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THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur radio

All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
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- **Adjustable dial torque**
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  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
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- **Superb interference reduction**
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Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
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- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-5/6/7 headphones
- SP-40/50B mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2S extra DC cable.

Kenwood takes you from HF to OSCAR!

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

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TS-930S All band transceiver with general coverage receiver

Throughout the contest and DX world, the TS-930S is recognized as THE HF rig to own—with the most outstanding performance per dollar ratio!

- Easily modified for HF MARS and CAP operation
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- Fluorescent tube digital display
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TS-430S Compact all band transceiver with general coverage receiver

Kenwood engineering brings you "Digital DXterity"—QSY from band to band, mode-to-mode, and frequency-to-frequency with ease!

- Easily modified for MARS operation
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- Programmable scanning
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- Superior solid state design
- VOX, semi break-in CW with sidetone
- Dual digital VFOs
- A complete line of accessories is available

10 Hz display shown (see operating manual)

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By Popular Demand!

TH-21BT/31BT/41BT

The smallest HT™ is now even better! The new "BT-Series" gives you a plus—a built-in DIP switch programmable CTCSS encoder! Now you can access more than one "private line" over the air! The original TH-21A Series (The Smallest HT™) is still available from the VHF leader—Kenwood!

- **High or low power.**
  Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
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  Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with PB-21.**
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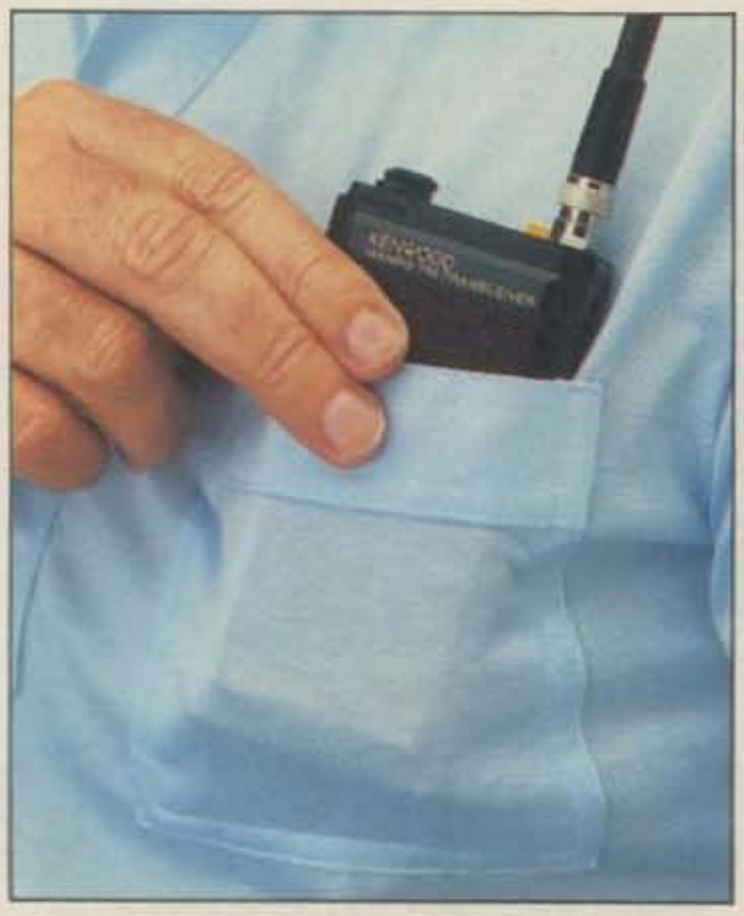
  Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31BT/A: 220.000-224.995 MHz in 5-kHz steps.
  TH-41BT/A: 440.000-449.995 MHz in 5-kHz steps.



- **Easy-to-operate, functional design.**
  Three digit thumbwheel frequency selection and top-mounted controls increase operating ease.
- **Repeater offset switch.**
  TH-21BT/A: ±600 kHz, simplex.
  TH-31BT/A: −1.6 MHz, reverse simplex.
  TH-41BT/A: ±5 MHz, simplex.
- **Standard accessories:**
  Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.**
  The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.**
  The high impact case is scuff resistant, to retain its attractive styling, even with hard use.

Optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **BC-2** wall charger for PB-21H
- **BC-6** 2-pack quick charger
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **BH-3** belt hook
- **AJ-3** thread-loc to BNC female adapter
- **RA-8A/9A/10A** StubbyDuk antenna
- **TU-6** sub-tone unit (TH-21AT/A only)

More information on the Smallest HT™ is available from Authorized Kenwood Dealers.

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TH-series transceivers shown with optional StubbyDuk antenna.
Specifications and prices are subject to change without notice or obligation.
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CQ The Radio Amateur's Journal

ON THE COVER: Speaking of Contests, here's the smiling face behind those familiar call letters, N2AA. Gene Walsh, N2AA, displaying the victory sign for our CQ readers. Photo by Larry Mulvehill, WB2ZPI.

MARCH 1987 **VOL. 43, NO. 3**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

If you look at the great number of amateurs who enter contests, the number of "Big Guns" is by absolute terms small. However, they are the ones to beat if only in wishful thinking, high hopes, and using every last resource. These are the best of the best not only in concentrated operating skill, but in equipment and antenna systems, too. The "Big Guns" represent an amateur radio "What if?" dream come true. It's usually the magnitude of the effort, the highly refined art of logistics, that impresses most of us, and depresses and psyches-out would-be contenders.

Elsewhere in this issue you'll read the obituary of Hazard "Buz" Reeves, K2GL, who for the last 30 years or so was one of the biggest of the "Big Guns" in contesting. The list of his operating teams over the years is akin to reading a *Who's Who* in amateur radio. The antenna systems alone are legendary. As with the passing of Don Wallace, W6AM, a really "Big Gun" in DXing, a void is left, and presumably another historic station disassembled. A long tradition is ended, and hopefully the dreamers out there are working on the next generation of traditions whereby dreams come true and all things are possible.

Amateur radio giants and "Big Guns" come in many sizes. It's with sadness that I report the passing of another legend of amateur radio, although he would never have thought of himself as a legend. Bob Gunderson, W2JIO, passed away in mid-January. I wasn't fortunate enough to spend that much time with either Don Wallace or Buz Reeves, but I was truly fortunate in spending a great deal of time with Bob. Bob was a giant to those of us who were licensed in the 50s and 60s. One of the first jobs I had was as a counterman at Hudson Radio on Fulton Street in New York City. This was the late 50s when New York had a number of electronics stores selling amateur radio gear. My first Friday at that store a man came in, obviously blind, and made his way expertly behind the counter next to me. "Whatcha makin?" were probably the first words he said to me. Those words were his trademark. As I quickly learned, Bob worked at the Fulton Street store on Fridays and worked at other Hudson stores during the week. He also taught full time, wrote articles, and put out a monthly phonograph record for the Braille Tech Press in which he described the articles in various electronic magazines of the day.

Well, Fridays were the busiest days of the week. Locals flocked to the store to have Bob ask them, "Whatcha makin?" Everyone talked about this or that project and especially the problems with making them work. All you had to do was describe what was going wrong or what the symptoms were and Bob could come up with an answer. No, it wasn't that he had an uncanny memory. He had been there. Most of his own station was home-brew, including the test equipment which he designed to work on variations in audio tones. Obviously, he couldn't see what he was doing, but it didn't stop him from doing it and teaching others to do the same.

To say that he had an avid following is an understatement. One of his greatest gifts was patience; he could talk you through just about any problem. It didn't matter to him whether you were 15 or 70. He truly believed and acted on the belief that we were all amateurs together.

I was very fortunate to spend almost two years of Fridays with him. Over the years we did keep a contact going via the telephone and one of the most important lessons I learned from him (which is one that I keep pushing on you) is to have a good time at what you're doing and to make amateur radio fun. He made it fun for a lot of us, and for a lot of us he was a legend and a giant.

What's New and What's Happening

As of this writing, January, our Travels With CQ haven't started yet for the 1987 season. We'll report on those in future issues. In March we celebrate an anniversary. In March 1951 a new column called Propagation appeared in *CQ* with George Jacobs, W3ASK, as the Propagation Editor. Thank you, George, for 36 years of hard work and service to the amateur community.

At present we are reshaping our WPX Award to include a VHF WPX Award. As soon as we iron out all the details and actually have awards to give out, we will announce the complete rules. While we are ironing, we are also ironing out the details for a new *CQ* contest. We hope to have the details in the next month or so. What all of this means is more activity and more for you to take part in. If you want to be a stick-in-the-mud and not enjoy yourself, that's up to you. For the rest of us, *CQ* will be offering a full range of awards and operating activities to challenge even the sporadic operator.

Well, if you look at the calendar, next month is April and April means Dayton. No, don't look for it. There's no song entitled *April in Dayton*. That other place can't hold a candle to Dayton, anyway. Granted, there are few if any tree-lined winding streets with cozy cafes where you can spend the afternoon. The only museum that people really get to has planes and not great works of art on display. The ballet, opera, and theater are definitely not even in the running as attractions, for April in Dayton portends something more uplifting for amateurs throughout the world. It's Hamvention time. If you really must and have to expose yourself to what the rest of the world calls culture during the last weekend in April, then go to the other place and sing the song. If you want the biggest and best infusion of amateur radio fun, then go to the Dayton Hamvention. Everything and anything to do with amateur radio will be on display, and best of all, for sale. There will be lectures and forums given by people you've only read about and never thought you'd meet. There are hospitality suites that seem to go on round the clock generating an excitement that's unique to this event. Why Dayton and not the other place? No one seems to know why. The other place has better restaurants.

Also next month is our first *CQ* Antenna Special issue of 1987. The antenna season comes into full bloom as the mighty proliferation of copper, aluminum, and steel takes root and grows toward the stars. It's time to repair the ravages of winter, and while you're at it, improve on last year's effort. Antennas are something that can always be fixed, changed, improved, or added to. We all like to read about them, and it's one of the few areas left where we can actually build, tinker, and experiment to our heart's content. Most simple antennas can be built with a few hand tools and materials found at a local hardware store. Of course, you could get a lot of good antenna stuff at a local hamfest, too, plus a few pointers and possibly a few extra hands to help get the antenna skyward.

These are some of the things that are happening and that we are working on. As of this writing nothing has been decided about Novice Enhancement. It would be a safe guess to say that it will come, and I wouldn't be too surprised to hear an announcement about its enactment at the Dayton Hamvention.

Preliminary checks through logs of our DX Contest plus first-hand reports would indicate that the sunspot cycle has indeed taken a favorable swing. So, 1987 looks like a good year for amateur activity. We still need more amateurs and preferably young ones. That part is up to you and your efforts.

We can't resurrect the golden days of amateur radio for any of us no matter how many times we rehash them. What worked for each of us at our particular moment changed with the next generation, and so it continues. Therefore, it is something yet to be tried or a combination of things that will work for the next generation. Our heroes, our giants, and in some instances our contemporaries are passing into the ranks of Silent Keys, an apt term. Perhaps if we worked at it, we could look forward to the day when that euphemism would be changed to some form of Broken Keyboard. The future is up to us, especially the future of amateur radio.

73, Alan, K2EEK

NEW!

More Than TNC-2 Compatible

PK-87™ Packet Controller

Amateur Net Price
$179.95

The PK-87 is not just another copy of the popular TNC-2, it's much more. With all the packet program features of the Multi-mode PK-232, the PK-87 is an economical new TNC designed to bring you enhanced, completely compatible packet software plus new hardware features for improved packet operation.

Software Enhancements

* AEA's exclusive "MBX" Mailbox Monitor command lets you read and save received data without confusing headers, callsigns, or repeats.

* New commands let you restrict the use of your station for connects and digipeater functions.

* Host mode for improved terminal program operation and development of specialized programs and applications.

* Compatible with existing WØRLI/WA7MBL PBBS/Mailbox/Gateway programs, with complete software command for remote selection of link rate, modem tone, etc.

* Autobaud routines for terminal data rates from 300 to 9600 baud (programmable down to 45 baud), and software control to set on-air data rates from 45 to 9600 baud.

Hardware Enhancements

* Eight front panel status indicators show Converse, Transparent, and Command modes; Multiple Connects, Data Carrier Detect, Push to Talk, Status, and Connect.

* High sensitivity (5 millivolts RMS), and dynamic range from 5 to 770 millivolts RMS.

* Rear panel AFSK output level adjustment from 5 to 100 millivolts RMS.

* One minute hardware watchdog timer provides system security in unattended VHF/UHF PBBS/Mailbox and digipeater operation

* Modem disconnect circuits guarantee compatibility with future high speed modem applications and developments.

* Zilog 8530 SCC provides dependable hardware HDLC for higher speeds, and AMD 7910 for reliable modem performance without calibration.

While the PK-87 can be used for HF operation, AEA recommends the PM-1 packet modem as a high performance front end for best results in HF packet service. Only the new AEA PK-87 has all these features. Contact your local AEA dealer and join the packet revolution today by ordering the new PK-87.

Prices and specifications subject to change without notice or obligation

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Our Readers Say:

Help Find An Old Friend

Editor, *CQ*:

I hope that a reader can help me with the following. I am trying to locate a friend of many years ago. His name is George Goldstein. George and I lived in Brooklyn, NY back in the 1930s. While I was badly injured at Fort Lewis, Wash., George went on to participate in World War II and was captured by the Germans, later freed. He became a ham some time in the late 40s. He was reported to have been a TV repairman in Richmond, Va. I lost touch with him around that time and have spent many years trying to locate him. A mutual friend, also a ham has been told that George may be in the vicinity of Miami, Florida along with a brother, Max.

If anyone can help reunite these two old friends, I would be very appreciative. It would be interesting to see how the last 40 years have treated us. Many thanks for any help.

G. Samkofsky, N4ZB
1420 Mount Vernon Drive
Holiday, FL 33590

Ode To A Tower

Editor, *CQ*:

The following poem was written by Marjorie Haddleton, XYL of Herb, WA2MST, and sent to me soon after my tower went up this Fall.

There it stands at a 50 foot height,
A silvery needle in the bright sunlight.
Its feet anchored firm in solid concrete,
Wires and cables making the unit complete.
Antenna on top with two swinging beams,
Silently turning by magic it seems.
Picking up DX any minute, any hour,
Oh happy am I with my radio tower!

Herb and Marjorie, using a 2 meter radio, saved two lives on July 8, 1983 by reporting a small boat capsized in high waves in Chaumont Bay, Lake Ontario, just before dark.

John A. Wagner, N2DMZ
Adams, NY

Garage Door Opener Interference

Editor, *CQ*:

I recently had new openers installed on my two sectional garage doors (WINDSOR) of Little Rock, Arkansas by a good firm in Nashville. When I transmitted on 7.010 MHz it caused both doors to go berserk. They went up and down, and even stayed open all night. An intolerable situation! Their receive frequency is 381 MHz. Receivers are mounted on circuit boards in small unshielded plastic boxes on the operators.

My buddy Harry Bruce, WA4GKT, suggested putting a .02 bypass capacitor at each receiver. I did and PRESTO! The problem was immediately fixed. This amateur station is 25 feet and 35 feet from the operators and well installed. The small-size wires from receivers to the push buttons on the wall were acting as antennas.

Moral: Have a good friend with a long memory. My friend remembered reading Bill Orr, W6SAI's article in a technical journal on door opener problems. This "fix" is quick, easy, and corrects the problem.

Robert Wessel, K4PR
Old Hickory, TN

Talk Power For Peanuts. HL-1K/A Kilowatt Tabletop HF Amplifier

Improve your peanut-whistle with some talk power from THL. Really good signals can be had with modest power and antenna set-ups and the FCC says that really high power is not necessary in most cases. That is good news for the HL-1K/A since the output (500W PEP) appears to be in line with their thinking. The HL-1K/A is type accepted by the FCC for use in the U.S. amateur bands. Solid construction (using reliable ceramic tetrodes with a proven track record) and compact size fit in almost anyone's budget and available space. Write Encomm today for the full details.

- *WARC COVERAGE
- *600 W PEP Max 1.8 thru 21 MHZ OUTPUT
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  (NOT AVAILABLE IN U.S.A.)

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Announcing

• **Dayton ARA Scholarship Program** - The Dayton Amateur Radio Association is now accepting applications for its 1987 Scholarship Program. Any licensed amateur graduating from high school in 1987 is eligible to enter. The $1,000.00 awards are based on a combination of financial need and academic accomplishment with consideration given for service to amateur radio and community involvement. Applicants are not restricted to those preparing to pursue four-year baccalaureate degrees. Those working toward associate degrees or planning to attend an accredited trade or technical institution will also be considered. Entries must be postmarked no later than May 15, 1987. Winners of the awards will be announced on or about June 1, 1987. For information and application forms write to: DARA Scholarship Committee, 317 Ernst Avenue, Dayton, OH 45405.

• **Amateur Radio Equipment Donations** - The Posts & Telecommunications Corp. (PTC) has advised that the Radio Society of Zambia (RSZ) can receive amateur radio equipment donations from clubs, societies, or any others through them. RSZ is dwindling in numbers due to non-availability of ham gear within Zambia. No tax or duty will be imposed on such equipment. Also, a novice class license will be introduced wherein interested persons will be starting with VHF communications. Therefore, even 2m rigs, repeaters, antennas, etc., can be donated as well through the PTC, who will then pass them on to the Secretary. The contact address is: The Chief Radio Officer, PTC Telecomms Headquarters, P.O. Box 71660, NDOLA, Zambia.

• **LPARC Winter Hamfest** - Althcugh this came to *CQ* a bit late, the LPARC will hold a Winter Hamfest at the Civic Auditorium in La Porte, Indiana, on the 22nd of February. ARRL VEC Exams at 8 a.m. in the basement. For info contact WA9GKA.

• **Sweetwater, TX** - Nolan County ARC will operate a special events station during the World's Largest Rattlesnake Roundup on March 13–15. Operation will be on 20 and 40 meter General phone bands from 1500 to 2400 UTC. For certificate, send large SASE and QSL to WR5B, Rt. 2, Box 121-A, Sweetwater, TX 79556.

• **Fairbanks, Alaska Special Event** - A Special Event will be held in conjunction with the Fairbanks Ice Festival and Yukon Quest Sled Dog Race, March 13–22. Look for stations in Novice through Extra frequencies, on all bands 10–160, and most all modes. Special QSL's will be available via the station worked. All cards will go via the bureau unless an SASE or SAE and return postage are supplied.

• **"Introduction to Amateur Radio" Seminar** - The Chicago Amateur Radio Club will hold a continuous seminar entitled "Introduction to Amateur Radio" on March 15 from 12 noon until 5 p.m. at the North Park Village, Community Room, 5801 N. Pulaski Rd., Chicago. Live operation of transmitting and receiving equipment will be demonstrated. Film from ARRL "The World of Amateur Radio" will be shown. The amateur radio "Novice Class" license seminar will start on Monday, March 16 at 7:30 p.m. at the same address in "J" building. For information call 312-545-3622.

• **Macon ARC Special Event** - The Macon ARC will operate W4BKM from 1500Z until 2100Z March 28 to commemorate the Cherry Blossom Festival. Operation will be phone 14.237 and CW 7.137. For a Cherry Blossom certificate, send a large SASE to Macon ARC, P.O. Box 4862, Macon, GA 31208-4862.

• **The folowing hamfests, etc., are slated for March:**

Mar. 1, **Randolph Amateur Radio Hamfest**, Winchester, IN. Contact RARA, Kedrick Robbins, W9QUH, R1 Box 389, Parker City, IN 47368 (317-468-6568).

Mar. 1, **State Technical Institute Hamfest**, Plainwell, MI. Contact Robert Mousseau, KA8VVM, State Technical Institute, 33 Alber Drive, Plainwell, MI 49080 (616-664-4461).

Mar. 1, **MTARA Fleamarket**, Chicopee, MA. Contact MTARA, Box 3494, Springfield, MA 01101, or call Bob, WB1EQS, 413-532-4891.

Mar. 1, **Mt. Beacon ARC Winter Hamfest**, Newburgh, NY. Contact Stan Disbrow, WA2KQY, c/o Mt. Beacon ARC, P.O. Box 841, Wappingers Falls, NY 12590 (914-876-1659).

Mar. 7, **Dalton ARC Hamfest**, Dalton, GA. Contact DARCI, P.O. Box 143, Dalton, GA 30722-0143.

Mar. 7, **Lakeway ARC Swapfest**, Morristown, TN. Contact Dennis Livesay, KB4LSX, 3214 Horner Drive, Morristown, TN 37814 (SASE).

Mar. 7, **City of Palms Hamfest**, Fort Myers, FL. Contact Harry Arnold, K9ALX, 5414 Brandy Circle, SW, Fort Myers, FL 33907 (813-482-3113).

Mar. 7, **Milwaukee School of Engineering ARC Hamfest**, Milwaukee, WI. Contact W9HHXFEST, P.O. Box 644, Room C-6, Milwaukee, WI 53201-0644.

Mar. 7, **Glasgow Swapfest**, Cave City, KY. Contact N4HCO, Rt. #9 Box 112B, Glasgow, KY 42141.

Mar. 8, **WECAFEST '87**, Valhalla, NY. Contact Westchester Emergency Communications Assn., P.O. Box 131, N. Tarrytown, NY 10591.

Mar. 8, **Indiana Hamfest**, Indianapolis, IN. Contact Aileen Scales, KC9YA, 3142 Market Place, Bloomington, IN 47401 (812-339-4446).

Mar. 13, **Evening Hamfest**, Madison, NJ. Contact Splitrock ARA, P.O. Box 3, Whippany, NJ 07981, or call Steve Halliburton, WA2SOC, 201-366-9642.

Mar. 14, **St. Patrick's Swapfest**, Midland County Exhibit Bldg., east of Midland, TX. Contact Midland ARC, P.O. Box 4401, Midland, TX 79704.

Mar. 14, **Interstate Repeater Society Fleamarket**, Hudson, NH. Contact I.R.S., P.O. Box 693, Derry, NH 03038.

Mar. 14, **Fox Cities ARC Swapfest**, Kaukauna, WI. Contact Don Baker, NB9J, 621 W. 7th St., Kaukauna, WI 54130.

Mar. 15, **Sterling-Rock Falls ARS Hamfest**, Sterling, IL. Contact Sue Peters, P.O. Box 521, Sterling, IL 61081 (815-625-9262).

Mar. 15, **Insurance City Repeater Club Computer/Amateur Radio Fleamarket**, West Hartford, CT. Contact Chuck Motes, K1DFS, 22 Woodside Lane, Plainville, CT 06062.

Mar. 21–22, **North Florida Ham/Swapfest**, Ft. Walton Beach, FL. Contact PARC, P.O. Box 873, Ft. Walton Beach, FL 32549.

Mar. 21–22, **1987 North Florida Ham/Swapfest**, Fort Walton Beach, FL. Contact Playground ARC, P.O. Box 873, Fort Walton Beach, FL 32549.

Mar. 22, **Tri County ARC Hamfest**, Jefferson, WI. Contact Bob Barker, K9RIJ, 724 Burdick, Milton, WI 53563 (SASE).

Mar. 22, **HAMCOMP '87**, New Jersey National Guard 112th Field Artillery Armory, Lawrence Township, NJ. Contct HAMCOMP '87, c/o KB2ZY, Box 441B, RD #1, Stockton, NJ 08559 (SASE).

Mar. 28, **Lawton Fort Sill ARC Annual Event**, Lawton, OK. Contact K5kCKQ, 912 Bell St., Lawton, OK 73507.

Mar. 28, **Springfest '87**, Egg Harbor City, NJ. Contact Shore Points ARC, P.O. Box 142, Absecon, NJ 08201.

Mar. 28–29, **LTARC Hamfest**, Elizabethtown, KY. Contact Lincoln Trail ARC, P.O. Box 342, Vine Grove, KY 40175.

Mar. 29, **Walla Walla Valley ARC Swapmeet**, Milton-Freewater, WA. Contact Bernie Frazier, WA7CBX, 610 S. First Ave., Walla Walla, WA 99362 (509-529-9879).

Mar. 29, **Lamarsfest 1987**, Grayslake, IL. Contact Lamars, c/o Marc Abramson, P.O. Box 751, Libertyville, IL 60048 (312-255-0642 8–10 pm CST).

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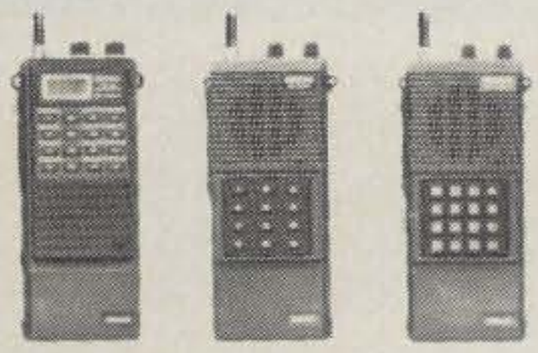

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VISA

New 20 meter world record holder ZY5EG taking a break after the contest.

The "DX Gooses Group" also known as South American Multi-Single champs LU1FKR.

Helen, AH6GQ, at the mike of her unique station. The amp is powered by a 2.5 kw gas generator, and the other equipment is powered by windmills and a hydroplant. No commercial electricity is available at her QTH.

Results of the 1986 CQ World-Wide WPX SSB Contest

BY STEVE BOLIA*, N8BJQ

Comments such as "Why schedule the WPX contest on Easter?"; "Why schedule Easter on the WPX weekend?"; and "Another *CQ* holiday contest!" are but a few of the many noted on the summary sheets of the participants in the 1986 *CQ* WPX SSB Contest. The combination of the Easter holiday and the lowest part of sunspot cycle 21 presented a formidable challenge to WPX contesters everywhere. Almost 1600 rose to the occasion, setting many records, working lots of DX and new prefixes, and having a good time.

With the exception of 10 meters, overall scores are still rising rapidly, with 6 world records, 11 continental records, and 1 USA record broken during the contest. Conditions favored South America. However, top scores were turned in from all parts of the world.

The new single-op champion is Rich Smith, N6KT, who returned to PJ2FR and reclaimed the top spot he held in 1983. Rich took advantage of excellent openings on 14 and 21 MHz to account for more than 3500 of his 4500 Q's. Rich only made 29 contacts on 10 meters and only 15 on 160 meters. Rich's 13M points shattered EA9IE's 1985 record by almost 5 million points. Finishing second, for the second year in a row (he tries harder) is Carl, AI6V/NH6. Making the most of his special AZ6 prefix, Arturo, LU6ETB, just edged out VP2MBA for third. Chuck, W7FP (VP2MBA), improved his score by almost a million points to move up from number 14 in 1985 to fourth in 1986, and the North American championship. Fifth place belongs to IO4VEQ, with W1BIH at PJ9J finishing sixth. Making his first serious attempt at WPX contesting, Jim Smith, VK9NS, turned in a fine 4.6M point log to finish seventh. Rounding out the top ten are 8P9AR operated by Ron, N6AUV; John, VE6OU/3; and Doug, VE5RA, at ZF1MM. The top six finishers all topped 5 million points in 86, compared with only three in 1985.

Some incredible single band scores were turned in in 1986, with three new world records established, along with several continental records. The top single band score, as well as the second highest single operator score of any kind, was turned in by Jim Hoffman, N5FA, at ZZ5EG. Jim's 9,794,448 points on 21 MHz is a new record, bettering the previous record held by HC9A since 1981 by over 3 million points. On 14 MHz Atilano, ZY5EG, found the going a little rougher, but still came away with his own world record, just edging by VP2EC's year-old record. For the trivia lovers, Atilano is Jim's father-in-law. Expect big things out of this family for many years to come, as N5FA has now moved to PY, and these two will be a force to reckon with for many years. The third single band record to fall belongs to Pedro, NP4A. Pedro set out to break VE3BMV's 7 MHz record and not only did he break it, but he just about doubled Yuri's score. Pedro utilized his three over three (160 and 90 feet) to make almost 2000 QSO's on 7 MHz. Guess the 9 hours he spent on the tower putting up the antennas was well worth it. While he did not get the world record he was after, Yuri, VE3BMV, did get a world championship and a North American record on 3.7 MHz with the fine 1.9M point effort. On top band Wally, LZ2CJ, turned in the top score, followed by IO4JMY and 5B4LP, who did get a new Asian record (he now holds 3 Asian records). Lest we forget 10 meters, XQ3D is the top finisher with 276,403 points.

Another world record was broken in the QRPp category, which is a tough one, even in ideal conditions. Danny, K7SS /WH6, became the first QRPp station to

*4121 Garden View, Beavercreek, OH 45431

The ops of Israeli special prefix station 4Z1Q. Left to right are 4Z4UT, 4Z4VG, 4X4PE, and 4X4OQ.

Pekka, OH8NW, operating at OH8PF /EA8, the 1986 Contest Expedition trophy winners.

top 2 million points, breaking H44R's 1984 mark. Congratulations, Danny. Single band QRPp leaders are KH6CP (28 MHz), LZ2EW (21 MHz), JA2JSF (14 MHz), YX3A operated by YV3AGT (7 MHz), OK3CTT (3.7 MHz), and RA6LU on 1.8 MHz.

The group at NP4CC is the multi-op, single transmitter champion for 1986, with expedition trophy winner OH8PF /EA8 edging out LZ7A for second. Number one in the multi-multi class is KH6XX for the second consecutive year. Finishing second in the multi-multi class, and holder of the new prefix world record, is N5AU, with 1008 prefixes in the log. What's next, guys?

In the USA, Austin, N4WW, claimed the top spot among the all band entries, followed by Randy, K5ZD, at NB1H (only 20K behind), with the 1985 leader, KI6P /WA6VEF, finishing third. Rounding out the top five are WX4G followed by KC1F. The top 5 all broke 3 million points, with less than 500K separating KC1F from N4WW. Among the single band entries, KQ2M's world fourth high on 14 MHz earned him a new USA record and the new USA trophy sponsored by KR2Q. Other single band leaders are W3BGN on 21 MHz, K5NW on 7 MHz, KR2J on 3.7 MHz, K5UR again on 1.8, and KR9G on 28 MHz. (Yes, there was some activity on 28.)

Adding much to the excitement of the weekend (and also a bit of confusion) were a host of special prefix stations and contest expeditions. XEFJTW operated by AA5B and K5HUI spent a good portion of the contest explaining where they were and what the call really was (I asked, too). Another deserving of special recognition is 3A2LF (3A6F during the contest), who has a brand new prefix for every WPX SSB Contest. Some of the others who helped to increase the multiplier total are: 4U1UN, 4M5J, DX2F, K4YT/DX0, XL7SV, YE0X, TR0A, YX3A, AZ6ETB, 3G3DX, JA3YKC/T32, 9L1SL, 3B8FP, VK9NS, HI60RCD, 3G4A, 3G4B, L4D, and ZF1MM, to name a few. A special thanks to all of these and to any others I might have overlooked for adding something special to the contest.

Much has been said and written about contest ethics recently, both in print and on the air. Complaints have been made concerning stations not being where they claim to be, multi-single stations violating the 10 minute per band rule, having multiple transmitters on the same band at the same time, out of band violations, etc. We do our best to keep the contest honest. However, writing rules to cover each possible situation, and monitoring every station for violation of these rules is an impossible task. Honesty by each of us, along with peer pressure on those suspected of violating the rules, is the best way to clean up our act. Remember, this is a hobby, and the object of the WPX contest is to have fun. Enough said.

As many of you know, I'm moving again. By the time youread this, I hope to be settled back in Dayton, and on the air. Hopefully, this will be my last move for several years. Moving a modest ham station, several computers, several thousand contest logs, a wife, two sons, and a rather large dog twice in less than two years is an experience I'd just as soon not repeat for a while.

For the multitude who posed the questions in the beginning of the article, moving a major contest is not something that can be done quickly or easily, and someone else has jurisdiction over question number two.

TROPHY WINNERS

SINGLE OPERATOR - ALL BAND

WORLD: North Florida DX Assn. Trophy. Won by: **Station PJ2FR operated by Richard J. Smith, N6KT.**
U.S.A.: Bob Epstein, K8IA Trophy. Won by: **Austin G. Regal, N4WW.**
AFRICA: Southeastern DX Club Trophy. Won by: **Juan Mario Ortigosa Castillo, EA8ACH.**
CANADA: Ed Sleight, K4SB Trophy. Won by: **John Sluymer, VE6OU/3.**
CARIB/C.A.: Arturo Gigante, Jr., HI8GB Trophy. Won by: **Station VP2MBA operated by Chuck Clayton, W7FP.**
EUROPE: Bernie Welch, W8IMZ Trophy. Won by: **Veroli Claudio, IO4VEQ.**
JAPAN: Palm Garden Radio Club Trophy. Won by: **Kinya Kimura, JH0LFE.**
OCEANIA: Down Under DX'ers Trophy. Won by: **Jim Smith, VK9NS.**
SOUTH AMERICA: Ron Moorefield, W8ILC Trophy. Won by: **Arturo J. Gargarella, AZ6ETB.**
WORLD QRPp: Dayton Amateur Radio Assn. Trophy. Won by: **Danny Eskenazi, K7SS/WH6.**

SINGLE OPERATOR SINGLE BAND

WORLD: John N. Reichert, N4RV Trophy. Won by: **Atilano De Oms, ZY5EG.**
U.S.A. 7 MHz: William Diggins, WA8LXJ Trophy. Won by: **John E. Hawkins, K5NW.**
CANADA: Gene Krehbiel, VE7KB Trophy. Won by: **Dale E. Green, XL7SV.**
EUROPE: Myron E. Crofoot, WB4VQO Trophy. Won by: **Jan E. Holm, SM2EKM.**
JAPAN: Ken Ruddock, K6HNZ Trophy. Won by: **Shigeyuki Seto, JK1MAZ.**
JAPAN 28 MHz: Joe Arcure, W3HNK, and Toshi Kusano, JA1ELY (Terry Appleton, W4GSM Memorial Trophy). Won by: **Naokatsu Toda, JH5AVE.**
WORLD 21 MHz: Lee Wical, KH6BZF Trophy. Won by: **Station ZZ5EG operated by Jim Hoffman, N5FA.**
WORLD 7 MHz: William Diggins, WA8LXJ Trophy. Won by: **Pedro J. Piza, Jr., NP4A.**
WORLD 1.8 MHz: Arch Doty, Jr., K8CFU Trophy. Won by: **Wally Stefanoff, LZ2CJ.**
U.S.A. 14 MHz: Doug Zwiebel, KR2Q Trophy. Won by: **Robert L. Shohet, KQ2M.**

MULTI-OPERATOR SINGLE TRANSMITTER

WORLD: Mike Badolato, W5MYA Trophy. Won by: **Station NP4CC operated by NP4CC, KP4BZ, WP4K.**

MULTI-OPERATOR MULTI-TRANSMITTER

WORLD: Henry Thel, VE7WJ Trophy. Won by: **Station N5AU operated by N5RZ, KM5X, K5MR, KE5CV, W5FO, N5TR, WB5VZL, NR5K.**
U.S.A.: Burt Curwen, KL7IRT Trophy. Won by: **Station KW8N operated by KW8N, N8DCJ, N8ATR, N8DMM, KU8E, KD8NS, NZ4K, KC8MK, KA8ETK, WA8BIN, WD8AJF, KQ8M.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **Station OH8PF/EA8 operated by OH8PF, OH8NW & OH8LP.**

(The **World Club Competition** Trophy and the **U.S.A. Club Competition** Trophy winners will be announced with the CW results, as each is a combined SSB and CW award.)

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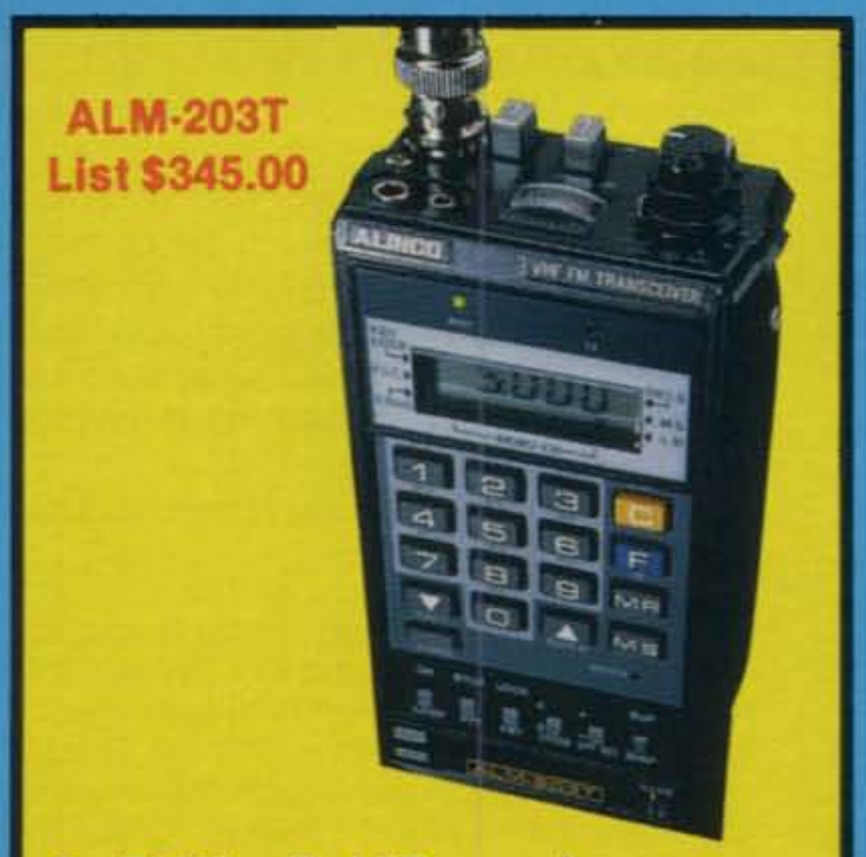

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The big signal on 15 meters belonged to Jim, N5FA, who operated ZZ5EG to a new world record and a score which has only been eclipsed by one other single op station in the history of the WPX Contest.

Number one Oceania Multi-Single was JA3YKC/T32 operated by members of the Osaka University Radio Club. Left to right are JI3ERV, JH4RHF, JH4WER, and JK3GRR.

A check of the WPX contest rules for 1987 will show a couple of minor changes which are worth mentioning. Rule 1 has been changed, eliminating the mandatory 5 break maximum. However, each break must be a minimum of 60 minutes, with at least 18 hours of off time for a single operator station. Also, rule 7 has been changed so that a portable prefix must indicate the DXCC country of operation. The trophy list also shows some additions, along with some deletions. Please check the current list and W1WY's contest column for any late additions for 1987. A copy of the current rules along with summary sheets and logs sheets can be obtained from *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801. Please include an SASE.

Thanks to all those who helped out with the 1986 contest. W8IMZ did a yoeman's job answering questions and handling lots of logs and other requests. Again, my wife Barb spent many hours opening mail, sorting logs, and the like. Also thanks to all of you who make my job easier by sending in legible logs that are duped and scored correctly.

We're still looking for new trophy donors for both the SSB and CW contests. Any individual, or club, wishing to donate a trophy may contact me through *CQ* magazine. Many categories are still available for both modes. Also, if you should win a WPX trophy, please drop the donor a note of thanks. It will be appreciated. Interesting photos of stations, operators, or unusual locations are also welcomed.

This year's contest will be March 28 and 29 (GMT). Please mail your logs to CQ Magazine, 76 N. Broadway, Hicksville, NY 11801. The mailing deadline is May 10, 1987. Logs sent to any other address may not ever find their way to me, or may be too late to count. If you want confirmation or receipt, send along a postcard with your log, and I will return it as soon as the log arrives. Hope to see you all, on the 28th and 29th of March.

73, Steve, N8BJQ

Random Comments

Lots of good ears out there; "thank you" to those with patience and good timing . . . *K7SS/WH6*. A funny contest for 5 watts. Hope to do it in the CW part, too . . . *YO5BQ*. Easter weekend NG for contest. Conditions very unusual—very few JA's . . . *W6YVK*. QRPp 10 equal heart shock. 88's for all the people who had patience to listen . . . *HK7IMB*. Worked first TU4 . . . *PA2PDN*. 900 milliwatts makes for lonnggg nights . . . *WA7NWL*. Good T/E but no short openings to the Carib. or Stateside. Ten is definitely not dead . . . *N5BA*. I thought a 45 minute band opening on 10 Saturday was bad until I sat through Sunday afternoon without any at all . . . *N9ACD*. Tried to work VK6IR on 15

for 35 minutes but no luck at the end . . . *ZS6PT*. Biggest thrill was picking up TR0A with QRPp . . . *KB7M*. Biggest thrill was having SU1ER and ZD9BV call me . . . *TU4BR*. Poor propagation. Very difficult to get through with 100 watts among those with 500 watts, especially on 20 meters . . . *3B8FP*. This is the most fun contest of them all . . . *AI6V/NH6*. Too bad can't catch the rare multipliers cause local QSO with high power masked them . . . *YC6LD*. My first attempt at all band operation in the WPX. Some very nice openings on 15 and 20 metres Stateside and Japan . . . *ZL1ANJ*.

Had a great time in the contest with only one bad spell of propagation lasting a couple of hours. Not bad for the 30 hour stint . . . *VK9NS*. Best results ever—maybe the new transceiver and 4-element Yagi did the trick. Having a rare prefix can create some big pile-ups . . . *K1BAZ/DV1*. Opening to Europe and U.S. was very short. Took advantage of opening to get as many multipliers as possible. JA's provided most of the points . . . *DV1NH*. First WPX contest—had fun—see ya in the CW test . . . *DX2F (KA3DRR/DV2)*. Very exciting contest with some good DX catches: HS0, OD5, JY, 3D6, ZL8 . . . *NB1H (Op. K5ZD)*. Lots of funny prefix's but lots of fun, too . . . *KA1EKR*. A shock to work 5X5GK leisurely for a new one all time in the general portion of 15! . . . *W0MHK/1*. Glad Easter doesn't fall on every WPX . . . *K1KJT*. Biggest thrill was being called by S79WHW, 7X2LS, and FO8JP . . . *NJ2L*. Need 10 meters to relieve QRM on 15 and 20; come back sunspots . . . *KF2O*. Worked 5 new countries. Wish I could have put in more time! . . . *WA2UDT*. Linear died one hour into the contest. So much for a big score on the low bands . . . *KS2M*. Africa opened up on Sunday afternoon—just when a lightning storm opened up . . . *KA2VAJ*. Too many USA calling CQ on 75 meters. Can't hear the DX or they get covered up. Fun contest anyway . . . *WA2VYA*. 101 for 101! . . . *KY2P*. A sluggish start. Spotted KT3M 140 QSO's by 1100Z Saturday. Not a good idea . . . *KQ2M*.

The only time I laughed during the contest was when a "VE" station jokingly asked me to QSO with him to qualify for the "Rag Chewers Club" . . . *KR2J*. Special thanks to W3GRF for the use of his fine station and antenna farm . . . *KM3T*. I must be in a bad operating spot, for everyone could work and hear the Western Pacific except me . . . *KA3OAX*. First WPX—wait till next year—hi hi. Worked UZ9AWZ, UQ1GZW, and UP1BZZ in hour's time after months of trying to get them . . . *K3ZLK*. Getting TR0A on the second call was a real surprise. Also had to fight jr. op KA3OAX for antenna time . . . *W3FTG*. Good condx. but favored SE Europe . . . *W3BGN*. Scheduling Easter during the WPX Contest should be prohibited . . . *AI3Q*. Easter had a definite effect on lowered participation on Sunday—very frustrating to be told I was loud in Europe and still receive very few calls. As always, a very friendly contest . . . *KQ3V*. Thanks to the VE's for the excellent activity . . . *N3BJ*. Good contest. Surprised at 800-plus contacts on 15 meters with no JA's . . . *WX4G*. This may be the bottom of the sunspot cycle, but still lots of juicy DX . . . *AI2C/4*.

After 52 years on the air I finally worked my first VE8 . . . *W4WKQ*. First big contest—loved it! However, I had a frustrating time trying to find out where 4N4 or AZ land is . . . *N4NGG*. Had a good score going Friday, but storm hit Saturday nite . . . *AA4MM*. Surprised when VS6DO called me on 20; even more surprised when he gave me #1 . . . *K5RX*. New antenna works great on the high bands but need something better on 40/80 than a wet noodle . . . *WB5BIR*. Some life still left on 10 meters . . . *WA5IYX*. Enjoyed it when someone said I was a new multiplier for them . . . *WB5J*. Was happy to get home from XEFJTW in time to give out another unique prefix . . . *AA5B*. Murphy lives in Oklahoma. Computer cratered along with 100 QSO's, then xmtr died, but I loved it . . . *NW5H*. If 40 DX ops would listen up there would be only 1 test instead of 2 . . . *W8AKS/6*. Very tough contest with low power and current propagation conditions . . . *K6CSL*. First serious 160 meter contest. Fun, but good listening ant. would improve my lot. 1825–1830 kHz DX "window" was both useless and unnecessary. Suggest abandoning it (at least for this contest) . . . *N6VI*. Finally tracked down HS0A for *CQ* 1986 WAZ award credit . . . NS7Z. Why was the HV on the amplifier turned off when I spent all that time calling K4YT/DX0? . . . *WB7RBJ*.

Excellent 40 meter Europe opening Saturday nite . . . *W7TJ*. Easter weekend sure poor for me—not a SSB op—see you for real using QRP in May . . . *KU7Y*. Finally got a JA opening the last two hours of the contest. Really helped my score . . . *KC7V*. Had a local noise level of S-7 for most of the weekend and my dog kept pulling out the plug on my AC power bar and putting me off the air (HI) . . . *WB7CLU*. It's interesting to tell HS0A three times that we've worked before. Why couldn't he have been XU1SS whom I need? . . . *WA7CGR*. Hard to tell the DX from the U.S.A. . . . *W7MLJ*. Only 2 "DX" QSO's—PJ2FR, ZL2BT. Very poor conditions on West Coast . . . *N6TR/7*. The way the Europeans keep calling you, it's hard to believe it's the bottom of the sunspot cycle!

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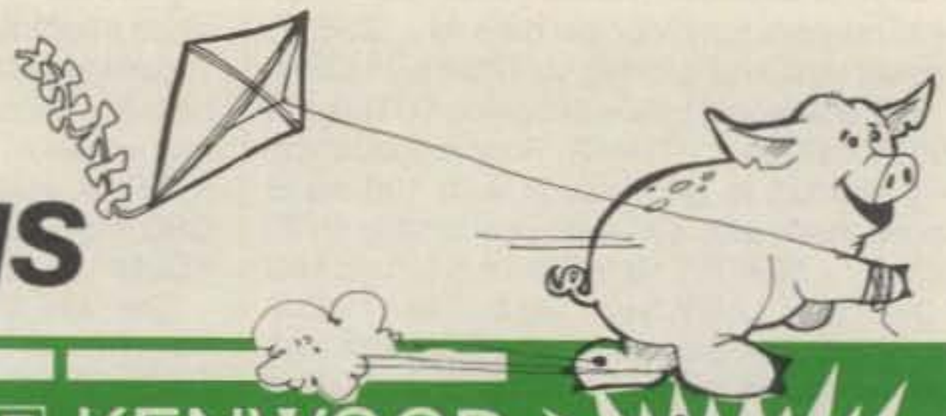

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U.S.A. TOP SCORES

SINGLE OPERATOR

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N4WW	**3,711,072**	AE6U	1,975,877
NB1H	3,689,000	K5RX	1,860,375
KI6P	3,471,048	AI8S	1,776,628
WX4G	3,411,632	AI2C/4	1,442,816
KC1F	3,255,420	NJ8N	1,225,440
KM3T	2,942,576	WA3SPJ	947,646
K3ZO	2,589,510	NJ2L	943,094

28 MHz

KR9G	3,536

21 MHz

W3BGN	476,000
N4MM	298,320
NC2V	273,375
KC7V	250,222
KA5W	249,250
KC2KU	243,570
K6SVL	141,476

14 MHz

KQ2M	**3,362,865**
N2AA	2,707,200
N7TT	1,262,976
KE7V	703,890
KQ9L	684,336
WF5E	574,449
AG7M	461,114

7 MHz

K5NW	**343,430**
N2WT	253,368
AG9S	130,000
KJ3L	85,626
KBØU	53,152
WA4QQV	28,518
N9BUS	6,784

3.7 MHz

KR2J	603,840
KN8R	392,128
KQ3V	230,864
KE8AZ	124,712
N3BJ	117,900
KØCS	106,128
KU6J	85,050

1.8 MHz

K5UR	64,722
AA4MM	41,600
N6TR/7	24,926
K7IDX	24,360
N6VI	18,300
W8IMZ	6,512
ABØX	6,000

QRPp

WB9HRO	A	55,796	N5BA	28	1,474
N8CQA	A	39,360	N1AFC	21	90,558
W6YVK	A	16,456	W6CN	21	18,216

MULTI-OPERATOR

SINGLE TRANSMITTER

KRØY	4,126,274	AB6R	2,189,408
KI1G	4,062,933	KM9L	1,948,684
KU4V	3,480,960	NE2W	1,545,783
AI7B	3,413,785	WI6Y	1,544,405
NU6S	2,318,360	AI6U	1,298,682

MULTI-OPERATOR

MULTI-TRANSMITTER

N5AU	**9,733,248**	WC6H	3,112,800
KW8N	**8,473,705**	W3GM	981,065
NT5D	5,178,184	KC3EK	924,960

WORLD TOP SCORES

SINGLE OPERATOR

ALL BAND

PJ2FR	**13,040,435**	8P9AR	4,620,532
AI6V/NH6	6,411,300	**VE6OU/3**	**4,091,976**
AZ6ETB	**5,357,160**	ZF1MM	3,877,216
VP2MBA	**5,312,502**	**N4WW**	**3,711,072**
IO4VEQ	**5,253,075**	NB1H	3,689,000
PJ9J	5,073,640	VE3XN	3,688,750
VK9NS	**4,685,280**	KI6P	3,471,048

28 MHz

XQ3D	276,403
CE6DFY	210,474
CE3ZI	113,240
CX2AAL	90,896
EA8VV	41,200
CE4NV	25,032
JH5AVE	**23,970**

21 MHz

ZZ5EG	**9,794,448**
CE6EZ	4,705,659
L4D	3,946,362
HC1OT	3,309,171
YU3BO	2,136,750
ZZ5ABW	2,099,760
VK6IR	1,736,928

14 MHz

ZY5EG	**5,087,020**
VE1NG	3,916,965
TU4BR	3,483,480
KQ2M	3,362,865
SM2EKM	**3,336,734**
AH6GQ	2,863,680
N2AA	2,707,200

7 MHz

NP4A	**6,668,184**
XL7SV	**3,454,864**
YV6CAX	2,062,800
UR2RRR	1,061,802
SM5AQD	936,992
UM8MO	934,272
UAØTO	886,080

3.7 MHz

VE3BMV	1,928,720
DF8XC	693,546
KR2J	603,840
HA4KYN	590,646
EA7AZJ	535,164
I4EWH	418,696
KN8R	392,128

1.8 MHz

LZ2CJ	**193,590**
IO4JMY	145,624
5B4LP	142,272
VE3PN	83,752
K5UR	64,722
HB9CXZ	54,026
AA4MM	41,600

QRPp

K7SS/WH6	**A**	**2,078,490**	LZ2EW	21	112,112
4X6IF	A	482,798	JA2JSF	14	64,500
IK6ATS	A	290,655	LZ2QV	7	58,764
DL8PC	A	262,152	OK3CTT	3.7	65,968
KH6CP	28	4,920	RA6LU	1.8	5,712

MULTI-OPERATOR

SINGLE TRANSMITTER

NP4CC	**11,201,571**	TRØA	6,624,268
OH8PF/EA8	**9,898,245**	IO3MAU	6,478,272
LZ7A	9,769,206	UZ4FWO	6,465,789
DFØSSB	8,651,334	HG7B	6,308,176
LU1FKR	7,710,374	RL8PYL	6,224,577
LU2E	7,204,068	FF3TV	5,723,514
HG6N	6,981,410	JA3YKC/T32	5,472,456

MULTI-OPERATOR

MULTI-TRANSMITTER

KH6XX	18,276,326	JA9YBA	4,966,032
N5AU	**9,733,248**	JA7YFJ	4,380,865
KW8N	**8,473,705**	WC6H	4,380,865
WL7E	7,521,330	JH8YCT	2,158,240
NT5D	5,178,184	W3GM	981,065

Great contest . . . *AI8S*. Spent 2 nites plotting propagation ala KH6BZF, then precisely laid out "idle times," ran gray-line charts, then slept through morning openings. Went out and bought a Jaguar XJS on Saturday AM to ease the frustration . . . *WD8QDQ*. Friend called me 24th hour into the contest. Was so tired it took me a full minute before I understood his urging that it was him . . . *KE8AZ*. The most U.S. stations I've heard on 160 in a WPX contest . . . *W8IMZ*. My 1st WPX contest, a real treat . . . *NE9O*. Biggest thrill was working VK9NS on 40 meter phone . . . *N9BUS*. I was again amazed at the polite U.S.A. exotic prefixes giving numbers to a lowly WØ . . . *WØRXL*. Who needs Murphy? Had too many non-ham problems . . . *KNØL*.

Substituted radishes, carrots, and cauliflower for my usual Granola Bars as "contest food." Got a 60% score increase . . . *KØCS*. Boy was I dumb to pick 160 for a single band effort . . . *ABØX*. 20 meters during the WPX sure means living in QRM city for a whole weekend . . . *SM2EKM*. Very high QRM from EU . . . *I4EWH*. Nice contest. Pity no VK's . . . *PAØZH*. Thrill holding 3 MHz band and being called by fellow operators and friends just to give me points . . . *GM4WEW*. What a difference from my last WPX contest in 1982! (4.7 million points) . . . *IV3PRK*. Sorry, many QRT for technical problems. The old FT-250 is 15 years old . . . *HA8KQX (Op. HA8IE)*. Nearly 50 US stations worked, and VU2 . . . *IO4JMY*. Had a terrible cough/cold so not in best form . . . *G3FXB*. Biggest thrill—working 3D6 on my "wet string"—conditions good . . . *G4YEK*. Poor

John, YV6CAX, seems pleased with his South American record score and world third place on 7 MHz.

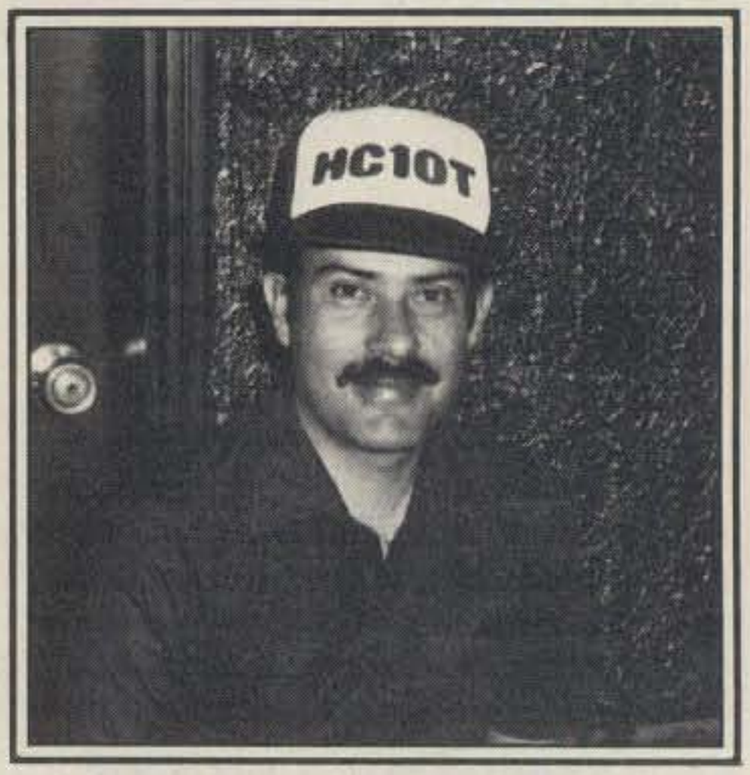
propagation to the US the first day—no pileups whatsoever. The second day was a whole lot better. The loudest signal from the States—N2AA . . . *OH1AF (Op. OH1EH).* Enjoyed the single op effort (usually operated in the UR1RWX team) . . . *UR2RJ.* High TVI—low score . . . *LZ1HA.* My first contest; I'll be a regular from here or from the states for years to come . . . *J40DT.* Good condx on Sunday. Some new countries for me . . . *OK1DMA.* Unfortunately the WX had been rude to my antennas, so they didn't work too well . . . *OZ1DPW.*

Spent most of my time on 28 MHz trying to beat it open. On 2nd day harmonics of some YU 14 MHz stations started coming through, and after 40 minutes of calling, a string of HA's and a few YU's were worked . . . *OH1ZAA.* I got a terrible cough just for the contest . . . *OH6YF.* Must get a beam for the next contest . . . *TF1PS.* A good contest even at this point in the solar cycle . . . *EI1DH.* Is the first contest in HF bands with my Italian call. Next year with my call from T77F . . . *IK2HSW.* My goal was to work HS0A for WAZ Anniversary award. Guess I don't win with this score, hi (3 pts) . . . *LA8CJ.* Conditions disappointing on 21 and 28, but quite lively on 14. Pleased to work into U.S.A. and Japan with little effort . . . *GM4GPN.* It's very difficult for a "little gun" to work on 20 meters between so many "big guns." I hope to do a better score next year . . . *EA2CAC.* Suffered on 20 meters, W's were too strong into Europe . . . *VK6DU.* Bob (W4ZFE) is an old school friend and had never worked a contest before and couldn't work my C64, but he enjoyed watching me . . . *W4WJJ.* Good to hear 15 open so well . . . *AA0A.* 160 and 80 were a big plus, 40 and 20 a big disappointment; overall score—way down . . . *KM0L.* Noise on 40 the pits . . . *NZ5I.* Biggest thrill—working WL7E on 160. Disappointment—K9ZO was operating at the time. I was asleep! . . . *KM9L.*

More U.S. prefixes than ever. How about an award for the first one to work over 1000 prefixes in the contest? . . . *NE2W.* Heard Russia Saturday nite but could not work one until Sunday. Our first contest. Lots of fun . . . *KE5TC.* Lost 2 amps, 15 meter quad, and rotator, all within 2 hours. Had fun anyway . . . *WK6V.* This was my 2nd time as a "sought after" station (1st was ARRL 1983 with CN8CX). Biggest thrills had to be when stations like JY8GO called me for the 2nd time and I had to tell them they were dupes . . . *KU4V. CQ* WW WPX has high energy, great participation, and equitable scoring system, a fun quotient of 1.86, and next year we will win it . . . *KI1G.* 21 hours into the contest we lost power supply; be back in May . . . *KJ9D.* New prefix (NF9) really boosted the score this year . . . *NF9S.* We had to be nuts to operate the test with dipoles. Glad we had a KW. Lost an 830 at 0130 Sat. Good opportunity for our new contesters to get their feet wet . . . *KA2RGI.* Now that my time on Guam is short, it was nice for all the multipliers to come by and work me . . . *AH2BE.* HI60RCD was a special call to commemorate the 60th anniversary of Radio Club Dominicano, Inc. . . . *HI60RCD.* Abnormally high amount of 75 meter inactivity . . . *VE4ALO.* Someone in U.S. asked me what kind of antenna could make so strong signal on 75 and 40 meters, though we had only GP (only 100 watts on 75) . . . *JA3YKC/T32.*

Our antennas were broken by snow so we could QSO only 4 stations! We had been resigned to play cards . . . *JA0ZNA.* Conditions were not so good, but on 3.8 MHz we had many pile-ups from the West Coast . . . *JA1YWX.* We faced a trouble during this contest. The AC line stopped suddenly. This continued for about 8 hours. We could have QSO more 300 stations without this . . . *JA1YAD.* Despite almost 4000 QSO's worked, only 3 JA's . . . *OH8PF/EA8.* The first time in Multi-Single in *CQ* WW WPX with low power station but very enjoyable. CUL . . . *YB0ZDC.* First time Multi-Single from YB land with special prefix. We had a great time. It was fun, fun, fun . . . *YE0X.* First contest operation with special HQ station call sign . . . *TR0A.* Our first serious contest effort. Enjoyed it . . . *JY8GO.* Beautiful conditions during 30 hours . . . *ZZ5EG (Op. N5FA).* Sometimes I had pile-ups with signals S0 . . . *ZY5EG (Op. PY5EG).* Will be back next year on 40 meters . . . *5B4LP.* I heard many stations of Europe and U.S.A., but they didn't hear me. Anyway, it was a nice expedition for me . . . *JM1LPN/JD1.* Good contest. Another dozen multipliers would have put me over the 4 million mark . . . *VE1NG.* About 100 WPX's and 1272 QSO's better than my last year's effort.

Want to be high score for N. AM. some year. Tnx great test . . . *VP2MBA (Op. W7FP).* Sure hope that solar cycle 22 isn't too far away . . . *VE7EIK.* Too many dupes from guys with very low totals. I appreciate the help, but . . . *VE5FX.* Very enjoyable. Would like to see it restricted to transmitter power only—no amplifiers . . . *VE1GB.* My very first contest—loved every minute of it . . . *XE1XJK.* Went for coffee at 1015 Sunday. Not much about. Tuned bottom for a change and WL7E like a tank for the last



Pedro, HC1OT, fourth in the world on 21 MHz, and a CQ reader.

state on 160, now for same on CW . . . *VE3PN*. I spent 9 hours on the tower putting up the antenna. Got everything ready one hour before start of contest. It was fun to operate below 7.100 MHz . . . *NP4A*. Neighbor in EU direction screaming about 15 meter TVI (21 MHz IF) . . . *8P9AR (Op. N6AUV)*. 20 over S9 line noise the first night. City is bad place to operate low bands. Apologize to all those I couldn't hear . . . *VE3BMV*. Most "dups" gave me serial numbers below 100. Best score yet, but lacked strong openings to Europe . . . *HH2WL*.

Station Operators
Multi-Operator Single Transmitter

KR0Y & K4VX, AH2U. **KI1G** & K1NG, KB1AW, KB1LN. **KU4V** & N4ZC, WA8MAZ, K2SD. **AI7B** & W7EJ. **NU6S** & KI6CG, K6GSS. **AB6R** & NC6U, NW6S, W6TMD. **KM9L** & K9ZO, WB9JKI. **NE2W** & N2CIC, NI2T, NK2H, N2HR, KD2PC, KA2CDE. **WI6Y** & AK6T, CE3AQI, K4UVT, K6ZM, KB6KKH, NB6L, WB6MZQ. **AI6U** & W6UQV, KB6HRB. **WK6V** & WB0QPO. **NF9S** & N9EJL, NB9C, WB9NOV, KD9TC. **NZ5I** & W5ASP, W9LVI, KA5ZPT, K5RVK. **KW6C** & K6KLY, WD6ERA. **KJ9D** & KK9V. **AA0A** & W0HBH, WD0FPY, NI0G, KA0DQI, KB0KK, KM0R. **KM0L** & K0UAA, KB0WD, KC0HV, KU0G, N0CDH, N0CLV. **KD5RW** & KD5RW, KA5DLM, KA5BOO. **N6CCL** & N6IYI. **KJ0G** & K0GAS. **WG5J** & WB0TEV/5. **WE6G** & W6REC. **W4WJJ** & W4ZFE. **W7UQ** & KA7KGE, KA7KGF, AK6N. **KA2RGI** & K2EAX, KA2CIW, N2FZA, N2GBT, WA2UJF, WB2RNI. **KE5TC** & KE5NU. **NP4CC** & KP4BZ, WP4K. **TI2OY** & TI2OZ. **VE4ALO** & VE4VV. **VE4AA** & VE4IM, VE4CCC. **HI6ORCD**: HI8LC, HI8DDC. **VE3UOT**: VE1BLG, VE2BTW, VE3AER, VE3CKR, VE3HTT, VE3NGT, VE7FPS. **XE2PPP**: XE2GDD, XE2JFR, XE2PEE, XE2PPT, XE2PQ. **VE7UBC**: VE7's FXV, FXG, FJX, EWU, DES, CXG, ACY, MT. **XEFJTW**: AA5B, K5HUI. **OH8PF/EA8**: OH8PF, OH8NW, OH8LP. **TR0A**: TR8JLD, TR8SA. **4Z1Q**: 4Z4VG, 4Z4UT, 4X4OQ, 4X4PE. **JA1YWX**: JI1CUP, JJ1HJR, JM1CAX, JF2IWL, JI2GUT, JR4NIV, JA6933. **HS0A**: HS1AOR, HS1ALP, HS1AMH, HS1BG, HS1AON, HS1AOK, HS1AOL. **JY8GO**: WA6POZ, W6RCL.

JA6YAI: JH6VLF, JE6MQW, JE6UWI, JF6KIV, JF6PPQ, JG6EAP, JG6OZC. **JA7YFB**: JN1RON, JE7JWB, JR7JLU, JR7OEF. **JR4QZH/4S7**: JR4QZH, JR4PMX, JE4COM. **JA1YAD**: JS1KNE, JS1PAQ, JH5GHM, JA9UFS, JH9AMJ, Minohara, Tabe. **JA0ZAV**: JA0VHI, JA0OSV, JA0RUG, JH0HON. **JA0YAD**: JR0JFM, JR0URQ. **JA1YCG**:: JO1MMI, JH5GHQ/1. **JR1ZTT**: JK1PZZ, JP1DTO, JR4WKV. **JA0ZNA**: JR0ELG & JR0MBD. **LZ7A**: LZ2CC, LZ2PO, LZ2HE, LZ2DF, LZ2SC, LZ2KK, LZ2E41, LZ2E72. **DF0SSB**: DL6FBL, DF9ZP. **HG6N**: HA6ND, HA6ON, HA6OQ, HA6NY, HA6NQ, HA6NF. **IO3MAU**: I3MAU, I3TSS, I3FIY. **HG7B**: HA7UG, HA5WA, HA5MY, HA7UO, HA5PP, HA6KQ. **FF3TV**: F6BBJ, F6CTT, F9IE. **HG9R**: Club Group. **GB0WAS**: G3KDB, G3NAS, G3NLY, G0DAY. **4N2E**: YU2LRU, YU2PA, YU2RA. **YU3AI** & YU3BM, YU3EO, YU3MM. **YT2R**: YU2OG, YU2MM, YU2OH, YU2DQ, YU2GR, YU2MY, YT2AA. **HG1Z**: HA1XY, HA1XR, HG1DRD, HG1ZE, HA1RS, HA1RT. **HA5KKC**: HA5LV, HA5MA, HA5OG, HA5MD, HA5WU, HA5MO. **PA3CEF**: PA3CEF, PA3DWD, PA3CEE, PA3CJK. **YT3T**: YU3BQ, YU3DE, YU3EIJ, YU3DRW. **OH8AV**: OH8MA, OH8DD. **HG1S**: Gyula, Pal, Ferenc, Tibor, Laslo, Karaly.

HA2KRM: Jozsef, Attila, Gabor, Csaba, Janos, Laszlo. **HA2KRP**: HA2RP, HA2EEO, HA2UG, HA2PP. **DL0WPX**: DF2ZO, DK2XX, DK8ZL, DL1FAK, DL2ZBN, DL2ZBP, DL3ZBA, DL3ZBC, DL4ZBJ, DL4ZBK, DH2FAR. **HA6KVB**: Jozsef, Zoltan, Peter, Sander, Laszlo Simon, Laszlo Suszter. **HA5KDX**: Balazs, Sandor, Laszlo, Istvom, Zoltan, Tibor. **Y54ZA**: Y54TA, Y54UA, Y54VA, Y25JA. **HA5KDQ**: HA5MK, HA5WE. **ON7ZV**: ON4GO, ON5's AV, IQ, ON6's AH, MH, QR, VL, ON7's KL, ZV. **SP5PBE**: SP5ELA, SP5FKW, SP5JTF, SP5JTM. **CQ1BZN**: CT1BZN, CT1RZ. **4N2X**: YU2LH, Zvonko. **HA8KZC**: HA8GZ, HA8UI, HA8ZC, HA8UB, HA8XF. **Y31ZO**: Y24ZO, Y31LO, Y31MO. **HA7KLG**: HA7MV, HA7LD, Aniks. **DL0JU**: Club Group. **Y44ZK** & Y44YK, Y44RK, Y22RK, Y23YK, Y38YK. **OK1ORA/P**: OK1-22310, OK1-21662, OK1DHP, OK1AYD, OK1DHL. **DK0IN**: Club Station. **G3UOA**: 8 Ops. **SP9KJT**: SP9OJR, SP9DBA, SP9MDA. **OK5SSM**: Club Group. **SP2PDI**: SP2CBS, SP2MKO. **HA5KDB**: HA5AIY, HA5XA, Gyorgy, Zsolj, Sandor. **OZ1ABA/A**: OZ1ABA, OZ4RS, OZ6ZZ. **LZ1KVZ**: LZ1ZF, LZ1-F-192, Velko. **LZ2KPD**: George, Nadya, Dan. **YO6KAL**: YO6EX, YO6BZH, YO6BTP, YO6CRO. **OH7AI**: OH7BY, OH7EU, OH7HM, OH7KR, OH7UV. **SP7KTF**: SP7LIH, SP7NJX. **F6FYD** & F6EXV. **HA8KAX**: HA8IQ, HA8LKB, HA8LKC. **YO6KBM**: YO6CJN, YO6DDF. **DK0CB**: DL2HCB, DL9HCL, DG3HY, DL1HCI, DL4HAQ, DL1HBT.

Y31ZA: Y31KA, Y31LA, Y31PA. **LZ1KNP**: Ilia, Dimitar. **HA8KCO**: Andras, Attila, Istvan. **EI7DJ**: EI8AU, EI5FK. **YU1EFG**: Ops of Radio Club "Boris Kidric." **G4XOM**: G4IEB, G4YBT, G4XOM, G0AGH. **LA2Y**: LA4MY, LA1HZ, LA6TCA, LA9PW. **OK1KQJ**: Club Group. **DF0CF**: Club Group. **LZ1KZM**: Dimiter, Urszula, Atanas. **SP1PEA**: Club Group. **4N2D**: YU2FK, YU2DZ, YU2DZ, YU2TL, Ivo, Tomy, Ante, Marijo, Zeljke, Mladen. **HA6KNX**: Jozsef, Gyula. **PA3CPG** & PA3CPI. **HA7KMP**: Thomas, Janos. **PI4TTC**: PA0FVH, PA2JMK, PA3CKY, PA3CNL, PA3DOX, PA3DUC, PA3DZP, PA3CTA, PA3EEX, PD0ORP, PD0OEK, NL8421. **HB0/HB9DFY**: HB9DFY, HE9WIV. **OK2KJT**: Club Group. **OK2KPS**: Club Group. **OK1KCF**: Club Group. **OK2KNJ**: Club Group. **OK2KDS/P**: Club Group. **OK3KVE**: Club Group. **HA7KNT**: HA7PX, HA7ZT. **OK1KCP**: Club Group. **OK3KFO**: Club Group. **JA3YKC/T32**: JH4RHF, JH4WER, JI3ERV, JK3GRR. **KH6DW** & WA6AUE. **FO8JP** & FO8IW. **AH2BE** & AH2AN, NY6M/KH2. **YE0X**: YB0TK, YCO's DPO, DPZ, DLG, EMJ, DNK, GVT, YDO's EAQ, HRO. **VK6DU** & VK6NMC, VK6ASR. **WH6W** & JR6NWN. **YB0ZDC**: YC0ERJ, YD0EHN, YD0HSE, YD0JDF. **VK6AFK/P**: VK6AFK, SWL ARDXC #2130 (Wesley Beck). **LU1FKR** & LU1FTU, LU2FDR, LU2FFD, LU5FHM, LU9FDG. **LU2E**: ZP5JCY, LU9FFA, LU2DKT, LU8DPM, LU8FEU. **CX1DX**: CX3AN, CX8BZ, CX9BC, CX4CC, CX1BBL. **LU1VZ**: LU1VK, LU9VAB, LU1VD, LU3DXL, LU1VJR, LU7VCA. **HK3MAE** & HK3IXJ.

CX1CC: CX4AQ, CX4ABU, CX3ABE, CX2ABF. **UZ4FWO**: UA4FZ, UA4FDS, UA4FAO, UA4FEF. **UQ1GWW**: UQ2-037-116, UQ2-037-83, UQ2GLK. **UQ1GZW**: UQ2GM, UQ2GN, UQ2GID, UQ2GKL, UQ2GKA. **UP1BZZ**: UP2BIG, UP2PAJ. **UZ6LWZ**: UA6-150's, 1060, 1240, 1103, 1336, RA6LRT. **UT4UXW**: UT5UGR, UB5XCM, UT4UX. **UZ2FWA**: UA2FF, UA2FGA, UA2FJ, UA2FX. **UB4QWW**: RB5QW, UY5ZM, UB5-064-866, UB5QLM. **UP1BZG**: UP2BCO, UP2BCT, UP2BOC, RP2BIL, UP2-038-439. **UP1BWW**: UC2WAO, UT4UN, UP2BIJ, UP2BKW, UP2-038-892. **UB4IWH**: RB5ID, RB5II, UB5IML. **UZ4WWB**: Nick, Alex, Boris. **UP1BWR**: UP2BIL, UP2BKF. **UB4MWA**: UB5MDA, UB5MMR, UB5MDD. **UB4MZL**: UB5MTV, UB4ML, UB4MPM. **UC1AWC**: Sologoob, Kabak, Burdin. **UP1BWG**: UP2BAA, UP2BJK, UP2BPI, UP2BZ, UP2BN. **UZ3QWX**: Andrej, Nick, Yuri. **UZ4LWU**: UA4LBF, UA4LDE, UA4LDN. **UR1RWW**: Club Group. **UZ3WWW**: Shavyrin, Klassen, Retling, Mickmailov, Pikkiev, Prockushev, Chaitsky, Krutikov. **UP1BWC**: UP2BQB, UP2-038-1730 & 1732 & 1734. **UZ4WWC**: Club Group. **UC10WU**: Victor, Vladimir F., Vladimir K. **UP1BYC**: Jurgis, Andrius, Vita. **UR1RWQ**: Varjo, Vark, Mikkiver. **UZ6AYN**: UA6AH, UA6ABX, UA6-101-1001, UV6AJH, UA6LE, UA6BGS. **UC1WWF**: UC2-006-27, UC2WBI, UC2WBP. **UZ1AWW**: Club Group. **UQ1GXJ**: UQ2-037-437, UQ2-037-462, UQ2-037-436. **UB4TWL**: Club Group. **UB4EXZ**: UB5EQG, UB5ELE, UB5-060-16. **UZ3AZG**: Ostrenko, Kuleshov, Maxurov. **UP1BZM**: UP2-038-1751, UP2-038-1744, UP2-038-1787.

UB0SZZ: Valil, Jaroslav, Vasil. **UR1RXL**: UR2ED, UR2RLK, UR2-083-083. **UZ4AWB**: Club Group. **UT4UWL**: UT5-186-162, UT5-186-201, UT5-186-204, UT5-186-205. **R4ANK**: Sergeev, Turman, Liangasov. **UZ3PWJ**: Club Group. **UZ3DZQ**: V. Budnikov, A. Korotaev. **UZ6AYG**: Club Group. **UB4JXZ**: UB5-067-2224, UB4JFJ, RI8BP. **UZ4FWX**: UA4FMV, UA4-148-4701, UA4-148-4821. **UB4LZJ**: Zoya, Victoria. **UB4WYA**: Nechytalyuk, Vyteu. **UR1RWB**: UR2-083-236, UR2-083-238, RR2RR. **RZ6AWP**: Club Group. **UB4WZB**: Baluk, Melnic, Gezasimov. **UT4UWT**: UT5-186-129, UT5-186-99. **UP1BYT**: UP2-038-1758, UP2-038-1759. **RL8PYL**: RL8PA, RL8PY, RL7PAV, RL7PAV, RL7PHO, RL7PHL, RL7PKF, UL7PAE, UL7PCZ, UL7-023-500. **UL8LWA**: UL7LEG, UL7LEN, A. Sytow. **UZ0CWW**: Frolov, Tuzkin, Saveliev, Pzokopov, Lukin, A. Pzokopev, Vlasovig, Zekov, Koldin. **UZ9CWA**: UA9CR, UA9CG. **UZ0QWT**: UA0QEJ, UA0QBS, Serge. **UZ0AWB**: UA0AFC, RA0AKL, UA0-103's -20, -239, -390, -712. **UZ9CZM**: UA9CMF, UA9COW, RA9CPQ, RA9CLK, UA9-154-2129. **UZ0LWO**: UA0NL, UA4PAM, UA0LD. **UI9BWF**: RI8BQ, UI8-053-841, UI8-053-855. **UZ9OWD**: UA9-145-316, UA9-161-288, UA9-145-168, UA0-130-554/U90, UA9-133-172/U90, UA9-145-364. **RD1DWZ**: UD60015, UD6001-334, UD6DCF. **UZ9CYP**: UA9CUA, UJA9-154-2105, UA9-154-2106. **UZ9YXO**: UA9YIH, UA9YJP, UA9YII. **UM9MWO**: UM8MAA, UM8MKO, UM8-036-103. **UZ9XWO**: Yurij S., Yurij D., Oleg, Andrej, Michael, Wladimir. **UW9CWF**: UA9-154-1512, RV9CCZ, UA9-154-1708. **UZ9CXU**: UA9CJ, RA9CSP, RA9CVC. **UM9MZD**: Vic, Alex, Lavi. **YO3KBC**: YO3BDP & YO3YZ. **YO5KAP**: Alex & Geza. **ZS6WRC**: ZS4NS, ZS4KK, ZS4HR. **YU2CAH**: Nesa, Zoraja, Zoki, Darko, Drasko. **UP1BZO**: RC2ICC, UP2BMX, UP2BOA, UP2BQN.

Multi-Operator Multi-Transmitter

KH6XX & KH6's ND, LW, BZF, KV, WH6BGI, WH6W, N2GC, 4X6AI. **N5AU**: N5RZ, KM5X, K5MR, KE5CV, W5FO, N5TR, WB5VZL, NR5K. **KW8N** & N8DCJ, N8ATR, N8DMM, KU8E, KD8NS, NZ4K, KC8MK, KA8ETK, WA8BIN, WD8AJF, KQ8M. **WL7E** & KL7Y, KL7U, KL7HFA, NL7G, WL7Y, NL7FU, NL7GP. **NT5D** & NM5M, K5LZO, KE5IV, N5IVF, NM5L, KN5H, K5IY, WB5N, KN5X, WB5RUS, WD5SP, **JA9YBA**: JA9IIG, JA9LNJ, JA9VBW, JA9VDA, JH7UJR, Mta, Kony. **JA7YFJ**: JO1HBF, JG2XUR, JR7's EFI, MPT, MRQ, OPP, SLG, JE7's BIZ, ENK, JWU, MKQ, MTI, RCC, WQH, XTQ, JF7's BJB, OJD, SWJ, JG7BUP. **WC6H**: K6TMB, W7MAP, NV6Z, WC6I. **JH8YCT**: JH8WAH, JH8WJY, JR8OFE, JE8BFO, Kouji. **W3GM** & KA3FXX. **KC3EK** & WA3EKL, KN3P, K3TM. **CE6OS**: CE6HJB, CE6BXD, CD6EUH, CD6GEY. **PI4DEC**: PA0LEG, PA0TUK, PA3CJF, PA3CLK, PA3CQU, PA3CZW, PA3DPK. **K6XO** & K. Brubaker. **JA3YCT**: Club group.

World champion PJ2FR with N6KT at the mike and station owner PJ2FR giving the thumbs up after another big victory. The trophies they are displaying are from the 1983 victory.

CONTINENTAL LEADERS

ASIA

AB	UF6FFF	2,867,918
28	**JH5AVE**	**23,970**
21	4X6NM	1,165,465
14	**JK1MAZ**	**1,292,040**
7	UM8MO	934,272
3.7	UA0FDX	53,256
1.8	5B4LP	142,272

AFRICA

AB	**EA8ACH**	**3,451,020**
28	EA8VV	41,200
21	CT3BM	756,565
14	TU4BR	3,483,480
7	No Entry	
3.7	No Entry	
1.8	No Entry	

EUROPE

AB	**IO4VEQ**	**5,253,075**
28	DJ1ZV	12,272
21	YU3BO	2,136,750
14	**SM2EKM**	**3,336,734**
7	UR2RRR	1,061,802
3.7	DF8XC	693,546
1.8	**LZ2CJ**	**193,590**

NORTH AMERICA

AB	**VP2MBA**	**5,312,502**
28	KR9G	3,536
21	W3BGN	476,000
14	VE1NG	3,916,965
7	**NP4A**	**6,668,184**
3.7	VE3BMV	1,928,720
1.8	VE3PN	83,752

OCEANIA

AB	AI6V/NH6	6,411,300
28	No Entry	
21	VK6IR	1,736,928
14	AH6GQ	2,863,680
7	No Entry	
3.7	KG6DX	350,014
1.8	No Entry	

SOUTH AMERICA

AB	**PJ2FR**	**13,040,435**
28	XQ3D	276,403
21	**ZZ5EG**	**9,794,448**
14	**ZY5EG**	**5,087,020**
7	YV6CAX	2,062,800
3.7	LU1FLY	9,744
1.8	No Entry	

MULTI-SINGLE

AF	**OH8PF/EA8**	**9,898,245**
AS	RL8PYL	6,224,577
EU	LZ7A	9,769,206
NA	**NP4CC**	**11,201,571**
OC	JA3YKC/T32	5,472,456
SA	LU1FKR	7,710,374

MULTI-MULTI

AF	No Entry	
AS	JA9YBA	4,966,032
EU	PI4DEC	600,928
NA	**N5AU**	**9,733,248**
OC	KH6XX	18,276,326
SA	CE6OS	760,612

Number groups after call letters denote following: Band (A=all), Final Score, Number of QSOs, and Prefixes. Certificate winners are listed in boldface.

QRPp SECTION WORLDWIDE

K7SS/WH6	**A**	**2,078,490**	**1609**	**395**
4X6IF	**A**	**482,798**	**600**	**283**
IK6ATS	**A**	**290,655**	**475**	**259**
DL8PC	**A**	**262,152**	**511**	**264**
RB5IJ	**A**	**192,072**	**400**	**212**
UA0FF	**A**	**175,956**	**369**	**258**
DL5FBL	"	114,699	343	221
OK1DKS	**A**	**76,095**	**244**	**171**
ON8WN	**A**	**69,112**	**262**	**163**
YO5BQ	**A**	**61,336**	**229**	**136**
OK1AJN	"	57,962	203	146
WB9HRO	**A**	**55,796**	**186**	**148**
UA9SG	**A**	**53,954**	**190**	**106**
JR3BNF/1	**A**	**42,164**	**171**	**127**
YO5AUV	"	40,767	138	107
N8CQA	**A**	**39,360**	**165**	**120**
OK3IAG	"	38,727	169	117
OH3AC	**A**	**22,100**	**131**	**100**
HB9DAX	**A**	**18,032**	**100**	**92**
W6YVK	**A**	**16,456**	**128**	**88**
EA3FHC	**A**	**13,832**	**113**	**91**
W6LC	A	13,527	96	81
HK7IMB	**A**	**12,036**	**68**	**68**
JE1BST/1	"	9,060	63	60
RB5EE	"	8,645	71	65
PA2PDN	**A**	**7,276**	**90**	**68**
JR0ELG	"	3,492	45	36
WA7NWL	**A**	**1,024**	**38**	**32**
KH6CP	**28**	**4,920**	**75**	**40**
EA4CFN	**28**	**3,900**	**45**	**30**
JH9HXF/1	**28**	**3,600**	**54**	**48**
N5BA	**28**	**1,474**	**28**	**22**
EA3ERT/p	"	126	8	7
N9ACD	**28**	**96**	**8**	**6**
LZ2EW	**21**	**112,112**	**241**	**182**
N1AFC	**21**	**90,558**	**239**	**162**
ZS6PT	**21**	**57,125**	**160**	**125**
RW3PW	**21**	**52,084**	**187**	**56**
W6CN	**21**	**18,216**	**113**	**88**
UB5FDM	**21**	**6,144**	**63**	**48**
AA4JI	**21**	**4,440**	**43**	**40**
JA8BMS/1	**21**	**2,870**	**41**	**35**
JR3EZH	"	1,764	32	28
KB7M	**21**	**352**	**12**	**11**
KT7G	"	72	6	6
JA2JSF	**14**	**64,500**	**190**	**150**
IK8CPS	**14**	**32,804**	**183**	**118**
SP4GFG	**14**	**5,376**	**64**	**48**
EA5FAG	**14**	**3,260**	**53**	**48**
UP2BB	**14**	**2,607**	**43**	**33**
EA2BTO	"	1,598	34	34
Y24LA	**14**	**570**	**20**	**19**
YX3A	**7**	**259,292**	**276**	**160**
		(Op. YV3AGT)		
LZ2QV	**7**	**58,764**	**209**	**126**
YO5QBP	**7**	**27,540**	**121**	**81**
UA9FM	**7**	**11,280**	**56**	**40**
JA1KFX	**7**	**1,550**	**29**	**25**
OK3CTT	**3.7**	**65,968**	**254**	**133**
OK1AIJ	"	25,296	141	93
SP90DY	**3.7**	**16,568**	**119**	**76**
Y26EH	**3.7**	**748**	**26**	**22**
RA6LU	**1.8**	**5,712**	**60**	**42**

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

NB1H	**A**	**3,689,000**	**2012**	**700**
		(Op. K5ZD)		
KC1F	**A**	**3,255,420**	**2017**	**644**
KA1LZR	"	310,378	520	311
KA1EKR	"	108,568	227	164
AA2Z/1	"	3,627	40	31
W1BWS	**21**	**88,672**	**233**	**163**
W0MHK/1	"	72,432	208	144
W1FJ	"	29,340	126	90
K1KJT	**14**	**414,252**	**558**	**333**
KU1X	"	800	20	20
K1TR	**7**	**6,156**	**60**	**54**
NJ2L	**A**	**943,094**	**1011**	**478**
KF2O	**A**	**431,800**	**564**	**340**
AF2K	"	345,138	605	366
WB2MAE	"	154,945	323	233
WA2UDT	"	125,400	275	209
K2YGM	"	85,440	245	178
KB2SE	"	79,182	216	166
W2PHW	"	76,677	224	183
W2FUI	"	75,774	211	146
KS2M	"	64,656	202	144
KA2VAJ	"	50,568	162	129
W2DW	"	49,266	162	119
KT2D	"	46,107	176	141
WA2VYA	"	23,862	150	123
KA2VYW	"	19,944	91	72
KY2P	"	16,867	101	101
WB2UVB	"	4,418	100	81
WV2ZOW	"	12,528	89	72
WA2HQB	"	3,807	55	47
NC2V	**21**	**273,375**	**466**	**243**
KC2KU	**21**	**243,570**	**438**	**230**
N2US	"	77,763	208	147
WB2DND	"	18,130	86	70
KQ2M	**14**	**3,362,865**	**2006**	**687**
N2AA	**14**	**2,707,200**	**1704**	**640**
WA2ASQ	"	19,747	112	91
WB2PXA	"	828	23	23
KA2WLI	"	56	8	8
N2WT	**7**	**253,368**	**491**	**276**
W2HG	"	5,136	143	107
KR2J	**3.7**	**603,840**	**868**	**370**
KM3T	**A**	**2,942,576**	**1958**	**658**
K3ZO	**A**	**2,589,510**	**1868**	**627**
WA3SPJ	"	947,646	1025	483
		(Op. KS3F)		
W3ARK	"	258,892	410	236
WB3BRF	"	229,878	493	297
KA3AVB	"	38,808	226	147
KA3OAX	"	31,916	131	101
K3ZLK	"	18,530	120	109
W3FTG	"	1,166	23	22
W3BGN	**21**	**476,000**	**658**	**280**
AI3Q	**14**	**298,620**	**450**	**316**
WB3DNA	"	110,175	239	195
WA3CGE	"	93,024	213	153
WA3VPL	"	3,432	47	44
KJ3L	**7**	**85,626**	**328**	**201**
KQ3V	**3.7**	**230,864**	**584**	**307**
N3BJ	**3.7**	**117,900**	**382**	**225**
N4WW	**A**	**3,711,072**	**2046**	**744**
WX4G	**A**	**3,411,632**	**2092**	**664**
AI2C/4	**A**	**1,442,816**	**1223**	**512**
N4UH	"	306,324	434	254
AA4MN	"	284,859	440	279
W4WKQ	"	264,485	508	313
N6AV/4	"	134,874	287	177
VE3JGC/W4	"	105,846	228	177
K4GKV	"	80,019	210	153
WK4F	"	69,420	175	130
W4UYC	"	68,970	223	165
W4KMS	"	59,684	216	172
WB4VQO	"	39,497	155	127
N4NGG	"	29,561	125	103
WU4G	"	6,300	48	45
KK3Q/4	"	3,100	68	62
N4MM	**21**	**298,320**	**466**	**240**
KC4GR	"	44,590	148	130
HK3GZB /W4	"	3,040	48	32
WF4G	**14**	**258,459**	**437**	**303**
K4OD	"	25,470	105	90
WA4QQV	**7**	**28,518**	**205**	**147**
AA4MM	**1.8**	**41,600**	**306**	**160**
K5RX	**A**	**1,860,375**	**1429**	**605**
NT5V	**A**	**663,714**	**1155**	**482**
K5FUV	"	392,746	635	359
N5JJ	"	306,736	646	304
W5PWG	"	255,644	659	316
WE5P	"	229,177	494	289
WB5BIR	"	175,421	429	263
KC5CP	"	171,860	388	260
N5UA	"	140,280	314	210
KI3L/5	"	74,120	275	170
WA5IYX	"	63,075	228	145
KY5N	"	57,602	227	166
K5WXZ	"	28,798	143	119
WB5J	"	13,440	120	105
W5EIJ	"	12,871	100	61
W5OB	"	10,395	77	77
K2SCU/5	"	8,791	70	59
KE5LQ	"	7,605	75	65
NV5L	"	2,898	68	63
KA5W	**21**	**249,250**	**403**	**250**
AA5B	"	1,909	30	23
WF5E	**14**	**574,449**	**1078**	**457**
NW5H	"	36,020	219	144
K5NW	**7**	**343,430**	**593**	**305**
KA5UDL	"	384	24	24
K7CW/5	**3.7**	**61,776**	**288**	**198**
K5UR	**1.8**	**64,722**	**602**	**201**
KI6P	**A**	**3,471,048**	**1982**	**582**
		(Op. WA6VEF)		
AE6U	**A**	**1,975,877**	**1378**	**467**
		(Op. K6HNZ)		
K6EID	"	549,930	604	345
AG6D	"	455,675	693	275
AJ6V	"	444,480	642	320
KV6H	"	331,441	702	319
KS6H	"	201,110	425	221
WB9LDD/6	"	175,050	401	225
W7CB/6	"	161,364	300	204
N8BJQ/6	"	141,432	327	213
W8AKS/6	"	86,976	232	151
W6WB	"	60,150	216	150
N6NF	"	52,311	175	141
W8MEP/6	"	43,688	179	133
KB6JK	"	29,835	149	117
W6ABW	"	28,569	142	89
WA6UFY	"	24,453	126	99
N6JMV	"	17,848	124	92
K6CSL	"	13,050	91	75
AA6EE	"	4,350	56	50
K6SVL	**21**	**141,476**	**379**	**226**
NJ6P	"	42,018	189	141
KK1A/6	"	10,152	88	72
NM6L	**14**	**39,249**	**171**	**147**
KU6J	**3.7**	**85,050**	**256**	**175**
N6VI	**1.8**	**18,300**	**288**	**122**
NK7U	**A**	**540,792**	**804**	**348**
KS7T	**A**	**430,164**	**738**	**378**
W7TSQ	"	383,080	527	305
W7AYY	"	155,364	334	214
NS7Z	"	82,877	222	179
KG7D	"	81,180	296	164
			(Op. K7LXC)	
WB7RBJ	"	62,608	229	172
KC7UP	"	50,179	171	139
KE8DM/7	"	16,744	116	104
KX7J	"	16,240	100	80
KC7MM	"	13,083	107	89
WA7TUX	"	6,624	82	69
W7TJ	"	6,210	37	30
KU7Y	"	2,730	45	42
W7GUR	"	2,704	37	26
KC7V	**21**	**250,222**	**596**	**293**
WB2WEO/7	"	29,400	162	105
N7TT	**14**	**1,262,976**	**1372**	**572**
KE7V	**14**	**703,890**	**871**	**474**
AG7M	"	461,114	736	307
WB7CLU	"	210,308	383	259
WA7CGR	"	78,498	217	126
W7MLJ	"	64,809	210	171
K7GWK	**3.7**	**31,200**	**132**	**100**
N6TR/7	**1.8**	**24,926**	**263**	**121**
K7IDX	**1.8**	**24,360**	**265**	**105**
AI8S	**A**	**1,776,628**	**1431**	**593**
NJ8N	**A**	**1,225,440**	**1133**	**460**
NE8T	"	508,387	708	409
			(Op. N8CXX)	
NO8H	"	277,536	466	294
W8UPH	"	188,244	356	252
KC8IZ	"	155,244	324	204
WD8QDQ	"	113,668	249	181
KB8IZ	"	110,544	269	147
K8CV	"	24,661	124	91
AC8W	"	20,920	140	112
KA8UOT	"	10,065	66	55

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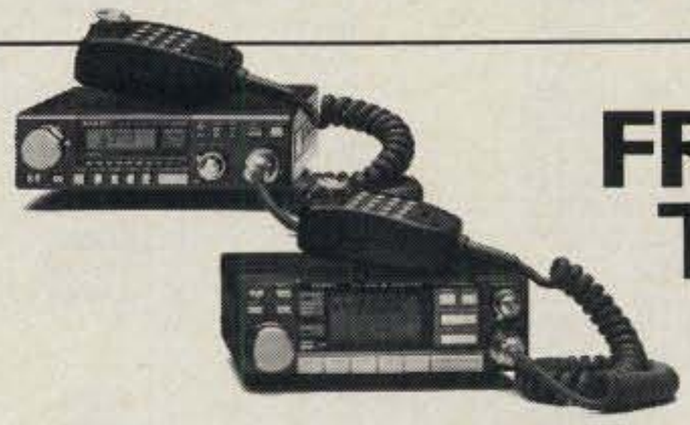

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KB8TT	"	7,632	60	48
N8EKS	"	3,663	45	37
N8FEH	**21**	**36,519**	**135**	**111**
K8KUH	**14**	**10,295**	**79**	**71**
KN8R	**3.7**	**392,128**	**920**	**352**
KE8AZ	**3.7**	**124,712**	**644**	**262**
K8DD	"	26,460	172	126
W8IMZ	**1.8**	**6,512**	**162**	**88**
NE9O	**A**	**227,304**	**493**	**287**
NG9L	**A**	**187,904**	**356**	**256**
WB9HYA /AE	"	32,660	154	115
W9KHH	"	6,136	65	52
KR9G	**28**	**3,536**	**43**	**34**
KQ9L	**14**	**684,336**	**798**	**424**
W9NUF	"	101,136	218	172
AG9S	**7**	**130,000**	**583**	**260**
N9BUS	"	6,784	60	53
KS9U	**3.7**	**75,250**	**348**	**215**
KV9I	**A**	**721,752**	**1208**	**488**
KK9L	**A**	**449,404**	**771**	**397**
W9GOQ	"	300,737	557	311
AC9S	"	278,208	448	276
KC9FJ	"	245,890	725	335
W9RXL	"	142,896	305	229
KN9L	"	112,500	459	250
WB9ISW	"	90,545	271	199
KS9T	"	45,499	233	173
W9QQQ	"	30,240	221	135
		(Op. N9GVQ)		
AD9H	"	30,178	224	158
WB9YJT	"	26,912	155	116
W9NGB	"	7,178	86	74
KB9U	**7**	**53,152**	**168**	**151**
K9CS	**3.7**	**106,128**	**544**	**268**
AB9X	**1.8**	**6,000**	**208**	**100**

ALASKA

AL7CQ	**14**	**301,040**	**426**	**284**
KL7HBK	**1.8**	**1,672**	**22**	**19**

BARBADOS

8P9AR	**A**	**4,581,360**	**3220**	**567**
		(Op. N6AUV)		

CANADA

VE6OU/3	**A**	**4,091,976**	**1971**	**644**
VE3XN	"	3,688,750	1937	650
VE7DLM	**A**	**168,462**	**293**	**191**
VE7FTC	"	150,282	272	198
VY1CW	**A**	**143,988**	**330**	**156**
VE3CWE	"	91,848	181	178
VE3MAM	"	61,722	167	127
VE3EZU	"	44,014	134	118
VE5BQ	**A**	**32,752**	**130**	**92**
VE7ETW	"	12,180	71	58
VE3GWM	"	2,550	32	30
VE1BNN	**28**	**2,550**	**34**	**25**
VE2AEJ/3	28	108	8	6
VE1NG	**14**	**3,916,965**	**2223**	**689**
VE5FX	**14**	**1,348,473**	**1360**	**471**
VE7EIK	**14**	**886,380**	**1036**	**374**
VO1QU	**14**	**555,426**	**709**	**354**
VE7AV	"	464,284	664	298
VE2KM	**14**	**298,984**	**567**	**281**
VE7EIQ	"	250,533	431	243
VE4AKN	**14**	**178,162**	**374**	**229**
VE3NBE	**14**	**97,962**	**217**	**174**
VE2EW	"	86,618	202	161
VE5AGA	"	70,119	243	147
VE1AGZ	"	69,355	177	143
VE3NYT	"	24,064	101	94
XL7SV	**7**	**3,454,864**	**1770**	**436**
VE3BMV	**3.7**	**1,928,720**	**1239**	**388**
VE7XYL	**3.7**	**309,960**	**440**	**189**
VE1GB	**3.7**	**116,116**	**185**	**154**
VE1AIH	"	24,528	85	73
VE3PN	**1.8**	**83,752**	**250**	**99**

CAYMAN IS.

ZF1MM	**A**	**3,877,216**	**2505**	**608**
		(Op. VE5RA)		

COSTA RICA

TI2ANL	**A**	**206,010**	**423**	**218**
TI9RC	"	18,880	113	80
		(Op. TI4BGA)		
TI2GHG	**14**	**52,890**	**209**	**123**

DOMINICAN REPUBLIC

HI3AMF	**A**	**802,384**	**807**	**419**
HI8LC	**14**	**34,450**	**160**	**106**

GUATEMALA

TG9R	**7**	**27,580**	**87**	**70**
TG9RZ	**3.7**	**104,328**	**183**	**138**

HAITI

HH2WL	**A**	**2,107,686**	**1985**	**469**

MEXICO

XE2IZ	**A**	**34,684**	**126**	**97**
XE1XJK	**21**	**213,322**	**511**	**202**
XE2NNZ	**1.8**	**40,120**	**147**	**68**

MONTSERRAT

VP2MBA	**A**	**5,312,502**	**3130**	**622**
		(Op. W7FP)		

PANAMA

HP8AHF	**A**	**33,764**	**111**	**92**

PUERTO RICO

NP4A	**7**	**6,668,184**	**1978**	**654**

AFRICA

CANARY ISLANDS

EA8ACH	**A**	**3,444,912**	**1908**	**564**
EA8VV	**28**	**41,200**	**142**	**103**
EA8BED	**21**	**56,336**	**171**	**112**
EA8BJX	**14**	**76,995**	**182**	**145**

CUETA

EC9JM	**21**	**162,240**	**342**	**160**

IVORY COAST

TU4BR	**14**	**3,477,383**	**1842**	**637**

KENYA

5Z4DJ	**A**	**476,850**	**556**	**289**

MADEIRA IS.

CT3DJ	**A**	**42,768**	**116**	**108**
CT3BM	**21**	**756,565**	**768**	**337**

MAURITIUS

3B8FP	**A**	**297,471**	**441**	**229**

NAMIBIA

ZS3BI	**A**	**58,710**	**292**	**95**

SIERRA LEONE

9L1SL	**A**	**43,888**	**146**	**104**

SOUTH AFRICA

ZS5IV	**A**	**79,134**	**218**	**121**
ZS4WD	"	2,976	33	32

TANZANIA

5H3ZR	**14**	**51,062**	**155**	**121**
		(Op. OH6ZR)		

ASIA

CYPRUS

5B4LP	**1.8**	**142,272**	**211**	**117**

ISRAEL

4X6NM	**21**	**1,165,465**	**1199**	**355**
4X6DK	"	278,880	525	224
4X6TT	**14**	**953,568**	**905**	**344**

JAPAN

JH9LFE	**A**	**1,218,060**	**983**	**402**
JH7AJD	**A**	**390,390**	**515**	**286**
JA6BIF	**A**	**344,430**	**524**	**267**
JA2ADH	"	219,611	315	229
JF3CCN	"	204,930	356	207
JE6JVJ	"	143,560	355	194
JA6LDD	"	136,500	273	156
JE7RJZ	"	92,960	254	160
JA8SW	"	89,813	197	163
JI2DLF	"	84,600	223	150
JA7JH	"	47,952	124	111
JO1RUR	"	46,217	152	113
JS1UMQ	"	38,808	156	99
JH9XUP	"	38,192	160	112
JG3NKP	"	36,554	126	98
JA1ASO	"	36,375	126	97
JA2ODS	"	35,920	118	80
JA1AAT	"	24,885	119	79
JP1SRG	"	20,925	100	75
JA6AKV	"	19,890	98	78
JA6IP	"	18,954	98	78
JA5EO	"	16,132	105	74
JN1ENK/3	"	12,338	101	62
JE2MDE	"	11,160	72	60
JH9QIG	"	10,175	81	55
7J1AAI/1	"	8,236	100	58
		(Op. K8HVT)		
JA1FO	"	1,608	28	24
JR3JRI	"	658	19	14
JN1TEO	"	608	18	16
JE1TTO	"	60	7	6
JH5AVE	**28**	**23,970**	**165**	**85**
JR6IQI	**28**	**17,661**	**159**	**87**
JH1UUT	"	2,006	37	34
JN1TEN	"	1,032	29	24
JR1OYL	"	180	10	10
JF2KUU	"	114	7	6
JR5HCU	**21**	**95,370**	**287**	**165**
JH9SPE/1	**21**	**68,640**	**237**	**160**
JP1FZA	"	49,275	180	135
JH7WKQ	"	48,800	220	122
JO1RDV	"	48,334	248	143
JE7SLC	"	45,694	197	134
JL1MWI	"	36,360	188	120
JO1TMU	"	35,105	164	119
JH1YTX	"	25,676	129	98
		(Op. JM1JHG)		
JE7HFQ	"	25,380	117	90
JA6EFT	"	16,729	112	80
JE2QYZ	"	14,626	101	71
JA3BBG	"	11,343	82	57
JA1QXC	"	11,285	80	61
JE8FOU	"	10,368	80	64
JJ2FJM	"	7,497	71	51
JQ1QCC	"	6,174	63	49
JH9EPI	"	5,208	51	42
JM3XHD	"	1,485	36	33
JG3SVP	"	1,275	29	25
JF2NXS	"	1,160	26	20
JR4THU	"	816	18	17
JH2WHS	"	455	15	13
JH7KTI	"	434	15	14
JA3RBC	"	370	13	10
JA6QDU	"	252	12	9
JA3FZI	"	175	13	7
JN1RFI	"	90	7	6
JK1MAZ	**14**	**1,292,040**	**1098**	**444**
JA3YBF	**14**	**1,201,050**	**995**	**450**
		(Op. JE6BXJ)		
JE4VVM	"	726,715	826	365
JE3ZFS	"	440,630	555	317
JF1WQC	"	306,360	444	276
JA9CGJ	"	271,054	400	266
JR6PGB	"	270,270	535	234
JH7QXJ	"	229,619	384	221
JA2BNN	"	126,412	289	187
JA9BEK	"	116,104	247	184
JE1AER	"	102,466	251	182
JA9UMV	"	68,689	215	149
JH1YTX	"	61,155	212	151
		(Op. Takesh)		
JA8BY	"	53,988	174	132
JA4PA	"	28,880	114	95
JA7RXU	"	25,220	122	97
JH9OBD	"	19,845	103	81
JQ1WJP	"	9,116	53	43
JA1GO	"	4,218	40	38
JI6DMN	"	3,145	42	37
JR4ISK	"	960	29	24
JE4MYY	"	372	13	12
JN1VUB	"	234	15	13
JA2SAP/1	"	189	9	9
JA2BAY	**7**	**851,604**	**617**	**318**
JA7HMZ	**7**	**615,404**	**519**	**274**
JH1YTX	"	2,160	25	20
		(Op. Tomono)		
JG6UHE	"	432	10	9
JH9SGG	"	868	14	14
JH9YWN	"	506	13	11
		(Op. JH9XBH)		
JA1NYV	"	217	13	7

KOREA

HL1IE	**A**	**257,023**	**777**	**221**
HL1ABR	**14**	**19,024**	**145**	**82**

MONGOLIA

OK1XC/JT	**A**	**287,920**	**691**	**236**
JT1BG	**14**	**17,765**	**101**	**85**

OGASAWARA IS.

JM1LPN /JD1	**A**	**91,266**	**600**	**106**
JH1ZFH /JD1	"	1,334	47	29
JM1MCF /JD1	**3.7**	**32,430**	**200**	**69**

SAUDI ARABIA

HZ1HZ	**A**	**1,168,457**	**1077**	**379**

U.S.S.R.

ARMENIA

UG6GAT	**A**	**16,104**	**244**	**66**
UG6JJ	**21**	**86,036**	**231**	**137**

ASIATIC

UA9MA	**A**	**1,319,351**	**1240**	**433**
UA9MR	**A**	**1,246,160**	**1115**	**421**
RW9WA	"	889,720	1115	377
UA9FAR	"	380,500	480	250
UW9FD	"	143,166	332	214
RW9UD	**21**	**106,755**	**362**	**165**
UW9EQ	"	44,856	160	126
RW9UR	**14**	**1,039,539**	**1117**	**419**
UW9YM	"	194,479	367	217
UA9XY	"	14,137	86	67
RA9JB	"	4,212	40	39
UA9CAW	**3.7**	**49,410**	**120**	**81**
UW9QA	"	42,750	137	75
RA9FA	**A**	**827,775**	**1028**	**325**
UA9ZDD	**A**	**710,277**	**866**	**323**
UA9SR	"	182,172	295	188
UW9CN	"	29,234	143	94
UW9LT	**21**	**172,549**	**780**	**169**
UA9SG	"	45,480	279	120
UW9CV	**14**	**52,688**	**205**	**148**
UA9TO	**7**	**886,080**	**1162**	**260**
UW9MF	"	111,192	365	123
RA9JB	"	58,310	333	85
UA9FDX	**3.7**	**53,256**	**125**	**84**

AZERBAIJAN

RD6DM	**A**	**2,460**	**35**	**30**

GEORGIA

UF6FFF	**A**	**2,867,918**	**2090**	**454**
UF6QAC	**21**	**49,206**	**186**	**118**
UF6VAW	**7**	**139,992**	**210**	**114**
RF6FHA	**1.8**	**16,380**	**70**	**42**

KAZACH

UL7JW	**21**	**58,938**	**202**	**114**
UL7DA	**14**	**887,012**	**960**	**401**
UL7BY	"	685,520	767	328
UL7ACI	**1.8**	**38,178**	**108**	**63**

KIRGHIZ

RM8MA	**A**	**437,937**	**790**	**277**
UM8MIG	**28**	**2,343**	**40**	**33**
UM8MP	**21**	**432,708**	**831**	**231**
UM8DX	**14**	**665,270**	**809**	**355**
UM8MIR	"	14,688	79	72
UM8MO	**7**	**934,272**	**817**	**288**

TURKOMAN

RH8AD	**A**	**105,909**	**274**	**129**

UZBEK

UI8LF	**14**	**176,512**	**323**	**197**
UI8OAA	**21**	**479,764**	**885**	**277**
UI8ZAA	**7**	**64,414**	**145**	**81**

EUROPE

AUSTRIA

OE1PPC	**A**	**260,633**	**490**	**263**
OE9SLH	"	18,160	109	80

BALEARIC IS.

EA6URP	**A**	**211,928**	**508**	**236**
		(Op. EA6GQ)		
EA6WX	"	93,984	266	176
EA6OA	**21**	**154,440**	**369**	**220**
EA6TC	**7**	**67,626**	**198**	**117**

BELGIUM

ON4ALL	**A**	**470,250**	**759**	**330**
ON4XG	"	112,662	302	198
ON5WL	**14**	**20,022**	**135**	**94**

BULGARIA

LZ1RN	**A**	**1,228,955**	**1415**	**481**
LZ1RW	"	20,340	104	90
LZ1HA	"	12,496	80	71
LZ2GS	**21**	**9,295**	**69**	**55**
LZ1GD	"	216	9	9
LZ1KWS	**3.7**	**89,856**	**287**	**144**
		(Op. Dimita)		
LZ2CJ	**1.8**	**193,590**	**658**	**135**
LZ1KOZ	"	34,191	128	87
		(Op. Plamen)		

CRETE

J49DT	**A**	**255,482**	**734**	**278**

CZECHOSLOVAKIA

OK3CEM	**A**	**2,056,173**	**1520**	**547**
OK2RU	**A**	**797,900**	**975**	**404**
OK3CRH	"	382,347	558	357
OK1KZ	"	330,504	630	282
OK1VD	"	253,682	430	286
OK1EP	"	162,986	314	227
OK3YCA	"	131,634	293	206
OK1DWX	"	84,923	258	163
OK3CTX	"	78,575	254	175
OK2PMM	"	61,490	189	143
OK3KV	"	54,670	240	142
OK2BDB	"	53,789	212	149
OK2BHQ	"	42,059	157	137
OK2PCF	"	39,116	179	127
OK2BLD	"	34,364	150	121
OK2BBI	"	32,079	130	111
OK2KVI	"	26,578	124	97
OK3KXT	"	23,130	130	90
		(Op. OK3BRK)		
OK3CWF	"	16,880	110	80
OK1MHI	"	16,464	102	84
OK3CEI	"	15,360	83	64
OK1DXW	"	4,730	85	66
OK1DMA	"	1,775	26	25
OK3CEG	"	672	19	14
OK1TW	**28**	**616**	**16**	**14**
OK3YX	"	40	5	5
OK3TMM	**21**	**18,642**	**85**	**78**
OK2SWD	"	176	9	8
OK3CSC	**14**	**2,465,495**	**1730**	**584**
OK3CFA	**14**	**775,935**	**1076**	**401**
OK2TBC	"	49,815	228	135
OK1KUZ	"	28,034	168	107
		(Op. OK1DSS)		
OK2BFX	"	22,750	140	91
OK3CMZ	"	60	5	5
OK1AZI	**7**	**205,936**	**448**	**211**
OK2DM	"	23,506	121	73
OK2BHJ	**3.7**	**57,552**	**289**	**132**
OK1MIZ	"	12,060	90	67
OK2BQP	"	10,880	80	68
OK1VMA	"	9,516	83	61
OK1OPT	"	924	23	22
OK3CQD	**1.8**	**25,578**	**146**	**87**
OK1JDX	"	23,520	124	80
OK1AMF	"	7,192	69	58
OK1DWC	"	1,242	25	23
OK2ABU	"	360	15	15
OK2PGT	"	126	9	9

DENMARK

OZ5EV	**A**	**320,016**	**432**	**339**
OZ3SK	**A**	**316,932**	**491**	**294**
OZ1DPW	"	80,227	285	157
OZ1EMY	"	33,517	161	121
OZ1INN	"	31,578	171	114
OZ6PI	"	22,050	121	98
OZ1CFV	"	3,002	43	38
OZ7AIR	"	2,625	38	35
OZ1FAO/a	"	936	26	26
OZ2BM	**21**	**2,790**	**34**	**31**
OZ4VW	"	84	7	6
OZ8CT	**14**	**145,415**	**379**	**229**
OZ7SG	"	2,625	39	35
OZ1AXG	**3.7**	**341,190**	**839**	**223**
OZ4MD	"	254,016	550	216

ENGLAND

G3FXB	**A**	**2,487,550**	**1680**	**559**
G4XTM	**A**	**139,152**	**301**	**156**
G4YEK	"	62,250	240	150
G9CLY	"	23,944	100	82
G4KHF	"	18,281	120	101
G4OBK	28	42	8	6
G4TNB	**21**	**88,230**	**218**	**173**
G4ZFE	**14**	**39,624**	**214**	**127**
G3NT	"	26,712	241	72
G6NK	"	5,376	94	42

FAROE IS.

OY2J	**A**	**1,260**	**35**	**28**

FINLAND

OH3YI	**A**	**1,347,836**	**1275**	**518**
OH2BVE	**A**	**452,928**	**631**	**336**
OH3TQ	"	273,714	459	266
OH2LU	"	87,870	227	174
OH1AP	"	74,477	316	211
OH6NEV	"	64,960	238	160
OH7NW	"	63,896	238	163
OH1BV	"	50,640	209	120
OH5VQ	"	21,344	110	92
OH8EP	"	4,368	46	42
OH1PY	"	4,171	43	43
OH1ZAA	28	112	14	8
OH6OS	**21**	**69,762**	**273**	**154**
OH3HS	"	8,415	75	55
OH2BUU	"	2,494	37	29
OH6AM	**14**	**1,813,649**	**1514**	**526**
				(Op. OH6EI)
OH1AF	**14**	**1,448,832**	**1505**	**528**
				(Op. OH1EH)
OH6AC	"	988,776	1040	443
		(Op. OH6CS)		
OH8LQ	"	718,080	1356	408
OH3OJ	"	698,255	1240	359
OH6YF	"	431,088	729	336
OH2BLV	"	47,068	166	164
OH9MV	"	30,866	186	122
OH6CD	"	21,018	154	93
OH2BFS	"	713	27	23
OH2KI	"	416	13	13

FRANCE

FE6DZU	**A**	**694,575**	**725**	**405**
FE6AOJ	**A**	**450,225**	**610**	**245**
F8WE	"	427,977	802	297
F6EXQ	"	168,644	317	266
FE6DRP	"	69,734	297	119
F8TM	"	12,802	93	74
F6EHV	"	10,212	85	69
FV6NDX	**14**	**310,880**	**570**	**290**
				(Op. F6AJA)
F6FIO	**7**	**383,194**	**581**	**271**

GERMANY (FRG)

DJ3HJ	**A**	**377,524**	**542**	**278**
DL2SBF	**A**	**111,725**	**224**	**205**
DJ1OJ	"	64,666	214	149
DL6LAG	"	55,074	194	134

DL7YS	"	46,530	170	141
DL8DAX	"	43,392	206	128
DK6BT	"	30,622	152	122
DF2LH	"	30,135	145	105
DL1BFU	"	11,402	100	71
DL7HK	"	9,490	65	65
DK5KJ	"	8,184	78	62
DF7YT	"	3,648	40	38
DJ1ZV	**28**	**12,272**	**86**	**59**
DL1SBF/P	**21**	**33,700**	**128**	**100**
DA2ER	**14**	**1,243,788**	**1154**	**442**
DL1RB	**14**	**114,027**	**309**	**191**
DA2NO	"	11,550	111	77
DK8JS	"	9,648	102	72
DL2YCD	"	3,478	38	37
DF6IT	"	6	3	3
DF8XC	**3.7**	**693,546**	**1062**	**343**
DH8FAV	**3.7**	**2,940**	**47**	**35**

GERMANY (GDR)

Y32UC	**A**	**1,308,510**	**1358**	**465**
Y35L	**A**	**1,066,638**	**1061**	**457**
Y33TB	"	602,872	891	358
Y22JJ	"	303,048	468	276
Y25FF/a	"	293,664	600	266
Y33UJ/p	"	169,505	452	203
Y32QD	"	141,840	435	197
Y44PF	"	138,375	407	205
Y36NC	"	120,564	360	197
Y24SK/a	"	112,582	293	181
Y24YH	"	90,791	283	163
Y41NK	"	82,335	285	165
Y43SM	"	72,838	253	158
Y24AK	"	60,152	248	146
Y44UI	"	43,076	195	121
Y32PH	"	34,320	160	120
Y82ML	"	32,592	227	84
Y64OI	"	30,090	130	102
Y44TN	"	28,028	137	98
Y21UL	"	27,250	138	109
Y49RF	"	27,195	130	105
Y22VI	"	25,792	159	104
Y39ZH	"	20,944	132	77
Y36TG	"	20,124	102	86
Y26HG	"	16,426	119	86
Y63VN	"	16,170	115	77
Y55TJ	"	16,020	180	89
Y46ZC	"	14,960	109	80
Y43TK	"	14,742	103	78
Y49MF	"	13,724	108	73
Y39OH	"	13,224	95	76
Y58ZG	"	12,596	101	67
Y36SG	"	11,773	76	61
Y22WD	"	11,718	70	63
Y56VF	"	10,519	91	67
Y37XJ	"	8,268	69	53
Y61YA	"	6,104	71	56
Y21HB	"	5,995	61	55
Y25JA/a	"	5,049	60	51
Y23HJ	"	4,896	60	48
Y32WH	"	3,400	52	40
Y26YM	"	2,484	40	36
Y43OL	"	2,108	40	34
Y58SA	"	1,988	29	28
Y20JHW	"	1,029	25	21
Y26DO	28	270	10	9
Y21WM	"	126	7	6
Y23LG	**21**	**24,992**	**104**	**88**
Y66QL	"	14,824	89	68
Y32KE	**14**	**203,628**	**420**	**239**
Y51UE	**14**	**137,004**	**365**	**196**
Y54XE	"	44,376	226	129
Y51YJ	"	43,434	212	127
Y38YK	"	23,256	117	102
Y63TI	"	14,668	96	76
Y66YF	"	8,784	106	61
Y47MN	"	5,940	100	54
Y25DF/a	"	4,136	70	47
Y23HE/a	"	1,736	34	31
Y59ZF	"	540	20	18
Y26MH/a	"	468	22	18
Y24PE	"	240	18	12
Y22OO	**7**	**29,304**	**151**	**99**
Y51XQ	"	21,648	124	88
Y47HN	**3.7**	**97,280**	**336**	**160**
Y24MB	"	51,414	230	123
Y43GO	"	33,200	185	100
Y38YE	"	13,104	99	72
Y23DH	"	6,360	73	53

GREECE

SV1JG	**14**	**853,258**	**1607**	**413**
J41PL	**1.8**	**31,062**	**152**	**93**

HUNGARY

HA8MM	**A**	**1,112,468**	**1033**	**469**
HA4XX	**A**	**758,098**	**919**	**374**
HA8KQX	"	675,702	934	387
		(Op. HA8IE)		
HA3KHC	"	135,792	394	184
		(Op. Tibor)		
HA6IAM	"	79,800	294	168
HA5HH	**14**	**32,332**	**204**	**118**
HA4ZM	"	5,724	80	54
HA3HV	**7**	**271,400**	**515**	**236**
HA4KYN	**3.7**	**590,646**	**947**	**287**
		(Op. HA4XH)		
HA5KHE	"	33,480	167	108
		(Op. HA7RO)		
HA5KTZ	"	7,560	76	54
		(Op. HG5AND)		

ICELAND

TF1PS	**A**	**91,298**	**311**	**191**
TF3SD	**14**	**4,879**	**57**	**41**

IRELAND

EI4DW	**A**	**163,312**	**426**	**236**
EI1DH	**14**	**177,288**	**504**	**249**

ITALY

IO4VEQ	**A**	**5,253,075**	**2508**	**631**
IO6FLD	**A**	**2,592,601**	**1663**	**583**
IV3PRK	**A**	**2,348,875**	**1660**	**575**
IV3YYK	"	466,200	637	333
IO8KHP	"	327,066	563	302
IO2MQP	"	217,832	382	241
IK1BBC	"	206,248	397	254
I4CSP	"	137,082	324	201
IK2HSW	"	16,800	113	84
IK2AEQ	**21**	**215,040**	**348**	**224**
IK8COG	**7**	**3,220**	**66**	**35**
I4EWH	**3.7**	**418,696**	**615**	**263**
I2VXJ	"	57,816	215	132
IO4JMY	**1.8**	**145,624**	**358**	**167**

LIECHTENSTEIN

HB0/DJ9YY	**A**	**86,790**	**261**	**165**

LUXEMBOURG

LX1GQ	**A**	**139,896**	**350**	**201**
LX2QR	**14**	**93,000**	**320**	**186**
LX9RL	**3.7**	**388,188**	**761**	**246**
		(Op. LX1RQ)		

MONACO

3A6F	**A**	**102,084**	**360**	**181**
		(Op. 3A2LF)		

THE NETHERLANDS

PA0ZH	**A**	**1,182,216**	**1215**	**454**
PA0KDM	**A**	**105,776**	**348**	**176**
PA0XPQ	"	78,500	261	157
PI4RCA	"	69,200	197	173
		(Op. PA3EDV)		
PA3BRK	"	42,588	163	148
PA3DRZ	"	27,068	124	101
PA2NJN	"	10,098	74	66
PI1GOE	"	7,021	72	59
		(Op. PE1LEW)		
PI4NZB/a	"	3,400	42	40
		(Op. PE1JLS)		
PA2SWL	"	1,950	30	30
PA3COA	"	1,296	35	27
PA3DWJ	"	828	26	23
PA2GER	28	70	14	10
PA3AMO	**21**	**1,430**	**27**	**22**
PA0QX	**14**	**36,186**	**191**	**111**

NORWAY

LA9DI	**A**	**83,790**	**255**	**171**
LA8DY	**A**	**75,947**	**242**	**173**
LA2AD	"	42,575	188	131
LA2CBA	"	32,208	157	132
LA2IZ	"	19,260	100	90
LA5TBA	"	434	15	14
LA9SN	**14**	**210,444**	**580**	**247**
LA1XDA	"	29,036	226	122
LA8CJ	"	3	1	1
LA9HW	**7**	**263,344**	**572**	**218**
LA4HW	"	141,372	344	189

POLAND

SP9PRO	**A**	**538,512**	**876**	**312**
SP6CIK	**A**	**340,433**	**600**	**277**
SP9IGY	"	110,538	329	178
SP9AKD	"	89,500	248	179
SP9BLF	"	76,194	241	153
SP1LOP	"	70,924	252	149
SP6JIR	"	57,800	251	136
SP9MRO	"	56,168	163	118
SP8AG	"	21,546	198	81
SP9IWO	"	10,790	76	65
SP2MSM	"	10,458	146	98
SP9EML	"	9,322	74	59
SP7FQI	"	8,024	77	59
SP2BMX	"	5,568	67	48
SP7DZA	"	2,336	38	32
SP9FIH	"	1,580	23	20
SP9EES/9	**21**	**83,752**	**232**	**152**
SP9FTJ	"	2,490	30	30
SP9ZD	"	494	14	13
SP9MQE	**14**	**33,960**	**180**	**120**
SP6DMI	**14**	**28,737**	**186**	**103**
SP5MXZ	"	23,595	248	155
SP9HZF	"	16,767	120	81
SP9AVZ	"	14,060	126	74
SP8HMK	"	9,246	80	69
SP6AGD	**7**	**62,140**	**203**	**130**
SP7DBI	"	1,976	32	26
SP6AYP	"	504	10	9
SP5GIQ/7	**3.7**	**118,560**	**386**	**156**
SP6DVP	**3.7**	**74,692**	**300**	**142**
SP9AAB	"	67,200	256	140
SP9MDY	"	26,578	142	97
SP3GXH	"	26,412	157	93
SP6GF	"	17,808	115	84
SP5BLI	"	14,850	109	75
SP3GVX	"	13,732	78	59
SP9IKN	"	896	56	16
SP5INQ	**1.8**	**27,000**	**149**	**90**
SP9DH	"	612	17	17

PORTUGAL

CQ2DIZ	**A**	**264,624**	**613**	**296**
		(Op. CT1DIZ)		
CQ8AHU	**A**	**108,675**	**266**	**175**
		(Op. CT1AHU)		
CT7AFN	"	103,448	284	193
CT1QF	"	92,130	275	185
CR8TM	"	64,260	204	140
		(Op. CT1TM)		
CT1DGK	"	34,680	158	120
CT1CIR	"	9,656	117	68
CQ7AUW	**14**	**411,426**	**790**	**342**
CT7UW	"	220,952	496	284
CQ5BY	"	52,800	210	176
		(Op. CT1BY)		
CT1CHF	"	35,217	167	129
CT4KQ	**7**	**341,280**	**451**	**240**
CQ0AES	"	245,376	406	213

ROMANIA

YO8KOD	**A**	**522,480**	**836**	**311**
		(Op. YO8DDP)		
YO3CD	**A**	**364,870**	**515**	**310**
YO5AVN	"	295,812	533	249
YO6AJI	"	132,170	550	213
YO9DIA	"	129,130	373	185
YO8BPY	"	99,372	316	169
YO9CUF	"	61,776	246	156
YO9DHZ	"	57,682	215	151
YO3JF	"	42,800	174	107
YO4US	"	37,590	181	105
YO3DCO	"	20,856	102	88
YO2AQB	**21**	**14,850**	**91**	**66**
YO5BAT	"	2,415	45	23
YO6ADM	"	48	4	4
YO9FL	**14**	**31,734**	**174**	**123**
YO5AAT	"	10,857	105	77
YO6BLU	"	532	25	16
YO5CYG	**7**	**123,004**	**317**	**161**
YO9CZW	"	69,948	235	134
YO2ARV	"	9,152	64	52
YO2DFA	**3.7**	**57,784**	**242**	**124**
YO5BHW	"	23,360	146	73
YO8CDQ	"	9,440	81	59
YO9BVG	"	2,774	54	38

SCOTLAND

GM4WEW	**A**	**173,886**	**426**	**219**

SHETLAND IS.

GM4GPN	**A**	**397,518**	**785**	**317**

SPAIN

EA3CCN	**A**	**1,661,651**	**1375**	**479**
ED1WPX	**A**	**474,360**	**761**	**335**
EA7FUR	**A**	**467,500**	**666**	**374**
ED3DRE	"	296,159	145	101
EA7GAA	"	213,495	404	215
EA1AW	"	205,247	404	269
EA7BHO	"	119,791	242	157
EA3NU	"	118,917	314	181
EA5FCO	"	118,560	309	208
EA5JC	"	104,825	281	175
EA3ELM	"	76,788	241	158
EA5FEX	"	56,240	172	152
EA2CR	"	47,925	182	135
EA5DCL	"	37,630	171	142
EA7FPT	"	33,712	188	112
EA2BSJ	"	8,449	97	71
EA1CRT	"	286	14	13
EA4DQD	**28**	**7,920**	**66**	**45**
EA3FGS	"	5,852	56	38
EA7DHP	"	5,328	55	36
EA1CON	"	2,964	42	26
EA2BIM	"	2,002	41	22
EA3ELZ	"	429	14	11
EA7AVU	**21**	**301,990**	**568**	**299**
EA3CZM	"	164,772	299	207
EA1DHB	"	46,607	170	127
EC3CHI	"	25,290	131	90
EA5AP	"	18,865	90	77
EA5DIT	"	16,872	83	76
EA1CES	"	6,614	77	56
EC3CGJ	"	817	20	19
ED3AQC	**14**	**1,468,368**	**1388**	**528**
ED4BVE	**14**	**556,479**	**848**	**363**
EA3AAY	"	282,348	621	276
EA2CAC	"	74,404	323	178
EA3FJM	"	58,598	254	166
EA3DXD	"	30,030	186	130
EA5EFV	"	20,592	129	99
EA7CDN	"	18,879	113	93
EA3FKC	"	14,535	112	85
EA5ADI	"	12,376	114	91
EA7LM	**7**	**110,360**	**244**	**155**
EA5BZS	"	43,232	165	112
EA5DWQ	"	264	38	33
EA7AZJ	**3.7**	**535,164**	**577**	**277**
EA5CGU	"	7,728	74	56
EA5CXL	"	2,100	33	30

SVALBARD

JW8A	**14**	**9,125**	**103**	**73**
		(Op. SP2FWC)		

SWEDEN

SM6BGG	**A**	**74,732**	**196**	**157**
SM0KNV	"	41,358	187	113
SM6DER	**21**	**47,124**	**170**	**126**
SM5CSS	"	13,536	88	72
SM0KV/0	"	13,002	73	66
SM2EKM	**14**	**3,336,734**	**2401**	**673**
SM5AOE	"	239,835	463	271
SM6LIF	"	132,696	276	228
SM3LIV	"	34,314	220	129
SM7TV	"	22,984	143	104
SM0BDS	"	18,216	106	92
SM5AQD	**7**	**936,992**	**937**	**376**
SM5CEU	"	43,920	165	120
SM5ARR	"	690	16	15
SM3CER	**3.7**	**840**	**21**	**20**

SWITZERLAND

HB9AAA	**A**	**1,434,798**	**1139**	**474**
HB9CWA	"	232,120	364	280
HB9DDS	"	14,615	109	79
HB9ACA	**21**	**181,812**	**330**	**218**
HB9CYF	**14**	**223,428**	**452**	**258**
HB9AON	"	1,421	35	29
HB9ADD	**7**	**289,680**	**429**	**240**
HB9BOU	**3.7**	**102,648**	**320**	**156**
HB9CXZ	**1.8**	**54,026**	**213**	**119**

YUGOSLAVIA

YU1OWW	**A**	**56,592**	**189**	**144**
YU1PQI	"	51,216	153	132
YU3TW	"	32,928	110	84
YU1ATA	"	4,472	53	43
		(Op. YU1TT)		
YU2AKL	**28**	**13,978**	**125**	**58**
		(Op. Males)		
YU2LLL	"	374	30	11
YU3BO	**21**	**2,136,750**	**1539**	**525**
YU2CT	**21**	**1,546,704**	**1386**	**414**
YU2OM	"	168,912	331	184
YU2CDS	"	83,080	226	155
YU7SF	"	29,939	130	91
YU7MGU	"	7,533	96	81
YT3M	**14**	**2,170,168**	**1764**	**542**
		(Op. YU3ZO)		
4N7ZZ	**7**	**310,642**	**564**	**254**
YU4EJC	"	95,184	286	144
YU7ORQ	"	2,604	36	31
YU7AJD	**3.7**	**15,038**	**107**	**73**
		(Op. YU7MCL)		

U.S.S.R.

EUROPEAN

RA1AA	**A**	**421,963**	**748**	**337**
UA3TN	**A**	**208,624**	**424**	**272**
UW6LC	"	95,914	258	182
UA4CDL	"	93,456	247	177
UW6AA	"	92,547	350	273
RA3VV	"	61,451	219	173
RV6AF	"	79,488	234	192
UW1BM	"	48,013	230	133
UA4CO	"	39,680	142	124
UV3MM	"	39,312	135	112
UZ6AXJ	"	18,326	151	77
UA3ZU	"	11,136	90	64
UZ3DX	"	10,165	98	95
RV6AB	"	7,228	55	52
RA3AC	"	1,080	29	27
UA6LQ	**28**	**4,578**	**48**	**42**
UA6LDX	**21**	**164,619**	**446**	**201**
RW3DN	"	129,250	314	199
RW4CA	"	84,660	350	170
RW3AN	"	1,566	25	24
UW1CX	**14**	**595,884**	**916**	**391**
RA1AO	**14**	**429,005**	**737**	**359**
RA1AL	"	386,580	794	340
RV6AK	"	309,474	900	297
RA1AG	"	135,584	455	223
UW3PZ	"	131,206	421	227
UV3DN	"	81,780	302	188
UV1AT	"	67,969	281	167
UW3GL	"	32,100	146	107
RA3GJ	"	30,256	160	124
UV3NB	"	19,964	113	92
RA3VA	"	14,773	95	79
UA4CED	**7**	**33,108**	**119**	**93**
UA3TG	"	4,992	80	26
UA4CLV	1.8	504	16	12

KALININGRAD

RA2FC	**A**	**200,680**	**448**	**232**
UA2EC	"	74,571	213	159

UKRAINE

RB5EG	**A**	**358,776**	**567**	**297**
UY5TE	**A**	**243,432**	**537**	**252**
RB5AL	"	95,205	292	165
UT5RY	"	89,056	307	176
UB4VWA	"	71,630	260	130
UB5AFI	"	44,634	163	86
UB5JOO	"	28,080	150	120
RB5HT	"	11,346	65	62
UT5UCM	"	3,348	41	31
UB5JKG	28	615	16	15
RB5CCO	"	60	5	5
UT4UO	**21**	**138,159**	**293**	**189**
UB5IRM	**14**	**1,719,708**	**1765**	**556**
RB5MF	**14**	**1,636,059**	**1813**	**543**
RB5DX	**14**	**1,239,733**	**1343**	**473**
RB5LO	"	602,140	949	385
UB5MLP	"	20,184	105	87
UB5CN	"	13,816	93	88
UB5ITW	**7**	**273,540**	**445**	**235**
RT4UF	**7**	**252,624**	**465**	**228**
UB5IFN	"	219,094	460	199
UB5LCV	"	122,640	274	168
RB4IWK	"	96,996	205	137
UB5HEX	"	21,094	145	106
UB5ISX	"	16,137	138	99
RB5FF	**3.7**	**196,524**	**452**	**206**
UB0YO	"	117,936	310	156
UB5AFI	"	44,634	163	86
UB5CCP	"	16,616	123	67
RT5UY	**1.8**	**9,752**	**55**	**46**

BYELORUSSIA

UC2AFA	**21**	**90,021**	**236**	**161**
UC2WAZ	**14**	**32,766**	**148**	**129**
RC2AP	"	616	22	22
UC2ACT	**7**	**27,048**	**129**	**92**
UC2AAD	**3.7**	**49,032**	**220**	**108**

KARELIA

RA1NA	**A**	**285,378**	**599**	**262**

MOLDAVIA

UO5GR	**A**	**26,068**	**132**	**98**

LITHUANIA

UP3BH	**A**	**729,120**	**924**	**392**
UP3BQ	**A**	**148,896**	**398**	**188**
UP2AV	"	113,487	333	181
UP2BN	"	42,602	200	119
UP3BA	"	14,823	100	81
UP2BBF	"	11,760	84	56
UP2OU	**21**	**13,872**	**90**	**68**
UP2NK	**14**	**1,033,519**	**1108**	**443**
UP2ND	"	34,524	167	126
UP2BLF	**7**	**125,120**	**352**	**170**
UP2OQ	"	6,136	64	52
UP2BW	**3.7**	**349,450**	**680**	**241**
UP2BNC	"	46,088	211	124
UP2BBD	"	14,300	139	50
UP2TP	"	14,008	106	68
UP2BNY	"	4,576	54	44
UP2BAY	**1.8**	**5,544**	**68**	**42**
UP2BQQ	"	450	17	15

LATVIA

UQ2GMR	**A**	**183,522**	**430**	**219**
UQ2GIP	21	156	14	12
UQ1GXY	**7**	**4,875**	**75**	**65**

ESTONIA

RR2RR	**A**	**27,740**	**105**	**95**
UR2RIY	"	9,378	99	83
UR2RJ	**14**	**1,731,400**	**1514**	**550**
UR2RER	"	1,836	30	27
UR2RRR	**7**	**1,061,802**	**993**	**371**
UR2RNX	**3.7**	**31,122**	**163**	**91**
UR2RNA	**1.8**	**9,486**	**91**	**51**
UR2RDJ	"	594	17	11

OCEANIA

AUSTRALIA

VK2EKY	**A**	**88,382**	**280**	**107**
VK4OX	**A**	**5,652**	**53**	**36**
VK4VKD	"	2,835	36	27
VK3SM	**A**	**1,107**	**25**	**25**
VK6IR	**21**	**1,736,928**	**1829**	**326**
VK4KWO	**21**	**76,912**	**294**	**92**

GUAM

KG6DX	**3.7**	**350,014**	**388**	**161**

HAWAII

AI6V/NH6	**A**	**6,411,300**	**2973**	**497**
AH6GQ	**14**	**2,863,680**	**2095**	**480**
NH6AB	"	773,736	883	309
AH6EK	"	265,185	446	213

INDONESIA

YB5QZ	**A**	**968,000**	**1020**	**352**
YB3CDL	"	829,500	969	300
YC6LD	**21**	**528,598**	**759**	**238**

YC0CLQ	''	394,560	698	192
YC3BXK/8	''	294,400	532	200
YC8VFB	''	245,557	515	169
YC7DF	''	163,602	318	183

NEW ZEALAND

ZL1ANJ	**A**	**2,037,576**	**1578**	**438**
ZL1IM	''	55,935	179	113
ZL1AXB	**14**	**1,684,803**	**1375**	**433**

NORFOLK IS.

VK9NS	**A**	**4,685,280**	**2762**	**516**

THE PHILIPPINES

K4YT/DX8	**A**	**3,255,075**	**2190**	**391**
K1BAZ/DV1	''	402,402	839	154
KD6TB/DU2	''	347,620	594	191
DV1NH	**21**	**770,196**	**1241**	**212**
DX2F	''	310,320	886	120
		(Op. KA3DRR/DV2)		
DV1AAR	''	168,000	479	105
WA7CQE/DV2	**14**	**227,766**	**481**	**174**

SOUTH AMERICA

ARGENTINA

AZ6ETB	**A**	**5,357,160**	**2592**	**690**
		(Op. LU6ETB)		
LU4LAV	**A**	**2,369,552**	**1477**	**548**
LU6ABT	''	13,632	81	64
L4D	**21**	**3,946,362**	**2074**	**651**
		(Op. LU4DM)		
LU1FLY	**3.7**	**9,744**	**50**	**42**

BOLIVIA

CP1AT	**A**	**4,459**	**51**	**45**

BRAZIL

PP5JD	**A**	**2,260,222**	**1407**	**526**
PY8ZWM	**A**	**1,640,107**	**1160**	**427**
PT7AUI	''	914,690	920	511
PY4BA	''	314,001	444	251
ZV2CW	''	9,686	60	58
		(Op. PT2CW)		
ZZ5EG	**21**	**9,794,448**	**4045**	**816**
		Op. N5FA)		
ZZ5ABW	**21**	**2,099,760**	**1500**	**520**
PY5NF	''	879,802	762	394
PY1TIA	''	2,294	42	37
ZY5EG	**14**	**5,087,020**	**2368**	**733**
		(Op. PY5EG)		
PY7AHJ	7	100	5	5

CHILE

CE3DNP	**A**	**2,601,271**	**1548**	**551**
3G4A	**A**	**674,515**	**764**	**313**
		(Op. CE4BQO)		
3G4B	''	231,318	444	181
		(Op. CE4ETZ)		
CE7HBY	''	5,586	89	49
XQ3D	**28**	**276,403**	**463**	**229**
		(Op. CE3DPD)		
CE6DFY	**28**	**210,474**	**414**	**198**
CE3ZI	''	113,240	287	152
CE4NV	''	25,032	124	84
CE6EZ	**21**	**4,705,659**	**2422**	**661**
CE4FXY	''	1,101,297	914	417
CE3IBQ	''	177,156	529	114
CE3NR	**14**	**765,952**	**761**	**352**

ECUADOR

HC1OT	**21**	**3,309,171**	**1882**	**597**

NETHERLANDS ANTILLES

PJ2FR	**A**	**13,040,435**	**4520**	**823**
		(Op. N6KT)		
PJ9J	**A**	**5,073,640**	**2910**	**572**
		(Op. W1BIH)		

PARAGUAY

ZP5LOB	**A**	**428,226**	**516**	**298**

PERU

OA4ZV	**A**	**960,258**	**887**	**338**

SURINAM

PZ5JR/7	**A**	**100,368**	**211**	**153**

URUGUAY

CX9CO	**A**	**1,627,242**	**1123**	**474**
CX2AAL	**28**	**90,896**	**234**	**152**
CW8AC	**14**	**1,006,670**	**958**	**365**
		(Op. CX8AC)		
CX8CG	''	292,875	481	217

VENEZUELA

YV5JUD	**A**	**17,316**	**89**	**78**
4M5J	**21**	**341,531**	**489**	**239**
YV1DWQ	**14**	**493,344**	**573**	**288**
YV6CAX	**7**	**2,062,800**	**923**	**382**
YV5VN	''	47,872	98	88

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

KR8Y	**4,126,274**	**2354**	**773**
KI1G	**4,062,933**	**2461**	**747**
KU4V	**3,480,960**	**2382**	**735**
AI7B	**3,413,785**	**2142**	**619**
NU6S	**2,318,360**	**1563**	**484**
AB6R	2,189,408	1562	494
KM9L	**1,948,684**	**1624**	**628**
NE2W	**1,545,783**	**1421**	**577**
WI6Y	1,544,405	1439	499
AI6U	1,298,682	1179	462
WK6V	1,199,205	1145	423
NF9S	1,189,080	1240	540
NZ5I	**1,130,330**	**1435**	**610**
KW6C	1,011,499	1267	487
KJ9D	838,926	882	446
AA8A	**767,016**	**1036**	**477**
KM0L	731,400	1062	450
KD5RW	455,620	890	418
N6CCL	420,147	576	273
KJ0G	327,957	496	291
WG5J	322,530	674	390
WE6G	317,312	534	296
W4WJJ	262,197	434	243
W7UQ	159,786	376	269
KA2RGI	131,312	325	232
KE5TC	13,950	113	93

NORTH AMERICA

NP4CC	**11,201,571**	**4801**	**837**
VE4ALO	**2,291,324**	**1756**	**532**
VE4AA	2,250,380	1704	530
HI6/RCD	**2,012,148**	**1460**	**601**
VE3UOT	**1,559,145**	**1077**	**479**
XE2PPP	**1,468,125**	**1305**	**405**
VE7UBC	**1,018,980**	**927**	**370**
XEFJTW	268,652	508	188

AFRICA

OH8PF/EA8	**9,898,245**	**3822**	**735**
TR8A	**6,624,268**	**3065**	**718**
ZS4WRC	**604,960**	**655**	**304**

ASIA

4Z1Q	**2,921,850**	**2125**	**450**
JE2YRD	**2,631,576**	**1652**	**551**
JA1YWX	2,316,366	1478	521
HS8A	**2,154,346**	**2703**	**478**
JY8GO	**1,989,306**	**1268**	**459**
JA6YAI	1,594,476	1281	468
JA7YFB	705,048	678	348
JR4QZH/4S7	**668,340**	**1074**	**316**
JA1YAD	503,034	590	294
JA0ZAV	262,025	404	235
JA0YAD	68,696	202	124
JA1YCG	11,520	78	64
JR1ZTT	9,600	66	60
JA0ZNA	48	4	4

EUROPE

LZ7A	**9,769,206**	**3897**	**879**
DF8SSB	**8,651,334**	**3450**	**953**
HG6N	**6,981,410**	**3533**	**802**
IO3MAU	**6,478,272**	**3169**	**736**
HG7B	6,308,176	3812	746
FF3TV	**5,723,514**	**2921**	**747**
HG9R	4,878,300	3088	700
GB8WAS	**4,504,500**	**2713**	**693**
4N2E	**4,078,270**	**2550**	**686**
YU3AI	3,744,404	2485	634
YT2R	3,290,196	2121	644
HG1Z	3,186,506	2184	622
HA5KKC	2,979,531	2115	633
PA3CEF	**2,669,920**	**1951**	**592**
YT3T	2,531,481	1995	569
4N4C	2,501,963	1931	601
OH8AV	**2,499,068**	**1926**	**572**
HG1S	2,480,270	1936	602
HA2KMR	2,353,176	1878	588
HA2KRP	2,266,414	1902	554
DL0WPX	2,131,282	1726	586
HA6KVB	1,757,448	1911	504
HA5KDX	1,701,336	1599	494
Y54ZA	**1,580,426**	**1553**	**503**
HA5KDQ	1,455,912	1370	438
ON7ZV	**1,345,540**	**1261**	**490**
SP5PBE	**1,331,550**	**1245**	**450**
CQ1BZN	**1,230,398**	**1567**	**481**
4N2X	1,194,268	1078	586
HA8KZC	1,190,836	1256	463
Y31ZO	1,126,788	1200	466
HA7KLG	1,118,876	1241	431
DL0JU	1,017,819	1088	447
Y44ZK	959,410	1160	370
OK1ORA/P	**816,750**	**840**	**495**
DK0IN	808,756	913	412
G3UOA	793,152	929	408
SP9KJT	790,740	1055	382
OK5SSM	781,847	873	407
SP2PDI	743,625	961	375
HA5KDB	726,528	837	473
OZ1ABA/A	**684,282**	**951**	**354**
LZ1KVZ	676,014	1041	367
LZ2KPD	643,215	892	411
YO6KAL	**635,513**	**915**	**371**
OH7AI	608,486	915	367
SP7KTF	514,280	804	344
F6FYD	454,260	596	339
HA8KAX	443,292	669	318
YO6KBM	362,853	748	267
DK0CB	340,860	618	276
Y31ZA	291,840	602	256
LZ1KNP	219,240	639	210
YU2CAH	204,073	489	227
HA8KCO	197,400	402	235
EI7DJ	**176,540**	**477**	**260**
YU1EFG	165,564	304	252
G4XOM	157,617	456	211
LA2Y	**156,387**	**485**	**231**
OK1KQJ	147,375	293	225
DF0CF	146,985	427	205
LZ1KZM	120,360	320	170
SP1PEA	116,544	291	192
4N2D	100,914	439	121
HA6KNX	99,510	314	155
PA3CPG	89,584	279	176
HA7KMP	88,200	272	180
PI4TTC	79,492	273	167
HB8/HB9DFY	**78,895**	**226**	**155**
OK3KHO	63,840	225	152
OK2KJT	57,629	202	143
YO5KAP	35,598	132	102
OK2KPS	27,648	133	108
OK1KCF	17,028	112	86
OK2KNJ	10,764	95	69
YO3KBC	10,230	72	66
OK2KDS/P	2,275	40	35
OK3KVE	1,836	45	36
HA7KNT	1,372	54	22
OK1KCP	338	13	13
OK3KFO	160	8	8

OCEANIA

JA3YKC/T32	**5,472,456**	**2862**	**456**
KH6DW	**4,931,076**	**2728**	**489**
FO8JP	**4,801,500**	**3094**	**485**
AH2BE	**4,490,175**	**2777**	**475**
YE8X	**3,799,907**	**2579**	**479**
VK6DU	**1,583,781**	**1360**	**303**
WH6W	929,969	1170	229
YB0ZDC	782,442	871	306
VK6AFK/P	190,430	482	137

SOUTH AMERICA

LU1FKR	**7,710,374**	**3000**	**721**
LU2E	7,204,068	3020	747
CX1DX	**4,132,413**	**2125**	**669**
LU1VZ	3,961,105	2224	577
HK3MAE	**738,075**	**643**	**325**
CX1CC	**800**	**22**	**18**

U.S.S.R.

CLUB STATIONS

ASIA

RL8PYL	**6,224,577**	**3134**	**673**
UL8LWA	2,741,760	1952	476
UZ8CWW	**1,656,531**	**1685**	**459**
UZ9CWA	**1,382,247**	**1059**	**383**
UZ0QWT	977,178	982	438
UZ0AWB	886,655	914	329
UZ9CZM	727,853	737	371
UZ0LWO	700,290	1144	310
UI9BWF	**673,968**	**901**	**304**
UZ9OWD	534,139	683	293
RD1DWZ	**500,410**	**565**	**326**
UZ9CYP	365,356	523	241
UZ9YXO	234,752	359	224
UM9MWO	**147,056**	**344**	**202**
UZ9XWO	139,772	288	166
UW9CWF	133,635	295	259
UZ9CXU	99,050	334	175
UM9MZD	15,198	136	102

EUROPE

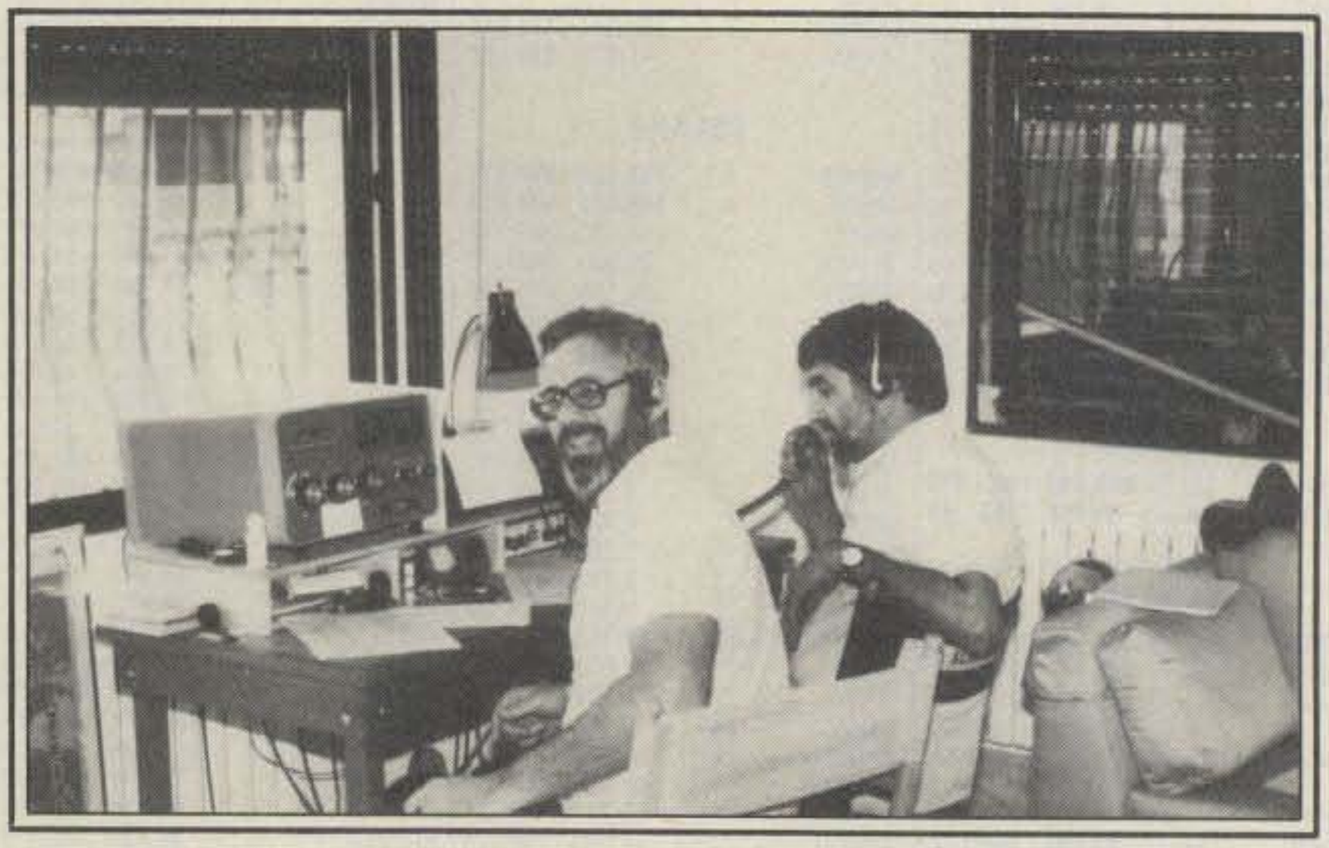
UZ4FWO	**6,456,124**	**3275**	**722**
UQ1GWW	**4,896,930**	**2841**	**755**
UQ1GZW	3,810,183	2290	647
UP1BZZ	**3,092,270**	**1845**	**650**
UZ6LWZ	2,761,395	2357	595
UT4UXW	**2,648,345**	**2244**	**595**
UZ2FWA	**2,492,280**	**2111**	**630**
UB4QWW	2,430,425	2052	553
UP1BZG	2,344,419	1708	561
UP1BWW	2,237,004	1731	538
UB4IWH	1,504,140	1482	516
UZ4WWB	1,438,446	1312	447
UP1BWR	1,424,241	1451	481
UP1BZO	1,353,249	1210	477
UB4MWA	1,197,570	1406	418
UB4MZL	981,057	1199	411
UC1AWC	**915,460**	**887**	**503**
UP1BWG	836,502	968	417
UZ3QWX	759,925	1048	396
UZ4LWU	688,721	842	319
UR1RWW	575,552	1003	368
UZ3WWW	536,452	877	343
UP1BWC	535,857	851	323
UZ4WWC	452,200	750	323
UC10WU	444,192	680	336
UP1BYC	354,200	634	280
UR1RWQ	**353,064**	**691**	**313**
UZ6AYN	346,840	691	290
UC1WWF	340,925	502	325
UZ1AWW	284,383	630	251
UQ1GXJ	279,312	560	253
UB4TWL	257,920	558	248
UB4EXZ	246,196	706	244
UZ3AZG	228,984	543	232
UP1BZM	213,444	496	198
UB0SZZ	153,850	456	170
UR1RXL	87,984	305	188
UZ4AWB	79,310	247	154
UT4UWL	78,970	288	149
R4ANK	73,684	270	169
UZ3PWJ	50,768	205	167
UZ3DZQ	49,000	210	140
UZ6AYG	37,088	188	122
UB4JXZ	35,140	192	140
UZ4FWX	22,139	136	89
UB4LZJ	19,758	145	111
UB4WYA	9,870	100	70
UR1RWB	6,382	66	39
RZ6AWP	6,300	82	63
UB4WZB	2,904	45	33
UT4UWT	1,968	47	41
UP1BYT	1,452	25	22

MULTI-OPERATOR MULTI-TRANSMITTER WORLDWIDE

KH6XX	**18,276,326**	**7271**	**799**
N5AU	**9,733,248**	**4818**	**1008**
KW8N	**8,473,705**	**4389**	**941**
WL7E	**7,521,330**	**3188**	**717**
NT5D	5,178,184	1821	836
JA9YBA	**4,966,032**	**2384**	**674**
JA7YFJ	4,380,865	2540	635
TI2OY	**3,293,052**	**2213**	**597**
WC6H	**3,112,800**	**2215**	**600**
JH8YCT	2,158,240	1261	470
W3GM	**981,065**	**893**	**437**
KC3EK	924,960	1157	480
CE6OS	**760,612**	**801**	**332**
PI4DEC	**600,928**	**751**	**356**
K6XO	403,056	553	324
JA3YCT	26,158	129	82

DISQUALIFIED: K8UNP—Did not sign portable as required by rule VII.

CHECK LOGS: The following logs were used for cross-checking. Check logs and SWL logs are always appreciated. Thank you.
AE6T, CE3AYZ, CE3BFZ, CE3BLJ, CE3BYL, CT1AVR, CT3DZ, DL5IC, EA1BZR, EA2CDG, EA2SN/1, EA3DAX, EA3EGI, EA8AMX, EC3CJE, GM4JFS, HA3KNA, HA5KHE, HA5KLF, HA5MY, HA8RJ, HA8XX, K3ZB, K6JG, K9JNB, KL7VZ, LA1MFA, LA1OEA, LA3PU, LA5QK, LA5XAA, LA8CD, LA9ML, LU7HJM, LZ1HP, LZ1KKZ, LZ2JF, NR0G, OH2CL, OH6GZ, OH8ZX, OK2BHJ, ON5FV, OZ1BTE, OZ2CE, OZ7HVI, PA3CNY, PA3DDK, PI5PVI, PP5JB, PT2TF, PY1OL, PY1QQ, RA1NB, RA3AR, RA3DKE, RA3GD, RA3VO, RA3VR, RA3VX, RA4HC, RA6LR, RB5AQ, RB5SB, RL7AB, RR2RX, RT5UO, RV3AF, RV9UV, RW3DF, RZ3AM, RZ3DZ, RZ6AWH, SM0CMH, SM0CSX, SM1CIO, SM5ARL, SM5ARR, SM6AVM, SM6CDN, SM6GOR, SM6KND, SM6LJP, SM6NXM, SM600I, SP-0237-WA, SP1CGP, SP1DMD, SP1LON, SP1LOR, SP2CYK, SP2DKI, SP2GOW, SP2IJV, SP2MHD, SP3BYZ, SP3NUT, SP3PJC, SP5CWQ, SP5PEN, SP6BIB, SP6CES, SP9BMQ, SP9PDF, UA0FS, UA3AGW, UA3AHA, UA3ATV, UA3DAO, UA3DLD, UA3DQS, UA3PB, UA3PDW, UA3PP, UA3TAM, UA3TBM, UA3XBB, UA4CKC, UA4HJA, UA4LCH, UA6ADC, UA6LMT, UA6RB, UA6WH, UA9FBV, UA9FZ, UB4CWW, UB4IWB, UB4UWW, UB4WZA, UB5CDF, UB5FCE, UB5IBV, UB5IMD, UB5PS, UB5VAA, UB5VCK, UB5WE, UB5YDX, UB5ZHQ, UB7QA, UH8EC, UJ8JJ, UL7LM, UL7PEI, UL8GWF, UQ1GWB, UQ2GT, UV3FD, UV3TE, UV6AY, UW0CW, UW3RR, UW3TN, UW9AO, UW9CL, UW9YI, UZ0CWA, UZ1AXB, UZ1ZWM, UZ2FWQ, UZ2FWZ, UZ3AWC, UZ3AWH, UZ3AYB, UZ3EWW, UZ3SWW, UZ4FWE, UZ4WWO, UZ6AZZ, UZ6HR, UZ6LZZ, UZ6UWA, UZ6XWC, UZ9AXX, UZ9HWW, UZ9OXG, UZ9SWY, UZ9UWN, UZ9UZA, V01AW, V01OP, WM6J, Y21DG/a, Y21SD, Y22DA, Y22TO, Y22UB, Y23CO, Y23EL, Y23RO, Y24HB, Y25MG, Y34YC, Y35UG, Y35WF, Y38UF, Y42ZA, Y43XE, Y46VD, Y48RD, Y55XD, Y56YF, Y59YM, Y64UF, Y67UL, YO4BJB, YO8AII, YO8CEZ, YO8KGS, YU7DR, YV5EF, YV5IVI. CQ



The voices of JY8GO, WA6POZ smiling, and W6RCL doing the work. Thanks, Gerry and Alan for the first JY entry in several years.

HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	999.00	**849.95**
PS-55 External power supply	199.00	**179.95**
AT-150 Automatic antenna tuner	445.00	**349.95**
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	
IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	**899.95**
PS-35 Internal power supply	199.00	**179.95**
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-44A SSB filter (2nd IF)	178.00	**159.95**

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	169.00	**154.95**
PS-30 Systems p/s w/cord, 6-pin plug	299.00	**269.95**
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	**149.95**
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	559.00	**489.95**
AH-2 8-band tuner w/mount & whip	625.00	**549.95**
AH-2A Antenna tuner system, only	495.00	**429.95**

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CW Filter: FL-45, FL-52A, FL-53A, or FL-54
World Clock: GC-5 • **Desk Microphone:** SM-6
Mounting Bracket: MB-5, MB-12, or MB-18

also, until 3-31-87

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Other Accessories - continued:	Regular	SALE
GC-5 World clock	91.95	**89.95**
6-meter VHF Portable	**Regular**	**SALE**
IC-505 3/10W 6m SSB/CW portable	549.00	**489.95**
BP-15 AC charger	14.00	
EX-248 FM unit	55.50	
LC-10 Leather case	39.50	
VHF/UHF base multi-modes	**Regular**	**SALE**
IC-551D 80W 6-meter SSB/CW	799.00	**719.95**
EX-106 FM option	140.00	**126.95**
BC-10A Memory back-up	9.50	
IC-271A* 25W 2 meters ... **CLOSEOUT**	859.00	**699.95**
AG-20* Internal preamplifier	64.00	
IC-271H 100W 2m FM/SSB/CW	1099.00	**969.95**
AG-25 Mast mounted preamplifier	95.00	
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	**1049**
IC-471A* 25W 430-450.... **CLOSEOUT**	979.00	**769.95**
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 ... **CLOSEOUT**	1399.00	**999.95**
AG-35* Mast mounted preamplifier	95.00	

***Preamp $9.95 with 271A/471A/471H Purchase**

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	115.00	**104.95**
PS-35 Internal power supply for (H)	199.00	**179.95**
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	
VHF/UHF mobile multi-modes	**Regular**	**SALE**
IC-290H 25W 2m SSB/FM, TTP mic	639.00	**569.95**
IC-490A 10W 430-440 SSB/FM/CW	699.00	**599.95**
VHF/UHF/1.2 GHz FM	**Regular**	**SALE**
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**369.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**479.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, UP/DN mic	429.00	**369.95**
IC-28H 45W 2m FM, UP/DN mic	459.00	**399.95**
IC-38A 25W 220 FM	459.00	**399.95**
IC-48A 25W 440-450 FM	459.00	**399.95**
HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-3200A 25W 2m/440 FM w/TTP	599.00	**499.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	**1089**
IC-120 1W 1.2 GHz FM Mobile	579.00	**499.95**
ML-12 1.2 GHz 10W amplifier	379.00	**339.95**
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	**1069**
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	**104.95**
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	**119.95**
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00	**1289**

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Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	**249.95**
IC-2AT with TTP	299.00	**259.95**
IC-3AT 220 MHz, TTP	339.00	**299.95**
IC-4AT 440 MHz, TTP	339.00	**299.95**
IC-02AT 2-meters	369.00	**299.95**
IC-02AT/High Power	399.00	**339.95**
IC-03AT for 220 MHz	449.00	**399.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2A 2-meters	299.00	**269.95**
IC-u2AT with TTP	329.00	**289.95**

Accessories for IC-u2A/T (CALL)

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	**399.95**
A-2 5W PEP synth. aircraft HT	599.00	**499.95**

Accessories for IC series	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier ... **SALE**	**99.95**
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$949.00	**799.95**
RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	**159.95**
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25 MHz-2 GHz scanning rcvr	1099.00	**969.95**
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	**119.95**
AH-7000 Radiating antenna	89.95	**(14)**

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Hazard "Buz" Reeves, K2GL
1906–1986

It is with a deep sense of loss that we report the passing of Hazard Earl "Buz" Reeves, K2GL, on 23 December 1986 at the age of 80 years. An entrepreneur of great vision and scope, Buz was a devoted amateur and contester for many years, establishing standards of operating and technical excellence which contributed much to the high levels of competition and skill which are obvious in today's contests. His professional contributions to audio and communications, in addition to other areas, have affected everyone in some way.

Graduating from Georgia Tech in 1928 with a degree in mechanical engineering, Buz formed his first company, Reeves Sound Studios, in New York City in 1933 with a small amount of cash and second-hand equipment. Having become an expert in recording, he was active, among other things, in developing techniques for sound movies and the manufacture of high-quality recording disks.

During WW II Reeves Ely Laboratories developed an X-ray cutting technique for the inexpensive mass production of high-quality quartz crystals. This process had a profound effect on radio communications both during and after the war, perhaps Buz's most significant contribution from the point of view of those in radio and electronics.

After the war Buz pioneered the use of magnetic tape for audio recording, and became active in the development of multi-channel stereophonic sound. His company Cinerama built a revolutionary three-projector movie system with multi-channel sound which was the forerunner (and impetus) of the wide-screen stereophonic movie theaters which soon spread nationally. Buz was also responsible for the first in-flight movie projectors, the phenomenal marketing success of the Waring Blender, early development of nickel cadmium batteries, and significant contributions in the use of magnetic tape in motion-picture sound. Reeves Instruments made contributions in radar and other areas. Reeves Telecommunications has produced, and is still producing, many popular and educational TV programs, and Buz conceived and founded the first computer-organized real-estate listing company, Realtron, with nationwide terminals. This is but a partial account of the scope of Buz Reeves, who had an amazing ability to foresee the possibilities of technical innovations and the drive to bring many of them into practical use.

In the early fifties Bill Leonard, W2SKE, did a program on Buz and Cinerama for his TV series "Eye on New York," and upon discovery of their mutual interest in amateur radio, they became good friends. Bill was a dedicated contester and soon convinced Buz of the merits of the sport. Some serious efforts were made, both multi- and single operator, when Buz found the superb location at the highest point in Tuxedo Park, New York and moved his home and station there in 1954. Several towers, multiple wires, and the first "Big Bertha" were installed and the contesting commenced in earnest. Buz had the insight to realize what could be done with multiple stations operating simultaneously, and the resources to implement it.

In the results of the 1958 *CQ* WW Contest Frank Anzalone, W1WY wrote, "K2GL had as many as four transmitters going at the same time and with the score on each band equal to the leading single band stations . . . . It has been suggested that we re-classify the multi-operator section. Perhaps divide it into two divisions, single transmitter and multi-transmitter." The following year saw the introduction of the multi-multi category, the "Americas Cup" of amateur radio.

Buz nurtured the growth of the station these 30 odd years, always the tough competitor and sportsman expressing delight in victory and admiration in defeat. During a party celebrating his eightieth birthday this past summer Buz was the first inducted into *CQ* magazine's new "Contesters Hall of Fame."

His quiet, easygoing manner and natural friendliness will be missed by all who knew him. The loss of Buz Reeves, entrepreneur and visionary, dedicated amateur and superb contester who showed what could be done, is a loss to all of us.

—N2AA

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- Feed Impedance . . . . . 50 Ohms
- Balun . . . . . 4:1 Rigid Coax

Mechanical

- Boom Length . . . . . 12′4″
- Element Length . . . . . 4.5″
- Mast Required . . . . . 2″O.D.
- Windload . . . . . 1 sq. ft.

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An Antenna Selector Switch With Automatic Grounding

BY JOHN SCHULTZ*, W4FA/SV0DX

Sitting before my transceiver recently listening to loud static crashes caused by distant lightning strokes and looking at the stormy, dark clouds outside, I finally decided that I should move ahead with a project I had had in mind for months. That project was to assemble a combined antenna-selector/automatic antenna grounding unit for my HF station. I had a separate antenna selector switch and grounding switch, but the problem was that I sometimes forgot to use the grounding switch to ground my station's antenna lines when I pulled the big power switch for the station. Therefore, the obvious solution was to put together a simple unit that allowed the selection of multiple antennas while the station was active and that automatically "grounded everything" when the main power switch to the station was turned off.

This article describes the relatively simple unit that was developed and which, in practice, has proved to be extremely useful. Any reader who has a bit of mechanical ability should easily be able to duplicate the unit. Also, the design of the unit can easily be varied to suit individual applications (e.g., the number of antennas involved). The only precaution to observe is that the design of the unit is **only** suitable for the HF bands. Its form of wiring would produce an unacceptable SWR level on VHF frequencies. Also, although it is a great comfort to know that "everything is grounded" when a station is not in operation, neither this device nor any other can totally protect a station from a direct lightning strike.

Circuitry

Fig. 1(A) shows the relay and manual switching used. S1 selects any one of three inputs (different transceivers or receivers). S2 selects any one of five different antennas or other loads. I elected to have the switch select any one of three antennas, a "special" load (an external signal generator), and a dedicated dummy load. The switching is very simple and straightforward. Relay RY1 and RY2 are each triple-pole double-throw units. When activated, they directly connect the inputs and outputs to S1 and S2. When the power is shut off and they are deactivated, they ground all of the inputs and all of the antenna loads. The TPDT relays were used because they were found as a surplus item. Regular SPDT or DPDT relays can be grouped together to perform the function described for any desired number of inputs and outputs.

Fig. 1(B) shows the power wiring for the relays used. Since the surplus relays used had 110 VDC coils, they were directly powered from the 110 VAC power line via a simple bridge rectifier. This setup is not really recommended and will be changed in the future. One really should try to use relays with 6, 12, or 24 VDC coils and power them from a line isolated power supply as shown in fig. 1(C). The LED shown in fig. 1(B) serves to indicate

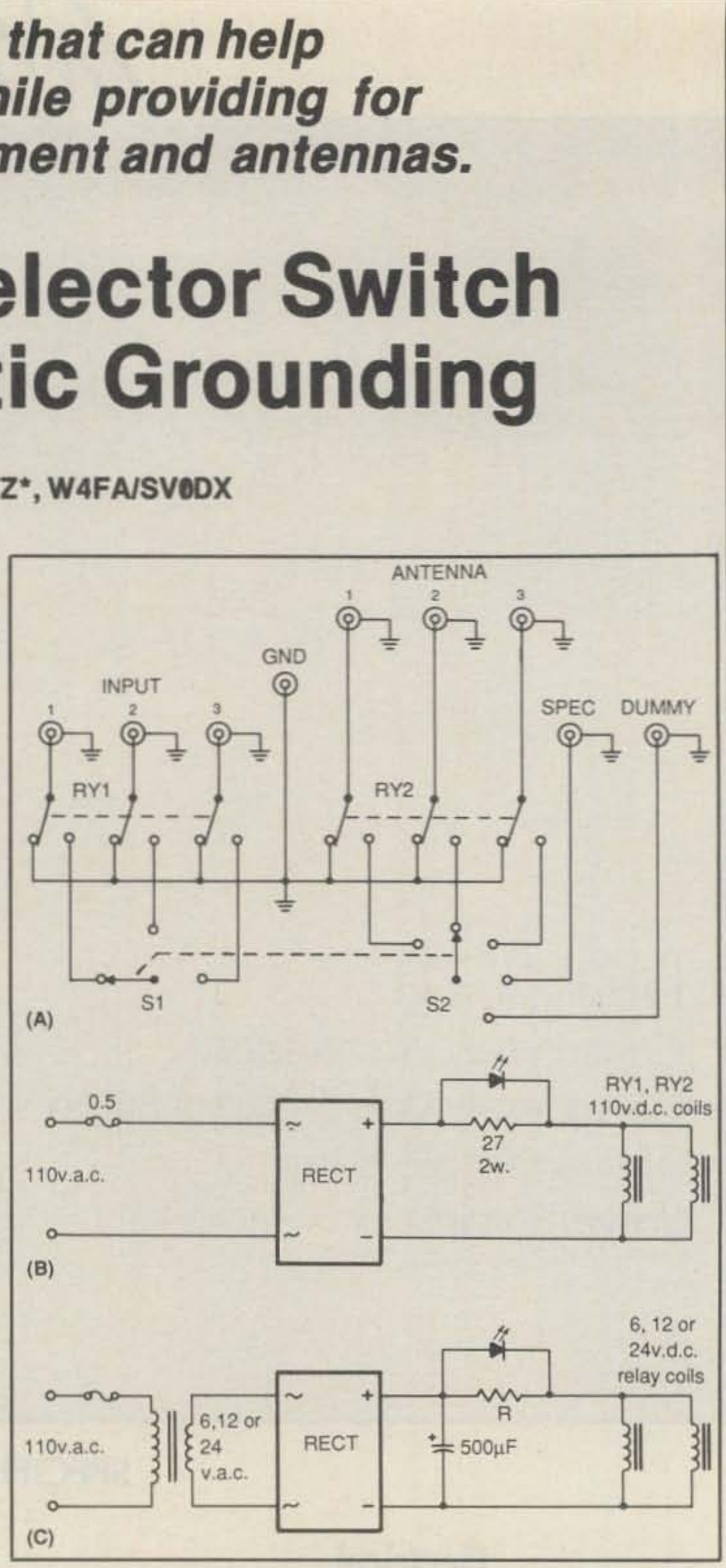
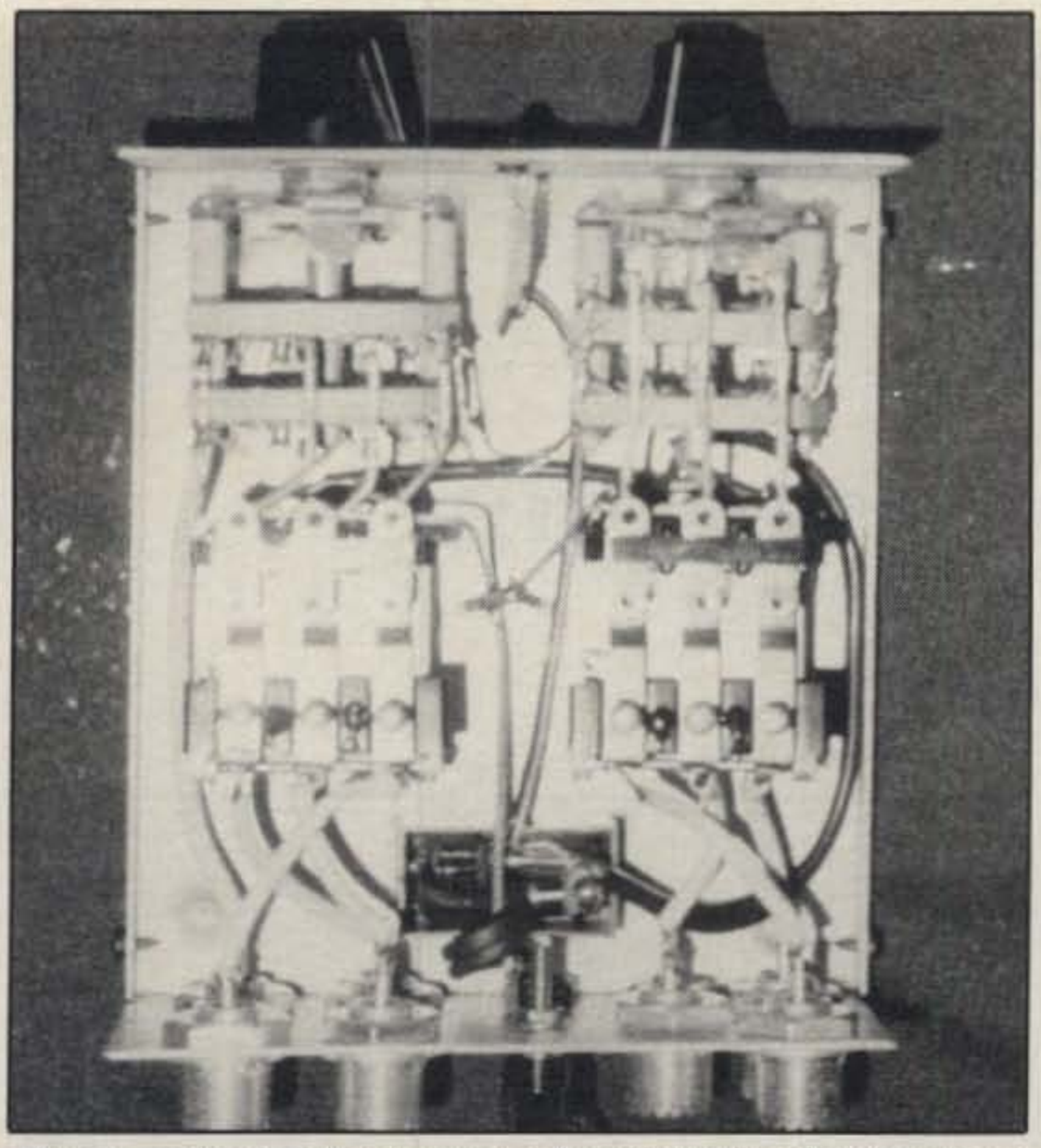


Fig. 1–(A) shows the basic wiring diagram for the switches and relays. (B) is the AC line power supply diagram for the 110 VDC relay coils. (C) is an outline for a line isolated power supply when relays with low-voltage DC coils are used. A plug-type transformer supply might also be handy to use.

that the relays have been activated, and not simply that primary voltage is present, since the LED obtains its operating voltage from the voltage drop across a resistor in series with the relay coil load. A similar scheme could be used with the power supply of fig. 1(C), but one would have to experiment a bit to find a suitable dropping resistor value across which to place the LED. If one doesn't want to bother with this slight refinement, a regular pilot lamp across the relay coils will at least indicate that they are being supplied with an operating voltage.

No on/off switch is shown because the unit's primary voltage

*c/o CQ magazine



The top cover has been removed to show the simple component layout. The input selector switch with its associated relay is on the left and the load selector switch/relay on the right.

comes from an AC power outlet strip which is controlled by a master power switch in my station.

Selecting Components

A great many new or surplus switches and relays with which to construct the unit can be found. I suppose it would be nice to have all of the components rated at a hefty 10 amps or so, but there is no need to go overboard in that direction, especially if only a 100 watt output transceiver is being used. On the other hand, since even 100 watts output will produce almost 1½ amps into a matched load, one should not use some of the "cheapie" rotary switches available on the market which can only handle less than an amp. The two relays need not have equal current ratings. If some choice is available, the relay used for RY2 should have the highest current rating, since presumably it will provide the most protection to station equipment as it grounds the antenna outputs when it is deactivated.

In the unit that was constructed, relays were used which had 10 amp contact ratings. The rotary switches were from the Centralab "PA" series, and each had two switch wafer sections wired in parallel (one wafer section would more than suffice for 100 watts output). The unit was tested at 1.5 KW output on all the HF bands and worked fine.

Again, I would emphasize that by hunting around a bit from mail-order surplus outlets or at hamfests, one can find very suitable components at no more than a few dollars each for the relays and switches.

Construction

The unit was constructed in a 2½" × 5" × 7" utility enclosure, but any enclosure that will allow reasonably short wiring between the in/out connectors, the relays, and the switches used would be suitable. If low-voltage DC relays are used, the power supply for them need not be within the enclosure. Many 12 VDC relays require less than 100 ma to operate, and an external plug-type power supply can handle several of them. The use of the external supply would also have the advantage of keeping the AC and RF leads well separated.

As can be seen from the photograph, the wiring of the unit is very simple. Since the relays which were used had pigtail leads going to their contact arms, the relays were placed so those leads could go to the various coaxial connectors mounted on the rear panel of the enclosure (as seen at the bottom of the photo). The ground bus from each relay and the lead from the rear-panel-mounted ground connector goes to a central ground lug which can be seen almost directly in the center of the photograph. A small piece of perforated board stock can be seen towards the rear of the unit. It contains the rectifier diodes for the relay coil line power supply. The power-supply LED is mounted on the front panel between the control knobs for the two rotary switches.

Measurements

As was mentioned, the unit as constructed easily handles 1.5 KW of output power. The insertion loss is below 0.2 dB. The SWR increase caused by the unit over a perfectly matched condition is 1:1.15 at 28 MHz. The capacitive coupling between the various side-by-side input and output lines varies only from 3 to 12 pF. Therefore, the unit is extremely suitable for HF use with the possible exception of making very sophisticated antenna comparison measurements on 10 meters.

Summary

A good, direct ground connection is essential if this sort of unit is to provide any real protection for a station! If you're not sure what a good ground is all about, read up on the subject before starting to construct the unit.

Fortunately, I can't testify that the unit has ever saved my station from lightning damage. However, it is very comforting to hear the relays in the unit fall out into a grounding position when I "pull the big switch"! In the meantime, I'm enjoying the in/out equipment and load switching functions provided by the unit.

Although the title sounds like the title of a 40s movie, the setting is present-day Shanghai. Today China is working to bridge the amateur radio gap from the 40s to the 80s.

Mission To Shanghai

BY TED CULLIAN*, K6RF

Back in the late 1940s there was enough amateur radio activity in China to keep DXers happy. By the end of the decade the Chinese were no longer active on the amateur bands. More than 30 years would pass before they were heard again. I was on my way to Shanghai to meet some of the new amateurs—if the monsoon lashing Tokyo's Narita airport didn't force China Airlines to cancel the flight.

The flight wasn't cancelled. Passengers from the Orient and the Far East, Americans and Europeans, swarmed aboard the hot, humid aircraft and buckled in for what promised to be an uncomfortable trip. As we churned down the runway, I thought of John Trevor, BY4AOM, and Mr. Xuru, BY4AA, and the bag I carried aboard. A few hours in this sweltering aircraft would get me there.

The air conditioning came on, condensing the moist air, and soon streams of water cascaded from the ceiling. One man unfurled an umbrella and continued reading his newspaper. With rain falling inside and out, everyone was on edge.

But relief was on the way. It came in the form of a comely flight attendant passing out cool, damp, lightly scented washcloths. A quick wash put us in a mood to appreciate what followed. And what followed was gifts for everyone—a handsome pocket-sized photo album covered with silk brocade, and later on a handy collapsible tooth-brush with a miniature tube of toothpaste packed in an attractive blue carrying case. An excellent dinner was served and the bar remained open. Although we were flying at 30,000 feet, I suspected that most of the passengers were at some higher altitude.

The turbulence increased during our long descent into Shanghai. Outside was total blackness—no lights, no villages, nothing to indicate that the most heavily populated urban area in the world was somewhere below. I would have felt a lot safer with John Wayne sitting up there in front. Without warning there was a jarring thump, a familiar squeal, and we were roaring down the runway at Hongqiao airport. As we filed out of the aircraft each of us received a delicately carved bamboo fan in a hand-painted sandalwood case. I would come in handy if I had to sit under a glaring light with customs officers interrogating me about the strange-looking things in my bag.

At BY4AA from left are: Hu; Chen; Mr. Xuru, station master of BY4AA; K6RF; Sadie, BY4AOM's XYL; John Trevor, BY4AOM; Wong; Cheng; and Tom.

Clearing customs was painless. Our tour director collected the baggage, loaded it on a cart, pushed it over to a customs officer, and after a brief conversation rolled it through the gate. We got VIP treatment: passports were checked, stamped, and with smiles all around we were waved through without inspection.

Now with the bag of radio parts safely inside China one problem remained: How to deliver it. Tom Wong, VE7BC, had warned me that transportation was not easy to arrange in Shanghai. I was worrying about that when our Chinese guide, Charles, showed up and herded us aboard a bus.

During the short ride to the hotel I explained to Charles about amateur radio and the bag I wanted to deliver to my friends. The address I gave him was 11 kilometers from the hotel. He was concerned about the distance, but promised to try to arrange for a cab. *Both ways!* Taxis are scarce in Shanghai and those few are based at the airport and the larger hotels. They are owned by the government; there are no privately owned taxis in China. Taxis do not cruise the streets looking for a fare, nor can you pick up the phone and call for one. It means if you go by cab, you had better have a way to get back.

Charles knocked on my door around 11:30 pm (no phone service in the room) to tell me he had arranged for a taxi to be at my disposal for a half day. He had written instructions in Chinese for my driver, whose name was Wong.

"Show it to him," he said. "Don't lose it. It tells him where to take you and where to meet us when you are ready to rejoin us." He smiled, "If you lose that paper, we may never see you again."

Greatly encouraged by Charles's part-

*2108 Bunker View Way, Oceanside, CA 92056

Shown atop a multi-story building are the antennas that put BY4AA's potent signal on the amateur bands.

ing words, I waited before the hotel for a cab to appear. Wong arrived on schedule. He spoke no English. I handed him the paper. He studied it for a moment, muttered something, and shook his head. I pointed to the paper, the cab, and me. He loosed a torrent of words and thrust the paper back in my hand. About this time a young fellow, who had been watching from the hotel, came over to help. "Where do you want to go?" he asked. His English was good. I told him the address on West Nanking Road and explained that Wong was to stay with me until I was delivered to the last address on the paper. He relayed this information to Wong. After an animated discussion, Wong started for his cab, beckoning for me to follow. The end of the quest was only a few minutes away, but no one had told me about the streets of Shanghai.

Travel in Shanghai

The streets of Shanghai are an overwhelming wall of surging humanity. We inched along through a sea of bicycles, people on foot, human-drawn two-wheel carts, bicycles towing heavily laden trailers, porters carrying heavy loads on poles balanced across their shoulders, and antiquated government trucks. Construction cranes reached into the sky. Behind stout bamboo scaffolding, multistoried buildings rose from the ground. New streets were being laid, squatting workers breaking old pavement with hand sledges and throwing it into donkey-drawn carts to be hauled away. A semblance of order was maintained at those intersections where there were traffic signals switched manually by a policeman sitting in a little kiosk at the corner.

One hour and forty minutes later Wong parked the cab and pointed across the street to a group of brick buildings. I got out to look around. There were no street signs, no number on the building, and, most unsettling of all, not an antenna in sight. This wasn't the place. I pointed to the directions, the building across the street, and shook my head. There wasn't anything I could say.

Wong had something to say—quite a bit, in fact. He then pushed me back into the cab and walked off down the street where he disappeared among the buildings. Ten minutes later he was back wearing a satisfied smile.

We drove back the way we came, turned into a narrow lane between two buildings, and stopped in the center of a large complex. I could see a TH-7, another Tribander stacked with a 4-element 6 meter Yagi, and an Oscar antenna. I had arrived at BY4AA.

Meeting The OTs

John Trevor, BY4AOM, was born in England but has lived almost all of his life in Shanghai. He is very fluent in English and, of course, Chinese. John came out to meet me and took me to the second floor where I received a warm welcome from the operators of BY4AA and BY4AOM. Mr. Xuru, the station master of BY4AA, is a very congenial man. He introduced me to his staff. Chen, a charming young lady and the ace CW operator at BY4AA, served tea, and we sat down to talk before touring the station.

How It Works In China

BY4AA is only one of the ever-increasing number of stations to appear on the amateur bands under the aegis of the Chinese Radio Sports Association (CRSA). Operators are employed and trained by the government. There are five operators at BY4AA and several more in training. New stations are coming on the air as fast as equipment (which is not to be had in China) becomes available to them.

To date, all stations on the air have been equipped by donations, most notably by JARL; Tom Wong, VE7BC, and BARS, the club at Boeing Aircraft. Money is scarce. The only way to get on the air is with donated equipment.

After a Q&A session Mr. Xuru showed me around. The operating positions were very neat and well equipped with Yaesu and Kenwood equipment of fairly recent vintage. All printed matter at the operating positions was in English, including their own list of banned stations. So, be polite when you call BY4AA.

It was getting late. I said my goodbyes, shook hands all around, and left with John, his lovely wife, Sadie, and four of his ops, all wearing bright blue hats with their old calls in white. The ride to BY4AOM was a replay of the earlier one, but with seven people in the cab. John kept advising Wong about better routes, but it still took 45 minutes to travel 6 kilometers.

At BY4AOM

John Trevor (in Chinese: *Sha Dee Wah*), station master at BY4AOM, and his

Gathered at BY4AOM are from left: Wong, ex-C2CA; Joh, ex-C1TH and station master of BY4AOM; Sadie, his XYL; K6RF; Tom, ex-XU8WM; and Cheng, ex-XU8EC.

The layout at BY4AOM, with Mr. Moa presiding from atop the antenna tuner.

operators are not members of the CRSA, nor are they employed by the government. This group is made up of previously licensed amateurs. They are: **A**ble **O**ld **M**en. Because of their experience and technical capability, they are permitted to operate outside the CRSA.

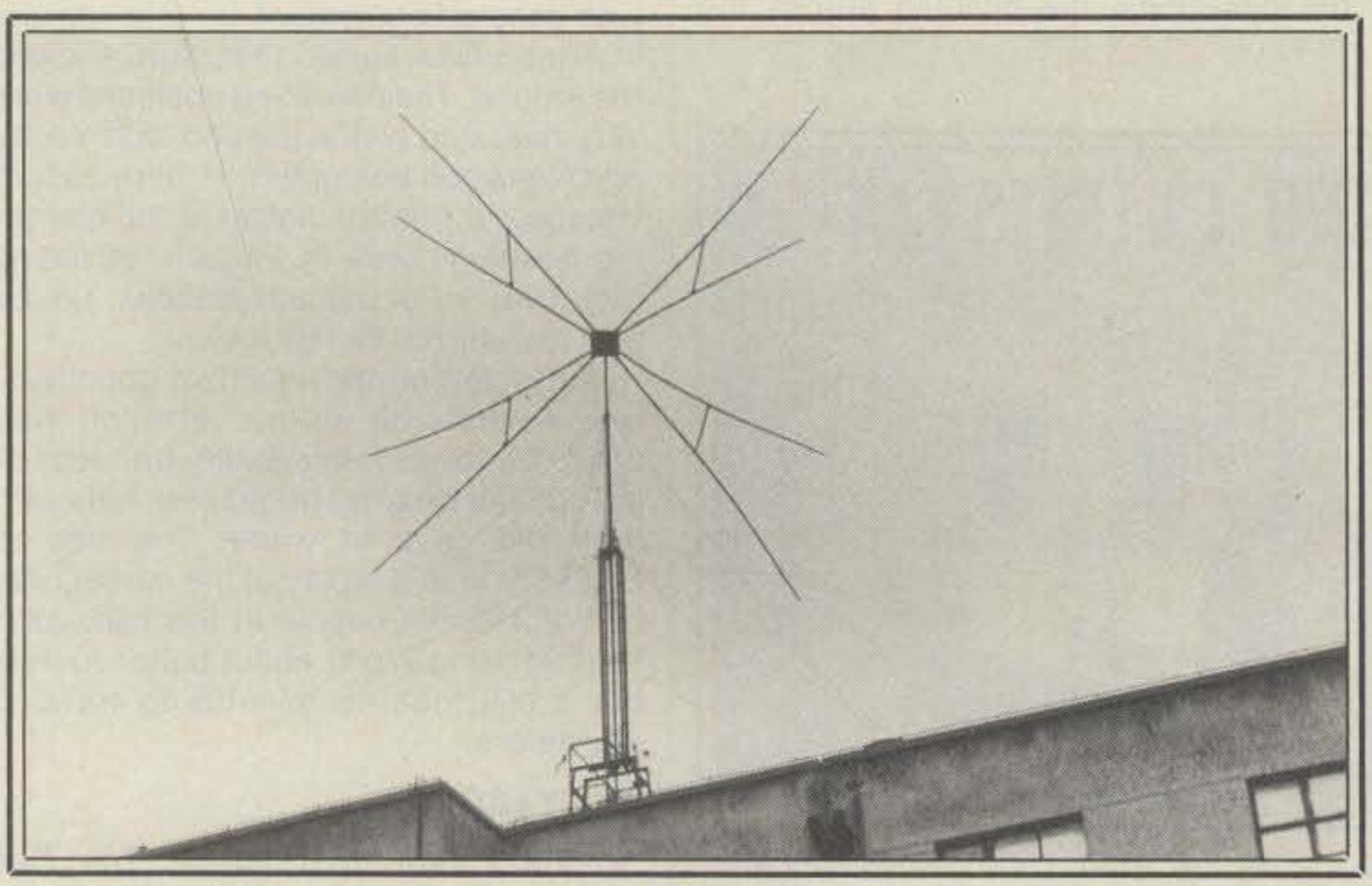
It is their responsibility to maintain the station equipment and train new operators. Currently, there is a class of 16 trainees. John's 15-year-old grandson has already qualified and operates the station.

The station is located on the second floor of The Shanghai Scientific Youth Center. On the roof of the long brick building is a 2-element boomless cubical quad covering 20, 15, 10, and 6 meters, fed with a single 300 ohm feedline.

Inside, next to the model-airplane shop, BY4AOM is spread out over two spacious rooms; one is used as a meeting and social activity room, and the other, separated by a wall of thick glass, is where the action takes place. Equipment includes a Collins KWM-2, an S-line, 30L-1, and a Drake TR-7. The legal power limit is an unspecified 100 watts. John urged me to try the operating position. With visions of a pile-up of historic proportions dancing through my head, I sat down and tuned 20 meters, then 15 and 10. Nothing. Not a signal. So much for being a hot-shot DX op.

It was my turn to answer questions for awhile, and then it was time to go. Sadie presented me with a statuette of a white-bearded, bald, benign old gentleman guaranteed to bring me peace, long life, and good fortune. (I dubbed him Mr. Moa and put him in my shack, where he performs various feats of magic—like getting me out of pileups. After the handshakes, and a hug from Sadie, I left to rejoin the tour—on time, I hoped.

We lost 20 minutes waiting at a crossing for a train that never appeared. But Mr. Moa was already at work. For although I had been warned that the group would leave the jade factory promptly at 2 o'clock, Charles was there when we arrived a half hour late. Visibly upset, he directed a few harsh-sounding words to Wong, who responded in kind as he drove away. We took off in the bus for Hongqiao airport, where we arrived with time to spare before our flight to Beijing.



The four-band boomless quad on the roof at BY4AOM.

Activity in the PRC

There are now 15 stations on the air in the Peoples Republic of China. The latest to appear is BY7KT in Canton. Three more stations are scheduled to begin operation before the end of 1986.

Private Amateur Radio?

"Yes," said Mr. Xuru, who fielded my questions, "private amateur radio, with personal call signs, will be a fact within two years."

The structure for issuing call signs is already in place. A new prefix, BZ, will be issued to private licensees operating club stations. Private stations (home operation) will use the prefix BG. Special call signs will soon be issued to *previously* licensed amateurs. Prefixes will be BY and suffixes will be A followed by the two letters of the old call sign. These call signs will be used when operating club or private stations.

How To Help

Getting a large number of stations on the air will require funds and equipment. If you wish to donate equipment to radio amateurs in China, you may write a letter to Mr. Xuru, 150 West Nanking Road, Shanghai Radio Sports Association, Shanghai, People's Republic of China. List the equipment to be donated and state specifically that it is a gift. Mr. Xuru will clear the manifest through customs and advise you when to ship. An airmail letter to the PRC will be delivered within five to seven days.

QSLing

Almost anything goes—SAE or IRC's of any vintage, or Chinese stamps.

Acknowledgements

My thanks to Merit Arnold, W6NLO, who was so generous with his donation of equipment, and to Tom Wong, VE7BC, whose invaluable advice prepared me to cope with the problems I encountered in China.

The Chinese People

It is refreshing to be welcome in a foreign land. The Chinese are warm and affable, curious about what we wear, our jewelry, video cameras, etc. Those who speak English are eager to engage in conversation and happy to be of service.

The facilities away from the metropolitan areas are quite spartan by western standards, but the people are friendly, and believe it or not, they like us.

Sometimes what appears to be something basic that everybody understands really isn't. To amateurs who build, soldering is one of those things we do often without thinking about what it is we are doing. This article is an overview of soldering and some new developments in soldering technology.

What's New In Soldering

BY VAUGHN D. MARTIN*

Indium, plastics, creams, and wetting. What do these have to do with soldering? Read on and you'll find out.

Conventional Soldering Techniques

Soldering is an everyday process for many of us. Yet our success in building electronic products or in repairing them frequently hinges on the quality of our soldering.

So exactly what is soldering, anyway? Conventional soldering is the bonding together of two or more metal parts with a tin-lead alloy (the solder itself). In a good solder joint, solder molecules actually mix with the molecules of the metal being soldered. This is called **wetting**. Soldering is the least expensive, yet most reliable method of connecting electronic components.

What kinds of soldering tools are available to you? Soldering irons (see fig. 1), soldering guns, and soldering pencils are all available. Many allow you to adjust the temperature of the tip by means of a thermostat. Fig. 2 shows you four common shapes of soldering tips. You will find a soldering pencil with a conical or semi-chisel tip best for small, detailed work. But how do you use these tools? Fig. 3 shows a four-step approach to soldering terminals or circuit boards.

Begin with a wet sponge. Heat the soldering tip and wipe it off on the sponge. Apply solder to the cleansed tip. This is called **tinning** the tip; it inhibits oxidation. Then place the soldering tip against the printed circuit board or against the terminal. Next, place the tip against the component to be soldered and apply solder. Be sure not to move the components while soldering. Apply heat long enough to allow the solder to flow evenly and uniformly over the joint.

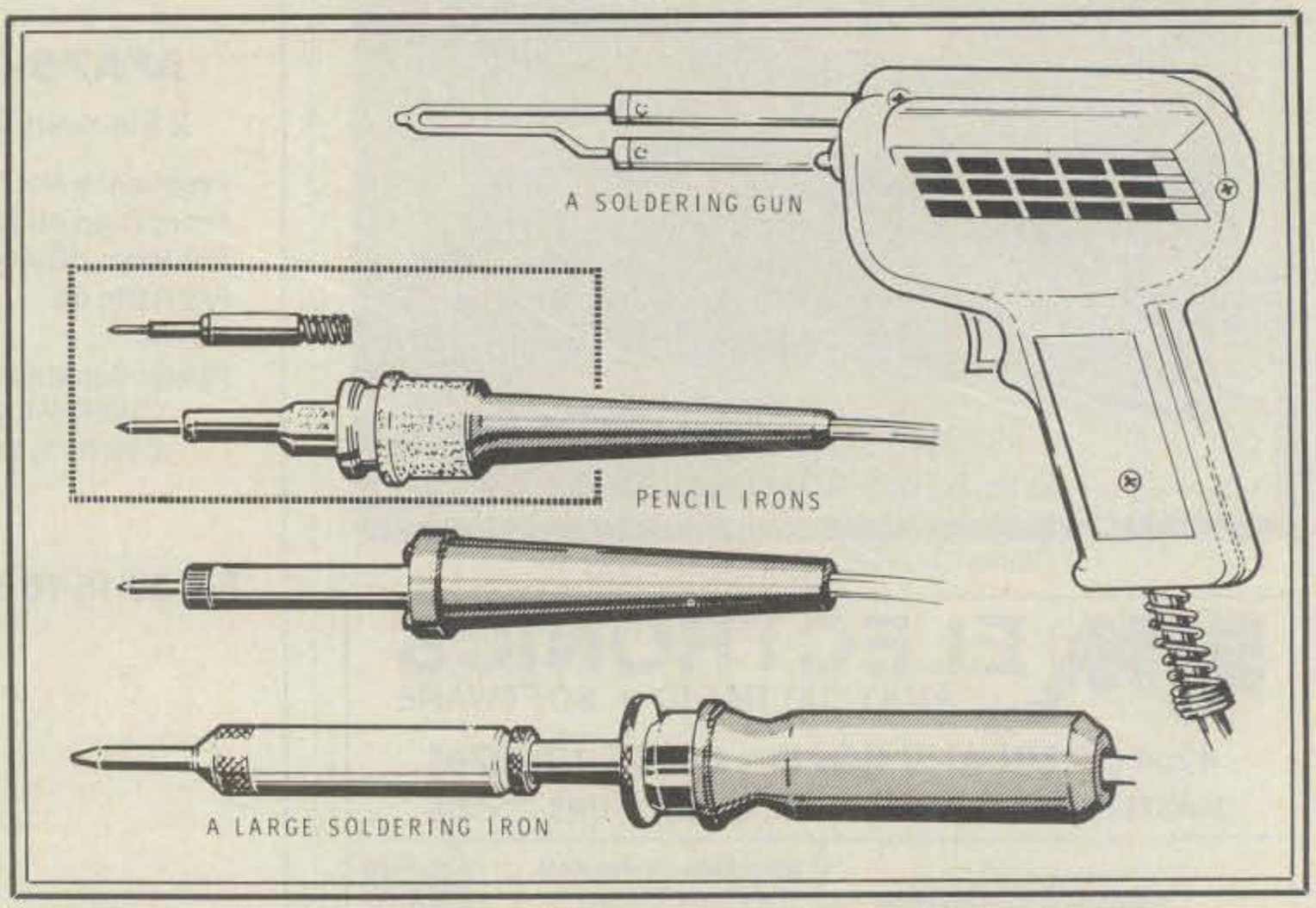


Fig. 1– The variety of different types of soldering irons.

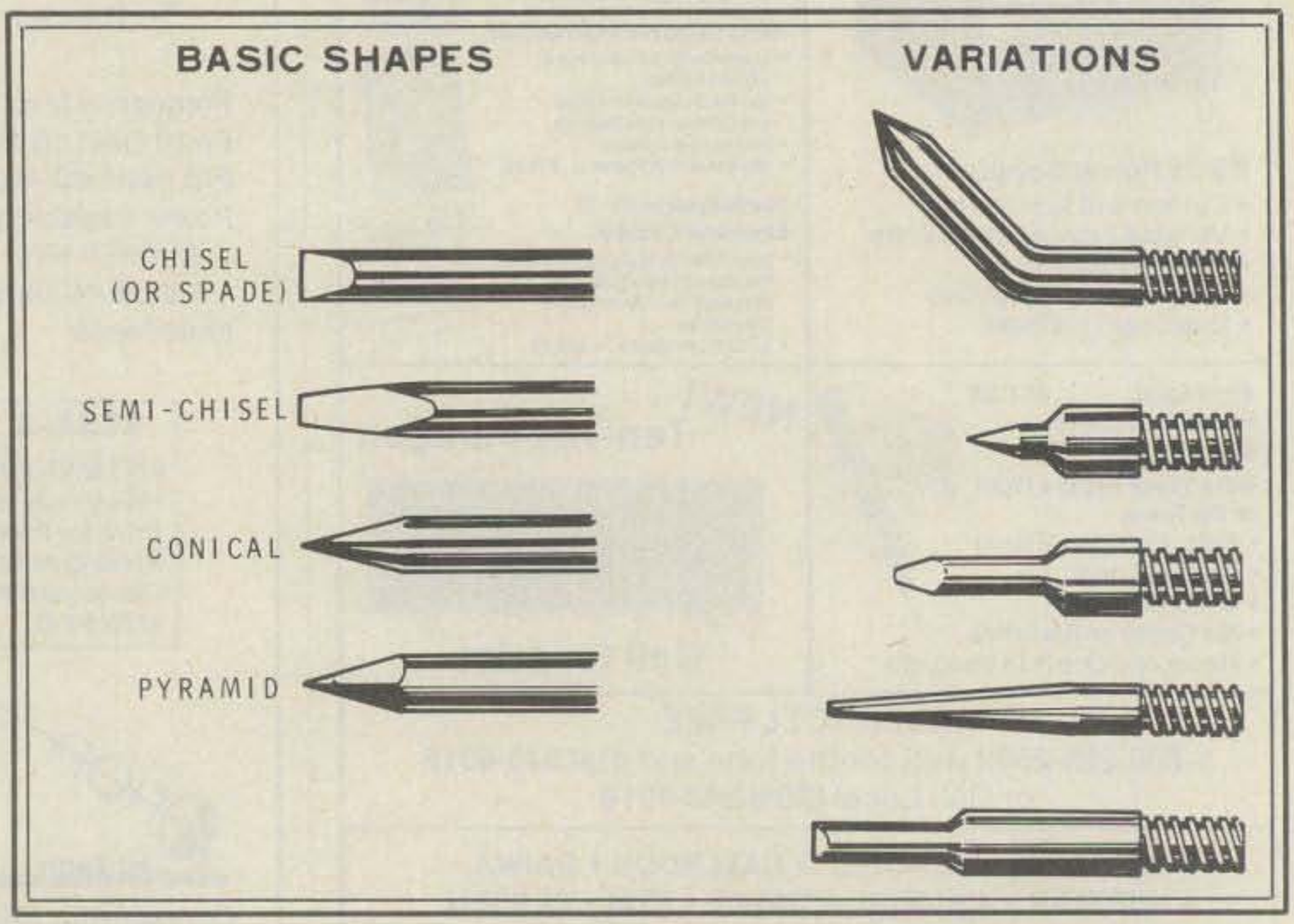


Fig. 2– The variety of different soldering iron tips.

*114 Lost Meadows, Cibolo, TX 78108

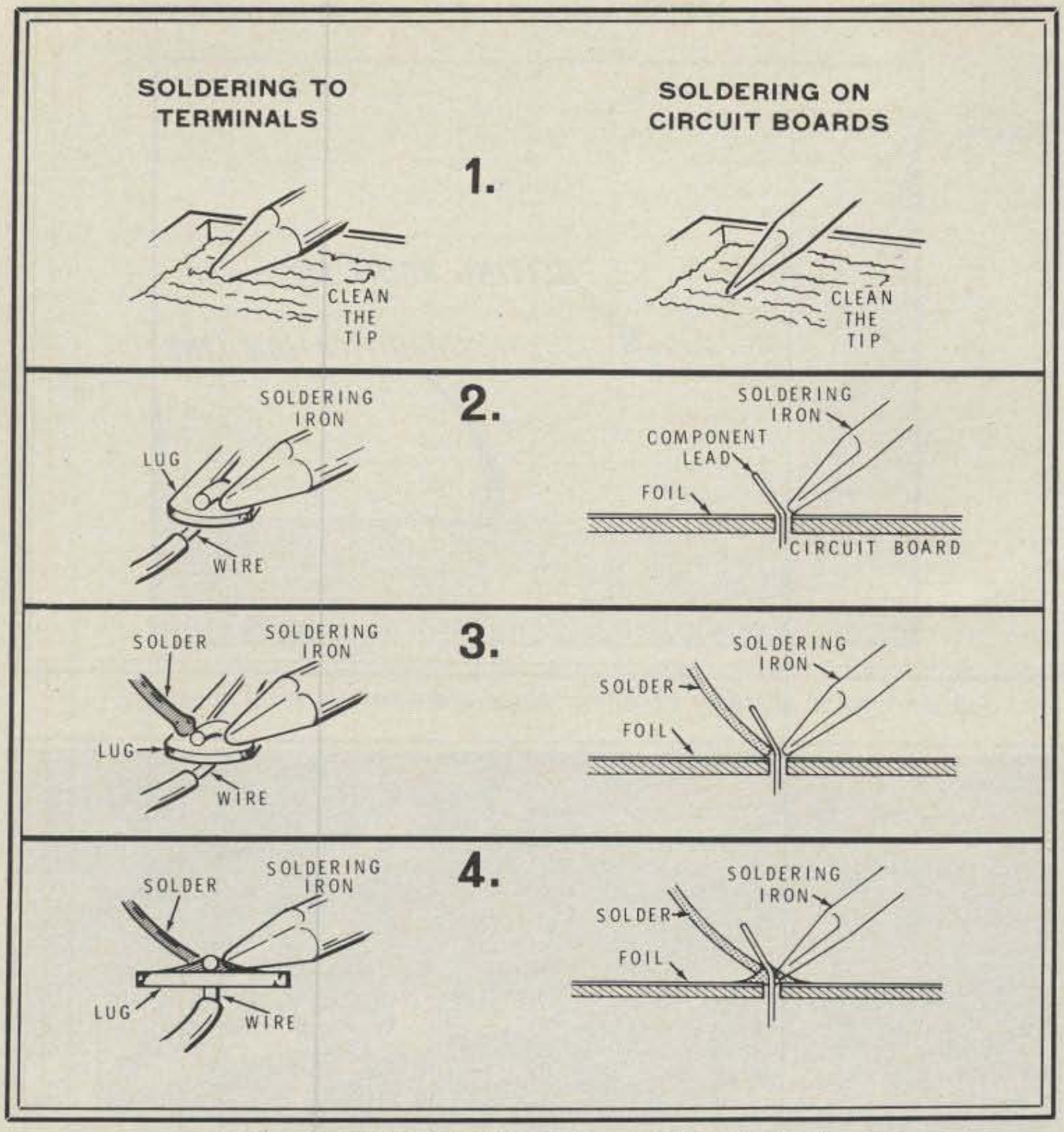


Fig. 3– A four-step approach to a good solder joint.

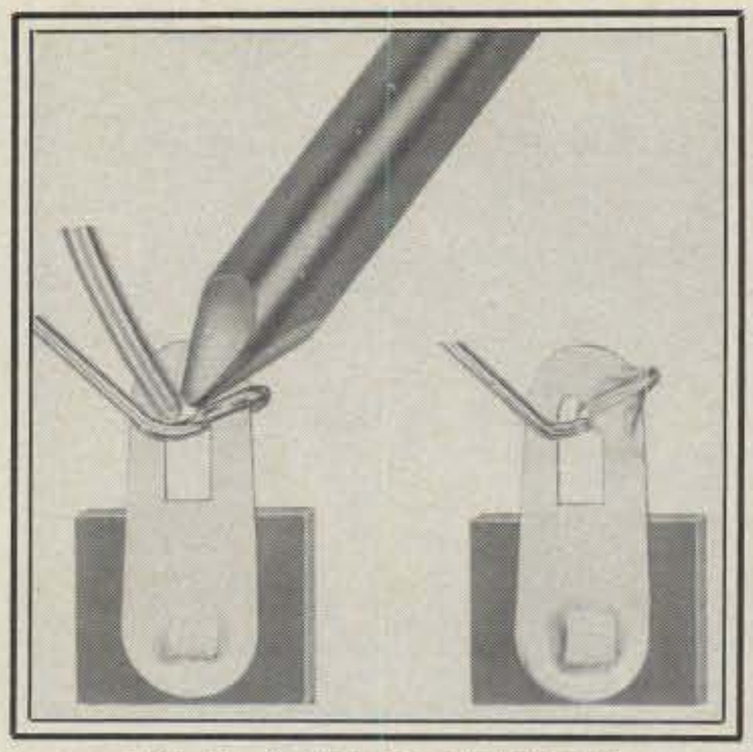


Fig. 4– A proper solder joint.

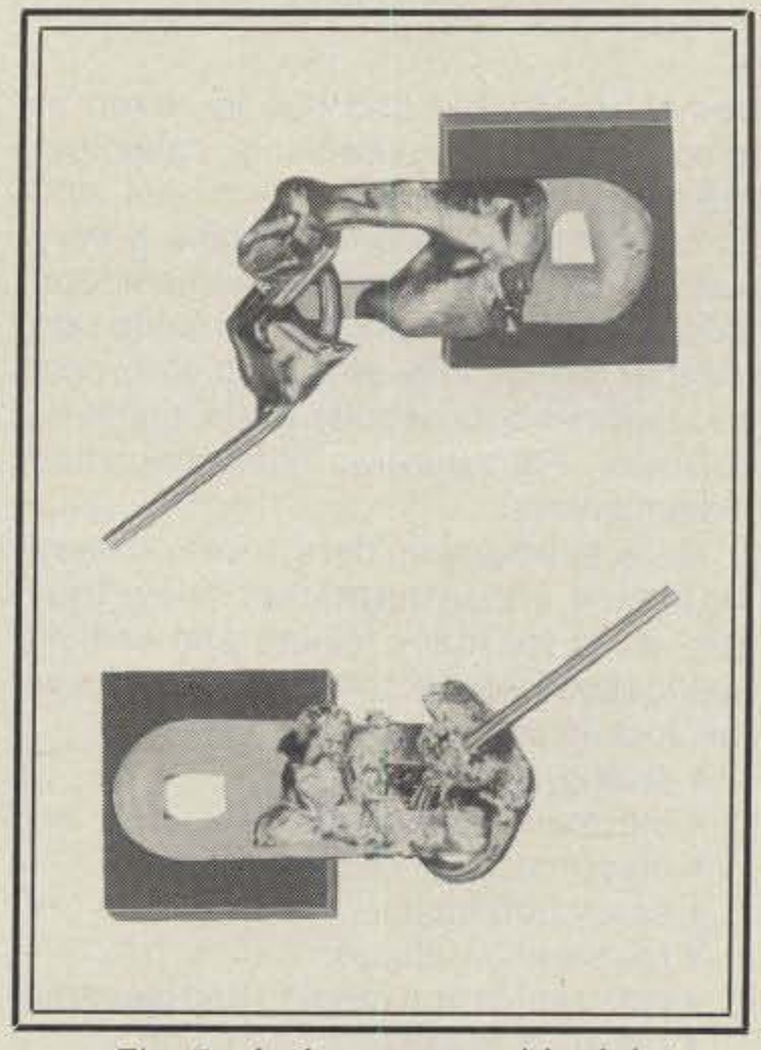


Fig. 5– An improper solder joint.

Before you apply solder, it's a good idea to bend the leads of your components to keep them from moving. You'll find that it's well worth the extra time.

If you soldered your joint correctly, it will be smooth and shiny like the joint on the right in fig. 4. If not, your joint will resemble the one in fig. 5. This is called a **cold** solder joint. It has a crystalline, grainy texture and is characterized by blobs and uneven solder flow. A "cold" joint is a poor conductor of electricity.

You must be extra careful when soldering integrated circuits (IC's). Typically, these devices have closely space pins at 100 thousandths centers, and this means trouble if you let solder flow to an adjacent IC pad (see figs. 6 and 7). To avoid this problem, use fine solder, a small soldering pencil, and great care. Then your results will look like fig. 8.

Occasionally, you will bridge a solder gap or solder a "cold" joint. You have two ways to remove the solder so you can start over. First, you can use a solder wick, which is a rosin-flux coated braid that absorbs molten solder. Or you can use a solder sucker. This instrument aspirates molten solder away from your solder joint.

Conventional Solder

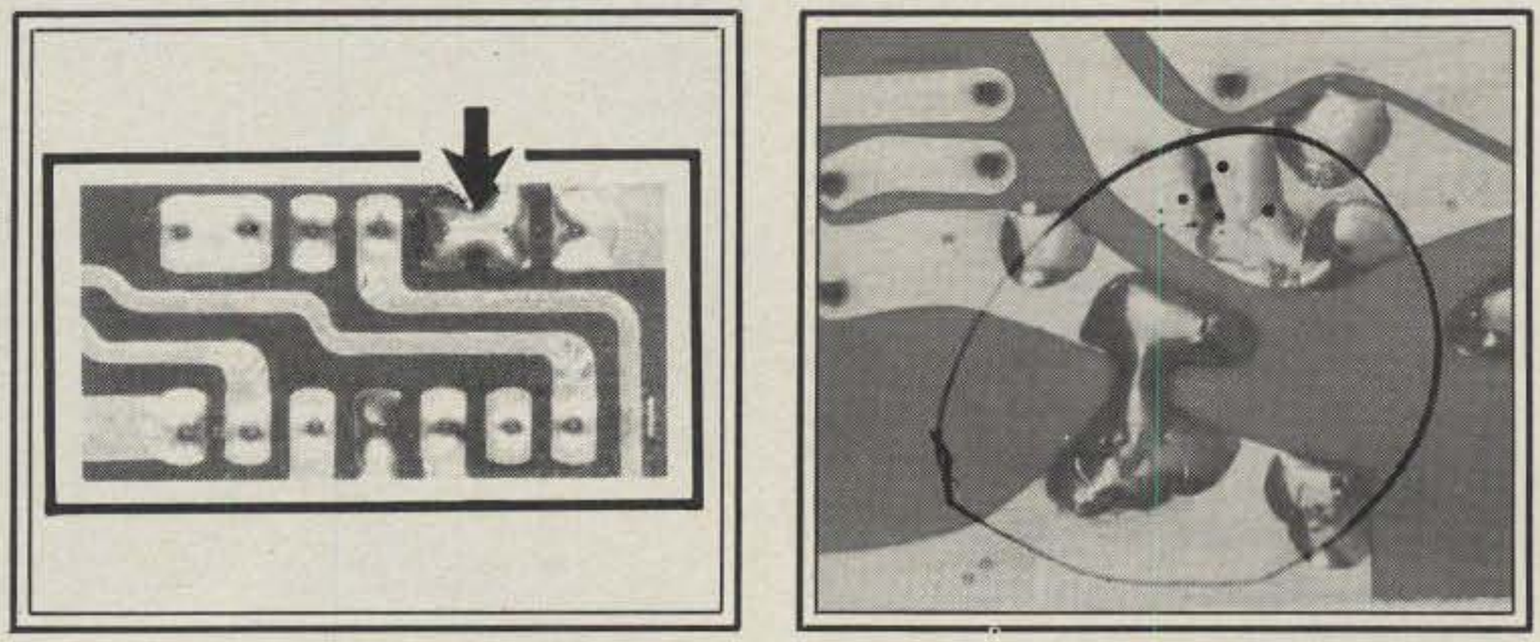
Conventional solder is an alloy of tin and lead which melts at a lower temperature than either tin or lead by itself (see fig. 9). The actual temperature at which solder melts is a function of the relative percentages of tin and lead in the solder. Solder with 37% tin and 63% lead yields the lowest melting point, but you will find that most solder is 40% tin and 60% lead.

Incidentally, the term **eutectic** is sometimes used synonymously with soldering. This is technically incorrect. Eutectic simply refers to the temperature at which a solid melts or freezes.

Flux is used to remove surface oxides from metal before it is soldered. It is available in powder, paste, or liquid form. And for convenience, many solders contain flux in their cores.

Indium Solder

One of the most exciting breakthroughs in soldering technology is the use of Indium, a semi-precious, non-ferrous, silvery-white metal with a brilliant luster. It is softer than lead (you can scratch it with your fingernail) and it is ex-



Figs. 6 & 7– Solder flowing over adjacent pins of an IC.

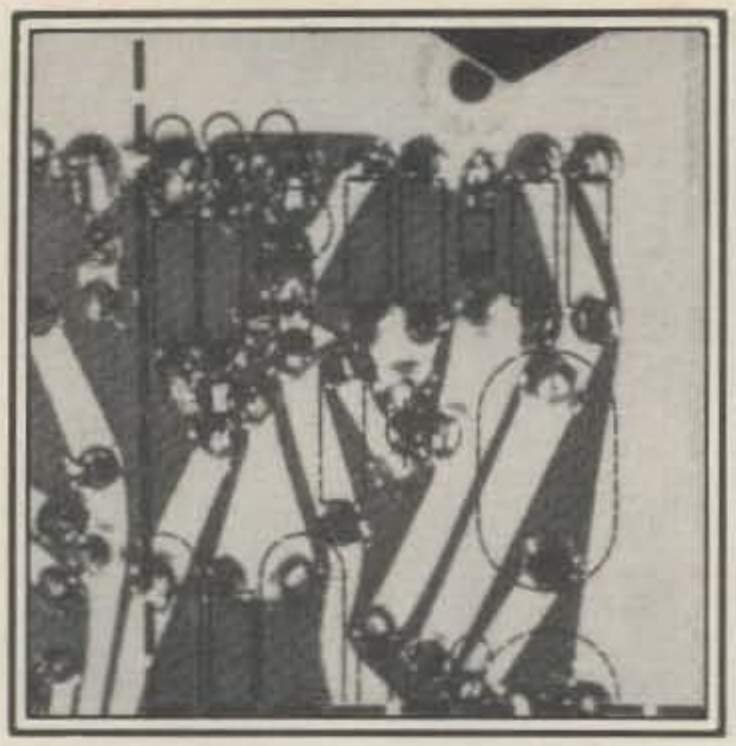


Fig. 8– A properly soldered IC.

tremely malleable and ductile, even at temperatures approaching absolute zero. It retains its shape when bent, and its softness and plasticity make it very suitable for gaskets, seals, and solders. Indium's ability to work into the oxide skin of other metals improves their electrical and thermal conductivity while inhibiting corrosion. Fig. 10 shows highly magnified Indium crystals.

Many specialty solders, most containing Indium, are on the market today. They are useful for many joining and sealing applications where conventional solders fail. Indium solders are:

- strong
- thermally conductive
- electrically conductive
- easily bondable
- resistant to fatigue
- resistant to scavenging and leaching
- resistant to alkaline corrosion

These advantages of Indium solders invite their use for the following applications:

- Multiple Bond Process Treatments. The melting point of these Indium solders is sufficiently below that of other solders to permit soldering without damaging other solder joints.
- Heat Sensitive Components. Indium solder's low melting point (Indalloy #136 melts at 136 degrees Fahrenheit) allows soldering without damaging heat-sensitive components.
- Corrosive Environments. Indium solders withstand both acid and alkaline corrosion.
- Vacuum Soldering. Indium solder's low vapor pressure ideally suits it to vacuum soldering environments where high vapor pressure solder would accumulate on and ruin other components.
- Low Toxicity Requirements. Indium solders with gold or bismuth and tin are good candidates to replace poisonous lead and cadmium solders in toys and cookware.
- Thermal Fatigue. Indium solders with lead or tin are highly resistant to temperature fatigue.
- Repair Requirements. Indium sol-

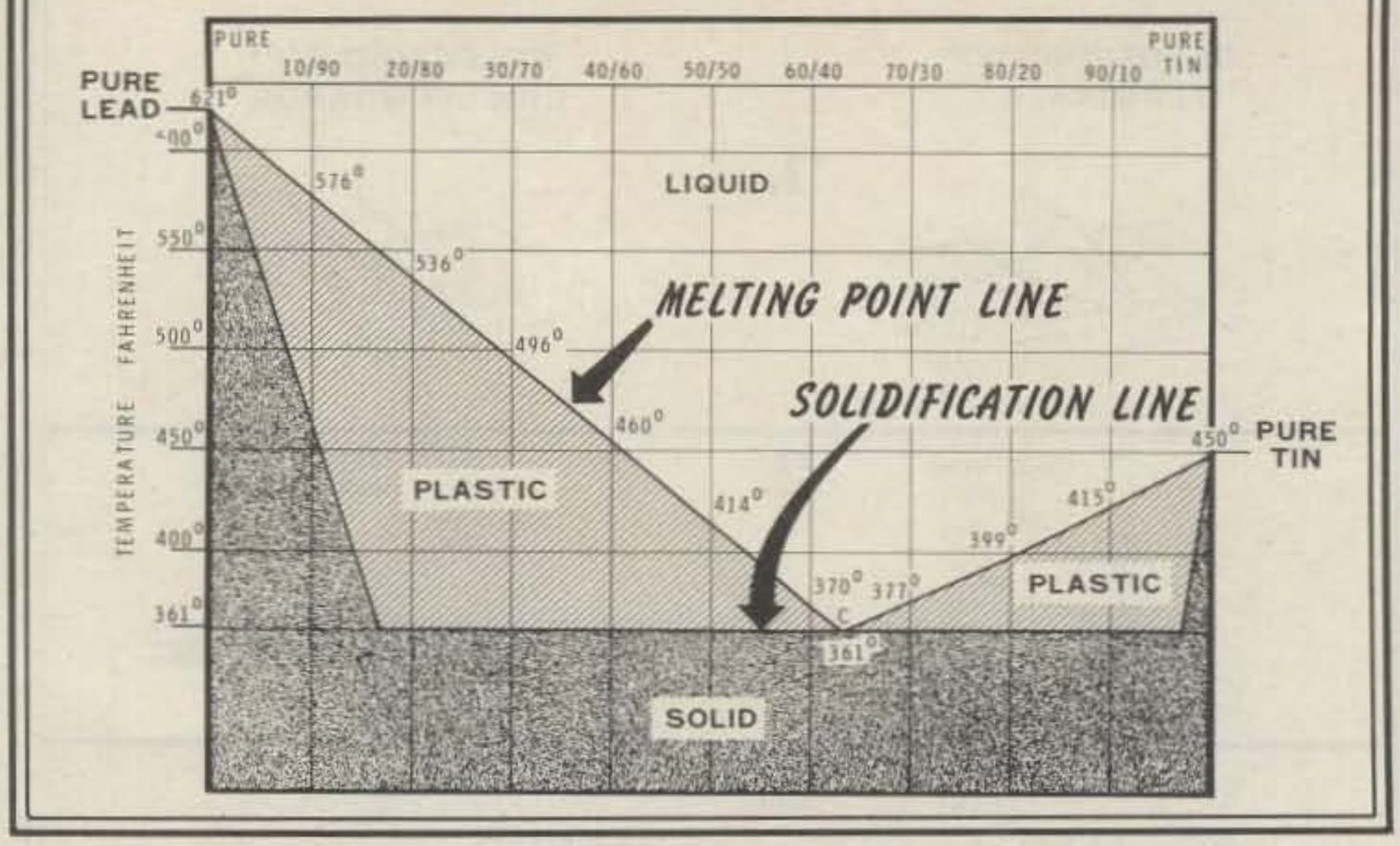


Fig. 9– A graph of solder's melting temperature versus its composition.

Fig. 10– A highly magnified view of Indium crystals.

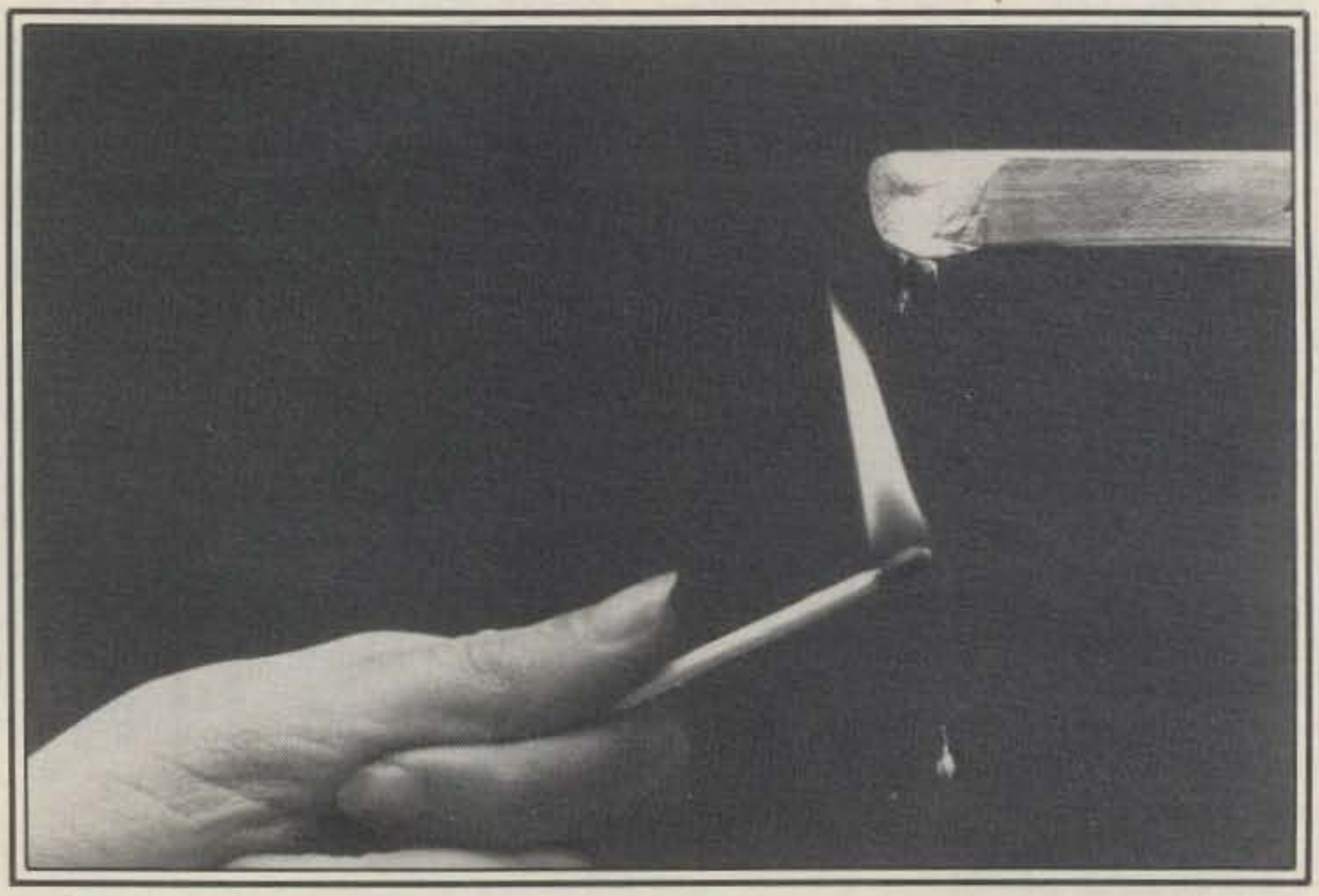


Fig. 11– An Indium fusible alloy being melted.

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Fig. 12– Manually dispensing the solder cream.

Fig. 13– An instrument that automatically dispenses liquids such as solder creams and holds components as well.

ders can be used for many applications for which epoxies and plastics are used, but they are much easier to remove should repairs or engineering changes be needed.

When Indium is combined in an alloy, it will wet glass, mica, quartz, glazed ceramics, and certain metallic oxides; and it will form a sub-oxide layer which increases its adhesion. To avoid interfering with this sub-oxide layer, you must not use flux. If you want to solder a metallic substrate to a nonmetallic substrate, precoat the former with solder containing flux; then completely remove the flux before soldering the metallic substrate.

Indalloys #1 and #4 have the best wetting qualities on non-metals. Indalloys #3 and #290 produce stronger connections because of the silver they contain, but they have slightly less wettability.

You can achieve bond strengths of between 300 psi and 700 psi with non-metallic substrates if you prepare them properly for soldering. Clean your non-metallic substrates thoroughly with a strong alkaline cleaner, rinse with distilled water, and rinse again with an electronic-grade acetone or methanol. In the case of glass, quartz, or glazed ceramics, heat to 350 degrees Celsius and cool. Heat the non-metallic substrate and the solder 20 to 30 degrees higher than the solder's melting point. Then gently rub the solder into the substrate with a nickel metallic felt or similar applicator. Cool the coated non-metallic substrate and solder to a second substrate.

Incidentally, you will find that an ultrasonic soldering iron is sometimes effective in wetting some non-metallic surfaces.

Fusible Alloys of Indium

A fusible alloy is an alloy of bismuth which contains tin, lead, cadmium, gallium or Indium, and which expands upon solidification. Such alloys have low melting temperatures, compared to most Indium alloys. But their poor wettability keeps them from being widely used as solders. Normal melting temperatures of the fusible alloys range from 40 degrees Celsius to 150 degrees Celsius.

This means that you can melt Indalloy fusible alloys, and keep them molten, on an ordinary hotplate. For special applications, you can even get Indalloys to melt as low as 10.7 degrees Celsius (51.3 degrees Fahrenheit). Fig. 11 shows an ordinary match melting a bar of Indalloy fusible alloy.

Plastic Solders

Let's now look at plastic solders. Some require heating to make them hard; others, the epoxies, generally do not. Instead, they are hardened by adding a catalyst, or hardener.

Many epoxies have excellent strength and wettability—even with non-metallic substrates. And they are good conductors of electricity. Emerson and Cumming's Econobond Solder 56C has resistance of 2 × 10-4 ohms/cm; Aremco-Bond 556 has resistance of 5 × 10-4 ohms/cm. The latter yields bonded shear strength of 3,000 to 4,000 psi within a temperature range after curing of −60 degrees Celsius to 200 degrees Celsius (−76 degrees Fahrenheit to 392 degrees Fahrenheit). And the great advantage of these epoxies is they do not have to be heated—a real plus when you are working with heat-sensitive semiconductors.

TRA-CON, Inc. of Medford, Massachusetts produces 56 different kits of premixed resins and hardeners with applications ranging from replacing conventional solder to providing insulation on a PC board by forming dielectric layers for repair of delaminated or "blistered" PC boards.

Surface-Mounted Components

No discussion of soldering would be complete without mentioning techniques for soldering surface-mounted (SM) components. These components are not only much smaller than conventional ones, but they have another interesting characteristic as well. They have no wire leads. Instead, they have what appears to be a semiconductor substrate with a small

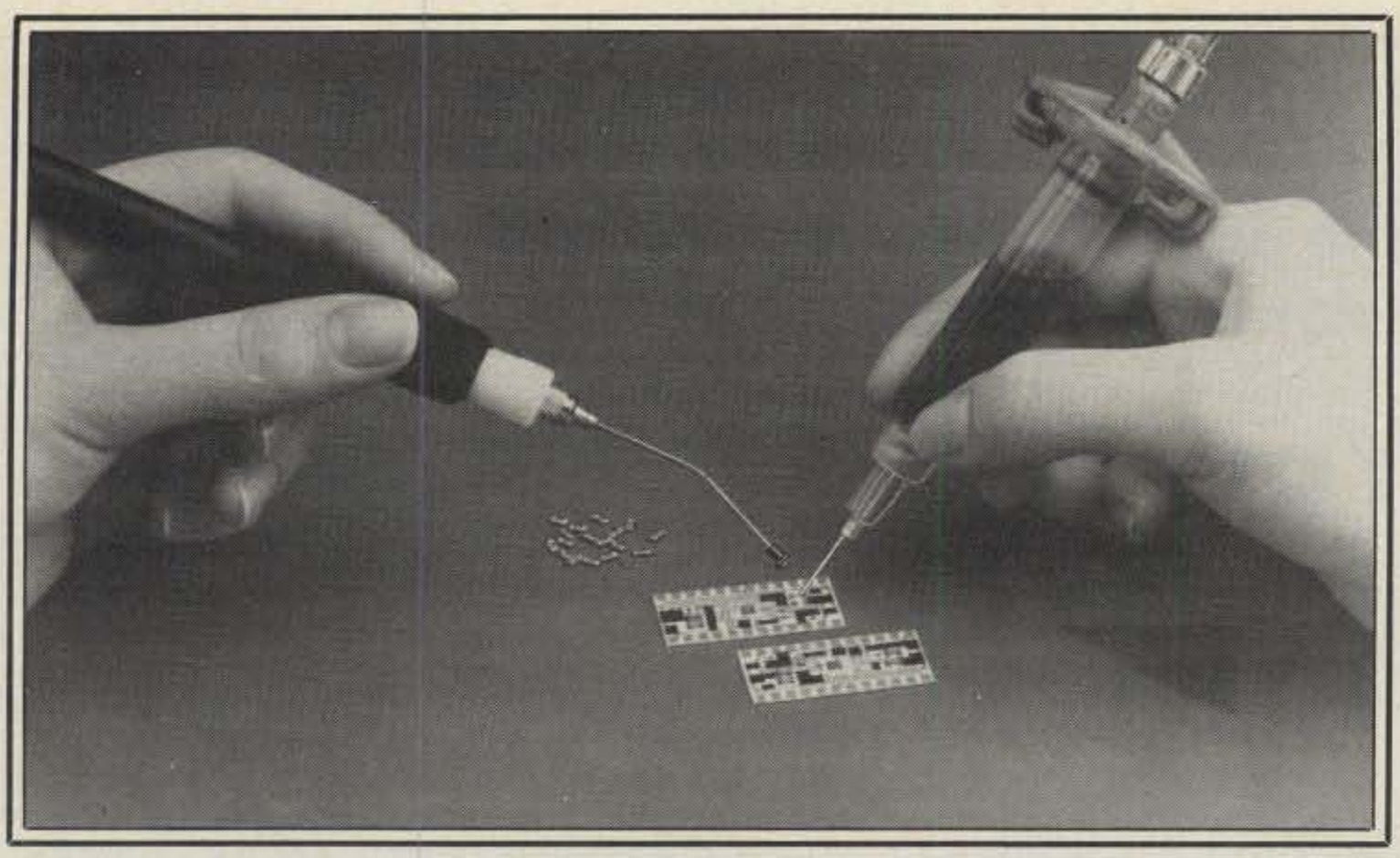


Fig. 14– An actual surface-mounted component board being soldered.

metal ridge along their edges. And they are precisely mounted to a PC board by precision vacuum placement, then robotically soldered in place.

Solder creams are available to make this precision automated soldering possible by letting us precisely place tiny, predetermined amounts of solder and flux on the conductors of PC boards, thick and thin film circuits, and flexible circuits. Or solder creams can be dispensed manually from a syringe onto a substrate (fig. 12). The intended use of soldering creams determines their viscosity, powder mesh size, metal content, and packaging.

Before you reflow your solder cream, be sure to cure it to avoid spattering and solder balling. Your substrate type, flux type, the metal content of your solder, and the amount of the solder cream deposited will determine your curing parameters.

The advent of surface-mounted components presents a problem to the engineer/technician in the breadboarding or prototyping stages. That is, how do you assemble these exceedingly small parts before a robot is finally programmed to do so after the design is finalized? During this initial stage of development the advent of just such an instrument (refer to fig. 13) was a welcome. This instrument, manufactured by EFD of Providence, Rhode Island, performs the two most vital functions in this soldering process. First, it dispenses discrete, easily controlled amounts of liquids like epoxies, and second, through a vacuum pick-up pencil it facilitates the handling of these extremely small parts (refer to fig. 14).

Conclusion

Now you know the many soldering possibilities available to you. Try them. And good luck soldering!

Editor's Note

The terms *Indalloy* and *Indium* are registered trademarks of the Indium Corporation of America, P.O. Box 269-GG, Utica, NY 13503. The company has several technical papers and general-purpose pamphlets available to interested readers. Simply write to Indium and request them. There is no charge.

Soldering illustrations are from the Heath Continuing Education series and construction manuals (Heath Company, Benton Harbor, MI 49022).

Are there some secrets to peacefully coexisting with your neighbors and still being able to operate your radio? KB1N shares some of the things he's learned about RFI and "the guy down the block."

Hi! I'm Your New Neighbor Part I

BY PETER R. O'DELL*, KB1N

"The only reason I am coming to talk to you is that I called the police and they refused to arrest you. You're interfering with my right to listen to the Tigers." He stood there looking like an angry bull sizing up his next victim. Bewildered, I asked him what he was talking about.

You've got to understand that it was not as stupid a question as you might think. I had the hood up on the car, and my wife was behind the wheel. There wasn't anyone else in our family then, either. In fact, I was in the process of trading equipment, so we didn't have a radio in the house.

"You're a ham, aren't you?" he asked.

"Yes."

"Well, I have a right to listen to my ball game. You're messing it up."

"You mean right now?"

"Yes."

"How could I be doing that? My wife and I are both out here in the driveway working on the car, and we've been at it for about a half hour. In fact, three days ago I sold all my equipment and shipped it off to some guy in Texas. So how could I be doing anything to your ball game?"

"I dunno."

It is amazing how quickly someone so angry can calm down. I asked him exactly what his problem was. He was attempting to listen to a nearby AM-broadcast station with a relatively strong signal. Something was interfering with his reception, and since our house had antennas going in ten different directions, he *assumed* that we were the source of all his problems.

I offered to help him track it down. As I recall, it was a defective fluorescent fixture. We didn't become buddies, but he never came back threatening me with arrest or worse. And I learned a really good lesson from that experience.

Other Times, Other Places

This wasn't the first time that RFI had raised its ugly head in my presence. A year or so before this incident we were living in a garden apartment. Our downstairs neighbor began to complain to the apartment management about the RFI. The relationships between us and the neighbors and the apartment management deteriorated (I wouldn't have made a good diplomat in those days.).

Ultimately, we went out house hunting and bought a house, even though we "couldn't afford it." Looking back on it, that episode of RFI was a real blessing in disguise. Besides moving into our own home, I came away knowing that these things had to be solved in a civil fashion.

So when our Tiger-fan neighbor accosted us, I maintained my cool, smiled, and asked enough questions to find out what was really going on. Then I went out of my way to help this poor fellow solve *his* problem, once he cooled down. Can you imagine what would have happened had I become angry when he accused us? Or worse, I might have told him how stupid he was; that always goes over big.

The really important lesson that I learned from that episode is the value of antennas that aren't connected to anything. You want them connected to radios sooner or later, but later is often better, if you play your cards right.

Wait! It's Good For You

When we moved to Connecticut, we found ourselves back in an apartment. The lease stated that "aerials" had to be attached to the chimney. I did not ask any questions. By the time we got around to thinking about putting up antennas, Sally had made friends with some of the other women in the complex.

When our crew finished, we had five inverted-Vees hanging from a mast attached to the chimney. But the coax did not have any connectors attached to the shack side—intentionally. After about 10 days one of the other women told my wife that we were causing all sorts of problems to the other residents' TVs and stereos.

Sally "innocently" told her that "Pete has been so busy he hasn't had time to connect the antennas to the equipment, which incidentally is still in the boxes." Then she showed her the coax without connectors hanging in the closet. How could we be causing anyone problems? Then it was just a matter of waiting for Mrs. Busybody to tell everyone else that we hadn't connected the equipment yet.

After another ten days we figured it was safe to connect the antennas. Once the antennas were identified as being harmless, they faded into the background of awareness and became almost invisible to our neighbors. We never heard another complaint, and we did operate a lot while we lived there.

UFOs Help, Too

The next time we moved to Connecticut (Don't ask. It'd take the whole magazine to explain how that happened.), we were back in an apartment again. This time the lease specified that there would be no external antennas of any kind. You folks don't really think that I would even consider violating a legal document like that, do you?

After settling in for a few weeks, three ham friends came over for Sunday lunch —and an antenna party. My theory is that something that an apartment manager can't see won't hurt me. We were putting up a long wire (technically a random-length wire) in the swamp behind the apartment building that we lived in. The wire (#22 stranded and almost invisible from the ground) came out of a window, went over the building, and on to several high tree limbs.

We were using a powerful slingshot to shoot a lead weight over the high objects. The weight was attached to an ordinary fishing line and pole. We'd simply remove the weight, attached a light-weight piece of nylon cord, and reel in the line. The nylon cord was used to hoist the wire into place. It is a simple enough process, unless you are trying to be unobtrusive.

But this is New England, where people are so good at minding their own business that it sometimes takes you 12 years

*7 Brian Road, South Windsor, CT 06074

to meet your neighbors. If anyone noticed us and our strange antics, they gave no indication. Not until five little boys came near to watch us.

Curiosity overcame one of them, and he asked, "What are you doing?" The solution was simple, we just ignored the question. But he persisted. I noticed that one of my compatriots was giving me worried looks, as if to say that we had to do something to shut him up.

In desperation, I turned to the inquisitive one and said, "This keeps the UFOs away. Every time I move somewhere, I put one of these up. If I don't the UFOs drive me crazy. But if I put one of these up, they leave me alone." Honest, I said it with a straight face.

As the kids backed away I smiled the best smile I could. I can only imagine what the parents said when the children told them about the strange man who put wires in trees to keep UFOs away. That's a much better scenario than one that comes out of them knowing the real purpose of the wire. No one complained to the management about our antenna.

Lessons Learned

These experiences proved to be very valuable to me. There is no question that real TVI and RFI have to be solved in a straightforward engineering manner. But if your neighbors know you have a radio and antenna, chances are you will be blamed for every screwy thing that happens to their TVs, stereos, and radios.

One of the most effective solutions is to make your antenna invisibile, either physically hard to detect or so common and harmless that it fades into the background. When you put up that first *visible* antenna, leave the connectors off the shack end for a couple of weeks. Once you are sure that everyone has seen it, make sure that the local busybody "discovers" that the antennas and equipment aren't even connected. Give her (him) a few days to broadcast the information to the neighborhood. Busybodies aren't quite as fast as the other broadcast media, but they are *so* effective. Now it's time to hook up the antennas and start having fun.

If someone does come knocking at your door complaining of interference, stay calm. Smile and ask questions. Once you know when, how often, and what kinds of interference you are dealing with, you can check your log to find out if it coincides with your operating. If not, show your log to the complainer and offer to help him solve *his* problem.

If your transmissions do seem to be involved, you could use some outside help. Contact your club president to see what assistance the club offers. There are several publications on the market that address this topic. Next time we'll take a look at real interference and what to do about it. CQ

W2FEZ gives us first-hand information on new technology being used to date this famous religious artifact.

How Old Is The Shroud Of Turin?

BY W. EDMUND HOOD*, W2FEZ

In the normal course of events a two-part series is run in order. However, in this instance we are in effect starting with the second part, the "what is hoped to be accomplished" rather than the "how it is done." The "how" part is a fascinating bit of reading, too, and will be presented later.

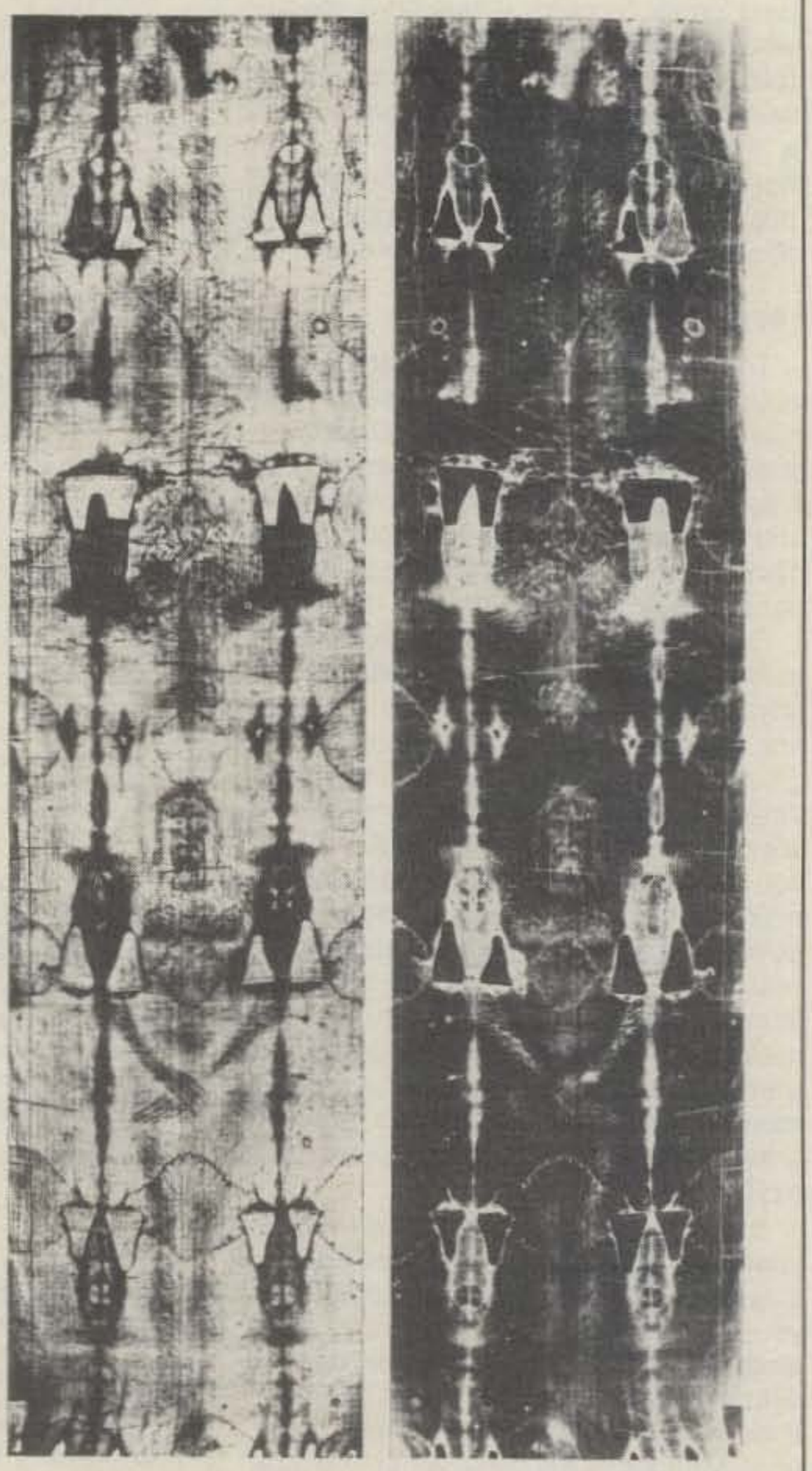
While the subject does not directly deal with amateur radio, the author's unique position would not have been likely had it not been through an early exposure to amateur radio some 35 years ago at a Boston Boys' Club. Once licensed, Bill pursued a career in electronics, finding time to write several articles for CQ over the years. He's now working at the University of Rochester, where they are involved in a very sophisticated bit of electronics and nuclear physics. Probably, about the time you read this article work will have begun on this new form of dating for the artifact. Amateur radio made it possible for Bill to be there and to report to us on this amazing technology.

—K2EEK

The Shroud of Turin is a piece of linen cloth about 3½ feet wide by 14 feet long. It gets its name from the place where it is kept—a cathedral at Turin, Italy. The surface of the shroud bears a faint, haunting image—that of a man who appears to have been brutally beaten and then crucified. There are also faint blood stains and traces of other body fluids.

The shroud first came to public light during the 14th century as alleged booty from a crusade. To many Roman Catholic people throughout the world it is a priceless relic, as they believe it to be the very shroud that covered the body of Christ when He was laid in the tomb. From a coldly scientific viewpoint, however, the shroud could be considered to have pretty slim credentials.

In recent years scientists from all over the world have been examining the shroud to determine exactly what it is and how the image got there. Their findings have only deepened the mystery. The blood has, according to Dr. John Heller, a member of the research team, been determined to be human or primate blood. There are also, around the edges of the scourge marks, traces of blood serum, which separates from blood in such an injury. Known technology of the 14th century was incapable of detecting these traces of serum in the cloth, and the serum itself was not even known to exist until the 19th century. Moreover, the image contains three-dimensional information from which computers have been able to reproduce the three-dimensioned form of the man, and scientists still don't know exactly how the image was made. Now there is no way the shroud can be *proven* to be what it is claimed to be. However, if it is sev-



The Shroud of Turin. The faint, barely visible image, here photographically enhanced, shows both a front and back picture of a man. It is as if he had been lain on one end of the cloth and then the remainder folded over at the head end to cover him. It is an extremely accurate graphic representation of the biblical account of the crucifixion. Blood stains show up black on the positive image of the shroud, white on the negative base.

**126 Wadsworth Ave., Avon, NY 14414*

SHROUD OF TURIN

Positive

Negative

Is this the face of Christ? Only God knows for sure. The image on the Shroud of Turin is a very faint, negative picture. However, it can be enhanced photographically. Then a negative picture of the shroud shows the picture positively. It's haunting!

eral centuries less than 2,000 years old, that would prove it not to be genuine. Since linen is made from flax, and flax, being a plant, is living matter, carbon dating can determine the age of the shroud by determining how long ago the plant died.

Because a fairly good-size piece of the shroud would have to be destroyed in order to carbon date it by conventional methods, the Catholic Church was understandably unwilling to allow it to be done. Then Dr. Harry Gove and some collaborators at the University of Rochester discovered a way to do it using a nuclear accelerator. Dr. Gove's method would only destroy a piece the size of a man's fingernail. It now appears that the carbon dating will be done before very long.

Since the new method was discovered at the University of Rochester, several other laboratories have begun using accelerators for carbon dating. Others have refined the conventional method so as to require only a few square centimeters. Consequently, it has been decided that several labs will run a carbon date test simultaneously. This makes good sense. It will greatly lessen the chances of error. The British Museum will oversee the project. Each of the labs will be given three samples of material. Two of these will be material of a known age; one of them will be from the shroud. Only the British Museum will know which is which. After all the labs have dated their samples, the British Museum, in collaboration with the labs, will examine the results and announce the conclusions.

Radiocarbon Dating

All living matter contains carbon. A certain percentage of that carbon is a radioisotope called carbon 14, which is ingested by the organism as long as it is alive. The percentage of the carbon that is carbon 14 is constant in all living matter. When the organism dies, carbon 14 is no longer taken in, and the carbon 14 that is already there slowly breaks down. The rate at which it breaks down is constant, and it takes about 6000 years for half the carbon 14 to decay. Therefore, if the percentage of carbon 14 in any material that once was living can be measured, the time since it died can be determined. Doing this measurement by conventional decay-counting methods can use up quite a bit of material. However, the accelerator method counts the carbon 14 directly without having to wait for some to decay, so very minute amounts of material can be tested. Accurate dating can be done with a sample no bigger than your fingernail.

This is how the samples are carbon dated. The material is carbonized in an atmosphere of nitrogen, the carbon deposited onto a holder and placed in the injector.

In the injector, a beam of cesium atoms is focused onto the carbon. The cesium atoms knock carbon atoms loose. The carbon atoms come away from the holder with one of these possible electric charges. Some of the particles have a positive charge. They are attracted back to the negative-charged sample holder. Some have a neutral charge. They drift about randomly and are lost. The remainder have a negative charge. These carbon atoms become the accelerator beam.

Only a few million volts is needed on the terminal to accelerate the beam of carbon atoms. After leaving the accelerator, a powerful magnet bends the beam through 90 degrees. Then the stable carbon beam current is measured to give a reference value to compare with the carbon 14 beam.

It takes a slightly different amount of magnetic energy to

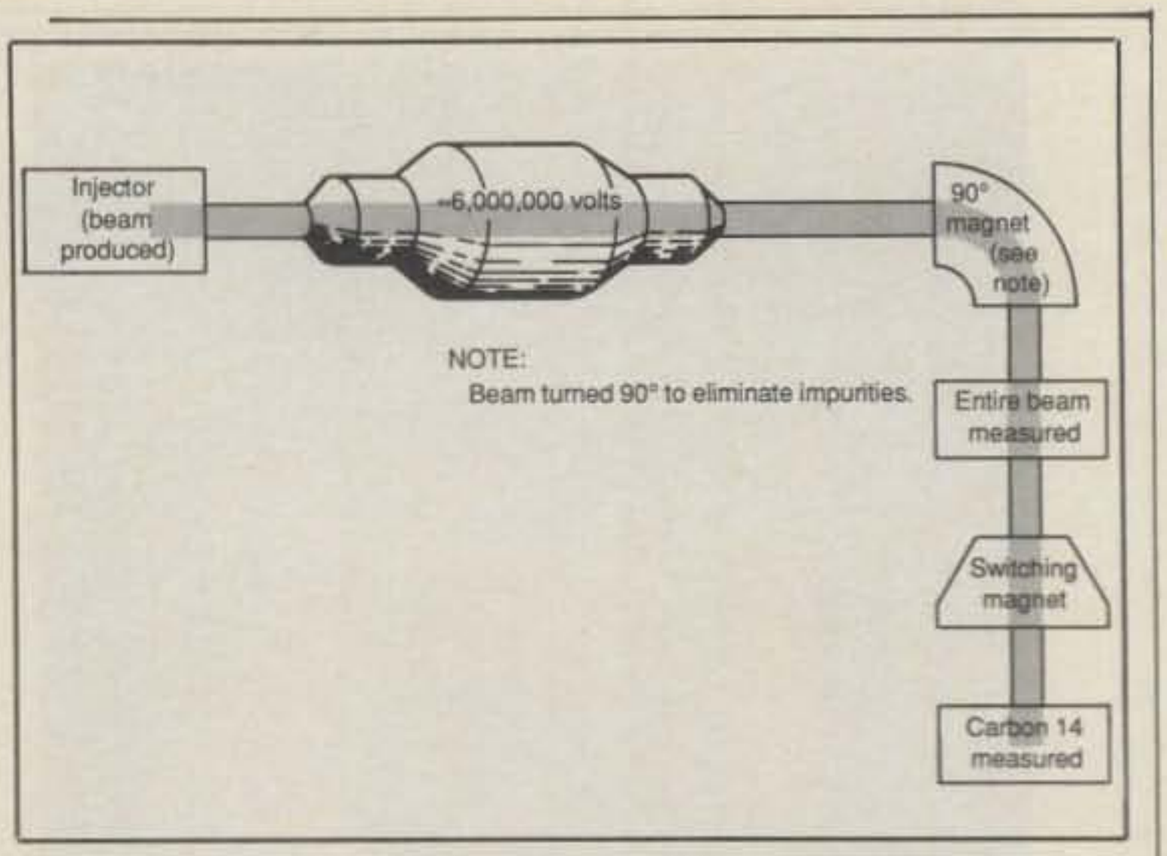


Fig. 1–The journey. Carbon atoms from the Shroud of Turin would be made into a particle beam by a cesium gun in the injector. A six-million volt terminal would then accelerate the carbon atoms to a very high energy level. The 90-degree magnet would eliminate any impurities. Then the volume of the carbon 14 beam would be measured. Finally, the switching magnet would send the beam along the proper target line to the detector, where the carbon 14 would be measured.

bend carbon 14 than it does to bend regular carbon. Consequently, after the 90-degree bend, the portion of the beam consisting only of carbon 14 atoms is easily isolated from the rest. The beam then enters a gas-filled chamber where the passage of high-energy carbon atoms produces electrical impulses. At the energy levels produced by the accelerator, the device is sensitive enough to detect the passage of *individual atoms*. Therefore, a very accurate measurement of a minute amount of carbon 14 can be made. This is compared with the total beam, previously measured, to give the percentage of carbon 14. Since the rate at which carbon 14 decays is known, and the percentage of carbon 14 that existed when the matter was alive is known, the time needed for the carbon 14 to decay to the measured amount can easily be calculated. This result will be the age of the material.

To a great many people the Shroud of Turin is an object of religious importance. This fact alone makes the testing extremely important. If the carbon dating determines the age to be close to 2000 years, that will mean that it could possibly be real. If the age is hundreds of years less than that amount, it will be a sure indication that the shroud is not what many people believe it to be.

If the dating does indicate an age close to 2000 years, that will not prove it to be Christ's shroud; it will simply prove that it *could* be. No person can ever know for sure. If it is much younger, that fact will not disprove any religious belief, as Christian belief is not based on the shroud itself, or upon any other relic. Furthermore, the shroud is an extremely valuable object even if it isn't what some think it to be. Many of the world's top scientists have tested it, and nobody yet knows how the image got there. The image itself, and the blood stains on the shroud, depict the exact facts surrounding the death of Christ as described in the Bible, and are medically accurate even according to knowledge that simply didn't exist at the time it was discovered. If all this were proven to be a fabrication, it would be evidence of a genius unparalleled in all known history—one possessing knowledge half a millenium beyond his time. We may never know whether or not this is, in fact, the shroud that covered Jesus, but either way the Shroud of Turin is indeed an object of very great mystery. CQ

Please send all reader inquiries directly.

CIRCLE 47 ON READER SERVICE CARD

CQ REVIEWS:

The Heathkit HW-6502 2 Meter HT And HWA-6502-2 Mobile Console

BY LEW MCCOY*, W1ICP

In a few instances Heathkit has departed from kits to fully manufactured pieces of gear for the amateur market. Their 2 meter handheld, the HW-6502, is an example of this, as is the mobile console, the HW-6502-2.

Let's discuss the handheld first. The radio is a very neat, compact (6½"H × 2½"W × 1½"D) transceiver weighing 1.2 pounds. Frequency coverage is from 144.000 to 147.99 MHz in 5 kHz steps. Operating voltage is from 7 to 12 volts DC (nominal). One small point about the handheld that was strictly my own impression: When I first handled the unit I got the feeling that here was a small transceiver that was very "solidly" built. I asked a few other amateurs if they got that impression also, and they affirmed my feelings.

The rated output at 10.8 volts is 5 watts on the HIGH position, 1.5 watts on MEDIUM, and 200 mw on LOW. On my measurements at 12.8 volts, the power out was 6.5 watts, 2.2 watts, and 300 mw for H, M, and L. The current drain at 10.8 volts was 1.2 A at H, 700 mA at M, and 300 mA for LOW. In my many tests I found it very convenient to have the three levels of power, and while the high-power position can eat up the battery, it was very nice to have the power available when needed.

The transmitter lineup is straightforward, as can be seen from the block diagram, fig. 1. The frequency modulation is developed by the VCO and the signal then amplified and fed through a low-pass filter to the antenna. Spurious radiation is rated at 60 dB down, and I found that in my tests the transmitter more than met ratings. Fig. 1 gives a more detailed description of the signal path.

The receiver sensitivity is excellent, rated at 0.25 microvolt at −123 dBm. Spurious response is listed by Heath at better than 60 dB down. I have found from much experience to be suspicious of any ratings versus actual field performance, particularly when it comes to intermodulation. It is one thing to live here in southwest New Mexico where repeaters are widely separated or few in number. But it is a completely different story in high-population areas where there are many repeaters and commercial VHF stations.

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

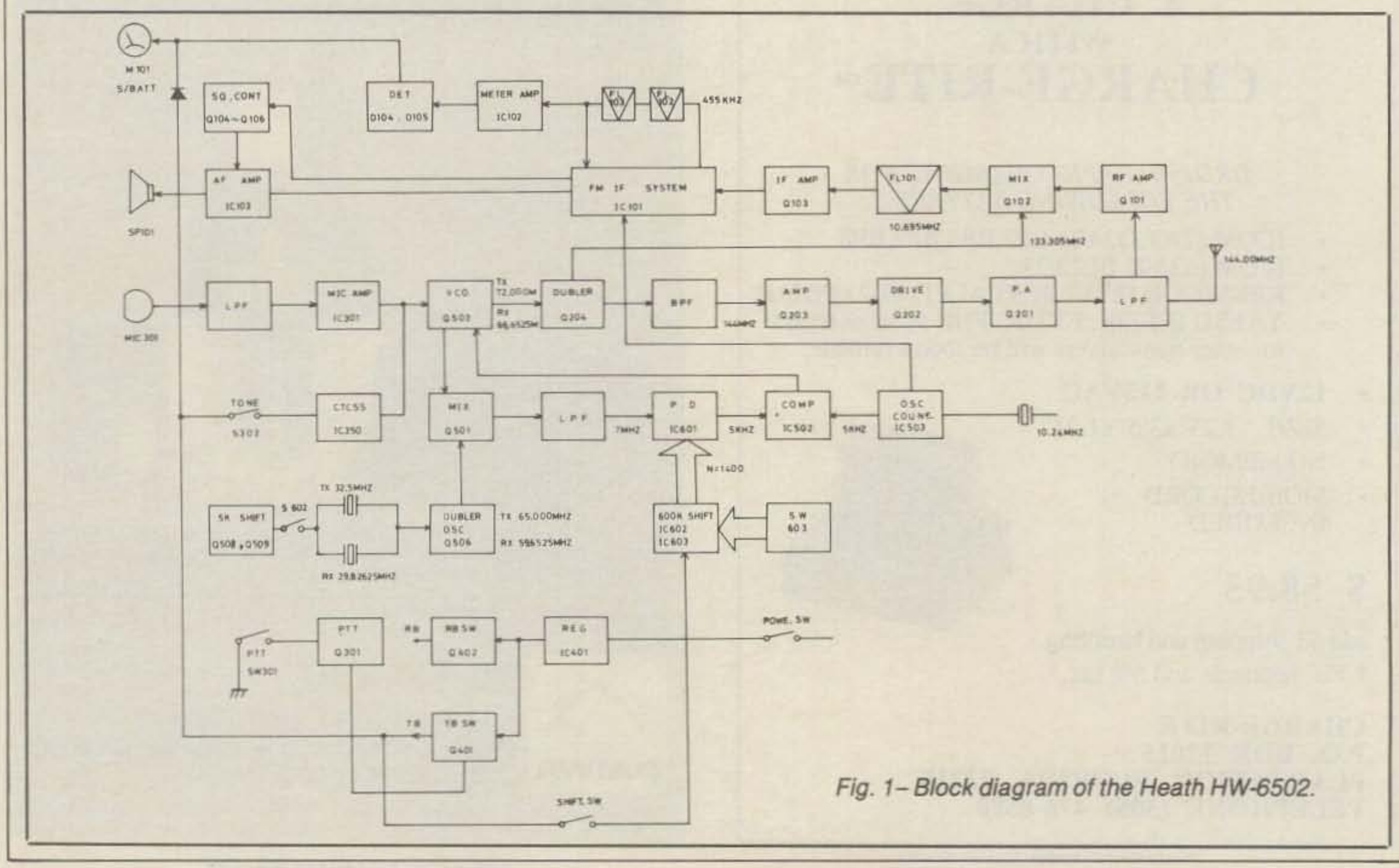


Fig. 1– Block diagram of the Heath HW-6502.

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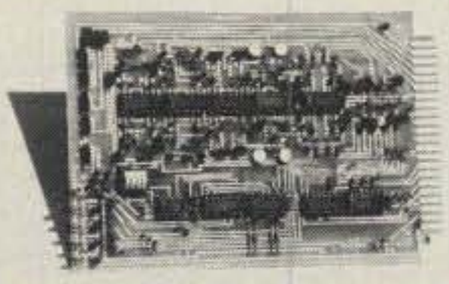

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CIRCLE 31 ON READER SERVICE CARD

The 6502 makes a neat package.

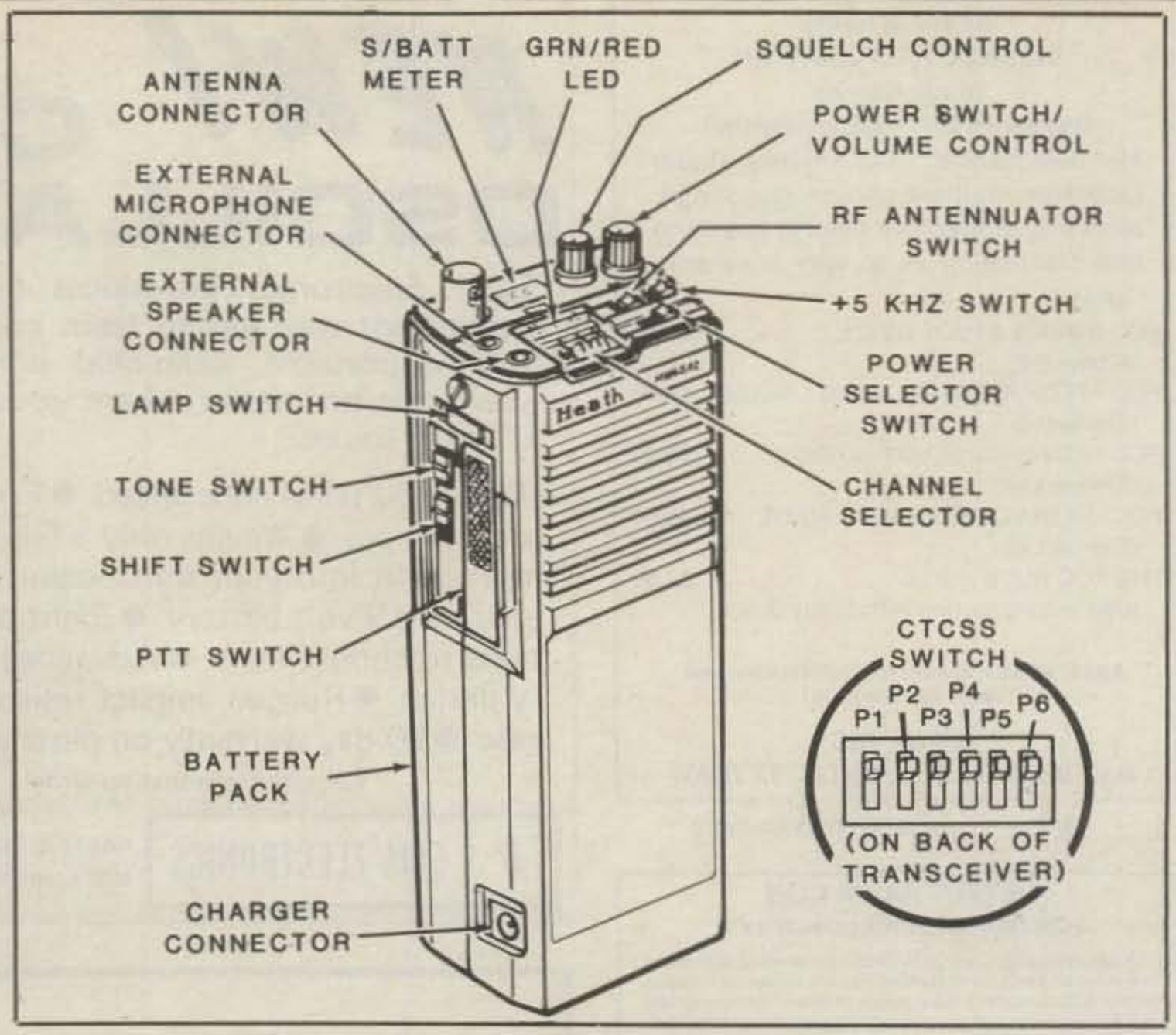


Fig. 2– This drawing is from the Heath manual and shows all the controls and switches on the handheld.

Intermodulation crud can eat up many handhelds. I had two occasions to check out the 6502 under very trying conditions. There is a bad area in El Paso, but that was nothing compared to a crowded hamfest. There is probably more VHF RF energy present in the exhibit halls and grounds of a packed hamfest than anywhere in the world! The Heath has an RF attenuator which is switch operated and is normally left off. I found that in a few instances of strong nearby signals I had to use the attenuator. However, considering where I was operating, the Heath unit gets my whole-hearted endorsement. It was clean.

Fig. 2 is from the instruction manual and shows all the switches and connector points for the 6502. Frequency settings are determined by three thumbwheel settings. Just above these switches on the top of the handheld is an S and battery-condition meter. A rear-mounted 6-position DIP switch is used to set any desired CTCSS tone.

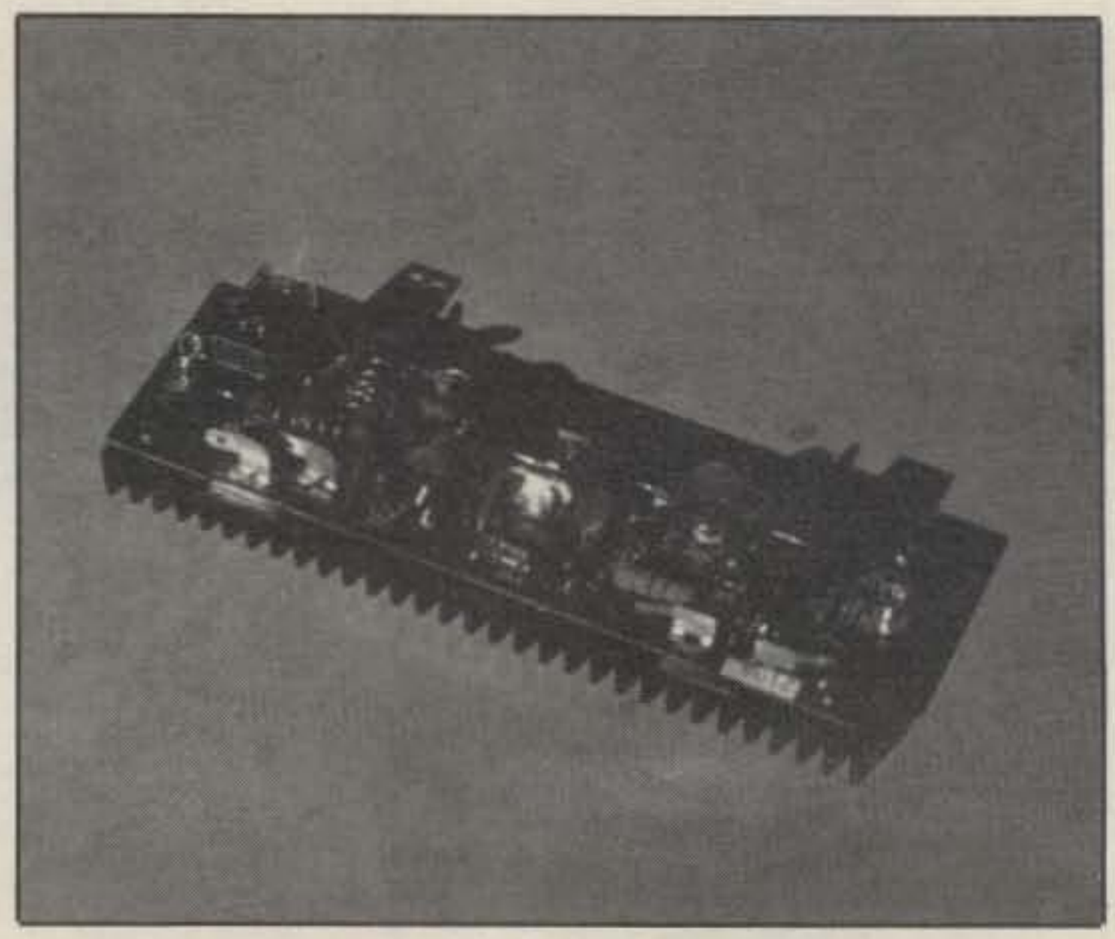
The handheld has a built-in subaudible tone generator which can be set for any of the tones, from 67.0 Hz through 2975.0 Hz. This, of course, increases the flexibility of the unit, permitting access to repeaters using tone access.

The transceiver comes with a rechargeable battery pack (and charger). Another feature is a lamp (and switch) for illuminating the meter and frequency setting switches.

The Heath 6502 Mobile Console

The Heath 6502-2 is the designation

This is the mobile console. The handheld battery pack is removed and the transceiver inserted into the console. Connections are then made for audio and RF.



Here is the amplifier as it is before installing it in the console.

for the "Mobile Console." The photograph will give the reader an idea of what it looks like. The 6502 is a nice concept in that the unit can be mounted in a vehicle, be it auto, boat, plane, or RV, and it allows you to use your handheld as a mobile rig. The console is 2¼"H × 6½"W × 8½"D (weight 3 pounds).

The console includes a speaker and connections for 12 volts from the vehicle battery. In operation, the battery is removed from the handheld and the transceiver is plugged into an opening in the console. Connections are made from the console to the speaker jack and antenna terminals of the handheld. There are antenna fittings on the rear of the console for connections to mobile antennas. I say "antennas," because there are provisions for a UHF antenna. It can be assumed that Heath is planning a UHF addition to their line because they mention "for future expansion." The console also has a power-on indicator in the form of an LED.

The 6502-1 Power Amplifier

Still another Heath item in this system is the 6502-1. This is 25 watt 2 meter VHF amplifier module that is designed to be installed in the mobile console. This is a pre-wired unit that comes ready to install. It takes about 30 minutes or so to install the amplifier in the console. The instructions are (three pages) the usual clear-cut Heath instructions. For full 25 watts output, the handheld must be used in the 5 watt position. Reduced output can be obtained for the amplifier by using the lower handheld power positions. I measured about 5 watts output from the amplifier with the transceiver in the 1.5 watt position and about ½ watt with the lowest setting.

Conclusions

As with the intermodulation tests, I give considerable attention to what the equipment actually does and what other amateurs say before I write new equipment reviews. In this case, I received nothing but fine reports in on-the-air tests with the new Heath units.

Also available from Heath is a mike with Touchtone pad for generating Touchtones. Some amateurs never use autopatch and so on, so I like the idea of Heath giving one a choice.

The instruction manuals are complete with block and circuit diagrams. And while the instruction manuals don't compare with those which come with actual kits, these were more than adequate and sufficiently detailed. The list price from my Heath catalog is $279 for the transceiver, $59.95 for the amplifier, and $129 for the console. The units are manufactured by Heath Company, Benton Harbor, MI 49022. CQ

No-49-50

CQ Showcase

Tokyo Hy-Power Labs HL-2K/A HF Amplifier

The THL HF amplifier HL-2K/A is compact in size and uses rugged 3-500Z transmitting tubes. The power supply is built in, using a transformer and high-voltage full-wave bridge rectifier circuit. The HL-2K/A is stable even under continuous key-down operation for an extended length of time, maker says. The HL-2K/A has two large panel meters that will monitor plate current (IP) all of the time, and either EP, IG, or PO. An off delay cooling fan system protects the tubes by cooling them for a timed period after the power has been turned off.

The HL-2K/A has a suggested list price of $1695. For more information, contact ENCOMM, Inc., 1506 Capital, Plano, TX 75074, or circle number 101 on the reader service card.

Xantek Super DX EDGE®

The Super DX EDGE adds two features to the DX EDGE. It calculates maximum usable frequency (MUF) between any two locations, and it also calculates great circle bearings (antenna direction) and distance between any two locations. It is available for the Commodore 64 and 128 computers. When the user identifies the two locations, the program will calculate the MUF between those points for any sunspot number or solar flux value, and will also calculate the great circle bearing.

Cost of the Super DX EDGE is $34.95. Owners of the DX EDGE can trade up to the Super DX EDGE for $24.95 plus their disk. For more information, contact Xantek, Inc., P.O. Box 834, Madison Square Station, New York, NY 10159, or circle number 102 on the reader service card.

Heath Company Winter 1987 Catalog

A wide variety of electronic kit products are in Heath's new Winter '87 Catalog. The catalog features several new product additions, including two SK-200 series beginner kits, the SK-205 Baud Rate Analyzer and SK-203 512K Printer Buffer, and a digital multimeter, the IM-2320.

There are over 400 electronic products and accessories in the colorful new Winter '87 Heathkit Catalog. To receive your free copy, write to Heath Company, Dept. 150-855, Benton Harbor, MI 49022 (in Canada: Heath Company, 1020 Islington Ave., Toronto, Ontario M8Z 5Z3) or circle number 103 on the reader service card.

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Additional features include three memory channels which store frequency and offset, PL encode/decode, night light, offset/reverse and scan function keys, 16-key DTMF pad for repeater autopatch standard, heavy-duty final amplifier and heat sink, 12 VDC input terminals and more. For more information, contact Trio-Kenwood Communications, 1111 West Walnut St., Compton, CA 90220, or circle number 106 on the reader service card.

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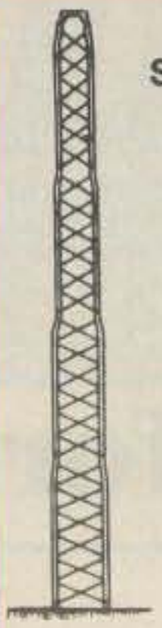

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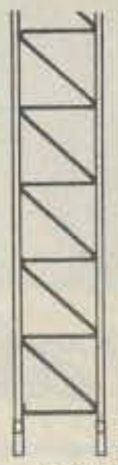

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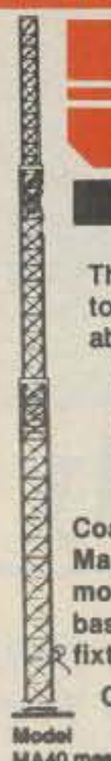

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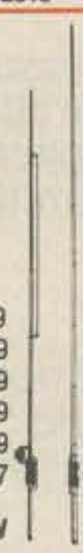

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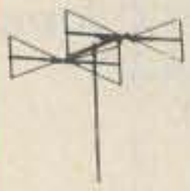

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Telex Tailtwister (20 sq ft rating) ..... $Call
Telex HDR300 Heavy Duty (25 sq ft rating) ..... $Call
Kenpro KR500 Heavy Duty Elevator Rotator $189
Kenpro KR5400 AZ/EL Rotor Package $319

ROTOR CABLE

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

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

20G ..... $39.50 45G $112.50
25G ..... $49.50 55G $149.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$ 899.
FK2558	58 ft.	13.3 sq. ft.	$ 949.
FK2568	68 ft.	11.7 sq. ft.	$ 999.
FK4544	44 ft.	34.8 sq. ft.	$1199.
FK4554	54 ft.	29.1 sq. ft.	$1299.
FK4564	64 ft.	28.4 sq. ft.	$1399.

25G Double Guy Kit ..... $249.
45G Double Guy Kit ..... $269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$ 15/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$ 29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$ 15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$ 29/ft
HPTG4000 Guy Cable (4000 lb rating)	$ 49/ft
HPTG6700 Guy Cable (6700 lb rating)	$ 69/ft
9901LD Cable End (for 2100/4000 cable)	$8.95
9902LD Cable End (for 6700 cable)	$9.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$69	$89
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

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TS-811A LIST $1049
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TW-4000A LIST $599
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TM 2550A (45W)	LIST $469
TM 2530A (25W)	LIST $429
TM 3530A (25W)	LIST $449

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Operation LIST $599
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NEW FT690R 6m Portable LIST $569.95
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Tech HT's
5W Output

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• 10 memories
• Battery saver
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• 10 memories
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Heavy Duty · High Quality · Rugged · Reliable

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- Fully Electrically Regulated 5mV Maximum Ripple
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- 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

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HF Transceiver Full Featured
Ultra Compact - Economical
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IC-28A LIST $429 **IC-28H LIST $459**
IC-37A LIST $499 **IC-47A LIST $549**
IC-38A LIST $459

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IC04AT - 70cm
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HT XCVRS

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2m HT

• micro design covers 140-163 MHz
• 10 mem. w/scan
• LCD Readout
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General Coverage HF Transceiver
Microprocessor Controlled Multi-Scan, 62 Memories

561 Corsair II	SALE $1,149.95
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4229 Tuner Kit	$189.95
425 Titan Amplifier	$2,299.95

rfconcepts

rfc 2-317 2M
30W In = 170W out
SALE $209.95

Model	Band	In-Out	Sale Price
2-23	2M	2-30W	$ 89.95
2-217	2M	2-170W	$239.95
2-117	2M	10-170W	$239.95

MIRAGE

AMPLIFIER SALE!
B3016
ONLY $229!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23S	2M	No	2W	30W	$ 99
B23A	2M	Yes	2W	30W	$129
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

AMP SUPPLY

Model	List	Model	List
LA 1000	$ 499	LA 1000 NT	$ 579
LK 500 ZB	$1295	LK 500 NT	$1595
LK 800 A	$2695	LK 800 NT	$2995
AT 1200	$ 229	AT 3000	$ 499

SALE PRICES TOO LOW TO PRINT
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AMERITRON

AL80A NEW 1000 W 3-500Z Amplifier	$699.
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RCS-4 4 Pos Remote Antenna Switch	$119.95
RCS-8v 5 Pos Remote Antenna Switch	$119.95
ATR 15 1500 W Tuner	$299.95

ALINCO

ELH-230D	89.95	ELH-730D	149.95
ELH-260D	129.95	ELH-730G	119.95
ALR-206T	279.95	ALM-203T	249.95

ACCESSORIES IN STOCK—CALL!

AEA

PK-232 Packet Controller	$299.95
PK-64 Packet Controller	$219.95
HF Modem for PK64	$99.95
PK-64A	$269.95
PK-64A w/HF Modem	$359.95
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407/422 Elect. Keyers	$69.95/$119.95
901/941D Tuners	$59.95/$99.95
949C/989 Tuners	$139.95/$299.95

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KAM features bargraph tuning and user programmable MARK and SPACE tones for RTTY and HF packet, as well as limiter/limiterless operation on HF for weak signal operation.

KAM's CW demodulator is also programmable for both center frequency and bandwidth.

KAM's RS-232/TTL terminal interfacing provides universal compatibility to all computers, including Commodores and PC compatibles.

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Suggested Retail $319.00

KAM's FEATURES

- Transmit and receive CW 6-99, RTTY/ASCII 45-300 baud, ARQ, FEC, SELFEC, Listen ARQ, VHF and HF Packet.
- HF and VHF radio ports.
- Command driven by your computer with over 100 software commands.
- User programmable baud rates for RTTY/ASCII—selectable in one-baud increments.
- User programmable MARK and SPACE tones on HF, you choose the tones.
- Selective RTTY Autostart operation.
- Separate CW demodulator filter with programmable center frequency and bandwidth.
- Separate CW keying relay for positive or negative keying.
- 12-pole programmable switched capacitance input filtering.
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MFJ-107 **$9.95**

These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

Read both UTC and local time at a glance with the MFJ-108, $19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE MFJ-1229 $179.95

Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multi-pole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates re-tuning while checking for inverted RTTY.

An extra sharp 800 Hz CW filter really separates the signals for excellent copy.

12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

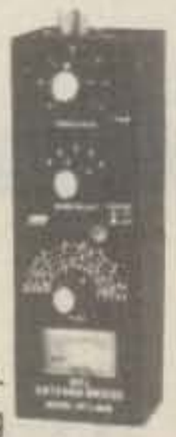
MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621 **$79.95**

MFJ ANTENNA BRIDGE MFJ-204B $79.95



Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches

REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna"

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator. gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ-1024 **$129.95**

200 WATT VERSA TUNER

MFJ-901B **$59.95**

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

ROLLER INDUCTOR TUNER

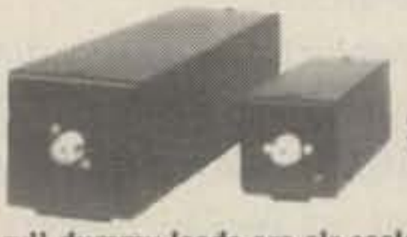
MFJ-989B **$349.95**

Meet the "Versa Tuner V", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everything from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989B is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! **Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted cross-needle meter** that reads SWR and forward and reflected power all in one glance. Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10¾ × 4½ × 15 inches.

MFJ "DRY" DUMMY LOADS

MFJ-262 **$64.95**



MFJ-260 **$26.95**

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt)**, SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW)**, SWR 1.5:1 to 30 MHz, 3x3x13 inches.

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CIRCLE 16 ON READER SERVICE CARD

CQ World-Wide WPX SSB 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	CG3MFA('85)	319,140	162
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	NP4A('86)	6,668,184	654
14	ZY5EG('86)	5,087,020	733
21	ZZ5EG('86)	9,794,448	816
28	CE6EZ('84)	5,437,936	644
AB	PJ2FR('86)	13,040,435	823
QRP/p	K7SS/WH6('86)	2,078,490	395

Multi-Operator Single Xmtr.

	VP2EC('83)	15,238,880	820

Multi-Operator Multi-Xmtr.

	KH6XX('85)	24,898,239	837

U.S.A. RECORD HOLDERS

Single Operator

1.8	K5UR('85)	122,664	228
3.5	KQ2M('85)	1,247,906	433
7.0	KI6P('84)	1,158,606	337
14	KQ2M('86)	3,362,865	687
21	AI7B('82)	4,151,232	576
28	N5AU('82)	3,094,249	571
AB	KI6P('85)	4,483,792	568
QRPp	W8ILC('82)	1,044,012	459

Multi-Operator Single Xmtr.

	N5AU('84)	6,301,977	759

Multi-Operator Multi-Xmtr.

	AI6V('81)	12,529,608	728

CLUB RECORD

North Texas Contest Club('84) 53,012,561

WPX (Prefix) RECORD

N5AU('86) 1,008

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	EA8AFS('85)	282,048	156
3.5	OH1RY/CT3('85)	2,816,754	453
7.0	OH1MA/CT3('85)	2,775,020	445
14	TU4BR('86)	3,483,480	637
21	EL2AV('81)	4,617,530	557
28	CN8CY('82)	2,947,811	487
AB	EA9IE('85)	8,744,508	708

ASIA

1.8	5B4LP('86)	142,272	117
3.5	5B4LP('84)	763,458	222
7.0	UM8MO('86)	934,272	288
14	C44LP('85)	2,467,900	460
21	4XØU('81)	2,823,916	514
28	4X4UH('80)	2,718,760	440
AB	4X1X('82)	3,932,586	529

EUROPE

1.8	LZ2BE('84)	261,504	144
3.5	DJ4PT('81)	745,216	328
7.0	OH2KI/ZB2('85)	1,954,210	365
14	4N3ZV('81)	3,586,240	560
21	OHØBH('83)	3,977,685	501
28	YU3MY('80)	3,530,016	412
AB	Y24UK('82)	6,285,436	586

Multi-Operator Single Xmtr.

AF	OH8PF/EA8('86)	9,898,245	735
AS	UK9AAN('80)	11,152,020	660
EU	9A1ONU('80)	13,362,486	723
NA	VP2EC('83)	15,238,880	820
OC	KD7P/NH4('85)	10,484,712	568
SA	ZY5EG('84)	14,758,625	875

NORTH AMERICA

1.8	CG3MFA('85)	319,140	162
3.5	VE3BMV('86)	1,928,720	388
7.0	NP4A('86)	6,668,184	654
14	VP2EC('85)	5,011,668	646
21	AI7B('82)	4,151,232	576
28	FGØDYM/FS7('80)	3,304,752	484
AB	N2BA/VP2M('85)	5,626,512	656

OCEANIA

1.8	T32AF('83)	16,872	37
3.5	KG6DX('86)	350,014	161
7.0	T32AF('84)	2,991,352	364
14	VR3AH('79)	3,526,153	437
21	VK4QK('80)	2,592,216	396
28	KB7IJ/KH2('82)	4,743,144	504
AB	AI6V/NH6('85)	6,677,500	500

SOUTH AMERICA

1.8	YV5JEA('84)	40,320	63
3.5	4M3AZC('84)	1,158,132	309
7.0	YV6CAX('86)	2,062,800	382
14	ZY5EG('86)	5,087,020	733
21	ZZ5EG('86)	9,794,448	816
28	CE6EZ('84)	5,437,936	644
AB	PJ2FR('86)	13,040,435	823

Multi-Operator Multi-Xmtr.

AF	9E3USA('69)	2,398,192	296
AS	UK9AAN('78)	10,702,776	532
EU	YZ1EXY('84)	14,503,141	881
NA	NP4A('82)	24,065,600	890
OC	KH6XX('85)	24,898,239	837
SA	ZZ5EG('85)	19,121,792	992

No-5-9-60

What goes around, comes around. Years ago when things were different, amateurs went from 811s to 572Bs. In today's world it sometimes pays to think about doing it in reverse.

An Economical Way To Refire The Clipperton L Amplifier

BY DALE SMITH*, N4EDE

My father-in-law, Dale, WQKNF, had a Clipperton L power amplifier that wasn't working. After checking the voltage and other possible failures, it was evident that the 572Bs were soft.

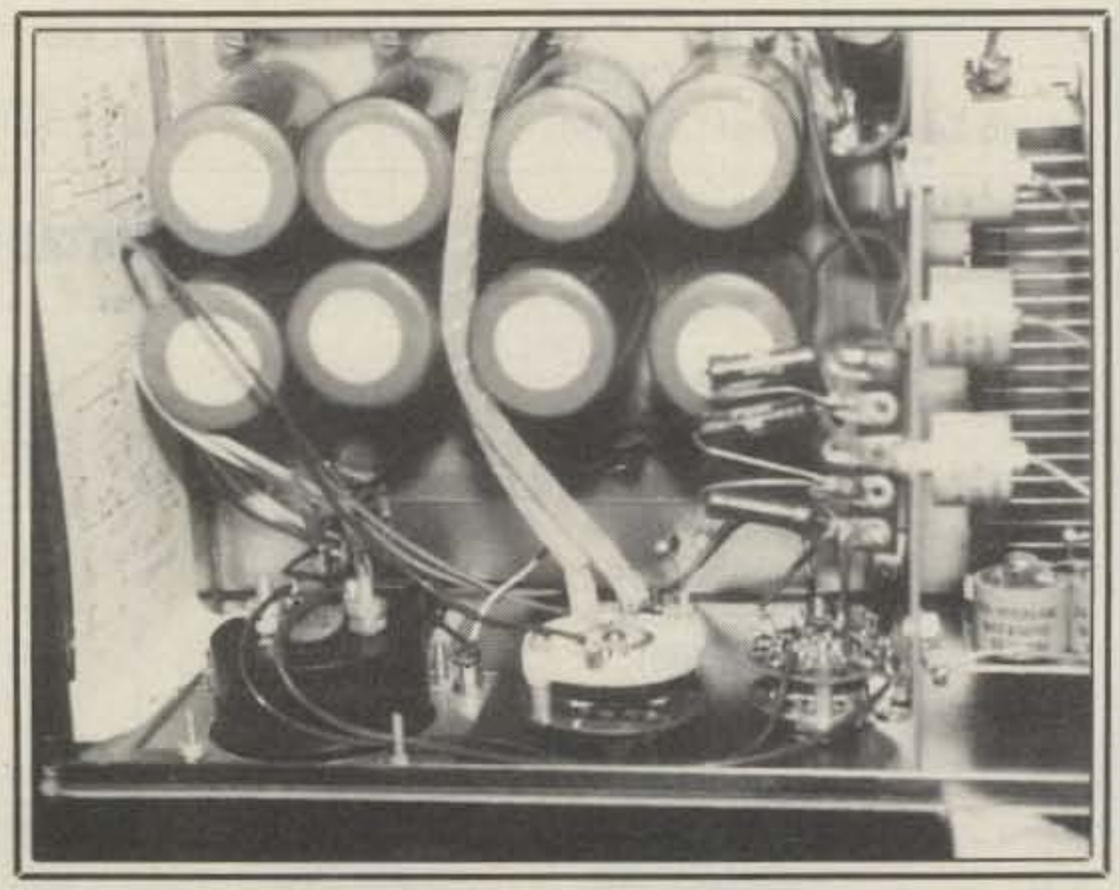
We called around to the amateur tube advertisers, and the cost to replace them was between $280 and $320. Ouch! Well, at that point Dale asked me if I wanted an amplifier. The tubes cost as much as a good used amplifier and buying more tubes wasn't practical.

After some thinking, I remembered the 811 tube WW II surplus. In fact, after checking some data on the 811, the tube sockets and filament voltage were found to be the same. The plate voltage was 1750 DC maximum, and the input power was only 3 to 12 watts. In lower power position we could expect about 700 watts CW DC key-down input, or 1750 PEP input, after making a slight modification (170 watts a tube). I took a look at the schematic on the power supply and a simple wire change would do it. The modification was as follows.

Remove AC plug, bottom and top covers with an allen wrench. **Bleed off the capacitors in the power supply.** Now remove the four 572Bs. Place the amplifier on its side with the transformer down. Locate the printed circuit board (PCB) where the diodes and the capacitors are located. Note that the diodes are in a "U" configuration. At the bottom of the "U" is a red wire. This wire goes to the transformer and has a splice, with some heat shrink tubing. Locate this splice and cut at the splice.

Feed the red wire up through the hole in the chassis. Next, remove the orange and green wires. Note, this green wire could look blue because of a color fade. They are both in plastic tubing. After removing the orange and green wires from the CW/SSB switch, move the orange wire to the CW side of the switch and solder. **Caution:** When you solder it, do not have any sharp globs of solder or strands of wire sticking out on the solder connection. This could cause a corona discharge point at this voltage.

Next, take the green wire and remove the plastic shield from it and set it aside. You will use it later. Next feed the green wire



An internal view of the Clipperton L power supply compartment. The three items at the bottom (front panel) are the meter, SSB/CW switch, and the current and voltage switch. The printed circuit board for the power supply is directly below the filter capacitors. Note the index card along the right side of the compartment. This shows the modifications made to the unit. Not only is this helpful to you, but it also might come in handy for the next owner.

through the hole in the chassis and solder it to the tubing to insulate it. This is the wire that hooks up to the "U." Slide the plastic tube over the red wire you cut and feed through the chassis. Solder it to the SSB side of the switch.

Now look over the work and check it with the schematic. Remember, **lethal voltages exist when powered up!** Next place the 811s in the sockets and attach the plate leads to the 811s. I added a small schematic of the modification on a small 3″ × 5″ card and placed it inside the amplifier. I made the change to show the modification in the instruction book as well. Replace

*8202 Claremont St., Manassas, VA 22110

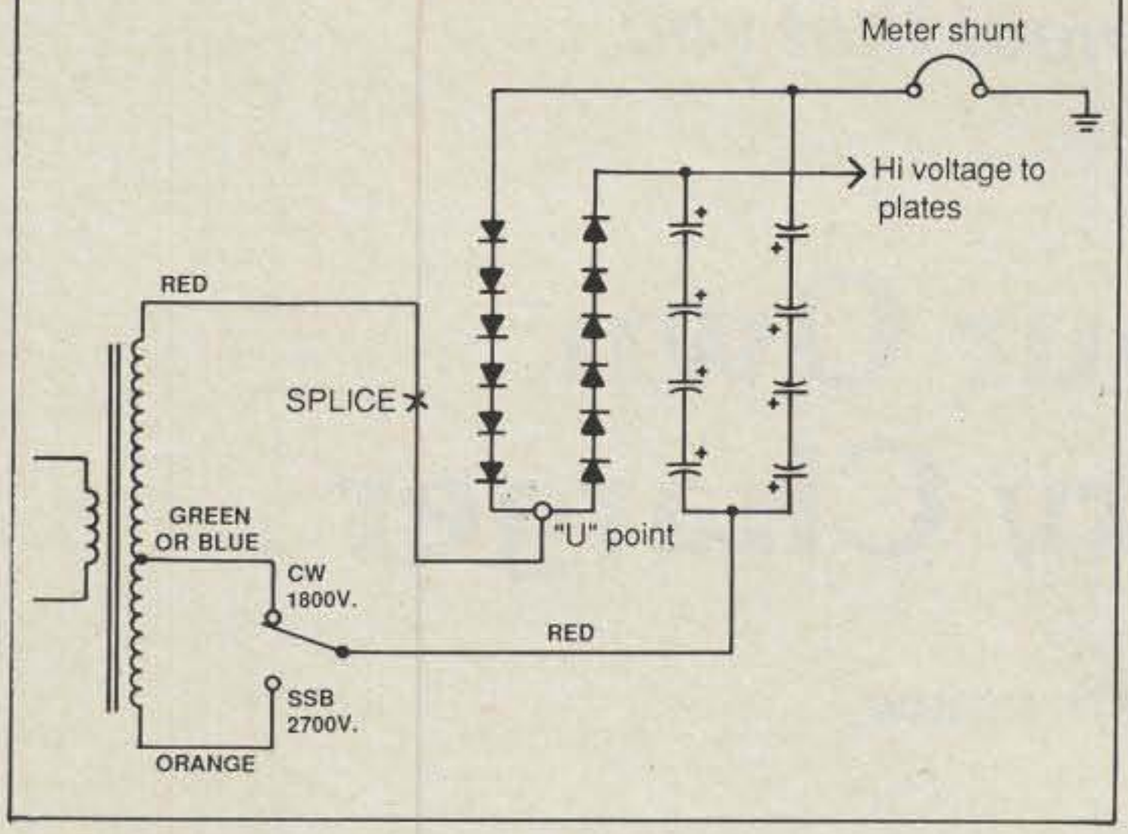


Fig. 1– Original schematic for the Clipperton L power supply.

the bottom and top covers. Now you can put it back on-line in your shack.

Do not over-drive these tubes. Fifteen watts should produce good results. The data on the tube says their input range is 3 to 12 watts. To tune up, use the CW or low-voltage side of the switch. To set resonance use about 700 volts DC. You then can move the switch to SSB or save the finals and leave it in the CW position.

In low power or CW place voltage is about 700 volts DC at 350 ma, resulting in 245 watts DC input key down, or 612 watts PEP input. In high power or SSB the high voltage is about 1750 volts DC at .600 ma and 1050 watts input key down, or 2625 watts PEP on SSB. I came up with this figure by multiplying CW keydown current by 2.5 to equal peak envelope power (PEP). DCI × 2.5 = PEP power input.

Remember these tubes are cheaper than the 572Bs, so you can afford to have a spare set on hand. You can use either 811s or 811As. The 811As are a bit heftier. They have ridges on the plates to dissipate heat better, and the 811s do not. Either one will do the job.

I got my 811s out of some old junked t-47/ART-13 transmitters. The amplifier was tested on 160–10 meters with excellent results! Also, the amplifier was an early model Clipperton L without the tuned input PCB. The exciter was a TS-930S Kenwood. WQKNF is once again enjoying his amplifer.

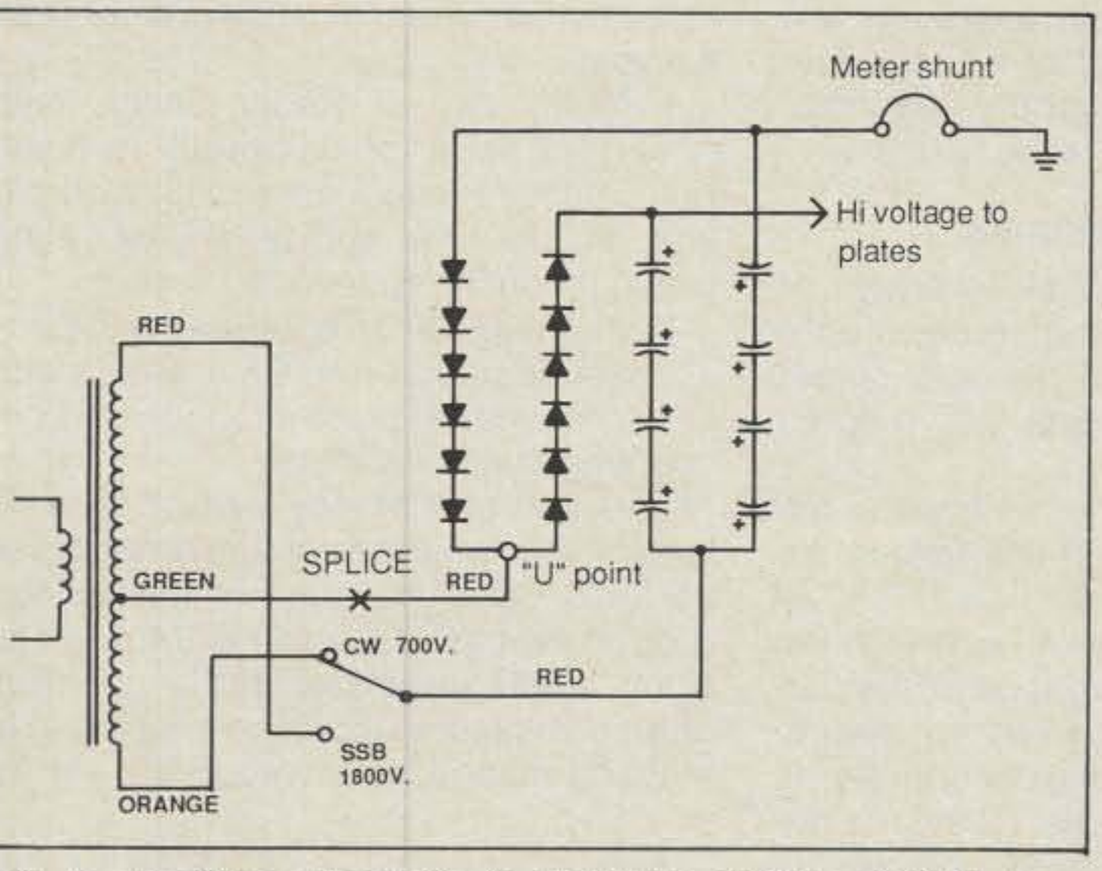


Fig. 2– Modified schematic to allow use of 811 or 811A tubes.

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Like to tinker? Here's a little project that you can tailor to suit your own needs.

Build Your Own NiCd Battery Charger

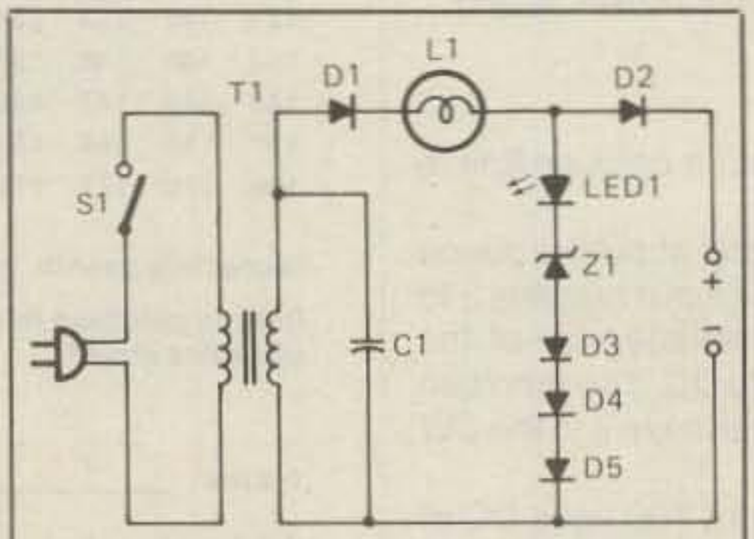
BY JIM BURTOFT*, KC3HW

Of all the changes occurring in amateur radio in the last ten years, none has altered the complexion of the hobby more than the arrival of the 2 meter handheld. The handheld has given "legs" to the hobby; and, whether you're coping with a natural disaster or simply nosing around a hamfest, that's a real boon.

Unfortunately, the "get something for nothing" principle works no better in electronics than anywhere else. In order to achieve mobility, the handheld's designers had to accept other limitations. For instance, one must power the rig with some sort of a battery—usually a NiCd. Yes, I know, we've been conditioned to think of a NiCd as the ultimate battery, but it isn't. For one thing, its current density is low. It's able to store only a fraction of the current that an equal size alkaline battery can store. It's also a difficult battery to recharge. Overcharge it, undercharge it, or charge it too rapidly and you'll find yourself in the market for a replacement.

This last problem—charging the NiCd—can be pesky, especially with the standard wall plug-in charger supplied with most handhelds. Take my ICOM 2AT, for instance. Its charger will recharge the battery in 15 hours. That sounds good on the surface, but think about it. If you *have* to be back to the shack to unplug the charger, it can put a crimp in your plans. Many times I've left a NiCd sit uncharged because I knew that my plans would put me far from home when it came time to unplug the charger. I had to wait for a more suitable time for recharging. Was I being overly cautious? I think not. Overcharging the battery causes heat to build, which eventually ruins it, and according to the ICOM's instruction manual, it *could* cause it to explode (wonderful!). Undercharge it and the battery soon "remembers" the lower charge point and will not take a charge past that point.

Then, of course, there's the question of how fresh the charge is. The plug-in can charge the battery but must then be disconnected. The battery is on its own until called upon for use.



C1: 470 F 35 WVDC electrolytic RS #272-1018.
D1–3: 1N4001 or equivalent RS #276-1101.
D4–5: See text.
L1: See text.
LED 1: See text.
S1: 120 volt on-off switch.
T1: 120 volt to 12 volt power transformer RS #273-1360.

Fig. 1– Schematic of the circuit.

Solution anyone? Well, you could plunk down the better part of a hundred dollar bill for a fancy drop-in charger. That's one possibility. Or you could build this simple NiCd charger which features voltage and current limiting. It also, as an added attraction, will keep the battery floating at full charge until you're ready to use it.

Choosing the Components

This project is a classic example of simplicity. Given the choice between a sophisticated "state of the art" circuit and an old but simple one, we've opted for simplicity.

Fig. 1 shows the schematic of the circuit. You'll notice that the values for some components are not listed. They're not there because they will vary with the current capacity and voltage of the battery that the unit will be built to charge. Therefore, the first step in construction is to determine three values: (1) the ma rating of the battery, (2) the voltage when the battery is discharged to the point that it will no longer operate the radio, and (3) the full charge voltage.

Let's go through the steps of finding the component values using the BP-3 standard battery pack for the ICOM series of handhelds as an example. From the specifications on the battery itself we can find readings one and three. The battery is rated at 250 ma and has a full charge voltage of 8.4 volts. Using a volt/ohm meter, we can measure the voltage when the battery is discharged. In this case, it is 7.2 volts. Now let's put this information to work.

Current limiting is handled by a single component—a light bulk, L1. Since it's in series with the battery, the current must pass through both the battery and the bulb. The bulb acts as a bottle neck, limiting the current available. Besides being the ultimate in simplicity, since the bulb is in series, it also acts as a pilot light. To find the proper bulb so that it serves as an appropriate "bottle neck," take the battery's current rating and divide it by 10 (250/10) which in this case is 25 ma.

To find L1's minimum voltage, subtract reading number two from 12 volts (12 – 7.2). L1's voltage must be greater than the difference between these two voltages. In this case it must be greater than 4.8 volts.

I found that a Radio Shack bulb #272-1140 fit my needs exactly. Its 6 volt rating easily exceeded the minimum voltage requirement, and its 25 ma rating was right on the button.

Voltage regulation is handled by LED 1, Z1, and diodes D4 and D5 in series with D3. To figure the values needed in this circuit, begin with LED 1.

This unit can be any size or style as long as you know the voltage drop across the unit. Take the value of the voltage drop (in my case 1.2 volts) and subtract it from reading number three, the full charge voltage. In this case it leaves a remaining voltage of 7.2 volts (8.4 v – 1.2 v = 7.2 v).

Next select zener Z1. Choose a zener with a breakdown voltage as close to the

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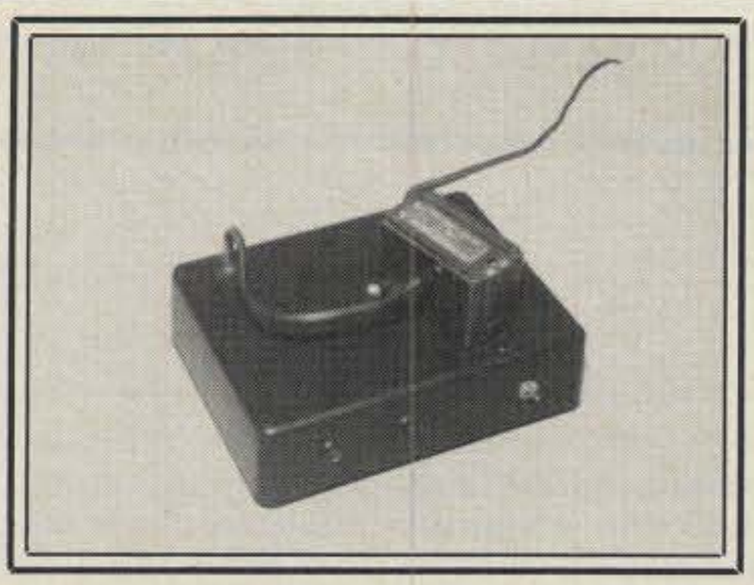
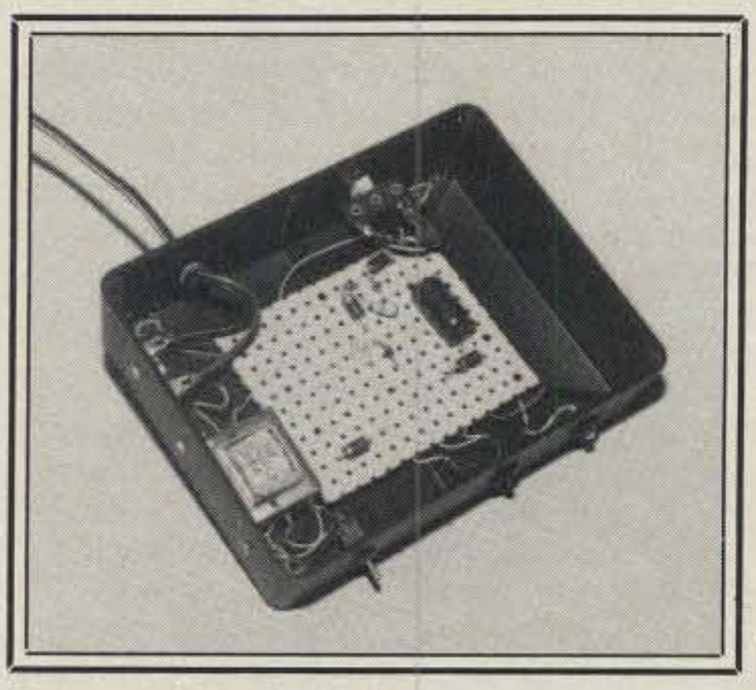


NiCd charger with a battery pack sitting on the unit being charged.



Bottom view showing component layout. In this project, simplicity reigns!

remaining voltage as possible without exceeding it. I chose a Radio Shack #276-561 with a zener voltage of 6.2 volts. Now subtract the zener voltage from the remaining voltage from the previous step. In this case we have 1.0 volts left (7.2 v – 6.2 v = 1.0 v).

This last remaining voltage, 1.0 volts, must be then "made up" by combining as many diodes as necessary, where each silicone diode counts for 0.7 volts and each germanium diode counts for 0.3 volts. In this case one germanium and one silicone diode will make up the 1.0 volts.

By judiciously selecting your LED, zener, and diodes, you can make their total voltage match the battery's full-charge voltage reasonably well.

Construction

Since the circuit is low-voltage DC, component selection and placement are not critical. Do use reasonable caution in wiring the 110 volt AC portion of the circuit, though.

LED 1 and L1 can be mounted through the cabinet using vinyl grommets. Drill a hole in the side of the cabinet. Insert the grommet and then push the LED or bulb through the center of the grommet. Grommets used around the cords going into or out of the cabinet also add a finished appearance to the project.

The battery is attached to the charger using the same plug as the wall plug-in charger uses. For the ICOM units this calls for a coaxial battery plug, Radio Shack #274-1567.

When the unit is complete, plug it in and turn it on. Measure the voltage at the battery plug with a VOM meter. It should be the same as the full-charge voltage, or 8.4 volts in our example. Note that I say "should be." The zener's breakdown voltage could be off slightly, or like me, one of those junkbox diodes that you thought was a silicone may turn out to be a germanium. Now's the time to fix things by adding or subtracting diodes.

Operation

With the battery attached to the charger and the charger turned on, bulb L1 will glow brightly and LED 1 will glow dimly or not at all. This indicates that the battery is accepting considerable current and that little or none is flowing through the voltage regulation portion of the circuit. As the battery begins to recharge, its voltage will rise until it finally reaches its full charge potential, which in this case is again, 8.4 volts. Since the regulator circuit is in parallel with the battery, the voltage across this circuit will be 8.4 volts also. At 8.4 volts the voltage across the regulator circuit will be high enough to overcome the voltage drop of the LED, the barrier voltage of the various diodes, and the zener voltage of the zener.

At this point the zener goes into breakdown, allowing current to flow through the regulator circuit. At this point L1 will glow dimly and LED 1 brightly.

The battery can remain connected to the charger after it is fully charged because the charging current is being diverted through the voltage regulator. However, although there is little or no current going through the battery, there is a voltage across it which prevents it from losing its charge. The battery floats at full charge until needed.

Conclusion

This circuit is about the simplest possible which provides those features that are really needed when working with NiCds.

Ideally you should have two battery packs. That way one can always remain plugged into the charger ready to go when needed. CQ

Antennas & Accessories

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

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

We Get Letters

Columnist W8FX opens the mailbag this month with some correspondence on the ever-popular, many-versioned Zepp HF skywire. He also offers tips on some interesting amateur radio and computer reading matter, as well as a survey of some new hamshack software.
—K2EEK

Last month we continued the "potpourri" focus of our previous column, covering a variety of Antennas & Accessories subjects. We first examined the rotating tower systems offered by Dick Weber, K5IU. We then took a brief look at several other new antenna products, including the Paragon vertical, Spider HF mobile antenna, and Sommer DJ2UT antenna product line. We concluded with a look at some new hamshack computer software we felt you would find of interest. This month we again open the mailbag for a look at some reader letters on the perennially favorite Zepp antennas, with some correspondence from W6QJI and W1FPZ.

Before digging into the mailbag, I'd like to mention that we receive a healthy slug of mail each month from readers, both hams and hams-to-be. Despite the increasing coverage of "accessories and computers" in the column, our antenna-related correspondence leads on about a four-to-one ratio. Whatever the makeup, I'm happy to have a full mailbox, as it shows that people are reading the column, and correspondence helps us to fill the gaps, so to speak, when working on subjects to write about each month. For the record, I try to answer all inquiries received, and also print readers' correspondence in the column if I feel that the letters' appeal would be a broad one.

When writing to us, you should address your letter directly to us at our Alabama QTH. Sending your letter to the *CQ* editorial offices in New York only results in delay and increased risk of loss. Write to us at 317 Poplar Drive, Millbrook, AL 36054. If you desire a personal reply, please enclose an SASE or IRCs, as we foot the bill for the postage ourselves. Now, to our letters.

The Extended Double Zepp Revisited

We received several interesting and informative letters from readers in response to our mention of this popular wire antenna in last June's column. To review, there are really many antennas that carry the name "Zepp," or "Zeppelin." One basic definition of a Zepp is a horizontal antenna that is a multiple of a half-wavelength long. One end is fed by one lead of a two-wire transmission line that is also a multiple of a half-wavelength long. However, the Extended Double Zepp antenna may be considered a "special case" of the dipole, or as a two-element Franklin colinear array. Actually, there's nothing terribly special about this wire antenna, which is shown in fig. 1.

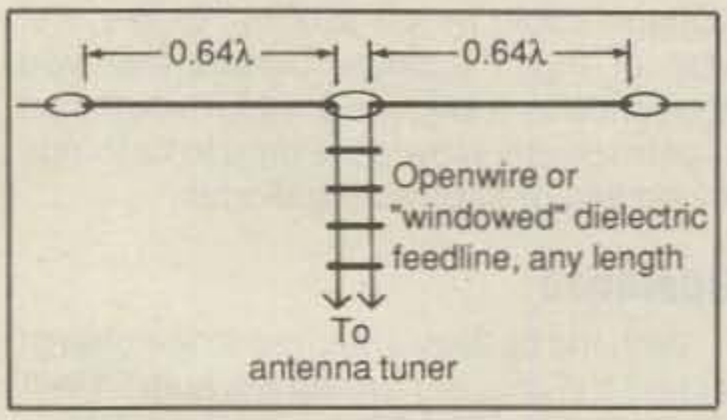


Fig. 1– The Extended Double Zepp antenna. The Extended Double Zepp is a "special case" of the two-element colinear, which normally has a gain of about 2 dB as compared to the ordinary half-wave dipole. By making the antenna a little longer, 0.64 wavelength on a leg, it exhibits a gain of about 3 dB on the band of primary interest. On this band, and at half the frequency, the antenna's maximum radiation is at right angles to the wire. However, on the higher frequency "harmonics," the pattern tends toward the X-shapes exhibited by one- and two-wavelength antennas. Construction details for the Extended Double Zepp are the same as for other parallel-line-fed antennas. Note that the Extended Double Zepp is a rather long *antenna—about 86 feet, for example, for a 20 meter version.*

It's well-known that colinears make very good 75, 40, and 30 meter antennas. The colinear system consists of two or more radiating sections from 0.5 to 0.65 wavelengths, with the current in phase in each section. As a general rule, the gain of a colinear system using half-wave elements is about equal to the number of elements in the array.

The Extended Double Zepp, however, exhibits gain over that of a simple dipole of about 3 dB. This is somewhat more than the usual two-element colinear gain of about 2 dB. The added gain is achieved by making the two colinear elements longer than the usual one-half wavelength. This effectively increases the spacing between the two in-phase half-wave sections at the ends of the wires—and wider spacing in a simple two-element colinear makes for higher gain. The optimum length for each element is 0.64 wavelength. The resultant horizontal pattern concentrates radiation rather tightly broadside to the wire, although some minor lobes are present in the pattern. The vertical radiation pattern is comparable to that of the dipole.

The antenna we've described here has a high impedance at its midpoint; this suggests use of openwire transmission line. While the use of such low-loss line should give satisfactory results when the system is fed through an antenna tuner, the line may behave better if a quarter-wave matching stub is used. One approach used to keep the impedance low is suggested by Bill Orr, W6SAI, in his *Radio Handbook*. He suggests using a shortened phasing stub to keep the whole array in resonance. In this arrangement, instead of having half-wavelength elements and quarter-wavelength stubs, the elements are 0.64 wavelength, while the stubs are shortened to but 0.11 wavelength.

Two of the letters we received in response to our call for reader experience with this type of antenna were from W6QJI and W1FPZ. They described similar, but slightly different Zepp-type antennas. Tom Sanders, W6QJI, wrote to us with some interesting material on the early Zepp, reminding us that there are several different antennas that go under the Zepp moniker:

"As background, the original antenna was invented by the Germans in World War I. It was probably several even multiples of a half wave long and was voltage fed with openwire line.

Although Zepps are sometimes fed by coax via an impedance-transforming balun, in most cases openwire is run to the hamshack, where an antenna tuner/transmatch is used to couple to coaxial cable. (Photo courtesy MFJ Enterprises)

317 Poplar Drive, Millbrook, AL 36054

The flattop trailed below the Zeppelins (used to bomb London) and parallel to the ground—hence the name "Zepp." The feeders were tuned at the transmitter in the gondola above the antenna. Appreciation of the increased gain came later, but I don't know who was responsible for the work—sounds like something John Kraus might have done.

"The Zepp antenna was quite popular before World War II. It was usually a half wave long, occasionally ⅝-wave, horizontal and fed with tuned feeders on several bands. I used one on 40 meters very successfully from 1937 to the start of World War II. I also used the Extended Double Zepp, as described in your article [in the June column—ed.]. It is an easy antenna to tune up, and it works very well. For several years, just after the war, I used an Extended Lazy H—four ⅝ waves in phase—in Colorado. Running 100 watts, and using a good homebrew receiver, I could work just about anything I could hear. And, the Extended Lazy H is a quiet receiving antenna.

"At present, I am using the original extended Zepp configuration with feeders at one end [fig. 2]. It is fed with an openwire matching section and a 4:1 coax balun, with RG-8/U to the shack. The Z0 of the matching section is not critical: I wound up with 200 ohms using the spare wire and PVC spreaders from my junkbox. Probably the nicest part of this story is that no extensive ground radial system is necessary.

"In my case, I live in a condo with antenna restrictions. The vertical runs up the side of a big fir tree, and the stub is mounted on the side of a fence. The vertical is about a foot from the tree, and the tree seems to have very little effect on the VSWR. The VSWR does rise to 1.2:1 when it rains, because the fence gets wet under the stub.

"Tuneup is easy. Cut the antenna by formula, and build the stub about ¼-wave long. Dip the whole system, moving the shorting bar to achieve resonance. Connect the balun a couple of feet from the short. Adjust the balun feedpoint and shorting bar position to get 1:1 VSWR. In my case, I tuned it to 14,025. The antenna bandwidth, for VSWR = 2:1, is about 250 kHz on 20 meters."

As always, the results are what count. Concludes Tom: "This antenna works very well; N7HCK and N7HTK are also using it with excellent DX results. On days when the band is open to Europe, for example, US stations (except the W6s) are weak with Europe often overriding the 'iron curtain'—the East Coast. This says 'low angle.' I have no trouble raising European stations with this antenna and 100 watts. Same for Asia and once in a while for Africa in the morning via long path. As simple as it is, this is a good antenna."

Continuing with a different perspective on the Zepp, John F. Rollins, W1FPZ, wrote to tell us that he has used the Extended Double Zepp off and on for years, with uniformly excellent results. John considers the antenna to be clearly preferable to the conventional half-wave dipole when one cannot mount a more sophisticated rotatable beam antenna and has the horizontal space. This performance improvement, he feels, is especially true of 80 meter operation. Writes John:

"I never had much luck eliminating standing waves with balanced feeders connected directly to the antenna. Application of the quarter-wave matching stub, together with a properly adjusted 600 ohm resonant line, always seemed to be the way to go. Adjusting the

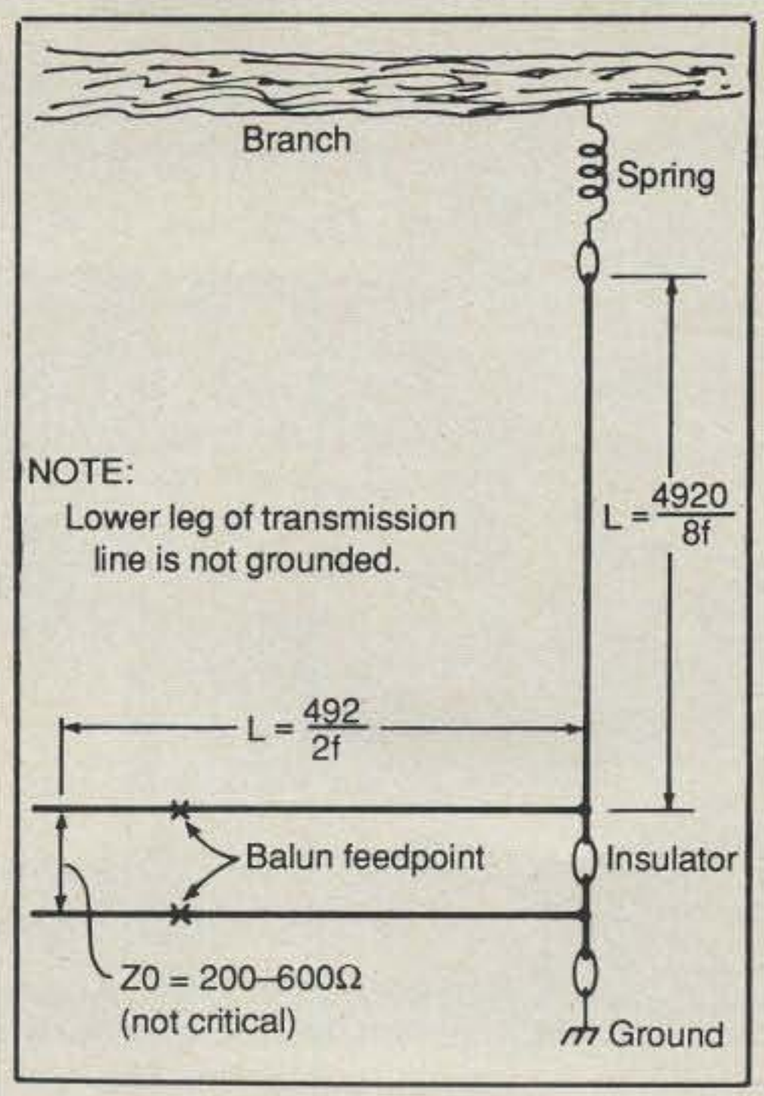


Fig. 2– W6QJI vertical Zepp. W6QJI hangs his "original Zepp" by a spring from a tall tree, and feeds it as shown using a 4:1 balun. The exact feedpoint is determined by trial-and-error. RG-8/U is used from the balun to the hamshack. As indicated in the text, there are various types of "Zepps." W6QJI calls his a "Vertical Extended Zepp."

shorting bar on the quarter-wave stub, and then finding the point of attachment of the 600 ohm balanced line on the stub is not as difficult as it first seems, once you have done it. Details of the procedure can be found in any of the earlier *ARRL Handbooks*.

"A shorting indicator for the stub can be made with a piece of stiff wire soldered to contacts of a flashlight bulb. A line current indicator can be made from a low current milliammeter, and a diode rectifier, or even a small neon bulb, run along the feedline will give an approximation as to which way to move the tap of the feedline on the stub.

"The Extended Double Zepp is described in the 1941 *Radio Handbook*, but the best treatment of the antenna was written by Hugo Romander, W2NB; this is found in the June 1938 *QST*. In his article, Romander also describes the use of parasitic elements with the Extended Double Zepp for increased gain and directivity. My curiosity was aroused on this aspect of the antenna a few years ago, in 1976, while operating as CX9AW in Montevideo, Uruguay. I first duplicated Romander's 20 meter, two-element array and found the results to be excellent. I then constructed a three-element array for 15 meters.

"For practical convenience I used 0.15 wavelength spacing of the elements. Spacing was maintained by using lightweight wooden spreaders. The results were impressive, I thought, and the array consistently outperformed my four-element, 15 meter quad to Europe. European operators frequently commented that I had the strongest signal coming out of South America—this with 600 watts output. The disadvantages of such an array are obvious, as its direction is fixed."

John concludes: "It goes without saying that any use of the Extended Double Zepp implies the use of an antenna tuner to go from a balanced 600 ohm line to an unbalanced 52 ohm line at the transmitter. I believe that most of the commercially made antenna tuners sold on the ham market today use a balun/toroid to convert a balanced feeder to the unbalanced line to the transmitter, and as mentioned in your article, the balun/toroid is not a practical way to make the transition. It is a simple project to build a suitable tuner for the purpose—various handbooks describe this type of tuner in detail."

From the Bookshelf

How to Read Schematics. Of special interest to amateur radio newcomers is this 272-page Sams softbound book, now in its fourth edition, revised and expanded to include the latest electronic developments, including logic diagrams and flowcharts. The book begins with a general discussion of electronic diagrams, and it goes on to cover the various components of an electronic circuit. The author is Donald E. Herrington, who has 35 years of firsthand experience in Sams' own technical book division in the presentation of electronic circuit diagrams.

The book, priced at $14.95, may be purchased directly from the publisher, or it may be purchased through bookstores, electronic distributors, and computer stores. Contact Howard W. Sams & Co., 4300 W. 62nd St., Indianapolis, IN 46268.

Three from G-Land. Three of the latest Radio Society of Great Britain (RSGB) publications are now conveniently available in the US, from the ARRL. The first book of interest is the *Radio Data Reference Book*, by G. R. Jessop, G6JP. This publication is organized into nine chapters. These include chapters on units and symbols; basic calculations; resonant circuits and filters; circuit design; antennas and transmission lines; radio and TV servicing; geographical and meteorological data; materials and engineering data; and mathematical tables. In addition, there are many useful tables, charts, and formulas to be found in the book. The hardback, 244-pager, now in the 5th edition, is priced at $15.

The second RSGB publication offered by the ARRL is the *Amateur Radio Operating Manual*. Now in its third edition, this 204-page book, by R. J. Eckersley, G4FTJ, is available in softcover for $10. Focusing on operating techniques British style, the book includes chapters on topics such as setting up a station, and mobile, portable, and repeater operation. The book also is replete with appendices, which include continental and regional maps containing prefixes as well as ITU callsign allocations, notes on foreign amateur operation, callsign systems for each country, addresses of licensing administrations, and the names and addresses of the various national amateur radio societies.

Last, but certainly not least, is John Morris, GM4ANB's *Amateur Radio Software*. This 328-page hardbound publication is intended to be a sourcebook for amateur radio applications programming. It contains some 86 BASIC language programs, as well as several written in assembly language. The book's introductory chapter describes the various differences which exist between competing versions of the BASIC language, so that the programs presented in the book may be modified as required to be used on different types of computers. The remaining chapters cover such topics

as CW; RTTY and data (including AMTOR and packet); antennas and propagation, including path loss; distances, bearings, and locators; satellites; circuit design aids; a simple database system; and a network analysis package. The book is priced at $15.

For more information, contact the American Radio Relay League, Inc., 225 Main Street, Newington, CT 06111.

Another Winner from Glossbrenner. Several times in the column we've highlighted the authoritative, encyclopedic books turned out by noted computer expert and author Alfred Glossbrenner. To recall, the books we've featured were *How to Buy Software* and *How to Get Free Software.* These two books are highly authoritative in the critical areas of selecting and acquiring software, and—although neither book is aimed specifically at amateur radio operators—I recommend their purchase for anyone who intends to make serious use of computers in the hamshack. The former book rightly bills itself as "the master guide to picking the right program"; the latter is a comprehensive sourcebook on tapping the vast and expanding sources of free (or nearly so) public domain, freeware, and shareware programs.

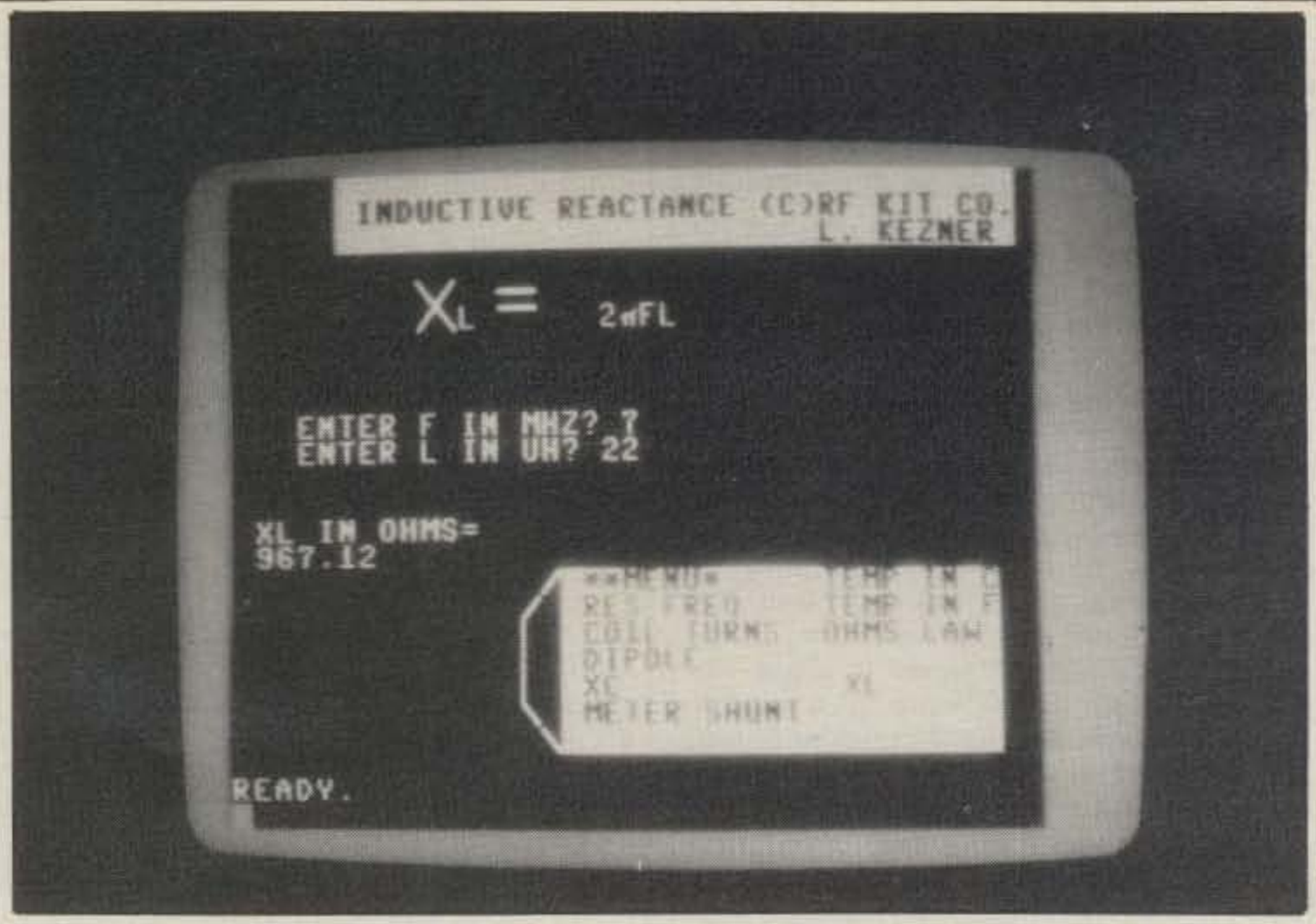
Glossbrenner's follow-on book is the 546-page paperback *The Complete Book of Personal Computer Communications* (ISBN 0-312-15760-6). The book focuses on the expanding "electronic universe" of personal telecommunications which the computer and modem allow you to enter. Billed as the book with "everything that you need to go online with the world," its 20 chapters cover subjects such as hardware (modem) and software (terminal program) selection; technical aspects of telecommunications; the various online utility services, such as CompuServe, Delphi, and The Source; bulletin board systems; business, financial, and investment services; electronic mail and conferencing; online shopping and home banking; and even telecommuting and the home-office interface.

In my view, Glossbrenner's book is bargain-priced at $14.95. It is available in many bookstores and computer shops, or it may be obtained from the St. Martin's Press, 175 Fifth Avenue, New York, NY 10010.

Software Snapshot

RF Kit Formula Disk. This month, we'll scan five sources of software. First up is a new disk for the Commodore 64. This is a handy "electronic utility package" which includes many commonly used RF formulas such as Ohms Law, inductive and capacitive reactance, resonant frequency, dipole antennas, temperature conversions (C to F and back), Great Circle bearings and distances, tower stress calculations, noon meridian passage, coil winding, meter shunts, and the like. The disk is interesting in that the math formulas provided are presented in their natural forms, similar to the forms in which you would work with them if manually performing the calculations using a stubby pencil. The program also includes instructions for you to program your own favorite formulas on the disk.

A special feature of the package is the inclusion of three programs which antenna enthusiasts and experimenters may find useful. One is DIRECTION FINDER, a Great Circle routine which quickly computes short- and long-path distances, beam headings, and time differences to a distant area. A second is STRESS CALC, which analyzes the data inputted on your planned or existing tower, then supplies you with wind-loading stress factors on the tower, and even computes guy-wire lengths. A third program is APASS, used to compute noon meridian passage for your longitude and time zone, to produce the exact time that a shadow from your tower or other vertical element points to True North—very useful for initial beam antenna orientation.



A typical screen display from the RF Kit Co. "RF Kit 1.0 Formula Disk." The program, for the Commodore 64, offers at least 16 sets of calculations in various electronics and amateur radio areas of interest. (Photo courtesy RF Kit Co.)

According to Larry Kezner, N7DVJ, RF Kit may have a second formulas disk in the field by the time you read this. Version 1.0 sells for $14.95 plus $1 shipping and handling, and is available from RF Kit Company, P.O. Box 27127, Seattle, WA 98125.

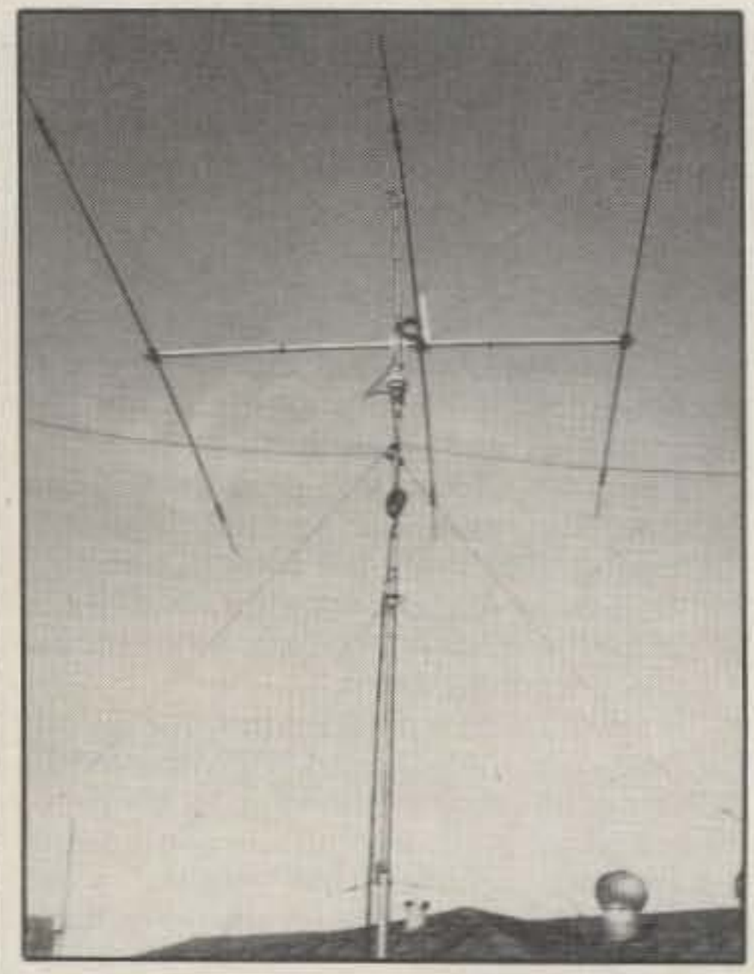
MultiComm 2.0. MultiComm is a multi-function amateur RTTY/ASCII/Morse communications program for the IBM-PC/XT. With this program, you can communicate in ASCII to send text files to other computers or call up landline bulletin boards. You can select standard Baudot speeds for full Teletype™ emulation to work amateur RTTY, copy press service bulletins, or monitor weather reports. The Morse Code feature may be used as a CW keyboard or as a learning device.

Some of the major features include interactive prompting with fast menu screens; definable function keys; terminal screen memory feature; simultaneous printing; file transmit and receive; relay and PTT control; date and time stamping; a large storage buffer; and more. Basic system requirements are 128K RAM, one disk drive, and an 80-column monitor. For RTTY communications, any terminal unit with an RS-232 interface will do.

Latest price I have on this program is $39.95. For more details, contact MultiComm Communications Software, 1806 Foxwood Drive, Houston, TX 77008.

PC-Library Software. From Comprehensive Software Systems (CSS) comes information on a large (more than 500 disk) library of IBM public domain and freeware programs, as well as programs from CSS's own considerable database. In a catalog I received from CSS I found a large quantity of software to operate a small business; numerous subroutines, functions, and utility programs; and several excellent mailing-list and wordprocessing packages.

The PC-LIB people issue a challenge in their catalog: if you're a computer hobbyist, you're challenged to come up with faster, more flexible, and more elegant routines than those found in the PC-LIB catalog. To back up their challenge, they offer you a free diskette of your



This nice-looking installation belongs to Frank, KC5M. It's an old, but still usable, Wilson System 33 triband Yagi. With it and using a Kenwood TS-830S and Alpha 76 amplifier, Frank has snared 5BDXCC, and has worked 303 countries on SSB and 242 on phone. Not bad for a location where deed restrictions prevent him from having an antenna at more than 26 feet above ground. (Photo courtesy KC5M).

choice from the catalog for each original program you submit. In addition, you're paid a $1 royalty for each copy of your program that customers order.

A current catalog of available programs is available for $6.95, while all programs are $6 per disk. A one-year membership is available for $15. For more details, contact Comprehensive Software Systems, 802 E. Martintown Rd., BTC 931, N. Augusta, SC 29841.

BV Engineering. We've mentioned the scientific and engineering software available from BV Engineering previously in the Antennas & Accessories column. An updated catalog from BV shows considerable expansion of the technical software offered for PC/MS-DOS, CP/M-80, CP/M, and TRSDOS computers. In fact, I counted some 16 programs for over 70 different computers. The machines supported include diverse systems such as the Zenith 100/150, Compaq, Kaypro II/4/X, Osborne I, SuperBrain, Zorba, Northstar, and TI Professional, among many others. Computers such as the Apple series and the Commodore 128 are even supported in CP/M mode.

The recent BV catalog includes plotter driver and scientific calculator programs; a high-resolution graphics program; network and transfer function analysis programs; signal processing software; and more. BV also offers a proofreader and writing style analyzer package and accompanying dictionary utility.

One of the more intriguing programs offered is COMCALC, the Communications Design Spreadsheet. This program is a menu-driven, spreadsheet-like design tool for the radio communications system engineer or sophisticated commercial user. Components of a complete communications system such as transmitter power and frequency, receiver noise figure, transmission path attenuation, and other factors are entered, with the program displaying the system's performance characteristics. COMCALC even presents a communications "budget" which tells the designer how much signal energy margin is available. The program also contains a specialized calculator to quickly solve many common communications problems such as line-of-sight (LOS) distances, units conversion, and parabolic antenna design.

For a copy of the BV catalog, contact BV Engineering Professional Software, 2200 Business Way, Suite 207, Riverside, CA 92501.

More from Uncle Bill. Way back in last July's column we took note of Uncle Bill's Code Course, a three-part, $9.95 Morse code training program designed for the Commodore 64/128 computer. Proprietor Bill Clarke, WA4BLC, subsequently write to us to advise that after two years of production and mail-order sales, he's updated his code course to Version 2.0, and has also decided to market the program through the "shareware" concept. Writes Bill:

"Shareware is the newest form of software distribution. Shareware allows, even encourages, the copying and sharing of computer software. However, the programs are under copyright, and there is a user's fee for their use. But, no fee is expected until the user has tried the program and determined its usefulness.

"The user's fee is nominal, and the user is honor bound to pay it. Uncle Bill's Software user fee is a modest $5 per program. We feel that, due to the lost cost, most users will elect to pay the fee. Information about shareware and user fees appears within the program. Also within the program is a copy routine that allows reproduction of the shareware software. This routine is accessible directly from the main menu.

"As with the original program, this new and enhanced version (V2.0) is made available to all clubs free of charge. All that we ask is that the club provide a formatted disk and a self-addressed and stamped mailer. The clubs may share the software as shareware with members, students, or anyone they wish. Individuals may purchase Uncle Bill's Code Course V2.0 by sending $7 to Uncle Bill's Software, Box 2403, Falls Church, VA 22042."

Bill also sent me a prototype of the Antenna System V2.0 disk, which will be available by the time you read this. To recall, this is an antenna modeling and development package for the Commodore 64/128 which focuses on the design of standard (full-size) antennas as well as reduced-size antennas for the ham who cannot install the larger versions. This program is also available on a shareware basis and carries a user's fee of $5.

Wrapping It Up

That's it for this time. We've covered two readers' experiences with various versions of the Zepp, pulled down some interesting reading from the bookshelf, and highlighted some new hamshack software. Next month we'll continue with more mail from readers of the Antennas & Accessories column. See you then.

73, Karl, W8FX

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Getting Started—Part II

This is the second part of an eight-part article. The first part covered the introduction, junk equipment, guidance, and facts regarding building and buying equipment.

New Versus Used Equipment

It used to be sensible and commonplace for Novices to establish their initial stations just to meet their operating needs as Novices. This is no longer the situation. It is now advisable to install an initial station that meets the Novice needs, but will also allow one to use increased operating privileges after upgrading to a General (or higher) license. The present situation makes it reasonable for Novices to consider both new and used equipment, whereas they previously purchased used gear almost exclusively.

Used equipment normally provides more communication capability at lower cost than new gear. The safest way to buy used gear is to buy it from an active amateur, preferably another member of your local amateur radio club. Purchasing equipment advertised in amateur radio magazines has proved to be surprisingly satisfactory, but it is best to purchase gear from nearby amateurs. There are still a lot of hybrid (combination solid-state and tube) transceivers on the used equipment market due to many amateurs changing over to completely solid state gear. These hybrid transceivers are usually a bit harder to tune up than the newer solid state rigs, due to the fact that the transmitter section final radio frequency stage has to be tuned and loaded to the antenna, whereas most solid state rigs do not require this tuning and loading. Do not let this adjustment requirement scare you away from hybrid rigs. It is easy to master this procedure. If your financial situation permits you to do so, get a transceiver that was marketed within the past decade. Equipment changes drastically and rapidly. You may as well take advantage of the latest improvements. If your financial situation is good, it is wise to get top-quality equipment at the start. Modern gear is fantastic.

If you buy used gear from a store, you would be wise to deal with an outlet that permits such equipment to be turned in if it is found to be unsatisfactory, with your full purchase price applied to any other used or new equipment you select. There is usually a 10- to 15-day limit to this type of turn-in offer, which is enough time to evaluate equipment. Don't assume that distributors check out and recondition all used equipment before they sell it. Experience has taught me that most used gear is sold in the same condition in which it is received as a trade-in. Also, please remember that (like cars) many owners trade in ham gear when it starts to give them trouble.

2814 Empire Ave., Burbank, CA 91504

This is Ken Jones, KA9VNH, of Muncie, Indiana. He has been licensed as a Novice since June 1986. Ken has worked 30 states and 3 countries. He recently received the Ten American Districts (TAD) award, which I sign. His station includes a Ten-Tec Omni transceiver with the matching heavy-duty AC power supply and remote VFO, plus a Butternut vertical antenna.

Cost Comparisons

When making cost comparisons between transceivers, be careful to consider the complete package you would buy in each case. Some of the items you may have to purchase in addition to the basic transceiver may be a 117 VAC power supply (for fixed station operation), a noise blanker, a suitable (narrow) code filter, a secondary frequency control (sometimes referred to as a remote VFO), SWR/power meter, microphone, electronic keyer, antenna tuner, and separate speaker. Some transceivers come with part of the preceding accessories, which makes a major difference in values.

Modern transceivers are primarily designed to provide mobile voice (SSB) communications. A properly designed radiotelegraph (A1A) transmitter produces a signal width that is about five times the sending speed. Assuming a top speed of no more than 20 wpm on Novice bands, one does not need anything wider than a 100 to 150 Hertz filter. Broader filters subject the listener to noise and other signals that may be present in the additional spectrum. The transceiver you select may have a narrow code filter available as an accessory item. If not, suitable filters are normally available from companies such as the Fox Tango Corporation. It is usually necessary to purchase a narrow-width code filter, so take this extra expense into consideration when determining the price of the package you are going to buy.

Solid-State Versus Hybrid Or Tube Equipment

Solid-state gear is usually smaller, uses less electric power, runs cooler, is lighter, and is suited to emergency use, since it runs on battery voltage. Transistors and other solid-state devices are less likely to be damaged by mechanical shock than tubes.

Completely (all) tube equipment is available at lower cost than hybrid or solid-state gear. The latest (newest) tube gear can meet Novice needs well, and still be useful for other modes of operation when one gets a higher class license. New amateurs are more at ease trouble-shooting tube gear than they are when working on solid-state equipment. If you are considering the purchase of tube gear that consists of a separate receiver and transmitter, I advise you to read the article mentioned in the introduction paragraph.

Hybrid gear is generally newer than tube equipment and it is older than solid-state gear. The receiver section and most of the transmitter is solid state. Usually, just the final RF amplifier and its driver use tubes in hybrid gear. Hybrid gear presents near state-of-the-art features at reasonable cost.

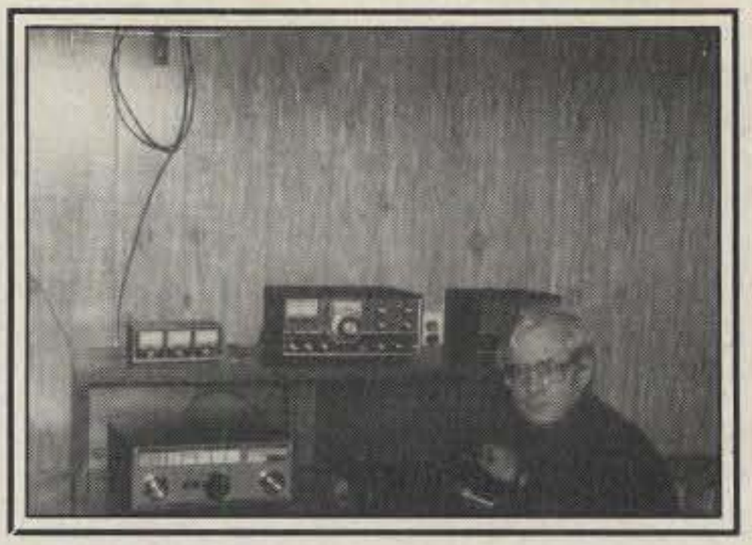
Solid-state equipment is now available in the used gear market. Generally, it provides up-to-date features and excellent performance. If you purchase new gear, I advise you to get all desired accessory items during the initial purchase. When equipment is no longer the current model, the accessories soon become unobtainable. The need for one particular

feature is frequently overlooked. That feature is dual frequency control which enables one to listen and transmit on frequencies that are more than 5 kHz away from each other. Some modern transceivers have this capability built in as they are sold. In other cases, the second frequency control is an accessory that must be purchased to supplement the basic transceiver; it has often been called a remote VFO (variable frequency oscillator). A couple of examples should help you understand the need for this second frequency control. Most transceivers include a control that permits the receiver to be tuned several kiloHertz above and below the transmit frequency, without moving the transmit frequency. This feature enables one to tune in a responding station that is not quite on frequency without shifting one's transmit frequency, which would probably cause the loss of the contact. This feature is called by many names on different equipment. A few of these names are offset tuning (OT), receiver incremental tuning (RIT), and clarifier. This offset tuning serves it purpose, but there are situations wherein one's transmit and receive frequencies are too far apart for offset tuning to get the job done. One example involves working DX voice (SSB) stations in the 14,100 to 14,150 kHz segment of 20 meters. USA amateurs are not allowed to use voice in this segment. The DX amateur could make a CQ call (general call to all stations) on a frequency such as 14,125 kHz and state that she/he is listening around 14,280 kHz. In this case, the USA amateur needs to transmit on 14,280 kHz and to receive on 14,125 kHz, which requires a second frequency control. Another example involves working military stations during Armed Forces weekend. The military stations transmit just below and above the amateur bands, stating the frequency where they are listening for replies in the amateur bands. Again, a second frequency control is required to work these stations.

High or Low Power

One does not need high power (QRO) to contact stations all over the world. One can use low power (QRP) gear and achieve good results. The May 1981 Novice column does a good job of introducing QRP operation to new amateurs. Medium-powered transmitter output does the job for most amateurs. We are allowed to run as much as 200 watts PEP (peak envelope power) maximum output power in the Novice bands, which is more than enough power to communicate effectively. Most of the modern rigs put out about 100 watts, which is enough power to meet our normal needs.

QRP rigs cost less, are smaller, are well suited to emergency use, and are less likely to cause interference to RF-



James D. Ray, KA1NHK, of Johnston, Rhode Island, is legally blind, but that does not stop him from climbing trees to erect antennas. Jim is a civilian employee of the U.S. Navy. He has been an amateur since July 1985. His station includes a Swan 500-CX transceiver, Butternut HF-6V antenna, 40/15 meter dipole antenna, Heath antenna tuner, and a random-wire antenna. Jim is a member of Courage Center Handi-Hams. He is also a member of the North Providence Amateur Radio Club. Jim obtained the Novice license as a present to himself on his 40th birthday.

sensitive devices such as televisions and audio systems. Good antennas and an excellent station ground are important to every station, and they are very important when QRP operation is used. When operating QRP on 15 meters, a directional antenna is almost essential. A simple monoband (one band only) 3-element Yagi-Uda can be mounted on a heavy-duty TV telescoping push-up mast, and it can be turned with a heavy-duty TV antenna rotator. This type of installation is not expensive and it provides easy worldwide communications opportunities, when it is used with a good rig.

It is not satisfactory to operate QRP on 40 meters when that band is crowded. QRP 40 meter operation should be restricted to times when activity is low. Otherwise, QRP signals are likely to be obliterated by stronger signals transmitted from QRO stations. QRP 80 meter operation is somewhat subject to the same problem that occurs on the 40 meter Novice band. However, 80 meters does not suffer from the high-power shortwave broadcast interference that ruins the 40 meter Novice band most evenings. International shortwave broadcast stations can be heard every 5 kHz (7105, 7110, 7115, etc.) throughout the 40 meter Novice band most evenings. The 80 meter band requires a relatively long antenna, which causes this band to be less popular with Novices. However, QRP operation is more likely to be successful and satisfactory on 80 meters than on 40 meters.

I like low-power operation and I often use a Ten-Tec Argonaut (5 watts input) transceiver that belongs to one of my sons. However, I do not advise Novices to get a QRP rig as their only equipment. If you can afford two rigs, A QRP transceiver is a fun second rig to use.

It is best to get equipment that puts out 50 to 150 watts power. Neither a low- or high-power rig is best for Novice use. Medium-output-power rigs provide good operating results without causing the problems that can be associated with operating high- or low-power equipment.

Transceivers

The word *transceiver* was coined from the first part of the word *transmitter* and the last part of the word *receiver*. Most early transceivers had some circuits that were used in both transmitting and receiving functions. Thanks to modern solid-state devices and reductions in component sizes, the receiver and transmitter sections in today's transceivers are usually completely separate, and the term *transceiver* just denotes transmitting and receiving equipment in a common single cabinet. Naturally, the transmitter and receiver portions of transceivers still share commonality of control circuits, power supplies, antenna changeover circuitry, and associated intercontrol between the receiving and transmitting sections. An advantage of the transceiver over separate units is that the interconnections between the receiver, transmitter, power supply, and control circuits are all inside the transceiver case.

If you do not have much room for your station, you should give first consideration to a transceiver, since it is usually smaller than a comparable transmitter and receiver combination. Students often tell me that they are getting a transceiver because it can be used either mobile or in a fixed station. This flexibility feature seems to be a strong point in favor of getting a transceiver, but experience has shown that less than one out of every few hundred amateurs actually uses a transceiver as both a fixed and a mobile station. It would be realistic to assume that your transceiver operation would probably be from just one installation, which is usually the fixed station location. After you upgrade in license, you may decide to install a transceiver in your car and to install a better station in your home. If you do not switch your transceiver to mobile use after you upgrade, you will most likely sell it or trade it in towards the purchase of new gear.

A transceiver usually costs a little less than a comparable transmitter and receiver combination. If you are making a choice between a transceiver and a transmitter and receiver combination, remember to compare transceiver costs against the combined cost of any transmitter and receiver, plus their required intercontrols. When considering transceiver cost, add in the costs of required accessories. Some transceivers have many

features built in, whereas most have to be purchased separately for use with transceivers.

Most transceivers are primarily designed to provide mobile voice (SSB) communication capability. Code capabilities of many transceivers are not satisfactory. Keying characteristics (the shape of transmitted dits and dahs) are poor with some older transceivers, and some older units emit an objectionable backwave (a signal output when key contacts are open). Many transceivers have no delay or insufficient delay before the receiver activates (comes on) after key contacts are opened. If your delay is not long enough, the receiver is activated between each character or word you transmit when working at a slow code speed rate. Most Novices need a 2- to 3-second delay, and it should be adjustable so that it can be reduced as code proficiency improves. This nuisance factor can be overcome by operating manual control (switching) between transmit and receive modes. A few of the older transceivers do not incorporate the sidetone oscillator feature, which enables you to hear your own sending while you are transmitting. This sidetone feature is important to amateurs who want to minimize sending errors by monitoring their own keying. It is not particularly important to be able to adjust sidetone pitch, but sidetone volume should be separately adjustable. It is not particularly hard to add a sidetone oscillator to equipment lacking this important feature.

In addition to code transmitting deficiencies, some transceivers are not good for code reception on today's crowded Novice bands. Since modern SSB (single sideband) transceivers are primarily intended for mobile voice communication use, many are delivered without a suitable (narrow bandwidth) code filter, although some have good code filters available as accessories. There is no sense in listening to about 3000 Hz of interference from atmospherics and other stations when a good code filter (100 to 300 Hz) can be used to eliminate about 90 percent of this interference. If lack of a code filter lessens the usefulness of your transceiver, and you are unable to obtain an accessory (plug-in) code filter, you can select one of the several excellent external filter devices that are available, and they will do the job very well for you. These external filters are simple to connect and use; they can be used to improve code reception of any receiver lacking this feature, including old communication receivers. The external filter is connected between the transceiver's speaker output and the external speaker/headphones.

Some transceivers lack the required capability for the operator to tune the receiver above and below the transmitting frequency without also shifting the transmitting frequency. This feature is usually called RIT (receiver incremental tuning), clarifier, or OT (offset tuning) on transceivers. Simply stated, RIT/OT lets you tune the receiver (only) a maximum of about 5 kHz above and below the frequency selected with the main tuning dial. This feature is very important, since some operators will not answer your general call (CQ) exactly on frequency. You must be able to move your receiver to tune in a station answering your CQ call, but not answering on frequency. If you move your main tuning dial to tune in an off-frequency reply, the other station may lose you because you have also shifted your transmit frequency. Even if the other operator does not lose you when you shift the main tuning dial, he/she may shift frequency to tune you in and you may lose their station. If two stations keep shifting frequency due to this type of problem, they may leapfrog out of a band. When answering another station, your RIT/OT should be set to zero (center point) or turned off, or you will not be answering on frequency.

In summary, a transceiver can be an excellent choice as your first station. Be aware that some older transceivers do not fully cover all four Novice bands (3.7–3.75, 7.1–7.15, 21.1–21.2, and 28.1–28.2 MHz).

This completes the second part of this eight-part article. The third part covers SWR/power meters, dummy loads, and receiver features.

Photographs Wanted

Photographs of Novices in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year *CQ* subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest *CQ* issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs. I have not received a picture from a Novice in Hawaii or Vermont.

73, Bill, W6DDB

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

It was a very happy occasion last September when we celebrated Buz Reeves, K2GL's 80th birthday at his spacious QTH in Tuxedo Park, NY. Fate has a way of reminding us, however, that the future is not predictable. Buz became a Silent Key just two days before Christmas, an unexpected sudden tragedy that shocked all of us who had been present at Buz's celebration.

We like to remember the party not as a "last hurrah," but as a parting farewell to a "par excellence" contester who will be missed worldwide by the contest fraternity. We have a feeling that the K2GL crew will still be an active competitor as a multi-multi in the future.

Farewell old friend, rest in peace. We will be thinking of you come contest time in October and November.

Who are you going to believe? The October issue of *Radio Communication*, the RSGB's official magazine, had the dates of their 7 MHz Contest listed as Phone Feb. 7–8 and CW Feb. 21–28. An RSGB Contest Bulletin received weeks after we made the announcement in the February calendar had the CW weekend as Feb. 28 to March 1. The stateside participation in this activity has been almost nil in the past. We doubt there will be any improvement this year.

The Kuwait ARS sponsored a contest on the occasion of the 5th Islamic Summit Conference on Jan. 25–30. If you worked any 9K2/IC5's during that period, send your entry to P.O. Box 5240, Safat 13053, Kuwait. We are forwarding the information to some of the stateside bulletins. It was only received about a month before the data mentioned above.

We are still holding some plaques won in the 1983 and 1984 World-Wide DX Contest. Those of you still waiting for your award, especially contest expeditions who usually don't give any shipping instructions or winners who have moved from the QTH used in the contest, should contact me.

Announcements for coming events should be sent to my home address indicated at the bottom of this column. Deadline for the June issue is March 15th, and April 15th for July events.

73 for this time, Frank, W1WY

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14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	Fb.28 - Mr.1	French Phone Contest
*	Fb.28 - Mr.1	Rats Nest & Crooked Stick
*	Fb.28 - Mr.2	YLRL YL-OM CW Contest
*	Mar. 7-8	ARRL DX Phone Contest
*	Mar. 7-8	QCWA Phone QSO Party
	Mar. 14-15	Maine QSO Party
	Mar. 14-15	RSGB Commonwealth CW
	Mar. 14-16	Virginia QSO Party
	Mar. 15	ZERO District QSO Party
	Mar. 15-16	Wisconsin QSO Party
	Mar. 21	YLRL East Meets West
*	Mar. 21-22	YL ISSB Phone Party
	Mar. 21-22	Bermuda Contest
	Mar. 21-23	BARTG Spring RTTY
	Mar. 28-29	**CQ WW WPX SSB Contest**
	Mar. 28-29	UBA SWL Phone Award
	Apr. 4-5	Connecticut QSO Party
	Apr. 4-5	IBM QSO Party
	Apr. 8-10	DX YL to NA YL CW
	Apr. 11-12	CARF Commonwealth Phone
	Apr. 15-17	DX YL to NA YL SSB
	Apr. 25-26	Swiss "Helvetia" Contest
	May. 2	Utah QSO Party
	May. 9	Nevada QSO Party
	May 23-24	UBA SWL CW Award
	May 30-31	**CQ WW WPX SSB Contest**
	July 18-19	**CQ WW WPX VHF Contest**

** Covered last month.*

Maine QSO Party

0000Z Sat. to 2359Z Sun., March 14–15

The Portland, A.W.A. is again running this QSO party. The same station may be worked on CW, phone, and RTTY on each band. ME stations may contact other ME stations for QSO credit.

Exchange: RS(T), QSO serial number, and QTH. County for Maine; state, VE province, or country for others.

Scoring: Count 1 point for phone contacts, 3 points if on CW, and 5 points on RTTY. ME stations multiply total by (ME counties + states + provinces + DX countries) worked for their final score.

All others use Maine counties for their multiplier (maximum of 16).

Frequencies: CW—1810, and 60 kHz up from low edge on other bands. Phone—1870, 3930, 7280, 14280, 21380, 28580. RTTY—3610, and 90 kHz up on other bands. Novice—3720, 7120, 21120, and 28120.

Awards: Certificates to the top-scoring stations and a trophy to the highest aggregate ME club score (ME stations indicate club affiliation in their logs).

Applications for the Worked All Maine Counties award may also be sent to the address below. Mail logs to Portland A.W.A., P.O. Box 1605, Portland, ME 04104.

Virginia QSO Party

1800Z Sat. to 0200Z Mon., March 14–16

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 SSB contact, two points if on CW, RTTY, or SSTV. 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: CW—60 kHz up from low end of each band. SSB—3930, 7230, 14285, 21375, and 28575. Also Novice bands on CW, 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 six plaques as follows: to top VA single operator stations, CW/SSB, CW only, Mobile, Novice/Tech, and to the top CW/SSB out-of-state station, and 4th area club.

Indicate each new multiplier in a separate column as it is worked. Include a summary sheet with your log, and an SASE if results are desired.

RSGB Commonwealth CW Contest

1200Z Sat. to 1200Z Sun., March 14–15

This is the Golden Anniversary of the Commonwealth Contest. An additional call area has been created for the contest only. Station GB5CC may be worked for additional credit.

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 (except GB5CC).

Activity will be on CW 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 SWL 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 April 14th and go to: A.K. Gray, G4DJX, 44 Sherwood Avenue, St. Albans, Herts., AL4 9PQ England.

ZERO District QSO Party

1800Z to 2400Z Sunday, March 15

This year's party is being sponsored by the Davenport RAC of Iowa.

Stations outside the ZERO district will be contacting ZERO stations only. ZEROs may work anyone. The same station may be worked on each band and mode, mobiles in each county change.

Exchange: RS(T) and state. ZEROs will also include their country.

Scoring: Phone QSO's count 1 point, CW contacts are worth 2 points. ZEROs multiply total QSO points by (states + VE provinces + DX countries + ZERO counties) worked for their final score.

All others use ZERO counties for their multiplier.

Stations making over 100 QSOs must include a dupe sheet with their log.

Frequencies: CW—60 kHz up from low edge of each band. Phone—3900, 7270, 14300, and 146.52. Novice 7130. *(Other bands?—ed.)*

Awards: None indicated, but certificates have been awarded to high scorers in each area in past contests.

Mailing deadline is April 20th to the Davenport ARC, W0BXR, 5305 White Post Road, Bettendorf, IA 52722.

Wisconsin QSO Party

1800Z Sun. to 0100Z Mon., March 15–16

This one is a shorty, only 7 hours, and 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.

Classes: Single operator, multi-operator, both single and multi-transmitter, Novice/Tech. and club.

Exchange: RS(T) and QTH. County for Wisc.; state or province for others.

Scoring: Phone QSO's count 1 point, 2 points if on CW.

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 by the number of Wisc. counties worked (maximum of 72).

Wisc. mobiles can add a bonus of 500 points to their final score for each county outside their own from which they operate (minimum of 15 QSOs from each county).

Frequencies: CW—3550, 3725, 7050, 7125, 14050, 21150. SSB—3890, 7290, 14290. Other bands may be used.

Awards: To the highest scorers in each state and each province, and the highest aggregate club score. Plus awards to the top scorers in each class for Wisconsin stations.

Logs with more than 100 QSOs must include with their entry a separate dupe sheet for each mode.

Mailing deadline is April 15th to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee, WI 53201.

1986 WAE CW Contest Results
Single Operator—North America

U.S.A.	
K1ZM	**777,920**
KC8C/3	**568,404**
W3GM	**479,360**
KQ3F	**297,136**
K8HVT	**238,650**
K3WW	**227,630**
WC4E	**176,000**
KA1LZR	172,752
K4YKZ	139,183
K5ZD/1	116,415
K2SX	**107,388**
K2POF	77,250
NQ2O	74,117
W9RE	**65,968**
K1XM	64,554
W3ARK	59,570
KA1DWX	59,075
KW2J	55,080
W2DW	46,949
K5KLA	**46,656**
KD2HE	41,216
N6EK/1	40,584
N6AW	**39,382**
KC1F	31,668
K4FPF	29,202
KQ1F	27,270
W2GKZ	24,644
W4YN	20,088
KE0Y	17,424
W6BIP	16,464
W8UVZ	15,246
NG0T	13,860
K3TX	12,180
K8CV	7,198
W1LQQ	6,440
KZ3B	5,106
K6NA	3,816
W5EIJ	3,360
K4BAI	3,026
W1OPJ	2,898
W6UQF	2,628
WA2UDT	2,400
W5NR	2,365
WL7E	2,108
N8BC	1,664
KG9N	1,656
K8MR	1,369
N0FFZ	896
N3CZB	352
K1EI	192
NN3SI	112
AH6EK	112
Multi-Opr.	
K1IU	**643,771**
N3BNA	96,023
WA7EGA	43,792
WB3JRU	20,496
Canada	
VE3ST	**27,590**
VE1CBF	9,447
VE3NBE	6,292
VE4MF	1,848
VE3OMU	1,428
VO1QU	**181,350**
Costa Rica	
TI8X	**25,872**
Dom. Rep.	
HI6@RCD	**12,450**
Panama	
HP1AC	2,958
Hawaii	
KH6IJ	2,296

Bermuda Contest

0001Z Sat. to 2400Z Sun., March 21–22

This is the 29th year for this popular contest open to amateurs in the United States, Canada, the United Kingdom, West Germany, and Bermuda.

Stations in the U.S. and Canada may work the U.K., West Germany, and Bermuda. The U.K. and West Germany may work the U.S., Canada, and Bermuda. Activity will be on the 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, phone and again on CW, 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 of no less than three consecutive hours must be clearly indicated on the log. Participation is for single operator stations only and must be from their own residence.

It is recommended that stations operate without the aid of a linear amplifier, in keeping with the spirit of the contest.

Exchange: RS(T) and QTH. Parish for VP9, state for the U.S., province for Canada, county for the U.K., and DOC number for West Germany.

Scoring: Five points for each QSO. Multiply total by number of different VP9 stations worked on all bands. (Note: It's each VP9 station, not each parish.) Counted once only per band regardless of mode used.

Awards: Certificates to top scoring stations in each U.S. state, VE province, U.K. county, and DL DOK (minimum of 100 QSO's). The overall winner in each of the above countries, 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 for the winners. (Note: Winners in '82, '83, '84, '85 and '86 are not eligible.)

Use a separate log sheet for each band and a dupe sheet for logs with 200 or more contacts. A penalty of three contacts will be deducted for each duplicate contact for which points are claimed. An excessive number of claimed duplicates means disqualification. The usual signed declaration is also required.

Entries must be received no later than

1986 Bermuda Contest Results
U.S.A. and Canada

W3MA	269,100	VE3NYT	3,150
VE3BVD	262,640	VE3CWE	2,835
K1ZM	195,125	W6HX	2,415
AK1A	185,625	VE1CYL	1,995
K2SG	151,430	KE8AZ	1,815
VE1NG	123,360	W4KMS	1,800
VE3XN	121,980	VO1AW	1,175
VE5RA	75,980	W9YCV	1,000
NJ8N	67,770	NL7V	975
N3RD	44,240	WK4F	780
VO1MP	31,700	VE1AGZ	570
W3VT	20,720	K8MOU	315
KE1E	20,640	W2IP	230
K3DH	15,345	VE7XYL	195
K3FN	12,600	W5EIJ	150
VE3BGX	9,020	KF1B	90
K1RM	8,310	W7KOI	85
VE2EBK	7,480	NZ5M	65
VE1CBF	6,880	KU7Y	65
KA1TY/2	6,240	KU7Y	50
VE2QO	5,600	W2CC	45

There was a total of 146 entries from the five participating countries.

May 31st by the Radio Society of Bermuda, Box HM275, Hamilton HM AX, Bermuda.

The Worked All Bermuda Award can no longer be obtained by contest log information. Proof of contact with all nine parishes is required in the form of QSL cards. Send your application to the above address attention the Awards Manager.

Trophy winners in the 1986 contest were G4GIR, DL6FBL, W3MA, VE3BVD, VP9LD and VP9LB. (BDA-CW)

East Meets West SSB Contest

1800Z to 2200Z Sunday, March 21

This is a new one sponsored by the YLRL and open to YL's only. East works West, and vice versa. The same station may be worked once on each band. No cross band, net, or repeater contacts allowed.

Those considered "East" are 1st, 2nd, 3rd, 4th, 8th, and 9th call areas; VE1–3, Europe, Africa, South America, Caribbean, and Central America (except Mexico). "West" are: 5th, 6th, 7th, 10th, KL7 and KH6; VE4–Ø,Asia, Oceania, Australia, New Zealand, and Mexico.

Exchange: RS, QSO number, name, and state, province, or country.

Scoring: One point for each different YL contacted on each band. (no multiplier).

Frequencies: 3955, 7255, 14295, 21395, and 28595. Plus or minus 15 kHz.

Awards: Winners will receive YLRL postcards.

Print or type original log and check for duplicate contacts. The operator's signature is required.

All entries must be received by April 21st and go to: Mary Lou Brown, NM7N, 504 Channel View Drive, Anacortes, WA 98221.

B.A.R.T.G. Spring RTTY Contest

0200Z Sat. to 0200Z Mon., March 21–23

This contest is sponsored by the British Amateur Radio Teleprinter Group and is being administrated by Peter Adams, G6LZB. The contest is open to all amateurs in three classes—single operator, multi-operator, and SWL.

Activity will be on all bands 3.5–28 MHz, but no 10 MHz. 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 less than 3-hour periods.

Exchange: RST plus a three-figure contact number and time in GMT (full four figures).

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. And a bonus of 200 points for each country worked on each band including your 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 are counted once only). W/K, VE/VO, and VK call areas will be counted as separate multipliers.

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.

Shortwave listeners must show call of station being heard, report of message being sent, and call of station being worked.

Awards: Certificates to the top-scoring stations in each class and to the continental leaders. Also in each W/K, VE/VO, and VK call area.

Use a separate log sheet for each band and a summary sheet showing the scoring, etc. Log forms are available from G6LZB; include 4 IRCs to cover postage.

Logs must be received by May 31st and go to: Peter Adams, G6LZB, 464

1986 BARTG RTTY Contest Results
North America

KT1N	494,340	WA6WGL	63,210
WB5HBR	207,432	WB5EUC	62,092
WB1AEL	203,814	W3AOH	49,856
WØWP	161,160	K8CV	32,550
NC2V	155,520	HP1AC	20,860
K6WZ	128,448	NØFMR	14,350
VE7YB	119,700	KL7PG	13,882
KB2VO	99,900	WØLHS	13,500
VE1TE	97,244	WA3JXW	3,100
VE6ZX	85,260	*WA7EGA	193,680
W6JOX	82,236	*Multi-opr.	

There was a total of 88 entries world wide.

Whippendell Road, Watford, Herts. England WD1 7PT.

CQ World-Wide WPX Contest

SSB: March 28–29 CW: May 30–31
Starts: 0000Z Sat. Ends: 2400Z Sun.

Complete rules were published in the January issue. They are the same as those used last year with the same format that has been in use these past many years. Therefore, it would serve little purpose to repeat them again, since they are well established world-wide. Following are a few points to keep in mind.

Only 30 hours out of the 48-hour contest period may be used by single operator stations. Off times can be taken in up to five periods, but off periods must be a minimum of 60 minutes in length. Multi stations can operate the full 48 hours.

The QRP section has become very popular and is worth your attention.

The definition of the prefix multiplier is spelled out in detail and is not to be confused with the interpretation used by the *CQ* WPX Award program.

A Prefix is the two- or three-letter/number combination which forms the first part of a call.

Also bear in mind that stations in call areas different than that indicated by their call signs are required to sign portable.

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 the multi-operator, single transmitter category 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 prohibited.

An alphabetical/numerical check list of claimed prefixes is a requirement and must be included with your log.

An updated trophy and plaque awards list now shows over 40 awards. Be sure to check the awards that are available.

Deadline for submitting your SSB entry is May 10th, and July 10th for the CW section. Be sure to indicate SSB or CW on the envelope.

All logs go to: *CQ* Magazine, WPX Contest, 76 North Broadway, Hicksville, NY 11801.

U.B.A. SWL Trophy

Phone: March 28–29 CW: May 23–24
0000Z Saturday to 2400Z Sunday

This SWL activity will be held annually on the last weekends of March and May and replaces the UBA Cup competition held in January and February.

Only 6 hours may be used out of the 48-hour contest period, 3 continuous hours on Saturday and the other 3 hours on Sunday.

Bands: 3.5–28 MHz. (no WARC bands).

Logs: To be columned as follows: Date/time in GMT, "station heard," RS(T) by the SWL, "station worked," points and multiplier. "Station heard" may be logged once only per band. (No CQ, QRZ, etc.) If points are claimed for both stations in QSO, the call of each must appear in the "station heard" column. Call of "station worked" may not appear more than 10 times on each band.

There is a penalty of 3 times the value of the "station heard" for duplicate logging, 1 point for "station heard."

Points: Stations in SWL's own continent 1 point; stations outside own continent 2 points.

Multiplier: Each different prefix heard on each band.

Final Score: Total points from all bands times the total prefixes on all bands.

Awards: Certificates to the top 5, and the first in each country with a reasonable score. Also the top YL and multi station.

Include a summary sheet showing the scoring, alphabetical list of prefixes on each band, and the usual signed declaration that rules and regulations have been observed with your entry.

Entries must be postmarked no later than 4 weeks after the end of each contest.

They go to: Marc Domen, ONL 6945, Gebr. Blommestraat 14, B-2200 Antwerpen (Borgerhout) Belgium.

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

Turkey Tropo, No Bones, All Meat

As reported in February's column, I expected to receive a lot of reports detailing the great DX worked by stations who were active during the Thanksgiving holiday. I didn't expect to receive quite so much, however; a total of nearly 100 reports of some kind were received. This included everything from postcards to complete photocopies of station logs and cassette recordings of the goings on. Terrific job, folks!

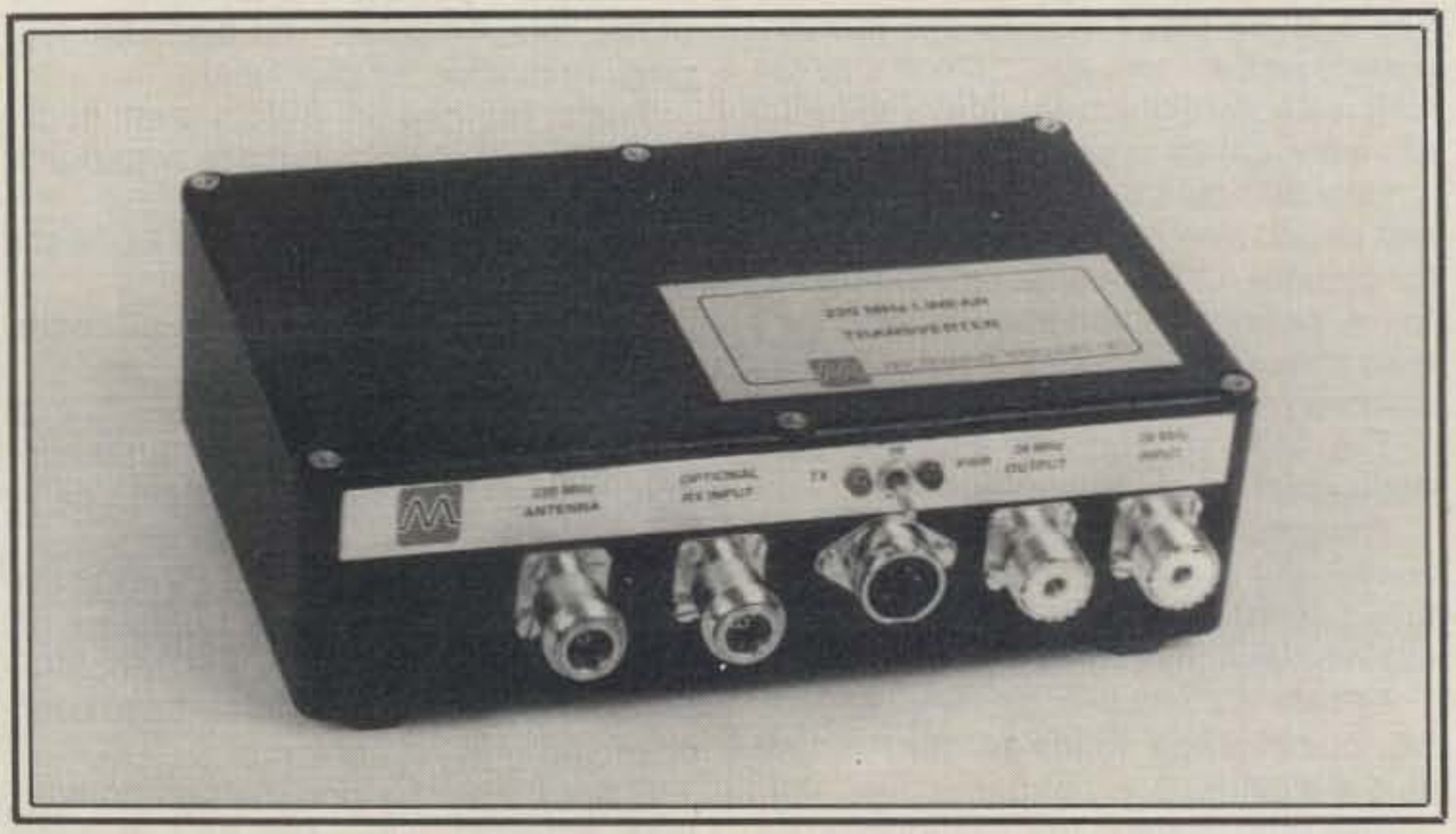
Since there will never be room to print all of this, I'll summarize a few of the more interesting reports, send copies of everything to friends who study propagation, and graciously thank all those who submitted information. It will be used.

Mike Rhodes, W8DN, was early in with his report dated December 8. Mike is a newcomer to VHF and has been active on 2 meter SSB only since the end of August, and had put a 70 cm station on the air in mid-September '86. Imagine his surprise on Thanksgiving evening to find both these bands open, east to the Atlantic coast and west to KS, OK, IA, and MO after such a short time on the air! W8DN is using a MMT144/28R transverter barefoot on 144 MHz and an MMT432/28S driving a 40 watt amplifier on 432 MHz, both transverters being driven from an IC-745 transceiver. His antenna systems, which sound more ideally suited for satellite work than for long-haul DXing, are circularly polarized crossed-Yagis, 12 elements on 144 and 20 elements on 432 MHz. Both antennas are installed 50 feet above ground and fed with ¾ inch CATV hardline.

Between 0026 UTC on 11/26/86 and 0051 UTC on 11/30, W8DN contacted 69 stations in 40 grids, mostly on 70 cm, from his Celina, OH (EN70) QTH. Good work, Mike! Not to mention good timing.

An inspirational report arrived from Larry Reiser, WB9MSV. He's one of the thorough fellows who mailed a cassette tape recording of his work, along with a written transcript. From the 27th through the 29th of November Larry worked a whopping 297 stations on 144, 220, and 432 MHz. His best DX on 144/432 MHz was WA1MBA, FN32, at 905 miles—no record, but as Larry points out, he was located near the center of the tropo and was working stations in many directions. WB9MSV worked 2 new states and 14 new grids on 70 cm, and 15 new states and 33 new grids on 135 cm! His 220 MHz station is most modest: an MMT transverter barefoot (15 watts) into a single 14-element KLM Yagi at 55 feet above ground, fed by Belden 9913 cable. Larry is quick to point out he's using no amplifier or preamp of any kind on 220 (yet), but conditions were so good that WA5TKU (TX) and W3GPY (PA) both succeeded in "pinning" his S-meter on that band.

153 Rodman Court, Eatontown, NJ 07724



The new Microwave Modules MMT220/28 features panel LED indicators, a more sensitive transmit mixer, and a dual-range crystal oscillator to provide increased band coverage.

Larry is a dedicated VHFer who is always looking for "new ones," and he's happy to help anyone needing his grid (EN50) or state (IL). Contact WB9MSV at (309) 243-9003 for a sked.

It was fun to receive a brief report from Herb Krumich, K2LNS, of Wilkes-Barre, PA. Herb used to be a "neighbor" of sorts when he lived in NJ, but as I was relocating to the Jersey shore, he was moving to the mountains of northeastern PA and now has a hilltop (2100 foot) QTH there. Using a temporary lashup (Jr. Boomer at 20 feet above ground, supported by a ladder) on 2 meters, Herb worked some 300 stations and 60 grids in 8 hours of operation over Thanksgiving weekend. He's fortunate that the incredible tropo duct set itself up at a high enough elevation for him to participate. In a subsequent on-the-air contact Herb told me he's very happy with his site, is working into the Detroit area nightly on 2 meters, and is looking forward to setting up towers and the balance of his gear for 50 through 3400 MHz. K2LNS will resume VHF/UHF contest operations during the summer of this year, probably using the WA2FGK call as he has in the past.

Craig Henderson, N8DJB, of Pemberville, OH succeeded in working 7 new states on 1296 MHz during the Turkey Tropo '86 and reports a strong aurora opening which occurred on 11/23–11/24. During the pre-Thanksgiving Au session Craig worked stations from VT to MN on 2 meters; then, "along about 0100 (on 11/24), one of the locals turned past south and heard strong signals from TN and NC. Well, within 10 minutes everyone was calling to the south although the aurora wasn't completely over yet . . ."

N8DJB goes on to report, "By sunrise Tuesday it didn't matter what direction one wanted to work—several 1296 contacts to IA and IL and 2 (meter) and 432 contacts in all directions . . . not going to work, or at least going in late seemed to be often-heard comments." Craig says that heavy rain on Wednesday (11/26) and the holiday on Thursday kept activity low until that afternoon, but then "all heck broke loose" and he stayed with it until 3 o'clock (local time) Friday morning. He continued operations on 23 cm and proceeded to work W7CNK, W5DFU, and W5ASH between 1400 and 1600 UTC Friday, and concluded with a 20-minute ragchew with K2JWE (NJ), whose signals peaked 20 dB/S9.

All that DX on 1296 MHz. N8DJB is surely running a killer station. Not quite. Craig is using 1.5 watts output on 1296, although he did not give the details of his antenna system. Another story to prove the adage about timing being everything.

Six Meters

I remember my first contact with 6 meters. I was a volunteer radio operator with Civil Defense and was 13 years old. This was back in 1964, and our rigs were Gonset Communicators (for you kids, these things were somewhere between crystal sets and what we're using now, leaning more heavily toward the crystal set end of the scale). The 2 meter Gonset rigs only had one panel meter (the even older sets used "tuning eyes" instead), and I didn't quite understand how this 1 meter radio was called a "2 meter rig," but I figured out a simple formula: You count the number of meters on the panel, and add one.

Then, when my brother Jeff (WB2DCV) introduced me to the 6 meter rig, I was really confused. It was a Gonset G-50, which had two

meters, one on each side of the front panel. Let's see. My formula must not be right. If I worked out an algorithm based on known quantities, a 10 meter rig would have either 9 or 3.33 meters on it.

Thankfully, by age 14 I was studying radio theory and things became a bit clearer. When I achieved my Novice ticket later that year, I was truly thankful that 40 meter rigs didn't have 39 or 13.33 meters, for I probably wouldn't have had the room for such a large rig. But I was always fascinated by 6 meters and that magnificent G-50 with its 48 watts of plate-modulated AM and built-in VFO, and knew for sure that someday I would be a Big Gun on 6.

Which brings me to a letter received from Harry Schools, KA3B, of Philadelphia. Harry is a 6 meter man through and through. Around these parts if you want to know anything about 6 meters, ask Harry. His first edition of the *North American 50 MHz Activity List* drew more than 100 requests for photocopies; now he's completing his second edition, which he says is much better than the first. The 1987 version has nearly 1000 new listings, and contains QSL manager information for DX stations, plus a list of stations desiring schedules, a rundown on the year's upcoming contests, a list of newsletters containing information on 6 meters, a repeater list, information on the available awards and certificates for the 6 meter enthusiast, an introduction to SMIRK (the international 6 meter operators organization), and other tidbits that only Harry would know to include. As I told you, Harry **is** 6 meters.

KA3B says the new *1987 North American 50 MHz Activity List* should be available sometime this month (March), and because it is such a large compilation and will cost so much to reproduce and mail, he is forced to charge $3.00 per copy—not at all unreasonable, especially considering all those copies mailed out free last year. Harry says, "My reason for putting together this information booklet isn't money—it's a labor of love—but I do not want to go broke doing it! If anyone is getting interested in 6 meter work or spends any amount of time on the band, this is the thing they'll need to make their operation go a lot smoother."

Harry also jotted down some thoughts on 6 meter contest operating. He would like to see a change in all VHF contest rules, including our CQ World-Wide VHF WPX Contest, to include "DX window" enforcement; i.e., only DX stations would be allowed to call CQ in the window from 50.100 to 50.110 MHz. Domestic stations would be allowed to respond to those calls, but would not be allowed to call CQ within this band segment. This kind of "DX window" rule is enforced in some specialty contests, such as the ARRL 160 meter event each December. Contestants would have to be self-policing, of course, but this works reasonably well when the rule is written, publicised, and understood. KA3B says, "This proposal may sound bizarre, but after the fiasco during the June contest in 1986 with U.S. stations covering up DX, something has to be decided now to make things better during our prime DX years, which are right around the corner."

Harry was elated to read (in our January column) that we're planning to expand the *CQ* WPX Award program to allow VHF/UHF prefixes, and "just out of curiosity" he went through his Activity List to find 243 different prefixes for stations known to be active on 6 meters in the U.S. alone. Wow! If we added in some DX, I'll bet there are at least 500 prefixes available on the band, or at least there might be when worldwide propagation returns to 6 meters.

Those interested in procuring a copy of the new *North American 50 MHz Activity List* are encouraged to write directly to Harry, KA3B, at 1606 South Newkirk St., Philadelphia, PA 19145.

Newsy Items

The South Texas Microwave Society is a newly formed group dedicted to the advancement of amateur microwave radio technology. At their charter meeting 12/22/86 the group, presided by Mark Allen, KA5YPU, discussed their initial goals: to promote activity on the 1.2 and 10 GHz amateur bands. Primary goals are to set up a 10 GHz operational beacon and a 1.2 GHz FM repeater in the Houston area. They would like to commence a close working relationship with similar amateur groups for purposes of technology exchange. If you are involved with such a group, please contact the South Texas Microwave Society at P.O. Box 7853, Woodlands, TX 77387.

A new amateur equipment manufacturer is in the offing; RF Concepts, founded by Ken Holladay, K6HCP, and Everett Gracey, WA6CBA. These fellows have lots of experience in manufacturing and marketing amateur gear and were the original co-founders of Mirage Communications. Everett was most recently President of Alinco Electronics in the U.S., so he's very much tuned in to the latest market requirements and trends. RF Concepts intends to offer as their initial product line a 170 watt all-mode 144 MHz amplifier with GaAsFET preamp, a 100 watt amplifier for handie-talkies, and what they say are "real repeater amplifiers" for these three bands. All these products will have VSWR and overdrive protective circuits included.

RF Concepts also intends to market a "very affordable" repeater controller, details forthcoming. They go on to say that a dual-band (144/432 MHz) amplifier, base-station amplifiers, and a line of state-of-the-art switching power supplies in the 10 to 35 ampere range are all "on the drawing board." As active VHFers, I'm certain we all hope these products materialize soon! For further information, contact RF Concepts, 2000 Humboldt St., Reno, NV 89509 (telephone 702-827-0133).

The Worked All California award is now available from the West Coast VHF'er. This new award has an effective date of 1/1/87 and all QSO's must be completed after that date, so I guess we're all starting with a pretty clean slate. The award is for contacts with or from VHF/UHF/SHF stations in the state of California. The rules are too lengthy for complete reproduction here, so please write for further information. Address all inquiries to John Kitchens, NS6X, Award Coordinator, P.O. Box 939, Camarillo, CA 93010.

The December '86 issue of the *The West Coast VHF'er* contained an interesting breakdown of sporadic-E (Es) conditions as monitored by Pat Dyer, WA5IYX. Pat used the commercial broadcast FM band, 88–108 MHz, as his indicator, and he has tabulated the number of days, number of incidents, and minutes of Es per month for the years 1974 through 1986. If we concentrate only on the peak Es season of May to August for the last six years, it is apparent that there has been a dramatic increase in Es activity as we've approached the solar minimum.

For example, the May to August season in 1980 produced 42 days, 98 incidents, and 5065 minutes of Es according to Pat's data. The same period in 1983 produced 60 days, 128 incidents, and 7775 minutes of Es. The 1986 figures are 53 days, 102 incidents, and 6750 minutes. Interesting. Anyone else have similar data from elsewhere in the country or the world?

Good old Harry. Where would we be without him? I'm speaking of Harry Schools, KA3B, of course, who has generated a listing of U.S. amateur radio prefixes to help participants in the *CQ* World-Wide VHF WPX Contest. This list will also serve as a good way to maintain your WPX status if you intend to qualify for the new *CQ* award. The list is pretty simple, starting with "AA1" and ending with "WZ0," and anyone could make up such a table, but Harry's actually done it by typing all the calls in nice, neat columns with breaks every ten prefixes. If you'd like a copy, send an SASE to my address as listed in this column, and I'll be glad to send you one.

Speaking of the WPX, we've received a lot of positive feedback in response to our mention of adding VHF/UHF credits to the *CQ* WPX Award program. While everyone seems in favor of this, some cautioned that we shouldn't fall into traps along the way. For example, John Kanode, N4MM, wrote, "I hope you do not make the same mistakes that have been made on other awards . . . the biggest being having eveyone start over." I understand what John means. Typically, a new award has a "start" date which is about the same day the award is announced. This means that anyone who has spent a lifetime compiling QSL cards can ignore all that and begin from scratch in amassing credits for a new award. Personally, I've never understood the need for award "start" dates; if you were on the air a zillion years ago and worked all kinds of prefixes (or whatever) that no longer exist, you still worked 'em and that should be acknowledged. The compensation for us newcomers is that the old timers will eventually die off and take their titles with them. I really don't see the problem.

Suffering from QRN? Power line noise? Unidentified static and things that go bump in the night? You might try a very good noise blanker, but it could be less costly and more expedient to simply find the source of the noise and eliminate it. To this end, a paper by John W. Spence, AC5K, entitled, *Power Line and Electrical Radio Interference* makes interesting reading. John's three-page paper discusses line noise, determining its source, and methods of elimination at the source. AC5K is a communications engineer and was employed for over five years as a technician for a Gulf States Utilities Company, where part of his job was to track down electrical noises in response to customer complaints. If you'd like a copy of this paper, reprints are available for $2.00, postpaid, from the author: John W. "Wes" Spence, AC5K, 465 Creekwood Dr., Silsbee, TX 77656.

"Hey, diddle diddle, the cat and the fiddle . . ." Guess what? Lunar Industries has actively reentered the amateur radio market with its well-known line of VHF and UHF preamps and VHF power amplifiers. According to an announcement received from Lunar president Lou Anciaux, WB6NMT, the company has moved into new, larger facilities and has appointed Glenn Rattmann, K6NA, as head of marketing for new amateur products. "A network of select dealers is being established and inquiries are encouraged," says Lunar's recent release. For more information, contact

K6NA at (619) 549-9555, or write to Lunar Industries, Inc., 7930 Arjons Drive, San Diego, CA 92126.

Speaking of new products, Microwave Modules Ltd. of Liverpool, England has officially announced the release of their new U.K.-manufactured 220 MHz linear transverter. Over the past few years specially-built 220 MHz transverters had been supplied from VE3CRU in Toronto, who modified the MMT144/28 design to play on 135 cm. Now the Microwave Modules factory is turning out the 135 cm units directly, and the new products incorporate improved transmitter mixer sensitivity (the unit can be driven to full power with just 1 milliwatt at 28 MHz) plus a dual-range crystal oscillator to allow nearly full-band coverage—an especially useful feature for those owning HF rigs which operate FM as well as SSB/CW. The 220 MHz units, model MMT220/28, are being imported and stocked by the PX Shack, 52 Stonewych Dr., Belle Mead, NJ 08502.

Operators on 23 cm take note: If you own an older F9FT "Tonna" antenna that requires service, you may wish to replace all the plastic parasitic element insulators which have doubtlessly deteriorated after prolonged exposure to the ultraviolet rays of the sun. The new insulators are made of a UV-stabilized plastic material which is much more resiliant, especially after years of service. I own both "older" and newer F9FT arrays for 1296 MHz, and can readily see the difference: The old insulators would break with just a hint of abuse, while the new ones bounce back even after rough handling. It is a time-consuming job to replace the insulators, especially on the 92-element (4 × 23 el) H-frame arrays, but this service should only be required once, and only on older systems. The new insulators are available from the PX Shack, address above.

Did someone say "service"? Not the kind where you hit the little ball with a racquet, but the kind where you attempt to repair something that's gone bad—and how can you do it without the proper equipment? Life is difficult without the right tools, and as a wrench is prerequisite to mechanical repair, an RF signal generator is a most valuable tool for radio equipment maintenance. Being a firm believer in this, I recently acquired a rebuilt Hewlett Packard model 608E signal generator (hey, you in the modern RF lab—stop laughing!) in splendid condition for what I think was a very reasonable price.

The 608E is an old workhorse which covers 10–480 MHz in several bands of about one octave each and features output level adjustment from 1 volt to much less than 1/10 microvolt, making it useful for receiver or transverter alignment, a temporary L.O., and a multitude of other functions. What makes this particular unit especially useful for those of us working with narrow-band high-sensitivity equipment is its extremely "clean" output signal and high degree of shielding. The signal from an old model 608 (they were made with a variety of suffixes indicating both relative age and features) is "clean" in many respects: It is almost entirely free of spurious outputs and, being a lightly-loaded variable-frequency oscillator with good buffering and no phase-lock loop, happens to show very little "phase noise." Many newer signal generators are not nearly so "clean," although most new-generation equipment offers many more features than the big old boxes.

In any case, I find the 608E an extremely useful piece of test gear. If nothing else, it allows me to test the sensitivity of my VHF/UHF receivers after each lightning storm to see if I lost any GaAsFETs! Cheaper signal sources are not shielded well enough to make receiver sensitivity measurements, while the newer, more elaborate machines cost thousands of dollars even on the used-equipment market. I happen to like the analog 608E, with its dials and meters. And I happen to like the place I found it, a gold-mine of a used electronic equipment store called Kentronix in Farmingdale, NJ.

Kentronix is one of those places that an electronic putterer like me just can't seem to escape. Operated by Brian C. Kent, who is not a ham but knows a bit about amateur radio, the store is filled to the ceiling with all sorts of electronic goodies of interest to the experimenter—especially the VHF/UHF experimenter. There are adjustable line sections, piston and switch-operated (resistive) attenuators, microwave power meters, noise figure meters, wideband oscilloscopes, dummy loads and, of course, signal generators. Kentronix also carries microwave components, coaxial adaptors and connectors, and some industrial tubes. If you live within driving distance of this place, visit at least once. If not, you might want to call to see if Brian has what you're looking for. His number is (201) 681-3229, and his address is P.O. Box 2444, Allaire Airport, Farmingdale, NJ 07727. Good stuff there.

Steve Noll, WA6EJO, of Ventura, CA has written a beautiful 116-page book called *Amateur Lightwave Communications*, subtitled *Lasers and their use in Ham Radio*." The cover drawing tells the whole story. It shows a laser transmitter and receiver set up on tripods, aimed for a distant horizon, with a gleaming red beam coming from the transmitter. The caption is, "CQ 474 THz."

In case you don't know, THz stands for Tera-Hertz, or one million MHz, and 474 THz is right in the middle of our widest amateur band—you know, the one with no upper limit. It is interesting that the Amateur Radio Service in the U.S. has 23,600 MHz or spectrum allocation in 20 well-defined bands, but that is much less space than we have available above 300 GHz. In the micron bands, the sky is the limit, at least for now, so why aren't we doing more experimenting up there?

I'm the first to admit I've done nothing up there, either. I'm used to communicating with waves we *can't* see, but Steve Noll's book makes fascinating reading. It's well conceived and written and would make a good hardbound publication. At this time *Amateur Lightwave Communications* is available directly from the author as a spiralbound book. Steve didn't give me the price, but I urge anyone interested in this subject to write WA6EJO for the details. His address is 1288 Winford Ave., Ventura, CA 93004-2504.

On The Air Again

Did you miss me? As I've bitterly griped in the past few columns, I've been off the air as the result of a recent move. I missed the Turkey Tropo completely (groan) but enjoyed reading about it. The good news is, I'm back on the bands (as of early January) and ready for schedules or whatever. My 6 meter antennas aren't up yet at this writing, but beams for 144, 220, 432, and 1296 MHz are installed on the newly erected tower, and beams for 50 and 902 MHz will follow soon. I have a new 902 MHz (commercial) transverter to review (the SSB Electronic LT33S) and intend to give it a workout for a couple of months prior to writing about it. In the meantime, keep writing!

73, Steve, WB2WIK

Awards

a monthly feature by
DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for March is:

Dale O. Mitchler, WB9YCO
USA-CA All Counties #495
All 20M SSB, Mobile, 7-8-85

"June 19, 1985, the date that the chase for the *CQ* All Counties Award came to an end, Jack, KA9JOL, gave me Milwaukee County, the last one for the 'whole ball of wax.' Thanks, Jack.

"Wow! What a chain of circumstances leading up to that final one. Scotty, N7AKT, broke into the County Hunters Net when I was telling Paul, WA3TUC, that I still had the same four left to go. Scotty said that he would go to the county in Kentucky and the last two counties in West Virginia in the next few days. I told him that I would be here waiting. I was on the night shift, so I had all day to listen.

"We were getting ready to go on vacation at the time, but our starting day had to be set back, as Scotty was in Kentucky. Well, after finishing Kentucky, my wife, Audrey, said we would have to change our plans so that I could get those in West Virginia. This we did. Scotty gave me Tyler in West Virginia. Now only two more—one in West Virginia and one in Wisconsin. Audrey said we would have to reset our vacation departure date so I could get that last one in West Virginia. I didn't expect Scotty to get to Logan County until the next morning, so we took my chain saw and went to my daughter's house about nine miles away to remove some tree branches brought down by a storm the previous night. On the way home I suggested stopping for supper but Audrey suggested that we take our food home to eat it. We had just sat down to eat when the phone call came. Scotty was in Logan County! I tuned up the rig and sure enough, there he was in my last in West Virginia, and second from last for All Counties. How the band has changed! Earlier, Scotty had been 2 × 2 and now he was 5 × 9—just beautiful. That is the way it ended. Thanks a million, Scotty.

"Now this is how it all started. I had my first touch of ham radio when I was 20 years old. But at that time I was more interested in baseball and fast-pitch softball. Next I got into fishing, and then into flying racing pigeons. Then it was amateur radio, and I wondered why I didn't get into it a long time ago.

333 South Lincoln Ave., Mundelein, IL 60060

The well-appointed station of Dale Mitchler, WB9YCO, USA-CA All Counties #495.

Dale, WB9YCO, and Audrey at home in Kaukauna, Wisconsin.

"Like so many others, I got interested via CB radio. When I got my amateur ticket, Jack, KA9JOL, used to stop by to see what I was up to. After a while I got him interested in ham radio. When Jack got his General ticket, he got into county hunting.

"I was in the process of getting my life back together at the time and had just purchased my house back and was doing a lot of remodeling. I was not planning on marriage, so I fixed the house the way I wanted it. The ham shack takes up one fourth of the front room. The best part of that is as Audrey says, 'that's the way it's going to stay.'

"Jack gave me some information on county hunting, and for a couple of days I tuned onto 14.336 and listened to what was going on. After a while I jumped in, and on February 26, 1982 I made my first county contact. I worked Bill, W4UVP, in Baldwin County, Georgia.

"I think the best thing about finishing the first time around was that I could then start the second time around. The second time is going to be any time, any band, any mode. I am not very active on the bands during the summer, since Audrey and I like to run around and also do a lot of fishing. We like lakes where the fish just about jump into the boat, so if you have that kind of lake around just let us know. We don't eat a lot of fish, but like the catch-and-release idea.

"USA-CA #495. If I tried to name all who made it possible, I am sure I would leave someone out. So, to all of you Mobilers, Net Controls, Assistant Net Controls—thank you all for USA-CA #495."

Awards Issued

Steve Batema, AK8A, made a clean sweep of it by claiming USA-CA All Counties #524, USA-CA 3000 #555, USA-CA 2500 #621, USA-CA 2000 #682, USA-CA 1500 #767, USA-CA 1000 #938, and USA-CA 500 #2138 All SSB, Mobiles, dated 11-1-86.

William E. Holmes, W4IGW, also qualified for a full complement of seals and ribbons by claiming USA-CA All Counties #525, USA-CA 3000 #556, USA-CA 2500 #623, USA-CA 2000 #684, USA-CA 1500 #769, USA-CA 1000 #941, and USA-CA 500 #2141, Mixed Band and Mode, dated 11-24-86.

Owen T. Chelf III, KY9Y, claimed USA-CA 2500 #622, Mixed, dated 11-8-86.

Joe Chambers, KF5AT, qualified for USA-CA 2500 #624, Mixed, dated 11-24-86.

USA-CA Honor Roll

3000		2500		2000		1500	
AK8A	555	AK8A	621	AK8A	682	AK8A	767
W4IGW	556	KY9Y	622	W6YLJ	683		
		W4IGW	623	WA1GW	684		
		KF5AT	624	WB0VNN	685		

1000		500	
AK8A	938	AK8A	2138
KC2QI	939	WA2DWP	2139
K4UEE	940	K4UEE	2140
W4IGW	941	W4IGW	2142
WB0VNN	942	KA8VVE	2142
WA1YZV	943	WA1YZV	2143

The total number of counties for credit for the United States of America County Award is 3076. The basic award fee for subscribers to CQ is $4.00. For non-subscribers, it is $10.00. Initial application must be submitted in the USA-CA record book which may be obtained from CQ Publishing Company, 76 North Broadway, Hicksville, NY 11801, U.S.A. for $1.25. To qualify for the special subscriber rate please send a recent CQ mailing label with your application. To be eligible for the USA-CA, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending a SASE to the USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060, U.S.A. DX stations must include extra postage for air mail reply.

USA-CA Special Honor Roll
Steve Batema, AK8A
All Counties #524, All SSB,
All Mobiles, 11-1-86

William E. Holmes, W4IGW
All Counties #525,
Mixed Bands & Modes, 11-24-86

Charles R. Imsande, W6YLJ, completed more of his paperwork and claimed USA-CA 2000 #683, All SSB, Mobiles, dated 11-22-86.

Ronald E. Johnson, WB0VNN, updated his record by claiming USA-CA 2000 #685, USA-CA 1500 #770, and USA-CA 1000 #942, Mixed Bands and Modes, dated 11-24-86.

Harry H. Martin, KC2QI, qualified for USA-CA 1500 #768, and USA-CA 1000 #939, All SSB, dated 11-10-86.

Bob Alphin, K4UEE, claimed USA-CA 1000 #940, and USA-CA 500 #2140, Mixed Bands and Modes, dated 11-20-86.

Joyce B. LaGasse, WA1YZV, was awarded USA-CA 1000 #943, and USA-CA 500 #2143, All SSB, Mobiles, dated 11-30-86.

USA-CA 500 certificates went to:

Steve Batema, AK8A, USA-CA 500 #2138, 11-1-86, All SSB, Mobiles.

Michael C. Saccento, WA2DWP, USA-CA 500 #2139, 11-15-86, All SSB.

Bob Alphin, K4UEE, USA-CA 500 #2140, 11-20-86, Mixed.

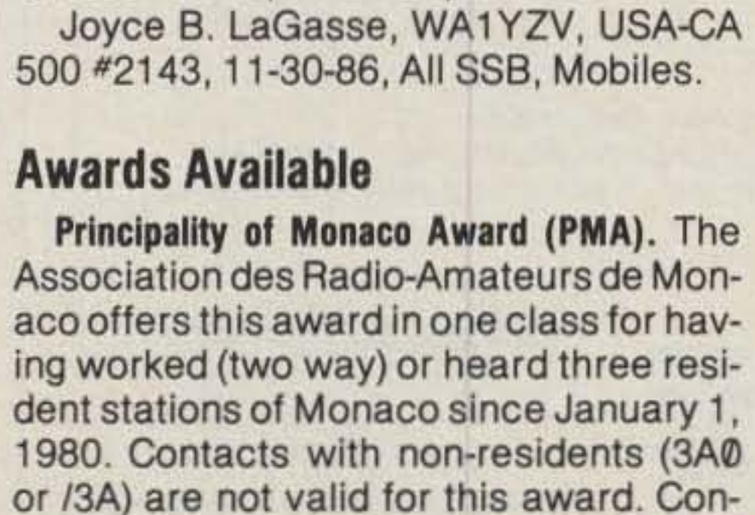
William E. Holmes, W4IGW, USA-CA 500 #2141, 11-24-86, Mixed.

Howard E. Guenther, KA8VVE, USA-CA 500 #2142, 11-24-86, Mixed.

Joyce B. LaGasse, WA1YZV, USA-CA 500 #2143, 11-30-86, All SSB, Mobiles.

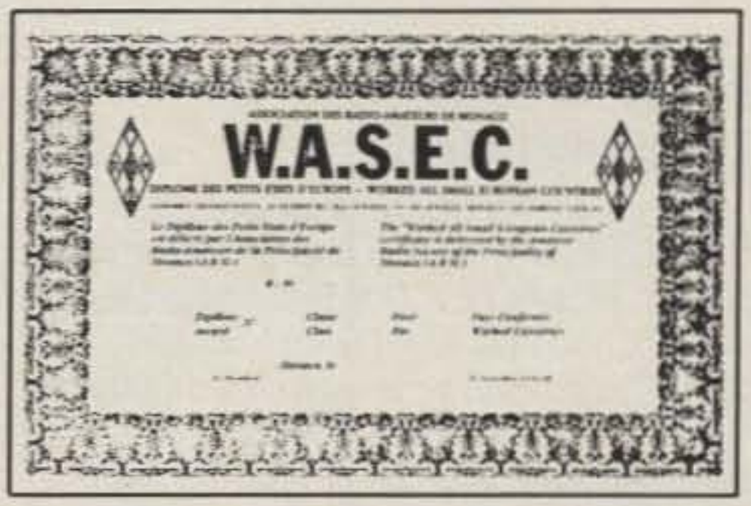
Awards Available

Principality of Monaco Award (PMA). The Association des Radio-Amateurs de Monaco offers this award in one class for having worked (two way) or heard three resident stations of Monaco since January 1, 1980. Contacts with non-residents (3A0 or /3A) are not valid for this award. Contacts via a repeater are not valid. All bands, modes, endorsements. To apply for the award, send QSLs or photocopy of logbook, or list of requested QSOs confirmed by the national award manager or two licensed amateur radio operators. Price: 10 IRCs or $6.00 U.S. Add 5 IRCs for air-mail registered mail. Mail application to C. Passet, 3A2LF, 7 rue de la Turbie, MC 98000, Monaco.



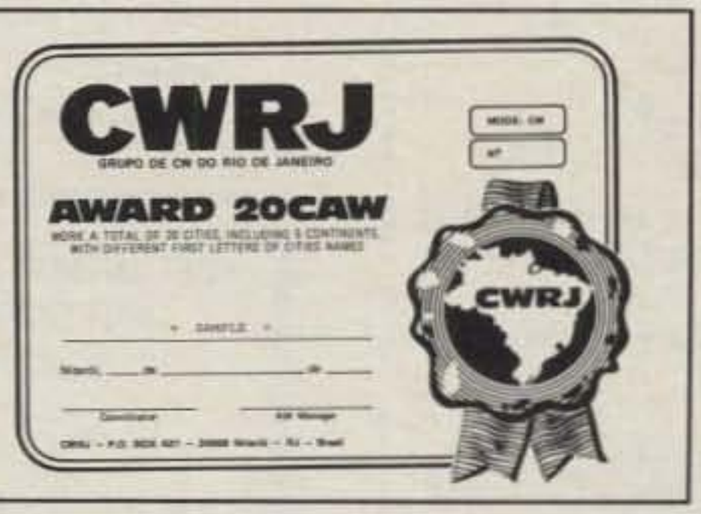
Principality of Monaco Award offered by the Association of Radio Amateurs of Monaco.

Worked All Small European Countries (WASEC). This award, also offered by the Association des Radio-Amateurs de Monaco, is for working (or hearing) small European countries: Class I—all eight countries, and Class II—three countries and Monaco. The small European countries are C31, HB0, LX, 9H, IA0, 3A, T7, and HV. All bands, modes, endorsements. Contacts via a repeater are not valid. The same cost and confirmation procedure as defined for PMA above. Mail application to C. Passet, 3A2LF, address above.



Worked All Small European Countries Award offered by the Association of Radio Amateurs of Monaco.

20CAW Award. This award is offered by Grupo de CW do Rio de Janeiro (CWRJ). General rules: (1) Only CW (2-way or SWL); (2) Fee of 6 IRCs; (3) Valid QSOs after July 1, 1985. Work a total of 20 cities, including 5 continents, with different first letters of city names (e.g., Atlanta, Blusenau, Chicago, etc.). Log: Calls/dates/city names. Award manager: Luiz Faria, PY2FK, P.O. Box 16681, Zip 03197, Sao Paulo–SP, Brasil.



20CAW Award available from the CW Group of Rio de Janeiro.

PFAW Award. The PFAW award is offered by the Grupo de CW do Rio de Janeiro (CWRJ). General rules: (1) Only CW (2-way or SWL); (2) Fee of 6 IRCs; (3) Valid QSOs after July 1, 1985. Form the phrase "PEACE AND FRATERNITY" with first prefix letters of call signs of stations worked. Contacts with CWRJ members may substitute for up to three letters. Log: Call/date, ordered to form the phrase. Award Manager: Luiz Faria, PY2FK, P.O. Box 16681, ZIP 03197, Sao Paulo–SP, Brasil.

PFAW Award available from the CW Group of Rio de Janeiro.

Western Kentucky DX Assn. Award. The Western Kentucky DX Association award is available for working three club members. Send log data and $1.00 U.S. to Don Tuggle, N4AOC, Rt. 9, Box 253, Bowling Green, KY 42101, USA.

Certificate offered by the Western Kentucky DX Association.

Radio Communications Citation. A Radio Communications Citation will be awarded to amateur radio operators or anyone assisting those operators during the national Australian telephone breakdown of 10–17 June 1981, and/or the Mexico City earthquake of 21–25 September 1985, and/or the San Salvador City earthquake of 11–19 October 1986, during which times radio amateurs and their friends came to the service of distressed members of the Australian community.

Persons and organizations qualifying for this award will have either originated, relayed, or delivered messages on the air, over the telephone, or by any other means, or provided updates to organizations such as government departments or the media or to national associations, or assisted as a net control or relay station, or been available in some way (e.g., a nonlicensed person helping an involved

Radio Communications Citation offered by the Australian Traffic Network.

operator, or a CB operator assisting in delivery of message collecting in the local area, or other members of the public whose special help is acknowledged).

Overseas amateurs or anyone who assisted them (as described earlier) in handling Australian third-party messages also qualify for this award. All Mexican radio amateurs involved in 1985 and all El Salvador amateurs involved in 1986 qualify. United States, Canadian, and others who helped Australian messages to flow in any way also qualify. Anyone who helped an overseas amateur (e.g., nonlicensed person) also qualifies.

By now citations will have been sent to persons and organizations known to have been involved. It is inevitable that in efforts of such magnitude participants may be overlooked or be unknown, change address or callsign, or otherwise be missed. Therefore, the citation is also being offered as a general award. Send details of your involvement together with $5 to Sam Voron, VK2BVS, 2 Griffith Ave., Roseville, N.S.W., Australia 2069.

Elemer Bielek, HA9RE, first HA to achieve USA-CA 1000.

Of Special Interest To County Hunters

As an aid to confirming counties that have been worked on the County Hunter Nets, a Mobile QSL Bureau is operated by NØCOL and NØCKN, Gwen and Jerry Pollard. The bureau acts as a clearing house for cards confirming contacts with mobile stations operating on the County Hunter nets.

The Mobile QSL Bureau has prepared a newly formatted, easier to read *County Outline Map Book* containing county outline maps of each of the 50 states, alphabetical listings of counties by states, cross-indexed maps showing adjacent states, space for logging contacts for USA-CA or other awards, and logging space for the Last County Award program. New countries are shown, together with listings of the Independent Cities. The book is printed on 70 lb. opaque paper and is three-hole punched for easy insertion into a standard 8½" × 11" binder. Cost: $10.00 U.S. sent UPS; DX stations send $12.50 U.S. funds.

For ordering *County Outline* books, or for further information on the bureau, send to Mobile QSL Bureau, P.O. Box 1806, Des Moines, IA 50306, U.S.A.

Erratum

Under "Awards Available" in the October 1986 column it was stated for the Union des Radio Club (URCA) award that "Contacts after January 1, 1986 are valid." It should have read "Contacts after January 1, 1968 are valid." My error; my apology.

Notes

Obviously, we do not live in a perfect world. However, with sunshine and warmth again on the upswing, we tend to feel that all is well. I hope it is so in your part of the world.

73, Dorothy, WB9RCY

CQ BOOK SHOP

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, $9.95. Order #C137

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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.
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Cubical Quad Antennas, 112 pages, paperback, $6.95. Order #R146.
VHF Handbook, 336 pp. paperback, $11.95. Order #R147.

Vertical Antenna Handbook, 2nd ed.
by Paul H. Lee, N6PL
Out of print for several years, this classic has been reprinted with updates, including an addendum on antenna design for 160 meters. Other sections include feeding and matching, short verticals, ground effects, and much more. 139 pages, paperback, $9.95. Order #C208.

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CQ BOOK SHOP 76 North Broadway, Hicksville, NY 11801

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Hicksville, NY 11801

Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The Sunspot Cycle Dilemma

The surge in solar activity reported for October 1986 diminished during November. The monthly mean sunspot number for November as reported by Dr. Andre Koeckelenbergh of the Royal Observatory of Belgium was 15. This compares with the value of 36 reported for October.

The highest daily level recorded during November was 46 on the first. There were five days during the month when the sun's surface was spotless. November's monthly mean value results in a smoothed sunspot number of 14, centered on May 1986, upon which the sunspot cycle is based.

The 10.7 cm solar flux level was 77.1, as reported by the Algonquin Radio Observatory at Ottawa, Canada.

In the December 23rd issue of *Preliminary Report and Forecast of Geophysical Data*, published by the Space Environmental Research Laboratory (SERL) of the National Oceanic and Atmospheric Administration, Boulder, Colorado, it is reported that the increase in solar activity with new cycle polarity spots in October 1986 raises the question whether solar minimum has passed and a new cycle (Cycle 22) has already begun. According to SERL, there are several different methods for estimating the end of a solar cycle, and some of these indicate that the minimum level for Cycle 21 may have occurred during early 1986, most probably in March. Other evidence, however, reported by SERL indicates that the minimum will not be reached until possibly as late as the third quarter of 1987.

Prof. Koeckelenbergh of the Royal Observatory of Belgium, the world's official keeper of sunspot records, on the other hand, appears to favor a date for the beginning of Cycle 22 as sometime in December 1986 or January 1987.

With this uncertainty, it is difficult to forecast the level of smoothed sunspot activity that can be expected during March 1987. Dr. Koeckelenbergh is forecasting a level of 16. The SERL reports that there is a 90% certainty that the level will be somewhere between 12 and 23. The level observed last March was 13. This means that HF propagation conditions this March can be expected to be at least much the same as last year, with a chance that they may be somewhat better.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1987

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 9, 22	A	A	B	C
High Normal: 1, 4, 6-8, 15, 20, 23, 28	A	B	C	C-D
Low Normal: 10-11, 14, 19, 21, 24-27, 31	A-B	B-C	C-D	D-E
Below Normal: 2-3, 16, 18, 29-30	B-C	C-D	D-E	E
Disturbed: 12-13, 17	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 (B) on March 1st, fair-to-poor (C-D) on the 2nd and 3rd, good (B) on the 4th, excellent (A) on the 5th, etc.**

March Conditions

In the 36 years that I have been writing this column, one of the questions that I have been asked most is "What season of the year is best for DX propagation on the HF bands?"

This isn't an easy question to answer since there are so many variables involved, and the answer can be different for different sets of conditions and for the various bands. In a general way, however, taking into account the overall number of hours each band between *10* and *160* meters can be expected to open for DX, and the number of different areas to which the bands may open, I believe that the *spring* and *fall* months are optimum for DX propagation.

There is a solar-ionospheric relationship to explain this. Spring and fall are called the *equinoctial* seasons. These are the times when the sun is most nearly overhead at the equator, making night and day of almost equal length in all parts of the world. On March 21st and September 22nd, the sun is *directly* over the equator, and the length of night and day is exactly equal.

The vernal, or spring, equinoctial period in the northern hemisphere has a noticeable influence on HF propagation conditions for a period of several weeks lasting from late February through late April. The effects of the autumnal, or fall, equinoctial period are felt from early September through late October.

During equinoctial periods it is always spring in one hemisphere and fall in the other. This tends to create an ionosphere of more similar characteristics throughout the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. It is this "ionospheric equalization" which takes place during the equinoctial periods that is responsible for optimum DX conditions.

An improvement in DX propagation conditions is usually most noticeable on the long circuits between the northern and southern hemispheres—for example, from the USA to Australia, South America, southern Africa, southern Asia, Antarctica, etc. Look for these openings during this coming month on the HF bands.

The best bands for DX propagation during March are expected to be *15* and *20* meters during most of the day; *20* and *40* meters during the early evening, and *40* and *80* meters during the hours of darkness and the sunrise period. Check-*160* meters during the hours of darkness and when conditions are High Normal, or better, check *10* meters for openings during the daylight hours. For more specific 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 for both *March* and *April*, as well as Propagation Charts centered on Alaska and Hawaii. The Short-Skip Charts contain band opening forecasts for predominantly one-hop paths, ranging in distances between approximately 50 and 2300 miles.

For day-to-day changes in HF propagation conditions expected during March,

CQ Short-Skip Propagation Chart
March & April 1987
Local Standard Time At Path Mid-Point

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	08-19 (0-1)	08-14 (1-0) 14-16 (1) 16-19 (1-0)
15	Nil	08-21 (0-1)	08-12 (1) 12-17 (1-2) 17-21 (1) 21-08 (0-1)	08-10 (1) 10-13 (1-2) 13-14 (2) 14-16 (2-3) 16-17 (2) 17-18 (1-2) 18-19 (1) 19-20 (1-0)
20	Nil	08-12 (0-2) 12-16 (0-3) 16-18 (0-2) 18-08 (0-1)	06-08 (1-2) 08-09 (2) 09-10 (2-3) 10-12 (2-4) 12-16 (3-4) 16-18 (2-4) 18-19 (1-3) 19-21 (1-2) 21-06 (1)	06-08 (2-1) 08-09 (2-3) 09-10 (3) 10-15 (4-3) 15-18 (4) 18-19 (3) 19-20 (2-3) 20-21 (2) 21-05 (1-0) 05-06 (1)
40	07-09 (0-1) 09-10 (0-2) 10-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)	06-07 (0-2) 07-08 (1-2) 08-10 (2-3) 10-15 (4-3) 15-16 (4) 16-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (0-1)	06-08 (2) 08-15 (3-1) 15-16 (4-2) 16-18 (4-3) 18-20 (3-4) 20-22 (2-4) 22-00 (1-3) 00-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-18 (3-2) 18-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (2-3) 02-06 (2)
80	08-11 (3-4) 11-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1) 06-08 (1-2)	08-11 (4-1) 11-16 (4-0) 16-18 (4-2) 18-20 (4-3) 20-22 (3-4) 22-00 (2-4) 00-06 (1-2) 06-08 (2)	06-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-00 (4) 00-05 (2-3) 05-06 (2)	06-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-00 (4-3) 00-05 (3) 05-06 (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 (4-3) 03-05 (3-2)	05-06 (0-1) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

ALASKA
Openings Given In GMT#

To:	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	21-23 (1)	21-23 (1) 23-01 (2) 01-02 (1)	06-13 (1)	07-12 (1)
Central USA	21-00 (1)	21-23 (1) 23-02 (2) 02-04 (1)	06-14 (1)	07-13 (1)
Western USA	19-21 (1) 21-23 (2) 23-01 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-05 (1)	06-08 (1) 08-12 (2) 12-15 (1)	07-10 (1) 10-13 (2) 13-15 (1) 10-14 (1)*

HAWAII
Openings Given In HST#

To	15 Meters	20 Meters	40 Meters	80 Meters
Eastern USA	08-12 (1) 12-14 (2) 14-16 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	18-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1)	19-21 (1) 21-00 (2) 00-02 (1) 22-01 (1)*
Central USA	08-12 (1) 12-15 (2) 15-17 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-05 (1)	19-21 (1) 21-01 (3) 01-02 (2) 02-03 (1) 22-02 (1)*
Western USA	12-14 (1)** 07-09 (1) 09-10 (2) 10-14 (3) 14-16 (2) 16-18 (1)	03-04 (1) 04-07 (2) 07-10 (4) 10-13 (3) 13-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	17-19 (1) 19-20 (2) 20-23 (4) 23-05 (3) 05-06 (2) 06-07 (1)	19-20 (1) 20-21 (2) 21-04 (3) 04-05 (2) 05-06 (1) 20-00 (1)* 00-03 (2)* 03-04 (1)*

#See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.
*Indicates best time for 160 Meter openings.
**Indicates best time for 10 Meter openings.
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.

see the Last Minute Forecast, which appears at the beginning of this column.

WW DX Contest Critique (CW)

The 1986 CW section of the *CQ* World-Wide DX Contest was held during the weekend of November 29 and 30. As reported earlier, the upsurge in solar activity and the improvement in HF propagation conditions observed during October, and specifically during the Phone section weekend, did not repeat during the CW section weekend. Conditions were, however, much as predicted in this column. For the most part they were Low Normal with some periods of Below Normal on openings passing through the polar regions. On November 29th the solar flux level was 74, the sunspot count 8, and the Geomagnetic A-Index 7 at mid-latitudes and 21 in polar regions. On November 30th the flux was 73, the sun's surface was spotless, and the A-Index rose to 13 at mid-latitudes and to 23 in polar regions. Conditions were more or less as expected, and this should be reflected in the 1986 contest scores.

VHF Ionospheric Openings

The possibilities for ionospheric openings on the VHF bands usually improve during March and the spring months.

A seasonal increase in short-skip openings due to sporadic-*E* propagation generally takes place during March, and an occasional 6 meter opening may be possible by this mode during the month. Sporadic-*E* openings most often occur during the daylight hours over distances between approximately 1000 and 1400 miles.

Auroral activity often peaks during March, especially during periods when HF conditions are Below Normal or Disturbed.

Not much meteor activity is expected during March, but some might be possible for very brief periods during minor showers that may occur March 14–15 and 24–25.

36th Anniversary

CQ pioneered propagation forecasts specifically tailored to the needs of radio amateurs. The first *Monthly DX Predictions* column appeared in the June 1946 issue, when *CQ* was little more than a year old. Edited by my good friend the late Perry Ferrell, the column appeared until November 1949. In March 1951 the monthly propagation column was resumed under my editorship.

This month's column marks the beginning of my *37th* year as Propagation Editor for *CQ*. In the field of HF radio propagation, elapsed time is often measured in terms of sunspot cycles rather than in months or years. By this system of reckoning, I have shared with readers of *CQ* the last years of Cycle 18, the complete spans of Cycles 19 and 20, and now what appears to be the complete span of Cycle 21!

A new sunspot cycle, Cycle 22, is now upon us. I hope that this column will continue to serve as a source of useful and reliable HF propagation information throughout its life.

73, George, W3ASK

DX

This month by
JOHN A. ATTAWAY, K4IIF

NEWS OF COMMUNICATION AROUND THE WORLD

The *CQ* World-Wide DX Contests in October and November 1986 were a bonanza for DXers. Despite a near minimum point in the sunspot cycle, KH6BZF reports in *QRZ DX* that solar flux peaked at 98 on October 24, 1986 and held at 95–96 throughout the contest weekend. As a result, sunspot numbers were in the 60s and 70s and 15 meters was wide open. Even 10 meters was hot at times, with VS6DO and many JA stations coming through on Sunday afternoon. Many veteran contesters reported conditions more favorable than those experienced during the 1985 *CQ* World-Wide Contests.

K4IIF was delighted with the opportunity to operate from the Cayman Islands using our ZF2JI call, and many other Contestpeditioners were on the trail despite the fact that poor propagation conditions were anticipated. Jim Rafferty, N6RJ, was also on Grand Cayman using his ZF2FL call, and our friend from last year's contest operation at 4U1ITU, Ben, DL6FBL, was portable from VP9, Bermuda. Other active groups included JW5E from Svalbard by LA5NM, LA6WEA, and JW6WEA; J49A from Crete by SV1JG and SV1IW, CR9EU from the Madeira's by G3PFS; CU0DX by CU2AK; 4U1ITU by a French group; 3G3E by CE3EEO; 8R1Z by NQ4I; TA2BK by Bahri, DJ0UJ; JY7Z by a mixed group of JY and W/K DXers; V22A by Craig, WB7RFA; FR/W6QL from Reunion Island by Iris and Lloyd Colvin. *QRZ DX* also reports that special callsigns used during the phone contest and not mentioned above included P40A, PJ1B, ZV8WAS, UP9A, LA7Q, Y34K, CV1R, ZY5EG, 4M4A, YX3A, K4YT/4D9, 4D2G, DX9HT, L4D, DX1A, J49A, P36P, VU2N, 3G3N, 3G1B, CQ2UA, CQ9MAS, TE1C, GB6AR, GB6AA, and ZD7A, contributing to a real windfall for DXers chasing prefixes for their WPX awards.

On the zone front, *The Long Island DX Bulletin* reports that K2HFX, starting from scratch, made WAZ on 20 meters during the phone contest weekend. This confirms our previous advice that the best weekends of the year for the pursuit of DX awards are the *CQ* Contest weekends, and of course the *CQ* WPX SSB Contest comes up the last weekend of March. Get ready!

A major thrill at ZF2JI during the phone contest in October was a particularly fantastic opening to the far east on 15 meters from 2200–2400 GMT on October 25 when we worked 192 JA stations, with the consecutive string of JA's broken only by DU9RG and K4YT/4D9. It was a contester's thrill at the low end of the sunspot cycle, and we are pleased to note that the pileup was disciplined and orderly as we worked from JA1–JA0, repeating in groups of two. No stations called out of turn. Ten meters had its best opening for us on October 26 when stations were logged from Europe to W/K/VE, to LU and PY, and finally to KL7, JA, and VK, including a contact with DX Hall of Famer Jim Smith, VK9NS, on Norfolk Island.

Contestpeditions during the *CQ* World-Wide CW Contest in November included P40GD from Aruba by W2GD; HC8A by K1XM and KQ1F; N6DX/KP2 by a large group; OH0AM by the OH DX Ring; FY5YE by OH2BBM; PT2CB by Ville, OH2MM; XF0L by OH2BQL; EA9AM by Martti, OH2BH; ZB2X by OH2KI; ZK1XU by W7TB; V2ACW by KA2DIV; OHSXT/EA8; KC6JC by KX6DX; GD0AVF by W2KN; VP2MU by KD2SX, K8GL, and others; JA4GXS/JD1; /J6L from St. Lucia by the Southwest Ohio DX Association; VS6 by JA5DQH; and XE2SI by the Southern California Contest Club.

P.O. Box 205, Winter Haven, FL 33882

News Flash!
K1MM Qualifies For First 160 WAZ

The announcement of the new 160 Meter Waz Award in the December issue of *CQ* had hardly cleared the presses when the first application arrived from the shack of Bill Poellmitz, K1MM. Bill's QSL cards and application were followed in only a few days by applications from Jim Dionne, K1MEM, Norwood Lowry, W3AP, and Paul Newberry, Jr., N4PN, in that order (K1MM #1, K1MEM #2, W3AP #3, and N4PN #4). Congratulations to these hardy "Top Band" DXers on qualifying for the first certificates at the 30 zone level. Who will be the first to win plaque #1 for confirming all *40* zones on 160 meters?

Bill Poellmitz, K1MM, is an outstanding DXer with many other accomplishments to his credit including DXpeditions to 1S1, 5Z4, CE0, FG0, FM0, FO0, FP0, FR0, H44, HD0, VK9, VS6, 5W1, VP2E, VS5, BY1, 9Y4, ZL0, and several other countries. He is a past president of the Southern New England DX Association and co-authored the W1AW DX bulletins for many years.

The 160 Meter WAZ Award is offered in 2 steps, 30 zones and 40 zones, with endorsement stickers at the 35, 36, 37, 38, and 39 zone levels. To apply, see complete rules on page 86 of the December 1986 issue of *CQ*.

De Extra
Preserving The Records

While researching old bulletins and magazine articles related to nominees for the DX Hall of Fame, we were impressed with the quality of interesting material from the early days of DXing which is still in the hands of older amateurs. Good examples were the copies of *R9* and *Radio Magazine* from the early 1930s which were loaned to us by Herb Becker, W6QD, for use in establishing the beginnings of WAZ and which served as the basis for the 50th Anniversary WAZ Award. This led us to Jim Maxwell, W6CF, who is an avid DX historian whose enthusiasm frequently exceeds even our own.

Letters and phone calls from Jim share the common fear that as older amateurs lose interest in the hobby or become Silent Keys, vast amounts of interesting and historically valuable material will be lost forever to the city dump. Family members who are not amateurs, and even some amateurs themselves, do not recognize the potential interest in old QSL cards, magazines, DX bulletins, and DX club newsletters, photographs, recordings, and old logs. Such things are usually considered worthless junk and tossed in the fire. Yet DXers have made real and unique contributions to the development of amateur radio, which is itself a national and international resource. These contributions should be preserved. We wonder if a complete set of the *West Gulf DX Bulletin*, Don Chesser's *DX Magazine*, or the *YASME Bulletin*, from the 1950s and 1960s, still exists today.

Most old material of this nature has little dollar value but is priceless from a historical viewpoint. *How can it be preserved?* Unfortunately, no long-range solution is at hand, but some short-term options are available. First, those who have a sentimental attachment to their DX accumulation should by all means hang on to it as long as it provides pleasure. But if they decide to clean house, old DX material shouldn't be thrown away. Some items do have a dollar value and can be sold or donated to a museum for some form of tax credit. The Antique Wireless Association Museum in Holcomb, New York and the Foothill College Electronics Museum in Los Altos, California will accept items of historical interest. Other material may be given to a local DX club, some of whom, such as the Northern California DX Club, maintain archives, or simply given to a trusted friend who appreciates its historical value and will treasure and preserve it.

Families should be educated so that the shack won't be instantly swept clean if a tragedy occurs. None of us expects to be a Silent Key overnight, but it will happen to all of us eventually and sometimes much sooner than expected. The family should understand the value of the material and should be told where it should eventually go—museum, archive, friend, or sold. A trusted friend who can help the family with tough decisions should be identified. In that way, priceless documents will not be lost forever.

Meanwhile, what is the long-term solution? W6CF would like your suggestions. If you have some thoughts, drop Jim a line at P.O. Box 473, Redwood Estates, CA 95044.

DXpedition To Aves Island

The Association of Radioamateurs of Venezuela (ARV) will celebrate its 20th anniversary by staging a major DXpedition to very rare Aves Island during the period March 19–22, 1987. The group will use the callsign 4M0ARV. This will be the first time that the 4M0 prefix has been used from this island, so it will be a good contact for prefix chasers as well as country seekers. Aves Island is located in the Caribbean Sea at 15 degrees, 40 minutes north latitude and 63 degrees, 37 minutes west longitude.

4M0ARV will use the following frequencies on CW: 1.825, 3.525, 7.025, 14.025, 21.025, and 28.025. SSB frequencies will be

The WPX Program

Mixed

1242	JJ3JJL	1247	JH7MSQ
1243	JA2MNB	1248	K5IC
1244	HA8XX	1249	YU7DR
1245	JA3HF	1250	YU1PJ
1246	I4EAT		

S.S.B.

1856	HB9MP	1858	K3ZPG
1857	I4EAT	1859	IT9CUE

CW

2408	JG1TSF	2412	I4EAT
2409	HA8XX	2413	JH8HZG
2410	IK5DEY	2414	K5IC
2411	HB9DDZ		

WPX

248 ..... DL-2004117

Mixed: 450 JJ3JJL, JA2MNB, HA8XX, IREAT, K5IC, YU7DR. 500 K5IC, JJ3JJL, JA2MNB, HA8XX, I4EAT, YU7DR, KS3F. 550 JJ3JJL, I4EAT, K5IC, YU7DR. 600 I4EAT, K5IC, YU7DR. 650 I4EAT, AB90, YU7DR. 700 JA4BAP, I4EAT, AB90, YU7DR. 750 I4EAT, YU1GR. 800 N2CIC, I4EAT, I2EAY, YU1GR. 850 I1EEW, N2CIC, I4EAT, I2EAY, YU1GR. 900 I4EAT, JA7FFN, YU1GR. 950 14EAT, I1WXY, YU1GR. 1000 I4EAT, I1WXY, YU1GR. 1050 I4EAT, I1WXY, AC2J. 1100 I4EAT, I1WXY, AC2J. 1150 14EAT. 1200 I4EAT. 1250 I4EAT. 1300 I4EAT. 1350 I4EAT.

S.S.B.: 350 HB9MP, I4EAT. 400 HB9MP, IK2AEQ, I4EAT. 450 I4EAT. 500 I4EAT. 550 I4EAT, IV3MJR. 600 I4EAT, IV3MJR. 650 I4EAT, AB90. 700 I4EAT, AB90, EI8AU. 750 N2CIC, I43AT, EI8AU. 800 I4EAT, EI8AU. I2KKL, I4EAT. 1050 I4EAT, W4UW. 1100 I4EAT, I1HAG. 1150 I4EAT, I1HAG. 1200 I4EAT, I6SF. 1250 I4EAT, I67SF. 1300 I4EAT, I6SF.

C.W.: 350 HA8XX, IK5DEY, I4EAT, LA8CE, JH8HZG, K5IC. 400 NK2W, IK5DEY, I4EAT, LA8CE, JH8HZG, W9IAL. 450 IK5DEY, I4EAT, LA8CE. 500 LA8CE, I4EAT, IK5DEY. 550 IK5DEY, I43AT, DK8NM, LA8CE. 600 IK5DEY, I4EAT, N3KR, DK8NM, LA8CE. 650 IK5DEY, LA8CE. 700 I2EAY, LA8CE. 750 LA8CE. 800 LA8CE, SP1ADM. 850 LA8CE, SP1ADM. 900 SP1ADM. 950 SP1ADM. 1000 DJ1YH, SP1ADM.

VPX Endorsement: 1000 . . . JA1-20784.

10 Meters:	I4EAT
15 Meters:	PA3BFH, I4EAT
20 Meters:	HA8XX, I4EAT, K3ZPG
40 Meters:	HA8XX, I4EAT
80 Meters:	HA8XX, I4EAT
160 Meters:	I4EAT, KL7AF

Asia:	I4EAT, AB90, JR1BMU, YU7DR
Africa:	I4EAT
No. America:	I4EAT
So. America:	I4EAT
Europe:	I4EAT, YU7DR
Oceania:	I4EAT, AB90

Award of Excellence: I4EAT With 160 meter bar

Award of Excellence Holders: N4NO, ZL3GQ, W4BQY, I0JX, WA1JMP, K0JN, WAVQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP.

Award of Excellence Holders with 160 Meter Endorsement: W9NUF, N4NX, SM0DJZ, DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF20, K5UR, OK1MP, N5TV, W8CNL, W1JR, W6OUL, W4BQY, W5UR, N4NO, W8RSW, N4KE, I2UIY, W8ILC, W1BUS, NN4Q, G4BUE, LU37L/W4, I4EAT, VE7WJ

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.

CQ's Jack Gutzeit, W2LZX, is shown here ready, willing, and very able to show four-month-old grandson Robert Ian the ins and outs of DXing. Incidentally, Jack's grandson's initials are "R.I.G." Hi!

1.825, 3.795, 7.095, 14.195, 21.295, and 28.595. There will be a 2 meter station on 144.090 MHz. The QSL address is 4M0ARV, P.O. Box 3636, Caracas 1010-A, Venezuela. (*Tks YV5EED*)

Rare Prefix and Special-Event Stations

A4/ND: Stations in the Sultanate of Oman used the suffix /ND from Nov. 14–23, 1986 to commemorate their national day. A4XND was the headquarters station of the Royal Omani Amateur Radio Society.

A8: All Liberian stations used this prefix from November 1 to December 31, 1986 in support of the Ganata Leprosy Colony. N5GAP handles cards and receives donations. (*Tks QRZ DX*)

BX1: Tom, VE7BC, is reported to be the first foreign amateur authorized to operate with his own callsign in China. Tom's Chinese call is BX1BC. (*Tks DXPRESS*)

FY9: FY9IS was operated by FY7AN from the Iles du Salut, December 13–14, 1986. This group includes the famous Devils Island.

GB2RIP: This station celebrated the 1100th anniversary of the city of Ripon, Yorkshire in the north of England. QSL to Gerry Bliss, G0CLY, Box 219, Menwith Hill Station, APO, New York, NY 09210-5360. (*Tks The DXer*)

J78: Stations on Dominica used the J78 prefix during the month of November 1986 to commemorate 8 years of independence.

TF3RGR: This was a special station in Reykjavik, Iceland during the meeting of heads of state in October 1986.

4K0D: This call was used by the Soviet Artic drifting station UPOL-28 to commemorate the 50th anniversary of the first Soviet polar expedition by Ivan Papanin. QSL to UA1MU. (*Tks QRZ DX*)

Here and There

Long Island DX Bulletin (LIDXB): The *Long Island DX Bulletin* marked its 25th anniversary in 1986. The LIDXB was first published in 1961 and has been on the scene continuously since 1961. It is one of the most outstanding sources of DX information available. Harvey McCoy, W2IYX, is editor. The bulletin address is P.O. Box 173, Huntington, NY 11743-0173.

Worked All Europe Award (WAE): K1RH is now the U.S. checkpoint for the WAE award. Send 3 IRC's, or $1.00, and a business-sized envelope for information and application blanks. (*Tks QRZ DX*)

Yasme DXpeditions: During last year's 6-month DXpedition to southern Africa Lloyd

Domenico, I1APQ, and daughter Claudia, age 10. I1APQ recently qualified for Single Band Phone WAZ #37 on 3.8 MHz. His rig is a Drake C-Line and Henry amplifier to a homebrew groundplane for 40 and 80 meters. He found Zone 1 to be his most difficult zone from northern Italy on 80 meters. I1APQ completed 5 Band WAZ on June 1, 1986 and has worked all DXCC countries except XZ and 70. He is 38 years old and married.

The WAZ Program

20 Meter Phone

581	I4YWC	584	WA1AYS
582	VK1ZL	585	JH6JTE
583	EA5CIX	586	KD9GG

10 Meter CW

57 ..... DK9MB

20 Meter CW

251 ..... N3KR

All Band WAZ

SSB

3064	IK8DOI	3066	KD9BG
3065	YB4FW	3067	WA2YNH

Phone and CW

6019	HK3DDD	6026	DL3ZH
6020	NJ0M	6027	I8RFD
6021	WA2HZO	6028	JA8IYI
6022	K6DR	6029	K9AJ
6023	KD6BG	6030	DL4FBZ
6024	N0CIB	6031	DL2ZAE
6025	WA1AYS		

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (39 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

5 Band WAZ

Standings as of December 1, 1986

New recipients of 5 Band WAZ with all 200 zones worked:

126. DF9ZP
127. Assigned
128. HK3DDD
129. W6GO
130. F6BEE
131. SP7KTE

The top 14 contenders for 5 Band WAZ are:

1. JA1BWA, 199
2. JA3EWU, 199
3. N4WW, 199
4. K5YRA, 199
5. W8UVZ, 199
6. JA0CWZ, 199
7. K9CEB, 199
8. G3GIQ, 199
9. SP6JCY, 199
10. W3GG, 199
11. W2YY, 198
12. K7UR, 198
13. K9GX, 198
14. DJ9ZB, 198

398 Stations have attained the 150 zone level.

and Iris Colvin made 50,000 QSO's. At the time of this writing Lloyd and Iris are in the Indian Ocean area. All QSL's go to the Yasme Foundation, P.O. Box 2025, Castro Valley, CA 94546. (*Tks DXPRESS*)

Minami Torishima: Rick, 7J1ACH, will be on the island until June. He concentrates on the lower frequency bands using a TS-930S, a Butternut vertical for 40, 80, and 160 meters, and an IC-720A to a 7-element KLM log periodic. (*Tks DXPRESS*)

Revilla Gigedo: The group which activated Clipperton Island last year hopes to be on as XF4ZU for one week during March. They will be joined by Mexican amateurs for an all-band, all-mode effort. (*Tks DXPRESS*)

African Tour: George Collins, VE3FXT, should be winding up his 5-month scientific tour to 7 countries of southern Africa. QSLs go to VE3DPD. (*Tks LIDXB*)

Mellish Reef: The callsign VK9MW has been issued for a DXpedition to Mellish Reef and Willis Island planned for some time in 1987. (*Tks QRZ DX*)

Tanzania: Noel, 5H3RB, will be in Tanzania for about 4 years. He has been reported on 21234 kHz at 1930 GMT. QSL to Box 9534, Dar es Salaam, Tanzania. (*Tks QRZ DX*)

Kermadec: Peter, ZL8HV, is on Raoul Island for a 12 month stay. He is active on all bands using an IC-720A to wire antennas. (*Tks DXPRESS*)

Cyprus: Mike Smedal, ex-A71AD, is active as 5B4TI and will be there for about 2 years. QSL to P.O. Box 7121, Nicosia. (*Tks Jim Smith*)

Indian Ocean Area: If you hear a rare one from the Indian Ocean during March, it may be WA6VNR and KB6MME, who will be traveling in the area. (*Tks QRZ DX*)

French Polynesia: FO8 callsigns are disappearing from the scene, being replaced by FO4 and FO5 calls. The FO4 prefix is used by operators licensed for 1–4 years and the FO5 prefix by operators licensed for 5 years or more. FO0 callsigns will still be issued to visitors. (*Tks QRZ DX*)

Uganda: Gerry, 5X5GK, operates from a medical clinic on an island in Lake Victoria. QSL to DJ5RT.

Kent, VE2LJ, operates from the small fishing village of Harrington Harbour, Quebec located in CQ Zone 2, just north of the 50th parallel. Kent is an ordained minister and will serve the United Church in Harrington for 3 years, giving DXers a great chance to work Zone 2 on all bands. Skeds can be arranged by calling him at (418) 795-3335. Kent's station includes a Hammond HL-1000 linear, donated by the Northern California DX Foundation, an ICOM 745, MFJ Grandmaster Memory Keyer, TA-33 at 40 feet, and dipoles for the lower bands. His QSLs are handled by John, VE3JDO, P.O. Box 880, Stittsville, Ontario, K0A 3G0 Canada.

DX Club News

NOFARS: Congratulations to Billy Williams, N4UF, on his re-election as President of the North Florida Amateur Radio Society (NOFARS). Headquartered in Jacksonville, Florida, NOFARS is one of the oldest and most active amateur radio groups in the United States. N4UF also toils in the DX vineyards as Manager of the CQ CW DX Award and the CQ SSB DX Award. Applications for these awards may be submitted to him at P.O. Box 9673, Jacksonville, FL 32208. (*Tks Balanced Modulator*)

CQ DX Awards Program

SSB

1506	YC0BAC	1511	YC0SY
1507	KU9Z	1512	NX5C
1508	TI2KD	1513	IK4FDQ
1509	KB2HK	1514	W9VA
1510	YC0EJG	1515	G4ZZK

CW

687	W1WAI	689	YU1HA
688	W9SC		

SSB Endorsements

310	9H4G/310	275	VE3DLR/290
300	WD9IIX/309	275	KB2HK/290
300	KU9I/308	275	KE4HX/288
300	I8KCI/305	275	WA2FKF/289
300	KB0U/303	275	K4JLD/282
300	WT4T/301	275	KU9Z/280
275	KC8EU/299	275	N2CIC/275
275	K4LR/293	200	TI2KD/244

CW Endorsements

275	WD9IIX/296	200	HA8UB/200
275	W9SC/277	28 MHz	HA8UB
275	W1WAI/276	3.5/7 MHz	HA8UB
250	K4JLD/257		

Total number of active countries is 316. 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.

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. Total countries are now 316. 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 endorsement involving the issuance of a sticker is $1.00.

CW

ON4QX	316	W2FXA	312	N4KG	305	N5FW	294	K7ZR	280
W9DWQ	316	W6ID	311	AB4H	304	W9RY	293	I5XIM	280
W6PT	316	K4XO	311	W0IZ	303	K8LJG	292	W2LZX	280
K4CEB	316	DL3RK	310	WA8DXA	302	N5DX	291	W9NUF	280
N4JF	316	AA6AA	309	YU2TW	301	WA4JTI	290	HB9AFI	279
K9MM	315	DL8CM	309	I3OBO	301	W1WLW	289	IT9QDS	279
N4PN	315	W9BW	309	W6SN	300	W4BV	289	WA4DAN	278
DL7AA	315	N4MM	308	WB4RUA	300	N8MC	288	DL1QT	277
N6AV	315	DL1PM	308	W0SR	300	WD9IIC	288	G2GM	277
W3GRS	314	K1MEM	308	W7CNL	299	W0HZ	287	KA3R	276
W8KPL	314	OK1MP	308	K3FN	298	WA2HZR	286	I8WY	276
K6LEB	314	SM6CST	308	K3UA	298	NN4Q	286	K4SE	275
K6JG	314	W4OEL	307	K9IW	298	K4CXY	283	N4AH	275
N6CW	313	SM3EVR	307	EA2IA	298	W6YQ	282	KQ9W	275
K9AB	313	W1NG	306	DJ7CX	297	K1VHS	281	K9BWQ	275
K6EC	312	K9QVB	306	WD9IIX	296	JH1VRQ	281	K2OWE	275
W4BQY	312	K8PYD	305						

SSB

K2FL	316	K5OVC	313	VE3MRS	306	I6PLN	299	OK1AWZ	288
W4EEE	316	YU1AB	313	KB5FU	306	KC8EU	299	I8KCI	288
K6WR	316	VE7WJ	313	EA1QF	305	JH1VRQ	299	KI3L	287
W4UG	316	F2MO	312	NA5W	305	DJ7CX	298	EA3KW	287
W6EUF	316	K8PYD	312	KZ8Y	305	K9SM	298	AB9E	287
VE3MR	316	W0SD	312	KB8KW	305	I8LEL	298	W5LLU	287
DL9OH	316	K9RF	312	XE1OX	305	JH4PRU	298	K2JF	287
N4JF	316	K4MQG	312	K3UA	305	K8VFV	298	N3ARK	286
I0ZV	316	N4MM	312	I8KCI	305	EA9IE	298	N8BJQ	286
KD8VM	316	I8ACB	312	XE1J	304	XE1NI	298	VE3CYX	285
I0AMU	316	W9SS	312	W8IMZ	304	I1POR	298	K9MNT	285
F9RM	316	N2SS	312	W6SN	304	HP1JC	297	KB5RF	285
TI2HP	316	LA7JO	312	VE7HP	304	K5DUT	297	AG9S	284
KS2I	316	OE2EGL	312	W4UNP	304	KB3OQ	297	KD8V	284
YV1KZ	316	K4XO	312	W6NLG	304	YU7KV	297	WB3HAZ	283
I8AA	316	LU3YL	312	NY5L	304	K3LUE	297	VE3MV	283
DJ9ZB	316	K6EC	311	I4EAT	304	WB3GPR	296	IN3ANE	283
W3GRS	315	W4SSU	311	XE1KS	303	KQ9W	296	AE5B	282
VE3MJ	315	I4LCK	311	W2LZX	303	KB3KV	296	CT1UA	282
4Z4DX	315	W0SR	311	WB3DNA	303	W4BQY	296	KC8YM	282
W9DWQ	315	K9BWQ	311	KB0U	303	W9OKL	296	AI9R	282
W9JT	315	K6XP	311	K0GT	303	I0SGF	296	TG9EP	282
ZL1AGO	315	K9AB	311	VE7DX	303	K7LAY	295	N1ALR	282
W4NKI	315	W1LQQ	311	K1MEM	302	W0IYR	295	K4JLD	282
VE2WY	315	W7FP	311	N5FG	302	KK0C	295	K9TI	280
K6YRA	315	N6OC	311	W6FET	302	KA9ABC	295	ZL1BOQ	280
W3AZD	315	DK2BL	310	W2FGY	302	I8ZTE	294	G4FAM	280
XE1AE	315	IV3YRN	310	K9HQM	302	WD0BNC	294	KU9Z	280
VE3GMT	315	AA6AA	310	WA4DAN	302	I5BDE	294	VE6PW	280
ZL3NS	315	W8JXM	310	I3OBO	302	WD8PUG	294	KB5DN	279
I8YRK	315	DL6KG	310	K9UAA	302	WB3CQN	294	EA6DE	279
VE1YX	315	WA4JTI	310	NJ2C	302	K4SE	293	JH8NYK	279
W4DPS	315	9H4G	310	KP4EQF	302	KC8JH	293	KX5V	279
I4ZSQ	315	N4PN	309	AI8M	302	AI5I	293	K4BYK	278
OK1MP	315	K1UO	309	WB4UBD	302	K4LR	293	I5EFO	278
ZS6LW	315	W6DN	309	N5FW	302	W9NUF	293	VE3IUE	278
I8KDB	315	W7OM	309	VE3FJE	301	WA4LOF	292	KB8O	278
W9BW	315	ZL1BIL	309	WB4NDX	301	AC0A	292	KG9N	278
N4WF	314	WD9IIX	309	WA3HUP	301	I2MOP	292	G4ADD	278
OZ3SK	314	W1NG	308	K8CMO	301	VE3FEA	292	WB0UFL	277
K9MM	314	VK4VC	308	W8ILC/QRPp	301	VP9CP	292	W4PTT	277
YV5DFI	314	YV5AIP	308	W9RY	301	W8LKG	292	KB0SY	277
K6JG	314	N6AV	308	YU2TW	301	XE1OW	292	I8XTX	277
CT1FL	314	W2CC	308	N4CRU	301	K1VHS	292	N0AMI	276
OZ5EV	314	AI8S	308	KZ0C	301	W0ULU	292	N7ASL	276
W2SUA	314	N4KG	308	N8BKF	301	SV1JG	292	WA6DTG	276
W0SFU	314	K8NA	308	KZ2P	301	VE3IPR	291	WA4OPW	276
W0YDB	314	WA4WTG	308	KE3A	301	N5AWS	291	AI9U	276
OE3WWB	314	SM4CTT	308	WT4T	301	WB6GFJ	291	KC2RS	276
VE3XN	314	G4CHP	308	NN4Q	301	W4JFE	291	WA9IVU	276
YS1RRD	314	KU9I	308	W4OHZ	300	W6MFC	291	K0HQW	276
N7RO	314	VE4SK	307	I5EFO	300	K2JLA	291	AB9O	276
K8LJG	314	WB1DQC	307	K9QVB	300	DU9RG	291	I8INW	275
W3GG	314	I0MBX	307	KB9KD	300	VE3CKP	290	WB1EAZ	275
I2LLD	314	KV2S	307	VE4AT	300	KB2HK	290	VE7BSM	275
K9LKA	313	WD8MGQ	307	WZ4I	300	KD5ZM	290	K8NWD	275
ON5KL	313	KB9OC	307	I2ZGC	300	VE3DLR	290	G3XTT	275
EA2IA	313	KB8DB	307	K2JLA	300	JA5PUL	289	G4GED	275
W8ILC	313	VK3JF	307	W6BCQ	300	W9TA	289	VE5FX	275
EA4LH	313	K9IW	306	WA2MID	300	WA2FKF	289	KS0Z	275
OZ8BZ	313	KR90	306	NW5K	300	K8ZZU	289	XE1MDX	275
N6AW	313	N4KE	306	KA8T	299	W4UW	288	KC2FC	275
W8PCA	313	WA0DCQ	306	WA0TKJ	299	KE4HX	288	N2CIC	275

NCDXC: As part of its 40th anniversary celebration, the Northern California DX Club (NCDXC) conceived of an interesting new mini-marathon based on *CQ*'s 40 zones. From December 10–20, 1986 club members were challenged to work 40 *band zones*. For example, if a member worked zone 23 on 20, 40, or 80 meters, he or she was credited with 3 band zones, or if zone 32 was worked on 10, 15, 20, 40, and 80 meters, credit was received for 5 band zones. No WARC band contacts were allowed, only 10–80 meters. (*Tks The DXer*)

YASME: The Yasme Foundation is offering plaques to DXers who confirm 30 contacts with past or present DXpeditions by Yasme members. The latter include Danny Weil, VP2VB; Lloyd, W6KG, and Iris, W6QL, Colvin; Martti Laine, OH2BH; Dick McKercher, W0MLY; Dick Spenceley, KV4AA; W6AM; W6OAT; W6RGG; N7RG; and others. A mounted brass replica of the yawl *Yasme* will be awarded to DXers who submit proof of contact with 60 Yasme Foundation members. Applications including QSLs and a list of contacts showing call, date, and time should be submitted to the Yasme Award Manager, W0MLY, Box 7, Rippey, IA 50235. (*Tks DX-NL*)

Canadian DX Association (CANAD-X): The Canadian DX Association is open to all interested amateurs and SWLs, nationally and internationally. It is administered by the Toronto DX Club. CANAD-X publishes an excellent monthly journal, *Long Skip*, presently edited by VE3IPR and provides an outgoing QSL Bureau managed by VE3EZU. Other services include QSL cards with the CANAD-X logo, the VE3TDX repeater which serves the western end of Lake Ontario, the Niagara region, and metropolitan Toronto, and a DX Information Net which is conducted Sundays at 1730 UTC on 14.173 MHz. Correspondence regarding membership should go to Wilf Antheunis, VE3FEA, c/o Canadian DX Association, P.O. Box 717, Station 'Q', Toronto, Ontario M4T 2N7, Canada.

The Toronto DX Club (TDX) meets on the first Monday of each month from October to June, plus the second Monday of September, at 4812 Yonge Street, just north of Sheppard Ave., in Toronto. (*Tks Long Skip*)

50th Anniversary WAZ

The following stations have met all the requirements for the 50th Anniversary WAZ Award:

1. Jerry Fiore, N4JF
2. Albert Hix, W8AH
3. W. Gibbons, K2TQC
4. Todor Dikor, LZ1HA
5. Bob Farkay, K9RHY
6. George McKercher, W0MLY
7. Franz Langner, DJ9ZB
8. David C. Norton, AB9O
9. James Sansoterra, K8JRK
10. Naoji (Nab) Hasagawa, JA2BL
11. Toshiro Ogino, JI1QPU
12. Hiroyuki Ogawa, JA8DNZ
13. David Ornee, KQ9W
14. Anton Iriawan, YB9QZ
15. Franco Benenato, IK8DYD
16. Betty Reich, WD9GQV
17. Steve Lamb, W9NUF
18. Edward Goodbout, W9DWQ
19. Jim Smith, VK9NS
20. Etsuro Sudo, JH1IED
21. Frank Gassmere, K9BWQ
22. Alan Rovner, WA2TMP
23. Rick Burke, VE1NG
24. Robert Peterson, N4VZ
25. Mamoru Wakasugi, JA8CAQ

Betty Reich, WD9GQV, is the first YL recipient of CQ's 50th Anniversary WAZ Award. Betty is an avid DXer with several major awards and three DXpeditions to her credit. In 1979 she operated from Montserrat as VP2MFT, in 1983 from the Canary Islands as WD9GQV/EA8, and in 1984 from Pitcairn Island as VR6BR. She is a retired school teacher and counselor, a widow, and a member of the Chicago Suburban Radio Club and DX, Inc. Betty was first licensed in 1977 and received her Extra ticket in 1982. The 50th Anniversary WAZ Award celebrates the founding of WAZ in 1936 and its 50 years as a major DX award. DXers who contacted the 40 zones between January 1 and December 31, 1986 are eligible for 50th Anniversary WAZ and may submit their cards to Leo, W4KA, 1044 Southeast 43rd. St., Cape Coral, FL 33904.

Rules and application blanks for the 50th Anniversary WAZ Award may be obtained from Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904. All QSL cards must show a date between January 1, 1986 and December 31, 1986. Contacts must be made on the 80, 40, 20, 15, and 10 meter bands. Applicants may use a combination of CW, SSB, AM, and RTTY.

Contest Hall of Fame

As most of you are aware, Buzz Reeves, K2GL, who passed away on December 23, 1986, was selected as the first member of the Con test Hall of Fame. John Attaway, K4IIF, who has administered the DX Hall of Fame since its beginnings 20 years ago, will also administer the Contest Hall of Fame. If you have a nominee for the Contest Hall of Fame, please contact John at P.O. Box 205, Winter Haven, FL 33882, including as much information as possible regarding your nominee's accomplishments.

The Contest Hall of Fame is not envisioned as a means of recognizing someone solely for winning a large number of contests. Recipients should have made major contributions to the enjoyment of the hobby by contesters everywhere. They should stand above the pack.

Baldur Drobnica, DJ6SI, received the DX Hall of Fame Award in May 1986 at the First Class Operator's Club Second Continental Dinner in Asendorf, Germany. This was the 25th presentation of the DX Hall of Fame plaque since the inception of the award almost 20 years ago. The first recipient was Gus Browning, W4BPD, on November 1, 1967. For a complete story on Baldur's DXploits see pages 90 and 91 of the September 1986 issue of CQ. The DX Hall of Fame is not an operating award. It is a means of honoring those few rare radio amateurs who have contributed substantially to the enjoyment of DX by everyone, often at great personal sacrifice of time and resources. If you would like to nominate someone for the DX Hall of Fame, send full particulars on the person's achievements to John, K4IIF, Chairman of the CQ DX Award's Advisory Committee, P.O. Box 205, Winter Haven, FL 33882. The Committee will be pleased to consider your suggestion. (Photo courtesy D.J. Andrews, G3MXJ via Al Slater, G3FXB)

Pagalu Island, 3C0

Pagalu Island, formerly known as Annobon Island, is a possession of the Republic of Equatorial Guinea. It is located in the Gulf of Guinea, less than 2 degrees south of the equator, 375 miles southwest of the capital of Equatorial Guinea and about 200 miles off the coast of Gabon. Its area is less than 7 square miles.

The island is part of a partially submerged volcano which rises to an elevation of 2000 feet. Volcanic deposits restrict agriculture and it can barely support its population of 1400 persons. A crater lake is situated at the summit of the island. Due to its close proximity to the equator, it has an annual rainfall of about 117 inches.

Pagalu was discovered by Portuguese navigators on New Year's Day about 1471, hence its original name of Ano Bon, later changed to Annobon. It was ceded to Spain in 1778 and later became part of Spanish Guinea. It was settled by African slaves from Portuguese Sao Tome and Angola. Its present inhabitants are descendants of those original slave settlers. Its name was changed to Pagalu with the new constitution of 1973 when many of the Spanish names were Africanized. If you worked 3C0A last summer, QSL to TR0A, P.O. Box 1826, Libreville, Gabon. (*TKS W5KNE, QRZ DX*)

QSL Information

Joe Arcure, Jr., W3HNK, was elected to the DX Hall of Fame in 1979 in recognition of his enormous contributions as a QSL Manager. Joe's work continues. The following is a recent list of stations for which Joe can provide you with a card. SASE to Joe Arcure, Jr., W3HNK, P.O. Box 73, Edgemont, PA 19028. (*Thanks W6GO/K6HHD QSL Manager's List*)

AI5P/	FM4DN	PY4AKL
AP2SQ	FM4DU	PZ1CF
CN8BG	FM5BH	P29BS
CO5GV	FM5WD	SM0CER
CQ4NH	FM7WD	SM7CRW
CQ4UH	F0AZC	TA3DX/1
CQ6LF	GW3DZJ	TF5BW
CR0UA	G5CTB	TF5EP
CR4NH	HC8GI	TG4VT
CS0UA	HD8GI	TG9VT
CS1UA	HH2WF	TI2JCC
CS4NH	HI8MOG	TR8BL
CS4UA	HI8XRG	TU2HJ
CT1BOH	HL1EJ	UA1PAM
CT1BT	HM1EJ	UK2FAA
CT1FL	HP1XLS	UX4L
CT1RM	HP1XYA	VE1BL/1
CT1TZ	JT0DKF	VK9BS
CT1UA	JT0GM	VP2EUQ
CT1UD	KH6GI	VP2EY
CT1UE	KH6XX	VP2EYL
CT2AK	KL7H	VP2KK
CT2SH	KL7NA	VP2VY
CT3AF	KP4D	VP5D
CU0UA	KP4RF	VP5MF
CU1UA	KV4EN	VP9AD
CU2AK	KV4EY	WP4C
CU4NH	LX1BW	W4GSM/HC8
CU5UA	LY4L	YS1GMV
CW3BR	NP4A	ZP0PX
CX4CC	OD5CS	ZP5CBL
DA2DX/	OX3LV	ZP5CF
EA8AK	OY3H	ZP5PX
EA8CR	OY5NS	ZS6WI
EA8GZ	OY7BD	Z24JS
EA8JJ	OY7JD	5B4AI
EA8QR	OY9LV	5U7AG
EL2BI	PJ8UQ	9H4L
EN4L	PJ8YL	9L1JT
FG0DDB/FS7	PY1CZL	9Y4NP
FG0UQ	PY1DBE	9Y50NP
FG0YL	PY1MO	

73, John, K4IIF

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Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

What Is An Amateur?

In a sentence, amateurs are individuals who are interested in the marvels of exchanging information via the radio spectrum. Everything they do is tied to it. The spectrum is a continuous range of electromagnetic radiations from the longest radio waves to the shortest known cosmic rays. You can see and hear spectrum! Light, the visible portion of the spectrum, lies midway between these two extremes. You can *hear* spectrum if it lies within the audible range—approximately between 15 and 20,000 vibrations per second, or Hertz as they are now known. The number of Hertz in a second is called the *frequency* of the spectrum.

Frequencies above the audio range are called *radio frequencies*. They can't be seen or heard, but they are still there. The radio spectrum is generally considered to lie between the frequencies of 10 kHz (10,000 Hertz—K, or kilo, represents 1,000) and 3000 GHz (*Gigahertz*, one billion Hertz). Mind-boggling and wondrous accomplishments are constantly taking place in the radio spectrum.

There are those who maintain that amateurs are licensed radio operators who don't use "10" codes, call each other "good buddy," or give out "smokey" reports. That may be part of today's definition, but that certainly isn't what being an amateur is all about! It has nothing to do with even being licensed. It has to do with venturing into the unknown world of exchanging information.

Early Wireless Communications

From the beginning of history, mankind has struggled to communicate with others some distance apart. Fire and smoke signals were used among primitive people. The aborigines of Africa used jungle drums. The great historian *Herodotus* tells that in 400 BC a reflected signal was sent from Athens to Marathon (about 25 miles) by means of sunlight reflected from a soldier's highly polished shield. In 300 BC a reflecting mirror of burnished metal was used as a lighthouse in Alexandria for the purpose of signaling to ships at sea. The bible tells us (in Jeremiah 6:1) that signal flares were used near Bethlehem. Paul Revere told of the British march on Lexington in 1775 by hanging a signal lantern in the old North Church tower: "One if by land, and two if by sea," as Longfellow put it.

Later, and for many years to follow, the form of signaling extensively used by the U.S. Army was the *heliograph*. This word comes from the Greek *helio*, meaning sun, and *graph*, meaning to write. Heliograph means literally *to write by the sun*. In 1890, the Army Signal Corps transmitted a signal by heliograph (the cutting on and off of the suns rays) from one mountain peak to another over a distance of 215 miles—a truly remarkable feat in those days!

In the 18th century shortly before the French revolution a new system of communication was devised. It was called *semaphore*. Interestingly enough, it was the result of a schoolboy prank wherein some schoolboys in two nearby schools devised a system so that they could send messages back and forth. The word *semaphore* comes from the Greek *sema* meaning a sign and *pherein* meaning *to bear*. Literally, semaphore means *to bear a sign*.

The French government immediately applied the semaphore system to military signaling. In their system, towers were placed every 5 miles or so. On top of each tower was erected the semaphore consisting of a mast and two movable arms. Semaphore signaling is still in use today between sailors on ships using flags. The semaphore system was used for a century and a half in the railway industry before slowly being replaced by colored electrical lights.

Up until the early 1800s all wireless communication was accomplished by use of the optical and audio spectrum. Communication via the radio spectrum has been with us only a relatively short period of time.

The Electric Telegraph

Like most inventions, the wireline telegraph has a complex and disputed ancestry. America, Russia, Germany, and England have approximately equal claim to its origin. Although Samuel Morse is remembered above most of his rivals, he was very far from being the first man to transmit information by electricity.

Morse sent his famous message "What hath God wrought?" (a question which, incidentally, still lacks a suitable reply) on March 24, 1844. But one standard history on the subject lists no less than 47 telegraph systems between the years 1753 and 1839. Most were only paper proposals, but some of them actually worked.

The history of the electric telegraph is generally considered to begin on February 17, 1753, *thirty-eight years before* Samuel Finley Breeze Morse was even born. (A good trivia question: What were Morse's middle initials and what did they stand for? There are those who maintain that the amateur's use of FB—meaning fine business—came from Morse's two middle names!) In 1753 a remarkable letter signed by one "C.M." (whose identity has never been established) was published in *Scots Magazine*.

Briefly, "C.M." proposed that "a set of wires equal in number to the letters of the alphabet be extended horizontally between two given places, parallel to one another, and each of them about an inch distant from the next . . ." The letter goes on to explain in detail how the wires are to be connected to the conductor of an electrostatic machine when it is desired to signal a particular letter. On the receiving side "let a ball be suspended from every wire, and about one-sixth to one-eighth of an inch below the balls, place the letters of the alphabet marked on bits of paper . . . ."

Of course, it was known since very early times that electrostatic forces would attract small pieces of paper, and by the middle of the 18th century simple frictional machines to produce electrostatic energy were fairly common. They mostly consisted of a glass cylinder rotated rapidly by hand, against which a leather cushion was placed.

"C.M." then proposed to use the electricity from such a machine, channel it through one of his wires, and let it attract on the receiving side the corresponding pieces of paper with its letter of the alphabet.

All the principal elements of the electric telegraph were there—a source of electricity, its manipulation to handle the information to be transmitted, the wire conductors, and the mechanism on the receiving side to read the information transmitted. This was nearly a century before Morse sent his first message via telegraph.

Electro-chemical telegraphs made their first appearance in 1800. One system had 35 wires running to a receiver, which was a water tank! When electricity was

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applied to one of the 35 wires, hydrogen bubbles signifying a particular letter rose from the wire in the bottom of the tank!

Around 1800 the Danish scientist *Oersted* found that electric current could produce a deflection of a magnet placed near it. For the first time *electricity had exerted force*! In 1825 this new knowledge was applied to telegraphy by Baron Schilling in Munich. He devised a magnetic telegraph in which letters were indicated by movements of a needle over black or white segments of a card. In Schilling's alphabet "A" was black, white; "B" was black, black, black; "C" was black, white, white; and so on. Here at last was the basis of a really practical telegraph and the time was now ripe for its exploitation, which occurred almost simultaneously in America and England.

In 1836 W.F. Cooke (an English medical student) immediately abandoned his intended profession and teamed up with Charles Wheatstone, professor of physics at King's College, London. Cooke and Wheatstone produced their first telegraph patent in June 1837 and carried out their first practical trials in the same year on a quarter mile line between two London railway stations. The receivers they used were called "needle instruments" in which letters were indicated by the deflection of vertical pointers to right or left. The system was slow, but messages could be sent and read by unskilled staff.

Cook and Wheatstone continued to improve their telegraph, finally reducing the number of needles to a single one. In 1846 they formed the Electric Telegraph Company, and by 1852 it was estimated that there were some 4,000 miles of telegraph lines in England. Queen Victoria knighted both Cooke and Wheatstone for their achievements, and Sir William and Sir Charles are to be remembered as two of the great pioneers of telegraphy.

They, as others before them, were bonafide amateurs in that they pioneered in the unknown world of communications. Simply put, *amateurs are electronic experimenters and pioneers*. Licenses weren't required in those days. Radio regulation didn't really get going until 1912, but that is another story. To be continued next month, when Samuel F.B. Morse arrives on the scene.

From The Mailbox

A monthly feature based on questions submitted by readers concerning amateur radio licensing, let's focus this month on a letter from Richard Durgin of Poplar Bluff, Missouri, concerning getting started in amateur radio.

I am ready to take the Novice test. Now what do I do? Amateur radio is not a closed hobby. Yet outsiders seem to think that it takes some magic combination to "get in." It doesn't. Thousands of amateurs across the nation stand ready to assist you to become a licensed amateur radio operator. There is bound to be one in your home town!

The problem, as we see it, is two-fold. One you have to find someone willing to administer the Novice examination to you, and two, once you locate a qualified volunteer examiner, this person needs to know how to go about the Novice testing procedure.

Let's dispel one of the myths in amateur radio right now. *Anyone* can become a ham radio operator. It takes no special skills whatsoever, whether you are 8 or 80. Furthermore, you don't have to attend any formal training program. All of the needed preparation materials are available mail order for you to review at your leisure. It isn't difficult at all.

The requirements for the beginning Novice amateur radio operator license are minimal. You simply pass a 20 question (usually multiple choice) written examination on elementary radio theory and regulations with a score of 74% or higher and a Morse code test at 5 words per minute. As a general rule, an applicant passes the code test if Morse code text is copied for one minute solid out of a five minute transmission or seven out of ten questions correctly answered about the information transmitted.

Actually, the FCC rules (§Part 97.27[a] and 97.29[c]) do not specify what passing a code test really consists of. This is left up to the volunteer examiner to determine. "The test shall be such as to prove the applicant's ability to transmit correctly by hand key—and to receive correctly by ear—texts in the international Morse code at a rate of not less than five words per minute," is how the regulation reads. Applicants are responsible for knowing the 26 letters of the alphabet, the numerals 0–9, and certain punctuation (period, comma, and question mark) and operating prosigns (AR, SK, BT, and DN.)

The FCC has further stated that it has been their experience that Morse code receiving proficiency is evidence of ability to send. In view of this, it is not necessary that a hand sending code test even be administered at all!

The examination is administered by a volunteer examiner who must hold a current General class or higher amateur radio license. The VE also must be 18 years of age, not be related to the candidate, and not be in a business closely related to amateur radio to preclude any conflict of interest. A volunteer examiner is disqualified if his amateur radio license has ever been revoked or suspended.

It used to be that the VE wrote to the FCC in Gettysburg, Pennsylvania, to obtain the written examination after first administering the code exam. Now the VE constructs and administers both the written and Morse code test. Many—maybe most—qualified amateurs do not know how to go about doing this. Even if you locate a qualified examiner, you may

have a problem getting the proper examinations administered due to lack of proper test administration information on the part of the VE. Here is where we try to help.

At present the Novice test is designed by having the volunteer examiner select 20 questions from a list of 200. A specified number of questions must be selected from each subtopic. The questions are supplied by the FCC, and the answers by the volunteer examiner. The test answer format can be multiple choice, true/false, fill in the blanks, and even essay type.

The current pool of 200 questions could swell to 300 if Novice enhancement gets approved. The FCC is working on this issue right now, and it may well become reality by the time you read this! The new questions will include topics such as repeater, high-frequency voice operation, and others, depending upon what the Commission approves in the way of additional privileges for Novices. There is even a proposal before the FCC that requires two VEs instead of a single VE.

In order to assist, we have predesigned and printed many different Novice examinations all set for administration by a volunteer examiner. All the VE has to do is hand the test to you! When you think you are ready to take the Novice test, contact a local amateur radio operator (General class or higher) and ask if he will administer the Novice test to you. Send us his name and we will forward the necessary written test (FCC Form 610) application form, and instructions directly to him in a sealed envelope. He will have to hand send the code test to you at five words per minute.

In our October 1986 column we mentioned that we had put together a special training kit for new Novice amateur radio operators. The kit, which costs $19.95 plus $2.40 postage ($22.35 in all), allows individuals with no knowledge of amateur procedures or Morse code to become qualified for the Novice license. The package contains cassette tape teaching all needed code characters; five word-per-minute Morse code test preparation cassette tape; comprehensive Novice manual listing a simple paragraph answer to each of the 200 questions; question and multiple-choice answer guide giving choices and correct answers to each of the 200 questions; Morse code telegraph key; Morse code tone oscillator so you can practice sending code; and FCC Rule Book (nearly 200 pages) covering all current regulations. At $19.95 (plus postage) it represents about a 50% saving over the regular price. We thought we might get 50 or so orders. We ended up getting nearly 400, and they are still coming in! It took us a while to reorder and collect all the needed materials, but all orders were shipped. We have stocked up again, and the deal is still available if you want one of these *Novice Packages*.

If you can't locate a qualified amateur to administer the Novice examination when you are ready, contact us and we will give you a list of qualified amateurs in your immediate area. We have a list of every licensed U.S. amateur sorted by city, state, and license class. You simply contact one of the amateurs from the list and ask if he/she would be willing to administer the Novice test to you. Then tell us to whom you want us to send the examination package. We do this at no cost, but please include $1.00 to cover printing and postage. If you are a General class (or higher) licensee, you might want one of these examination kits to keep on hand in the event you want to conduct a Novice examination.

It is also our contention that once licensed, Novices can *easily* upgrade further to higher class licenses without formal training. We have other training packages available covering both the written and code examinations for the Technician, General, Advanced, and Extra class licenses. Send a self-addressed stamped envelope for details. CQ

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WANTED: BOOKS, Pre-1925 Radio, Pre-1900 Electricity and Telegraph, Pre-1940 Television, Books, Magazines, or any other literature. Jim Kreuzer, N2GHD, 6270 Clinton, Elma, NY 14059 (716-681-3186).

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Yagi Antenna Design is based on the series in **Ham Radio Magazine** by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to its editors: Bill Myers, K1GQ; Clarke Greene, K1JX; and Mark Wilson, AA2Z. This ARRL publication stands to be a "classic" that should be added to every radio amateur's technical library. The book is available only in hard cover, and is printed on high quality textbook paper. There are over 210 pages of detailed information on Yagi design. For more detail, refer to the column at right. The retail price is $15.00. Please add $2.50 ($3.50 for UPS) for postage and handling. Also available at your favorite ARRL dealer.

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NOW AVAILABLE: COLLINS: 75A2 RCVR w/mechanical filter conversion, $250. SM-2 Desk microphone, $65. 32S3A, 516F2, 75S3C w/200 & 500 Filters, all round emblem, last model mfg. (3.76 purchased), $1,500. KWM2 with power supply, $395. DRAKE: FS4 synthesizer, $230. Etek FR-4, $185. "C"-Line, $495. NB-4 noise blanker, $95. R4C with 2 filters, 500 & 1500, $330. T4XC xmtr AC4 P.S., $300. MS4 SPKR, $45. TR4CW with AC4 P.S., $325. TR4C, AC4, $295. RV4 VFO, $125. 34PNB, N.B., $110. ICOM: R-71 Gen Cov RCVR, $600. IC-751 XCVR, $770. KENWOOD: SM220 scope, $325. TS-520, $325. TR-7950, $295. R-1000, $275. R-2000, $425. TL-922A Amp, $1050. YAESU: FRG-7 with fine tune, $225. FRG-7000 RCVR, $350. SP-107 P, $79. K3UKW, Tony Musero, 1609 So. Iseminger St., Phila., PA 19148 (215-271-8898).

MILITARY ELECTRONICS: CPRC-26 Manpack Radio, compact, transmits/receives 46–54 MHz FM (6 meters: see March 1985 *Ham Radio*), with battery box, antenna, handset, crystal: $22.50 apiece, $42.50/pair. R-390A Receiver, .5–30 MHz, all modes: $195 checked, $115 repairable. R-108 Receiver, 20–28 MHz FM: $27.50 mint. R-748 Receiver, 130–150 MHz AM single channel: $27.50. ARC-27 Guard Receiver, 220–248 MHz AM single channel: $12.50 mint. 45 Day Replacement Guarantee. Add $4.50/piece shipping (R-390A shipped UPS collect). Baytronics, Dept. CQ, Box 591, Sandusky, OH 44870.

QSL CARDS. Free samples. Shell Printing, KD9KW, P.O. Box 50, Rockton, IL 61072.

REPLACE RUSTED ANTENNA BOLTS with stainless steel. Small quantities, free catalog. Elwick, Dept. 619, 230 Woods Lane, Somerdale, NJ 08083.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath, and all others. Six ½" digits. 5" wide by 1¼" high metal cabinet. Send $2.00 for information and receive a $30.00 discount. Includes accuracy comparison of the simple "BCD" readouts, found in new radios, against our "Calculating Frequency Counter" readouts. Please be specific. GRAND SYSTEMS, Dep't. D, POB 3377, Blaine, Washington 98230.

REVISED 1986–87 AWARDS DIRECTORY OF THE WORLD from VE3GCO/VE3XN, Garry V. Hammond, for $10 US postage paid airmail.

WANTED: Old radio tubes (50's, 845), over 15-year old speaker systems, units, from W.E., RCA, Jensen, JBL, Altec, Tannoy. Equipment from W.E.., Langevin, Mcintosh, Marantz. Tel: 818-576-2642. David, P.O. Box 832, Monterey Park, CA 91754.

QSLs, QSLs, RUSPRINT QSLs: Quantities of 100, 200, 300, more. Full color Old Glory and Liberty, also Parchment, Golden Eagle and others. SASE appreciated. Rt. 1, Box 363-CQ, Spring Hill, Kansas 66083.

CONNECTICUT'S HAM STORE, Rogus Electronics, 250 Meriden-Waterbury Turnpike, Southington, Connecticut 06489 (203-621-2252).

MICROWAVE ANTENNAS from $69.95, Call 1-800-247-1151.

LIQUIDATION SALE: Radar detectors $69.00. Call B&B Inc., 10517 Upton Circle, Bloomington, MN 55431 (1-800-826-7626).

CABLE TV CONVERTERS. Scientific Atlantic, Jerrold, Oak, Zenith, Hamlin. Many others. Visa & M.C. accepted. Toll Free 1-800-826-7623. B&B Inc., 10517 Upton Circle, Bloomington, MN 55431.

DENTRON RADIO: The New Dentron Radio Co. Inc. wants to thank all of you for your great support. Well, it feels real good that all of you out there care. Again, please call or write with your service questions, replacement parts, technical, new product information. Dealers are wanted across the world. A great program. Easy credit terms, floor planning, leasing. Co-op advertising, etc. Dealer inquiries invited both domestic, international. Happy New Year. Dentron Radio, P.O. Box H, East Rockaway, NY U.S.A. 11518. Telephone 516-536-2620.

THE 18TH ANNUAL B*A*S*H will be held on FRIDAY NIGHT of the Hamvention, April 24, 1987 at the Conference Center (Madison Room) of the HARA ARENA AND CONFERENCE CENTER (the same location as the Hamvention) starting at 7:00 p.m. There is no admission charge, and free continuous entertainment. Hot dinner, sandwiches, snacks, and beverages are available. Two exciting top awards, and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. Sponsored by the Miami Valley F.M. Association, P.O. Box 263, Dayton, Ohio 45401.

SELL: ICOM IC-471H, $700, and IC-1271A, $600. Both include internal power supplies and microphones. Like new condition. SASE for list of additional equipment. Bill Giffen, KE0FM, P.O. Box 25602, Colorado Springs, CO 80936 (303-481-4885).

SWITCH SPEAKER AND HEADPHONES without unplugging. Audio control box. One-evening project. Plans 50¢ plus SASE. Richard Bombard, 2607 Elk St., Charleston Hts., SC 29418.

TRADE: World War ONE Signal Corp telegraph set, other items, books, magazines FOR? N4ZB, 1420 Mount Vernon Drive, Holiday, FL 33590.

CONTESTERS: Tired of reaching for the buttons on your memory keyer? Put your memory buttons at your fingertips, modify your Bencher or Brass Racer with the Contest Paddle Base. Gain that competitive edge. Send for free information to: C. Robson Company, 6950 Kreider Rd., Fairview, PA 16415.

ATTENTION: Kenwood TS430S, TS440S, TS940S, ICOM 745 & 751, Yaesu FT-757GX owners! Modification for general-coverage transmit the right way. $5.00 each or 3 for $10.00. Many other mods available. Money order or cash to W. Thomas, P.O. Box 96, Uniontown, PA 15401.

T-SHIRTS, HATS: Order 12 pieces, receive 144 piece price. Write Herb's Pro Shop, RT. 309, Wilkes Barre, PA 18702.

TUBES rare, old, and current, reasonable. Send list for quote. Ted Youngman, 2225 Vigo St., Lake Station, IN 46405.

SELL OR TRADE for Kenwood TS940S or TS930s with Spkr. Two Sets HEATHKITS with crystals, filters, digital analog dials 3.5 to 30.0 and manuals. Two 401 Xmitters, two 303 receivers, two 620 scopes, two 600 spkrs, $500.00 per set. One 1 kw SSB linear amplifier Model HA-14 $500.00 with Pwr supply. Call Joe, KA7AZM, 1-206-588-5804.

WANTED: Hams with an appreciation for craftsmanship and quality to purchase a quartz world-clock mounted in a beautifully finished solid slab of hardwood. For details: SASE to "THE TAXMAN" KA9IRS, 51377 Greenhill Drive, South Bend, IN 46628.

SLEP MAIL-ORDER SPECIALS: Lab Calibrated signal generators: HP8640B AM/FM solid state 500 kHz thru 1024 MHz, see latest HP catalog $5,500.00, HP606A 50 kHz thru 65 MHz $375.00, HP608C 10 mHz thru 480 MHz $345.00, Military TS-403/U microwave 1.8 GHz thru 4.2 GHz $285.00, URM-25D 10 kHz thru 50 MHz $245, TS-510A/U 10 MHz to 420 MHz, military version of HP608D $295.00, HP616B microwave 3.8 GHz thru 7.6 GHz $375.00, HP620A microwave 7 GHz thru 11 GHz $450.00, HP614A 900 MHz thru 2100 MHz $345.00, HP/Boonton 202H AM/FM, 54 MHz thru 216 MHz $275.00 Satisfaction guaranteed. VISA, M/C or check. Add shipping. Write or phone Bill Slep 704-524-7519, Slep Electronics, Highway 441, Otto, NC 28763.

ROSS'$$$$ NEW SPECIALS (March only): KENWOOD TS-430S $694.90, TH-21AT $194.90, TR-2600A $239.90, AT-250 $289.90, TS-780 $759.90. ICOM IC-745 & PS-35 $949.90. YAESU FT-767GX $1569.90, FT-2700RH $1469.90, FRG-7700 $379.90, FRG-8800 $499.90. ALL L.T.O. Phone or send SASE for over 7500 ham-related items in stock for immediate shipment. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, P.O. Box 234, Preston, Idaho 83263 (208-852-0830).

QSL CARDS: Have us make your call into a personalized logo or choose from our selection of high-quality designs. For free brochure write to: Select Design Cards, 611 Webster, Palo Alto, CA 94301.

ROSS'$$$$ USED March SPECIALS: KENWOOD VFO-820 $129.90, TS-700A $329.90, VFO-520 $109.90, TS-520S/WCWFL $409.90. YAESU FT-101E $429.90, FP-301 $95.90, FRV-7700 $75.00, DRAKE TR-7 w/filters $589.90, RV-7 $139.90, WH-7 $89.90, MN-2000 $179.90. Phone or send SASE for USED ITEMS LIST. OVER 7,500 NEW ham items in stock. MENTION AD. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. ROSS DISTRIBUTING COMPANY, 78 South State, P.O. Box 234, Preston, Idaho 83263 (208-852-0830).

HEATHKIT: DC Electronics $35; AC Electronics $45; Semiconductor Devices $45; Trainer $90; Metrics $20; texts only. All plus trainer $215 postpaid. Call (315) 253-6663. W2RUK, 7 Charles, Auburn, NY 13021.

FOR SALE: Amateur radio wall calendars at $5 each, including USA postage. Excellent gift. Enclose shipping label. W6LS, 2814 Empire, Burbank, CA 91504-3297.

WANTED: A schematic diagram and alignment instructions for a Radio Shack Realistic DX-160 receiver. Contact Jim Groll, P.O. Box 4728, Mesa, AZ 85201.

ICOM 745 w/two CW filters, FM board, keyer, mike and PS15 power supply, $750. Marvin Rosen, N3BQA, 20 W. Madison St., Baltimore, MD 21201.

WANTED: SWL cartridge by Microlog, Inc. for Commodore VIC-20; Info-Tech, or AEA RTTY/MORSE interface and software. Douglas D. Shinn, WB8SCD, 113 Henry Street, Ravenswood, WV 26164 (304-273-4280).

ROBOT 400 with B&W VIDEO CAMERA $350.00. YAESU FT-720 R with speaker mic, quick/normal charger, and base pwr supply, other xtras $200.00. I pay shipping. Isaac Leonard, KA2MTD/DA1DX, HHC 649th Engr Bn, APO NY 09081.

ANTIQUES: JOHNSON-VIKING Model 122 Remote VFO (?). Also, Meteor model SB-175 transmitter. Make offer. SASE for info. WB4EGX.

SWAN 350A AC/DC built-in 10-80 meters, manual, $200, U-ship. Midland 13-500 2 meter rig with nine sets of crystals installed, 144-148, $85. FT-101E 10-160 meters, works only on AC, comes with mike and manual, $300. Murch antenna tuner with manual, $75. For more info on above send SASE to Box 518, Whitehouse, FL 32220.

VACUUM RELAY, Military equivalent to Jennings RB1E, Rayvac H8/S2, SPDT, 26 VDC coil, new. $32.00 includes shipping, 48. J.M. Hoffer, 24 Cherry Road, Framingham, MA 01701.

SOFTWARE FOR SALE: Radio Shack Diskmate for Tandy Model 1200PC, shipping prepaid, $105. WB2VJF, please call Bill 201-471-3798.

WANTED: Old Callbooks, 1953 to 1958. W1TSP, 70 Paulson Rd., Waban, MA 02168.

H*A*R*K: Radio Archives newsletter. For youth, elderly, and low incomes. $1/$6 yr. 2308 Garfield #304, Minneapolis, MN 55405.

TRADE: Two-Way Radio Test Equipment for Ham Radio like TS-430, FT-757, TR-9000? K6KZT, 2255 Alexander, Los Osos, CA 93402.

AUGUST 1917 QST, Vol. 2, No. 9, VG Condx. Trade for telegraph item. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

4-1000A PULLS at $75.00 each, 4D32 at $35.00 ea., loctals and octals $2.00, miniatures $1.00 ea. Jennings vacuum variable 300 mmF at 10,000V at $50.00. New heavy-duty power TV transformers at $20.00 ea. new. Levy, W5QJT, 101 East Driftwood #44, Fredericksburg, TX 78624 (tel. 512-997-2534).

NOVEL SIMPLE external module puts any CB on LF/all Ham HF bands. All modes/pwr out. 39¢ stamp for free info. Irv Megeff, KD2EF, 729 Lori Dr. #101, Lake Worth, FL 33461.

NEEDED: ICOM IC-SP2 Speaker and Yaesu TC-2 2M & TC-6 6M converters. C.T. Huth, 229 Melmore St., Tiffin, OH 44883.

VERMONT HAM please help me find telegraph equipment used on the St. J & LC railroad. Dick Randall, K6ARE, 1263 Lakehurst, Livermore, CA 94550.

TEKTRONIX OSCILLOSCOPE PROBES, new, big di$count, SASE for list. Sell or trade for: linear amplifier parts, vacuum capacitors/relays. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

H*A*R*K: Radio Archives "basic gear" bulletin. For youth/elderly and low incomes $1. Electronic Avocations, 2308 Garfield #304, Minneapolis, MN 55405.

WANTED: Any AM 2 meter transceiver such as Gonset, Clegg, etc. I will pay shipping. Joseph Schwartz, K2VGV, 11 Windham Loop, 1JJ, Staten Island, NY 10314. Call 718/698-8069.

12 VOLT DC FANS, brushless. Rotron 3¼ × 3¼ × 1¼, $14.00. Panasonic 2⅜ × 2⅜ × 1¼, $12.00. All items new, includes shipping 48. J.M. Hoffer, 24 Cherry Road, Framingham, MA 01701.

FOR SALE: Swan 350-D, digital readout with built-in power supply in mint condition. $300. Ron, NM4I, 703-944-5626, Meadowview, VA.

COMPACT KENWOOD TM-211A 2M 25 watt, remote speaker. $245 FOB. K1LEC, N. Springfield, VT 05150-0073 (802-886-8121).

DRAKE FANATICS: Showroom clean Drake MN 2000 2 KW antenna tuner. Built-in wattmeter and SWR meter. Manuals and original cartons. You ship. First $225 takes this beauty away!! KA1BFV, 31 Duane Ln., Burlington, CT 06013 (203-673-7802 after 7PM).

FOR SALE: Antique and modern used radio and electronic books, parts and items. (No tubes.) Everything in excellent to brand new cond. SASE for latest list. H. Lash, 19 E. 157th Street, South Holland, IL 60473.

WANTED: 455.5 to 456 kHz crystal. Type holder unimportant. Bob May, K4SE, Box 453, Jonesboro, TN 37659.

ANTIQUE RADIO BUFFS . . . The Antique Radio Club of America provides to members a Journal, Conventions, etc. ARCA, 81 Steeplechase Road, Devon, PA 19333.

30S1 $1800, 2K4-A $1200, 3K $1500. W1FBG 603-964-6658.

WANTED: Vic 20 computer, new or like new condition. KB2QM, 116 Jane Drive, Syracuse, NY 13219 (315-488-6840).

TEN-TEC 2510 $350, Mirage D1010N $250, ARR Gasfet Preamp $50, Astron RS35M Supply $125. K8AC, 6513 Deerview Dr., Raleigh, NC 27606 (919-851-7546).

ICOM IC-22 2M FM, xytls for 20 channels, needs new final $45; 16 key Pipo pad $27; Taylor 5/8 mag. mt ant $15; all for $80. Charles Bright, 4115 Buckley Ridge Ct., St. Louis, MO 63125.

NATIONAL RADIO CO. equipment manuals and NCL-2000 parts, SASE. Maximilian Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

CQ, QST, Ham Radio, and 73 Magazines; 1940s to present, also other radio books, publications. Send large SASE for list. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

YAESU FT-101E, YC601, YO-100, SP-101 PB, YP-150, FV-101B, 300 w. filter, mike, cables, books, cartons, like new, $850.00. U-ship. Phone: 317-738-2497.

TRADE SHURE 55S Mic on Dazor Floating Fixture MP866D (desk boom) for Kenwood AT-130. R.J. Bombard, 2607 Elk St., Charleston Heights, SC 29418 (803-553-2261).

FOR SALE: Heath HW-5400 XCVR w/PS SSB filter and keypad entry, $600. WA2HAL 212-877-0980.

WANTED: TV-506, HEIGHTS or UNIVERSAL aluminum towers mint, round 51S1, S-line. T.N. Colbert, Burton, OH 44021.

FOR SALE: 150–174 30–50 MHz FM receiver, tube-type, made by Monitor Radio $80 or trade for working 2 meter FM transceiver, mobile or base doesn't matter. Send SASE for info or inquiries. J. Ballard, 352½ College St., Woodland, CA 95695.

FOR SALE: Argonaut 509, Manual, Excellent, $200; HW-8, power supply, rechargeable battery, $105; MFJ 1621 portable transceiver antenna, 10–40 meter, mint, $52. KE0JF, Mark Bills, P.O. Box 116, Mystic, IA 52574 (515-647-2839).

WANTED: Copy of manual for Gonset G-63 receiver; Alvin Bernard, P.O. Box 38313, Orlando, FL 32819 (305-351-5536).

HW-8 FANS: The New Hot Water Handbook is here. Second Edition, Spiral bound. US $5.00, DX $7.00 postpaid. Send to Michael Bryce, WB8VGE, 2225 Mayflower NW, Massillon, OH 44646.

AWA's, "The Old Timers Bulletin," 1983 thru 1985, wanted. Dick Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

ANTENNA SUPERMARKET half-size 80 meter dipole (approx. 66 ft.) (used) $23; Heathkit IG-102 RF signal generator $25. Charles Bright, 4115 Buckley Ridge Ct., St. Louis, MO 63125.

NEED SCHEMATIC and connecting power plug for Gonset, model 3025-B, 2 meter AM transceiver, 6/115 VAC. Joseph Schwartz, K2VGV, 11 Windham Loop, 1JJ, Staten Island, NY 10314 (Tel: 718-698-8069).

FOR SALE: New 1¾" × 18 ft. antenna boom, .052 wall, 6061-T6 aluminum, 6 ft. sections with couplers. Shipped UPS for $20.00. George Shira, Rt. #7, Box 258, Anderson, SC 29624.

WANTED: Heathkit HG-10B VFO. John V. Guy, KA6JJZ, 1651 Catalpa Drive, Apt. 2C, Anaheim, CA 92801.

ICOM station for sale, seen in March and Sept. CQ VHF section. Complete from Yagis to ground rods, computer, etc. 6M legal limit amp, one of a kind. All radios mint with boxes. WILL NOT BREAK UP. $4000 FIRM. Call for details. 606-234-1799, Ron, N4KCM.

WANTED: A Drake linear amplifier, Model L-7 or an L-75. Phone 303-694-2145, Bill, 3277 E. Phillips Dr., Littleton, CO 80122.

FOR SALE: Heath HW-8 mint, AC supply, headphones, manuals, and modification booklet, $125. K2EV, Marty Yoskowitz, 4 Hereford La., New City, NY 10956 (eves. 914-638-3855).

WANTED Vacuum capacitors, vacuum relays and Eimac power tubes, sockets, and chimneys. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

FOR SALE: Heath General course, TET 2-element 40M beam, Vic 20 with cassette, also with Kantronics interface, with board. KD9TY, Ken Wolfe, Box 134, Buffalo, IN 47925 (219-278-7808).

WANTED: Davco DR-30 receiver; socket for 861 tube. Al Faragher, KC9IV, 318 W. 3rd Ave. N, Aurora, MN 55705.

WANTED: 1940-1941-1942 ARRL Radio Amateur's Handbooks in good condition. Send price and condition to Adelbert J. Smith, W7JQY, 3410 Peninsula Rd. #226, Oxnard, CA 93030.

WANTED: Kenwood DM-81 dip meter, AEA CK-2 keyer, Palomar Noise Bridge, Kenwood antenna tuner, back copies of Radiosport. AA6EE, 16832 Whirlwind, Ramona, CA 92065 (619-789-3674).

WANTED TO SWAP: Ham radio related programs for Commodore 64/128. Send a disk of public domain programs receive a disk back. Don Trayes, WB4CVH, 38 Elmwood Place, Goose Creek, SC 29445.

WANTED: Old Allied "Ocean-Hopper" super-regenerative receiver w/plug-in coils. State condition and price. KG1V, 17 Heritage Road, Acton, MA 01720.

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However you decide, you get all this operating flexibility: Powerful 5-watts output (4.5 watts on 440 MHz). Battery saver. Push-button recall of 10 memories, each that independently stores receive frequency, standard or non-standard offset, even optional tone encode and decode.

Push-button scanning routines for scanning all memory channels, selected ones, or all frequencies between adjacent memories. And a priority feature to return you to a special frequency.

You also get a high/low power switch, power meter, backlit display, 500-mAh battery, wall charger, and soft case. Plus a choice of many interchangeable options, including a VOX headset, fast charger, hard leather case, and plug-in subaudible tone encoder/decoder for controlled-access repeaters.

Let Yaesu's 220-MHz FT-109RH, 2-Meter FT-209RH and 440-MHz FT-709R give you the decided advantage in HT performance and upgrade ability. It may be the most enjoyable HT buying decision you ever make.

220 MHz

2 Meters

440 MHz

YAESU

CIRCLE 9 ON READER SERVICE CARD

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011. (513) 874-3100.

Prices and specifications subject to change without notice.

ICOM IC-275

THE VHF SUPERSTAR!

- **All Mode Operation: FM, SSB, CW, Packet**
- **Wideband Reception (from 138 to 174MHz)**
- **Packet Compatible (with front panel DATA switch)**
- **2-Meter Transceiver with the features of an HF**
- **DDS (Direct Digital Synthesizer)**

When you're ready to experience all the multimode excitement 2 meters offers today's amateur, you're ready for the glamorous new IC-275. Its FM capabilities are unlimited, its wideband receiver coverage (138 to 174MHz, Tx 140.1 to 150MHz) includes public services and NOAA weather bands, plus CAP and MARS, and its SSB/CW operations are an OSCAR enthusiast's and VHF DX'ers delight. No other VHF transceiver is comparable to the IC-275 in features, performance, reliability and ease of operation.

Outpacing the Competition. The IC-275 includes dual VFOs, 99 tunable full function memories, true passband tuning, crystal resonant notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, multifunction meter, velvet-smooth tuning knob and an easy-to-read amber LCD readout with variable backlight.

Four Scanning Modes. Full spectrum, programmable limits, mode scan and memory scan with selectable lock-out (scans 99 memories in five seconds!).

An FM'ers Dream Rig. Separate knobs for band tuning and memory selection. Standard repeater splits built-in; odd splits programmable. Includes 32 built-in subaudible tones, and actual subaudible frequency is displayed. Unit supplied with HM-12 up/down scanning mic and DC cord.

It's Packet Ready with rear connector for audio input/output and front panel data switch that reduces switching time to less than 5 ms and mutes the mic.

Two Versions to Fit Your Needs. The **25 watt IC-275A** includes a built-in AC supply. The **100 watt IC-275H** uses an optional external AC supply. Both units are the same size as the ultra compact IC-735 HF rig, and are DC cord interchangeable. You can alternate their fixed or mobile use!

The Matching ICOM IC-475 UHF Transceiver is also jam-packed with deluxe multimode features, and it's the ultimate OSCAR mate for the IC-275. Two versions, the 25 watt **IC-475A** and the 75 watt **IC-475H**, are available to suit your needs.

Exciting New Options include a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-475, FL-83 500Hz 10.7491MHz CW filter and an AG-25 mast mounted preamp.

ICOM

First in Communications

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CIRCLE 58 ON READER SERVICE CARD