver is operating properly.

Various tests of the MP1 and MP2 using various loads for s.w.r. and various power levels and comparing the results against laboratory-grade instruments showed the MP1 and MP2 readouts to be amazingly good. As many power levels as possible were tested. On the h.f. bands accuracies within 4% for power levels up to 600 watts output were the norm and within 5% on the 2 meter band for power levels in the 100 watt range.

The peak-reading capability of the MP1 and MP2 was found to be a bit on the "scotch" side. Compared to calibrated oscilloscope readings, the MP1 and MP2 displayed peak power outputs that were about 10% below those observed on laboratory instruments. But considering the extremely reasonable price class of the MP1 and MP2, they simply have to be rated as "best buys." Mirage does provide an extremely long five-year warranty on the units, providing the owner has not modified them. CQ

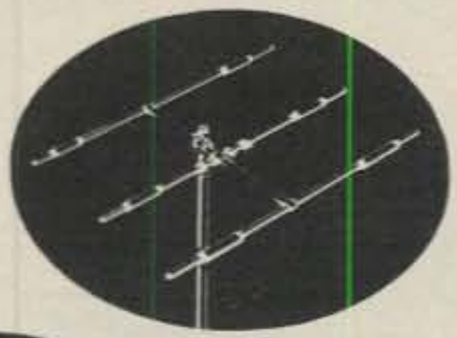
OUTSTANDING PERFORMANCE with MOSLEY ANTENNAS

NEW!

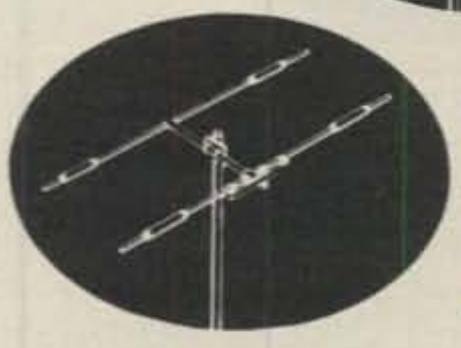


MODEL Pro-37

The Pro-37 follows in the Mosley tradition of high performance, dependability, and quality construction. The Pro-37 is pre-drilled for easy assembly. No adjustments or measuring. Average assembly is about 1½ to 2 hours. As with all the Mosley antennas we use stainless steel hardware throughout. Rugged construction makes our antenna the cleanest, strongest of its class, no cluttered elements or boom to cause electrical and mechanical problems down the road. Put it up and leave it up. In performances it has no peers...It is as broadbanded or broaderbanded than any antenna made. Its gain and front to back is as good or better than other antennas in its class, even those with longer booms. Mechanically we feel it's the best built.
The Pro-37 has 7 elements on a 24 foot boom which needs no boom support. It has 3 wide spaced elements on 20 and 15 not counting the extra driven element. 10 meters has 4 wide spaced elements not counting the extra driven element. The Pro-37 uses a unique direct feed system which enables the driven elements to contribute gain to the antenna, while giving it the broadest possible frequency spectrum. Clean design makes the antenna easy to assemble and erect and solves maintenance problems. No clutter on the elements or boom. The Pro-37 uses the proven Mosley traps which on the Pro-37 will handle 2.5 KWDC out on C.W. and 5 KWPEP on SSB.
We're quite excited about the Pro-37 and we know you will be too!



TA-33 Jr.
Three element rotary beam aerial.
10-15-20M.
Rated to 300W.



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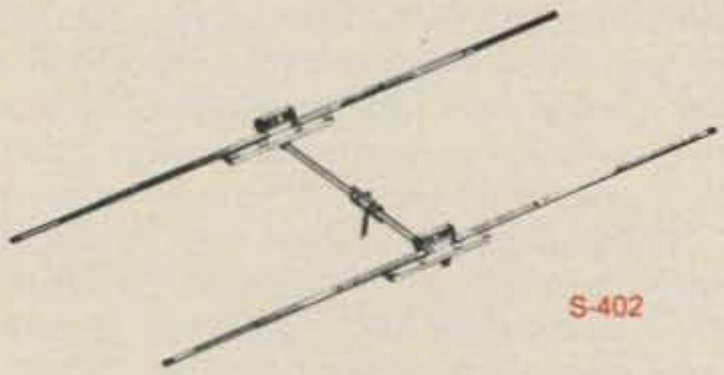

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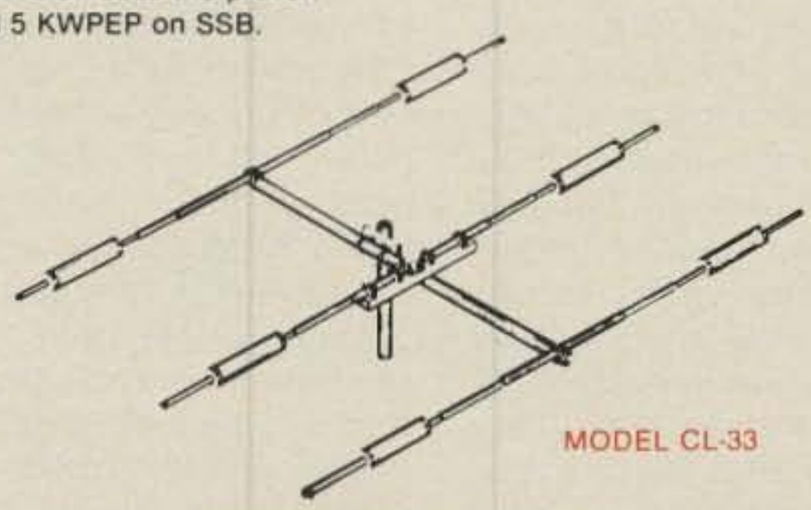
V-4-6



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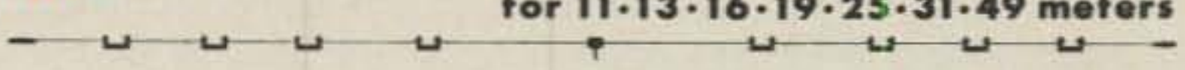

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QRP

a monthly feature by
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

New QRP Trend: Under One Watt Output

It has been about 14 years since QRP operation was first defined in terms of less than 5 watts r.f. output from the transmitter. At that time 5 watts seemed a quite reasonable challenge, since only a scattered few were running such "fantastically low" power levels! Since then literally millions of contacts have been successful at power levels of under 5 watts ouput. At this time about 64 operators have claimed the DXCC QRPp Trophy (5 watt level), about 4 have claimed the DXCC 200 QRPp Plaque (200 countries, 5 watt level), and believe it or not, 8 have qualified for the DXCC Milliwatt Trophy (DXCC with less than 1 watt output). Ron Moorefield, W8ILC, has pushed his 1 watt s.s.b. standings to about 297/292! Quite a few operators have pushed their 5 watt totals to within reach of the 200 country level.

On the contest scene the ARRL and *CQ* DX contests continue to draw long lists of operators into the QRP sections, and 5 watt scores have steadily built up to the million-point level. It is a rare experience when I operate a DX contest for more than an hour and don't encounter some other QRPer in there battling it out with the kw's. In terms of our own QRP QSO parties sponsored by various QRP organizations around the world, activity is at an all-time high. After living through the early years when we fought just to get guys to participate in these events, it is a joy to sit back and scan a 10 kHz wide spectrum centered on the QRP calling frequencies and listen to the plethora of mini-signals working each other. What we hear in such situations has led many of us to the next step in the evolution of the QRP branch of the hobby.

Back when we started the movement, we explained our purposes in terms such as: "to encourage operators to attempt contacts at low power levels in order to determine whether such power levels are practicable for consistent, dependable radio communications." After a while we realized that 5 watts and a good antenna can do almost anything that a kw can, and our purpose shifted slightly. The problems that we encountered had little to do with a 5 watt signal's inability to make contact; rather, the major obstacle to successful QRPing was the deafening level of QRM generated by the 200-1000 watt signals that dominated the bands. In other words, the life of the typical QRP operator would be quite enjoyable, with a very low frustration level, if he only had to contend with the QRM generated by other 5 watt stations. We encouraged QRP operators to enter contests, work toward awards, attempt clean sweeps in the SS, battle it out on Field Day, and accept the then "impossible" challenge of DXCC QRPp in order to demonstrate to the amateur fraternity at large that high power simply is not needed to do the job. In fact, 1000 watts is a brutal, selfish excess except in rare instances in which propagation requires it in emergency situations. Also, its use flagrantly violates the 1936 FCC Regulations in 99% of the cases in which it is used.

That the above is so is easily observed by noting during a QRP QSO party that the QRP signals around the QRP calling frequencies often include many at the S8-S9 level (*real* S-meter readings, etc.). My own experience *always* suggested to me that even 5 watts output is beyond what is needed for most situations. Since 1975 my operating has been with one or a pair of phased verticals, or a simple dipole, and I have always been able to generate long strings of contacts in contests at the 20-30 and above per hour levels. In DX contests I've always managed runs of 25 and 30! Naturally, DX contests have been the real "test situation." I have no doubt that a TH6DX at 90 feet would have made my efforts much more productive, and that another 600 watts of additional output would have allowed me another 20-60 minutes of an "opening" to a given area. In fact, these additional advantages probably would have produced an "opening" many times when propagation and my simple antenna didn't support communication to a given area. But what's the point?

I guess my personal attitude enters the picture in regard to this question. In my view, a goal is challenging only as long as I cannot achieve it every time I try. If I can do it every time, it simply is no longer a challenge. It is routine and boring! I believe that this attitude is fundamental to human nature. And after talking to many QRO DXers, I know that it is universal among them! Find a QRO DXer who has made it to the Honor Roll, and you'll find a person for whom the excitement of DXing has been reduced to waiting month after month for someone to put a "new one" on the map. Others transform themselves into "instant DX" by catching a plane to the Caribbean during the DX contests. And there's nothing wrong with any of it. I just think it is missing the whole point. Just by sitting out here in South Dakota with a dinky antenna and 5 watts, I can have alll the excitement I can handle in regard to DXing, because I'm never going to work every DX station that I call! I'll experience a lot of frustration, too, believe me! But every one that gets away makes the one I work that much more important and thrilling! A difficult success is much more impressive when it is framed by numerous failures!

It seems that QRP veterans get around to mulling over what their QRP operating has taught them about the power level question whenever they have a chance. I've had numerous such discussions on the air, landline, and in person at various conventions. Recently we've taken to applying to ourselves and the 5 watt QRP level the same critique that we've always applied to the QRO guys. We've finally realized that not only do we not need 1000 watts, a lot of the time *we don't need 5 watts*!

The QRP Forum at the ARRL National Convention in Houston was an inspiring event, with Wes Hayward, W7ZOI, Chris Page, G4BUE, George Dobbs, G3RJV, George Burt, GM3OXX, Ed Popp, K5BOT, and a group of other QRP veterans in attendance. Fred Bonavita, W5QJM, was the one who kept saying, "Hey, let's do something about it. Let's get behind Ade's One-Watt Trophy Field Day category and support it in the QRP ARC I and the G-QRP-C contests and programs." The QRP ARC I Board of Directors took up the idea, and they have decided to integrate a 1 watt award into their QSO Party awards program. I will sponsor the award. It will be a special certificate to the highest scoring under 1 watt entry in the spring and fall QSO parties sponsored by the QRP ARC I, provided that there are two or more such entries. It will be labeled "The Milliwatt" certificate. Hence, QRPers will have four specific awards for under 1 watt operation: DXCC Milliwatt, the QRP QSO Party Milliwatt Certificates, and the Field Day One Watt Trophy. When and if the G-QRP-C comes to some decision about joining the 1 watt trend, we'll make a note of it and add to the list whatever awards they offer.

But let's keep the proper perspective about these awards. The point of an award is to encourage a particular type of activity. In this case, the awards are in-

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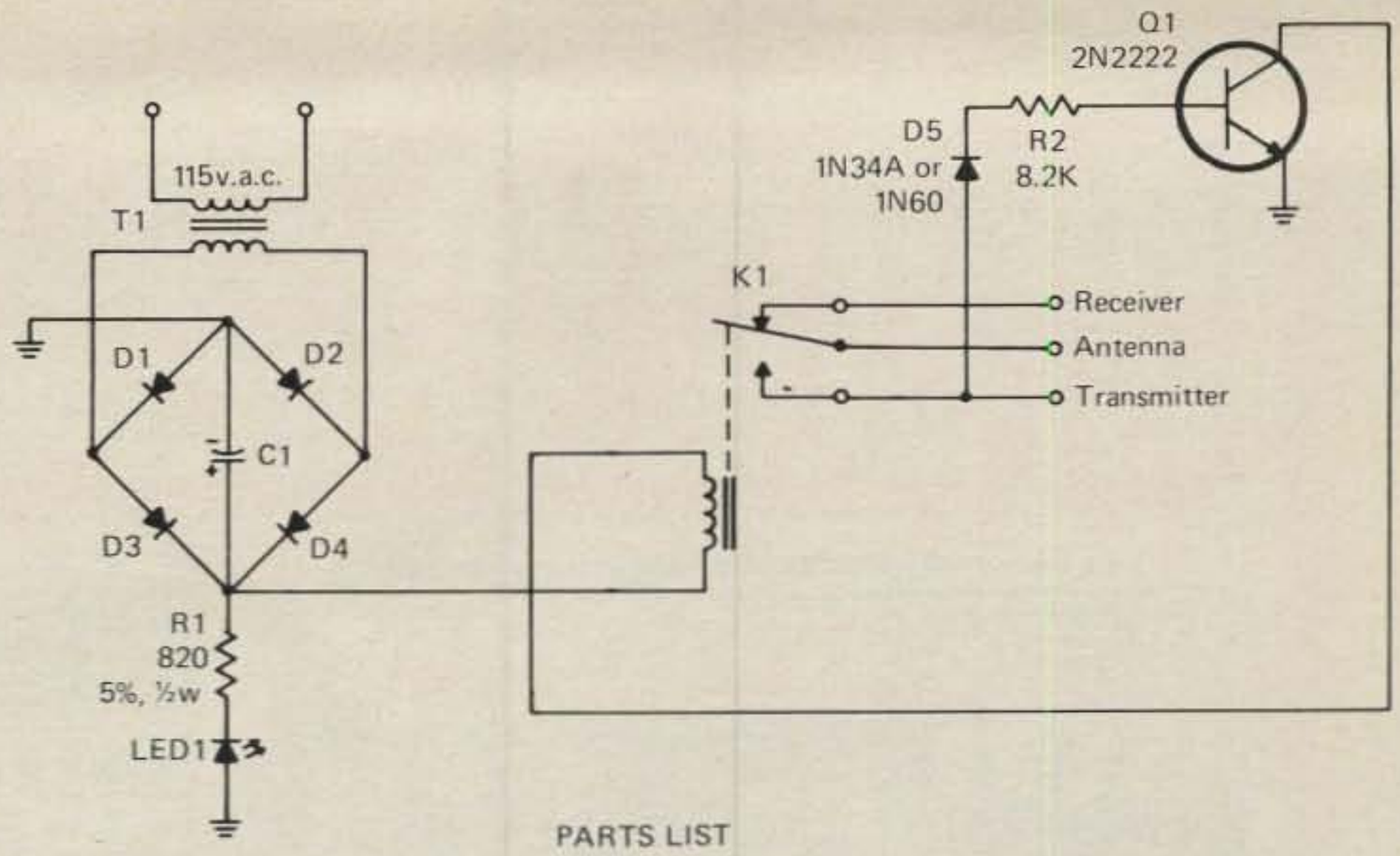
tended to encourage operation at the 1 watt and under level. Furthermore, these awards are offered in the context of operating events which require the submission of results. From the growing collection of results, we can determine more about the power versus distance relationship and add to our knowledge of this relationship. In a sense, this is the manner in which QRP operators contribute to the public welfare—by providing a field-testing of propagation to complement the work done by the professionals with their oblique sounders and the like.

The time seems right for emphasizing an under 1 watt approach. For one thing, the QRP ranks include a great number of veterans of 5 watt operation who have the skills and knowledge necessary to operate at the lower power levels. Also, interest seems to be on the rise. In its first year the One Watt Trophy Field Day category drew one entry. This year we received 10 entries, 9 in the single-transmitter category and one in the club category. Of these, 6 entries exceeded 150 contacts, and of those, 3 pushed above the 250 contact level! KA1R, operating from the home QTH (and hence not eligible for the trophy), turned out 375 c.w. and 175 s.s.b. QSO's. One watt totals? Why not? Going back through the FD results records, we have met outstanding 1 watt performances just about every year. In other words, it can be done!

The QRP ARC I QSO parties are another case. The competition with QRO QRM isn't anywhere near its bedlam level during Field Day or a DX contest. I've always operated the parties at the 5 watt level. But talking about milliwatt power operating and hearing G4BUE's presentation at the QRP Forum in Houston made me aware of my standard QSO party experience: I always worked everyone I called, and more often than not, I would sit on a frequency, call "CQ QRP TEST," and almost always have two or more QRPers respond. I realized that I was always impressed with this, concluding that "5 watts sure can do the job." Unfortunately, it took a while before the logic carried to the next stage: "I really must not need this much power." Therefore, inspired by G4BUE's milliwatt exploits, I decided to run the fall QSO party at 1 watt to try it out. The third station I worked on 15 meters was G4BUE at 750 milliwatts! Too much power! I then cranked the Argo down to 200 milliwatts and proceeded with a half-dozen easy QSO's. Just to make it tidy, I dropped to slightly below 100 milliwatts output. Why not? Three easy QSO's later I slid into G4BUE's frequency and called him with 100 milliwatts. Sure enough, he heard me, and with a bit of difficulty on either end, we made it through! South Dakota to England with 100 milliwatts to a pair of verticals! It was exciting and embarrassing at the same time. Here I've been pushing QRP to QROers for years, and actually I've been something of a QROer myself! I ended up with about 65 QSO's at the 100 milliwatt output level for a few hours of operation. I missed only four calls. In fact, as I kept knocking off QSO's, I was very aware of the distinct possibility that I could have made half of the list with 10 milliwatts! Next time!

Now this new emphasis on under 1 watt QRPing isn't intended to cast any type of shadow on the nobility or validity of 5 watt QRPing. Five watt operation is just as important and challenging as ever. I'm not advocating discrediting 5 watt operation. In fact, I'll continue to operate at that level myself. What we want to do is alert veteran QRPers to the value of exploring milliwatt power operation and encourage them to take on this challenge in the operating events for which the awards are offered. If anyone wants to undertake under 100 milliwatt efforts in these events, we'll award a special certificate to entries showing 30 or more contacts at this very low level. In addition, we'd like to get operating reports about under 1 watt operation for future columns in *CQ*.



PARTS LIST

D1-D4 = 50 PIV, 0.25a., silicon diodes.
C1 = 470μF, 15v., electrolytic capacitor.
K1 = SPDT 12v.d.c. relay.
T1 = 117v.-12v., 150mA (min), transformer.

Fig. 1– Simple QRP T-R switch schematic.

N4IMB QRP T-R Switch

Many QRPers operate discrete homebrew receivers and transmitters, and an automatic T-R switch is a definite advantage in such a situation. We'll devote the rest of this month's column to a simple circuit submitted by Aaron, N4IMB, and Laurie, KB4DCS, Thoroman of Oviedo, FL. The circuit is shown in fig. 1, and a hook-up diagram is shown in fig. 2. Aaron and Laurie write:

"Here is a simple, easily assembled T-R switch compatible with a low-power c.w. transmitter. The original is used with a 50 watt tube transmitter and has given good service for many months. It is also low cost, since most of the parts are common junkbox items, and should run no more than $10.

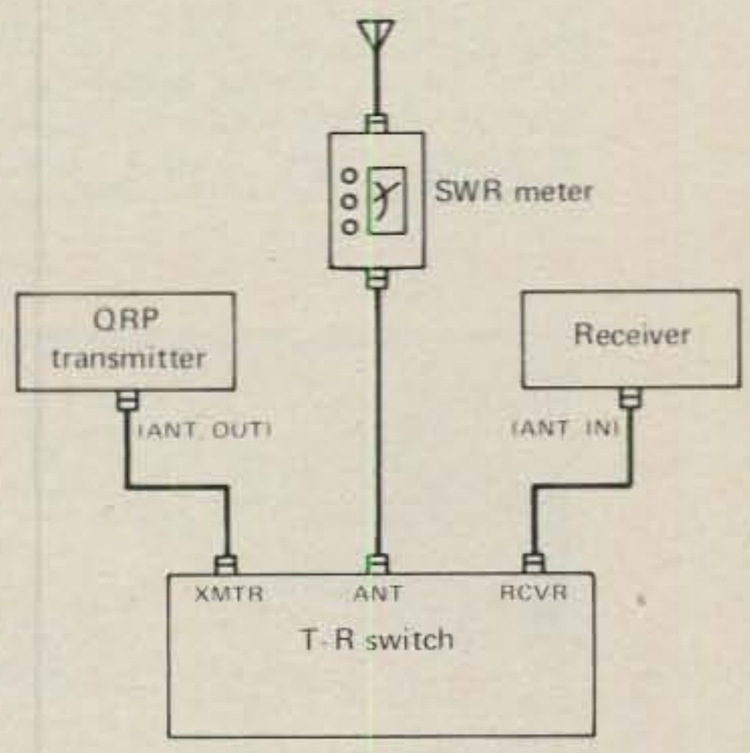


Fig. 2– T-R switch/component hookup.

"**The Circuit.** After being rectified by T1 and the diode bridge, power feeds RE1, Q1, and lights power indicator light, LED 1. Incoming antenna signals are automatically fed into the receiver, whose coaxial cable is connected to the normally closed relay contacts (fig. 1, point A). When the transmitter key is held down, the transmitter output signal is detected and rectified by D5, changing the r.f. signal to d.c. voltage. This is fed into the base of Q1, driving Q1 into conduction, which activates the coil in RE1, closing the contacts at point B. The c.w. signal is then transferred to the antenna. Whenever the key is released, the relay contact returns to the receiving position at point A.

"**Assembly.** We were fortunate enough to scrounge up a box just right for the job at a local garage sale. This was a metal switchbox about 3" × 3.5" × 1.5" with three built-in coaxial connectors. Built from scratch, this should cost about $6. Once you have your box built, you can begin by drilling a small hole for the LED indicator light. Solder the relay, RE1, to the antenna's coax connector and mount transformer T1 to the chassis. The rest of

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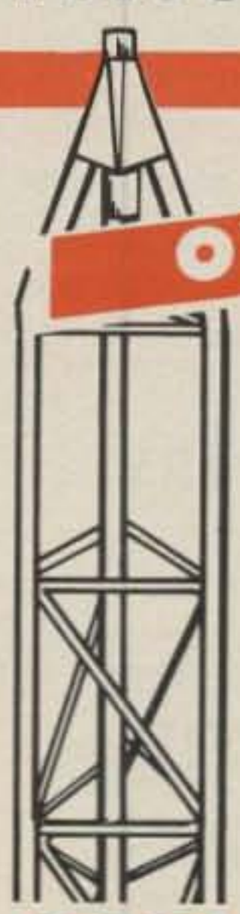

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the parts placement is not critical. You may use point-to-point soldering or mount and solder your parts on a small piece of perfboard. Just be certain that parts will not short against the chassis when the cover is in place. You may wish to line the cover or sides with electrical tape where parts may make contact.

"**Hookup.** Hopefully, you already have some short coax jumper cables. If not, just take a 2 foot length of coax and add coax plugs (male) to each end. You can also buy these ready-made. You will need two of them.

"If you wish to use an s.w.r. meter in the setup, you will need one more coax jumper. Hook jumpers from the T-R switch to antenna connectors on your receiver and transmitter, and a jumper to the s.w.r. meter as in fig. 2. The antenna attaches to the s.w.r. meter, and you can easily substitute a dummy load for quick tuning up.

"We hope you, too, find the N4IMB T-R switch to be a very useful addition to your shack."

Our thanks to Aaron and Laurie for sharing this circuit with the gang. We'll close out this column with the rules for the upcoming QRP ARC I QRP QSO Party during the weekend of April 21–22.

QRP QSO Party

This c.w. party running from 1200 UTC April 21 to 2400 UTC April 22 permits a total operating time of 24 hours for entrants. The contest is open to all radio amateurs and is not limited to members of the club. Only stations operating at under 5 watt output levels will be eligible for awards, which consist of certificates to the highest scoring stations in each state, province, country with two or more entries, and to the highest scoring under 1 watt entry as described earlier. Activity centers on the official *QRP Calling Frequencies* for c.w.: 1810, 3560, 7040, 14060, 21060, 28060, and 50360 kHz; Novices and Technicians on 3710, 7110, 21110, and 28110 kHz. Stations are encouraged to call "CQ QRP" even if no one appears to be on frequency. If everyone listens, it's the same as no one on frequency!

Exchanges: QRP ARC I members send RST, state/province/country, and QRP ARC I membership number; non-members send RST, state/province/country, and power output.

QSO Points: A given station may be worked once on each band for QSO points. A contact with a member station equals 5 regardless of location; each non-member U.S. or Canadian contact equals 2; each non-member contact other than W/VE equals 4 points.

Power Multipliers: For 4–5 watts output ×2; 3–4 watts output ×4; 2–3 watts output ×6; 1–2 watts output ×8; less than 1 watt output ×10.

Bonus Multipliers: Total score ×2 if 100% natural power (solar, wind, etc.) with no storage battery. Total score ×1.5 if 100% battery power.

Scoring: Total of QSO points for all bands multiplied by number of states/provinces/countries (total of all bands) multiplied by bonus multiplier (if any) multiplied by power multiplier yields total score. No 30 meter contacts will be counted.

Entries: Suggest use of a separate log sheet for each band used. Entry consists of full log data (date, time, station, band, exchange, power level) plus separate work sheet showing times off the air (if the total operating time approaches 24 hours). S.a.s.e. or IRC's for direct results; otherwise, results appear in the *QRP Quarterly*.

Deadline: Submit logs by May 21, 1984 to: QRP ARC I Contest Chairman, Eugene C. Smith, Jr., KA5NLY, #16 Fairmont Drive, Little Rock, AR 72204.

Membership Details: Operators may join the QRP ARC I and be assigned a "QRP Number." Members will receive the excellent *QRP Quarterly* with its member news, circuits, and articles. To join send $6.00 to: QRP ARC I Sec./Treasurer, Edwin Lappi, WD4LOO, 203 Lynn Drive, Carrboro, NC 27510.

Well, gang, that's it for this month. Hope to meet many of you in the QSO Party.

73, Ade, W0RSP

CQ REVIEWS:

OAK HILLS BREADBOARDS

BY LEW MCCOY*, W1ICP

To my knowledge, after checking amateur parts catalogs and the advertising in the various magazines, no one manufactures what I am about to review here. At least no one but Oak Hills Research and Publishing. As you can see from the accompanying photo, Oak Hills manufactures breadboards—breadboards, that is, for amateur projects.

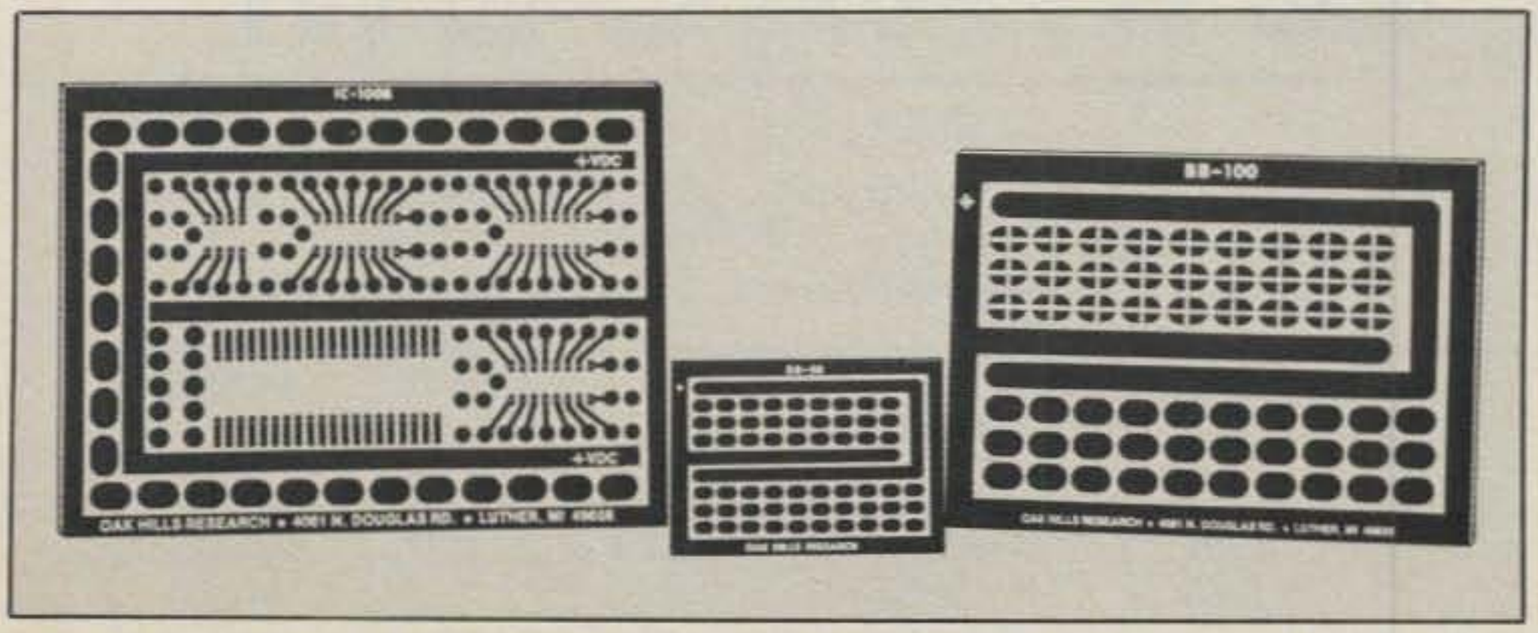
As far as I know, there has been a real need for the type of product described here. These are circuit boards that can be used for experimental purposes or circuit development work. They are excellent for projects for club or training groups. Of course, they can be used for a permanent project; I plan such a use for the larger board for some computer hardware.

At present there are four different boards available. The first is the BB-50, which measures 1¾" × 2⅜". It consists of 57 mounting pads plus a ground and B plus bus. The price is $2.00. The BB-100 is twice the size and has 27 pads split into four sections (ideal for transistor mounting) plus another 30 individual pads, $3.00 each. Next is the IC-100A which measures 4" × 5¼" and is set up for five integrated circuits plus many other pads; cost is $4.00 each. And last is the IC-100B, which is the same size as the IC-100A, but will take a 40-pin IC plus three 16-pin IC's and one 8-pin IC; the cost is $4.00 each.

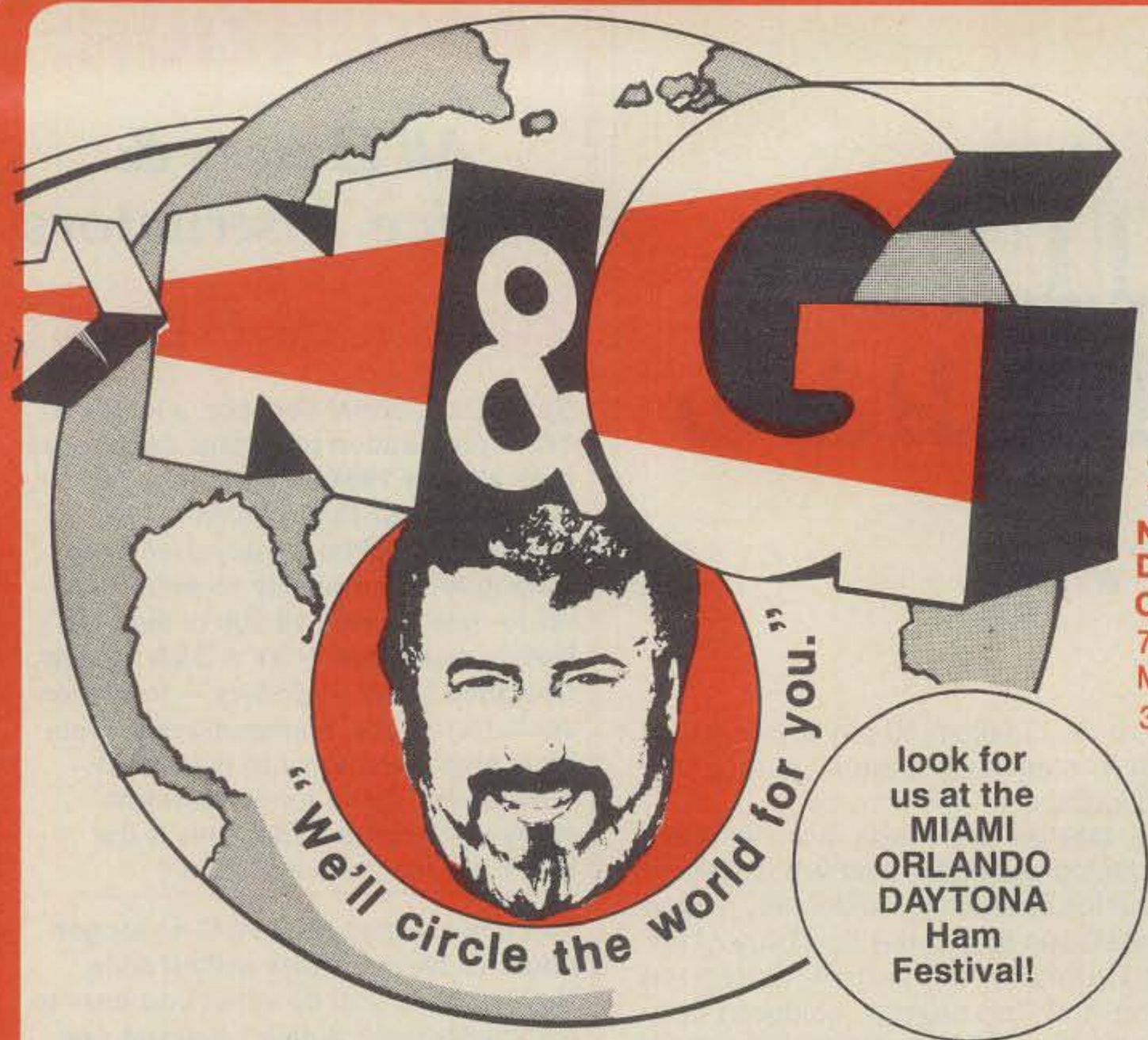
The boards are made from a really first-class glass-epoxy and are tin-plated to enhance soldering. Incidentally, I used a 35 watt iron to test the durability of the pads. On one of the pads, I started out making and "unmaking" soldered connections to try to determine just how many such connections I could make before the pad lifted off the board. In other words, I was attempting to "test to destruction." After 30 tries at the pad I said to heck with it; it more than passed our product review criteria!

In my opinion, these boards can save an amateur a lot of headaches. I never did like the mess of etching my own boards, and certainly these boards will satisfy many amateur requirements and, of course, the cost is more than reasonable. I would be remiss if I didn't mention that Oak Hills Research and Publishing was started up by Doug DeMaw, W1FB, former ARRL Technical Editor, after his retirement from the ARRL. Doug has a pretty good idea of what is needed by the amateur. His company will also make special double-sided boards to order. At present, the above described boards can be obtained directly from Oak Hills Research and Publishing, 4061 North Douglas Road, Luther, MI 49656, phone (616) 797-5251. CQ

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



At the left is the IC-100B with the BB-50 in the center. At the right is the BB-100.



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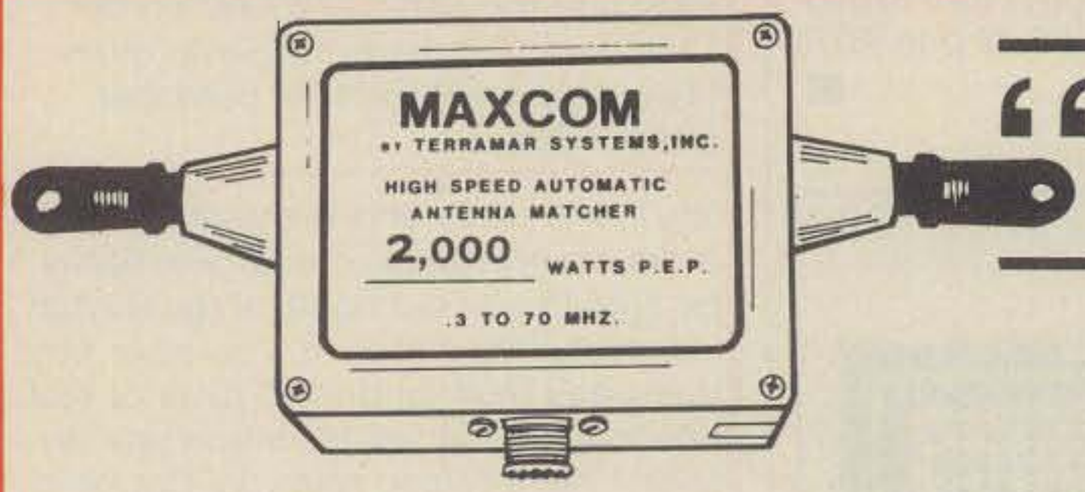

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CIRCLE 51 ON READER SERVICE CARD

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:

Robert F. Sawinski, KD4DJ
All Counties #424, 5-31-83

"In 1940 I joined the United States Army Air Corps, planning on going to Air Corps Photography School in Colorado. I finished basic training and was waiting for an opening, and while I was waiting, I was informed I could go to Scott Field, Illinois, Radio School. I didn't know what a resistor or capacitor looked like, and I didn't know a dit from a dah in c.w. Since I was ready to move on, I signed up for the 22-week course at Scott Field. They kept us busy with four hours of code and four hours of theory each day. It was necessary to pass 16 w.p.m. in code groups to graduate. About midway through the course I was told, much to my surprise, that I had passed the 20 w.p.m. code test. I graduated in 1941 and was assigned to a squadron a few months before Pearl Harbor.

"After my time in the military service I returned to Swift & Company where I was employed as an industrial engineer. I remained with the company until I retired as Chief Industrial Engineer in 1979.

"In 1977 I was listening on 2 meters and started a QSO with Carl Prochaska, W9ABM, who has All Counties #148. After a few minutes Carl started telling me about the County Hunters Net and that day I received my first county—Dupage, Illinois—from Carl on 2 meter simplex. Thanks, Carl, it has been fun.

"I then borrowed a Hustler whip antenna and gave out my first two counties: Dupage and Will Counties in Illinois. Since that time I have given out about 350 counties. That is not a large number, but it represented 20 states.

"After I retired from Swift & Company we moved to North Carolina. We have nine acres on top of a small mountain and have at least six different antennas. I made sure that I would locate so I could avoid TVI problems. My closest neighbor is a block away and he is also a ham, so that helps.

"I do consulting work for other meat packers now and it permits us to go mobile frequently. My wife has become very adept at logging or driving while I do my own logging. I have to give her credit for putting up with my expensive toy, as she calls it, and I do appreciate her patience with me.

"Pete Gray, KC4IF, and I made a mobile trip through South Carolina and Georgia covering 1000 miles in one day and giving out counties. KC4IF made a special trip to Kentucky to give me my last three counties for the 'whole ball of wax.'

"I can't begin to thank all the people who helped me attain this award, because the first county is just as important as the last. I hope to keep mobiling and giving out counties, and plan to try a second time to get All Counties mobile on 20 meters. I also plan to act as NCS more often now—73, Bob."

333 South Lincoln Ave., Mundelein, IL 60060

Bob Sawinski, KD4DJ, All Counties #424.

Special Honor Roll
All Counties

#440 Bill Miller, KC0VB, 10-30-83
#441 James A. Whittaker, WB0TVL, 11-5-83
#442 Gwen Tolsdorf, N0COL, 11-5-83
#443 Harry Perrine, KC2RS, 11-12-83
#444 Jack Kupp, Jr., W3ARK, 11-19-83
#445 Burl Keeton, N5DUQ, 11-21-83
#446 Raymond F. Albright, W6KAW, 11-25-83
#447 Mary Parsons, KC5UO, 11-29-83

Awards Issued

Bill Miller, KC0VB, completed all the paperwork and qualified for All Counties #440, endorsed all 20 Meter S.S.B., All Mobile.

James A. Whittaker, WB0TVL, took time from his work as President and Awards Chairman for MARAC to finish them all and came up with All Counties #441, Mixed.

Gwen Tolsdorf, N0COL, waited until she had them all worked with mobile stations and then acquired All Counties #442, All Mobile.

Harry Perrine, Jr., KC2RS, did a lot of paperwork and had me send him All Counties #443, Mixed.

Jack Kupp, Jr., W3ARK, added All Counties #444, endorsed All C.W., to his fine collection. Jack also has USA-CA 500 through USA-CA 2500 endorsed All S.S.B., so before many more months have passed Jack will have a double endorsement on his USA-CA certificate.

Burl Keeton, N5DUQ, did his paperwork and was sent All Counties #445, endorsed All S.S.B., All Mobile.

On November 24, 1979, Raymond F. Albright, W6KAW, received USA-CA 500 #1410. On November 25, 1983 Ray was awarded All Counties #446, All S.S.B.

Mary Parsons, KC5UO, claimed All Counties #447, endorsed All 20 Meters, All S.S.B., All Mobile.

Roger Hansen, KL7HFQ, had me send him USA-CA 2500, Mixed.

Eugene Kawalewski, W1TEE, waited until he had 2500 counties and sent for USA-500 through USA-CA 2500, Mixed.

Herbert Werry, DJ3OE, added USA-CA 1500 and USA-CA 2000, all C.W., to his collection.

Edward Sanders, WA6VJP, added another seal to his certificate by qualifying for USA-CA 2000, all C.W.

Wilbur Lewis, K0OJG, picked up USA-CA 1500 #654, Mixed.

Regis Kramer, W4ILE, added another seal for USA-CA 1500 #659. Regis is working them all A-1, All QRP, 5 watts input.

Sue Strom, WB0SUN, qualified for USA-CA 500 and USA-CA 1000.

USA-CA 500 certificates were sent to:

Arnie Hurtig, SM1IKL, Mixed.

Bill Miller, KC0VB, 20 Meter S.S.B., All Mobile.

James A. Whittaker, WB0TVL, Mixed.

Gwen Tolsdorf, N0COL, All Mobile.

Glenn Haffly, WD4B, All 20 Meter S.S.B., All Mobile.

Sue Strom, WB0SUN, Mixed.

Octavio Guerra, EA8QY, All S.S.B.

Henry Perrine, Jr., KC2RS, Mixed.

Niko Indarto, YB2BLI, Mixed. First

USA-CA Honor Roll

3000

KC0VB	472
WB0TVL	473
N0COL	474
KC2RS	475
W3ARK	476
N5DUQ	477
W6KAW	478
KC5UO	479

2500

KC0VB	529
WB0TVL	530
N0COL	531
KC2RS	532
KL7HFQ	533
W1TEE	534
N5DUQ	535
W6KAW	536
KC5UO	537

2000

KC0VB	583
WB0TVL	584
N0COL	585
DJ3OE	586
KC2RS	587
W1TEE	588
WA6VJP	589
N5DUQ	590
W6KAW	591
KC5UO	592

1500

KC0VB	650
WB0TVL	651
N0COL	652
DJ3OE	653
K0OJG	654
KC2RS	655
W1TEE	656
N5DUQ	657
W6KAW	658
W4ILE	659
KC5UO	660

1000

KC0VB	802
WB0TVL	803
N0COL	804
WB0SUN	805
KC2RS	806
W1TEE	807
N5DUQ	808
W6KAW	809
KC5UO	810

500

SM1IKL	1883
KC0VB	1884
WB0TVL	1885
N0COL	1886
WD4B	1887
WB0SUN	1888
EA8QY	1889
KC2RS	1890
YB2BLI	1891
YU3NP	1892
W1TEE	1893
VE3MRP	1894
N5DUQ	1895
JJ1RZG	1896
KC5UO	1897

Mike Lowe, G4KHB, in Pine County, Minnesota, running counties from the U.S.

Ben Buettner, DL6RAI, looking for counties from Ergolding, West Germany.

USA-CA Award issued to a station in Indonesia.

Aleksander Pipan, YU3NP, All C.W.
Eugene Kawalewski, W1TEE, Mixed.
Brian Mitchell, VE3MRP, Mixed.
Burl Keeton, N5DUQ, All S.S.B.
Shunichi Sekiya, M.D., JJ1RZG, All C.W.
Mary Parsons, KC5UO, All 20 Meter Mobile.

New Awards

West Kent Amateur Radio Society Award. The award, sponsored by the WKARS in Royal Tunbridge Wells, Kent, G.B., is available to licensed amateurs and s.w.l.'s (on a "heard" basis) for confirmation of QSO's with WKARS members and also with other amateur stations within a 20 km radius of Tunbridge Wells. This radius encompasses parts of the Counties of Kent, East Sussex, and Surrey.

To qualify for this award, U.K. amateurs must accumulate 20 points and others 10 points. Points per QSO are as folows: QSO with past or present members of WKARS—3 points; QSO with Club Station G3WKS—5 points; QSO with other stations within stated radius—1 point.

This award is available for all c.w., phone, or mixed modes either all h.f. (1.8–30) or v.h.f. QSO's with mobile stations (/M) do not count. QSO's with portable stations (/P) are valid.

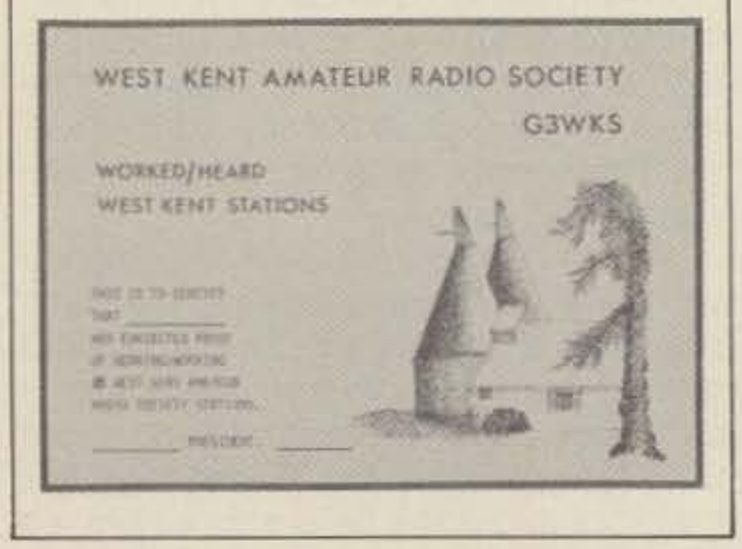
Send list of contacts with the following data: callsign, QTH, date, time (Z), frequency band, and class of emission used.

Ted Boerkamp, VE3NKZ, from Hamilton, Ontario, has been licensed since 1981. His h.f. equipment includes a Yaesu FT-101ZD transceiver, FC-902 antenna tuner, and 40 foot random-wire antenna up about 35 feet. He uses an FT-208R handheld on 2 meters. He has made about 400 contacts in 53 countries and holds the Ragchewers Award and has just completed the WAS Award.

U.K. stations please enclose a second-class-letter postage stamp with your application; others send one IRC.

Present and past members of the WKARS: **G2** BT, LA0DO; **G3** AIO, AMG, FVV, IOM, KIP, PEY, TLB, WKS, PX, YOU, YPY, ZYP, ZZD; **G4** BIA, BKG, BOO, BWH, CCQ, DFY, DIX, DRB, DRV, DYF, EMV, ERW, EUK, FDC, FWG, FYG, GTN, HUW, IBQ, IJH, JFD, JZP, MXL, NAJ, OSH, OTV, OYW, PBF, PML, RPQ, RWT, SGI, UDW, UPI; **G6** TQ, BNJ, DUU, HVW, JUB, HFX, RHU, OOE, KLG; **G8** CAA, CDD, CDP, FFG, GYB, IJH, IWP, KHP, KNA, KOA, KPU, KPZ, KQJ, LMV, MLZ, ZXC, NOB, OFO, ORZ, PWO, RUX, SAS, UEH, UFY, UJM, VMG, VWN, WLH, WZK, XCS, ZXC.

Apply to G3WKS via QSL Bureau or direct to Alex Korda, G4FDC, 5 Windmill Court, North Street, Tunbridge Wells, Kent TN2 4SU, Great Britain.



West Kent Amateur Radio Society Award.

The Match Town Award. In the year 1284 the town of Jonkoping, Sweden, was founded, which means that during this year of 1984 Jonkoping will be celebrating its 700th birthday.

The club station in Huskvarna, Sodra Vatterbyygdens Amator Radio Klubb, SVARK, which covers both Jonkoping and Huskvarna, will therefore be issuing this lovely award, which consists of a four-color diploma and a beautiful silk stream-

Match Town Award.

er. They have named the award "The Match Town Award," since the world's first match-stick factory was built in Jonkoping.

To achieve this award, all you have to do is work hams in Jonkoping county—F6. Four points are required for SM stations, while other stations in Europe need three points and DX stations need two points. Each QSO with Jonkoping county gives one point, but there is an extra one point bonus when you have a QSO with the club station, SK7AX.

Any legal contacts are allowed, crossmode, crossband, etc., but only between January 1, 1984 and December 31, 1984. So, if you hear an SM7 on the bands, give him a call. He could be in the town of Jonkoping!

It is not necessary to send QSL cards, just a copy of your log with information of the contacts. Send your application to Award Manager, SVARK, P.O. Box 2035, S-561 02 Huskvarna, Sweden. The fee for the award is $5.00 U.S., 10 IRC's, or 30 SEK.

The Bathtub Award. This award is sponsored by the Nanaimo Amateur Radio Association of Nanaimo, Vancouver Island, British Columbia, Canada, "The Bathtub Racing Capital of the World." Requirements for the award:

a. Work five different Nanaimo area stations or members of the Nanaimo Amateur Radio Association and send certified log extract.

b. Contacts may be on any amateur band and in any mode.

c. Station contacts must be made after January 1, 1983.

d. The cost of the award is $3.00 or 10 IRC's.

e. Send award applications to: Awards Manager, Ernie Harding, VE7FCK, P.O. Box 954, Nanaimo, B.C. Canada V9R 5N2.

The Bathtub Award.

MARAC "Merit" Award.

The award is a distinctly designed certificate with an artist's rendition of one of Nanaimo's famous Racing Bathtubs in action.

Nanaimo is probably best known for the zany antics of the World Championship Bathtub Races held each July between Nanaimo and Vancouver, B.C., when up to 200 of these motorized bathtubs brave the dangers of the often stormy Strait of Georgia at speeds up to 30 m.p.h.! The Bathtub Race originated in Nanaimo many years ago and now has grown to international status, with entries coming from all over the world.

MARAC Merit Award. This award with gold seal is issued free to any amateur upon recommendation of any MARAC member. If, in your opinion, any amateur has contributed some outstanding service to amateur radio, write to the awards chairman stating the facts. The information will be presented to the MARAC Executive Committee for action. The MARAC Awards Chairman is James A. Whittaker, 3019 O'Henry Road, Minneapolis, Minnesota, U.S.A.

Notes

There will be a Mini Convention for County Hunters on May 18 and 19 at Little Falls, New York. For further information contact Keith Turner, WA2TJL, 510 Pine Avenue, Herkimer, NY 13350.

Because of the increasing popularity of the USA-CA Award, of which I am custodian, and the fast-changing world of amateur radio, I have decided to establish an advisory committee to assist me with important questions and help make the necessary decisions. The following people have graciously consented to serve on the committee: Dick Lennon, N2BL; Al Miller, W0EWH; Scott Lehmann, N9AG; Dennis Johnson, N0WA; Bob Fuss, W4OWY; Bill Smith, W7GHT; Wayne Johnson, N9WA; and Bob Dyson, K0AYO. There are no plans to change the award or the rules of the program. It is our plan to maintain this prestigious award with its present popularity and integrity.

Here in Midwest America we are looking forward to springtime—or perhaps our last violent storm before springtime. I hope things are going well where you are.

73, Dorothy, WB9RCY

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Tuning the 20 Meter Beacon Network

How would you like a continuously available 20 meter arrangement that would allow you to check propagation around the world right from your operating desk? Maybe you would like to directly compare various antennas in your setup, check your beam's front-to-back ratio, compare sensitivity and/or S-meter calibrations of two or more receivers, or maybe you could use an accurate in-band time and frequency marker. Those capabilities are now being provided on 14,100 kHz 24 hours a day seven days a week, and everyone is welcome to use the new and unique service. Home propagation studying and forecasting have never been easier.

The world-wide 20 meter beacon network was organized and funded by the North California DX Foundation for the basic purpose of giving listeners a practical opportunity to investigate signal propagations. The additional capabilities, however, are limited only by one's imagination. The network presently consists of eight stations (although several more stations may be added in the near future). Located in various continental areas around the world, each beacon station runs no more than 100 watts output to an omnidirectional antenna. A listening period of only 10 minutes will let you assess all available paths and their minimum required power levels.

The location of each beacon station and the format of the transmissions of each are shown in Tables I and II. The sequence begins on the 10 minute multiple (7:00, 7:10, 7:20, 7:30, etc.) with 4U1UN/B in New York. The station identifies at the 100 watt output level, and then transmits a continuous carrier for approximately 9 seconds. RF output then is briefly interrupted (1 second) and dropped to 10 watts for 9 seconds. Output next is dropped to 1 watt for 9 seconds, and finally to 100 milliwatts. The station then returns to the 100 watt output level, identifies, and "passes it over" to the next station in sequence. Approximately 1 second later, W6WX/B at Stanford University in California follows suit with an ID and 100/10/1/.1 watt transmissions. The next minute's transmission emanates from KH6O/B in Honolulu, which is then followed by JA2IGY/B, 4X6TU/B, OH2B, CT3B, and ZS6DN/B. Approximately two minutes of silence follow and then 4U1UN/B "leads off" the next 10 minute sequence.

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

Station	Time	Location
4U1UN/B	0000	United Nations, New York
W6WX/B	0001	Stanford University, California
KH6O/B	0002	Honolulu Community College, Hawaii
JA2IGY/B	0003	JARL, Mt. Asama, Japan
4X6TU/B	0004	Tel Aviv University, Israel
OH2B	0005	Helsinki Technical University, Finland
CT3B	0006	ARRM, Madeira Island
ZS6DN/B	0007	Transvaal, South Africa

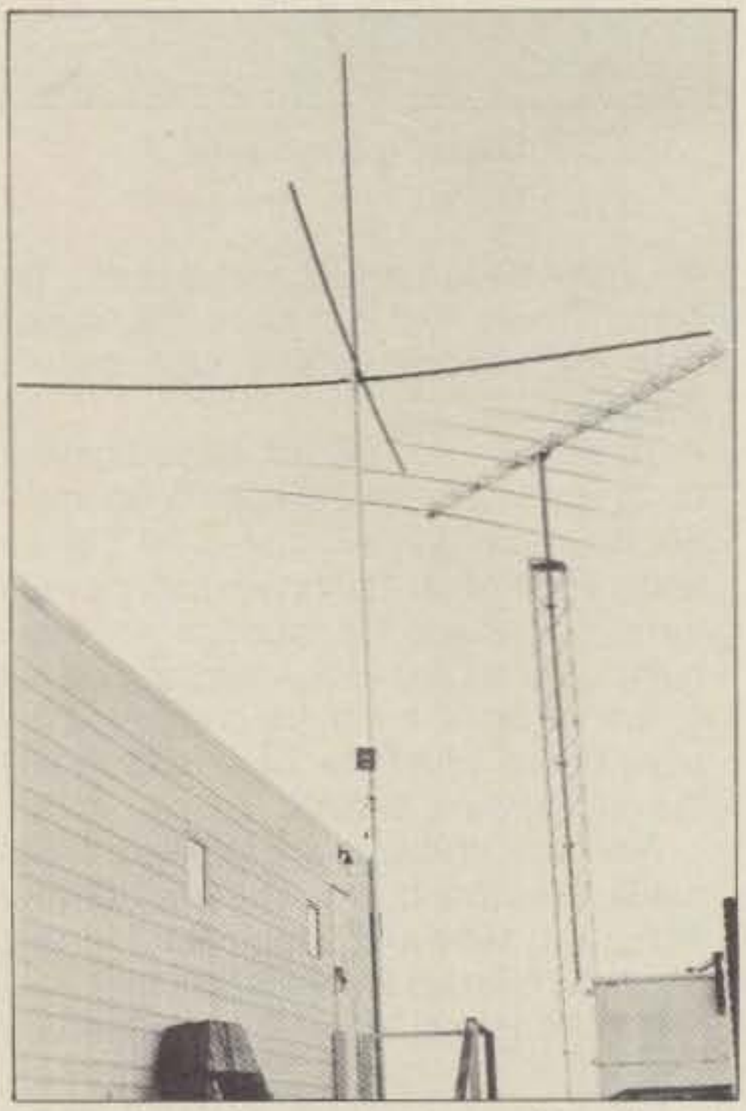
Table I– NCDXF beacon network data. Sequence repeats every 10 minutes and may vary as additional stations are added to the network.

Power Level	
100 W	QST de (beacon I.D.)
100 W	9 second dash
10 W	9 second dash
1 W	9 second dash
0.1 W	9 second dash
100 W	SK (beacon I.D.)

Transmission time: ±58 seconds
Speed: 20 w.p.m.

Table II– Information transmitted by each beacon.

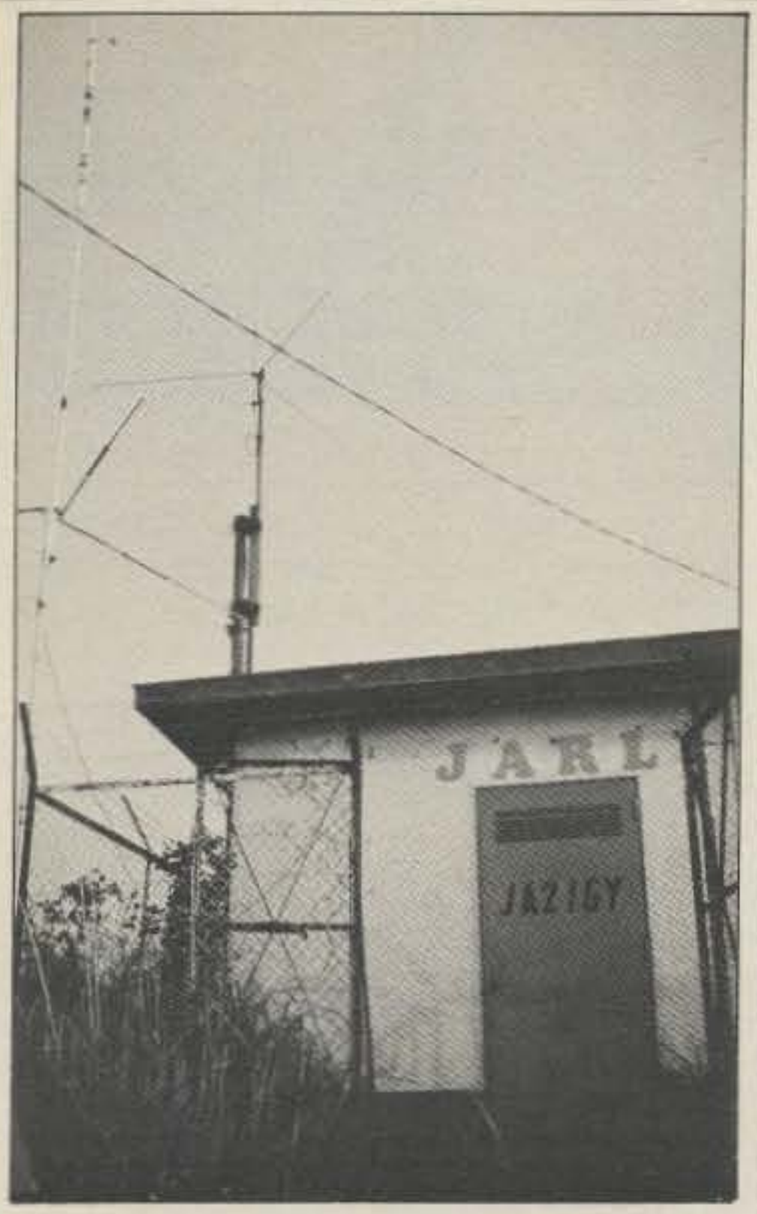
The beacon network provides factual proof of what can be accomplished with the traditional "100 watts and a dipole" setup. Indeed, it's truly amazing to note how often many of the beacons can be copied at the 100 milliwatt level. Don't just take our word for that; listen for yourself and see. Chances are good that 20 meters will be open in some rather unexpected directions, and if you can hear them at the 10 watt level, amateurs in those areas can surely hear you at the 100 watt level. While on the subject of beacon monitoring, we also suggest letting your observations be known to the network's observation coordinator, Al Lotze, W6RQ, 46 Craigmont Avenue, San Francisco, California 94116. Group interest and regular reports of observation are especially desirable. The next time you're working on some project in or near the shack, flip your receiver to 14.099.6 MHz and check the activity. Chances are good that you'll be surprised with the results.



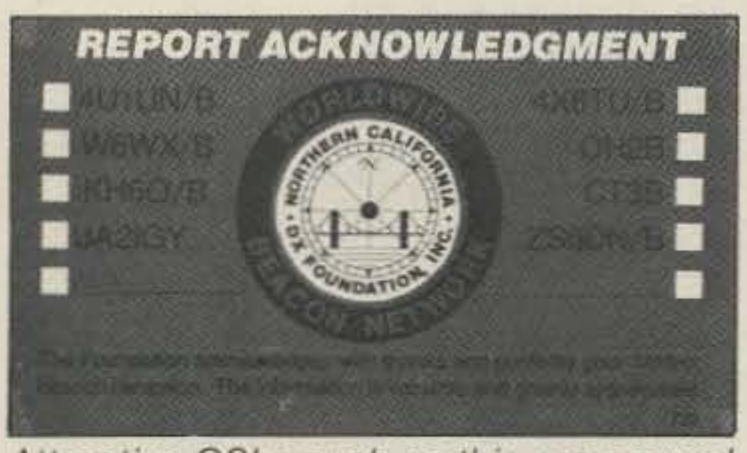
The W6WX/B setup is located inside this trailer on the Stanford University Campus. Although radiating wires are barely visible in the photo, the antenna consists of two quad loops mounted at right angles for omnidirectional coverage. Loops are insulated from each other at the top and connected to the insulator on the phasing box at the bottom (right above trailer). Each loop is 71 feet 7 inches around and 17 feet 11 inches on each side. Log periodic array in background was previously used in ionospheric research by Stanford Research Institute.

Using the Beacons

In addition to checking the network to determine which 20 meter paths are open at various times, there are several other applications for the beacons. Comparing the propagation forecasts broadcast by WWV at 18 minutes past each hour to signals of known direction and level on 20 meters yields a self-taught knowledge of how things work. Notice, for example, how magnetic or ionospheric storms derate northern hemisphere propagation (such as Japan/U.S. paths) while enhancing southern hemisphere communications (such as Australia or far-South America/U.S. paths). Notice how the K index and sunspot count affect DX signals, and notice the times when



Shack housing the JA2IGY/B setup in Japan. Beacon antenna (left) is a Hidaka Model 41W trapped vertical.



Attractive QSLs such as this are passed to beacon monitors reporting their observations and thoughts to system coordinator W6RQ.

those factors don't match actual propagation. A simple vertical antenna is good for checking these factors, and it minimizes some of the "propagation tricks" you might experience with a beam antenna. What kind of tricks? Unusual backscatter (which, incidentally, varies significantly with different areas of the country and the world) is one of the most interesting phenomena. In Alabama, for example, eastern U.S. signals are often nearly as strong from the south as from the north, but South American signals are primarily received from the south. Signals from California and Hawaii, however, have always appeared in their proper direction. We mention these idiosyncracies should unusual or unexpected figures evolve when checking a beam's front-to-back or front-to-side ratio.

If you would like to check your beam antenna's general on-the-air performance, point it directly at a beacon and quickly note the S-meter reading at the beginning of a 9 second dash. Next, rotate the antenna and note S-meter levels form the beam's side and rear during that same power level dash. Each S-unit corresponds to roughly 3.1 dB of signal gain or loss. Don't panic if you only measure 8 or 9 dB difference at this time, as you may be experiencing some form of backscatter. Use another beacon for measuring, and rotate your antenna in another direction. Once you are comfortable with this technique, you may want to expand and calculate your beam's actual radiation patterns for various directions (some of those guy wires may be doing more than merely staying the tower).

Another truth which may come into focus at this time is a lower than expected front-to-back ratio (especially if a triband beam is being used). Although a manufacturer may state that his beam has a 27 dB front-to-back ratio (roughly 9 S-units), this is a maximum figure obtained under ideal conditions on the beam's single, "best" band. The beam's average front-to-back figure (which most of us realize) usually falls between 16 and 18 dB on 20 meters.

Comparing sensitivity or "DXability" of different receivers is possible by connecting each to a common antenna via a tee or coax switch. If you are comparing transceivers, unplug the mike and disable the VOX to prevent one unit from ac-

As part of the national events associated with World Communications Year, OH2B was officially inaugurated on March 1, 1983, in Finland. This beacon is located at the Helsinki University of Technology at their Department of Electrical Engineering. Shown in opening ceremony photo are (left to right) SRAL president OH5NW, beacon project overseer OH2PZ, and beacon maintenance/operation manager OH6GJ. The remaining fellow needs little introduction—that's world-renowned DXer OH2BH.

cidentally "RFing" the other. Tune the beacons and notice first hand in your own shack which rig performs "best," but don't draw conclusions merely based on S-meter readings. In fact, it may prove interesting to temporarily ignore looking at any meter or dial and simply listen to the comparisons.

Since each beacon's power levels are attenuated in 10 dB steps, S-meter readings *should* drop approximately 3.3 S-units with each power reduction. Both upper and lower S-meter ranges can be checked by monitoring various beacons. You may be quite surprised (or shocked) at the results of these checks. Meter readings and "copy-ability" don't always go hand in hand.

Finally, the beacon network is a reasonably accurate frequency marker and time reference for amateurs using rigs without crystal calibrators or WWV tuning. Actually, it may prove easier and quicker to tune the beacon network (and simultaneously check propagation) than to retune for WWV.

Looking Ahead

Since the beacon network is still somewhat new and since there's room for several more optimum-located stations in the system, future studies and applications should prove quite interesting. As NCDXF President John Troster, W6ISQ, points out, there are some interesting aspects to be learned when all beacons can be heard in sequence and at their lower power levels.

Close-up view of the OH2B system: a Kenwood TS130S, PS30 power supply, and the beacon controller.

HF communications, which are necessarily dependent on the earth's ionosphere and magnetic flux, might be compared to surfing or riding in a hot-air balloon. One must "go with the waves or currents" rather than oppose them. Through the actions and operations of the 20 meter world-wide beacon network, we can move one step closer to understanding and using ionosphere effects to our advantage. That signal-reflecting medium may be somewhat variable, but it has always added a tasteful challenge to its taken for granted reliability.

An Ionospheric Alternative: OSCAR 10

While HF communications continue to be the mainstay of amateur radio, and in-band beacons such as those of the 20 meter network add predictability to propagation, I might also mention an alternate concept presently gaining acceptance. I'm now considering our most recent amateur satellite, OSCAR 10. Being essentially unaffected by ionospheric conditions while providing several hours of reliable communications capabilities each day, this latest OSCAR is destined to become a true "star" during upcoming times of low sunspot activity.

As an example, OSCAR 10 is now being used for daily communications between the Australian, U.S., and South American areas. Typical operating times cover several evening hours, and only slight antenna movements are required each hour. Uplink frequencies are in the 435 MHz range, and downlink frequencies are in the 145 MHz range. As you've probably noticed, several manufacturers recently have introduced equipment especially designed for all-mode operation in these ranges. Possibly that may be an indication of future evolutions in amateur operations. A primer on OSCAR 10 was included in our March and April 1983 *CQ* columns. Additional information is aired each Sunday at 1900 GMT on 14.282 MHz, the AMSAT Net. I'm also preparing an upcoming *CQ* column containing full (and simplified) operating details of OSCAR 10. Watch for that during the near future.

73, Dave, K4TWJ

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THE INS AND OUTS OF THE WASHINGTON SCENE

No-Code Defeated

As should be well known by now, the proposal to create a "no-code" class of amateur license (P.R. Docket 83-28) was defeated by the Commission on 14 December 1983. The action was hailed by Robert Foosaner, Chief, Private Radio Bureau, FCC, as a vote of confidence in the Amateur service. Said Foosaner: "The Commission took a close look at amateur radio today, and found it to be strong."

These comments were echoed by Ray Kowalski, Chief, Special Services Division, PRB. According to Kowalski, the Commission made its decision on the basis of the following three determinations:

1. An analysis of the "state of health" of the Amateur service showed that the service is not stagnant and that new people are continuing to enter its ranks.

2. Current licensing requirements do not discriminate against handicapped persons.

3. There is still a need to foster and maintain a cadre of operators who are skilled in telegraphy; such operators would be needed in times of emergencies as well as for duty in the military services, should the need arise.

With the defeat of the no-code docket, it is highly unlikely that the Commission will ever revisit the matter again. However, the possibility exists that the Commission will consider the creation of a new "computer hobbiest radio service." This new service, which would not be a part of the Amateur service, would be designed to serve the needs of those computer enthusiasts who want to experiment with radio communication techniques.

Raymond A. Kowalski, Chief, Special Services Division, PRB, Interviewed by CQ

Elsewhere in this issue readers will find an exclusive, penetrating interview with the chief of the Special Services Division, PRB, Mr. Raymond A. Kowalski. As head of the division that administers a wide variety of Private Radio services—including the Amateur service—Mr. Kowalski probably has more day-to-day contact with our service and its licensees than any other person in the Commission. In his exclusive interview with *CQ*, Mr. Kowalski discusses his division and personnel, the Commission's program of "unregulation," implementation of the Volunteer Examination Program, concerns relative to amateur nets, the business use of amateur radio, and activities that could threaten our frequencies.

For an insider's look at the Amateur service from one of the key people charged with its administration, don't miss this month's exclusive interview with Mr. Raymond A. Kowalski.

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Carl L. Smith, WØBWJ, Assumes Presidency of ARRL

Following the untimely death of Victor Clark, W4KFC, Carl Smith, WØBWJ, automatically assumed the presidency of the ARRL. Under the League's Articles of Association and By-Laws, Smith will fill the unexpired term as ARRL President until the League's Board of Director's meeting in April 1984. As ARRL Vice President since 1970, President Smith was a member of the IARU Observer team at the 1979 WARC and at other world-wide conferences.

President Smith also served as ARRL Rocky Mountain Division Director from 1961 to 1970. Prior to that, he was division Vice Director in 1957–58, assistant director in 1955–56, and Colorado SCM in 1955–56.

President Smith lives in Denver and is a retired airline pilot with over 42 years of experience. He has been actively involved with ARES, weather nets, RACES, and the Denver Radio Club.

League May Call Special Election For President

There is a possibility that a special ARRL Board meeting could be called as this is written (mid-December, 1983). The purpose of the meeting would be to elect a new president.

According to Jim Cain, K1TN, editor of *The DX Bulletin* (Vernon, CT), problems surrounding the implementation of the Volunteer Examiner Program have some ARRL directors worried that a "power vacuum" could develop in Newington, CT, and Washington, DC, leaving the League vulnerable to the political winds of Washington. Cain also believes that the scheduling of an extraordinary meeting to elect a new president would be consistent with the Board's recent moves to "flex its muscles" and exert more control over management at Headquarters in Newington.

Foosaner Commends Mark Barettella, KA2ORK

Following the U.S. military operation on Grenada, and the related traffic handling by amateurs on Grenada and in the U.S., Robert S. Foosaner, Chief, PRB, FCC, sent the following letter to Mark Barettella, KA2ORK, one of the amateurs on Grenada responsible for keeping communications open:

Dear Mark:

I want you to know how impressed and proud we at the FCC are of you and your fellow amateur operators for your remarkable achievement in communicating information from Grenada during the recent operation.

By your actions, you have proven once again the value of amateur radio in providing necessary communications in times of need. Our country was fortunate to have an amateur radio operator like yourself on the scene who was ready, willing and—most important of all—able to communicate when the normal means of communications were disrupted. It was during those first critical hours that it was learned, through your courageous and resourceful efforts, what assistance the students needed.

Please accept my warmest congratulations for a difficult job well done. I am thankful that you and your classmates came through the ordeal safely.

Sincerely,
Robert S. Foosaner
Chief, Private Radio Bureau

Ham-in-Space Operation a Success

Following more than a decade of planning, NASA Mission Specialist Dr. Owen K. Garriott, W5LFL, became the first active ham-in-space. And according to *Amateur Satellite Report* (AMSAT's newsletter for the Amateur Space Program), the first confirmed contacts between W5LFL and hams on earth probably occurred on orbit #40 (Wednesday evening, 1 December 1983). At that time, Garriott was reputed to have worked Washington Area

Coordinator Jim Smith, KA7APJ, of Seattle. Reports of earlier contacts (orbit #35) remain unconfirmed as we go to press.

In addition to the myriad hams who worked the Columbia, contact was made with Sen. Barry Goldwater, K7UGA, and His Majesty King Hussein of Jordan, JY1. The contact with King Hussein, which took place on orbit #91 (4 December 1983), was particularly noteworthy because of His Majesty's support of the amateur space program. In 1981, for example, HM donated $10,000 to AMSAT during a trip to the U.S.

According to AMSAT, signals received from Dr. Garriott's HT were full quieting most of the time, and the operation is considered by many to have been an unqualified success. Marring the event, however, was the circus-like atmosphere on the band. For, in addition to the thousands of competent operators who took to the air, the event also saw every Neanderthal who could push a mike button attempt to make contact. Reports of chaotic calling, threats, and counter-threats were the order of the day, at times leading some to wonder if the whole affair made sense.

In the end, however, most amateurs agreed that the ham-in-space operation was indeed worthwhile. Amateur radio captured the pages of the world's newspapers and the imaginations of their readers. Through Owen Garriott's efforts, millions, once again, were given a look at some of the exciting things being accomplished in telecommunications by people from every walk of life . . . a look that many hope will translate into new licensees who will continue amateur radio's tradition of making significant contributions to the radio art.

FCC Releases Second Report and Order on WARC Implementation

On 8 December 1983, the Commission released its *Second Report and Order* in the Matter of Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979 (General Docket 80-739).

For readers of this column there were few surprises. The Commission, for example, adopted the *Primary* radiolocation allocation proposed in the NPRM for the 1900–2000 kHz band. However, amateurs may continue to use this band on a *Secondary* basis, provided they do not cause interference to the Radiolocation service. The applicable footnote in the Table of Allocations regarding amateur operations in this band (NG15) is subject to modification at any time. Operators using this band should watch the amateur literature carefully for any changes made by the Commission.

Other actions taken by the Commission included the adoption of a *Primary* amateur U.S. allocation in the band

10,100–10,150 kHz (though on a worldwide basis, the Fixed service has a *Primary* allocation and the Amateur service has a *Secondary* allocation). And with deliberations ongoing over the use of the band 220–225 MHz, the Commission retained *Primary*, co-equal, U.S. allocations in this band for the Amateur, Fixed, and Mobile services.

The Commission also approved the provision that amateur stations operating near the Canadian border in the band 420–430 MHz must operate in accordance with an agreement between the United States and Canada. And in the band 1215–1240 MHz, amateurs no longer have an allocation (a *Secondary* amateur allocation, however, exists in the U.S. in the band 1240–1300 MHz).

For details on these and other frequency management matters, readers are referred to the FCC's *Second Report and Order* in the Matter of General Docket 80-739 (WARC Implementation).

220 MHz Survival Again the Subject of Concern

Reports reaching *Westlink Report* late last year indicated that the Commission is considering a reallocation of the 220–225 MHz band to the Land Mobile service. *Westlink Report* further noted that if the reallocation proposal was approved, "the so-called reallocation will call for the removal of all amateur radio activity from that band in deference to Land Mobile users of amplitude companded SSB."

The proposal for reallocation to the Land Mobile service was actually raised within the Commission in January 1983, and is but one of many proposals under consideration relative to the band 220–225 MHz. At this writing, a source within the Commission noted that while the Commission will be taking a long, hard look at the 220–225 MHz band, a decision had yet to be made in the matter. The source did note, however, that in the matter of "Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979" (General Docket 80-739; Second Report and Order released 8 December 1983), the ARRL had argued that the band was needed by the amateur community, *especially if Commission action in Docket 83-28 establishes a codeless class of amateur license* (emphasis added). Thus, defeat of the no-code proposal could now increase pressures for reallocation of the band to other services (principally, the Land Mobile service).

ARRL Files Request for FCC Action on Volunteer Examiner Coordinators

According to *The ARRL Letter*, the League, on 7 December 1983, filed a Request for Agency Action with the Commission, urging that agency to quickly adopt rules that would permit VECs to recoup out-of-pocket expenses incurred in the examination process. Such an action is necessary, said the League, to implement the cost reimbursement provisions of a bill recently adopted by Congress that would permit VECs to be reimbursed for their expenses (as now proposed, the amount cannot exceed $4 per examinee). The legislation approved by the Congress left the implementation of the reimbursement provisions to the Commission.

In commenting on the League's request, however, Ray Kowalski, Special Services Division, PRB, said that the Commission will take a "measured approach" in acting on the Request for Agency Action. "We want to hear about the practicality of various reimbursement procedures . . . more about how the money should flow to the VECs and their volunteer examiners. We are fully cognizant of the League's desire to implement the Volunteer Examination program, but we want to make sure that we account for the various concerns that arise whenever it comes to the handling of money."

Given the above, it appears likely that before taking action in this matter, the Commission will issue a Notice of Proposed Rule Making (NPRM).

Radionavigation Systems in 420 MHz Band Cause Interference to Amateur Operations

A commercial radio navigation system which shares the 420 MHz band with amateurs on a *Secondary*, non-interference basis has been interfering with ATV, FM simplex, and OSCAR A-O-10 mode L downlink operations in southern California. According to *Westlink Report*, a combined air and ground search operation conducted by amateurs in cooperation with personnel from the FCC's Long Beach, CA, office located the unit on Signal Hill at a telephone company site.

The unit was manufactured by Sercel and was being operated by Navigation Systems, Inc. Efforts were immediately begun through the Commission to have the system silenced. Further, since the Sercel unit transmits a 2.5 MHz wide signal, the Southern California Repeater and Remote Base Association has called for the immediate removal of all such systems since there is no band of frequencies 2.5 MHz wide in the 420 MHz band to accommodate their operation.

Amateurs Begin Experiments With Packet Meteor Scatter Communications

The December 1983 issue of *QEX* (The ARRL's Experimenter's Exchange) contains an article describing amateurs'

work on the development of a technique called "packet meteor scatter" that uses the same TNC (Terminal Node Controller) hardware as is used in packet radio.

The *QEX* article, written by Jeffrey W. Moore, KQ1E, notes that amateurs have been communicating via meteor scatter (m.s.) the same way for many years. The techniques generally used involve long schedules on frequencies in order to make short contacts which rarely consist of anything more than the exchange of "call signs, reports, and a 73."

The new packet m.s. communication mode, although slow, would permit the exchange of data and information at approximately 100 bytes per hour (a byte, consisting of 8 bits, is one character; if we assume 5 characters plus one space per word, 100 bytes per hour is roughly equivalent to 16 words per hour). The techniques employed are similar to those already used in commercial and military communication systems.

Readers interested in participating in meteor m.s. tests are encouraged to contact Jeffrey W. Moore, KQ1E, 40 Dunster Road, Sudbury, MA 01776.

U.S. Engineering Enrollment Reaches All-Time High

According to *IEEE Spectrum*, "enrollments in the 286 engineering schools in the United States reached an all-time high of more than 400,000 undergraduate students in the fall of 1982." Further, while freshman enrollments changed little from the previous year, graduate-school enrollments were up over 5% from 1981. The study which yielded these data was conducted by the Engineering Manpower Commission of the American Association of Engineering Societies (AAES).

Among its other findings, the study showed that the percentage of graduate students who are U.S. citizens is on the rise, reaching 55% in 1982. And women were increasingly found to be choosing engineering as a profession, with a jump of over 11% observed in female undergraduate engineering enrollment during 1982.

Survey results are available from the AAES publications department at 345 E. 47th St., New York, NY 10017.

R.F.I. on the Increase Nationwide

According to *The Wall Street Journal (WSJ)* radio frequency interference (r.f.i.) is on the rise, "causing havoc in many fields." Among the "victim devices" of interference from nearby radio transmitters and devices producing incidental radiation are breath analyzers, sensitive receivers used for radio astronomy, shuttle-base communications, and receivers aboard airliners landing at Washington's National Airport.

According to some professionals in the field, said the *WSJ*, "the general level of electromagnetic radiation on the planet is rising about 50% a year." This is nothing new to the FCC, which continues to receive a very high number of complaints each year . . . mostly from the public whose television receivers are not designed to reject strong signals from nearby transmitters.

Arnold Zais, president of the Keene Ray Proof division of Bairnco Corp., a maker of interference shields, told the *WSJ* that "trying to deal with all this is like trying to talk at a party where the background noise keeps getting louder and louder." Indeed, the problem is getting worse. Computers are increasingly cited as the source of r.f.i., and even video-game machines have caused their share of problems.

Meanwhile, as has been reported in this column on a number of occasions, automobile manufacturers are increasingly under pressure to make their cars' electronic ignition systems less susceptible to interference from nearby r.f. transmitters. Even r.f.i. from other electronic devices in the engine compartment itself (e.g., spark plugs) is a source of increasing concern.

About the only ones who are benefitting from the r.f.i. problem are the companies that sell equipment and services to combat interference. The industry growth rate, in fact, is now 30% per year.

Pirate Radio Operator Sentenced

In late 1983, Victor G. Alcorn of Sayville, NY, was sentenced to 18 months probation and ordered to pay a $750 fine for operating an unlicensed FM radio broadcast station in violation of Section 301 of the Communications Act.

The sentence was handed down by Federal Magistrate David Jordan of the U.S. District Court for Eastern New York, with the case prosecuted by the U.S. Attorney using evidence gathered by the FCC's New York District Office.

Alcorn had been arrested in July 1982, following an unlicensed broadcast. He first came to the attention of FCC engineers when they investigated a complaint of interference to the instrument landing system at MacArthur Airport in Islip, NY. Despite warnings and the imposition of monetary forfeitures by the FCC, Alcorn continued to operate, challenging the FCC to catch him.

The action against Alcorn was part of the FCC's continuing effort to take action against operators of pirate radio stations. An FCC spokesperson emphasized that other pirate radio operators would also face stiff penalities and fines when caught by FCC enforcement engineers.

Your Washington Editor extends his appreciation to Mr. Fred Thomas, Office of Science and Technology, for his contributions to this month's column.

CQ BOOK REVIEW

World-Wide Sunrise/Sunset Tables

New, Revised 1984 Edition
By John A. Devoldere, ON4UN

BY ALAN M. DORHOFFER*, K2EEK

The World-Wide Sunrise/Sunset Tables were first printed in 1977 by the author, John Devoldere, ON4UN. John is also the author of the famous book on 80 meter DXing and the winner of numerous amateur achievement awards. When one views his accomplishments, one has to ask, how was it done? This book is one part of "how" it was done.

As the current solar cycle races towards its minimum, DXers are increasingly finding that the usable spectrum is shrinking at an alarming rate. It's not surprising, then, that more and more of today's savvy operators are upgrading their stations to take advantage of the fantastic conditions that will be experienced on the 40, 80, and 160 meter bands in the years ahead. But large antennas and high power alone will not necessarily ensure a good DX score on these bands. To be really effective, you'll also need a good understanding of when the propagation is expected to peak on paths of interest, and that means you'll need to know the sunrise/sunset times at your location and at the station you're attempting to work.

One of the easiest ways to obtain the data you'll need is to purchase a copy of the newly revised *World-Wide Sunrise/Sunset Tables* by John Devoldere, ON4UN. The booklet contains sunrise/sunset times for over 500 geographical areas of the world, including all of the "countries" listed in the ARRL's DXCC list. More than 100 locations in the U.S. are covered, with other large countries represented by sets of tables computed for their larger cities. The tables are arranged in alphabetical order by callsign prefix, and each includes the latitude and longitude of the specific location used in the calculations. In most cases, the city or town located at these coordinates is also given. Below the table heading are listed the sunrise and sunset times at intervals of one-half month.

In using the tables, the first thing you should do is to note the sunrise and sunset times for your location and the location of the station you're trying to reach (a free printout of your own sunrise/sunset times is included with each order). Then *for paths in darkness*, Devoldere says that you can expect to experience a peak in propagation around sunrise at the eastern end of the path and again around sunset at the western end of the path. It's that simple! But what a difference it could make when you're trying to schedule that elusive station you need for WAZ or some other award.

The *World-Wide Sunrise/Sunset Tables* includes the instructions you should follow in using the tables as well as examples of how to use the data for three typical paths. And while there's a bit of confusion as to so-called "crooked" paths (they *are* great-circle path; the fact that they look crooked on some maps is a result of the map projection used), the material provided should enable anyone to quickly develop the skills required to take advantage of sunrise/sunset propagation peaks.

Copies of the *World-Wide Sunrise/Sunset Tables* are available from the author (John A. Devoldere, ON4UN, 215 Poelstraat, B9220 Merelbeke, Belgium) for $10 US, postage paid. Payment must be made by banknote or international money order (checks not accepted). Included with each order is a personalized computer printout of beam headings from your location to over 500 areas of the world (such a table may be obtained separately for $4 US).

In summary, the *World-Wide Sunrise/Sunset Tables*—and perhaps a copy of *The Shortwave Propagation Handbook* from *CQ*—will give you the advantage you'll need to snag the rare ones on the 40, 80, and 160 meter bands. CQ

*Editor, CQ

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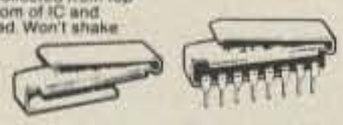

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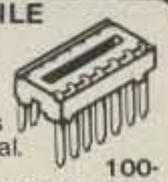
11306	22	1.12	1.02	.85
11307	24	1.25	1.14	.95
11308	28	1.52	1.38	1.15
11309	40	2.05	1.86	1.55

TI LOW PROFILE SOCKETS

Tin plated copper alloy 688 contact pins with gas tight seal.



Stock No.	No Pins	1-24	25-99	100-999
11201	8	$.10	$.09	$.08
11202	14	.14	.13	.12
11203	16	.16	.15	.14
11204	18	.18	.17	.15
11205	20	.20	.18	.16
11206	22	.22	.20	.18
11207	24	.24	.22	.20
11208	28	.28	.26	.25
11209	40	.40	.37	.33

EKI KITS come with all parts necessary to assemble!

- Stock No. 88844 TV Jammer Kit "wipes out" your TV screen .... **$ 7.71**
- Stock No. 88850 Whooper Alarm Kit makes a great alarm or siren..... **$11.33**

MANY, MANY MORE KITS AVAILABLE IN FULL LINE CATALOG

ELPAC POWER SUPPLIES – DC/DC CONVERTERS

SINTEC Stock No. 300 MW Type	ELPAC No.	Input Voltage (VDC)	Output Voltage (VDC)	Output Current (MA)	Dimensions (HxWxD) in Inches	Price
13825	CB3801	3.0-7.0	12±0.6	0-25	.48x.51x3.05	$ 7.95
13826	CB3811	3.0-7.0	-12±0.6	0-25	.48x.51x3.05	7.95
13827	CB3802	3.0-7.0	15±0.7	0-20	.48x.51x3.05	7.95
13828	CB3812	3.0-7.0	-15±0.7	0-20	.48x.51x3.05	7.95
13829	CB3804	3.0-7.0	28±0.7	0-10	.48x.51x3.05	7.95
13830	CB3814	3.0-7.0	-28±0.7	0-10	.48x.51x3.05	7.95
1.5 W TYPE:						
13831	CL3801	4.0-7.0	12±0.6	125	.651x1.2x1.77	$24.95
13832	CL3811	4.0-7.0	-12±0.6	125	.651x1.2x1.77	24.95
13833	CL3802	4.0-7.0	15±0.7	100	.651x1.2x1.77	24.95
13834	CL3812	4.0-7.0	-15±0.7	100	.651x1.2x1.77	24.95
13835	CL3804	4.0-7.0	28±1.4	50	.651x1.2x1.77	24.95
13836	CL3814	4.0-7.0	-28±1.4	50	.651x1.2x1.77	24.95
13825-1	DATA SHEET FOR DC/DC CONVERTERS					.25

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Tests all batteries ranging from 1.35V to 4.5V.
Controls:
3- position switch provides ranges: 1.35-1.5V; 2.7-3.0V; 4.05-4.5V. Durable, pocket size, self-contained. Test leads are permanently attached.
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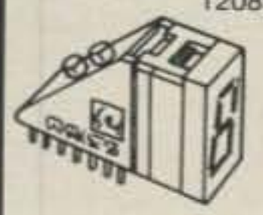
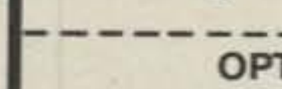
Stock No.	Color	1	100
12082	Red	$1.12	$ .99
12085	Green	1.84	1.63
12087	Yellow	1.92	1.70
12089	Orange	2.08	1.84

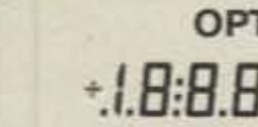


Right Angle Socket for Above Displays

Stock No.	1	100
11010	$1.24	$ .99

OPTEL LCD's with pins


Stock No. 47005


Stock No. 47006

Stock No. 47007

Stock No.	Description	1	10
47005	3½ dig, .5"	$ 5.95	$ 5.50
47006	4 dig, .5"	5.95	5.50
47007	4 dig, .7"	11.90	11.00

The Battery Just Wrap™ Tool

New battery powered tool wraps insulated wire around .025" square posts without need for pre-cutting and pre- stripping. Complete with bit and 100 ft. 30 AWG wire.

Stock No.	Description	Price
13340	Battery just-wrap tool with bit and 100 ft. 30 AWG wire	$49.95
13341	Replacement bit	9.95
13342	100 ft. blue replacement wire	6.95
13343	100 ft. white replacement wire	6.95
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13345	100 ft. red replacement wire	6.95

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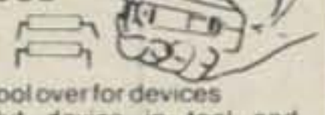
Stock No.	Description	Price
13346	Hand drill with .039 dia. bit (no batteries)	$24.95
13347	Replacement bits: 2 each of .040 and .060 dia.	5.95
13348	Drill stand	13.95

PIN FORMING TOOL

puts IC's on their true row to row spacing. One side is for .300 centers, Flip tool over for devices on .600 centers. Put device in tool and squeeze.



ONE TOOL DOES 8 thru 40 PINS!

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Stock No. 11059 $12.95

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13297	18 pin
13298	20 pin
13299	22 pin
13300	24 pin
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13302	40 pin
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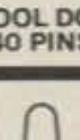
$1.82 per pack



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CIRCLE 26 ON READER SERVICE CARD

Antennas

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

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Bits, Bytes, and Beams

In this month's Antennas column author W8FX mixes ham radio software notes with a description of an interesting, quad-like beam from south of the border. We think that you will find his brew of bits, bytes, and beams an interesting one.

Last month in *CQ*, we took a second look at the subject of s.w.r.—reflection mechanics—and the various misconceptions surrounding s.w.r. concepts. We also examined some new amateur radio software and highlighted several program sources. We also took another and more critical look at the double bazooka antenna, which we had covered in a previous column.

This month we will make note of the so-called "quadricube" antenna design of Antonio Lascurain, XE1LFA. We will also discuss a v.h.f./u.h.f. ray path program designed by W6ZGN and modified by your columnist to run on the Commodore 64 computer. We'll also examine an interesting **M**aximum **U**sable **F**requency (**MUF**) propagation program and a set of logging programs from the Ham Data Company. Finally, we will make mention of the tutorial-style, amateur-oriented *vicCOMM Journal*, which is edited by Edwin Cox, AA4B.

Let's head south of the border first.

The Southern Cross Antenna

Not long ago we received an interesting flyer advertising construction plans for a "quadricube" antenna, which was dubbed "the Southern Cross." Although we were not familiar with the design, the literature suggested that the antenna was a variant of the Cubical Quad of more familiar design.

We corresponded with Antonio Lascurain, XE1LFA, asking for more information on his antenna. We found that the antenna resembles the three-band boomless quad, but with some notable differences. The antenna's frame is formed by four triangles having their vertices in the center of the array. Unlike most quads, which are constructed mostly of bamboo or fiberglass, the two-element "quadricube" is constructed of PVC pipe for high dielectric strength, durability, and low cost. The triangular shape of the PVC frame and the relatively short distance between the two Quad elements (1.6 meters between the 20 meter driven element and the reflector, for example) impart a rigidity and strength usually lacking in the quad, *according to XE1LFA.* Despite the antenna's reputed strength, its fully assembled weight is only about 35 lbs., so it's possible to turn it with a standard TV antenna rotator.

317 Poplar Drive, Millbrook, AL 36054

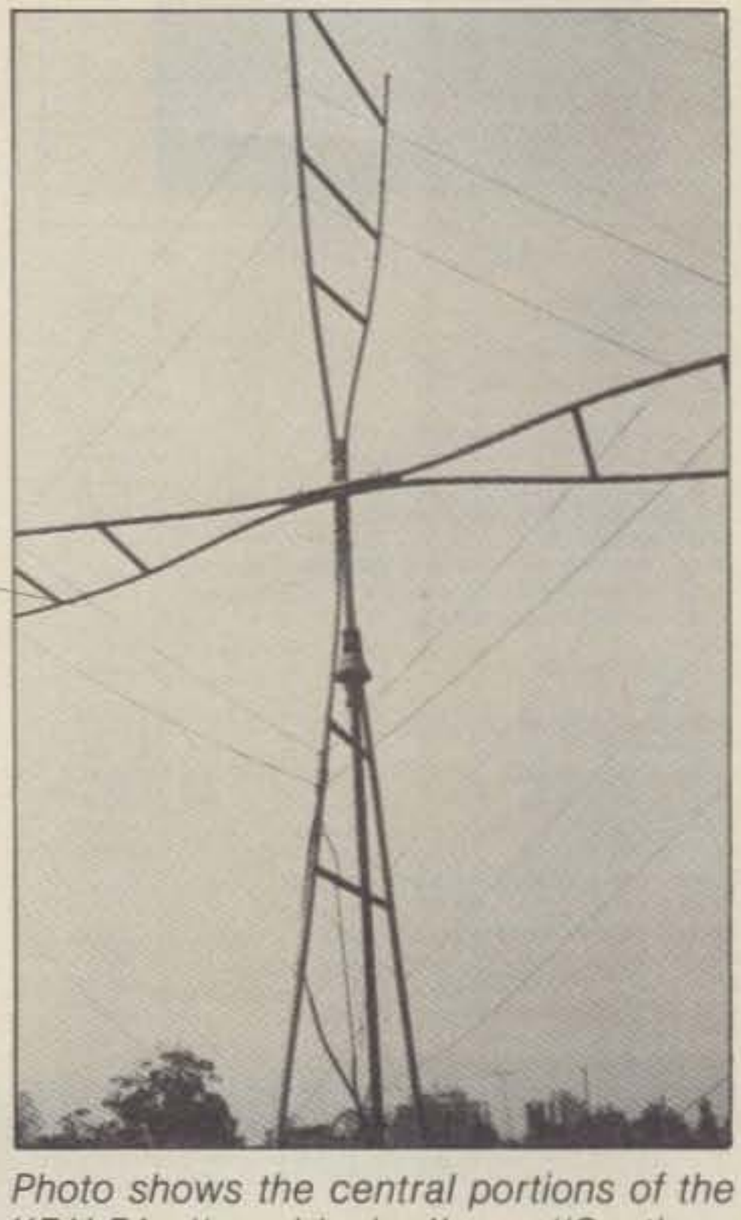


Photo shows the central portions of the XE1LFA "quadricube," or "Southern Cross," antenna. The two-element antenna covers 20, 15, and 10 meters. (Photo courtesy XE1LFA)

The frame shape and dimensions used, which include 0.08 wavelength element spacing on all bands, are designed to yield a fairly constant 52 ohm feedpoint impedance on the three bands: 20, 15, and 10 meters. Although an impedance transformer or antenna tuner is not required, a linear balun ("bazooka") is recommended for use with the antenna for decoupling purposes. A separate 52 ohm feedline is used on each band, so the antenna is, perhaps, more properly characterized as consisting of three monobanders, rather than as being a single tribander. Minimal interaction is said to exist between the three antennas which make up the array.

Antenna construction appears to be relatively simple, with no special tools or skills required for installation, and the PVC pipe should be available practically anywhere. Construction plans are available for $20 from Mr. Antonio Lascurain, XE1LFA, Pino 59, Col. Florida, Mexico, D.F., 01030, Mexico.

We would like to learn of the results obtained by any *CQ* reader in constructing and using the Southern Cross.

V.H.F./U.H.F. Ray Path Program

Why can't I work into the repeater? But my friend, only a mile or so from my own QTH, has no problem "getting in." And if I install a repeater myself, is my location good enough to provide coverage adequate to make the project worthwhile? These are good questions many of us have asked, but we may only have had rough guesses for answers.

Knowing the effective "radio horizon" is important in estimating v.h.f. and u.h.f. coverage. The radio horizon may be estimated mathematically, and various degrees of complexity in the calculations may be used to yield increasingly accurate results which may be used to predict repeater or base station coverage.

If the optical horizon is known, the effective radio horizon can simply be "eyeballed" by multiplying the optical horizon distance by four-thirds. This extension of the optical horizon is possible because of the fact that when v.h.f. and u.h.f. signals are transmitted along the earth's surface, they don't exclusively travel in straight lines, but rather they bend down slightly beyond the optical horizon. This occurs as a result of the earth surface's absorption of the lower portion of the wavefront. This phenomenon of surface refraction causes the radio horizon to be extended roughly by one-third—as though the earth's effective diameter were one-third larger than it actually is.

The propagation of signals by surface refraction is popularly known as **groundwave**. Groundwave, of course, is the "normal" means of regular v.h.f. and u.h.f. propagation, although as we well know, the troposphere and higher levels can have pronounced effects on coverage. Modes such as super-refraction, E-layer propagation, ducting, meteor trail ionization, and the like, all contribute to significantly increased radio range.

It's not too difficult to use trigonometric means to determine the radio horizon, although the calculations can become tedious without a programmable calculator or computer. To facilitate such calculations, Jack Priedigkeit, W6ZGN, developed a BASIC language computer program. This program was published in his article "A Simple Computer Model for VHF/UHF Propagation," in June 1983

```
PROGRAM:  RAY PATH PGM

 0 REM ************************************
 1 REM * VHF/UHF RAY PATH PROGRAM          *
 2 REM * FROM QST, JULY 1983, P. 33        *
 3 REM * BY JACK PRIEDIGKEIT/W6ZGN         *
 4 REM * MODIFIED FOR COMMODORE 64         *
 5 REM * BY KARL THURBER/W8FX              *
 6 REM ************************************
 7 REM
 8 PRINT"[CLEAR]":POKE 53280,6:POKE 53281,11:POKE 646,15
 9 PRINT"[RVS]VHF/UHF RAY PATH PROGRAM[RVOFF,DOWN2]"
 10 INPUT"ANTENNA HT-MSL (H1)";H1
 20 INPUT"ANTENNA HT-MSL (H2)";H2
 30 INPUT"DISTANCE-MILES (D0)";D0
 40 INPUT"EARTH RADIUS FACTOR (K0)";K0
 50 DH=H1-H2
 60 K1=1.5*K0
 70 K2=(D0↑2)/K1
 80 IF ABS(DH)>K2 THEN 165
 90 D1=0.75*K0*DH/D0+D0/2
 100 H0=H1-D1↑2/K1
 110 IF H0<0 THEN PRINT" [RVS]LOS NOT POSSIBLE     "
 115 PRINT" [RVS]D3        H3           [RVOFF]"
 120 FOR N=0 TO 20:D3=N*D0/20
 130 H3=H0+(D3-D1)↑2/K1
 140 PRINT D3,H3
 150 NEXT N
 160 END
 165 PRINT"[CLEAR,SPACE,RVS]D3        H3           [RVOFF]"
 170 K3=DH/D0+D0/K1
 180 FOR N=0 TO 20:D3=N*D0/20
 190 H3=H1-K3*D3+D3↑2/K1
 200 PRINT D3,H3
 210 NEXT N
 220 END
```

Fig. 1– V.h.f./u.h.f. ray path program. Note: The Commodore graphics and control characters are difficult to reproduce here. Therefore, the special characters in lines 8, 9, 110, 115, and 165 in the listing above have been translated into clear text. The bracketed words spell out any special characters. These listing conventions are similar to those followed by Compute! *and other magazines for Commodore users.*

QST. The program he developed not only calculates the simple radio horizon, but it also computes and displays in tabular form the actual ray path height between two antennas at a given distance.

This enables one to see if **L**ine-**O**f-**S**ight (**LOS**) propagation between two points is possible, and if not, the program gives an idea of how much one or the other antenna needs to be raised to enable LOS communication. The program also allows one to "plug in" values of effective earth radius ("**k**") other than the nominal four-thirds figure previously discussed, in order to see the effects of slightly different meteorological conditions on the signal path.

I adapted W6ZGN's ray path program for the Commodore 64 computer, adding some screen prompts and a few other refinements. With Jack's permission, I have included it here as fig. 1. To use the program, you simply load it into the computer and enter several variables by means of the keyboard. These variables include the altitude of the antennas, **H1** and **H2**, in feet above **M**ean **S**ea **L**evel (**MSL**); the separation distance in miles, **D0**; and the earth radius factor, **K0**. The program will cause the computer to output a listing of the distance in miles from the antenna at H1 and the height of the ray path above MSL at 20 equally spaced points along the propagation path.

Should the antenna heights be too low for the separation distance, the ray path is blocked by the earth's curvature, and the screen will display "LOS NOT POSSIBLE." The computer will then print negative altitudes where the ray path falls below MSL. This information may be used to estimate the increase in antenna height necessary for a LOS path to exist.

As mentioned, a k-value of four-thirds is the nominal figure used in such calculations. Changes in atmospheric refraction conditions can change the earth radius factor by a small amount, although with the special propagation effects described previously, the path may be extended dramatically. Intrigued, I asked Jack about the value of "k" and what its practical limits might be. His response was both fascinating and instructive:

"... 'K' depends upon the rate at which the humidity and temperature change with altitude along the propagation path. For example, when you look up and see a nice fluffy cloud, you know that the humidity and temperature inside the cloud differ from the air about the cloud; otherwise, there would be no cloud. Thus, a radio ray passing through the cloud will have a different radius of curvature, or effective 'k.' Since it is not practical to measure the detailed micrometeorology along the propagation path, it is necessary to use the average values for 'k.' I have, in my younger days, spent many hours flying instrumented aircraft in and about clouds to measure the refractive index, only to find that the fine detail had changed during the time it took to fly the propagation path. However, the average value of 'k' for the path remained about the same."

Jack also mentioned that "... the National Bureau of Standards (NBS) has analyzed 8 years of data collected by the U.S. Weather Bureau, and has made a series of maps for the USA showing contours of the average 'delta-N' value (*refractive index gradient—ed.*) at 0300 and 1500 hours for each month of the year. Scanning these maps, it is seen that the average value of 'delta-N' ranges from 30 to 65, depending on geographical location and season. This corresponds to a range of 'k' values from 1.2 to 1.7."

"I hesitate to categorize the values of 'k' by weather type, as NBS did not relate the 'delta-N' to the prevailing air-mass type. I would venture to say that, just like the local weather, we can expect to see short-term conditions that depart from the long-term average values; that is why I used a range of 1.1 to 2.0 for the values of 'k' in the article. I think these are the practical limits for 'k,' although not necessarily the limits under extreme conditions."

From kitchen to hamshack, it seems that the personal computer has taken over the American household. Although we have no intention of turning your Antennas column into a computer column, we nevertheless will highlight computer topics whenever we think that they will be of particular interest to column readers. Special focus, of course, will be on computer software that supports an antenna, propagation, or technical computational function. (Photo courtesy Radio Shack)

Ducks are getting smaller!

Jack also pointed out that he would stop short of directly equating groundwave with ray path calculations, since he considers groundwave to be that component of the radiated signal which follows the surface of the earth as far as the opti-

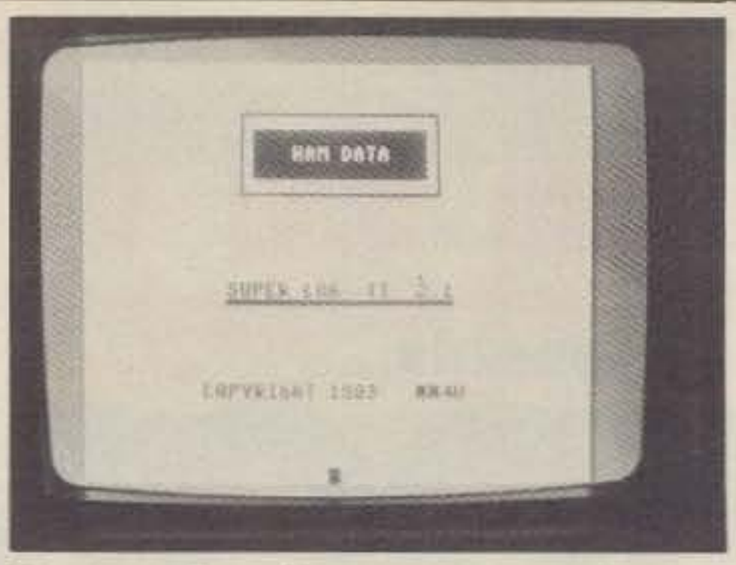
clearly and professionally printed. The program should be of value to DXers who desire greater accuracy in predicting path success than can be obtained with the monthly predictions generally available. Cost is quite reasonable, considering what the program offers—about $13 on cassette, with an additional charge for the disk version.

Incidentally, the major program algorithm is well founded, being based on work done at the Naval Ocean Systems Center (NOSC) in San Diego to develop a practical MUF-prediction program that would fit within the available memory constraints of personal computers—no small challenge, considering the up to 200K programs usually required for MUF calculations. A groundbreaking BASIC language MUF program was presented by Robert B. Rose, K6GKU, of NOSC, in his December 1982 *QST* article, "MINIMUF: A Simplified MUF-Prediction Program for Microcomputers." This program was designed for a Tektronix computer, and so must be modified for it to run on other computers. Through the "On Line" column in *QST*, translations of the original MINIMUF Program are available for several popular personal computers. Information on these programs is available for an s.a.s.e. with 37 cents postage from the ARRL, Dept. PX, 225 Main St., Newington, CT 06111.

Fig. 2 shows a sample product of the "Propagation Chart" program sold by Ham Data. This product was generated on my Commodore 64 computer and was printed out on a Vic 1525 printer.

I also had the opportunity to examine several of the Ham Data "Super Log" program series. These inexpensive (under about $20) but nicely written and well-documented programs, Log I through Log IV, are full-featured computer-based logging routines that allow you to save all standard ARRL-type log entries on tape, disk, or paper. These routines enable you to change entries and to add information, such as QSL card updates and additional remarks. The programs also feature a search mode which enables you to find previous contacts using various search criteria. Some 400 records can be maintained with the Commodore 64, less with the Vic-20 (the exact number with the Vic depends on the memory expansion used, if any).

The menu-driven logging programs allow selection of the desired function, such as to load or view the log, log in, change data, search for previous entries, summarize contact totals, and save or close the log. Some handy features of these programs include automatic entry of the time for each contact, an "alarm clock" reminder, several search modes (by call sign, name, QTH, date, and band), and user selectable printout of various



The Ham Data Co. specializes in full-feature logging and contest/dupe-checking programs, as well as a maximum usable frequency (MUF) determination program. Shown here is the initial title display of their "Super Log II" program for Worked All States tracking. We'll devote increased column space to ham software topics in the future, without losing the essential flavor of the Antennas column. (W8FX photo)

Shown here is the main menu of the Ham Data "Super Log III" program. This log is designed to save all ARRL-type log entries on tape, disk, or paper. A DXCC summary is provided for all ARRL DXCC countries. (W8FX photo)

```
JAN 1        SUNSPOT# 100

+-------------+-------------+
|  DEGREES    |   MILES     |
|   105.4     |  8766.15    |
+-------------+-------------+

DX = SOUTH AFRICA
```

Fig. 2– Propagation program printer output. Shown above is a sample "screen dump" from the Ham Data "Propagation Chart" program for the Commodore 64 computer. Displayed are the MUF (in "MGHZ") over each hour in a 24-hour UTC period. The path displayed is that

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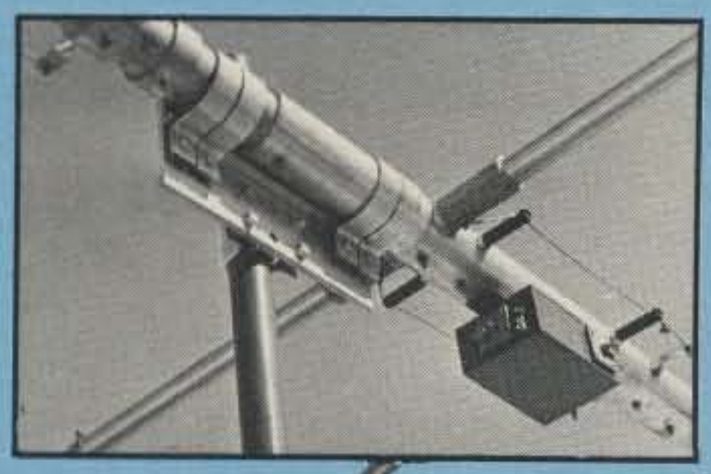
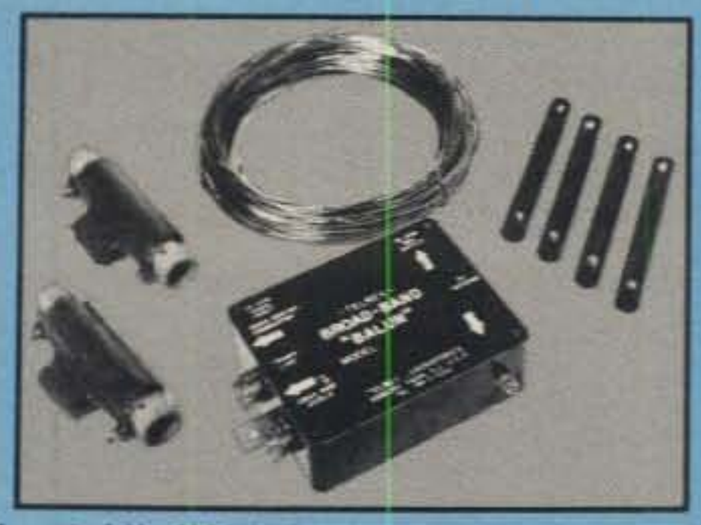


MIVD/2 frequencies
$84.50 Post Paid (U.S.)



A Telrex "Balun" fed "Inverted-Vee" kit is the ideal hi-performance inexpensive and practical to install low-frequency mono or multiple band, 52 ohm antenna system.

Better than optimum full sized Dipole performance in an antenna which can be set up within the hour, needing a minimal support structure (existing tower, house, tree, etc.). The "Inverted-Vee" produces a low-angle "Balanced" Omni-Directional pattern, which increases the signal to noise, and signal to interference ratios. Complete simplified instructions are provided. NO TUNERS NEEDED!

2MVS814 kit
$201.00

Special N-type coaxial connectors, solid rod elements (driven thru the boom), tinned connecting lugs, and s/s electrical hardware provide you with peace of mind for many years!

If top 2 Meter performance is your requirement, the 2MVS814 kit consisting of 2 ea. phased 2 Meter "Balun" fed precision tuned 8 element Arrays outperform even quad stacked antennas of other makes.

A FEW OF THE WORLD'S FINEST!

MODEL	Description	GAIN	Value	PRICE
2M1528C	2 Meter 15 element	(17 DBD)	160.00	**131.00**
10M523	10 Meter 5 element	(13 DBD)	342.00	**285.00**
10M636	10 Meter 6 element	(14.6 DBD)	745.00	**625.00**
15M532	15 Meter 5 element	(13 DBD)	545.00	**455.00**
15M845	15 Meter 8 element	(15 DBD)	1120.00	**925.00**
20M536	20 Meter 5 element	(12 DBD)	645.00	**535.00**
20M646	20 Meter 6 element	(14 DBD)	1130.00	**945.00**
40M214	40 Meter 2 element	(5.6 DBD)	740.00	**615.00**
40M329	40 Meter 3 element	(8.3 DBD)	1139.00	**950.00**
40M346	40 Meter 3 element	(9 DBD)	1975.00	**1650.00**
TB4EC	10, 15, 20M Tri-Band	(5.5 DBD)	252.00	**205.00**
TB5ES	10, 15, 20M Tri-Band	(8.5 DBD)	398.00	**330.00**
TB6EM	10, 15, 20M Tri-Band	(10 DBD)	735.00	**565.00**

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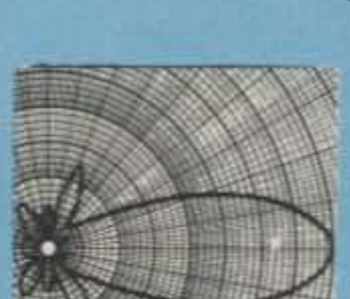

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clearly and professionally printed. The program should be of value to DXers who desire greater accuracy in predicting path success than can be obtained with the monthly predictions generally available. Cost is quite reasonable, considering what the program offers—about $13 on cassette, with an additional charge for the disk version.

Incidentally, the major program algorithm is well founded, being based on work done at the Naval Ocean Systems Center (NOSC) in San Diego to develop a practical MUF-prediction program that would fit within the available memory constraints of personal computers—no small challenge, considering the up to 200K programs usually required for MUF calculations. A groundbreaking BASIC language MUF program was presented by Robert B. Rose, K6GKU, of NOSC, in his December 1982 *QST* article, "MINIMUF: A Simplified MUF-Prediction Program for Microcomputers." This program was designed for a Tektronix computer, and so must be modified for it to run on other computers. Through the "On Line" column in *QST*, translations of the original MINIMUF Program are available for several popular personal computers. Information on these programs is available for an s.a.s.e. with 37 cents postage from the ARRL, Dept. PX, 225 Main St., Newington, CT 06111.

Fig. 2 shows a sample product of the "Propagation Chart" program sold by Ham Data. This product was generated on my Commodore 64 computer and was printed out on a Vic 1525 printer.

I also had the opportunity to examine several of the Ham Data "Super Log" program series. These inexpensive (under about $20) but nicely written and well-documented programs, Log I through Log IV, are full-featured computer-based logging routines that allow you to save all standard ARRL-type log entries on tape, disk, or paper. These routines enable you to change entries and to add information, such as QSL card updates and additional remarks. The programs also feature a search mode which enables you to find previous contacts using various search criteria. Some 400 records can be maintained with the Commodore 64, less with the Vic-20 (the exact number with the Vic depends on the memory expansion used, if any).

The menu-driven logging programs allow selection of the desired function, such as to load or view the log, log in, change data, search for previous entries, summarize contact totals, and save or close the log. Some handy features of these programs include automatic entry of the time for each contact, an "alarm clock" reminder, several search modes (by call sign, name, QTH, date, and band), and user selectable printout of various log data and QSL card confirmation labels.

I had the opportunity to play with the

The Ham Data Co. specializes in full-feature logging and contest/dupe-checking programs, as well as a maximum usable frequency (MUF) determination program. Shown here is the initial title display of their "Super Log II" program for Worked All States tracking. We'll devote increased column space to ham software topics in the future, without losing the essential flavor of the Antennas column. (W8FX photo)

Shown here is the main menu of the Ham Data "Super Log III" program. This log is designed to save all ARRL-type log entries on tape, disk, or paper. A DXCC summary is provided for all ARRL DXCC countries. (W8FX photo)

```
JAN 1        SUNSPOT# 100
```

DEGREES	MILES
105.4	8766.15

DX = SOUTH AFRICA

Fig. 2– Propagation program printer output. Shown above is a sample "screen dump" from the Ham Data "Propagation Chart" program for the Commodore 64 computer. Displayed are the MUF (in "MGHZ") over each hour in a 24-hour UTC period. The path displayed is that from Montgomery, Alabama to South Africa. Note that date, beam heading, and distance are also displayed.

W8FX SAMPLE LOG

DATE	FREQ	TIME	NO	CALL	SENT	RCVD	NAME	QTH/REMARKS
810504	07.000	2115	1	WB9VJZ	46	57	JOHN	MADISON WI/NCX-5
810906	14.000	2110	2	WB2DEQ	589	599	DICK	MIDDLETOWN NJ/
810910	14.000	1855	3	W2IV	59	59	HARPER	ARGYLE NY/
810914	14.000	2058	4	W2AQT	589	589	BOB	WESTWOOD NJ/
810914	14.000	2135	5	WA4ZJJ	589	589	DENNIS	GRIFFIN GA/
811006	03.800	2122	6	W4CIB/4	59	59	HARLEY	PENSACOLA FL/
811011	03.500	1112	7	KA0ADF	599	589	RAY	MUSCATINE IA/
811012	28.000	1215	8	K7EA	579	UNK	BILL	UNK/
811111	28.000	0140	9	WA2KCL	58	53	BARBARA	HYDE PARK NY/
811213	14.000	2247	10	W8NVQ	599	599	JIM	DAYTON OH/

TOTAL— 10 STATES— 7 CONFIRMED— 4

DATE FREQ UTC
810504 07.000 2115
RADIO/RST
WB9VJZ / 46

W8FX SAMPLE LOG

DATE	FREQ	TIME	NO	CALL	SENT	RCVD	NAME	QTH/REMARKS
810906	14.000	2110	2	WB2DEQ	589	599	DICK	MIDDLETOWN NJ/
810910	14.000	1855	3	W2IV	59	59	HARPER	ARGYLE NY/
810914	14.000	2058	4	W2AQT	589	589	BOB	WESTWOOD NJ/
810914	14.000	2135	5	WA4ZJJ	589	589	DENNIS	GRIFFIN GA/
811213	14.000	2247	10	W8NVQ	599	599	JIM	DAYTON OH/

TOTAL— 10 STATES— 7 CONFIRMED— 4

Fig. 3– "Super Log" printout. At top is a sample printout from the "Super Log II" program by Ham Data; note the remarks at right which include QSL sent/received (S/R) information in reverse print, and the states worked/confirmed summary. Below this is a sample QSL confirmation label printed out from the data in the first contact on the above log. The printout at bottom is a selective one which shows 20 meter (14 MHz) QSO data only. A similar program, which includes DXCC summaries, is available as "Super Log III." Up to 400 records may be maintained on the Commodore 64, less on the Vic-20. Several other contest-oriented logging programs are offered.

"Super Log II," designed especially for summarizing WAS progress, and "Super Log III," written with DXCC in mind. Both programs performed their intended functions very nicely and should be of real value as practical operating aids. The worked/needed/confirmed summary features are quite handy, and they underscore some of the real benefits to be obtained from computer-based logging. Some serious operator errors could "crash" the program, resulting in loss of current log data, although the user's manual included some suggested recovery procedures. A newer program, the "Super Log IV" (which I did not have the opportunity to peruse), is also available to combine the WAS and DXCC functions of the Log II and III programs.

Further information on these programs can be obtained from Chip Lohman, NN4U, at Ham Data Co., 3331 Bybrook Lane, Woodbridge, VA 22192.

Fig. 3 shows at top a sample printout of all log data; in the middle, a typical QSL card confirmation label; and at the bottom, a customized printout of the same log but showing 20 meter (14 MHz) contacts only.

vicCOMM Journal

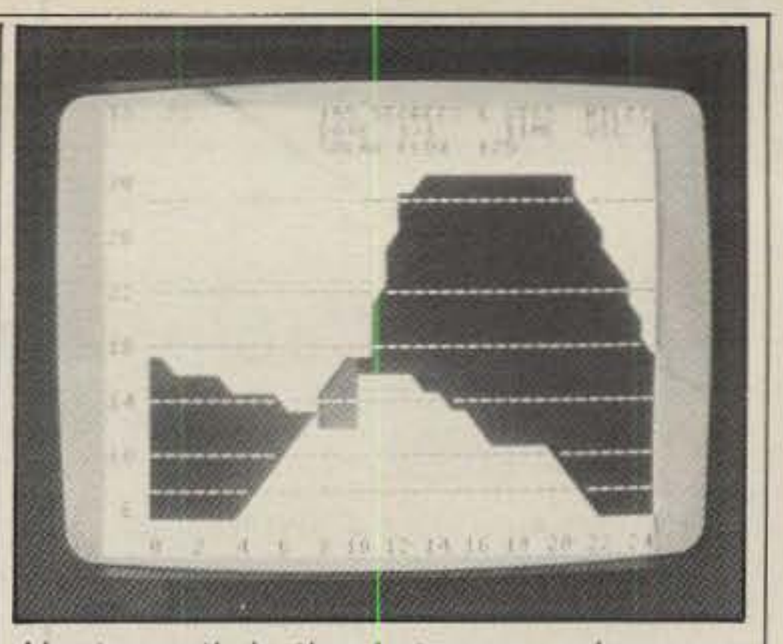
We were recently treated to a few copies and program cassettes from AA4BB's publication, the *vicCOMM Journal*. The magazine's primary emphasis is on the Vic-20, although it has some coverage of the Commodore 64, including comparisons between the two computers. The magazine is published bimonthly by Edwin B. Cox, AA4BB, Box 5491, Duke Station, Durham, NC 27706.

Interestingly, the magazine has several subscription options. The basic hardcopy magazine is $9 for a year's subscription of 6 issues, with a 1-year cassette-based sub at $36 and a 1-year disk-based sub at $45, as this is written. Selected individual program listings from the magazine are also available on disk or cassette, and hardware required by some of the programs is available separately.

Amateur radio is a major emphasis of the magazine, with early issues featuring c.w., SSTV, and RTTY applications; MUF determinations; antenna design; bearing calculations; filing and logging programs; and terminals and interfaces, to mention but a few areas covered. There is also a heavy emphasis on BASIC and machine-language programming, and on harnessing computer capabilities that are not well documented or explained in the manufacturers' manuals.

I found the material in the magazine to be interesting and useful, certainly not a rehash of old public domain software topics. The material presented was actually quite technical and complex, although the carefully written, tutorial style of the magazine helps to carry the reader from the entry level to a fairly advanced stage very quickly. Also, the availability of program software on disk or cassette will appeal to those readers who don't want the tedium of typing lengthy programs into their computers.

According to Ed, his goal is to make good software and information available to the public for a minimal investment, particularly to serve special interests such as amateur radio. Ed also contributes a Vic-20 column to the Birmingham, Alabama based *Computer Trader Magazine*. We wish Ed luck with his venture!



Next month in the Antennas column we will examine several MUF/LUF propagation programs. A typical screen presentation of the Base 2 Systems "MUFPLOT" program is shown in this photo. Note the lightly shaded area near the center of the photo. It shows that communication over the given path is not possible during the indicated hours. (W8FX photo)

Summary

This month it's been a mixture of bits, bytes, and beams in the Antennas column. We've discussed a new "quadricube" antenna from Mexico, a v.h.f./u.h.f. ray path program, and several software offerings of interest to the ham computerist. Next month it's more topics of timely interest along similar lines. See you then.

73, Karl, W8FX

Additional Reading

Jacobs, George, W3ASK. The "Propagation" column, a monthly feature of *CQ*.

McCoy, Lew, W1ICP. "Propagation: Getting the Signal from Here to There—or Vice Versa," *CQ*, September 1981.

Pocock, Emil, W3EP. "The Weather That Brings VHF DX," *QST*, May 1983.

Priedigkeit, Jack, W6ZGN. "A Simple Computer Model for VHF/UHF Propagation," *QST*, June 1983.

Rand, Philip, W1DBM. "Writing Antenna Design Programs for Your Personal Computer," *CQ*, August 1983.

Rose, Robert B., K6GKU. "MINIMUF: A Simplified MUF-Prediction Program for Microcomputers," *QST*, December 1982.

Sundstrom, Thomas R., W2XQ. "How Come I Can't Hear Anything?" *CQ*, September 1983.

Walker, Billy, W5GFE. "Predicting Radio Horizons at VHF," *QST*, June 1978.

No - 83 - 84

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Cable Television Interference—Part I of II

Novices are unlikely to encounter cable television interference (CATVI) until they upgrade in license class and start operating on the v.h.f. (30 to 300 MHz) bands, but it can happen. The subject of CATVI is a growing concern to all amateurs. This two-part article should be of interest to amateurs who are unfamiliar with cable television (CATV) and/or CATV interference.

James B. Anthony, KB4GNP, of Madisonville, Kentucky, is a truck driver and a shortwave listener who obtained a Novice license in August 1983. His station includes an Icom 720A transceiver, Butternut vertical, 10 meter dipole, and 15 meter dipole. That is a great suffix in his callsign—Gross National Product (GNP).

What It is

Cable Television (CATV) is mushrooming faster than CB radio expanded in the 1970s. The first community antenna television (CATV) service was initiated in 1948 to provide TV signals to people located in areas where TV reception was poor to nonexistent. Those initial CATV systems consisted of a master television antenna system and a signal distribution system that fed received TV signals through coaxial cables to viewers. Within a decade, CATV operators were using microwave to import TV from nearby cities, and some operators were distributing their own programs. Satellite communications greatly expanded CATV programming capability in 1975 and pay CATV exploded on the American scene. Seventy CATV operators served 14,000 subscribers in 1950. By the end of 1981, 4600 CATV outfits were serving more than 20 million homes. One San Diego company had more than 200,000 subscribers at that point, and it now has more than 225,000. At the start of 1982 almost 85 percent of all domestic earth station applications received by the FCC were from CATV operators. As of June 1983 the top 100 multiple system operators averaged 247,859 basic subscribers, with a high of 2,500,000 and a low of 28,471. As of June 1983 the top 100 systems (by geographic area) averaged 66,673 basic subscribers, with a high of 225,000 and a low of 43,000 included in this group. Almost 6000 CATV system operators are now serving about 29.5 million subscribers in 16,000 American communities. It is estimated that about 84 million United States households have TV. CATV industry forecasts show approximately 58,900,000 basis subscribers by 1990, which would be 62 percent of all American households equipped with television. The preceding figures are intended to let you know the enormous scale of CATV activity in our country.

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The cable television industry uses huge segments of frequency spectrum (presently about 5 to 450 MHz) that is assigned to several radio services for their over-the-air uses. CATV signals are required to be nonradiating; they are supposed to be contained within shielded cables. The maximum allowable frequency leakage level for CATV is 20 microvolts per meter at 10 feet, from 54 through 216 MHz. The maximum allowable CATV system leakage level up through 54 MHz, and above 216 MHz, is 15 microvolts per meter at a distance of 100 feet. These leakage levels are specified in Part 76 of the FCC Rules and Regulations, which also states that the operator of a cable television system that causes harmful interference shall promptly take appropriate measures to eliminate the harmful interference. In other words, CATV is a closed cable signal delivery system that is not intended to radiate signals over the air. The Chairman of the Community Antenna Television Association's engineering committee advised me that CATV signal leakage can be kept below the FCC's maximum allowable levels by proper installation and good maintenance.

Fig. 1 shows a typical cable TV system. The programming can be accomplished at any one of several points in the system, where origination facilities are available. Four trunks are shown in this figure, but a CATV system can have a single trunk or several trunks. Two or three trunks most commonly are used. Furthermore, trunks are sometimes split at points that are far from the headend. The bridging amplifier (bridger) provides input to the distribution (feeder) system. The trunk amplifier, directional coupler, and bridger are usually contained in a single housing. The trunk cables feed other bridgers, and each bridger has one to four outputs (as needed).

Each CATV channel is 6 MHz wide, which is the normal width of a standard (fast scan) television signal such as one has on over-the-air free television broadcasts. Most CATV interference involving amateurs is related to CATV channels E and K, which are 144–150 and 222–228 MHz, respectively. Amateurs usually experience squelch breaks when a CATVI situation exists. When a worst-case CATVI situation exists, amateurs usually hear a steady signal at 145.25 or 223.25 MHz in the amateur 144–148 or 220–225 MHz band, respectively. If a CATV installation is degraded to the point where interference occurs, a dual problem is likely to exist; the CATV signals interfere with the amateur, and amateur transmissions can cause mild to complete picture distortion on the CATV channels. This amateur interference to CATV viewing can occur despite the amateur transmitter r.f. output being clean with spurious (unwanted) signal output at (or below) current FCC equipment requirements.

Cable television interference (CATVI) can be due to any one (or a combination) of CATV system faults. The most common CATVI causes are improper installation, wiring or system alteration by subscribers, storms or accidents damaging cables, loose connections, rodent attacks on cables, and CATV degradation due to aging. Other CATVI causes include corrosion and mechanical failure of low-cost connectors, drop cable shielding being less effective than the shielding provided by solid aluminum trunk cables, and drop (feed) cables being damaged by wind forces and cable motion. A continuous monitor and maintenance program is required to minimize CATVI problems and to quickly correct CATVI when it occurs.

CATVI is not limited to amateurs. CATV systems use frequency spectrum that is assigned to many radio services. Interference to other radio services has been reported. CATV interference to Federal Aviation Administration (FAA) aeronautical frequencies is a current concern. An FCC report and order regarding CATV in-

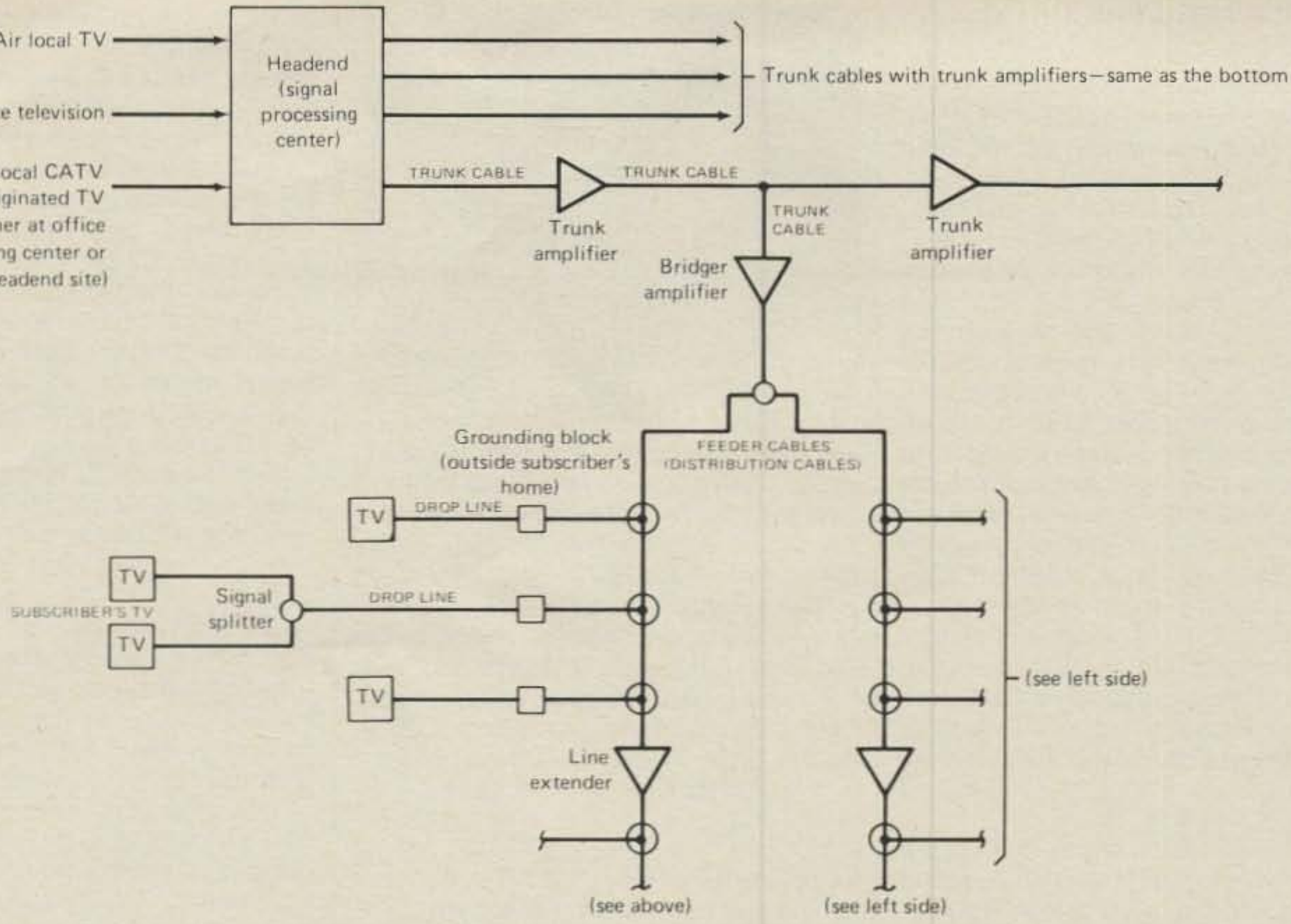

Fig. 1– Typical cable television system installation.

terference to aeronautical and navigation over-the-air frequencies is due in June of 1984. A CATV operator serving Escondido, California, lost the use of CATV channel F (150–156 MHz) because his signal caused harmful interference to California Department of Forestry communications. Despite the possibility of interference to on-the-air radio services, the CATV industry requires the use of huge blocks of frequency to provide CATV viewers with a selection of many channels. Existing technical limitations prevent CATV system operation much above 400 MHz, and the lowest over-the-air u.h.f. TV channel (14) starts at 470 MHz. Consequently, the FCC cannot restrict CATV operation to just the frequency spectrum that is used for over-the-air (radiated) TV transmissions without drastically reducing CATV service to their customers.

CATV Channels

Titsch Communications, Incorporated published an excellent table that shows direct relationships between contained (nonradiating) CATV channels and the various radiating radio services that use the same frequencies. This 16.5 by 21 inch color table shows "trouble areas." The amateur radio frequencies shown as trouble areas are 144–148, 220–225, 420–450, 1215–1300, and 2300–2450 MHz. The 11 meter CB band is included in this category, along with land mobile (40–45 MHz), aircraft distress (121.4–121.6 MHz), government fixed and mobile (around 169, plus 335.4–399.9 MHz), and aeronautical navigation (328.6 to 335.4 MHz). This table is available at a cost of $3.50 each from Titsch Communications, Inc., c/o Pam Berke, 2500 Curtis Street, Denver, Colorado 80205.

Table I shows the frequency limits of some CATV channels that could cause CATV interference to amateur operation. The video is 1.25 MHz above the low end of each CATV channel, and the audio is 250 kHz below the top end of each CATV channel.

CATV and CATVI Booklets

The Cable Television Bureau of the Federal Communications Commission is at 2025 M Street NW, Washington, DC 20554. Their Information Bulletin 18 is entitled "Cable Television"; it is a 32-page detailed explanation of cable television.

The ARRL CATVI desk published a 91-page book on CATVI. This book provides an excellent introduction to the subject. The title is "Cable Television Interference: Working Materials for the Radio Amateur." The first section lists the steps one should take to initiate CATVI corrective action, and it includes sample letters to be sent to the CATV system operator and to the FCC. The second section contains magazine reprints about CATV and CATVI. The third section of this ARRL book provides reference materials; it includes a history of CATV, recent developments, CATV glossary of terms, and a list of the top 50 cable system operators. The fourth section has sample CATVI clauses for use in municipal cable TV franchise agreements. FCC and media publicity is covered in the fifth section. The last section shows sample CATVI complaints and presentations.

CATV Channel	Limits (MHz)	Video (MHz)	Audio (MHz)	Amateur Band
T-7	5.75–11.75	7.0	11.5	40/30 m.
T-8	11.75–17.75	13.0	17.5	20 m.
T-9	17.75–23.75	19.0	23.5	15 m.
T-10	23.75–29.75	25.0	29.5	10 m.
18(E)	144–150	145.25	149.75	2 m.
23(J)	216–222	217.25	221.75	3/4 m.
24(K)	222–228	223.25	227.75	3/4 m.
57(UU)	420–426	421.25	425.75	75 cm
58(VV)	426–432	427.25	431.75	75 cm
59(WW)	432–438	433.25	437.75	75 cm
60(XX)	438–444	439.25	443.75	75 cm
61(YY)	444–450	445.25	449.75	75 cm

Table I– Frequency limits of some CATV channels that could cause interference to amateur operation.

Magazines That Cover CATVI

CQ, Ham Radio, QST, and *73* magazines all cover CATVI at one time or another. I hope you never experience CATVI, but you probably will encounter this difficulty sometime in the future. It is advisable to be prepared for CATVI, and existing magazine articles can help you understand this subject. As an ex-TVI (television interference) committee chairman for a major metroplex (Boston), I cannot help feeling that I have been down this road before. However, I believe that anything that it worth having is worth the effort it takes to protect it, and amateur radio operating privileges are worth safeguarding. Most interference to amateur operation is not from cable television leakage. Past issues of amateur radio magazines contain many articles covering the various types of interference that can be caused to (and by) amateur radio operation. These causes and cures are too numerous to mention in this article, but you should understand that CATVI is not the major source of interference to amateurs at this time.

Mr. Wayne Sheldon is Chairman of the Community Antenna Television Association's engineering committee. He published an article about CATVI in the November 1982 issue of the *Community Antenna Television Journal (CATJ).* His article covers a CATVI seminar which was a part of the 9 October 1982 ARRL Convention held at Santa Cruz, California.

Tanya McGrew, KA7OXJ, of Portland, Oregon, has been licensed for about one year. Her first contact was with JE7LST in Japan. Tanya has worked 16 states and 5 countries so far. Her station includes a Kenwood TS-520 transceiver, Drake B-line equipment (T4XB transmitter and R4B receiver), and a Hustler 4-BTV antenna. She shares this station with her husband, Kelly, KW7N. Tanya and Kelly have three children who do their best to keep their parents busy. Listen for Tanya on the Novice bands. Your best chance to contact her is on 40 meters.

The October 1982 issue of *CQ* includes an interview with Wendell H. Bailey, KC3BU, regarding CATVI. He is a National Cable Television Association (NCTA) Vice President in their Science and Technology Department. If you have access to a copy of that *CQ* issue, I hope you will read it. It is positive in content and appears to be a bit optimistic, but that is understandable since an amateur was being interviewed by another amateur. Mr. Bailey makes it very clear that amateurs are not at fault when CATVI occurs. He pointed out that 10,700 copies of a reprint of recent *QST* CATVI articles were distributed to CATV system operators. This seems to have been an attempt to increase CATV system operators' awareness and knowledge of CATV/amateur interference, plus the need for cooperation in eliminating CATVI. He emphasized the need for education and cooperation in lieu of confrontation and regulatory changes. His position is that amateurs are included among the people who want good CATV service, whereas CATV system operators look to the amateur radio fraternity for some of the technicians and engineers they need to install, operate, and maintain CATV systems.

This completes the first part of this two-part article about CATVI. Next month's conclusion covers other sources of CATV information, CATV operator's negative comments, the positive CATV position, FCC, what to do if CATVI occurs, when you should not complain, etc.

73, Bill, W6DDB

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Setting Up and Using Your Own Ham Shack
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World Press Services Frequencies
by Thomas Harrington
A comprehensive manual covering the field of radioteletype news monitoring—antennas, receivers, terminal units, monitors, and more. Contains 3 master lists of times of transmission, frequencies, plus ITU list of over 50 news services worldwide. 72 pages, paperback, $8.95. Order #U173.

The Shortwave Propagation Handbook, 2nd ed.
by George Jacobs, W3ASK, and Theodore J. Cohen, N4XX
A new, revised edition of the popular guide to all your propagation needs. Contains up-to-the-minute information and charts, and guides you through producing your own propagation data. 154 pages, paperback, $8.95. Order #C137.

The Radio Publications Group—The "Bill Orr Series"
These easy reading classics belong in the library of any active ham. Loaded with practical how-to information, with tables, charts, and formulas arranged for handy reference.
Beam Antenna Handbook, 200 pages, paperback, $7.95. Order #R143.
Wire Antennas, 192 pages, paperback, $7.95. Order #R144.
Antenna Handbook, 192 pp. paperback, $7.95. Order #R145.
Cubical Quad Antennas, 112 pages, paperback, $6.95. Order #R146.
VHF Handbook, 336 pp. paperback, $11.95. Order #R147.
Interference Handbook, by W.R. Nelson, 247 pages, paperback, $9.95. Order #R172.

World Radio TV Handbook 1984
The world's only complete directory of international broadcasting and TV stations—the established, authoritative guide endorsed by the world's leading broadcasting organizations. A comprehensive listing of short-, medium-, and long-wave stations revised and updated to reflect actual conditions. Also includes special features on listening gear, how to adapt older receivers for use today, and DX club activities. 600 pages, paperback, $17.50. Order #B097.

Radio Handbook, 22nd ed.
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The RTTY Handbook
by Byron H. Kretzman, W2JTP
An old classic and a must for those interested in RTTY machine technology. Covers history, general practice, basic principles, equipment, and operation. No RTTY enthusiast's library is complete without this book. 191 pages, paperback, $3.95. Order #C198.

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Say You Saw It In CQ

DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATIONS AROUND THE WORLD

Surely there's a special place in hell,
Full of chains and whips of heavy leather,
For those who in a pileup, contest style,
Must send name, address and current weather. —*W4UP*

Where do you stand in the *CQ* Awards Program? As the League's DXCC is the most well-known and widely pursued DX award in the world, most DXers begin their DXing by chasing countries. However, eventually the countries give out, or the ones you need are few and far between, and you begin to look for new challenges. The *CQ* Awards Program has those challenges. Our awards are structured so that there is always another goal to pursue. WAZ is offered for many combinations of band and mode, and in WPX it's literally impossible to work them all, as the supply of new prefixes is practically inexhaustible.

The *CQ* awards are based on three widely differing sets of criteria: the 40 zones of the world, prefixes, and countries. The flagship of our awards program is WAZ (Worked All Zones). The basic WAZ is awarded on proof of contact with the 40 *CQ* zones of the world using a mixture of c.w. and phone (s.s.b.), all s.s.b., or, if you have a few zones confirmed from the old days using a.m. phone, all phone for a mixture of a.m. and s.s.b. QSOs. The number of DXers worldwide who have attained the basic c.w./phone WAZ award is approaching 5700, while almost 2800 have attained s.s.b. WAZ and 586 have qualified for phone WAZ.

The WAZ program, however, is far from over for these DXers, as WAZ certificates are also available for individual bands and modes. On 20 meters 484 DXers have qualified for the single-band phone award and 209 for the single-band c.w. award. On 15 meters 191 DXers have qualified on phone and 102 on c.w., while on 10 meters 270 have made single-band WAZ phone and 50 have made single-band WAZ c.w. If low certificate numbers turn you on, some really good ones are still available on the low frequency bands. For example, the next 80 meter single-band WAZ on c.w. will have the number 5, and on phone the number 26. On 40 meters the next phone award will be number 24 and the next c.w. award will be number 49.

But that's still not all! The *CQ* Awards Program also challenges you with the most difficult DX award of all—5 Band WAZ. Earning a simple c.w./phone WAZ is equivalent in difficulty to working about 250 countries. Therefore, a 5 Band WAZ is approximately the same as 200–250 countries on each band and consequently is considerably more difficult than 5 Band DXCC. The very first 5 Band WAZ plaque was awarded to ON4UN, while plaque #2 went to K4MQG. To date only 69 DXers have earned this prestigious award worldwide.

If the WAZ, Single-Band WAZ, or 5 Band WAZ Awards sound interesting to you and you would like to receive the complete rules, an application blank, and a zone map, send a self-addressed, stamped (37¢) envelope to the WAZ Manager, Mr. Leo Haijsman, W4KA, 1044 S.E. 43rd St., Cape Coral, FL 33904. On the back of the WAZ application is a list of CQ Awards check-points. Please note that VE1RY on this list has changed his QTH. His new address is P.O. Box 640, Kingston, N.S., Canada B0P 1R0.

P.O. Box 205, Winter Haven, FL 33880

Ferrais "Ari" Giulio of Bassano del Grappa, Italy, has his Single-Band WAZ certificates on 10, 15, and 20 meters using only a trap vertical antenna with a Yaesu FT-401. Ari has been a licensed amateur since 1975 and is presently retired.

Henry Lewis, G3GIQ, found the most difficult part of the 5 Band WAZ chase was working the Far East on 80 meters. Henry is an electronic design consultant. He has worked over 300 countries and has a 160–10 meter total of over 1400 countries. He is secretary of the Chilton Radio DX Club, a 25 member group with 10 members above the 300 country mark.

The WPX Award

Another very popular award in the *CQ* lineup is the Worked All Prefixes Award, which we abbreviate WPX. Certificates are offered for contacts with 400 different prefixes by mixed mode, 300 prefixes on s.s.b., and for 300 prefixes on all c.w. Certificate endorsements are available for specified numbers of prefixes on each continent and on each band, as well as for working greater numbers of prefixes. In addition, a WPX Honor Roll is maintained for each mode. To qualify for the present Honor Roll requires at least 600 prefixes. To top the Honor Roll you would need over 2500 prefixes mixed mode, 2400 on s.s.b., and 2000 on c.w. The Honor Roll is published periodically as a feature of the DX column.

While we're on the subject of the WPX Award, Norm Koch, K6ZDL, the award's manager, has brought to our attention a few errors in the changes in the WPX Honor Roll that we reported in the January issue. The corrected listing of deletions which will be used is as follows: DT (all); GC (all); MP4, OQ; PK (all); VO4; VO6; VP1, 6, 7; VQ (all except VQ9); VR (all except VR6); VS (all except 5, 6); XV; ZB1; ZC3, 5, 6; ZD1, 2, 3, 4, 5, 6; ZS7, 8, 9; 1M4; 3W8; 8F3.

Novices and Shortwave Listeners. *CQ* also offers prefix awards especially for Novices and shortwave listeners (s.w.l.'s). The certificate for Novices is called the WPNX and can be earned by contacting 100 prefixes as a Novice. The s.w.l. award, called VPX for verified prefixes, requires confirmation of a specified number of prefixes.

For complete rules and an application blank for WPX, WPX endorsements, WPNX, or VPX, send a self-addressed, stamped (37¢) envelope to the WPX Manager, Norm Koch, K6ZDL, P.O. Box 1351, Torrance, CA 90505.

The CQ DX Award Program

CQ has two awards for the country chaser: the *CQ* S.S.B. DX Award for working 100 countries on s.s.b., and the *CQ* C.W. DX Award for working 100 countries on all c.w. Both awards use the DXCC country list, and an Honor Roll is maintained for each mode and is published periodically in the DX column. The minimum number of countries for Honor Roll status is 275.

These awards are not intended as

The WPX Program

Mixed

1078	JA4BAP	1082	JA5NSR
1079	W9ROK	1083	KF8K
1080	JA6VNR	1084	NE8V
1081	DK1JX		

S.S.B.

1635	CT1AHU	1636	NE6I

C.W.

2231	F6HKD	2233	KØAOZ
2232	W9ROK	2234	AE1X

Endorsements

Mixed: 450 W9ROK, JA6VNR 500 W9ROK, JA6VNR 550 N3KR, NE6I 700 KA7T, KO2Q 900 W6YMH 950 JA2KVD, IT9QDS 1000 IT9QDS 1050 IT9QDS, WB8ZRL 1100 IT9QDS 1200 IT9HLO 1350 SM3EVR, N4UH 1450 YU7SF.

S.S.B: 350 NB5C, CT1AHU, WA5BWM, W3IJT 400 CT1AHU 500 WA3GNW 550 K2SHZ 600 K2SHZ 650 K2SHZ 700 K2SHZ 900 WB8ZRL 1200 VE1YX 1550 WØYDB 1600 9H4G 2050 W2NC.

C.W: 350 F6HKD, W9ROK 400 F6HKD, NE6I 450 F6HKD 650 GW3SB 700 GM3YTS 800 K2SHZ 850 K2SHZ 900 K2SHZ 950 K2SHZ 1000 K2SHZ 1050 K2SHZ 1100 K2SHZ 1150 K2SHZ 1200 K2SHZ 1250 K2SHZ 1300 K2SHZ 1350 K2SHZ 1400 K2SHZ.

10 meters:	VE1YX, WA3GNW
15 meters:	JA4BAP, K6UXO, W2EMW, NE6I
20 meters:	W9ROK
40 meters:	KK5P
80 meters:	VE1YX, OZ5EDR
160 meters:	VE1YX
Asia:	JA4BAP, W2EMW, I2WTU
Africa:	W2EMW
No. America:	W9ROK, AE1X, W2EMW, VE1ACK
So. America:	KDX1A
Europe:	CT1AHU, JH8NYK, JA4BAP, KO2Q
Oceania:	W2EMW

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.

head-to-head competition with DXCC. The s.s.b. version was introduced 30 years ago to promote the use of this mode, which was very new at that time. It was so new, in fact, that a certificate could be earned by working only 50 countries. It acquired a following of dedicated DXers, so we continued it even after s.s.b. became the dominant voice mode.

The c.w. version came along in the 1970s as an incentive to boost the use of c.w., which was declining relative to voice operation.

If a purely c.w. or a purely s.s.b. award for working the countries of the world is interesting to you, an application blank and rules sheet may be obtained by sending a self-addressed, stamped envelope to the *CQ* DX Award's Manager, Mr. Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208.

Speaking of Prefixes . . .

The weekend of March 24–25, 1984 is the annual *CQ* WPX S.S.B. Contest. This is the best weekend of the entire year to add to your prefix count on s.s.b. Prefixes are the contest multiplier, and many countries allow their amateurs to use special prefixes just for this contest. Portugal and Brazil have been outstanding in their use of contest prefixes during past events. See Frank's Contest Calendar for further information, and look out for the C.W. WPX Contest in May.

Roy, WA2SON, is one of the talented few to earn Single-Band WAZ on 40 meter c.w. Roy is only 35 years old, but he has been licensed for 24 years. He is a 95% c.w. operator and only uses phone to confirm a new country. His 7 MHz WAZ was attained using a rotary dipole. Roy comes from a family with ham radio traditions. His father is WA2RKV and his brother is WA2HZO.

More Prefix News

CY9/CYØ—Canada's D.O.C. has issued the callsigns CY9SAB and CYØSPI for use by all operations from Sable Island and St. Paul Island, respectively. (Unfortunately, this may create a merry problem for QSL Managers.)

HSØ—Club station HSØHS had special permission to operate in last fall's *CQ* World-Wide DX Contests. Other HS stations still remain off the air by government edict.

JY7—Jordanian amateurs used the special JY7 prefix in honor of King Hussein's birthday. If you log seven JY7 stations you will qualify for a special prefix from the Royal Jordanian Radio Amateur Society, Box 2353, Amman, Jordan.

TO8—TO8AB was QRV from France, Nov. 22–23, 1983, to mark the 60th anniversary of the first trans-Atlantic QSO between 8AB (France) and 1MO (U.S.A.). QSL to F6AOI.

XX9—This is a new prefix for Macao, replacing CR9.

ZL—Effective Jan. 1, 1984, the New Zealand out-islands were assigned new prefixes as follows: ZL7 Chatham Island, ZL8 Kermadec Island, ZL9 Auckland & Campbell Islands, and ZK3 Northern Cook Islands.

4V2—4V2C was a special prefix used for contest operation from Haiti.

6V & 6W—From Nov. 1 to Dec. 31, 1983, the prefix series 6V1–6V8 was used by Senegal; 6V9 was reserved for club stations and 6VØ for visitors. From Jan. 1, 1984, the series 6W1–6WØ is being used.

DX QSL Services

If your QSLing costs are exceeding your budget, you need a DX QSL service. There are three such services now available to U.S. amateurs, and they will route your cards directly to a DX station, to his or her QSL manager, or to the QSL bureau, and do it much cheaper than you can do it yourself.

A DX QSL service differs from the ARRL outgoing bureau. The ARRL routes your cards only to other bureaus, not directly nor to QSL managers. Basically, a DX QSL service receives your QSL cards, determines the best way to get you a card in return, accumulates several cards for each destination—DX station, manager, or bureau—then periodically mails a packet to each. Once your QSL is processed by the DX station or QSL manager, it is usually mailed back to the QSL service, who in turn sends it to you, usually via your own QSL bureau.

The main reason for using a QSL service is to save money. It is less expensive to route your DX QSLs via a QSL service, because where it would cost you 40¢ to airmail a card to a DX station, or 20¢ to a U.S. or Canadian QSL manager, the QSL service can send several cards in one envelope for a few pennies per card. In addition, when you consider the cost of the return card, a "green stamp," and one or more IRCs or stamps, the savings become more important. Of course, the

The WAZ Program

10 Meter Phone

267	KL7D	268	JG1PII

15 Meter Phone

185	VE3CYX	188	JR6LLN
186	I2MQP	189	DJ8NK/A
187	JR6LDE		

20 Meter Phone

480	I1XA	482	ON5KL
481	VE7DX		

15 Meter C.W.

101	N4KE

20 Meter C.W.

207	W5ODD	208	WA6SIX

All Phone

586	CX2CS

All Band WAZ

S.S.B.

2775	EA7ABW	2783	HI3AMF
2776	EA9JV	2784	KWØF
2777	PP2ZDD	2785	KC5M
2778	WD9EWT	2786	JA3BLN
2779	NB7R	2787	CE3BBW
2780	CT4NH	2788	KØVZR
2781	VE1CAQ	2789	GW4BKG
2782	HB9AUS	2790	K3LUE

C.W. and Phone

5666	EA2APU	5676	YU2SAR
5667	EA3AVV	5677	I2YWR
5668	EA9JV	5678	G4AAQ
5669	OK2PDD	5679	DL8TC
5670	JA1WAE	5680	DJØFV
5671	YU7AJD	5681	JA1BCQ
5672	KC5M	5682	JA1SDV
5673	SK4BX	5683	ON4JU
5674	JA5NSR	5684	ON4QP
5675	KBØG	5685	W9LOF

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 W.A.Z. 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 December 1, 1983

All 200 zones worked:

1. ON4UN
2. K4MQG
3. SM4CAN
4. AA6AA
5. W8AH
6. W6KUT
7. EA8AK
8. LA7JO
9. EA3SF
10. OH1XX
11. EA8OZ
12. W0SD
13. K0ZZ
14. ON6OS
15. OK3TCA
16. K6SSS
17. ZL3GQ
18. OK3CGP
19. SM0AJU
20. OZ3PZ
21. I3MAU
22. I2ZGC
23. 4Z4DX
24. N4KE
25. K5UR
26. K9AJ
27. SM3EVR
28. LA5YJ
29. DL3RK
30. N4WJ
31. G3MCS
32. SM5AQD
33. W0MLY
34. I0RIZ
35. ON5NT
36. OH6JW
37. OK1AWZ
38. IV3PRK
39. DJ6RX
40. OH3YI
41. I4RYC
42. ZL1BIL
43. I4EAT
44. ZL1BQD
45. TG9NX
46. XE1J
47. F5VU
48. W3AP
49. YO3AC
50. K3TW
51. XE1OX
52. VE7IG
53. OK1ADM
54. CT1FL
55. WA1AER
56. N4RR
57. UW0MF
58. W4DR
59. OK1MP
60. W1NW
61. OE1ZJ
62. HB9AHL
63. HB9AMO
64. LA6OT
65. UR2QD
66. UK2RDX
67. ZS5LB

The top 10 contenders for 5 Band WAZ:

1. N4KG, 199
2. JA3EMU, 199
3. N4WW, 199
4. W1NG, 199
5. F6DZU, 199
6. W8VUZ, 198
7. LA9GV, 198
8. K4CEB, 198
9. OK1MG, 198
10. K1MEM, 197

241 Stations have attained the 150 zone level

Giampaolo, I8KDB, has one of the best known calls on the air from Italy. In addition, he is our CQ DX Awards checkpoint from I-land, a post he has held for many years. Giampaolo is an electrical engineer, is married, and has three sons. Italian amateurs wishing to apply for the CQ awards may reach him at Via Fracanzano, 31, 80127 Napoli, Italy.

Our newest awards checkpoint is Rasheed Jalal, YK1AA, of the Technical Institute of Radio in Damascus, Syria. Rasheed has provided confirmed contacts with Syria for most of the world's active DXers. The Technical Institute of Radio is a member of the IARU.

cost per card depends on the particular service you use and the way that service handles cards.

Using a QSL service is not only less expensive, but it also reduces your QSL chores. You no longer need to know the address of the DX station or manager, and it takes only a single envelope to send several cards to the service. You spend less time addressing envelopes and more time turning the bands for DX.

There are three QSL services operating in the U.S. at this time. They are as follows:

WD8AWS DX QSL Service, 1613 Merrill Street, Kalamazoo, MI 49008.

N7RO DX QSL Service, 2935 Plymouth Drive, Bellingham, WA 98225.

W1EP QSL Service, 293 Center Street, Raynham, MA 02767.

Each QSL service has its own unique features, and it is up to you to select the one which best suits your needs. Therefore, before actually using a service you should obtain their current information sheets and understand how their service functions. A self-addressed, stamped, business-size envelope to the above addresses should bring their latest information sheets and prices. Good QSLing! (Thanks Bob Winn, W5KNE, in *QRZ DX*)

CT on 160 Meters

Portugal approved 160 meter operation for its amateurs in late 1983. This adds CT1, CT2, CT3, and the special Portuguese prefixes to your 160 meter possibilities. Listen in the DX window for CT1AAZ, CT2AK, CT4BV, and others.

10 Meter King

Congratulations to VE1BNN, whose QSO with HK0TU gave him 301 countries logged on the 28 MHz band. Reg also has 10 meter Single-Band WAZ on both c.w. and s.s.b. Does any other DXer have a comparable record on this band?

African Countries—A State of Flux

The boundaries of many African countries were decided at some European conference table during the post-World War II years. Frequently these boun-

daries reflected the wheeling and dealing of the old colonial powers, not the ethnic, linguistic, or economic realities of the area. Eventually things will be adjusted by the usual tribal wars, revolutions, and general mayhem. That could mean more new countries for the DXCC list.

A case in point: Chad. In addition to maybe splitting off the northern provinces of TT8, those more Arab in culture, possible fragmentation pops up in the south where armed and angry ethnic groups have challenged the central government. The result could be formation of a "semiautonomous" southern region along the lines of the Southern Sudan, ST0. Another new country? Only time will tell. (Thanks *Totem Tabloid*)

Those Russian Countries Which One Did You Work?

The old bromide—you can't tell the players without a program—was never more true than when looking for USSR multipliers during a major contest. In simpler times a station in Soviet Georgia was simply UF6, a station in White Russia was UC2, and Uzbek was UI8. However, it is much more complicated today, so we've compiled the following list to help you sort them out. We don't guarantee this list to be 100%, as new calls come on the scene periodically, but we hope it's at least 90%.

The full story goes on beyond this table. When you think you know the system,

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. This report reflects the deletion of Serrana Bank, Bajo Nuevo, and the SA/I Neutral Zone. Total countries are now 315. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00. The basic award fee is now $4 for *CQ* subscribers and $10.00 for non-subscribers. Please attach your latest *CQ* mailing label to qualify for the $4.00 rate.

C.W.

W6PT	315	N6AV	310	K1MEM	303	AB4H	291	WD9IIX	279
DL7AA	314	K4XO	309	OK1MP	302	N5DX	291	K9IW	279
ON4QX	314	N6CW	308	WA8DXA	302	I3OBO	290	W4BV	277
W3GRS	314	W4BQY	308	K9QVB	302	W1WLW	289	YU2RTW	277
W9DWQ	313	W4OEL	307	SM3EVR	300	SM6CST	286	N8MC	277
K4CEB	313	K6LEB	307	K3FN	298	W9RY	283	WB4RUA	277
W8KPL	313	W1NG	306	W0IZ	298	K8PYD	281	K8LJG	277
N4PN	313	DL3RK	306	DJ7CX	297	K7ZR	280	K4SE	275
K6EC	312	W9BW	304	W6SN	295	WA2HZR	280	DL1QT	275
K9MM	312	AA6AA	303	W0SR	295	I5XIM	280	W6YQ	275
W6ID	311	N4MM	303	W7CNL	292	W2LZX	280	W0HZ	275
K6JG	311								

S.S.B.

K2FL	315	W0YDB	311	VE3MRS	302	WA4LOF	292	KC8YM	282
W6EUF	315	EA4LH	310	N5FG	302	WB4KTG	292	AI9R	282
K6WR	315	OE2EGL	310	G4CHP	301	AC0A	292	I0SGF	282
W3GRS	315	DK2BL	310	N6OC	301	W8ILC/QRPp	292	TG9EP	281
W3NKM	315	I3LLD	310	VE3FJE	301	W9RY	291	I1POR	281
DL9OH	315	K9RF	310	K9HQM	301	WA4DAN	291	KB5FU	281
W4UG	315	OE3WWB	310	WB4NDX	301	KV2S	291	N5AWS	281
VE3MR	315	K4XO	310	W7OM	301	VE3IPR	291	K9TI	280
W9DWQ	314	VE3GCO	309	WA3HUP	301	WB3DNA	291	I2MQP	280
I0AMU	314	K8LJG	309	K8CMO	301	KB5FU	291	N5FW	280
F9RM	314	W2SUA	309	WD8MGQ	300	WB6GFJ	291	K8ZZU	280
I8AA	314	W9SS	309	W4OHZ	300	JH4PRU	290	VE3FEA	280
VE3MJ	314	N6AW	309	YU1DZ	300	W4UNP	289	W8IMZ	279
W4EEE	314	N7RO	309	LA7JO	299	JA5PUL	289	KK0C	279
I0ZV	314	DL6KG	309	AI8S	299	KM6B	289	KA8T	279
XE1AE	313	VE7WJ	308	WA0TKJ	299	WD0BNC	289	W4JFE	279
I4ZSQ	313	W1NG	308	I6PLN	299	W9TA	289	KB5DN	279
I8KDB	313	VK4VC	308	W6FET	298	K4CXY	289	EA3KW	279
W9KRU	313	YV5AIP	308	K9SM	298	KR9O	289	W6MFC	278
ZL3NS	313	K6XP	308	I8LEL	298	W7FP	288	AI8M	278
VE3GMT	313	LU3YL	308	K8NA	298	K0GT	288	K4BYK	278
YV1KZ	313	N4PN	308	W2FGY	298	I8KCI	288	N9AMF	278
W3AZD	313	4Z4DX	308	HP1JC	297	I5BDE	288	W6BCQ	278
ZS6LW	313	ZL1BIL	308	DJ7CX	297	N2ATD	288	I5EFO	278
DJ9ZB	313	N2SS	307	K5DUT	297	K1VHS	287	VE3IUE	278
K6YRA	313	VE4SK	307	JH1VRQ	297	EA9IE	287	WD8PUG	278
ZL1AGO	313	K8PYD	307	I0MBX	297	W6NLG	287	KB3KV	277
W4DPS	313	OZ8BZ	307	W6SN	297	AB9E	287	KB8O	277
K6JG	313	N4KE	306	WA0DCO	296	KB9KD	287	KP4EQF	277
W9JT	313	N6AV	306	K9IW	296	KE3A	287	WB0UFL	277
VE2WY	312	K1UO	306	XE1NI	296	KC8JH	287	K9TI	277
F2MO	312	W8PCA	306	I8ACB	295	W4BQY	287	W4PTT	277
K9MM	312	W0SR	306	IV3YRN	295	KB3OQ	286	W0IYR	277
K9LKA	312	K9BWQ	306	I3OBO	295	YU2RTW	285	N7ASL	276
W3GG	312	YV5DFI	305	K9UAA	295	K8VFV	284	WA6DTG	276
N4WF	312	W8ILC	305	K9QVB	295	KB5RF	284	ZL1BOQ	276
W9BW	312	WB1DQC	305	SM4CTT	295	NA5W	284	WA4OPW	276
I8YRK	312	W2CC	305	WA9PWN	295	W0KU	284	WA2FKF	276
OZ3SK	312	VK3JF	305	W1LQQ	294	N8BKF	284	VE6PW	276
CT1FL	312	9H4G	304	KB8DB	294	WB3HAX	283	I8INW	275
W0SD	312	AA6AA	304	AI5I	294	VP9CP	283	JH4PRU	275
K6EC	311	WA4JTI	304	I8ZTE	294	XE1OW	283	W8LKG	275
W4SSU	311	WA4WTG	304	K4SE	293	XE1OX	283	WB3CQN	275
K4MQG	311	XE1J	303	NA5W	293	VE3CKP	283	WB1EAZ	275
W0SFU	311	XE1KS	303	WD8MOV	293	VE3MV	283	VE7BSM	275
I4LCK	311	W2LZX	303	KB8KW	293	W0ULU	283	KZ2P	275
OK1MP	311	W8JXM	303	WD9IIX	293	AE5B	282	K8NWD	275
N4MM	311	W6DN	302	WB4UBD	293	CT1UA	282	K4LR	275
K5OVC	311	K1MEM	302						

CQ SHOWCASE

ICOM IC-HS10 Headset and IC-HS10SB PTT Switchbox

ICOM has introduced the IC-HS10 Headset and IC-HS10SB PTT Switchbox which can be used with all ICOM handheld transceivers. The IC-HS10 Headset has pivoting microphone, is lightweight, has adjustable boom, and folds up for safe and compact storage. The IC-HS10SB PTT Switchbox is compact, has a belt clip, provides transmit-receive switching control, and mic gain control, and has a molded plastic connector for speaker/mic connection to handheld.

The Headset and PTT Switchbox are each available for $19.50. For more information, contact ICOM America, Inc., 2112 116th Ave. N.E., Bellevue, WA 98004, or circle number 106 on the reader service card.

Liss Radio Publishing Personalized Hardbound Logbook

The *Personalized Hardbound Logbook* by Liss Radio Publishing is the alternative to dogeared, spiral-bound logbooks. Styled in simulated leather, with the owner's name and callsign stamped in gold on the cover, this book is carefully designed for ease of use. The logbook is designed to lay relatively flat on the operating table. The 8½" × 11" pages have an extra wide margin at the spine so that one does not have to write into the "fold." Each line is extra wide to accommodate those operators with bold handwriting. Each page of log entries has a whole page of comments lines opposite it so that the owner will have plenty of room for QSO information, equipment, and other notes of interest. Also, two pages of blank s.w.r. graphs are located in front of the logbook so that the owner can plot s.w.r. curves for each station antenna.

Each logbook is available in blue or brown simulated leather for $19.95 plus $1.50 shipping and handling. A version for s.w.l.'s will soon be available. Write for club discount rates. For more information, contact Liss Radio Publishing, P.O. Box 937, Hammond, IN 46320, or circle number 101 on the reader service card.

CQ DX Awards Program

S.S.B.

1297	YU7AJD	1300	PA3AAN
1298	WA4OPW	1301	G4JKC
1299	W3AMQ		

C.W.

599	YU7AJD	602	K6UXO
600	KR9O	603	W6YQ
601	KR9F		

S.S.B. Endorsements

310	VE3MR/315	275	WB4KTG/292
310	W0YDB/311	275	W4UNP/289
310	K5OVC/311	275	KC8YM/282
310	K4XO/310	275	WA4OPW/276
300	WB1DQC/305	250	KF2X/258
300	VE3MRS/302	3.5/7 MHz	K4CXY
300	N5FG/302		

C.W. Endorsements

300	K4XO/309	275	W6YQ/275
300	OK1MP/302	28 MHz	OK1MP

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.

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you come up on 10 meters and hear an RB5 or RF6. The substitution of R for U in the Soviet system formerly indicated a technician class licensee whose privileges were restricted to 28 MHz and higher. However, some of the R callsigns may also indicate a special-event station such as during the Moscow Olympics. Then, when you think you really have it figured out, they throw some 4K prefixes at you, usually denoting a special contest station or an antarctic location. Hang in there! Here are the countries, in alphabetical order, with the prefixes and/or prefixes plus first suffix letters which identify them. Stations with UK callsigns are club stations.

Country	Identifiers
Armenia	UG6 & UK6G
Azerbaijan	UD6, UK6C, UK6D, & UK6K
Asiatic Russia (Siberia)	UA9, UK9, UV9, UW9, UX9, UZ9, UA0, UK0, UV0, UW0, UX0, & UZ0
Estonia	UR2, UK2R, UK2T, & UK2V
European Russia	UA1 & UA3–UA6, UN1, UV1, UV3, UV4, UW1, UW2, UW3, UW4, UX1, UX3, UX4, UZ1, UZ3, UZ4, UK6A, UK6B, UK6E, UK6H, UK6J, UK6L, UK6N, UK6P, UK6R, UK6U, UK6W & UK6Z
Franz Josef Land	UA1, UA1P, & UK1
Georgia	UF6, UK6F, UK6O, UK6Q, & UK6V
Kaliningradsk	UA2 & UK2F
Kazakh	UL7 & UK7
Kirghiz	UM8, UK8M, & UK8N
Latvia	UQ2, UK2Q, UK2G, & UK2H
Lithuania	UP2, UK2P, & UK2B
Moldavia	UO5 & UK5O
Tadzhik	UJ8, UK8J, & UK8R
Turkoman	UH8, UK8H, & UK8I
Ukraine	UB5, UK5, UT5, & UY5
Uzbek	UI8, UK8A, UK8G, UK8K, UK8L, UK8O, UK8Q, UK8S, & UK8Z
White Russia	UC2, UK2A, UK2C, UK2E, UK2I, UK2L, UK2O, UK2S, UK2W, & UK2Z

QSL Information

AD1S/KH5 to AD1S
BY1PK to P.O. Box 6106, Beijing, Peoples Republic of China
DK7PE/6W8 to Rudi Kleine, Untergasse 25, 6501 Niederolm, West Germany
DL1VU/KC6 (E. Carolines) to DB5UJ
DL1VU/KH0 (Marianas) to DB9CI
ED9CM to EA9IE, P.O. Box 410, Cueta, Spain
FG0WW/FS to K1DG
GB0WCY to GD3KHE
GD4UFB to DK9ZL
GJ3SXW to G3SXW
HB0P to F6FQK
HK0TU to HK3DDD
J28DS to F6DZD
J88AQ (St. Vincent) to W2MIG
JA3YKC/JD1 to JA2VUP
JY8RF to N5AU
K4IIF/KV4 to W4KA
KA1UA/J8 to KS1C, 75 Michigan Ave., Lynn, MA 01902
KX6OH to N6ABW
L2X to LU2DX
LX1BI to KB3MC
LU1ZA (South Orkney Is.) to LU2CN
OA4SS to KB6J
OH0AC to OH2NM
ON6WR/HB0 to ON6WR
OX3AX to OZ5DX
OX3GH to WA2TTI
OX3SG to LA5NM
OY1MJ to HB9CJX
OY1R to W2KF
P29SO to VK3BSO
PJ8DFS to SM5AQD
PJ8UQ to W3HNK
PT7SD to WB8SSR
RU4W to UK4WAA
RW9A to UK9AAN
ST2SS to YU2DX
SU1RK to DL5JP
SV5JH to DJ9ZB
SV0CT/SV5 (Rhodes) to N4AXT
T2ADX, T2RTY, T2YKC to JA2VUP
T32AQ to AD8J
T32AR to W0RLX
T32AS to AD1S
TE3ORC to TI2RC
TJ1QS to F6DZU
TU2NW to AK3F
V2AS to OE3ALW
V3EE to N6ADI
VK2BQQ/LH (Lord Howe) to P.O. Box 3209, Sydney 2001, Australia
VP2KBH, VP2KBI, VP2KBJ to K8EFS
VP2KBZ to VE3KZ
VP2KD to WA6ZEF
VP2VDH to N6CW
VP2VEG to W0DVZ
VP8ASG to G4ERU
VP9JT to W4EV
VQ9EA to WB8KYT
VQ9FZ to W5YLP
VS6DQ to HB9AQZ
VS6GZ to OE1HGC
VS6JB to W2TK
XU1KC, XU1SS, XU1YL to JA1HQG
YN4RCD to WB8SSR
YS9EW to I0WDX
YS9RVE to WA0JYJ
ZD9BV to W4FRU
ZF2HF to KM5R
ZK2ZM to K6ZM
ZL4OY/C to VK3DWJ
3X4EX (after June 6, 1983) to N4CID
4V2C (Haiti) to NQ4I
4O3WCY to YU3ER
5H3SG to KA3FIB
5W1DZ to WB2LVB
6W8CC to F6CVE
6Y5IC to KE3A
9M2HB to N4FFN
9N1MM to N7EB
9X5WP to WB6VKD
9Y4RD/SU to KA2DDJ

C.W. Into Foreign Languages

Does your DXing need a new challenge? VE3MGY and VE3EIM are offering a book entitled *C.W. Into Foreign Languages*, which will enable you to carry out QSOs in several languages using c.w. The first edition covers Spanish, German, Swedish, Dutch, Russian, Norwegian, French, Polish, Hungarian, and Yugoslav (Serbo-Croatian). A later edition may include Greek, Portuguese, Italian, Turkish, Arabic, and Japanese. All common phrases are used to make you sound like a native.

An interesting feature of the book is a call-sign prefix directory which lists the prefix of a country followed by the language commonly spoken in that country. For example, if you hear a 5V, you can immediately open your book to the French section. If you hear a 3Y, switch to Norwegian. It's very well organized.

For complete information on *C.W. Into Foreign Languages* contact C.W. Publications, P.O. Box 2571, Station A, London, Ontario N6A 4G9 Canada.

73, John, K4IIF

Seiichi Tamai, JA4IKD, of Okayama, Japan, is a recent winner of the coveted Single-Band WAZ certificate. Seiichi is 46 years old and has been licensed since 1959. His super antenna system includes 5-element Yagis on 10 and 20 meters, a 6-element Yagi on 15 meters, a 2-element Yagi on 40 meters, and both a ground plane and a dipole for 80 meters. His rig is a Yaesu transceiver and a Henry 2KD5 linear.

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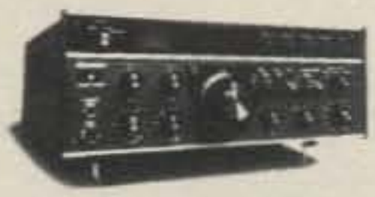

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PLATE XFMR: 3500 VAC @ 1.0 AMP ICAS, 115/230 VAC Pri., 41 LBS	$185.00
PLATE XFMR: 4000/4600 VAC @ 1.5 AMP ICAS, 230 VAC Pri., 60 LBS	$250.00
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FILMT XFMR: 5.0 VCT @ 60 AMP, 110/220 VAC Pri., 13.4 LBS	$ 85.00
FILMT XFMR: 7.5 VCT @ 21 AMP, 105/117 VAC Pri., 9.5 LBS	$ 45.00
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Break Communications Systems, Inc. has introduced 4, 6, and 8 foot wide wood/mica communications consoles ($375, $425, and $475, respectively). The replaceable front panel is bolted in with steel clamps for easy, low-cost station updates. Front-panel holes are precisely cut by computerized X-Y wood cutting table, and hole/equipment gaps are less than 1/32". The price includes front-panel cut for your station; hidden accessory shelf for power supplies, dummy loads, etc.; preassembled rear-equipment support system (rigging); teak mica; casters; multiple tap station ground bus; one set of puppets of your equipment, and one-half-scale front-panel grids for station layout. Corner units are available ($150) to integrate standard width consoles into "L," "U," and circular configurations.

Many options, both standard and custom, are available. For information, contact Larry Kushner, WA6BKC/4, at Break Communications Systems, Inc., 5817 SW 21 St., Hollywood, FL 33023, or circle number 102 on the reader service card.

Hallward Products "Buyers' Guide to Radio and Electronic Parts"

This guide locates electronic components sold by retail mail-order companies that specialize in selling small quantities. *The Buyers' Guide to Radio and Electronic Parts* has two main sections: the Directory, where parts are listed alphabetically, and the Supplier Information section, where company addresses and phone numbers can be found. The guide is maintained in a computer and updated as listings change, so new editions are made available.

The Buyers' Guide is paperback, 124 pages, and sells for $6.95 postage paid. For more information, contact Hallward Products, 39 Sunset Court, St. Louis, MO 63121, or circle number 107 on the reader service card.

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

We have a problem. In last year's WPX Contest there was some confusion in determining the status of some of the new prefixes that were being used in the contest for multiplier credit.

This came about because originally we referred to the WPX Awards program prefix list as the standard to be used in the WPX Contest. However, with the appearance of many new double-figure calls, the Awards program has made some changes in their prefix list.

Since the WPX Contest Committee and the WPX Awards Committee do not agree on the interpretation of a prefix, we can no longer refer to the WPX Awards list as the standard for contest purposes. To our way of thinking a prefix is a prefix, period, no exceptions. A J3 is one prefix, and J37 is another prefix even though it identifies a station in the same area.

Many stations go to a lot of trouble to get permission to use an exotic prefix in their call during the contest period. It would be a pity if we did not give it new multiplier credit.

Another point of confusion is the status of the call used by a portable station operating from an area other than its home base. The portable prefix is counted as the multiplier, not the prefix in the call. That is why we emphasize that in portable operation a station must sign its portable location. The explanation of a prefix multiplier is spelled out very clearly in the rules, no exceptions to confuse the issue.

Deadline for June activities is March 15th and April 15th for the July issue. Send all information to my home address please.

73 for this time, Frank, W1WY

Calendar of Events

*	**Feb.**	**24-26**	**CQ 160 M. S.S.B. Contest**
†	Feb.	25-26	YL-OM C.W. Contest
†	Feb.	25-26	RSGB 7 MHz C.W. Contest
†	Feb.	25-26	French Phone Contest
	Feb.	24-26	OOTC C.W. QSO Party
	Mar.	3	DARC "Corona" 10 M. RTTY
†	Mar.	3-4	ARRL DX Phone Contest
†	Mar.	10-11	QCWA Phone QSO Party
	Mar.	10-11	IARS CHC C.W. Contest
	Mar.	10-11	RSGB Commonwealth Contest
	Mar.	10-12	Virginia QSO Party
	Mar.	11-12	Wisconsin QSO Party
	Mar.	17-18	Bermuda Contest
†	Mar.	17-18	YL ISSB C.W. QSO Party
	Mar.	17-18	IARS CHC S.S.B. Contest
	Mar.	17-18	G-QRP Club Activity
	Mar.	17-18	Tennessee QSO Party
	Mar.	17-18	Kentucky QSO Party
	Mar.	23-25	OOTC Phone QSO Party
	Mar.	**24-25**	**CQ WPX S.S.B. Contest**
	Mar.	24-26	BARTG RTTY Contest
	Mr.31	Apr.1	Connecticut QSO Party
	Apr.	7-8	DX-YL to N.A.-YL C.W. Contest
	Apr.	14-15	DX-YL to N.A.-YL S.S.B. Contest
	Apr.	21-22	ARCI QRP C.W. Contest
	Apr.	28-29	Massachusetts QSO Party
	Apr.	28-29	King of Spain Contest
	May	**26-27**	**CQ WPX C.W. Contest**

* *See January issue.*
† *Covered last month.*

OOTC QSO Party

C.W.: Feb. 24–26 S.S.B.: Mar. 23–25
2300Z Fri. to 2300Z Sun.

This is the 17th annual QSO Party for the Old, Old Timers Club. Activity is for members only and rules were given in detail in "Spark Gap Times," the Club's newsletter. Members, therefore, have been fully informed and it will not be necessary to go into detail.

C.w. activity will be found 1805–1810, 3730, 7040, 14040, 21040, and 28040. On s.s.b. it will be 1810–1820, 3910, 7265, 14280, 21360, and 28600, plus or minus 10 kHz.

A separate log should be used for each party, c.w. or s.s.b., and it is requested that a separate sheet also be used for each band.

Mail your entry within one week of the end of each party to: Lew Sieck, K4NE, 12270 4th Street East, Treasure Island, FL 33706.

14 Sherwood Road, Stamford, CT 06905

DARC "Corona" 10 Meter RTTY

1100Z to 1700Z Sat., March 3

This is the first of a series of four 10 Meter RTTY contests sponsored by DARC for 1984. The remaining three will take place on May 6, September 1st, and November 3rd. Activity, of course, is on 10 meters only in that portion of the band used for RTTY.

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

Exchange: RST, QSO no., and name. U.S. stations will also include their state.

Scoring: One point per QSO. Use the WAE and ARRL country list for your multiplier. In addition, W/K, VE/VO, and VK call areas will be considered as separate multipliers (See Aug. *CQ* for WAE list.)

Final Score: Total QSO points times the country and call area multiplier.

Awards: To leading station in each classification.

It is recommended that you use official log forms, which can be obtained from DF7FB. Include an s.a.s.e. with your request. You can also make up your own and include a summary sheet with detailed information.

Reports and inquiries go to: Klaus K. Zielski, DF7FB, P.O. Box 11 47, D-6455 Erlensee, West Germany. Contest entries should be received within 30 days after the end of the contest.

IARS/CHC International Contest

C.W.: March 10–11 S.S.B: March 17–18
0000Z Sat. to 2400Z Sun.

This is a joint venture by the International Amateur Radio Society and the Certificate Hunters Club. It is a semiannual contest and evidently open to IARS and CHC members only. I see no indication for non-member participation.

Exchange: RS(T) IARS and/or CHC number, and state, province, or country (579 IARS 955 CHC 175 CA).

Scoring: Total QSOs multiplied by the sum of countries × IARS/CHC members worked. A member of both clubs will count as two multipliers. The same station may be worked once on each band.

Frequencies: C.W.—70 kHz up from bottom of each band. S.S.B.—3960, 7260, 14300, 21360, 28600.

Awards: Plaque to the highest overall scorer. Certificates to the top scorer on each band and to the 10 runner-ups.

Include a summary sheet with your entry and a check sheet for logs with 100 or more contacts. Also include a large s.a.s.e. for a copy of the results.

Mailing deadline is June 1st to: Ted Melinosky, K1BV, 525 Foster Street, South Windsor, CT 06074.

RSGB Commonwealth CW Contest

1200Z Sat. to 1200Z Sun., March 10–11

Only RSGB members residing in the United Kingdom and radio amateurs licensed to operate within the British Commonwealth and British Mandated Territories are eligible to participate.

Contacts between stations in the same call area are not permitted. All the British Isles prefixes count as one call area.

Activity will be on c.w. only, and it is requested that operation be confined to the lower 30 kHz of each band, 3.5 through 28 MHz (except for Novice contacts).

Exchange: RST plus a three-figure QSO number starting with 001.

Scoring: Each contact is worth 5 points. In addition, a bonus of 20 points may be

claimed for the first, second, and third contact with each call area on each band.

Entries: May be single or multi-band.

Each band is scored separately and totaled for the final all-band score. There is no multiplier; just add the total QSO and bonus points from each band.

Multi-band scores cannot also be used for single-band awards. You can request that a single band be judged for awards. Only single operator entries will be accepted.

Use a separate log sheet for each band and include a summary sheet showing the scoring and a signed declaration that all rules and regulations have been observed.

There is also an s.w.l. section with rules and scoring same as above. If both stations in contact are heard, they can be reported as separate entries for credit.

Awards: Certificates to the first, second, and third place winners in all areas, both single and multi-band, and three Rose Bowl Trophies for the overall winners.

Logs must be received by May 14th and go to: R.L. Glaisher, G6LX, 279 Addiscombe Road, Croydon, England CR0 7HY.

Virginia QSO Party

1800Z Sat. to 0200Z Mon., March 10–12

The Sterling Park ARC of Virginia is again sponsoring this year's party. The same station may be worked on each band and each mode; VA stations may work other in-state stations for QSO and multiplier credit; and VA mobiles in each county change.

Exchange: QSO no. (starting with 001) and QTH. County for VA; state, province, or DX country for others.

Scoring: One point per s.s.b. contact, two points if on c.w. VA stations multiply total QSO points by sum of states, provinces, DX countries, and VA counties worked.

Others multiply total VA QSO points by the number of VA counties worked (maximum of 95).

Frequencies: C.W.—60 kHz up from low end of each band. S.S.B.—3930, 7230, 14285, 21375, and 28575. Also Novice bands on c.w., and both modes on 160 except in the "DX Window."

Awards: Certificates to winners in each state, province, DX country, and VA county. There are five plaques as follows: to top VA single operator stations, c.w./s.s.b., c.w. only, Mobile, QRP, and to the top c.w./s.s.b. out-of-state station.

Indicate each new multiplier in a separate column as it is worked. Include a summary sheet with your log, and an s.a.s.e. if results are desired.

Mailing deadline is April 15th to: Virginia QSO Party, c/o Ken Harrigan, KB2LT, 2 Darus Court, Sterling Park, VA 22170.

In celebration of World Communications Year in 1983, the Australian Amateur Radio Teleprinter Society made a special and successful effort in their annual RTTY Contest. Here is Mr. R.E. Butler, Secretary General of the International Telecommunications Union, presenting a trophy to Bruce Berisford, VK2RT, winner of the VK single operator section.

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., March 11–12

This is a shorty, only 7 hours, and it is again sponsored by the West Allis Radio Amateur Club. The same station may be worked on each band and mode, and mobiles in each county change. Wisconsin stations may contact other in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for Wisc.; state or province for others.

Scoring: Phone QSO's count 1 point, 2 points for c.w. Wisc. stations multiply total QSO points by (U.S. states + VE provinces + Wisc. counties) worked for their final score. DX contacts count for QSO points only. Others use total Wisc. QSO points times number of Wisc. counties worked (maximum of 72).

Wisc. mobiles can add a bonus of 500 points to their final score for each county from which they operate outside their own (minimum of 15 QSOs from each county).

Frequencies: C.W.—3560, 7050, 14060. Phone—3990, 7290, 14290. Other bands may also be used.

Awards: Go to the highest scorers in each state and province, and the highest aggregate club score.

Logs with more than 100 QSOs must include a dupe sheet with their entry.

Mailing deadline is April 15th to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee, WI 53201.

Bermuda Contest

0001Z Sat. to 2400Z Sun., March 17–18

This popular contest is open to amateurs in the U.S., Canada, the United Kingdom, and West Germany. Stations in the U.S. and Canada may work the U.K., W. Germany, and Bermuda. The U.K. and W. Germany may work the U.S., Canada, and Bermuda. Activity will be on 3.5, 7, 14, 21, and 28 MHz bands. Cross-band or cross-mode contacts are not permitted.

The same station may be worked on each band, on phone and again on c.w., providing there is a 30 minute separation between contacts on the same band. You are limited to 36 hours out of the 48-hour contest period. Off times must be no less than three consecutive hours and must be clearly indicated in the log. Participation is for single operator stations only, and must be from the operator's own residence.

Exchange: RS(T) and QTH. Parish for VP9's, state for W/K, province for VE's, county for the U.K., and DOC number for the DL's.

Scoring: Each completed QSO is worth 5 points. Multiply total by the number of different VP9 stations worked on each band. (*Note:* It's each different VP9 station, not different parishes.)

Awards: The top stations in each U.S. state, VE province, U.K. county, and DL DOK will receive printed awards. The overall winner in each of the above areas, however, will receive something more substantial: a trophy to be presented at the Society's Annual Dinner in Bermuda in October. Round-trip transportation and hotel accommodations will be provided by the Society. (Trophy winners for 1979, '80, '81, '82, and '83 are not eligible.)

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts on one band. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excess of claimed duplicates may mean disqualification. A signed declaration that all rules have been observed is also requested. Entries must be received no later than May 31st by the Radio Society of Bermuda, P.O. Box 275, Hamilton 5, Bermuda.

G-QRP Club C.W. Activity

Saturday & Sunday, March 17 & 18

The G-QRP Club has announced the following schedules for 1984. C.W. March 17–18, S.S.B. May 5–6, C.W. September 22–23, C.W. December 26–31.

The following times (GMT) and frequencies will be used for the c.w. activities.

3560 kHz—1200–1300, 1400–1500, 2100–2200.

7030 kHz—1100–1200, 2000–2100.

10106 kHz—1300–1400, 2000–2100.

14060 kHz—0900–1000, 1730–2000, 2200–2300.

21060/28060 kHz—1000–1100,1500–1730.

The s.s.b. frequencies are: 3690, 7090,

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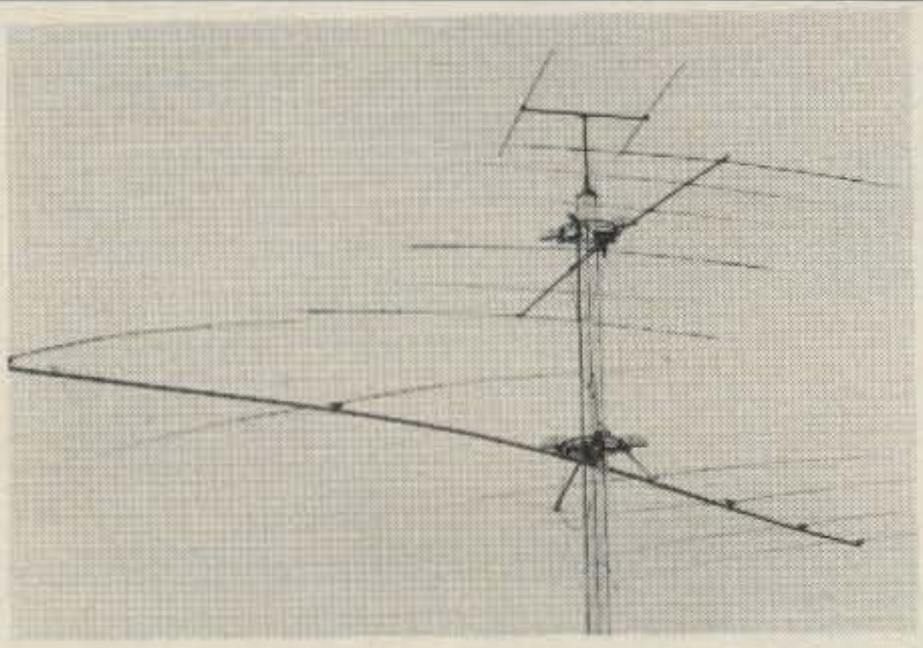

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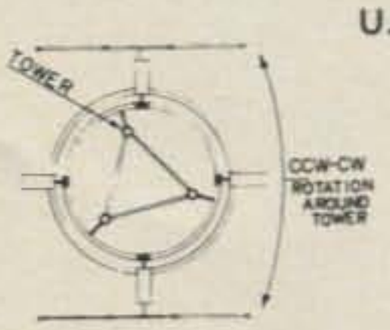

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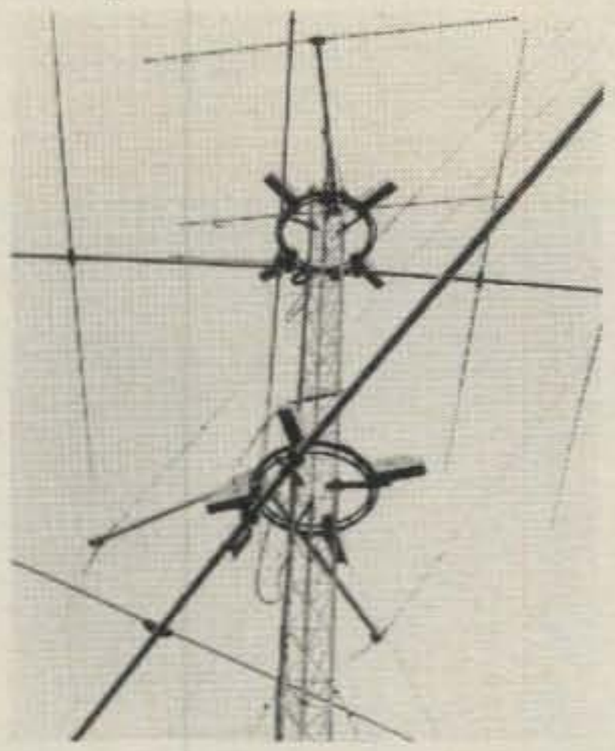

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14285, 21385, 28885 at the same times indicated for the c.w. bands.

In addition to the above, the G-QRP Club has weekly activity periods on Sundays between 1100Z and 1230Z and again from 1400Z to 1530Z on the International QRP frequencies mentioned above.

This is not a contest, but QRPers are invited to participate and report their activity to: Christopher J. Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW England.

Tennessee QSO Party

2100Z Sat. to 0500Z Sun., March 17–18
1400Z to 2200Z Sun., March 18

The Oak Ridge ARC, a member of the Tennessee Council of Amateur Radio Clubs, is again directing this year's party. The same station may be worked on each band and each mode, mobiles in each county change. Tenn. stations may work in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for Tenn.; state, province, or country for others.

Scoring: C.w. contacts are worth 1.5 points; phone contacts 1 point.

Tenn. multiply total QSO points by sum of states (50) + VE Districts (7) + Tenn. counties (95) worked. (DX contacts count for QSO points only.)

Out-of-state stations multiply total QSO points by sum of Tenn. counties worked (maximum of 95).

Mobile and portables can add 500 bonus points to their final score for each county operation outside their own county (minimum of 10 QSOs per county).

Frequencies: C.W.—1815 kHz and 50 kHz up from bottom of each band. Phone—1860, 3980, 7280, 14280, 21380, 28580. Novice—3725, 7125, 21125, 28125 (minimum of 10 mins. on each band or mode change).

Awards: First-place certificate to three Tenn. categories—Phone, c.w., and Novice—and each state, Canada, DX, and out-of-state Novice. Four plaques go to the top Tenn. home station, mobile, portable, and out-of-state station. Entries submitting logs with at least 25 contacts will also be rewarded.

Use a separate log for each band and a dupe check sheet if you make over 100 contacts per band and mode. You can submit logs for each mode only or combine phone and c.w.

Include a large s.a.s.e. with your entry and mail before May 1st to: Oak Ridge ARC, Att.: Mel Wardell, W4PJ, P.O. Box 489, Oak Ridge, TN 37830.

Kentucky QSO Party

2100Z to 0700Z Sat., March 17
1400Z to 2200Z Sun., March 18

This is the second annual party sponsored by the Western Kentucky DX Assn. The same station may be worked on each band and each mode, and mobiles in each county change.

Exchange: RS(T) and QTH. County for Kentucky; state, province, or country for others.

Scoring: Two points for 160 meter contacts, phone or c.w. C.w. contacts count two points on all bands. S.s.b. count one point on 40 and 80; 1.5 points on 10, 15, and 20. Combine c.w. and s.s.b. QSO points.

Final Score: Kentucky multiply total QSO points by states (50) + VE districts (9) + KY counties (120) worked. Others multiply total KY QSO points by KY counties worked (maximum of 120). DX contacts count for QSO points only.

Kentucky mobiles and portables add 1000 points to final score for each county operation outside own. Minimum of 25 contacts per county.

Frequencies: C.W.—1815 and 60 kHz up from bottom of each band. Phone—1840, 3985, 7285, 14285, 21385, 28585. Novice—3725, 7125, 21125, 28125. A minimum of 10 minutes on each band or mode.

Awards: Certificates to the top scorers in each state, Canada, DX station, and Novice. Four plaques to the overall winners: KY fixed, mobile, portable, and out-of-state stations. Also to all entries with at least 25 contacts.

Include a summary sheet and a cross-check list for logs with over 50 contacts per band or mode. Also include a large s.a.s.e. (37¢) for results and awards.

Mailing deadline is May 5th to: Western Kentucky DX Assn., Att.: William D. Shipe, WM4N, Route #1, Adairville, KY 42202.

B.A.R.T.G. Spring RTTY Contest

0200Z Sat. to 0200Z Mon., March 24–26

After 16 years, Ted Double, G8CDW, found it necessary to give up direct involvement in this contest sponsored by the British Amateur Radio Teleprinter Group. However, he will still be responsible for the awards program. Peter Adams, G6LZB, has taken over administration of contest activities and should be contacted for any additional information.

This contest is open to all amateurs and s.w.l.'s on all bands 3.5–28 MHz (no 10 MHz, however). Operation is limited to 30 hours out of the 48-hour contest period. The 18 hours off may be taken at any time, but not in less than 3-hour periods.

Shortwave listeners must show call of station heard, report of message sent, and call of station worked.

Exchange: RST plus a three-figure con-

tact number, and time in GMT (full four figures).

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. A bonus of 200 points for each country worked on each band including own. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total number of countries worked on each band, and number of continents worked (continents counted once only).

Final Score: (a) Total QSO points × country multiplier. (b) Country multiplier × bonus points × continents worked. Add sum of (a) and (b) for your final score.

Awards: Certificates to the top stations, single operator, multi-operator, and s.w.l., to the continental leaders, and each W/K, VE/VO, and VK call area.

Use a separate sheet for each band and include a summary sheet showing the scoring, etc. Log forms are available from G6LZB by sending 2 IRC's to cover mailing. Logs must be received by May 31st and go to: Peter Adams, G6LZB, 464 Whippendale Road, Watford, Herts. England WD1 7PT.

CQ WW WPX Contest

S.S.B.: March 24–25 C.W.: May 26–27
Starts: 0000Z Sat. Ends: 2400Z Sun.

Complete rules were published in the January issue. Rules are exactly the same as those used last year with the same format that has been in effect these past many years. Therefore, it would serve little purpose to repeat them again here, since they are well established worldwide.

The definition of the prefix multiplier is spelled out in detail and is not to be confused with the interpretation used by the WPX Award program. The multiplier is determined by the number of different prefixes worked and is counted *once* only, regardless of how many times it is worked on other bands.

Another point to keep in mind is that in multi-operator, single transmitter operation, only one transmitter and only one band may be used during the same 10-minute period. Picking up a new multiplier on another band during the same time period is definitely not permitted.

An alphabetical/numerical check list of claimed prefixes is now a requirement and must be included with your log.

As mentioned in last month's column, a new trophy has been added to the s.s.b. section of the contest: The Terry Appelton, W4GSM, Memorial Award sponsored by Joe Arcure, W3HNK, and Toshi Kusano, JA1ELY. It goes to the Japanese station making the highest score worldwide on 28 MHz (a real challenge on 10 meters).

Deadline for submitting your s.s.b. entry is May 10th, and July 10th for the c.w. section. Be sure to indicate s.s.b. or c.w. on the envelope.

Send logs to the WPX Contest Director, Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424. Of course, you can also always use the *CQ* home office address.

Connecticut QSO Party

2000Z Sat. to 0200Z Mon., Mar. 31–Apr. 2
Rest Period 0500Z to 1200Z Sunday

This party is usually held by the Candlewood ARA in December. They hope to have it back to its original date next time.

The same station may be worked on each band and mode for QSO points, mobiles in each county change. DX stations count for QSO points but for only one multiplier.

Exchange: Signal report, QSO serial number, and QTH. County for CT stations, ARRL section for others.

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

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

Frequencies: C.W.—40 kHz up from bottom of each band. S.S.B.—3927, 7250, 14295, 21370, 28540. Novice—3725, 7125, 21125, 28125.

Awards: Non indicated, probably an oversight. I'm sure the usual certificates will be distributed to the winners in each category and section.

Mailing deadline is April 30th to: Candlewood ARA, Att.: Rosemary Dillon, N2EFA, P.O. Box 954, Danbury, CT 06810. (Include a large s.a.s.e. for a copy of the results.)

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Monthly mean solar activity observed during November 1983 dropped to its lowest level in six years. Prof. A. Koeckelenbergh of the Sunspot Index Data Center at the Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean number of 33.2 for November 1983. This is the lowest monthly level reported since November 1977. In fact, during November the sun's surface was completely devoid of spots from the 22nd through the 26th.

This sharp decline in monthly mean solar activity reduces the *12-month running smoothed sunspot number*, upon which the sunspot cycle is based, by five points in a one-month period to a level of 77 centered on May 1983.

A smoothed sunspot number of approximately 60 is presently forecast for March 1984, as Cycle 21 continues to decline towards a minimum value now expected sometime during 1987.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1984

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 8, 12, 19	A	A	B	C
High Normal: 7, 11, 18, 20, 26-27	A	B	C	C-D
Low Normal: 1,3-4, 6, 9-10, 13, 17, 24-25, 28, 30-31	A-B	B-C	C-D	D-E
Below Normal: 2, 5, 14, 16, 21, 23, 29	B-C	C-D	D-E	E
Disturbed: 15, 22	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on the 1st, fair-to-poor (C-D) on the 2nd, good-to-fair (B-C) on the 3rd and 4th, etc. Conditions are expected to be good-to-fair (B-C) during the WW WPX S.S.B. weekend of March 24-25.

1983 CQ DX Contest Critique

Well, it finally happened! A major radio storm hit right during the phone section of the *CQ* World-Wide DX Contest. The *CQ* forecast for the phone section called for generally good conditions, with High Normal expected on October 29th, and between Low and High Normal on the 30th. We did caution, however, that a radio storm was expected to begin on October 31st, perhaps marring the last few hours of the phone section. The storm actually began two days earlier than expected, on October 29th, and it marred conditions during most of the contest period.

Based upon world-wide reports and observations, both days were rated as between Below Normal and Disturbed on the *CQ* rating scale. Usable frequencies were noticeably depressed, signals were much weaker than usual, noise levels were considerably higher, and "blackout conditions" existed for periods of time for paths passing near or across the polar regions. The radio storm that occurred during the phone section will, no doubt, be reflected in considerably lower final scores than during similar contest periods during the past several years.

Conditions during the CQ WW C.W. Contest weekend of November 26th and 27th were much improved over those of the phone section and came close to the *CQ* prediction for High to Above Normal conditions on the 26th and High Normal conditions for the 27th. World-wide assessments rate the 26th as Low to High Normal and the 27th as High Normal. Solar activity during the c.w. period was exceptionally low, with solar flux levels of 83 and 87, respectively. This resulted in somewhat fewer *10* meter openings than expected. Otherwise, usable frequencies, signal levels, and times of band openings, etc., held up pretty much as predicted.

11307 Clara Street, Silver Spring, MD 20902

March Propagation

March is a month of *equinoctial* propagation on the h.f. bands. This is typified by *fewer* east-west openings on *10* and *15* meters; more hours of daylight in which DX openings can occur on *15* and *20* meters; fewer hours for DX openings on *40*, *80*, and *160* meters; *improved* openings on all bands between the northern and southern hemispheres; and a seasonal increase in the static levels on all bands.

During much of March and continuing into early April, relatively similar h.f. propagation conditions exist in the temperate regions of both the northern hemisphere (where it is spring) and the southern hemisphere (where it is fall), as compared to the more extreme ionospheric conditions that exist when it is summer in one hemisphere and winter in the other. As a result, DX openings between both continents are usually at their best during March and April and again during September and October. Good inter-hemispheric openings are forecast this month for all bands between *10* and *40* meters, with some openings possible on *80* and *160* meters as well. Typical of such openings are the paths from the U.S. to South America, to Australasia, and to central and southern regions of Africa, etc.

The best times to look for inter-hemispheric openings are shortly *before* local sunrise and again shortly *after* local sunset on the *40*, *80*, and *160* meter bands; and for an hour or two *after* sunrise and again from an hour or two *before* to about an hour or two *after* local sunset on *20* meters. For *10* and *15* meter inter-hemispheric openings check towards the southeast and south from a few hours *before* noon through the early afternoon hours. Check later in the afternoon for openings towards the south, southwest, and west.

On a worldwide basis, it should be a toss-up between *15* and *20* meters for the best DX band during the *daylight* hours of March. Some *10* meter openings should also be possible during the daylight hours. From sundown to midnight, DX honors will likely be shared between *20* and *40* meters, with *20* opening towards the south, southwest, and west, and *40* opening towards the east, north, and south. Some fairly good *80* meter DX should also be possible during this time period, with conditions much like *40* meters, but with weaker signals and high noise levels. From midnight to sunrise, best DX bands should be *40* and *80* meters, with some openings also possible on *160* meters. Openings during this time period should peak towards the south and west. For more detailed information, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts which are valid through March and April, as well as Propagation Charts centered on Alaska and Hawaii. The Short-Skip Charts contain band-opening information for predominantly one-hop paths, ranging in distances between approximately 50 and 2300 miles.

For day-to-day changes in h.f. propagation conditions expected during March, see the Last Minute Forecast,

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FB Ratio 9/14/21/28		12.4/21.8/22.3/20.1	0/21.7/22.3/20.2
Power		1KW CW	1KW CW
VSWR 7.0 - 7.1		2.0:1 or better adjustable	
7.1 - 7.25		2.0:1 or better adjustable	
14.0 - 14.5 21.0 - 21.45 28.0 - 29.0		1.5:1 or better	
Boom Length m/ft.		6.0/19.8	4.0/13.2
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HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. 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) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " 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.

3). 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. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave 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 10dB loss, it will lower by one level.

5. Propagation data cohtained 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.

CQ Short-Skip Propagation Chart
March & April, 1984
Band Openings Given In Local Standard Time At Path Mid-Point Using 24-Hour Time System

Band (Meters)	*Distance From Transmitter (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	*NIL*	08-09 (0-1) 09-12 (0-2) 12-14 (0-3) 14-16 (0-2) 16-18 (0-1)	08-09 (1-0) 09-12 (2-1) 12-14 (3-2) 14-16 (2-3) 16-17 (1-2) 17-18 (1) 18-20 (0-1)
15	*Nil*	08-09 (1) 09-15 (0-2) 15-17 (0-1)	07-08 (0-1) 08-09 (1) 09-10 (2) 10-15 (2-4) 15-17 (1-3) 17-18 (0-2) 18-20 (0-1)	07-08 (1-0) 08-09 (1) 09-10 (2-3) 10-15 (4) 15-17 (3) 17-18 (2-3) 18-20 (1-2) 20-21 (0-1)
20	11-13 (0-1) 13-15 (0-2) 15-16 (0-1)	07-10 (0-1) 10-11 (0-2) 11-13 (1-3) 13-15 (2-4) 15-16 (1-3) 16-18 (0-3) 18-20 (0-2) 20-07 (0-1)	06-08 (1-2) 08-10 (1-3) 10-13 (3-4) 13-15 (4) 15-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (1)	06-07 (2-1) 07-08 (2) 08-10 (3) 10-15 (4-3) 15-18 (4) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-06 (1)
40	06-07 (1-2) 07-09 (2-3)	06-07 (2-3) 07-09 (3-4)	06-07 (3-2) 07-08 (4-2)	06-08 (2-1) 08-15 (1-0)

	09-18 (3-4) 18-19 (2-3) 19-21 (1-2) 21-00 (0-1)	09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-00 (1-2) 00-06 (0-1)	08-09 (4-1) 09-11 (3-1) 11-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-20 (4) 20-21 (3-4) 21-00 (2-3) 00-02 (1-3) 02-06 (1-2)	15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (3) 02-05 (2-3) 05-06 (2)
80	07-08 (2-3) 08-11 (3-4) 11-18 (4-3) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-05 (1) 05-07 (1-2)	07-08 (3-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-22 (3-4) 22-02 (2-4) 02-05 (1-2) 05-07 (2)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-02 (4) 02-05 (2-3) 05-07 (2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-02 (4-3) 02-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-2) 03-05 (3-2)	05-06 (1-) 06-19 (0) 19-20 (1-0) 20-22 (2-1) 22-03 (2) 03-05 (2-1)

ALASKA
March & April, 1984
Openings Given in GMT

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	21-23 (1)	20-21 (1) 21-23 (2) 23-01 (1)	20-23 (1) 23-02 (2) 02-05 (1)	06-13 (1) 07-12 (1)*
Central USA	21-00 (1)	20-22 (1) 22-00 (2) 00-02 (1)	20-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1)	07-09 (1) 09-12 (2) 12-14 (1) 08-12 (1)*
Western USA	21-01 (1)	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-00 (2) 00-03 (3) 03-05 (2) 05-07 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.

* Indicates best time for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

HAWAII
March & April, 1984
Openings Given in Hawaiian Standard Time

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	10-12 (1) 12-14 (2) 14-15 (1)	08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-13 (1) 13-15 (2) 15-19 (3) 19-21 (2) 21-05 (1) 05-07 (2)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	10-11 (1) 11-14 (2) 14-16 (1)	06-08 (1) 08-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-05 (1) 05-08 (2)	18-19 (1) 19-22 (2) 22-01 (3) 01-04 (2) 04-05 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Western USA	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-17 (3) 17-18 (2) 18-20 (1)	15-18 (4) 18-20 (3) 20-00 (2) 00-04 (1) 04-06 (2) 06-09 (4) 09-11 (3) 11-13 (2) 13-15 (3)	17-19 (1) 19-20 (2) 20-21 (3) 21-23 (4) 23-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-06 (1)*

which appears at the beginning of this column.

V.H.F. Ionospheric Openings

Auroral activity tends to increase during equinoctial periods, improving chances for auroral-associated v.h.f. ionospheric openings to occur. Check the Last Minute Forecast for those days which are expected to be Below Normal or Disturbed, since these are the days on which v.h.f. auroral propagation is most likely to be possible during March.

A seasonal increase in short-skip openings due to sporadic-*E* propagation usually occurs during March, and an occasional 6 meter opening may be possible during the month. Such openings are more likely to take place during the daylight hours over distances between approximately 1000 and 1300 miles.

Trans-equatorial scatter propagation conditions generally improve during equinoctial periods. Some 6 and possibly 2 meter openings may be possible via this mode during March. TE openings must cross the magnetic equator at or near a right angle, and the best time for such openings is between 8 and 11 p.m. local time. Conditions favor openings between the southern tier states and Caribbean islands into the southern countries of South America. At best, TE openings are very weak, with considerable flutter fading.

Not much meteor activity is expected during March, although some v.h.f. meteor-reflection-type openings may be possible during minor showers expected March 11–15 and 22–26.

33rd Anniversary

This month's column marks my 33rd year as Propagation Editor for *CQ*. Reckoned in terms of sunspot cycles, this extends from the middle of Cycle 18 to the presently declining period of Cycle 21. Special recognition is due the editors and publishers of *CQ*, who had the foresight to introduce propagation predictions and forecasts in *CQ* from almost the initial issue, and to continue it on a regular basis. This column has never missed a deadline or an issue. It has been written in more than two dozen countries, in all corners of the world, under all sorts of conditions, from very peaceful to very warlike.

There are a great number of interesting propagation events coming up in the years ahead on the h.f. bands, and I expect to continue to report them to you here on the pages of *CQ*!

73, George, W3ASK

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TUBES FOR SALE: 5894-$14, Eimac 304TL $40. J. Adinolf, 1028 Fairview, Ojai, CA 93023.

TELETYPE 28ASR Auto CR/LF, Chad type reperf, tape winder, paper winder $275.00. Model 19 Auto CR/LF, 14 reperf $125.00. N4BRX, 413 Seneca, Louisville, KY 40209. Phone 502-368-7845.

FOR SALE: DENTRON Cooling Fan for GLA-1000 A or B. New $10.00. Also a Factory Modification 500 watt Zener Diode to lower idle current on the 1000B from 200 MA to 100 MA, $5.00. Both items include shipping. Bob Bradley, 1002 Forest Road, La Grange Park, IL 60525.

WANTED: Print Head for Centronics Line Printer, Model 306. NFPA Type II, Head Assy Part #63002437 (molded in), RP 37446 (stamped on). George Lee, K5HT, 612 Gemi, Longview, TX 75604.

RADIO BOYS books by Chapman and Breckenridge for sale. SASE. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

W5VAQ ESTATE SALE. Henry Radio 2K-3 Linear, power supply, dummy load, low-pass filter, excellent shape $300.00. 45 ft. Rohn crank-up tower, triband beam, best offer. Located Lafayette, LA. Skip Broussard, 816-221-8300; 333-4679.

TRITON II (481) solid state xcvr, 200 watts, with CW filter, perfect condx, $240. U-ship. W5HWP 512-358-4382.

GENERAL Coverage Receiver, Collins R390A/URR @ to 30 MHz, rack mount, Excellent Condition, $325. U-ship. W5HWP 512-358-4382.

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WANTED: Synchros; Tubes; MS Connectors URA-17/CV-483; AM-2123A(V)/U; SB-973; and anything Navy shipboard. Bill Williams, P.O. Box 7057, Norfolk, VA 23509, phone 804-853-9146.

ROSS $$$$ USED March SPECIALS: AZDEN PCS-3000 $199.00. COLLINS 32-S1/75-S3/516F2 $599.00, KWM2 $495.00, KWM-380 $2200.00, 75A4 $239.00, 51S1 $$$ MAKE OFFER. DRAKE L-75 $589.00, T4XB, R4B, AC4, MS4, $519.00, TR-DR7 $869.00. ICOM IC-25A $219.00, IC-245SSB $189.00, IC-215 $89.00, IC-502 $145.00, IC-740 $839.00. KENWOOD TS-120S $399.90, TS-130S $469.90, TS-180S $539.90, TS-520 $429.00, TS-520S $479.90, TS-530S $495.00, TS-600 $399.00, TS-820 $495.90, TS-820S $565.00. YAESU FR-101, FL-101 $529.90, FT-620B $259.00, CPU-2500RK $187.00, FT-310D $329.00. $$$$ If this month's special is not what you are looking for, send Call letters, name, & phone # for personal price quote. Over 5,000 ham-related items in stock. MENTION AD. PRICES CASH, FOB PRESTON. CLOSED MONDAY AT 2:00. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 phone (208) 852-0830.

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ATLAS WANTED: Model 10 XB Crystal Oscillator for 210X Transceiver, or Polaroid of board. Keith Frick, 940 Canon Rd., Santa Barbara, CA 93110.

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SUPER-PRO receiver, circa 1945, BC-1004, 540 kc-20 mc. with power supply, manual and spare tubes. Pick up or you pay shipping. Best offer. Phone W2JGR (516) 593-8050 eves.

WANT: Any RSGB magazines or books. Nathan Copeland, W1ODA, 72 Groveside Road, Portland, ME 04102.

WANTED: Drake DC-4 power supply. Robert B. Dawson, RR 9 Box 532, Greenfield, IN 46140.

WANTED: Maxi-Tuner or MN-2700, Azden PCS-300. SELL/TRADE: MT-2000A $145; IC-255A $199; IC-260A $299. Robot 70 SSTV $149. KØMK 218-865-6541.

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KW TS-520 $475, SP-520 $35, Lafayette HA-350 rec. $125, Heath HW-202 2mtr. port. $100, Stoner Pro-40 ssb, Soc-40 console, Spk-40, $550, + More. KA1HZD, 413-734-3886.

WANTED: Good used Rohn 25G tower. Max height 100 ft. Will pick up if not too far. Con Helber, KØRAX, St. Rte 1 Box 96, Middle Brook, MO 63656.

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HEATH Model VHF-1 Seneca Transmitter, mint cond., no reasonable offer refused. M.J. Waltash, 7009 Brecksville Rd., Independence, OH 44131. Phone 216-524-2834.

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WANTED: Military Radio Set Type AN/PRC-77, military batteries type BB-451. Michael P. Murphy, 11621 Valle Vista Rd., Lakeside, CA 92040. Phone (619) 561-2726.

WANTED: Wilson or Drake 2 meter gear. Have Bird equip for trade. Will also consider Santec or Azden. Allen E. Brown, P.O. Box EE, Stafford, TX 77477.

RCA Volt-Ohmyst WV-98B $30, WV-77E $15, Simpson 260 $18, Heath HD-11 Q-Multiplier $5, DuMount 346 VTVM $20. K6KZT, 2255 Alexander, Los Osos, CA 93402.

HEATHKIT DX-20 cw xmtr 50 wts, nice, $25. Clegg 99er xceiver 6 mtr a.m., nice, $25. Plus UPS on each. WA2PCL, 101-23 Lefferts Blvd., Jamaica, NY 11419.

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ICOM IC-701, P.S., MIC, mint, original packing, all cables, relays, manuals, cover $760.00. HW-8, new warranty, $130.00. Hank, WA2OVG, (212) 796-8617, or 696-4000.

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YAESU PKG, clean, spotless FT101ZD, FV101Z CW filter, fan, DC chopper, manuals. Ship FOB orig boxes for $595. Art Ford, 552 Hillside Ct., Melbourne, FL 32935, phone 305-254-0361.

TELEGRAPH and wireless keys wanted for a private collection. K6ARE, Dick Randall, 1263 Lakehurst Rd., Livermore, CA 94550.

WANTED: Novice needs complete amateur station in working condition. Send info. Ed Wisowaty, 911 Widwood, Aikene, SC 29801. Phone 803-648-1580.

SELL: 120' SUPER STRONG microwave tower. 18" square steel. 20' sections ideal for heavy-duty EME mount, $150. Whole tower $700 firm. T.N. Colbert, 13609 Colony, Burton, OH 44021.

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WANTED: Kenwood KRC-411 AM/FM car stereo, TR-2400, TR-7850, Astron RS-35M, TR-7950, Maxi-Tuner. KØMK, 690 Vermilion Trail, Gilbert, MN 55741.

WANTED: Bird 43; TEK HP equip catalogs. SELL: Mosley 2-el triband quad. W7KSG, 1876 E. 2990 S., Salt Lake City, UT 84106.

FOR SALE: Waters BP filters, 50 and 144 MHz, $12 ea. pp. LMB Cabinet $30 pp. E. Erickson, 343 Catherine St., S. Amboy, NJ 08879.

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FOR SALE: Heath HW-8, keyer, pwr supply $180. Heath VF-2031 HT, mic, pl, TT pad, chgr $130. KA9CIM, 204 Sequoia, Glen Ellyn, IL 60137.

HALLICRAFTERS HT-18 Tx. $25, Knight Star Romer Rec. 200 kc–30mc $30, Sylvania 216 RF Sig-Gen 80kc–60mc $30. K6KZT, 2255 Alexander, Los Osos, CA 93402.

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QPRers: Get details of the G-QRP-Club and free sample magazine from Rev. G.C. Dobbs G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham, B37, U.K.

SASE for large list of excess equipment. George Churpek, N6FL, 839 Cambon Cir., Ojai, CA 93023.

NEED DATA for Superior Model 85 Tube Tester. Advise copy costs. J. Dettleff, 7995 Valley View Rd., Northampton, PA 18067.

WANTED: Kenwood 7950, Icom IC-211, Ten-Tec 4229 2KW antenna tuner. Sell: Robot 70 SSTV $145.00. KØMK, 690 Vermilion Trail, Gilbert, MN 55741.

WANTED: Hallicrafters SR-34, R-44B Black Spkr. Conar 400 XMTR, 500 RCVR. Hammarlund SP600VLF RCVR, 5300-R SPKR. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

BUNNELL MINIATURE KEY, practice unit No. 523 & Beeko learners key wanted. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

QST 1936 to 1982: Best offer over $400.00 plus shipping. WA2FSR, 239 Fox Meadow, Scarsdale, NY 10583, Ph. 914-725-1191.

HELP: Junior High School 180 needs donations of equipment, books, parts and magazines relating to amateur radio and SWLing for ham radio program. G. Skloot, KE2N, JHS 180, 320 Beach 104 Street, Rockaway Park, NY 11694.

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WANTED: To purchase TS-120, 100MX, 210X or FT7B, etc., in need of repair. Tort, KØHQW, 65 Dellbrook Ct., O'Fallon, MO 63366.

WANTED: Volumes one and seven, "Hints and Kinks for the Radio Amateur" by the American Radio Relay League. K4LVZ, POB 562144, Miami, FL 33256-2144.

WANTED: Drake RV-4 in good condition. Will pay top dollar. Bill Fields, W4DIA, 714 Windsor Rd., Savannah, GA 31406.

WANTED: Ten-Tec 515 Argonaut transceiver QRP w/pwr supp/manual; state price and condx. Morton Berger, K4JIL, 305-735-9137.

YAESU YC-601 Dig. Display Wanted. G.T. Suchecki, 2157 W. Verona Ct., Milwaukee, WI 53215, phone 1-414-383-1433.

HAL DS-3100 KSR, CW & RTTY terminal, like new and all manuals, $1100. Swan 400 with VFO Base PS and mobile PS, $275. (703) 343-1362, WA4BIX, Rt. 4, Box 430, Salem, VA 24153.

FOR SALE: Complete Sets—Sams Photo Facts Nos. 39, 55, 57, 274, 329, 343, 447. Mike Stasiak, 3819 White Ave., Baltimore, MD 21206.

SELL: Heath SB 102 transceiver, $150. WD2AEC 914-634-9212.

SELL: Heathkit HW-202 2M transceiver, $105 p.pd. or trade for handi-talkie. WA7YDU, 943 W. 4th St., Laurel, Montana 59044, phone 1-406-628-6151.

WANTED: Service Manual or zerox copy for Collins Receiver, Model 51S-1. Tom Richison, K5FRI, Rt. 2, Box 121-07, Coweta, OK 74429.

WANTED: Ten-Tec PM Series QRP gear (PM-1, 2, 3, AC-4, 5, RX-10). State price and condition in letter. Also Wanted: IC-21 2 meter rig. QSL R.H. Arland, Box 1454, APO NY 09127.

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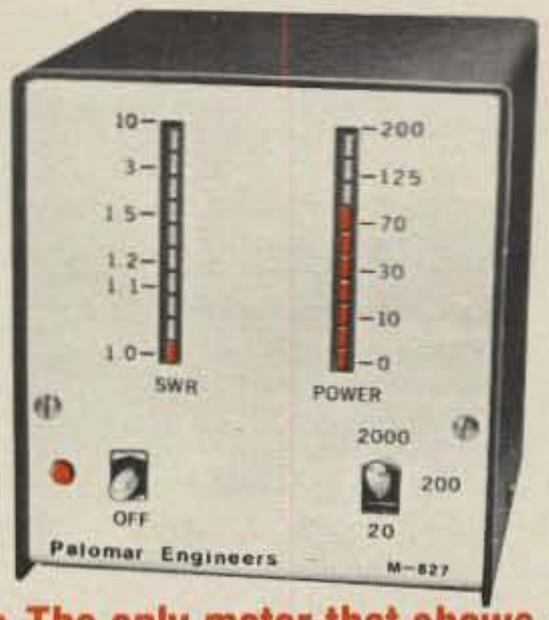

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Automatic. No "set" or "sensitivity" control. Computer sets full scale so SWR reading is always right. Complete hands-off operation.

Light bar display. Gives instant response so you can see SSB power peaks. Much faster than old-fashioned meters.

Easy to read. No more squinting at old-fashioned cross pointer meters. You can read the bright red SWR and power light bars clear across the room!

Model M-827 Automatic SWR & Power Meter only $119.95 in the U.S. and Canada. Add $3 shipping/handling. California residents add sales tax.

MasterCard VISA

ORDER YOURS NOW!

Send for FREE catalog describing the SWR & Power Meter and our complete line of Noise Bridges, Preamplifiers, Toroids, Baluns, Tuners, VLF Converters, Loop Antennas and Keyers.

Palomar Engineers

1924-F West Mission Rd.
Escondido, CA 92025
Phone: (619) 747-3343

Please send all reader inquiries directly.

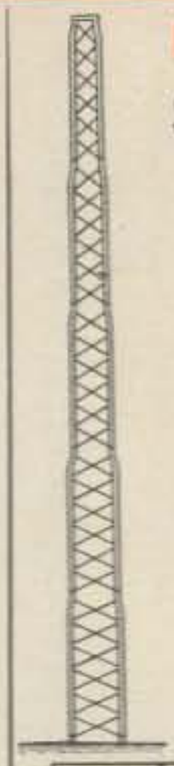
ANTENNA/TOWER SALE!

BUTTERNUT ELECTRONICS CO.

- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

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

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



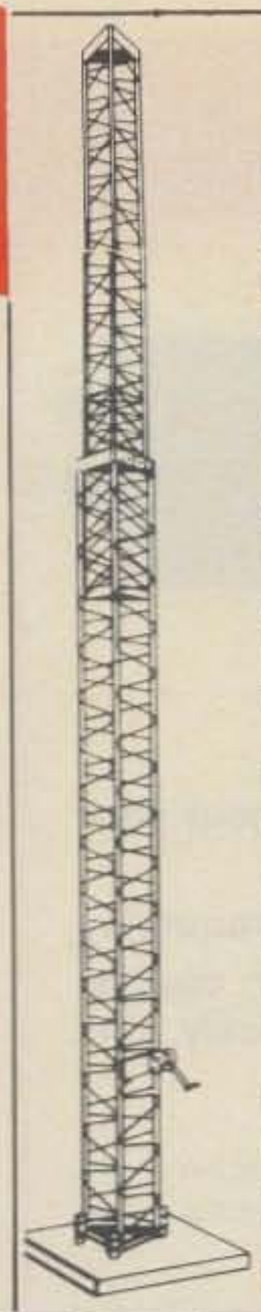
UNARCO-ROHN Self Supporting Towers — On Sale!

Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And — Save even more — include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BX86	289	24	313
HBX48	48 ft	10 sq ft	303	BX87	369	26	395
HBX56	56 ft	10 sq ft	385	BX88	449	30	479
HDBX40	40 ft	18 sq ft	281	BX87	339	26	365
HDBX48	48 ft	18 sq ft	363	BX88	429	30	459



hy-gain CRANKUP SALE!

All Models Shipped Factory Direct— Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting— no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.,	$ 967
HG52SS	52 ft.	9 sq. ft.,	$ 959
HG54HD	54 ft.	16 sq. ft.,	$1499
HG70HD	70 ft.	16 sq. ft.,	$2399

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

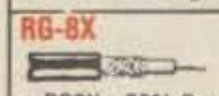
RG-213U

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

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

RG-8X

$.19/ft $179/1000 ft



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

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax ™	$1.49/ft
⅞" LDF5-50 Andrew Heliax ™	$3.99/ft

select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

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

AMPHENOL CONNECTORS

Silver PL259	$1.25	Nickle PL259	$.90
UG21B N Male	$2.95	UG23D N Female	$2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld	$.12/ft	14 Ga. Copperweld	$.10/ft
14 Ga. Stranded	$.10/ft	18 Ga. Copperweld ¼ mi	$30
450 Ohm H.D. Line	$.16/ft	H.D. End Insulators	$2/ea
Van Gorden 1:1 Balun			$11
Van Gorden Center Insulator			$6

HUSTLER

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

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

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

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

HF MONO-BAND ANTENNAS

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

VHF/UHF BEAMS

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

OSCAR/TWIST ANTENNAS

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

VHF/UHF FM ANTENNAS

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

HY-GAIN

Broadband 3-el Triband Beam Explorer-14, In Stock—$289

QK710 30/40 mtr. Add-On-Kit	$79.00
V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$179
TH2MK3S 2-el Triband Beam	$159
HY-QUAD 2-el Triband Quad	$299
402BAS 2-el 40-mtr Beam	$219
205BAS 5-el 20-mtr Beam	$329
155BAS 5-el 15-mtr Beam	$189
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$249
203BAS 3-el 20-mtr Beam	$149
153BAS 3-el 15-mtr Beam	$89
103BAS 3-el 10-mtr Beam	$69
DB1015BAS 3-el 10/15 mtr Beam	$179
64BS 4-el 6-mtr Beam	$59
66BS 6-el 6-mtr Beam	$119
18HTS 80-10 mtr Hy-Tower Vertical	$429
LC-160 160-mtr Coil Kit for 18HTS	$39
214 14-el 2-mtr Beam	$39
2BDQ 80/40 mtr Trap Dipole	$59
5BDQ 80-10 mtr Trap Dipole	$119
BN86 80-10 mtr KW Balun W/Coax Seal	$19

MOSLEY

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

Tri-Ex TOWERS SPECIAL PRICES! SAVE$$!

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$6200	Call

ALPHA DELTA COMMUNICATIONS

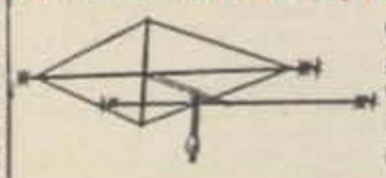
Transi-Trap ™ Surge Protectors—In Stock Now!

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

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
80m-1 80-mtr Rotatable Dipole	$469
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$339
40m-4 4-el 40-mtr Beam	$649
20m-6 6-el 20-mtr Beam	$689
15m-6 6-el 15-mtr Beam	$439
10m-6 6-el 10-mtr Beam	$259
10-30-7LPA Log Periodic Beam	$639
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
435-18C 435 MHz Satellite Antenna	$65
432-16LB 16-el 432 MHz Beam	$69

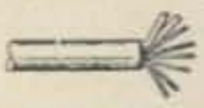
MINI-PRODUCTS HQ-1 only $159!



Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$109
Alliance U100 (for small beams & elevation)	$49
Telex HAM 4 (15 sq ft rating)	$199
Telex Tailtwister (20 sq ft rating)	$249
Telex HDR300 Heavy Duty (25 sq ft rating)	$479
Kenpro KR-500 Heavy duty elevation rotor	$189.00



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)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

Foldover Towers

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

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

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.13/ft
1/4" EHS Guywire (6000 lb rating)	$.16/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.12/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.35
1/4" CCM Cable Clamp (1/4" Cable)	$.45
1/4" TH Thimble (fits all sizes)	$.30
3/8EE (3/8" Eye & Eye Turnbuckle)	$5.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle)	$6.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$9.95
3/16" Preformed Guy Grip	$1.99
1/4" Preformed Guy Grip	$2.49
6" Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32" or 3/16" Cable)	$1.39
502 Guy Insulator (1/4" Cable)	$2.49
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)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$6.95
9902LD Cable End (for 6700 cable)	$7.95
Socketfast Potting Compound (does 6-8 ends)	$12.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

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

Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

1108 Summit Ave., Suite 4 / Plano, Texas 75074

MasterCard VISA

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Mon.-Fri.: 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

TELEPHONE: (214) 422-7306

CIRCLE 43 ON READER SERVICE CARD

COMMUNICATIONS EQUIPMENT SALE!

ICOM

ICOM IC-751A LIST PRICE $1399
CALL FOR SPECIAL SALE PRICE!

ICOM IC-745 LIST PRICE $999
CALL FOR SPECIAL SALE PRICE!

IC-02AT
NEW 2 METER
TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

KENWOOD

TS-930S LIST PRICE $1799
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TS-430S LIST PRICE $899.95
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TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES

FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-726R LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List $319
FT-708R 440 MHz HT
List $319
- **LCD Display**
- **10 Memories**

CALL FOR SPECIAL PRICES!

SANTEC

NEW ST142μP
2M HT

- 3.5W/1W/0.1W
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

List $339.95
SALE $299!

ST144μP	$259.95
ST222μP	CALL!
ST442μP	CALL!

SANTEC Accessories

SM3 Speaker Mic	$34.95
ST-LC Leather Case	$34.95
ST-500 NiCad Battery	$29.95
ST-4QC Base Charger	$69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ETO ALPHA SALE!

76PA $1699!

Model	List	Sale*
76A	$1985	CALL
76PA	$2395	CALL
76CA	$2695	CALL
374A	$2595	CALL
78	$3495	CALL

***Sale Prices Too Low To Print— CALL & SAVE $$!**

TEN-TEC SALE!

CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock for Fast Shipment!

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

4229 2KW Tuner Kit $189.95!

HAL SALE!

NEW RTTY/CW COMPUTER INTERFACES

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

CWR6850 RTTY/CW TERMINAL

List $999 SALE $749.95!

Other HAL Products On Sale

CWR6700	$439.95	DS3100ASR	$1699.95
CWR6750	$629.95	MPT3100	$2199.95
CT2100/KB2100	$749.95	RS2100	$289.95
CT2200/KB2100	$949.95	ST5000	$219.95
DSK3100	$1049.95	ST6000	$649.95
ARQ1000	$649.95	KG-12	$169.95

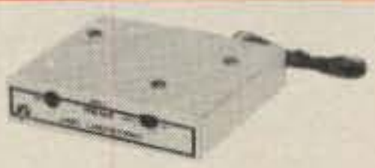
TOKYO HY-POWER LABS

HL-30V Reg. $69.95
SALE $59.95

HL-82V . $139.95	HL-90U . $329.95
HL-160V $289.95	HC-200 . . $89.95
HL-20U . . $99.95	HC-2000 $289.95

KDK FM2033

List $339 Sale $299



JANEL QSA5 PREAMP $39!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

MIRAGE AMPLIFIER SALE!

B1016
$249

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

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty · High Quality · Rugged · Reliable

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

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MODEL RS-50A

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

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

All AEA Keyers, Antennas & Accessories In Stock!

MFJ 1224 COMPUTER INTERFACE $89.95

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

KANTRONICS

The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

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

METRON MA1000B AMPLIFIER

Solid State 1KW Amplifier

- No Tuning
- 13.8 VDC Operation
- Remote Bandswitching
- Compact
- Heavy-Duty Construction

List Price $895 SALE PRICE $795.95!

TEXAS TOWERS

Telephone (214) 422-7306

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

Monday-Friday 9 AM - 5 PM Saturday 9 AM - 1 PM

CIRCLE 54 ON READER SERVICE CARD

YAESU SALE!

FT-ONE

GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

Buy Now and Receive These Accessories Free:

300Hz CW Filter . $FREE	600Hz CW Filter . $FREE
800Hz CW Filter . $FREE	6Khz AM Filter . . $FREE
Memory Backup . $FREE	Installation . . . . . $FREE

List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!

FT-980

CAT SYSTEM—Computer Aided Transceiver

- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-in CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!

FT-102

160-10MTR WITH WARC BANDS TRANSCEIVER

- Digital Readout
- Built-in AC Supply
- Variable Bandwidth
- IF Shift
- CW/SSB/AM/FM Modes
- RF Speech Processor
- Noise Blanker
- Much, much more—

List Price $1149—Call for Special Low Texas Towers Discount Price and Save $$$

FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

List Price $599—Call for Special Low Texas Towers Discount Price and Save $$

FT-230R 2mtr FM $359
FT-730R 440Mhz FM $399

- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$

FT-726R VHF/UHF
All Mode Tri-Band Transceiver

- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

Please Call For Price & Delivery Information

VHF/UHF Multimode Portables

FT-690R 50Mhz	$379
FT-290R 144Mhz	$399
FT-790R 430Mhz	$399

Call today for Special Discount Price & Save $$

FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

Manufacturer's List $499—Call today for Your Special Discount Price!!

FT-208R 2mtr HT $319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT $319
RF Out: 200mw/1.0W

- LCD Display
- 10 Memories
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YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

SATELLITES!! **SCATTER!!**

FM!! **EME!!**

The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

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ICOM IC-745

160-10 MTR 100W XCVR / 0.1-30MHz RCVR

The IC-745 represents a major breakthrough in the ham industry...a full featured HF base station transceiver with a combination of standard features found on no other transceiver in its price range.

Compare these exceptional standard features:

- 100KHz - 30MHz Receiver
- 16 Memories
- 100% Transmit Duty Cycle Transmitter with exceptionally low distortion
- IF Shift AND Passband Tuning
- Receiver Preamp
- 10Hz/50Hz/1KHz Tuning Rates with 1MHz band steps
- Adjustable Noise Blanker (width and level)
- Continuously Adjustable AGC with an OFF position
- Full function Metering with a built-in SWR Bridge
- Optional Internal AC Power Supply

CIRCLE 17 ON READER SERVICE CARD

Other Standard Features.
Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, all-mode squelch, program band scan, memory scan (frequency and modes are stored), receiver and transmitter incremental tuning and VOX.

ICOM's proven transceiver designs and technology are used in the IC-745 all ham band transceiver which includes SSB, CW, RTTY, AM receive and an optional FM **plus** a 100KHz to 30MHz general coverage receiver.

ICOM System.
The IC-745 is compatible with ICOM's full line of standard HF accessories.

Accessories available include the IC-PS15 base supply, IC-PS30 system power supply (switching), IC-PS35 internal power supply, the IC-2KL linear amplifier, AT100 automatic antenna tuner, AT500 automatic antenna tuner, HP1 headphones, and HM12 hand or SM6 base microphone.

Options. The EX241 marker and EX242 FM module, plus a wide variety of filters for sharp audio reception are available.

Filter	-6dB Width	Center Freq. MHz
FL45	500 Hz	9.000
FL53A	270 Hz	9.000
FL44A	2.1 KHz	0.455
FL52A	500 Hz	0.455
FL54	250 Hz	0.455

The IC-745 is the only transceiver today that has such features standard...the number of options and accessories available...and such an affordable price.


IC-745
Shown with IC-PS35
Internal Power Supply.

ICOM
The World System

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