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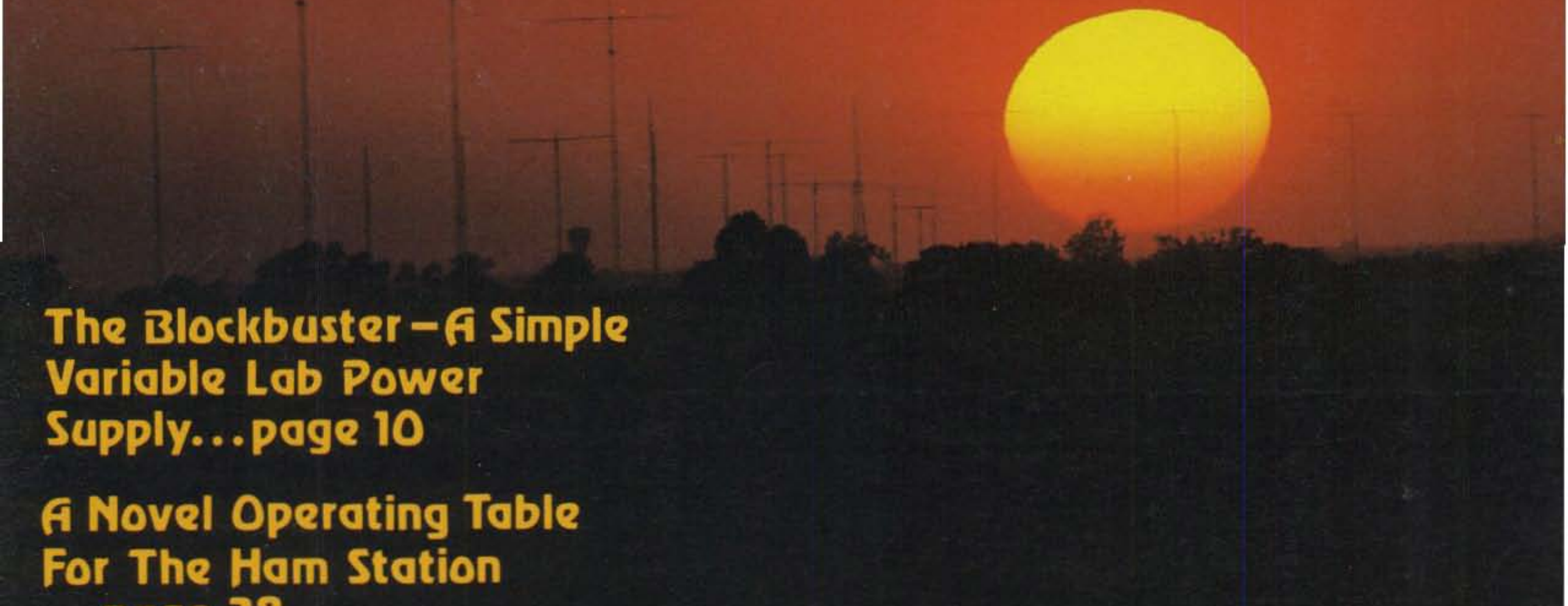

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THE RADIO AMATEUR'S JOURNAL

Top-Notch.

VBT, notch, IF shift, wide dynamic range

TS-830S

Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

TS-830S FEATURES:

- **160-10 meters, including three new bands**
  Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- **Wide receiver dynamic range**
  Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.
- **Variable bandwidth tuning (VBT)**
  Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.
- **IF notch filter**
  Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.
- **IF shift**
  Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.
- **6146B final with RF NFB**
  Two 6146B's in the final amplifier provide 220 W PEP (SSB)/180 W DC (CW) input on all bands. RF negative feedback provides optimum IMD characteristics for high-quality transmission.
- **Built-in digital display**
  Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.
- **Adjustable noise-blanker level**
  Built-in noise blanker eliminates pulse- type (such as ignition) noise. Front-panel threshold level control.
- **Various IF filter options**
  Either a 500-Hz (YK-88C) or 270-Hz (YK-88CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.
- **More flexibility with optional digital VFO**
  VFO-230 operates in 20-Hz steps and includes five memories. Also allows split-frequency operation. Built-in digital display. Covers about 100 kHz above and below each 500-kHz band.
- **Built-in RF speech processor**
  For added audio punch and increased talk power in DX pileups.
- **RIT/XIT**
  Receiver incremental tuning (RIT) shifts only the receiver frequency, to tune in stations slightly off frequency. Transmitter incremental tuning (XIT) shifts only the transmitter frequency.
- **SSB monitor circuit**
  Monitors IF stage while transmitting, to determine audio quality and effect of speech processor.

More information on the TS-830S is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

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Matching accessories for fixed-station operation:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/ SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- TL-922A linear amplifier
- SM-220 Station Monitor
- PC-1 phone patch
- HC-10 digital world clock
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF
- HS-5 and HS-4 headphones
- MC-30S and MC-35S noise-cancelling hand microphones

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

Small wonder.

Processor, N/W switch, IF shift, DFC option

TS-130S/V

An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP.

TS-130 SERIES FEATURES:

- **80-10 meters, including three new bands**
  Covers all Amateur bands from 3.5 to 29.7 MHz, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz. VFO covers more than 50 kHz above and below each 500-kHz band.
- **Two power versions...easy operation**
  TS-130S runs 200 W PEP/160 W DC input on 180-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands. Solid-state, wideband final amplifier eliminates transmitter tuning, and receiver wideband RF amplifiers eliminate preselector peaking.
- **CW narrow/wide selection**
  "N-W" switch allows selection of wide and narrow bandwidths. Wide CW and SSB bandwidths are the same. Optional YK-88C (500 Hz) or YK-88CN (270 Hz) filter may be installed for narrow CW.
- **Built-in speech processor**
  Increases audio punch and average SSB output power, while suppressing sideband splatter.
- **SSB narrow selection**
  "N-W" switch allows selection of narrow SSB bandwidth to eliminate QRM, when optional YK-88SN (1.8 kHz) filter is installed. (CW filter may still be selected in CW mode.)
- **Sideband mode selected automatically**
  LSB is selected on 40 meters and below, and USB on 30 meters and above. SSB REVERSE position on MODE switch.
- **Built-in digital display**
  Six-digit green fluorescent tube display indicates actual operating frequency to 100 Hz. Also indicates external VFO or fixed-channel frequency, RIT shift, and CW transmit/receive shifts. Backed up by an analog subdial.
- **IF shift**
  Allows IF passband to be moved away from interfering signals and sideband splatter.
- **Built-in RF attenuator**
  For optimum rejection of intermodulation distortion.
- **Single-conversion PLL system**
  Improves stability as well as transmit and receive spurious characteristics.
- **Built-in VOX**
  For convenient SSB operation, as well as semibreak-in CW with sidetone.
- **Effective noise blanker**
  Eliminates pulse-type interference such as ignition noise.
- **Compact and lightweight**
  Measures only 3-3/4 inches high, 9-1/2 inches wide, and 11-9/16 inches deep, and weighs only 12.3 pounds.

Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.

More information on the TS-130 Series is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

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Matching accessories for fixed-station operation:

- PS-30 base-station power supply (remotely switchable on and off with TS-130S power switch).
- SP-120 external speaker
- VFO-120 remote VFO
- MC-50 50kΩ/500Ω desk microphone

Other accessories not shown:

- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- AT-130 compact antenna tuner (80-10 m, including 3 new bands)
- MB-100 mobile mounting bracket
- MC-30S and MC-35S noise cancelling hand microphones
- PC-1 phone patch
- TL-922A linear amplifier
- HS-5 and HS-4 headphones
- HC-10 world digital clock
- PS-20 base-station power supply for TS-130V
- SP-40 compact mobile speaker
- VFO-230 digital VFO with five memories

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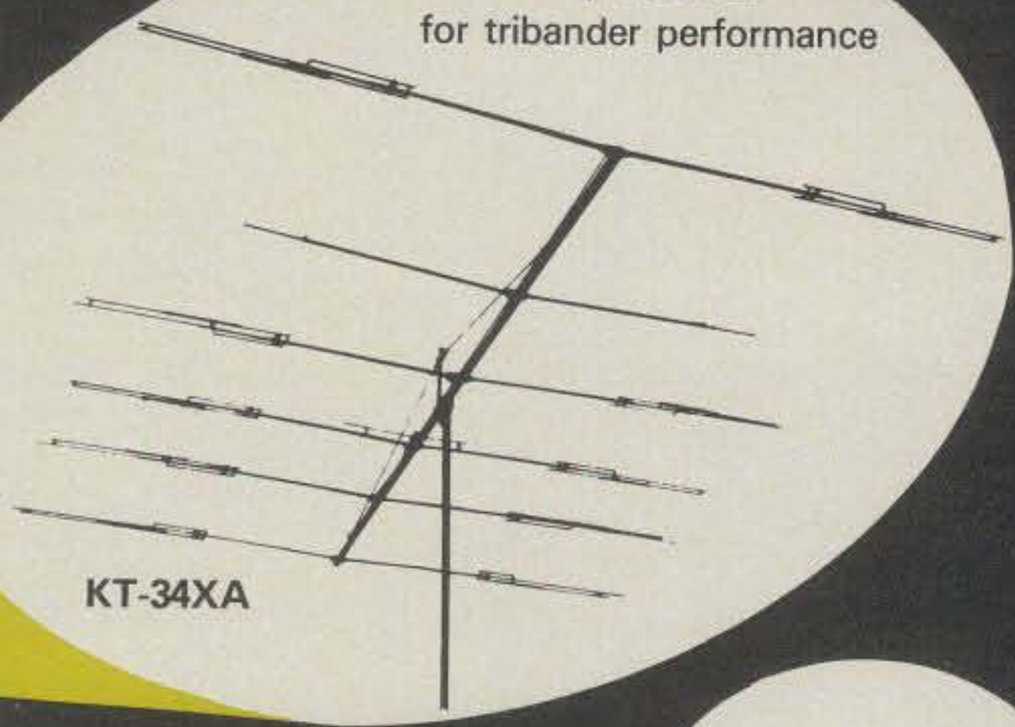

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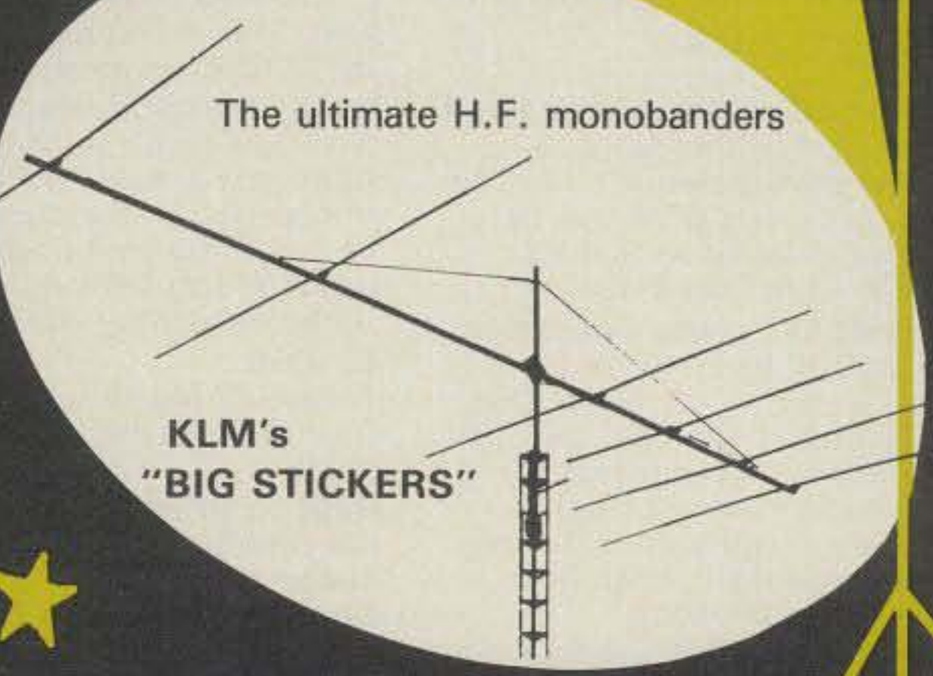

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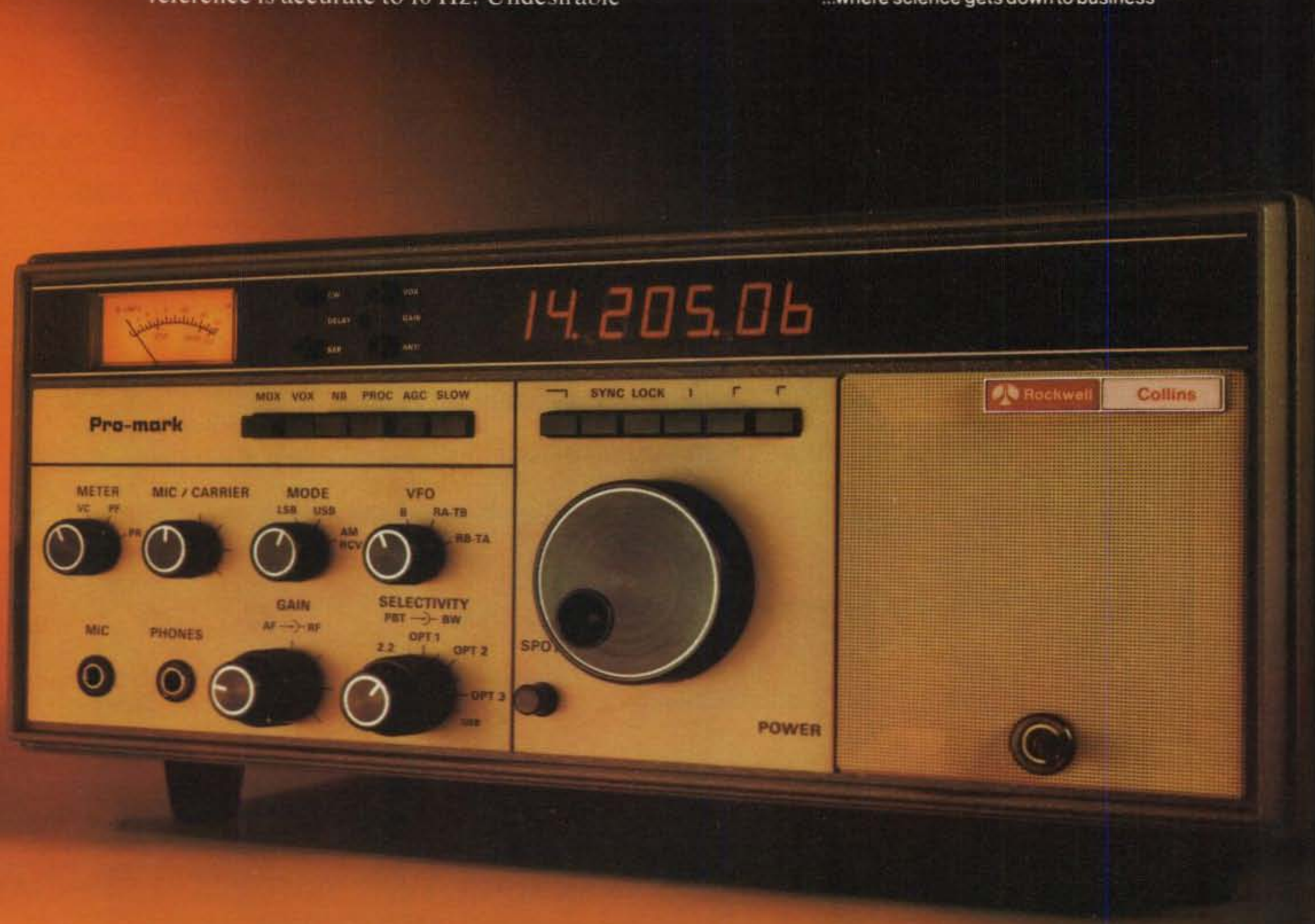

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CQ The Radio Amateur's Journal

ON THE COVER: Ray Adler, KB5UN took this dramatic shot of the N5AU "Antenna Farm" from a distance of 4 miles. We thank both Ray and Gordon, N5AU for making it possible.

SEPTEMBER 1981 **VOL. 37, NO. 9**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

Summer is an interesting time for amateur radio. Almost every weekend there's either a hamfest to go to or an operating event to take part in. It's also theoretically the best time to work on antennas both new and old in preparation for the long winter ahead. I say theoretically, because as we all know the finishing touches are done as the ice forms over the elements (and fingers).

With an abundance of nice weather it's also a good time to get out and meet people and get rid of the winter palor that amateurs are prone to. I drove down to the Philadelphia area, Montgomeryville to be exact, and visited Jack Burghart of Philadelphia Resins Corp. They make the Philystran® guying material. I watched them make the rope-like material and jacket it in various combinations for a multitude of uses. The basic ingredient is Kevlar®, a Dupont fibre that's super strong, tough, and impervious to just about everything. It's the same material used in weaving bullet-proof vests.

In early June we went to Dallas for HamCom, a pleasant mixture of amateur equipment and computers for all to see. We had a terrific reception at our booth, and as usual, Texans tend to be exuberant. In the last four years the show has grown remarkably in both attendance and spirit. They also have a great flea-market. I did manage to find a few "toys" that I had to have, and so I sat with them on my lap for the whole flight back. I scheduled my trip to allow an extra day so that I could see the folks at AGL for a look-see at the antenna system that I've heard so much about.

I flew into Dallas early on Thursday and called Bill Kennamer, K5FUV, of AGL (he also writes a continuing DX series for us in his spare time). I met Bill and he took me on a tour of the new store. They have just about everything they sell on line in an operating position so that the customer can try it out before buying. It looks like a great spot for a Saturday morning hangout for the locals. After lunch we drove north of Dallas to a small town that's become a notable spot on the amateur radio map, Rockwall.

Rockwall is the home of Gordon Fogg, N5AU, who is also the owner of AGL. Gordon's home is at the crest of a rolling hill and is not too much different from the great number of very nice, comfortable homes in the Dallas area. What sets this one apart, really apart, is the antenna system. You can't help but notice the "antenna farm" from at least a mile or two away. If you are crass enough to count, there are 24 very large towers supporting very large antennas comprising one heck of an antenna system. Gordon's passion is contests, and he is putting together an "ultimate" contest station.

The house was built recently with amateur radio in mind by a local contractor who is also a ham. The radio room is the size of most living rooms and boasts five complete operating positions on custom operating tables. There is over a one-half mile of coax and rotor cable running through the walls. I was hoping to get some pictures of this unique setup, but in the best tradition of Murphy, the Dallas area and most of Texas was inundated by bad weather and lots of rain. So much for dragging a heavy camera bag around the country. However, we're putting together a picture story of the first N5AU contest effort.

The following Monday (after arriving home from HamCom late Sunday evening) I started a week on jury duty which kept me out of the office during the day. Jury duty is a unique way to spend a week. It's not at all like the movies, and it certainly gives you a different, if not skewed, perspective of justice and the judicial process.

In mid-June Dick and I went to Washington D.C. for the AFCEA show (Armed Forces Communications and Electronics Association). Although this is primarily communications equipment for government, commercial, and military services, many of these same exhibitors manufacture amateur equipment. We didn't have too much time to spend looking at the very impressive exhibits (some 500 in number), as we went specifically to attend the annual AFCEA Amateur Radio Operator Luncheon. Ted Cohen, N4XX, our Washington Correspondent, hosts this luncheon for amateurs in industry and government service.

Two days later, Dick and I were off to Atlanta for the 53rd Atlanta Hamfest. Needless to say, it was very warm and humid in Atlanta, but the heat didn't put a damper on having a good time. This show also solicited and attracted exhibitors and people who were primarily interested in computers. However, once some of them had a close-up look at amateur equipment, you could tell that there was definite interest and enthusiasm and that spark that attracts us all. Of course, the other side of the coin is also true, in that amateurs with little knowledge of computers had a fantastic time being exposed to and learning about them.

The balance of the summer should be spent closer to home catching up on mail and preparing some really great features for *CQ*. One of the recurring messages we receive at shows is how much everyone likes what we've been doing the last two years. While it is always nice and satisfying to hear praise heaped on *CQ*, and granted it does flatter our egos, we can't rest on whatever laurels we've garnered. Like Avis and Frank Borman of Eastern Airlines, we've got to try harder and do it better each and every month. The response to our Antenna Special issue was extremely good, so we are planning a few more special issues for the near future.

By now most of you know that the reply date for comments on PR Docket 80-729 (Revision of the Amateur Radio Service Rules into "Plain Language") has been extended two months beyond the original date. I think that this whole fiasco is a prime example of waste. I would like to think that the original idea to simplify was done in response to demand for or in answer to requests for this undertaking. It wasn't. I would like to think that there is no sinister plot against amateur radio in these changes which ultimately can destroy amateur radio. There isn't, and I can believe this. I believe we are witnessing the failure to think things through, the lack of a purpose or reason, the creation of "make work" for the sake of doing something, and the utter disregard or ignorance of what amateurs have been doing for well over a half century. Through and by the "old rules," amateurs have led American technology in both electronics and communication techniques. Via these same "old rules" amateurs have, through our *unique* service, saved thousands of lives throughout the world, aided dramatically in countless disaster relief efforts, and worked diligently to alleviate suffering and misfortune at every

(continued on page 106)

Here's a Concept You Haven't Seen In Amateur Radio For A Long Time— Low Price.

The right design — for all the right reasons. In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

Low power or high power, ARGOSY has it. Now you can enjoy the sport and challenge of QRPp operating, and, when you need it, the power to stand up to the crowds in QRM and poor band conditions. Just flip a switch to move from true QRPp power with the correct bias voltages to a full 100 watt input.

New analog readout design. Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

The right receiver features. ***Sensitivity*** of 0.3 μV for 10 dB S+N/N. ***Selectivity:*** the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB. Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. ***Offset tuning*** is ± 3 kHz with a detent zero position in the center. ***Built-in notch filter*** has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of the i-f type has 50 dB blanking range. ***Built-in speaker*** is powered by low-distortion audio (less than 2% THD)

The right transmitter features. ***Frequency coverage*** from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. ***Convertible power:*** 100 or 10 watts input with 100% duty cycle for up to 20 minutes on all bands. ***3-function meter*** shows forward peak power on transmit, SWR, and received signal strength. ***PTT*** on ssb, ***full break-in*** on cw. PIN diode antenna switch. ***Built-in cw sidetone*** with variable pitch and volume. ***ALC control*** on "high" power only where needed, with LED indicator. ***Automatic*** normal sideband selection plus reverse. ***Normal 12-14V dc*** operation plus ac operation with optional power supply.

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Announcing

● **Three Mile Island DXpedition** - The Central PA DX Club will hold a TMI Fun DXpedition on August 22-23 from 1200Z Saturday until 2100Z Sunday. Tentative Frequencies on phone are 3900, 7240, 14260, 14290, 21325, 21375, 28625, and 146.58. Tentative CW frequencies are 21125 and 7125. The callsign used will be WB3DNA/portable TMI. A QSL card will be sent to all contacts upon receipt of an SASE or IRCs. QSL to CPDXC, c/o WB3DNA, T. Fanus, 6140 Chambers Hill Road, Harrisburg, PA 17111.

● **K2BSA/4 QSL Information** - QSL's for station K2BSA/4, which operated from the 1981 National Scout Jamboree at Ft. A.P. Hill near Fredericksburg, Virginia from July 27 through August 4th, should be sent with a business-size s.a.s.e. to K2BSA/4 Jamboree, c/o ARRL, 225 Main St., Newington, CT 06111 for a special commemorative QSL.

● **Ed Redington Memorial Scholarship Fund** - 1981 contributions for this fund set up in the memory of W4ZM are now being requested. Donations in any amount will be gratefully accepted and acknowledged. Please send your contributions to Foundation for Amateur Radio, Ed Redington Scholarship Fund, c/o Richard F. Vincent, K3AO, RFD #1, Box 230, Bryantown, MD 20617.

● **Special Events Station N∅ARU/∅** - This special event station, "Fire Muster," will be on the air September 12 from 1400–2200 UTC commemorating Burnsville, Minnesota's Third Annual Fire Muster. Operating frequencies include 7.260, 14.285, 21.285, 28.550 MHz, ±5 kHz. Local 2-meter contacts will be on 16/76. Stations wishing a commemorative QSL should send an s.a.s.e. to N∅ARU, c/o David L. Justis, 14129 Frontier Lane, Burnsville, MN 55337, or via the ARRL DX Bureau.

● **Warwick, Rhode Island 50th Anniversary Special Event** - On September 12 and 13 from 1300Z to 2200Z Warwick radio amateurs are sponsoring a special event to commemorate the 50th anniversary of Warwick, Rhode Island. Contact a participating Warwick amateur to receive a certificate signed by the mayor of the city. Frequencies are: Phone—28750, 21380, 14300, 7275, 3950; C.W.—28075, 21075, 14075, 7075, 3575; Novice—21175, 7125. Mail QSL and three first-class stamps to Pat Mancini, K1COI, 11 Amherst Dr., Warwick, RI 02889. For more information, contact Robert A. Weigner, KB1C, 61 Kirby Ave., Warwick, RI 02889.

● **Sweetwater ARC Mini-DXpedition** - On September 12–13 the Sweetwater ARC of Wyoming will be conducting a mini-DXpedition to old Ft. Bridger, Wyoming. Operation will be from 1800 GMT on the 12th to 1800 GMT on the 13th on 7.250, 3.950, 14.300, 21.400, 28.580 ±5 kHz. C.W. to be announced on phone frequencies. A donation of $1 is requested to receive a special certificate. QSL to D.L. Zwemke, KB7LZ, 1010 Bridger Dr., Green River, Wyoming 82935.

● **W9EEB Special Event Station** - The Morton ARC of Morton, Illinois, will operate station W9EEB during the annual Morton Pumpkin Festival. The Pumpkin Award will be issued to all who QSL. Operation will be September 16–18 from 2300 to 0200 UTC on 7.280, 14.280, 21.380, and 28.680 plus or minus QRM. Send QSL and large s.a.s.e. to W9EEB, 701 Columbus Ave., Morton, IL 61550.

● **Woodland ARC Station W8FM** - To commemorate the opening of the Gerald R. Ford Museum, the Woodland ARC will operate station W8FM on September 17 and 18 from 1600 to 0000 UTC, and on the 19th from 1300 to 0100 UTC. Phone frequencies are 28.650, 21.410, and 14.310 MHz. To receive a certificate QSL to W8FM, P.O. Box 6102, Station C, Grand Rapids, MI 49506.

● **DXpedition to Cedar Island** - The McHenry County Wireless Association has announced a DXpedition to Cedar Island for September 19 and 20. No amateur radio activity has ever before taken place from this island on Pistakee Lake in McHenry County, Illinois. The call used will be KB9I with expected frequencies of 21365 and/or 7265.

● **W5RIN To Operate During 80th Anniversary of Spindletop** - This operation will take place on September 26 and 27 from 1700Z to 2300Z UTC. C.W. will be in the low 25 kHz of the Novice 10, 15, 40 meter band plus or minus QRM. Phone in the low 25 kHz of the general portion of the 10, 15, 20, 40 meter band plus or minus QRM. Listen for "CQ Spindletop" on phone and "CQ SP" on CW. Send QSL and $1 for a certificate to Certificate Manager, BAR & RC, 3090 S. Major Dr., Beaumont, TX 77707.

(continued on page 105)

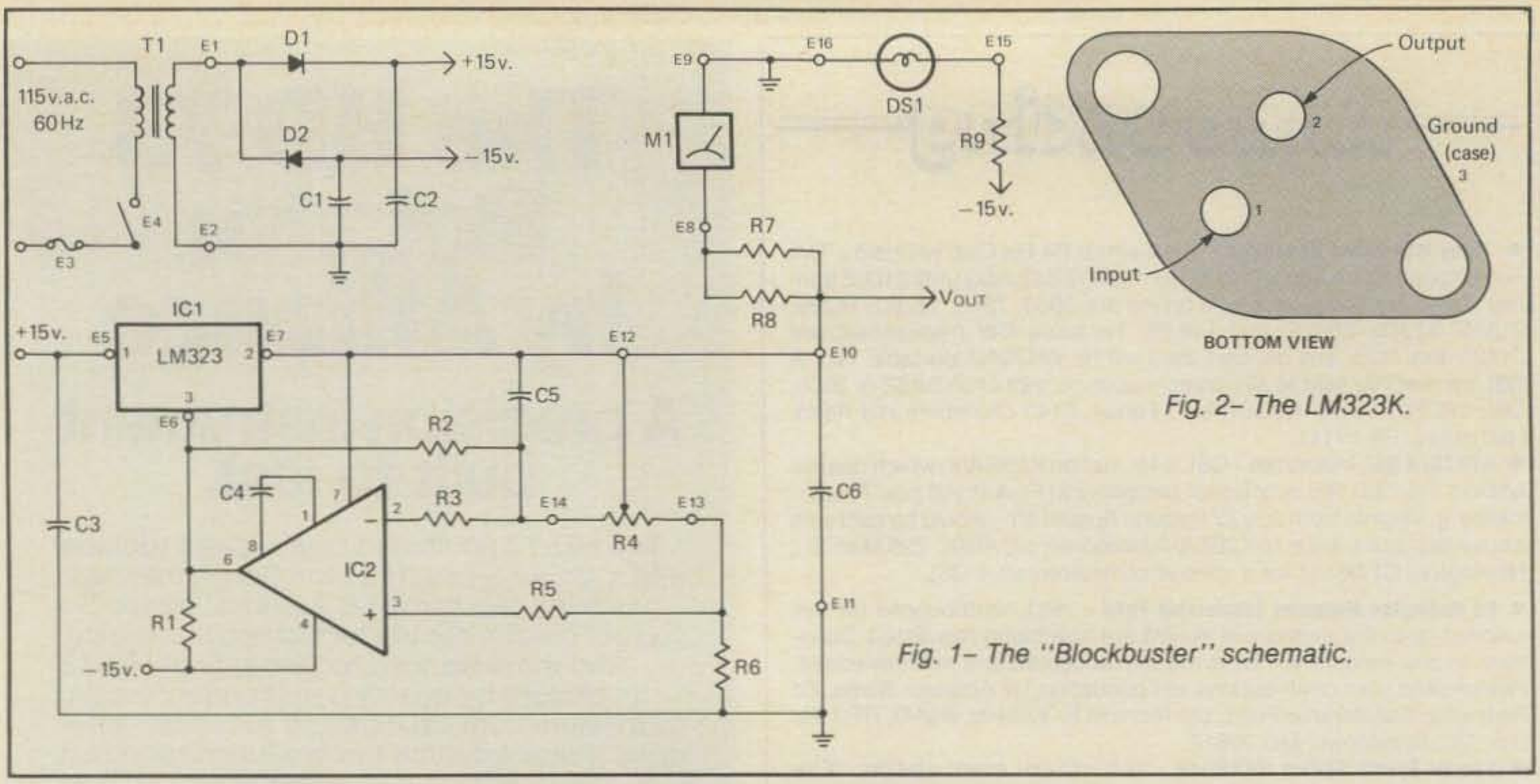

Fig. 1– The "Blockbuster" schematic.

Fig. 2– The LM323K.

Here's an excellent construction project that will find plenty of use around the shack. You will also note that you were taught some basics along the way and it didn't hurt at all.

The Blockbuster: A Simple Variable Lab Power Supply

BY VAUGHN D. MARTIN

The Blockbuster is a relatively simple variable lab power supply with a 0–10 v.d.c. range and with a whopping 3 amp output capability.

The basis of the project, which has only 2 IC's, is an LM323K voltage regulator from National Semiconductor. This is a three-terminal positive voltage regulator with a fixed preset value of + 5 v.d.c. This 3 amp regulator is virtually blowout proof. It possesses current limiting, power limiting, and thermal shutdown. It provides all of the advanced features of the LM109 1 amp regulator, which is a very popular device; the only difference is the output capability.

If used in the fixed output voltage configuration, no external components are required; however, if the device is more than 4 inches from the filter capacitor, a 1 μF solid tantalum capacitor is recommended to be used on its input. A 0.1 μF capacitor may be used on the output, depending on the application. That is, if used in a fast switching digital logic application, voltage transient spikes often occur and this capacitor takes care of them nicely. This same capacitor can serve to swamp out stray capacitance. The regulator's nominal output voltage is 5.0 v.d.c. ± 0.2 v.d.c.

Note fig. 1, the schematic. It is obvious that this fixed output voltage regulator is going to be manipulated to give it a variable output range and also that quite a number of external components are used to create this desired effect which is in strict contradiction to the opening comment about few if any external components required. Bear with me and all this will hopefully become very clear.

Refer to fig. 2, a pictorial representation of the regulator's package and its schematic. Note that this three-terminal device has only two terminals protruding

**114 Lost Meadows, Cibolo, TX 78108*

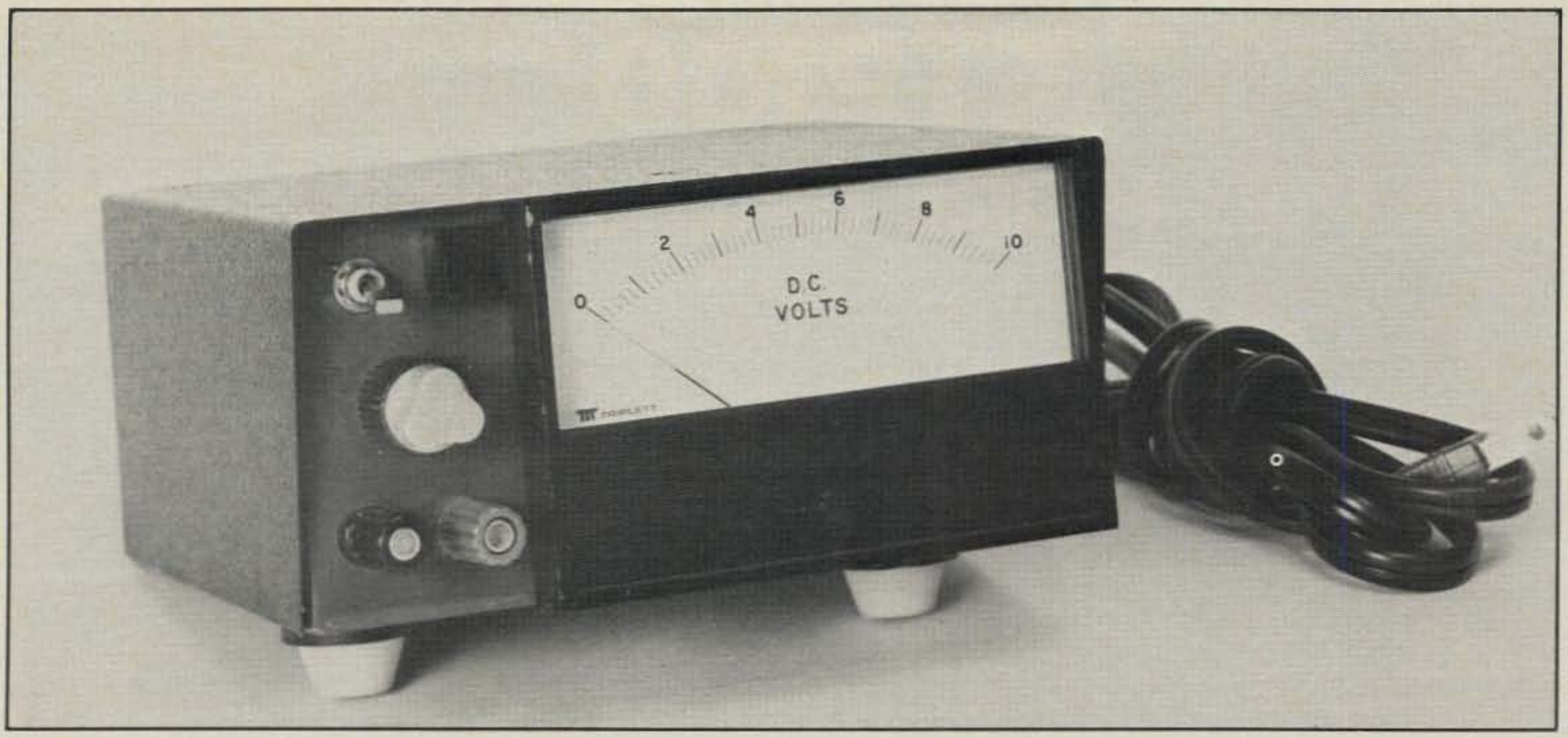

Fig. 3– The finished product.

from its underside. The missing third "terminal" is the case itself, which is ground.

Fig. 1 shows an operational amplifier, also called an "op amp" in the circuit. This op amp deserves some explanation. An op amp almost always has a differential amplifier as its first stage and a class-B push-pull emitter follower as its last stage. Its schematic symbol is the traditional amplifier symbol of a triangle. There are two inputs and one output. These two inputs are marked (+) and (–.) for noninverting and inverting inputs respectively. The op amp amplifies the algebraic difference appearing on these inputs. The (+) input indicates that the input and output are in phase; conversely, the (–) input indicates that the input and output are 180° out of phase. Basically, the op amp's purpose in this application is to supply the regulator's ground with a +5 to –5 v.d.c. reference. Obviously, when the regulator's ground pin is at –5v, its output, which is normally +5v, is –5v down from that, or 0 v.d.c. Conversely, when the ground pin of the regulator is raised above ground, e.g., +5 v.d.c., then its normally +5 v.d.c. output is raised by this amount to +10 v.d.c. Varying the pot varies the op amp's output from this –5 to +5 v.d.c. extreme, causing the regulator to be offset by these amounts and giving you the ability to make a fixed output voltage device a variable output voltage device.

Construction

The finished project is shown in fig. 3. The PC artwork pattern is shown in fig. 4. All components go on the non-foil side, but looking closely at fig. 5, you can see the foil pattern showing through to a sufficient degree to get the proper orientation for the components, plus their reference designators are etched on the board. Resistor R7 is optional for meter trimming. Resistor R9 is off of the board and is a series current limiting resistor for the display; its size largely depends on the type of visual indicator used. If an LED visual indicator is used, then this resistor should be approximately 910 ohms. The E16 hole in the board is next to the E15 hole but is obscured by the radial lead capacitor C1;

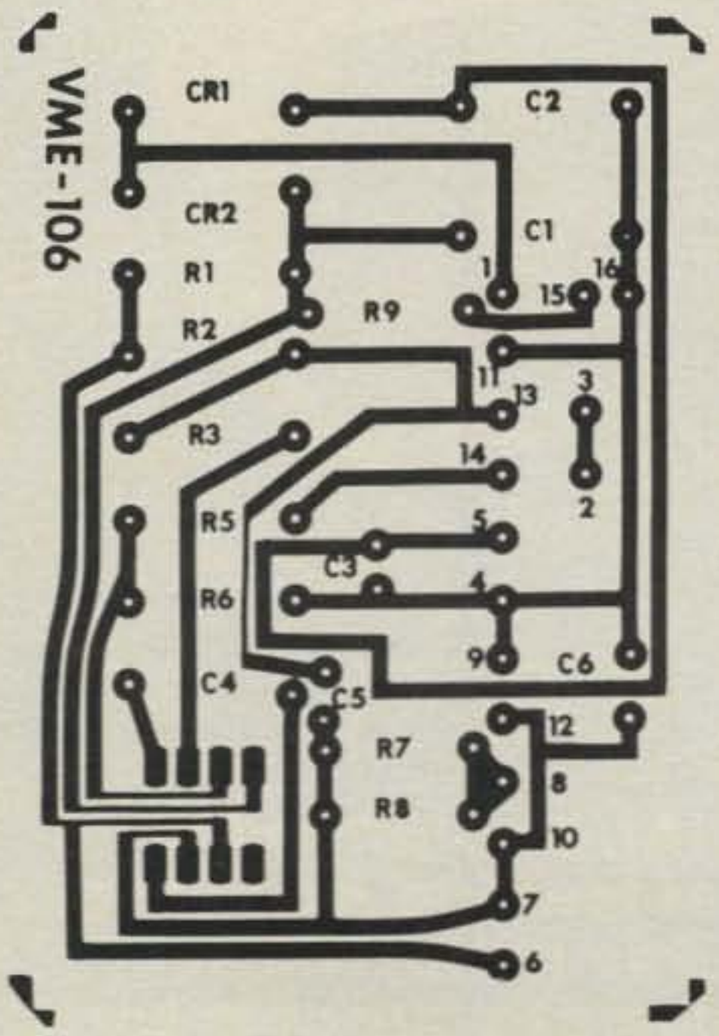

Fig. 4– The PC artwork pattern.

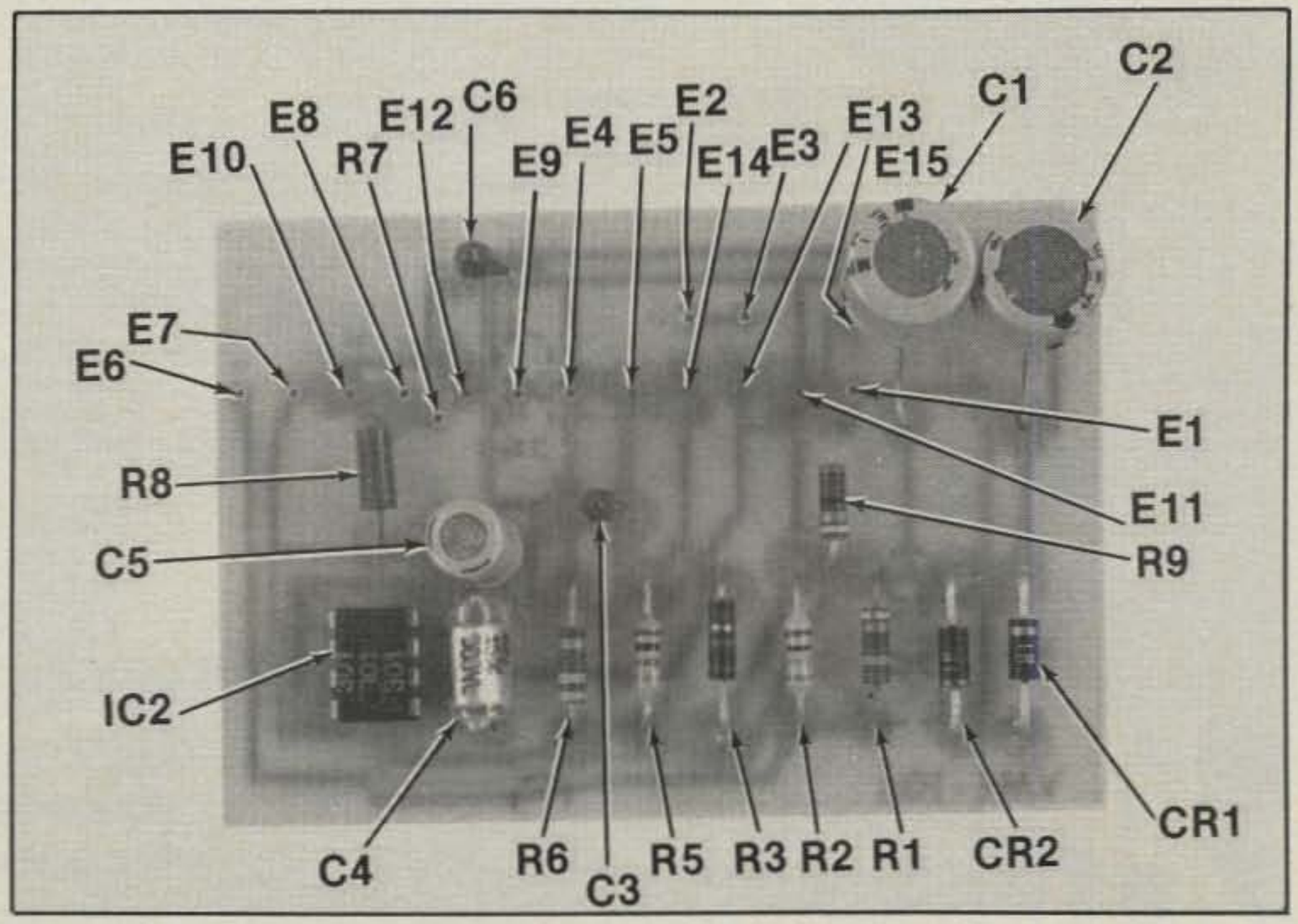

Fig. 5– The component placement photo.

CT2100

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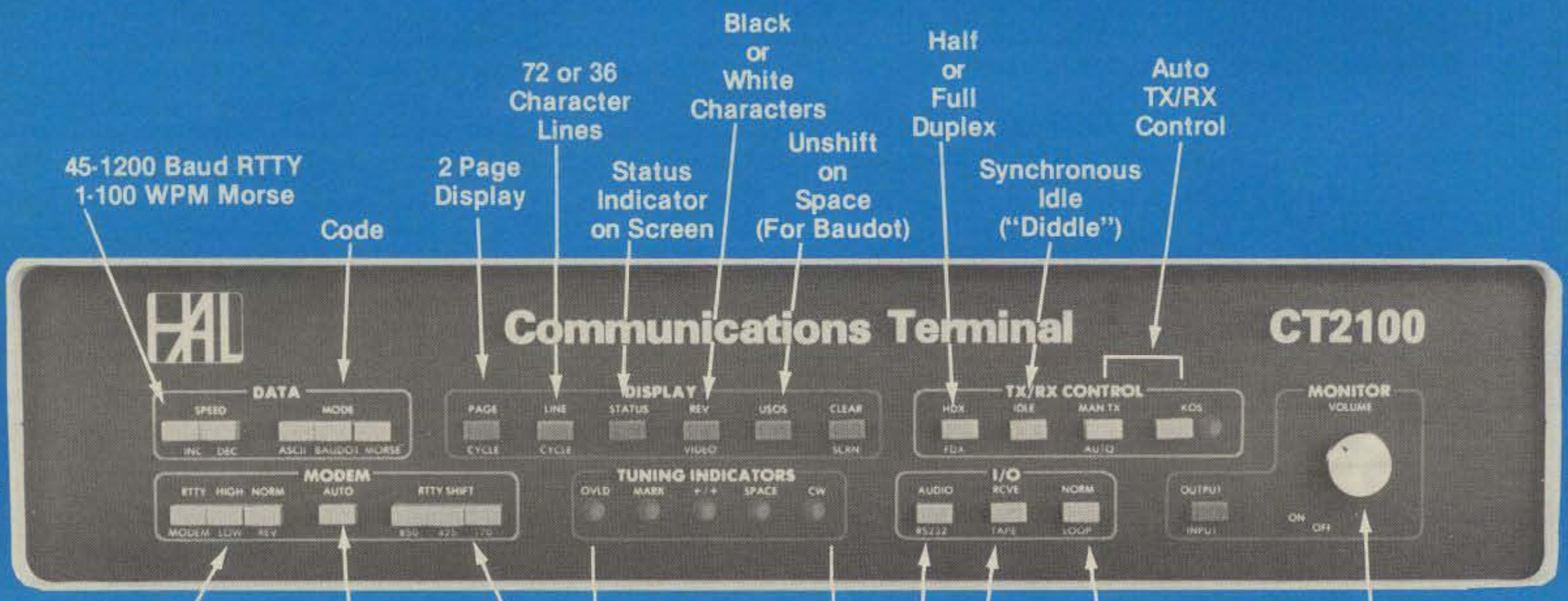

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CIRCLE 10 ON READER SERVICE CARD

it is underneath it. Therefore, wire E16 first, snip the excess off flush with the board with a pair of diagonal cutters, and then mount C1. Pin one of the op amp is to the left of the "notch" common to DIP (dual in-line package) IC's. There are numerous wires exiting and entering the board itself. These are represented by "E" numbers on the schematic and corresponding numbers on the PC foil pattern. As an example, note the pot's wiper. This comes into the board at E12 and is common to E10, the place where the output voltage is taken off. Note the presence of numerous ground points, E9, 16, 2, and 11. I mounted the IC regulator external to the cabinet and heat sinked it for additional protection. Refer to fig. 6. Remember, though, that the case is ground and is raised above and below this potential in our particular application, so if you insulate this with a heatsink tab and thermal grease, be sure to have a solder lug in intimate electrical contact with the case of the regulator. This solder lug should have a wire attached to it and run into the case and attached to the PC board as per the schematic.

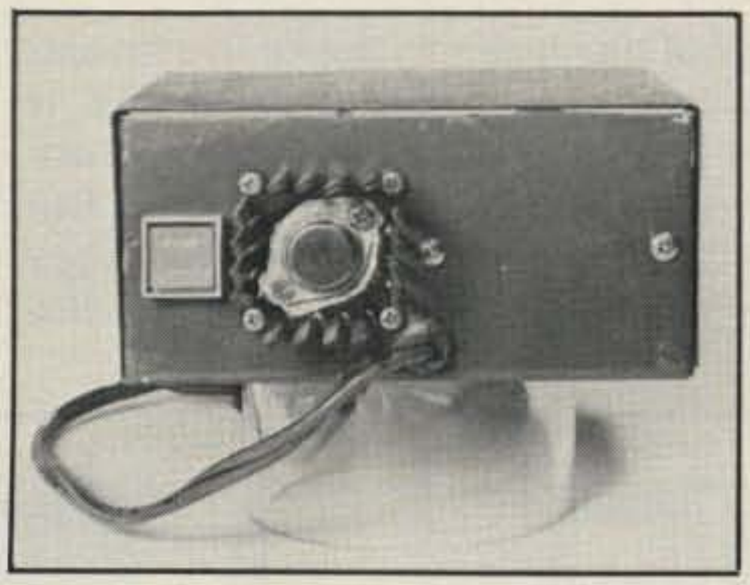

Fig. 6– The regulator mounted with the heatsink.

I used a 1 mA meter with a 10K series resistor for a full 10v scale. To be extremely precise, you may wish to use a 10K 1% resistor and then parallel a larger resistor with it to take cognizance of the analog meter's approximately 50 ohm internal resistance. If so, there is a spot on the PC board, namely the R7-R8 combination, so that these resistors may be paralleled with one another. The "crop" marks around the periphery of the board may be too confining for you. If so, ignore them and make the board larger. A larger board may provide more room for mounting holes and fixtures for attaching the PC board to the back of the cabinet. A fuse can also be added if desired.

Parts List

IC 1	LM323K Voltage Regulator
IC 2	LM301AN Operational Amplifier
D1, D2	PR5400 3A 50 PRV Rectifier Diodes
R1	1.3K 5% ¼ watt
R2	10K 5% ¼ watt
R3	2K 5% ¼ watt
R4	10K pot, front panel mountable
R5	1K 5% ¼ watt
R6	3.3K 5% ¼ watt
R7	10K 1% ¼ watt
R8*	Depends on meter's internal resistance, used for trimming.
R9	See text
C1, C2	750 μF, 25 v.d.c. (Radial Leads) Electrolytic
C3, C6	1 μF Solid Tantalum
C4	300 pF
C5	10 μF, 20 v.d.c. (Radial Leads) Electrolytic
T1	12 v.a.c. 3A Transformer
F1	3A Sloblow
S1	SPST
M1	1mA Full Scale Meter
DS1	Incandescent Lamp or LED

**Optional*

Sources of Supply

LM323K $8.98 from Digi-Key Corporation, P.O. Box 677, Highway 32 South, Thief River Falls, MN 56701.

TO-3 Heatsink, same source, part #680-1.25A, $2.80.

LM301AN op amp, same source, price $ .58.

Line cord, 3 conductor molded 18 gauge, 6', part #193c, from same source, $1.39.

CR1 and CR2, from same source, part #PR5400, $ .35 each. ■

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CIRCLE 31 ON READER SERVICE CARD

1980 CQ World-Wide DX Contest Phone Results

BY BOB COX*, K3EST, and LARRY BROCKMAN**, N6AR

There it was, 1980, and the sunspots kept on hopping! Scores have continued to climb as activity, skills, and equipment improve. Although there was a disturbance that affected propagation on the low bands, the high bands experienced superb openings, with over 170 countries available on 10, 15, and 20 meters.

Top All-Band honors went to EA8AK. Fernando averaged over 100 QSO's/hour. He walked away from the nearest competition by more than 4M points! When you look at the band-by-band breakdown, you will see that multipliers made the difference over the second-place effort of KP2A (Opr. N6ZZ) and the third-place score of N2BA/HI8, neither of which let moss grow under their antennas. The top U.S. honors went to K7RI from downtown Seattle, Washington. His JA runs pushed him ahead of K1VTM (Opr. K1JX), W1ZM (Opr. K1ZM), and W2PV.

Single Bands

Once again 28 MHz rose to the occasion, showing that 600 kHz is barely enough space to operate when the band is wide open. The World High score came from KH6XX, Randy, of multi-operator multi-transmitter fame. His score of 1.7M was followed by I0MGM with 1.3M and 9Y4VU with 1.28M. From stateside, N7DD set a new U.S. record with 754K. With countries showing up right and left and all 40 zones active, 10 meters was a nice place to go fishing. Close behind 28 MHz was 21 MHz in sheer volume of QSO's. Pedro, NP4A, was World High with 1.4M points. He was followed by YU3EY with 1.23M points and KG6DX

Zone 40 was active with TF3IRA. (Left to right) TF3YH, TF3CW, TF3JB, TF3DC.

with 1.21M points. Stateside, KM6B came close to the U.S. record set last year with 806K points. K9DX again finished second with 690K. The World High 14 MHz score was I5NPH with 1.06M, followed by fellow countryman I2VRN with a score of 944K. The top U.S. score was K2HFX with 475K, followed by K9RF. With enormous potential is 7 MHz, and SP3DOI took advantage of good activity to lead I6NOA and take the World High score with 281K. KM4K captured the top U.S. spot on 7 MHz. On 3.8 MHz poor conditions limited scores, but 4M3AZC was in the right spot to win for the world with 181K, while N4KE was U.S. high with 44K. Finally, 1.8 MHz yielded QSO's through the QRN. YU3EF was World High with 10K, and K5UR from the middle of the U.S. took top band honors with 2.3K. You should see the juicy DXCC that showed up in the submitted logs: UM8, UL7, EA8, 4X, JA, KC6, UA9, VK, to name just a few.

Multi-Single

I4RYC from a mountaintop in central Italy put it all together and broke the World All-Time multi-operator single transmitter record with a score of 9.9M points. They were closely followed by EI9CB, VP5WW, and GW6GW, all with scores over 8M. The multiplier search station makes this category very competitive, requiring skill and careful timing so as not to violate the 10-minute rule. In the U.S., K0UK, from another mountaintop in Colorado, utilized European and Japanese openings to maximize their winning score. K3LR and N4ZC finished a close second and third.

Multi-Multi

With last year's VP2KC record something to aim for, a group made up of members of the Potomac Valley, Frankford, and Western Washington Radio Clubs banded together for a DXpedition to PJ2. After extensive computer checking using a new statistical technique, a score of 37,760,742 emerged. Now if you look at last year's VP2KC score, you will see that after the dust had settled this year a difference of 0.02%, or less than 4 QSO's, resulted between the PJ2CC and VP2KC scores. Wow! Consider over 33,000 QSO's were made by both stations! That in a horserace is called a photofinish. The Quito Radio Club, HD1QRC, put together a terrific effort for 19M points, the largest score ever from continental South America. ZZ5OW was third with 11M points. In the U.S. N2AA won the multi-operator multi-transmitter spot by over 3M points with 10.6M. Second went to K8LX with 7.4M points.

QRPp

Well, Chris, G4BUE, once again took the flea power category, this time on s.s.b. His 905 QSO's and 207 countries yielding 493K topped TG9GI's fine effort of 398K.SP2FAP and AI6V were third and fourth in the All-Band category. Other World QRPp leaders were UM8MAO on 28 MHz, WB4BBH on 21 MHz, N3UN on 14 MHz, OK1AIJ on 3.8 MHz, and UT5DK on 1.8 MHz.

*6548 Spring Valley Drive, Alexandria, VA 22312

**7164 Rock Ridge Terrace, Canoga Park, CA 91307

Steve, K3SA, with son, Scott.

Rule Change

The CQ Contest Committee responding to letters and on-the-air comments has decided to recind the rule requiring that the original log be submitted. If you can submit your original log, please do so, so that copying errors are reduced. If you do not submit your original log, the committee reserves the right to ask for the original log if further cross-checking becomes necessary.

Reminder

Please remember to remove all duplicate QSO's from your log. Each year we receive many world-class scores with duplicates not removed. It's *no fun* disqualifying someone for something so easily corrected. Take a load off our shoulders and make sure there is no chance of a problem arising with your log: *Remove duplicate contacts!*

CQ Contest Committee

The CQ Contest Committee consists of active contesters. Their expertise was used to check your logs. The members of the Committee are Chairman, Frank, W1WY; John, K9DX; Terry, N6CW; Yuri, VE3BMV; Dave, K2SS; John, K1AR; Lew, N6VV; Don, N4IN; Fred, AD6C; Glenn, K6NA; Jim, W7EJ; Reg, N6SV; Gene, N2AA; Doug, WB2VYA; and Gene, W3ZZ. A special thanks is long overdue to contest chairmen of various countries who inform their fellow amateurs of contest events and in some cases check logs for submission.

Congratulations to all the winners!

73, Bob, K3EST, and Larry, N6AR

An all-out effort by Quito Radio Club, HD1QRC.

U.S.A. QRM

Worked a 5X on 2 bands, a JT1 calling us and 86 countries on 10 meters—what a contest! . . . *AI8S*. How does one miss VK on 15 meters? . . . *KA9A*. Terrible rain/wind storm that weekend! Couldn't keep 20 KLM on Europe; raided by police cause of TVI . . . *K1RQ*. A 20 hour commercial AC failure foiled what looked like our best multi-single effort to date . . . *K1UO*. 14 hours of power outage provided by a super wind storm . . . *K1IK*. Surprised when 6O0DX answered my CQ . . . *K2FL*. Power outage for 5 hours (nice Murphy weekend) . . . *K2OY*. 10 meters was dynamite . . . *W3BGN*. Over the million mark for the first time . . . *K2PLF/3*. Found my 80/40 dipole was on the ground thanks to very high winds. I'm amazed that I was able to work Europe . . . *W3IQS*. I hate 4 a.m.! . . .*KA4S*. This is the best contest in ham radio—don't change anything! . . . *W4PRO*. A7XD answered the CQ of our YL operator! . . . *K4HEX*. Biggest thrill was working VU2HI long path . . . *WA7KLK/QRP*. Worked CR9B for WAZ . . . *AJ7S/QRP*. Much satisfaction for QRPp participation—2 new countries, CR9 and 5X5 . . . *I5JHW/QRP*. A big thanks to all who listened for QRPp stations . . . *K1MNR*. 9N1MM answered my CQ Contest—all this after 2 years of trying to work him! . . . *KA2BYQ*. I'm multi-op if you count Murphy . . . *N2WT*. Working G3JKI/5A for zone 34 . . . *WA2RLQ*. Working DXCC in 18 hours . . . *K2JMY*. CQ ought to sponsor a shopping trip for the wires . . . *WB2MCB*. Murphy—Why me? Without power 9 plus hours . . . *N7TT/2*. Very high winds here. 14 hour power outage sort of cramped my style . . . *K2BK*. Lost power in storm for 13 hours—take incentive away to get back on . . . *N2NT (Op. W2YV). My first CQ WW—wish I had discovered it years ago . . . W3ICM*. Two minutes after the linear died, BV2B called for "ones" . . . *K1WJL*. Thought we would lose antenna in 75 mph winds, but didn't—only lost more hair! . . . *K1KJT*. PJ2CC asking me if I wanted a banana. . . *N1APE*. 10 was unbelievable . . . *KB3HH*. First contest in 10 years I didn't work at least one new country . . . *K4KZZ. Biggest thrill—4S7KK responding to my CQ. Biggest disappointment—N7DD refusing to give me a report . . . AE4Q*. I believe KA6HIQ/KH3/interim HL should receive an award for the longest call . . . *N4PB*. The biggest thrill in all CQ WW was working VS6DO on 40 meters . . . *KM4K*. Lost my amp after the first day, 100 watts doesn't get it on 40 . . . *K4JRB*. Darn those multi-single stations just looking for multipliers! . . . *N4KE*. 40 meter antenna failed first nite but I didn't realize it—thought condx were just lousy! . . . *K5TA*. It sure helps when European and African DX occasionally stand by for West Coast! . . . *WB6MBF*. We built this multi-multi station two weeks before the contest on top of a 2000 foot hill with the help of at least 50 people . . . *KL7RA*. Quite a thrill having H44SH and 3B8RS answer our "CQ VE" call on 75 meters . . . *W4DR*. This was our third CQ WW and largest score yet—will keep trying . . . *K6MEP*. Lost electric power for 20 hours . . . *N2RM*. Lower bands very poor . . . *N7RO*. Are you sure the sunspot cycle peaked? . . . *AD3V*. Glad to see less activity by contest hecklers this year . . . *K7RI*. Biggest thrill was teaching my beautiful, non-ham wife to dupe the logs . . . *W7CB*. Unusually high noise level this year; the power company says volcanic ash fallout is causing dirty insulators . . . *N7AM*. When JT0YFU called I thought he was another JA . . . *K7HCD*. Next year I'll be glad to trade my KW and dipole for lower power and a good beam . . . *KA7DHU*. Absorption very bad on 40 . . . *K7UR*. Tried to explain the contest to a neighbor; no luck . . . *K8MN*. Like to hear DX stations sign calls more often . . . *K9NS*. Birds roosted on my beam and made it rotate slowly . . . *N8AHK*. Most valuable lesson is how to improve next year . . . *KF8K*. What punishment; can't wait til next year! . . . *N8ARA*. Worked my first JA in 29 years of hamming . . . *W8HNI*. Poor activity from VK and ZL . . . *W8YGR*. First DX Contest even though licensed since '46—amazed! . . . *W8DXT*. Hint: don't eat tacos during a Phone Test . . . *WD8JUB*. Got CR9B at 2359Z! . . . *WD9IIX*. Changing coil taps on the low band vertical in my stocking feet kept me wide awake—but next year it's a relay! . . . *WD9DEE*. Fun running with the big guns . . . *W9MYG*. Hard to do my high school homework with the Contest running . . . *KA9FXB*. My first DX Test and TL8WH called ME! . . . *WD9GYY*. The Phone Test was rough on my recent dental surgery . . . *AC0N*. The new log sheets are great . . . *W0YK*. Agony is when wife brings home a new rig Saturday and you can't stop the Contest to get it hooked up! . . . *AK0A*.

DX QRM

Many dupes because many stations calling 3 or more times. Good condx on 10 meters; all U.S. boys are good ops! . . . *OK1TA*. Just giving guys some points and having fun with pile-ups. Hi . . . *OH6UM*. Good propagation, good participation, very nice contest, tnx . . . *I2MQP*. Thanks, nice contest . . . *UK2GBL*. Will be running at least 5 elements instead of dipole next year's contest . . . *UK2PRC*. Conditions were down compared to last year . . . *UK9AAN*. Bad propagation to JA and VK with my longwire, Hi! . . . *UP2AV*. Thanks for nice contest . . . *UQ2GEI*. Noise level S9 most of the night on 80 meters . . . *LA5QK*. Two hours before the contest the coax cable to the 4-element beam was broken, but will be fixed by the CW part of the contest . . . *DK2QJ*. My first fone contest . . . *OZ1FTE*. At last! After 10 years, first time over a million points . . . *SM0DJZ*. Sure was good for county hunting, about 50 new ones . . . *SM0CHA*. A sincere thanks to K1BV for not giving me the usual 5905 report . . . *SM5EUF*. Terrible weather during the contest. My quad was covered with ice and had no F/B ratio . . . *SM4CNN*. Six days to check the log . . . EA2IA. An SP called me just to say that a KH0 was waiting . . . *EA6GT*. Do you know how hard it is to find contest logs after your wife has put them away while moving? . . . *EA1PT*. This contest further increases my determination to build a linear . . . *G3ZHL*. Swung my quad south to work FR0FLO and lost an element. Worked him anyway . . . *G3SNN*. I wanted to test my new antenna—it works . . . *F6EMA*. Would have higher score, but ended early due to severe case of food poisoning . . . *PA3AEB*. Only found out after the contest that it was 5 not 10 watts I needed to qualify for QRP . . . *EI4DN*. The stateside pile-ups were a dream . . . *K2ON/C6A*. Oh! For some more multipliers! Great fun, great contest! . . . *VE7ZZZ*. Power outage Sunday, went to battery, worked 5 mults—QRO who needs it! . . . *VE3KKB*. Great fun on a father-son DXpedition . . . *FG0GBL/FS7*. Computer ok, logging program bombed . . . *HZ1AB*. Got to Truk 30 minutes after the contest started! . . . *KC6ZR*. Profuse apologies to FO0DX who bucked our pile-up for 15 minutes while we ignored him, thinking him a phoney! . . . *GW6GW*. 399 dupes! . . . *IV3PRK*. We are still improving . . . *I1KN*. Big snow storm and hours of S9 noise . . . *OH2AA*. Good activity from U.S.A., G.L. in 1981 Contest . . . *HA4KYH*. Blew up two KW-1000's . . . *G6CW*. Every time we had to work at the antenna system, it was rainy . . . *I4OJT*. Good propagation on 10 meters . . . *I2CZ*. Conditions not very good during the night because of very strong aurora borealis. Our QTH is 150 miles north of the Arctic Circle . . . *LA1H*. This was our first 48 hour shortwave contest. We are 16 and 17 years old . . . *DL0PE*. World's premier contest event getting better and better . . . *VE3BMV*. It was fantastic! . . . *VE7CVM*. If VE3KZ's antenna is twice as high as mine, should his score be twice as high? Some day I'll beat him on 20! . . . *VE3FRA*. Just missed DXCC by one country. Super contest . . . *VE4TU*. Thrill to work so many countries in so short a time. . . *VE7FAO*. Usual excellent contest . . . *VE1TG*. Getting too old to cut the mustard . . . *VE4RP*. Superb conditions, added 13 new countries . . . *VE5ZU*. Wish I could have the same type of JA pileup when operating from England . . . *G4CNY/VP9*. My first contest and my wife says my last one without a computer for the paperwork . . . *ZS3HL*. Many antenna and amplifier problems on this expedition . . . *I8GZQ/IH9*. Power was off here during most of the contest, when I could be here. Next year plan better setup with call ST0CF . . . *K5LBU/ST0*. Most enjoyable contest . . . *S83T*. Spent first 9.5 hours of the contest under house arrest with gear and passports confiscated in a hotel room full of machine-gun-armed soldiers! . . . *WN4FVU/5X*. Even a modest beam is difficult to put up in the apartments of Hong Kong . . . *VS6JR*. Hope this special call helped me break the Asian record . . . *4X0U*. How sad that HM must be in zone 25! . . . *HM1PW*. Had a terrible cold, so only ran single band . . . *CR9B*. 110 countries in 48 hours shows the universal interest in this contest . . . *HZ1HZ*. Fantastic conditions first night, poor the second . . . *VK4LX*. Single ops could do with compulsory rest periods as in WPX . . . *VK5OU*. The best conditions ever. Contestants were also better behaved. Ten was so crowded, the lowest clear frequency was 28,808! . . . *AH2E*. Next year I promise to break 2 million single band points on 10 meters. Thanks to all for an absolutely splendid time . . . *KB7IJ/KH2*. Beam quit last 11 hours. QSO rate went way down on the vertical . . . *KG6DX*. Could not penetrate the W7 pileup on 5N20DOG and TL8 . . . *KH6NO*. It was a good contest; I enjoyed it . . . *KX6PI*. Very difficult to crack thru the QRM curtain to Europe . . . *ZL4BQ*.

STATION OPERATORS

Multi-Operator Single Transmitter

AA4MW/1 & Net. **AF6S** & N6AUS. **AG8Z/3** & KB3IQ, N3SD, WB3JGD, N3PA, WB3BHI, WA3ZJE, N3ALL, WB3HGE, WB3JZN, KB3LU, KA3BRO, WB3KVO, KA3AYU, W3IOW. **4I8S** & KB8IZ, KB8OS, WD8RIG, WB0LNZ, W8CY, N3BJ, KA8FOI, **AJ6V** & Net. **AK6P** &KB6FM. **AK6T** & K6ZM. **CO2FRC:** CO2JA, CO7RR, LZ1BY, VE1KG. **CZ6ZT:** VE6KW, VE6OU, VE6WQ. **DA2CF:** DA1MV, DA1TD, DA1UO. **DJ4GL:** K5TM, K5WM. **DK0CC:** DL2BAQ, DL5BAN. **DK0KU:** Club. **DL8DC** &DL1VF, DL8CH, DL8CM, DL8FR, DL8HA. **DL0IU:** DF2HC, DF7BL, DF5FC, DK1WB, DK7AL, DL3AY. **DL0PE:** DF3OE, DF6AU. **DL0UE:** DF2OK, DF3AV, DJ5FT, DJ7MG, DK1II, DL3LU, DL5OL, DL7BL, DL8RL. **DL0UR:** DF4NP, DL8RH, DL8SAB. **EA2QU** & EA2SN, **EA3AIN** & Sanz, Aranda. **EA3CBQ** & EA3AUV, EA3AVV, EA3AQQ. **EA5ADI** & EA5AMW, EA5AQX. **EE7TH**, & EA7UH, EA7WC, EA7WK. **EA8ND** & EA8SB. **EI9CB** & G3UKS, G4CEB, K8MR, N8ET. **F3TV:** F5IN, F6ARC, F6BEE. **F5OJ:** F2QQ and 4 ops. **F6KAW:** F6AOJ, F6EPY, F6FLV, F6GDK, Michella, Francilse, Mike, Louis. **FG0GBL/FS7:** K8BPX, W8ATK. **FM7AV** & F6AOJ, FM0FJE. **G3HTA** & G3RUX. **G3KMI:** G4JNI, G4JTY, G4GHU, G4HQU, G4KAE, G8UDK, G8KAV, G8IOE. **G4CVZ** & G4JJE. **G6CW:** G3TVY, G3YUT, G4AFJ, G4EKW, G4HNS, G4IJX, G8IMC, G8RYK. **G6UW:** G3XTT, G3YZO, G3ZAY, G4BAH, G4BUO. **G8JC:** G3TQD, G3TQZ, G4FWR, G5DCS, G8NWR, G8NSL, G8TUP, G8XGG, G8XRC. **GD5DPA:** PA3AIC, PA3APA, **GW4BRS:** GW4DZE, GW4JOG, GW4KHQ. **GW6GW:** GW3GHC, GW3KYA, GW3NJW, GW3NWS, GW3NYY, GW3OAY, GW4BKG,GW4BLE, GW4EAT, GW4IGR. **HA1KZZ:** HA1XB, HA1ZZ, Horvath, Nemeth, Czapary. **HA2KMR:**

KL7RA, multi-multi, operating from hilltop outside of Fairbanks.

Winning ON multi-operator single transmitter, OT5JE (ON6HE and ON6KD).

New multi-operator single transmitter record: I4RYC.

Kiss, Peli, Fuhasz, Molnar. **HA2KRZ:** Sipos, Simon, Raduly, Balogh, Lemon, Gal. **HA3KHC:** Nemeth, Szabo, Borsfold. **HA3KNA:** Thesz, Muller, Kisantal, Weisz. **HA4KYH:** HA4XX, HA4YO, HA4YQ. **HA5KDB/p:** Toreki, Blasko, Ulbrich. **HA5KFL:** Laszlo, Ferenc, Tamas, Jozsef, Laszlo, Kenderess, Tibor. **HA5KJD:** Meszaros, Papp, Kohalmi. **HA5KKB:** Csukovics, Szilagyi, Lukacs, Gyurfi, Appel. **HA5KKC/7:** Loszlog, Vikdor, Lajos, Csaba, Yozset, Rezsoj. **HA7KRK:** Csige, Szekely. **HA8KAX:** Abelovszki, Toth. **HA9BVK:** Mihaly, Ruszka, Varga, Szucs, Fenei. **HAØKLE:** HAØLC, HAØLJ, HAØLO, HAØLZ, HAØMK, HAØMJ. **HG6V:** Laszlo, Laszlo, Lajos, Geza, Andras, Istvan. **HK3AXT** & HK3AFD, HK3TF, K3ZO. **HP1XRK** & HP1XAT, HP1XAW, HP1XOG, HP1XUL, HP1XVY. **HZ1AB:** KØJJ, KA4ODG, KL7CD, N6OL, W5TXV, W5UJF, W6KUK, W7KJJ, WA8MOA, WAØDEI, WAØLSB, WB5YAH, WB6DLF, WBØLOA, WD8DPL, Herb, Mike, Ray. **I1KN** & I1ANP, I1DFS, I1FNX, I1JJZ, I1LBH, IW1PDP, I1SBU, Lorenzelli. I1POR & I1FQH, I1OJE. **I2CZ** & I2RVW, I2SLA, I2YCF. **IV2PRK** & I1UW, IN3DYG, I3EVK, I3FIY, I3GNX, I3MAU, I3ON. **I4OJT** & I4GZV, I4JMY, I4KDJ, I4OUT, I4YNO, I4YSS, I4ZNU. **I4RYC** & I4ADS, I4EAT, I4IND, I4LCK, I4USC, I4VEQ, I4VOS, I4ZSQ. ISØDTK & ISØBYR. JA2YKA: JG1FIF, JJ1BTA, JH2QXG, JR2GMC, JE2RQT, JE2SRB, JA4UDP, JH4VBQ, JA9NFU. **JA4YFH:** JA4XKL, JH4BXA, JH4CDN, JH4DIT, JH4FMI, JH4MVB, JH4SQJ, JG3IIO, JH6PHS. **JA4ZQA** & JA4CUU, JA4CVJ, JA4KKW. **JA7YAA:** JA9PPC, JR7OMD, JH7UJH, JH7WTC, JH7CWD, JK1GIS, JH7LIS, JH7HWR, JG1IGW, JH8BME, JH7IMN, JH7GFO, JR7UVL. **JA7YAB:** JA7UMT, JH7AJY, JH7ITR, JH7SSJ. **JA7XCQ:** JI1FLB, JI1OFP, JF2DCZ, JH7FZI, JR7KWW, JR7UGG, JR7XUZ. **JF1YID:** JA1DNZ, JK1OPL, JA1DPM, JA1RDG, JH1FVE, JI1MTM, JL1EEF, JR1FYR, JAØFSB. **JH7YJA:** JH7NHE, JA7DWU, JH7LRS, JR7QKR, JR7FED, JR7DHY, JH7XWT, JH7GGI. **JR3YXT:** JH3AYV, JH3DBI, JH3UHG, JR3FML. **K1GSK** & W1DA. **K1IK** & WB1ELC, KA1DE, WB1FBF, W1NHJ. **K1MEM** & Net. **K1MM** & Net. **K1RQ** & WB1AUL, WB1GZD, W1ZT, W1GG. **K1RU** & K1YR, AF1O. **K1RX** & AK1A, K1GQ, K1HI. **K1UO** & N1AC, KA1GM. **K2FL** & N2ATX. **K2ITG/3** & WB2KCN. **K2ON/C6A** & WB2EOO, Thompson. **K2OY** & WA2STM. **K2PLF/3** & KB3MF. **K3CR** & N4BIX, LA4LN, WD8PUH, WN3VAW, Cooper, McKee. **K3HPG** & WB3FOG. **K3LR** & AF3P, WB3GUR, K8CX, K3VK, KA8GCD, KA3DRR, KA3DPQ, KA3EOX, KA3DWN. **K3UC** & K3VDU, AJ3H. **K4HEX** & AA4FF, N4CMJ, N4UA, KT4U, W4WWQ, WA4DLY, WA4RTS, WA4WIJ, WB4ZPF, WD4EXG. **K5KG** & K5GN, K5TU, N5DU. **K6DC** & K5GOE. **K6YK:** K6YL, WA6BYI. **K7EY** & K7SE, K7BQY, W7ZQ, KA1EXF, KB7Z. **K7MX** &K5KT. **K8DD** & AC8W, K8JLB, N8AXH, WA8BSF. **K8GG** & W8UVZ, AB8Y, WB8OFG, WD8IFX. **K8NA** & N8JW, W8LU, W8TA, K8IA, WD8CRY, WD8KZS. **K8TL** & KB8TL, W8KRV, N8BCN, N8BJQ, WD8PWQ. **K9HWU** & KØFU, WD9DSS, KA9FSO. **K9KA** & K9GL. **KØAT** & ADØF, WØSML, KØJSY, N4RR, WØWP, WBØUFL. **KØUK** & KØCL, K9MWM, WØKEA, NØAFO, AE1V, WDØASM, WBØFOR, KØKE, HH2TD, WBØITG, KAØDQR, KAØCKL. **KA4S** & W4NL. **KA9A** & W9LT, K9UWA, KB9MO. **KB3EI** K3TM. **KB3HE** & KA3ETS, WB3LNZ. **KB7ND** & K7RDG, W2IQZ, KB7JQ, W7CI, K1SC, AA7D, WB7WVI. **KB7G** & N7BJA, WB7RTG, N7AYF, KC7I. **KB7KE** & KB7OS, KD7T, N7ALS, W7DOQ, WB7QHV. **KB7W** &WA7UQB, W7DAZ, K7VV. **KB9J** & N9AFV, N9BGS. **KC4B** & AA4M. **KC6ZR:** W7EJ, W7ZR. **KHØAC:** W7FP, WB7QFH. **KL7Y** & AL7H, KL7IB, KL7ITG. **LA1H:** LA1LO, LA2TAA, LA3HW, LA3HX, LA3WX, LA5NM. **LA5X:** LA1EE, LA3LJ, LA3RT, LA4CQ, LA5UF, LA6VM, LA7DS, LA7XK, LA9DL, LA9ZO. **LZ1KSN:** LZ1AC, LZ1QD, LZ1QV, LZ1QX, LZ1XS, LZ1ZL. **LZ2KKZ:** Willy, Chris, Gene, Nick. **N1TZ** & K1SF, K1KNQ, W1BR, K1FIR, WA1UZH. KA1BBD, KA1ERF, **N4HB** & N4ND, KB4GX, WB4BVY, W4RNP. **N4KG** & N4AJZ, K4ZGB, KR4F, WN4KKN. **N4WW** & W4LVM. **N4ZC** & AA4VK, N4AXT, N4CQ, WA4ZMM, N5TH. **N6BFQ** & W6LEN. **N6BT** & WA6VEF, N6KT. **N6ST** & Net. **N6SV** & N6RJ, KM6K. **NØBIJ** & NØBKL, NØBIL, NØBKY, N9BDM. **OE2VEL** & DF6CY, DK9CW, DL2MAM, OE2DYL, OE6EEG. **OE4SZW** & OE3GSA, OE7UU. **OH1HS** & OH1BC. **OH2AA:** OH2BM, OH2BNP, OH2BQB, OH2BQS, OH2BRW. **OH7AB:** OH7UE, OH7VR, OH7XY. **OK1KCF:** OK1KZ, OK1-18707. **OK1KCU:** Club "Svazarmu". **OK1KTW:** Club. **OK1KYS:** OK1FRF, OK1FVA. **OK1ORA:** OK1AVD. **OK2KVI:** Club Vitkovice. **OK2KZR:** OK2PEW, OL6BAB, OK2-25093. **OK3KII:** OK3CLI, OK3-17661. OK3KPN: Club Meteor. **OK3RMW:** Club Merkur. **OK3VSZ:** OK3CRW, OK3EK, OK3FON, OK3PQ, OK3ZAF, OK3-26701, OK3-26928. **OR7AX** & OR1AHZ, OR5AZ, OR5OT, OR6BZ, OR6KL, OR6VN, OR6WK, OR7AZ, OR7BD, OR7FM, OR7HP, OR7NZ. **OR7WR** & ON4AN, ON4WE, ON5YF. **OT5JE** & ON5KH, ON4BB, ON5CY, ON6HE, ON6KD. **OZ5DD/a** & OZ4CR. **PAØGN** & PZ2AWJ, PA2EFR, PAØERA, PAØGIN, PE1BBI. **PI1ARS:** PAØHTR, PE1EVX, Kanon. **PI1IRC:** DL9BB, G3MNN, G3MOJ, G3XHK, PAØHNB. **PI1PT:** Van Kessel, Goudsmit. **PY3FJ** & PY2SOB, PY3ZZ, PP5JD. **R5M:** UB5MAK, UB5MDC, UB5MNM, UB5MNX, UB5MOA, UY5LK. **SM5AOE** & SM6BJI. **SM5AZU** & SMØATN, SMØBGM, SMØMC. **SP3ZAC:** Konrad, Grzegorz. **SP3ZAU/3:** SP3FLR, SP3IOE. **SP7KTE:** Students. **SP9KAD:** SP8HRA, SP9LWC. **SP9PBH:** Club. **SR9PDF:** SP3JDZ, SP2-7631, SP9FIH, SP9DFH. **SP9PEZ:** SP9-2962, SP9-2846. **TF3IRA:** TF3CW, TF3DC, TF3JB, TF3YH. **U4W:** Fomin, Kusnetsov, Lapin, Markov, Shevtsov, Zagumennov, Zapolski. **UK1NAD:** Club. **UK1TAR: UA1TDG,** UA1-144-7, UA1-144-340, UA1-144-350. **UK1TAV:** Varganov, Ivanov, Jakymenko, Krasnozechev. **UK2AAF:** Bazan, Vershok. **UK2AAX:** UC2-008-119, UC2-009-523, UC2-009-613. **UK2BAG:** UP2BAE, UP2DT, UP2BZ, UP2BAA. **UK2BAS:** UP2PAJ, UP2-038-609. **UK2BBB:** UP2BAW, UP2BBB, UP2BDM, UP2MB, UP2PCW, UP2PX, UP2-038-892, UP2-038-938. **UK2BBC:** UP2BDW, UP2-038-728, UP2BFH, UP2-038-346. **UK2BBM:** UP2BEY, UP2-038-1524. **UK2BBX:** UP2QA, UP2-038-794. **UK2BCG:** UP2BEJ, UP2BFN, UP2-038-1620, UP2-038-1613. **UK2BCM:** UP2BDX, UP2BGW, UP2-038-881, UP2-038-1630, UP2-038-1622. **UK2GBL:** Aigars, Gints, Luks. **UK2GJT:** UQ2GFB, UQ2FU, UQ2GGB. **UK2IAJ:** UC2ICK, UC2-008-50, UC2-008-114. **UK2OAA:** Bondarenko, Esatov, Korobuschenko. **UK2PAO:** UP2BK, UP2-038-624. **UK2PAP:** UP2BCI, UP2OX, UP2PAX. **UK2PAT:** UP2BCO, UP2BCW. **UK2PCR:** UP2BBT, UP2BCR, UP2BDF, UP2BFI, UP2BFL, UP2PAJ, UP2-038-609. **UK2PRC:** UP2-038-517, Rita. **UK2RAQ:** Eenlo, Kubjas, Liivrand. **UK2RDX:** UR2RRJ, UR2REZ, UR2RCH, Mart, Toivo, Andi, Nigul, Edmund. **UK3AAO:** UA3-132-71, UA4-094-440. **UK3ABO:** UA3-170-193, UA3-170-194, UA3-170-339, Borisov. **UK3AAC:** UA3AMW, UA3-170-342, Eremin. **UK3EAO:** Grinev, Lukyanchikov, Pozharkin. **UK3DAH:** UA3-142-1228, UA3-142-1253, UA3-142-1254, UA3-142-1280. **UK3IAR:** UA3IBT, UA3-126-226, UA3-126-252. **UK3SAB:** UA3SAQ, UA3-151-25, UA3-151-28. **UK3TAG:** UA3-170-193, UA3-170-194, UA3-170-339, Borisov. **UK3WAF:** Basov, Haydikov, Krutikov, Marenkov, Pikkieh, Prusako. **UK4ABZ:** UA4-156-46, UA4-156-72, UA4-156-732. **UK4CBL:** Vasenkim, Kokorin, Kondolov. **UK4FAV:** UA4FAU, UA4FCJ, UA4FCM, UA4-148-273. **UK4WAB:** Baranov, Mamuschin, Mantorov, Pankov, Saifullin, Sakerin. **UK5EAQ:** Medveden, Taranenko, ZaBara. **UK5EFW:** Bajko, Bublejnik. **UK5FAB:** Emelvanenko, Grishin, Lewkun, Shabski, Trifonow. **UK5MAG:** UB5MDL, UB5MDP, UT5HP, UB5-059-011. **UK5MBQ:** Club. **UK5MCO:** UB5MGG, UB5-059-230, UB5-059-231. **UK5MCP:** RB5MST, UB5MLV, UB5MOJ, UB5MPD. **UK5MDF:** UB5EC, UB5MBZ, UB5MCD, UB5MGY, UB5MNP, UB5MQF. **UK5MDI:** UB5MBM, UB5MJS, UB5-059-57, UB5-059-111. **UK5PA:** Vornuke, Lyapunow, Yaroshenko. **UK5QBE:** UB5QBG, UA6LXC, UB5QCJ. **UK5UBF:** UB5-065-562, UB5-065-726, UB5-065-754, UB5-065-951, UB5-065-952. **UK5UDX:** UB5UAL, UB5XCM, UB5-065-734, UB5-065-862. **UK5WAA:** UB5CN, UB5WAL, UB5WCF, UB5WCO. **UK6APA:** UA6APP, UA6APR, UA6APW, UA6ARD, UA6ARX. **UK6HCZ:** UW6FC, UA6HKP. **UK6LAI:** UA6-150-78, UA6-150-820, UA6-150-850, UA6-150-888. **UK6LAZ:** UA6LHK, UA6-150-798, UA6-150-792, UA6-150-831. **UK6LEW:** Brizgov, Gupin, Kalminckov, Ushich. **UK6LTG:** UA6LAM, UA6LWD, UA6LXV, UA6-150-618. **UK7AAH:** RL7AAL, RL7AAS, RL7AAV, UL7AAC, UL7-179-111, UA6-102-009/UL7. UK7LAF: UL7-026-199, UL7-026-203, UL7-026-207. **UK7GAA:** Club. **UK7PAL:** UL7PAE, UL7PBY, UL7PCZ, UL7-023-349. **UK8MAF:** Club. **UK9AAN:** EZ9AAA, UA9ACZ, UA9AEN, UA9AIS, UA9AJD, UA9AK, UA9AKO, UA9AKZ, UW9BY, UA9-154-092, UA9-165-1288. **UK9FER:** UA9FAR, UV9FN. **UK9SAD:** Friedman, Ilkaev, Kirkuhin, Porubaimekh, Rongin. **UK9SAY:** UA9SGW, UA9SHE, UA9SHD, UA9SHO. **UK9SBI:** Gorlanov, Martynov, Samakaev. **UK9UAA:** Bonbarenko, Ehlakov, Glybin, Kononenko, Pleshivtsev. **UBØABB:** UAØAGI, UAØ-103-114, UAØ-103-551, UAØ-103-219, UAØ-103-390, UAØ-103-239. **UKØLAK:** RAØLFI, UAØLCZ, UAØLDZ, UAØLFK. **VE1DXA:** VE1AIH, VE1AVX, VE1FH, VE1MX, VE1UG. **VE1UNB:** VE1ABU, VE1BEC, VE1BGM, VE1BTG, VE1GF, WB5UWI. **VE2CUA:** VE2ABM, VE2BVS, VE2DDQ, VE2DFH, VE2DUB, VE2EWH, VE2EWI, VE2XB. **VE3EDC** & VE3EEW, VE3JAR, VE3JAY. **VE3KKB** & VE3CRG. **VE3KUD** & VE3HKS, VE3LFM. **VE4TU** & VE4DW, VE4ABF. **VE4XK:** VE3MHI, VE4RM, VE4VV. **VE5AE** & VE5MC, VE5QY. **VE7AFY** & Ops. **VE7ZZZ:** VE7DUS, VE7ENF, VE7ENI, VE7SK, VE7VX. **VK2DHT** & VK2NDK, VK2VEW. **VK5UB** & VK5NKP. **VO2BF** & VO2CC. **VP5WW:** W4FDA, W9RN, WA4DRU, WB4EYX, WB4IAE. **VP9IB** & N5UR, VP9IW. **W1BK** & N1CW. **W1OO** & K1SA, N1AFC, WA1PDG. **W1YN** & AG1C. **W1YNE** & AB1D, K1DA, N1NA, KA1LA, N1ASR, AG1K, WB1CPZ. **W2NSD:** WB8BTH, KA1LR, KA1D, WB6TOV, N1BEJ. **W2UI** & N3KR. **W3BGN** & K2BMI, KC2X, WB2WIK. **W3IQS** & Net. **W3GG** & N3TO. **W3MA** & K3ZA. **W3RJ** & N3AD. **W4PRO** & N4ABZ, WA4LNG, N4EA, WA4WPO. **W4QAW** & W3ZZ, KA1GD, WØMYN. **W6BIP** & WA6DJI. **W6FQF** & Net. **W6GO** & K6HHD. **W6KG/SV9** & W6QL. **W6MZQ** & Net. **W6TPH** & Net. **W6ZYC** & Net. **W7DK:** K7OLC, K7ETU, N7AXS, K7GYP, N7AGC, WB7OTY, HR4HR, WB7CFH, WB7OXA, WA7BLY, AD7S, WA7FUS, N7ARO, WA7ZSR. **W7NI** & K5MM. **W8LQZ** & WB8TPR. **W8NGO** & K8ZE, KB8PW, WD8JTJ, WD8JTK. **W9DUB** & WB9AUK, K9BN, K9JF. **WØSD** & NØAIT, WBØPJP, KØSD, NØACL, WAØUFS, KBØQA. **WA3EKL** & KA3EJT, KA3ENO. **WA4QQV** & WA4QMQ, N4AOC, KB4PI, WD4MDY. **WA4WuH** & N4OE. **WA6OEY** & Net. **WA7YCZ** & WB7VXR. **WB2FZO** & K1EB, WB2SJG, K1TA. **WB2ITR** & WB2PWV, N2AXU, N4BTI. **WB3EKV** & WA3EUL. **WB4AJS** & K4JRB. **WB4FOT** & WA4YNV, WA4LSD, WA4YOF, WA4PAB, KA4BOE, WB4LSG, N4BS. **WB4KXF** & WBØYCJ, KA4FOO. **WB6RWJ** & KA6ING. **WB7CLU** & WB7WQE. **WB9PVI** & N9BMS. **WBØOYA** & WBØUFL. **WD4FIG** & WD4HLZ, WB4SFM, WA4LED, WA4VGE. **Y23DL** & Y23CL. **Y24UK** & Y23ED, Y21YK, Y24TK. **Y31ZA** & Y31WA, Y31PA, Y310A. **Y31ZJ** & Y23BJ, Y31QJ, Y31WJ. **Y67ZL** & Y67XL, Y26EI. **YO8KGH:** YO8AIN, YO8CMA. **YU1HFG:** Club Nikola Telsa. **YU2CRM:** Calopa, Martinic, Posavec. **YU3BC** & YU3TAQ. **ZF2DA:** N4AJO, W4YKH. **ZL2AH:** J. Reed, P. Reed. **ZS6BPL** & ZS6BNZ, ZS6BQP.

STATION OPERATORS

Multi-Operator Multi-Transmitter

AA4S & WA4BBN, WD4DIY, WD4DJA. **ABØI** & WA6DGX, ABØX, AEØK, KØBRO, KØCS, KØFYJ, KØTLM, KØVBU, KØXR, KBØU, KBØX, KCØB, NØSS, NØXA, WBØISW, WBØTKJ. **AD3V** & AC3S, W3NX. DJ1BC: DJ8RI, DJ6KH, DJ6TK, DF3BV. EA1VG & EA1LO, EA1HG, EA1XI, EA1NQ, EA1MQ, EA1FK, EA1OW, EA1WY. EA3NA & EA3SA, EA3AVQ. EA5RCM: EA5TD, EA5AEZ, EA5ET, EA5NT. GB4ANT: G3LDI, G3NKQ, G3MPN, G3VZT, G3XZL, G3CWI, G3SEM, G4BAV, G4CVW, G4BTY, G8HWD, G8TTV, G5CSU, G5CZM, G5BBX. HB9H: HB9AGC, HB9ALM, HB9AIB, HB9BAL, HB9BLQ, HB0BUT, HB9BYW, HB9BYT, HB9BUX, HB9CAT, HB9ZE, HB9BZM, HB9BPN. HD1QRC: HC1HV, HC1EE, HC1GZ, HC1HC, HC1HW, HC1FM, HC1BI, HC1PG, HC1VL, HC1IH, HC1DD, HC1RE, HC1NS, HC1NP, HC5EE, HC5EA, HC5NP, K7CA. JA1YXP: JI1HGD, JH4OWG, JE3UBC, JH4QLX, JA7WFS, JA5OWP, JF2DIB. JA2YEF: JAØUEX, JR2TPD, JF3THB, JR2PVI, JA9QNC, JF2KKL, JE2ATB, JF2GNY, JE2LDO, JH2TBS, JR2TWA, JF2ACB, JE2KIH, JF2NTV, JE2TUH, JE2RDI, JE2RWP, JR2UWZ, JE2WBH, JF2WMP, JH9CTW, JE2FRT, JH5FSN, JE2KCR, JH4XKJ. **JA3YBF:** JH4CES, JR3IOT, JE3KIV, JA9QPF, JR3VSW, JA9TAF, JA5XUU, JF3KZB, JH4IFF, JI3AEH, JF3NXN, JH5BIT, JE3PAS, JE3MCC, JE3DPD, JF3ELY, JH3KIL, JF3NAL, JF3MTT, JR3UPD. **JA3YKC:** JH2LRS, JR2SQU, JA3ODC, JH3KWQ, JH3PKS, JH3VOT, JR3BKH, JR3BVX, JR3LOO, JR3FRR, JR3PRR, JR3RIU, JR3SUK, JR3XGK, JE3MLA, JE3MAS, JE3MXQ, JE3VBM, JF3BHS, JF3HZG, JF3PMM, JF3SFP, JG3EMB, JI3DNR, JH4AJU, JH4WER, JR4BSM, JA5GZB, JA5TDH, JA6VXM, JR6JNF. **JA3YQD:** JE2HOI, JE3EPK, JF3PLF, JG3POU, JR3GWH. **JA6YAI:** JH6SQI, JH6KMX, JE6DVH, JE6RBJ, JE6RNB, JE6RSB, JR6ATZ, JR6EZE, JR6IZV, JR6GAG. **JA6YDH:** JA4JYL, JH6MWG, JH6NFR, JH6NLY, JH6SWF, JH6RAD, JH6DRF, JR6KDI, JR6KYA, JE6ASN, JE6LFQ, JE6SAY. **JA7YRR:** JA7CEC, JA7CFB, JA7CLN, JA7CLX, JA7CXV, JA7FDY, JA7JUD, JA7LBY, JA7WSC, JA7MQM, JA7MQQ, JA7OZW, JA7RQE, JH7MEV, JH7MEX. **JA9YAV:** JA9SQO, JA9VWC, JA9SOT, JE2FRQ, JE2JLM, JF3ONO. JH1YDT: JAØVSH, JF1EAL, JK1FLU, JK1RJU, JH1GNU, JK1CQG, JI1QPU, JE1SCJ, JF1SDH, JJ1ETB. **K1CC** & AK4L, K1NYK, K1TO, K1ZZ, KA1BMB, KA1EKY, W1GNC, W1VD, WA1YEC. **K2UA** & K2BU, KD2T, N2ME, N3AD, KA3BKR, WA2HGM, WA2DPU. **K3II** & WB3EFI, WB3JYY, WB3JZE. K3IU & K3KU, K3RT. K3ND & AA3B, K3FD, K3GQJ, K3RL, W3GM, WB3DJF, WB3FIZ. K3WW & K3WJV, KB3GJ, KA3BLP, K3VW, K2ZSY, WB3FIY, WA4ARV, N3ARK. **K3ZJ/4** & K3TW, K3WVW, K4PQL, K7SV, N4LB, WB4SGV. **K6MEP** & K6VMN, WA6IJZ, N6MA, WA6FPX, N6VR, AK6A, N6ADI, W7MSR, WB6EDA, N6BPF, N6AFI, AC6I, WA6DJS, W6HWK. K6RU & K6XO, K6SEM. K8LX & AA8U, K8GM, K8MD, N8EA, W8WW, WA8TBQ, WA8YVR, WA8ZDT, WB8ALP, WN8PEE, WD9HFW. K9XR & K9HDE, K9HMB, K9KU, K9PPY, K9RS, W9TM, WA9EYY, WB9TIY. **KB2EZ** & KB2MG, WA2FUV, WB2MJS, W2LBB, WA2LQM, WB2PUH, WA2UYY, WA2KEV, N2ARJ, WA2YDG, WD2AER. KL7R & AL7Z, AL7AS, KL7AG, KL7AZJ, KL7GL, KL7ENY, KL7JAF, KL7Y. KL7RA & AL7AF, KB8RR, KL7IVX, KL7IWE, KL7IAK, KL7IXZ. **KN6M** & KB6YF, K6XC, KI6P, K6KAP, N6CKM, W6EEN, WB6FBI, WB6NMU, WB6KNU. **LA1K:** LA1JU, LA3GW, LA3TAA, LA3ZAA, LA3XAA, LA6ZAA, LA9SX, LA9HT, LA9MW. **LA9K:** LA1FH, LA2SQ, LA3AO, LA3KV, LA4MV, LA5JS, LA7FY, LA8DY, LA8TF. **DA1WA/LX** & DA1DS, DA1AS, DA1MR, DA1PN, DA2AL, DA2HS, DA2KR, DA2BA. **N2AA** & K2BQ, K2SS, K2TT, K2GL, K2NG, K2GM, K1KI, N1XX, WA2OVE, WB2VYA. **N2RM** & N2MM. **N3LR** & N3RS, W3BI. **N4TJ** & WD4OLV, WB8TCT. N5AU & WD5GNJ, KM5R, W5LSF, W5FO, K5AQ, N5AJW, AF5K, N5CR, KM5X, K5FUV. **N7RO** & AI7P, KA7AUH, W7EKM, WA7ZWG, WB7TRU, WL7AFF.

LZ7A: LZ2SC, LZ1CL, LZ1YQ, LZ1KSP, LZ2DF, LZ2CC, LZ2IF, LZ2KIM, LZ2UF. **OK1KSO:** OK1WT, OK1JCW, OK1AEZ, OK1JWA, OK1SF, OK1AZI, OK1TS, OK1AMF. **OR6AH** & ONSAV, ON5IQ, ON6AH, ON6MH, ON6QR, ON6VL, ON7ZL, ON7KL. **PAØRCA:** PAØWFB, PA3ASO, PA3ASF, PE1CSW, NL387. **PJ2CC:** N4RV, N4MM, K3EST, W3AZD, N8II, N3RD, N3ED, K7SS, N7ZZ, W4BVV. **SK2KW:** SM2DMU, SM2DQS, SM2EPR, SM2DGU, SM2EKM, SM2HAK, SM2ALH, SM2DGQ, SM2KWQ, SM2KWV, SM2KWW, SM2LMG, SM2HTF, SM3DMP, SM7DLZ, SMØGMG, OH6DX. **W2OW** & N2HR, K2OC, KA2CDE, KA2JFT, KF2X, N2BXC, KG2Y, KG2Z, KI2X, WB2FDN, WA2RBJ, N2BZX, WB2SGS, N2DE, K3MIY, KA2KJQ, **W2VJN** & N2GJ, W2REH, WA2IFG, WA2ZKY. **W3FA** & K3ZZ, N3GB, W3ABC, WA3KCY, WA3ZAS, WB3JRU. **W3DHM** & W2QY. W3LPL & K3DI, K4FJ, K8JW, N2FB, N3TR, W3MR, WA3UXU, WD4AXM. **W3MM** & K3GM, K3OO, K3ZUF, N3VV, KB3DJ. **W4DR** & K4WHN, KG4W, KX4S, KA4EVH, N4BLX, NB4A, W4BAI, W4MYA, WA4HOT, WA4IZK, WD4IMC. **W6RDF** & WB5CSO, K6XT, N6ND, N6NR, W6UQF, WA6DBC. **W9LA** & W9XM, W9ZM, K9QXY, N9RB, WB9NOV, WB9OQU, WB9RNF, WD9CPX, WD9CWJ. WB3EAG & KA3FAB. **YU7AJD:** YU7ORS, Sasa, Dule, Voja, Bata, Brane. **YU7BCD:** YU7ODO, YU7ODS, YU7OQI, YU7OQZ, YU7ORR, YU7QBC. ZZ50W: PY5EG, PY50W, PY5CA, PY5WKW, PY5ZBU, PY5WRO, PY5PS, PY5OGG, PY5OF, PY5XRM, PY5VM, PY5JA. 4U1ITU: DF8JU, DJ7NW, DK8JB, DL4EP.

PHONE TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND

World

EA8AK, Fernando M. Fernandez
Donor: Bill Leonard, W2SKE

World—QRPp

G4BUE, Chris J. Page
Donor: Adrian Weiss, K8EEG/0

U.S.A.

K7RI, Thomas J. Owens
Donor: Potomac Valley Radio Club

Canada

VE7BTV, Hal D. Hickey
Donor: Jack Baldwin, VE7RG

Carib./C.A.

HI8GB, Ing. Arturo Gigante,Jr.
Donor: Jim Neiger, N6TJ

Europe

OH6JW, Antti Kiviluoma
Donor: W4BVV Operators

Africa

S83T, Len Deklerk
Donor: Gordon Marshall, W6RR

Asia

JA1ELY, Toshikazu Kusano
Donor: Japan CQ Magazine

Japan

JR1AIB, Yasuyuki Inoue
Donor: Palm Garden Contest Club

Oceania

AH2E, Mark Wilson
Donor: No. California DX Club

SINGLE OPERATOR, SINGLE BAND

World

KH6XX, Randall F. Sobol
Donor: K2HLB Memorial, No. Jersey DX Assoc.

World—21 MHz

NP4A, Pedro Piza, Jr.
Donor: Lee Wical, KH6BZF

World—3.8 MHz

4M3AZC, Alberto Llavia
Donor: Fred Capossela, K6SSS

U.S.A.—3.8 MHz

N4KE, Ron Blake
Donor: Arnold Tamchin, W2HCW

U.S.A.—28 MHz

N7DD, Larry Pace
Donor: Don Thomas, N6DT

U.S.A.

KM6B, Jim Stevenson
Donor: So. California DX Club

Canada

VE7IN, Earl A. Dery
Donor: Gene Krehbiel, VE7KB

Carib./C.A.

6D6LCH, Luis Chartarifsky
Donor: KP4ES Memorial, NP4A, Pedro Piza, Jr.

Oceania—14 MHz

KX6PI, Norman E. LaRiviere
Donor: VK3JW Memorial, Pacific DX Net

So. America

9Y4VU, Franklin Brooker
Donor: Rafael Ponce de Leon, CX3BR

MULTI-OPERATOR, SINGLE TRANSMITTER

World

I4RYC (Oprs. I4RYC, I4ADS, I4EAT, I4IND, I4LCK, I4USC, I4VEQ, I4VOS)
Donor: Don Wallace, W6AM

Canada

CZ6ZT (Oprs. VE6KW, VE6OU, VE6WQ)
Donor: Calgary Amateur Radio Assoc.

MULTI-OPERATOR, MULTI-TRANSMITTER

World

PJ2CC (Oprs. PJ2FR, PJ9EE, K3EST, N4RV, N4MM, N8II, N7ZZ, N3RD, W8LRL, N3ED, W3AZD, W4BVV, K7SS, K0OO)
Donor: Radio Club Venezolano

U.S.A.

K2UA (Oprs. K2BU, WA2HGM, K2UA, N3AD, KA3BKR, N2ME, WA2DPU, KD2T)
Donor: Dale Hoppe, K6UA

Europe

SK2KW (Oprs. SM2DMU, SM2DQS, SM2EPR, SM3DMP, SM2DGU, OH6DX/SM2, SM2EKM, SM7DLZ, SM0GMG, SM2HAK, SM2ALH, SM2DGQ, SM2KWQ, SM2KWV, SM2KWW, SM2LMG, SM2HTF
Donor: Bob Cox, K3EST

CONTEST EXPEDITIONS

World—Single Operator

KP2A (Opr. Phil Goetz, N6ZZ)
Donor: Stuart Meyer, W2GHK

World—Multi-Operator

KC6ZR (Opr. W7EJ and W7ZR)
Donor: The Yasme Award

TOP SCORES

WORLD

Single Op All Band

EA8AK	8,996,673
KP2A	5,254,080
N2BA/HI8	5,071,046
YX2AMM	4,898,361
OH6JW	4,582,048
XE2MX	4,182,528
DJ4PT	4,182,321
G3FXB	3,770,819
UB5MCS	3,754,543
FO0DX	3,703,203

Single Op Single Band 28 MHz

KH6XX	1,762,332
I0MGM	1,318,966
9Y4VU	1,281,635
I5SDG	1,279,314
4X0U	1,187,200
G3MXJ	1,182,800

21 MHz

NP4A	1,431,000
YU3EY	1,235,675
KG6DX	1,213,940
LU7MAL	1,142,248
KV4FZ	1,097,096
OH0AM	1,043,178

14 MHz

I5NPH	1,062,936
I2VRN	944,415
6D6LCH	915,040
EA9IE	852,900
OH8SR	830,088
DL0PG	805,812

7 MHz

SP3DOI	281,970
I6NOA	233,996
OA4AWD	220,719
CT2CE	173,826
JA2BAY	161,568
DK6PY	123,018

3.8 MHz

4M3AZC	181,794
HI8JAG	80,136
YU2BOP	74,568
I4AVG	66,598
UA6LGX	52,976
YU4VBR	52,950

1.8 MHz

YU3EF	10,305
UC2ACA	9,920
OK1AWQ	7,844
UB5MDA	6,075
OE1LPW	5,358
VE1BNN	5,358

Multi-Op Single Transmitter

I4RYC	9,918,368
EI9CB	9,364,212
VP5WW	8,741,677
GW6GW	8,641,050
IV3PRK	8,365,761
KC6ZR	7,605,360

Multi-Op Multi-Transmitter

PJ2CC	37,760,742
HD1QRC	18,846,176
ZZ5OW	11,049,401
N2AA	10,687,196
SK2KW	10,224,864
LZ7A	10,165,332

USA

Single Op All Band

K7RI	2,972,846
K1VTM	2,694,282
W1ZM	2,678,325
W2PV	2,612,984
K1AR	2,375,588
K5RC	2,277,450
W6BH	2,266,719
W6RR/7	2,250,600
N3BB	2,234,676
W3GRF	2,196,678

Single-Op Single Band 28 MHz

N7DD	754,536
W0YK	665,379
W7ISX	608,495
W7WA	551,152
W5MYA	538,350
K0ZX	493,885

21 MHz

KM6B	806,680
K9DX	690,228
K6EVR	437,801
W9RE	430,400
W5JW	409,224
W7KHN/6	396,675

14 MHz

K2HFX	475,924
K9RF	312,050
W8UA	268,280
K0KX	266,000
N4CT	257,850
K1NG	255,816

7 MHz

KM4K	45,450
K2IGW	43,092
AD8C	32,153
WB9QPN	31,200
WA6KKM	30,745
K4JRB	30,192

3.8 MHz

N4KE	44,910
AB1A	24,309
W8ZF	19,992
WA4SVO	18,894
N7RK	11,200
K9WZA	10,620

1.8 MHz

K5UR	2,324
AD4U	972
W4PZV	882
N4IN	798
K5NA/2	676
K6SE	540

Multi-Op Single Transmitter

K0UK	4,097,840
K3LR	3,574,664
N4ZC	3,414,725
K8NA	3,353,544
W3BGN	3,280,200
WB2FZO	3,028,525

Multi-Op Multi-Transmitter

N2AA	10,687,196
K8LX	7,425,600
K2UA	6,607,288
K9XR	6,580,175
W3MM	6,430,168
K3WW	6,372,093

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSO's/Zones/Countries on each band.

WORLD TOP SINGLE OPERATOR—ALL BAND

Station	160	80	40	20	15	10
EA8AK	30/6/14	294/18/58	374/24/66	1031/33/85	1377/32/100	2155/30/107
KP2A	45/5/6	297/12/34	199/17/45	824/22/56	1833/32/78	2463/28/81
N2BA/HI8		80/7/14	460/19/51	1467/28/77	1442/25/66	1957/29/85
YX2AMM		232/10/22	466/18/41	1189/31/74	1056/23/77	1430/22/59
DH6JW		129/11/41	200/22/56	991/32/81	1526/30/80	864/36/93
XE2MX	54/4/4	300/13/14	589/22/31	606/32/65	1011/31/70	2025/28/75
DJ4PT	34/2/8	290/10/46	360/20/58	580/25/68	940/26/67	1680/30/69
G3FXB	14/3/13	193/11/40	241/8/38	424/30/80	900/25/77	1491/32/74
UB5MCS	20/4/13	62/6/26	166/13/47	857/35/83	583/29/67	1653/30/80
FO0DX		13/5/5	244/20/26	848/37/94	825/31/76	1377/28/65

WORLD TOP MULTI-OPERATOR SINGLE TRANSMITTER

I4RYC		73/10/51	306/18/59	1259/38/114	1370/38/114	2989/35/115
EI9CB	33/5/24	313/13/48	422/10/53	1034/37/116	1352/35/104	3177/32/95
VP5WW	5/4/4	479/15/38	341/20/55	1480/29/98	2078/30/97	2934/28/93
GW6GW	18/4/18	76/11/44	425/15/62	1413/33/107	1115/33/96	2737/31/96
IV3PRK		145/15/58	288/30/76	1512/36/120	1137/36/94	1997/33/99
KC6ZR		55/12/16	157/22/38	825/37/95	2904/35/71	2256/31/63

WORLD TOP MULTI-OPERATOR MULTI-TRANSMITTER

PJ2CC	287/12/29	835/21/76	1466/26/84	3555/37/148	4768/37/149	5029/35/148
HD1QRC	57/6/9	572/18/38	920/23/62	2430/35/119	3664/36/124	2880/35/104
Z2SOW		16/9/13	248/22/48	2174/34/95	1525/36/92	3648/34/120
N2AA	40/6/12	238/25/75	320/29/84	1367/40/150	1593/36/127	1348/35/127
SK2KW		303/9/42	539/30/84	2012/40/132	3350/37/106	1314/36/108
LZ7A		713/17/65	480/16/54	2059/39/134	2312/38/127	2134/40/122

USA TOP SINGLE OPERATOR—ALL BAND

Station	160	80	40	20	15	10
K7RI	8/7/8	90/15/23	312/17/23	277/31/64	974/28/60	1013/29/78
K1VTM	7/3/4	135/21/56	127/23/61	237/35/93	541/34/92	672/30/90
W1ZM	14/5/7	95/20/50	85/20/50	331/31/91	642/33/98	568/31/97
W2PV	18/5/8	66/15/30	67/18/44	402/35/88	512/34/93	779/30/106
K1AR	6/3/4	60/11/33	94/20/51	254/29/69	543/31/99	778/29/95
K5RC	8/6/5	31/13/21	115/19/40	314/34/77	387/32/82	908/31/90
W6BH		25/12/15	193/20/31	304/33/80	902/30/66	588/30/82
N3BB	1/1/1	50/11/23	83/16/40	314/32/85	391/29/78	922/30/92
W3GRF	2/1/1	39/12/29	111/23/55	293/32/85	336/32/98	768/30/100
N6RO	4/4/4	95/21/30	211/22/36	127/28/57	695/32/79	556/30/77

USA TOP MULTI-OPERATOR SINGLE TRANSMITTER

KØUK	18/8/10	58/18/35	298/23/45	388/38/112	1004/37/98	747/35/107
K3LR	8/6/7	48/15/44	97/24/56	414/37/117	595/33/108	982/32/105
N4ZC	5/4/4	25/12/25	79/23/60	493/39/119	527/32/108	982/34/111
K8NA	5/5/4	39/18/31	115/23/56	444/38/110	732/32/108	768/34/105
W3BGN	10/5/6	78/18/45	83/23/54	494/38/116	306/34/112	971/33/116
WB2FZO	3/2/2	57/13/37	101/19/55	437/35/103	578/33/100	842/30/101

USA TOP MULTI-OPERATOR MULTI-TRANSMITTER

N2AA	40/6/12	238/25/75	320/29/84	1367/40/150	1593/36/127	1348/35/127
K8LX	15/5/5	242/21/55	206/27/72	1300/40/139	1163/34/116	1015/34/115
K2UA	19/5/8	153/23/63	93/17/45	1045/39/137	1217/37/121	1070/34/117
K9XR	44/8/10	139/20/46	166/24/65	946/38/137	1158/37/126	1073/34/120
W3MM	22/5/9	115/18/58	138/25/69	910/39/130	850/36/121	1340/33/126
K3WW	33/6/9	133/19/52	176/27/72	1181/40/138	881/36/119	1053/32/113

WORLD TOP 10 QRPp

(5w input)

1. G4BUE 493,884
2. TG9GI 398,198
3. SP2FAP 197,750
4. AI6V 194,040
5. W8ILC 161,102
6. AJ7S 145,666
7. WA4FHQ 131,296
8. N2GC 129,850
9. DK5EZ/EA8 127,872
10. N2US 127,302

Number groups after call letters denote following: Band (A=all), Final Score, Number of QSO's, Zones and Countries. Certificate winners are listed in Bold Face.

PHONE RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

K1VTM	**A**	**2,694,282**	**1719**	**146**	**396**	**(Opr. K1JX)**
W1ZM	"	**2,678,325**	**1735**	**140**	**393**	**(Opr. K1ZM)**
K1AR	"	**2,375,588**	**1735**	**123**	**351**	
AA2Z/1	"	1,603,440	1420	109	284	
K1DG	"	1,582,462	1306	117	310	
W1PH	"	878,274	868	100	254	
WB1ANT	"	740,914	960	75	196	
K1LL	"	654,576	731	86	226	
K1LS	"	525,228	682	83	193	
WA1DZW	"	525,096	619	87	219	
N1AU	"	475,020	664	78	183	
W1XK	"	435,336	537	78	213	
W1GD	"	411,536	535	73	199	
K1WJL	"	387,750	564	61	174	
K1WLW	"	387,342	564	70	173	
AJ1I	"	371,952	538	66	180	
WA1ZAM	"	254,826	388	70	164	
W1FJ	"	218,504	402	53	138	
WA1CCR	"	206,147	337	53	158	
K1BV	"	203,786	446	40	117	
AK1B	"	169,540	364	48	125	
W1BWS	"	159,580	291	63	139	
K1LXJ	"	157,677	331	46	123	
W1BIH	"	156,462	215	79	188	
W1ZT	"	154,050	294	61	134	
W1RR	"	153,657	288	57	132	
W1HCS	"	116,718	284	42	105	
WB1DQC	"	114,741	237	52	119	
W1IHN	"	106,296	220	52	120	
W1HX	"	75,900	169	54	111	
WA1ZBS	"	66,783	204	32	81	
K1YRP	"	65,540	201	35	81	
WB1HIH	"	64,240	181	52	94	
K1RB	"	62,514	149	50	101	
KN1DPS	"	34,726	125	30	67	
K1FWF	"	27,548	114	35	62	
W1ICF	"	23,306	103	28	58	
KA1DS	"	20,636	96	25	52	
WB1ETU	"	17,845	76	27	56	
W1JR	"	17,724	78	30	54	
W1ICU	"	**11,880**	**67**	**24**	**42**	
WA1YVT	"	**8,250**	**55**	**16**	**34**	
W1PLJ	"	**5,750**	**45**	**15**	**31**	
AG1C	"	**4,140**	**31**	**17**	**28**	
AD1C	"	**221**	**7**	**6**	**7**	
W1HNZ	**28**	**183,400**	**712**	**24**	**76**	
KA1CVM	"	161,568	528	26	82	
WA1JGK	"	123,394	404	28	75	
N1AC	"	72,963	253	28	71	
WB1EAZ	"	70,782	267	23	71	
WA1FCN	"	57,836	261	19	57	
KA1CXC	"	50,764	261	21	53	
K1EFI	"	42,975	198	18	57	
WB1ABF	"	34,480	160	22	58	
W1HGS	"	29,607	141	20	51	
K1TN	"	28,120	132	22	52	
KA1CUR	"	25,848	120	21	51	
W1WEF	"	24,768	129	17	47	
WB3GPR/1	"	21,983	89	24	65	
W1WY	"	5,778	40	15	39	
AB1U	"	3,002	51	11	11	
WB1EYI	"	1,071	17	7	14	
K1IJU	"	729	27	8	19	
W1NG	**21**	**367,928**	**884**	**35**	**113**	
K1KJT	"	122,364	406	29	79	
KA1GG	"	116,271	397	26	78	
W1FM	"	63,540	244	25	65	
AK1G	"	44,945	183	24	65	
K1YL	"	38,356	159	22	64	
N1APE	"	28,015	129	16	49	
K1NG	**14**	**255,816**	**585**	**38**	**114**	
K1WB	"	**213,850**	**558**	**33**	**97**	
W1DO	"	10,512	50	24	49	
K1XA	**7**	**28,860**	**135**	**22**	**56**	
AB1A	**3.8**	**24,309**	**124**	**21**	**52**	
K1VHS	"	4,140	39	15	30	
AA1K	**1.8**	**493**	**23**	**5**	**8**	
W1BB	"	252	7	3	6	
W1JZ	"	120	11	2	3	
W2PV	**A**	**2,612,984**	**1844**	**137**	**369**	**(Opr. K2TR)**
N2LT	"	**1,723,722**	**1409**	**117**	**312**	
AA2Z	"	**1,603,440**	**1420**	**109**	**284**	
N2IC	"	1,599,032	1374	112	292	
N2SS	"	1,478,016	1335	105	279	
K2DM	"	1,313,500	1236	103	267	
N7TT/2	"	1,241,768	1081	113	299	
W2GD	"	1,100,900	1004	107	283	
W2TA	"	1,019,030	983	100	262	
W2IFK	"	815,408	860	94	234	
K2NJ	"	751,140	765	103	248	
N2MR	"	644,864	652	104	248	
K2UU	"	643,788	700	94	230	
W2YV	"	638,918	681	90	239	(Opr. N2NT)
WA2IFS	"	471,168	581	82	206	
K2BK	"	444,154	565	80	194	
KF2U	"	442,680	658	60	178	
K2TD	"	437,598	490	91	231	
K2PA	"	424,386	556	85	186	
AE2A	"	356,070	636	54	141	
W2YC	"	334,332	478	76	175	
WB2YOF	"	297,134	492	65	153	
N2VW	"	295,236	390	86	192	
K2OIX	"	267,421	383	78	175	
N2ATD	"	264,040	391	67	163	
N2JJ	"	228,550	458	45	130	
K2SNK	"	228,452	392	54	145	
K2XA	"	227,046	350	68	169	
W2RQ	"	213,041	475	43	120	
WA2YCQ	"	204,943	394	52	139	
N2AWH	"	158,685	379	41	108	
N2BIN	"	146,944	306	52	112	
W2JGR	"	138,918	276	48	125	
W2TE	"	138,308	338	33	109	
W2FGY	"	122,450	274	46	112	
WB2TCQ	"	116,403	251	47	114	
K2SPO	"	97,875	263	34	91	
W2LU	"	89,178	200	58	109	
KA2CDJ	"	80,700	208	51	99	
W2SDO	"	75,486	186	41	97	
WA2TJE	"	67 900	176	45	95	
W2PFQ	"	59,530	172	29	77	
WA2LJM	"	57,096	166	35	87	
K2JMY	"	55,440	131	51	103	
W2DW	"	47,492	139	39	85	
KA2ELB	"	41,650	139	40	79	
W2FUI	"	40,090	144	27	68	
WA2JCX	"	38,535	135	34	71	
W2SAW	"	35,040	126	27	69	
W2SNI	"	34,125	137	32	59	
KA2EAY	"	33,984	130	35	61	
N2BCF	"	30,176	137	28	54	
WB2EOQ	"	28,825	97	34	71	
N2KA	"	24,158	100	39	55	
KB2SE	"	20,400	98	28	52	
W2OUM	"	18,796	120	22	52	
WB2MCB	"	16,380	79	24	54	
WA2RNX	"	16,214	85	22	45	
WB2PXA	"	8,106	67	13	29	
N2EK	"	7,424	45	25	33	
AB2S	"	5,850	45	16	29	
KA2IBT	"	4,402	32	15	32	
WB2ZGN	"	2,624	28	10	22	
KB2UB	"	391	9	8	9	
W2IIJ	**28**	**426,750**	**984**	**33**	**117**	
KE2C	"	223,500	634	30	95	
K2VV	"	212,680	703	23	81	
KB2NU	"	198,628	547	30	97	
WB2QEU	"	176,250	490	30	95	
KB2SG	"	171,875	475	29	96	
K2MFY	"	102,752	347	26	78	
WB2ZEL	"	91,086	325	23	71	
WB2TKD	"	51,460	212	22	61	
W2AYJ	"	51,210	198	29	61	
KA2DNJ	"	25,984	170	15	41	
KA2AEV	"	22,806	128	18	45	
W2QL	"	19,968	109	19	45	
W2QKJ	"	4,512	35	12	35	
WB2OWM	"	1,176	20	7	14	
N2PP	**21**	**349,888**	**777**	**36**	**118**	
KA2BYQ	"	165,066	472	32	91	
W2HPF	"	95,796	313	27	81	
WA2LOG	"	91,020	288	27	84	
N2WT	"	84,360	258	32	82	
WA2ORX	"	42,720	157	30	66	
KC2P	"	41,678	168	28	63	
KF2O	"	30,320	135	20	60	
KB2KN	"	28,126	128	25	57	
WA2YLY	"	21,580	117	19	46	
N2FI	"	1,144	19	8	14	
K2HFX	**14**	**475,924**	**967**	**38**	**134**	
WA2RLQ	"	50,920	133	40	94	
WA2PHA	"	6,024	98	24	49	
K2IGW	**7**	**43,092**	**203**	**22**	**59**	
WB2BNJ	"	3,390	41	9	21	
KA2K	**3.8**	**7,138**	**88**	**13**	**30**	
WB2RNT	"	80	6	3	5	
K5NA/2	**1.8**	**676**	**84**	**5**	**8**	
W2XQ	"	533	30	5	8	
N3BB	**A**	**2,234,676**	**1761**	**119**	**319**	
W3GRF	"	**2,196,678**	**1548**	**130**	**368**	**(Opr. KØDQ)**
KB3AG	"	**1,634,290**	**1545**	**105**	**265**	
N3RL	"	843,496	804	107	277	
K3NZ	"	800,955	812	98	251	
K2PLF/3	"	774,750	731	112	263	
K3KNH	"	761,328	854	90	216	
N3KZ	"	735,111	875	88	221	(Opr. WA2BFW)
W3UJ	"	734,446	808	90	224	
K3KA	"	708,662	781	93	230	
WA3VUQ	"	684,173	803	83	218	
K3FN	"	626,967	739	81	216	
WB3CIW	"	567,567	673	82	215	
N3HW	"	546,992	701	75	197	
W3GRW	"	515,928	617	79	217	
W3GNQ	"	495,978	599	84	210	
WB3AVN	"	444,230	558	74	236	
W3AP	"	400,680	457	99	216	
K3ON	"	397,835	561	69	182	
WA3HNO	"	336,622	564	59	155	
W3ICM	"	295,470	500	69	176	
W3ARK	"	287,625	407	60	172	
K3SA	"	287,448	407	60	172	
AI3Q	"	263,432	332	97	201	
W3GRS	"	256,637	339	80	191	
W3AZ	"	249,690	424	58	147	
W3KT	"	227,997	346	71	160	
W3JPT	"	223,450	400	56	149	
W3YFV	"	217,704	408	56	132	
W3EYW	"	199,136	327	72	152	
W3GN	"	178,398	320	66	132	
W3GNM	"	177,840	341	56	124	
W3HVM	"	164,348	324	54	127	
AF3E	"	152,900	293	72	148	
WB3KIL	"	147,060	305	49	122	
WA3IMY	"	137,566	297	54	115	
W3KV	"	128,128	260	47	129	
AD3Z	"	126,994	241	59	134	
K3VY	"	117,180	248	54	126	
W3BB	"	101,801	239	49	98	
WB3GCG	"	93,964	237	55	114	
K3JGJ	"	93,632	240	36	97	
W3AOH	"	91,770	252	47	91	
K3TC	"	77,550	198	45	96	
W3KFQ	"	77,490	209	47	88	
W3BNQ	"	68,585	175	49	96	
WB3AZE	"	49,078	165	29	77	
K3ZUF	"	37,942	280	69	134	
K3DH	"	34,701	110	46	83	
W3PN	"	27,734	100	27	71	
WA3YTI	"	25,232	109	23	60	
W3EAN	"	21,840	108	26	58	
K3NL	"	9,086	62	22	37	
W3FQE	"	4,921	77	15	22	
K3WS	**28**	**214,656**	**582**	**31**	**97**	
WA2SFB/3	"	181,480	596	28	76	
KB3HH	"	55,404	240	22	59	
N3RW	"	43,624	188	22	60	
K3TG	"	26,950	90	27	83	
WA3DMH	"	11,501	73	15	38	
W3FJY	**14**	**76,275**	**237**	**32**	**81**	
K3UU	**7**	**30,000**	**151**	**20**	**55**	
K3GYD	"	25,800	124	22	53	
N1GL/4	**A**	**1,836,030**	**1320**	**128**	**362**	
K4PI	"	**1,509,555**	**1182**	**137**	**334**	
K4KZZ	"	695,628	758	82	242	
W3YY/4	"	693,865	688	111	254	
K4BAI	"	544,168	701	77	194	
AI2C/4	"	511,658	579	94	228	
N4RA	"	449,360	589	82	192	
W4RW	"	399,360	538	72	188	
N4DW	"	391,761	547	78	183	
WA4IVL	"	343,827	477	73	180	
KU4J	"	323,408	448	83	189	
AA4GA	"	322,175	474	73	172	
KB4UX	"	285,840	425	70	170	
KA4C	"	273,215	368	87	178	
N4XD	"	253,055	416	68	147	
KB4CD	"	248,571	411	58	155	
K4BYK	"	244,524	313	82	202	
WA4NTP	"	239,172	380	71	157	
KC4M	"	231,579	340	80	163	
W4BV	"	228,969	343	77	170	
W4EI	"	198,030	355	59	146	
N4ZG	"	190,530	328	67	152	

W4YE	"	165,025	334	48	127
WA4NRQ	"	147,420	330	46	110
K4CTY	"	147,246	271	60	134
W4CUE	"	145,075	300	53	122
					(Opr. N4QB)
AE4Q	"	143,071	253	49	124
AJ2E/4	"	136,629	298	45	126
W4AVY	"	124,425	254	49	126
KQ4M	"	118,193	236	52	129
N4IA	"	112,047	237	56	113
KC4FX	"	108,783	259	48	105
WD4RCO	"	97,028	198	67	124
KB4YG	"	96,426	173	68	130
W4WJJ	"	90,724	229	48	100
W4UYC	"	70,920	226	41	79
W4UVP	"	57,120	166	41	79
NB4X	"	52,080	176	42	70
W4KMS	"	45,936	129	43	89
W4CEB	"	44,888	132	43	81
W4RX	"	38,376	126	41	76
K4BAM	"	38,000	139	32	68
K4OAQ	"	36,375	141	27	70
N4UA	"	35,808	132	34	62
W6NWS/4	"	29,294	118	27	70
KJ4G	"	28,985	112	27	58
W4JVN	"	27,927	117	28	59
W4OGG	"	24,710	152	27	43
WA4PPS	"	15,680	74	30	50
W4PC	"	10,074	54	22	47
AK4T	"	8,804	50	31	40
WA4QBX	"	4,136	36	18	29
WA4NIB	"	3,978	36	13	26
KT4W	**28**	**490,620**	**1139**	**33**	**115**
K4RV	"	**457,024**	**1075**	**33**	**115**
K3KG/4	"	439,155	1180	31	104
WB4DWD	"	426,240	1134	33	111
N4NW	"	319,740	776	34	112
AA4A	"	220,698	571	30	104
KØSVX/4	"	191,436	522	33	96
N4VZ	"	153,083	392	31	102
K4HAV	"	142,191	448	28	83
WA4LBJ	"	136,017	399	29	90
N4PB	"	125,769	388	29	84
DL8UI/W4	"	124,013	440	29	78
W4VZB	"	89,572	323	25	73
K8CFU/4	"	78,085	275	24	73
WB4VQO	"	71,003	258	28	73
WA3RID/4	"	70,300	247	27	73
WB4ZPF	"	3,990	47	9	21
WB4VMS	"	3,003	31	8	25
N4CD	"	1,431	20	11	16
KT4H	"	1,372	19	12	16
N4MO	**21**	**92,962**	**315**	**28**	**88**
W4JD	"	88,140	305	30	83
W4ZTW	"	76,529	273	27	76
K4KSV	"	64,638	198	33	81
WA4HNL	"	57,984	219	27	69
W4ZWZ	"	50,964	195	25	68
N4CT	**14**	**257,850**	**612**	**39**	**111**
K4IR	"	54,240	171	35	78
N4TZ	"	39,676	156	27	64
WD4KQJ	"	5,967	57	12	27
KM4K	**7**	**45,540**	**180**	**25**	**67**
K4JRB	"	30,192	150	22	52
KC4OV	"	19,516	127	21	47
N4KE	**3.8**	**44,910**	**207**	**25**	**65**
WA4SVO	"	18,894	126	17	50
AA4NC	"	4,880	53	9	31
AD4U	**1.8**	**972**	**64**	**8**	**10**
W4PZV	"	**882**	**68**	**7**	**14**
N4IN	"	798	23	7	12
K5RC	**A**	**2,277,450**	**1763**	**135**	**315**
					(Opr. K5ZD)
K5TA	"	**1,307,665**	**1188**	**123**	**292**
K5KLA	"	**1,124,928**	**1066**	**116**	**262**
K5NW	"	907,172	938	107	251
K5DX	"	709,440	839	104	216
WA3OVC/5	"	462,992	555	99	205
N5JB	"	436,800	587	81	179
WD5CGC	"	401,808	542	74	190
N5BA	"	379,354	453	94	204
KB5FU	"	278,721	446	75	168
K5TSQ	"	268,671	394	80	169
W5DV	"	251,215	381	74	161
K5MA	"	250,956	361	89	159
KA5W	"	231,812	356	86	152
W5HEZ	"	184,398	302	68	151
AI5A	"	178,525	336	62	131
W5OB	"	118,150	251	54	116
K5YPV	"	117,276	236	59	115
K5LP	"	94,856	240	49	93
WB5DBT	"	87,580	210	51	94
WD5FLK	"	56,792	198	43	81
W5GN	"	52,976	166	32	80
W5AE	"	49,852	149	43	78
W5UR	"	47,799	121	50	91
N5JJ	"	47,444	150	50	66
W5KCR	"	45,593	129	46	81
N5HB	"	31,866	125	45	68
KA5Q	"	31,185	112	35	64
WA5ZKO	"	30,345	110	35	67
K5HUI	"	23,856	75	46	66
WB5RYC	"	17,550	95	23	42
W5LMG	"	17,444	78	36	53
W5OSJ	"	11,856	63	32	44
WN5MBS	"	11,196	67	21	37
K5DEC	"	4,692	51	22	24
K5HT	"	2,052	38	20	34
W5YB	"	1,044	20	8	10
W5MYA	**28**	**538,350**	**1251**	**36**	**114**
K5TJ	"	377,953	869	33	118
WA5BYG	"	179,596	584	31	87
K5RF	"	76,046	287	23	71
K1DWQ/5	"	56,400	213	26	68
WA5BKN	"	21,924	174	9	33
WD5IAF	"	18,546	106	20	46
AK5E	"	12,993	77	22	39
K5XY	"	7,956	81	14	25
W5JW	**21**	**409,224**	**1073**	**33**	**103**
WB5UDX	"	202,500	598	31	94
W5LKP	"	104,760	307	32	88
WB5ZAM	"	45,568	257	20	44
KA5DHB/DV	"	43,290	203	21	53
WD5GNY	"	13,216	92	20	36
K5FC	**14**	**186,677**	**476**	**36**	**103**
					(Opr. WA4CTA)
K5QY	"	147,246	408	35	103
N5RR	"	25,187	100	29	60
KB5EB	**7**	**24,906**	**122**	**22**	**53**
W5VGX	"	12,015	100	17	28
AF5H	**3.8**	**3,096**	**45**	**12**	**24**
WB5LBT	"	2,496	35	10	22
K5BZU	"	2,414	32	11	23
K5UR	**1.8**	**2,324**	**171**	**10**	**18**
W6BH	**A**	**2,266,719**	**2012**	**125**	**274**
					(Opr. WA6IQM)
N6RO	"	**1,998,780**	**1688**	**137**	**283**
K6HNZ	"	**1,469,604**	**1482**	**118**	**230**
K6RR	"	1,441,134	1441	125	229
					(Opr. K7JA)
K6NA	"	1,375,284	1287	123	249
N6AR	"	1,331,877	1196	129	264
N6OJ	"	978,688	1338	87	169
N6HR	"	488,202	602	99	187
N6AN	"	429,348	695	80	142
N2YQ/6	"	345,320	607	62	132
W6US	"	335,818	524	83	155
W6OKK	"	335,068	569	72	139
WA6AHF	"	327,918	504	84	174
K6ITL	"	279,072	437	73	155
K5VNJ/6	"	261,320	444	87	148
WA6NHB	"	212,064	460	73	115
N6CCN	"	210,405	384	69	126
WA6TKT	"	187,350	444	51	99
WB6JMS	"	172,088	315	74	122
W6YQ	"	169,422	327	63	124
W6LQC	"	162,900	322	60	121
AD6D	"	155,770	304	68	117
K6PU	"	154,090	291	65	125
W6DU	"	145,035	318	59	106
N6JM	"	139,784	285	60	113
AF6F	"	122,670	296	52	93
W6BYH	"	117,836	240	66	112
WB6UOM	"	101,442	230	65	94
W6BZE	"	82,880	216	58	90
WD6EWG	"	80,518	252	52	74
N6UW	"	75,174	212	53	81
W6CHV	"	71,944	146	63	121
N6GG	"	54,328	125	59	93
WA6UFY	"	49,035	170	40	65
WA6LFF	"	46,250	136	45	80
WB6DNN	"	38,808	163	35	49
W6QNM	"	32,724	123	33	68
KJ6Z	"	32,200	135	36	56
N6NF	"	24,192	176	21	27
K6UGS	"	20,664	111	29	43
W6ERS	"	20,250	100	31	44
W6ISQ	"	14,089	68	31	42
W6KBD	"	11,766	86	26	27
W6VG	"	9,600	71	20	28
W6OUL	"	8,493	50	22	35
W6QDE	"	8,183	58	20	29
W6SWE	"	7,625	44	23	38
N6BTY	"	6,600	57	22	33
K6SSS	"	6,336	35	31	33
K6EWL	**28**	**424,168**	**986**	**35**	**113**
W6XJ	"	**373,761**	**1053**	**35**	**92**
					(Opr. WB6OKK)
KB6OZ	"	**282,204**	**796**	**34**	**100**
WB6MBF	"	175,780	572	28	82
WB6HDG	"	124,120	413	29	78
N6TO	"	105,575	348	33	70
N6IC	"	95,481	327	30	73
K6YRA	"	67,787	168	35	102
N6AW	"	57,057	144	35	108
K6KLY	"	45,878	145	30	83
W6ZUM	"	21,357	125	19	44
W6OVO	"	17,550	122	18	36
W6BS	"	11,648	79	17	35
KM6K	"	4,768	51	19	32
W6SC	"	2,808	39	11	13
AA6EE	"	1,482	34	10	9
W6NXB	"	657	28	5	4
KM6B	**21**	**806,680**	**2051**	**37**	**103**
K6EVR	"	**437,801**	**1420**	**34**	**85**
W7KHN/6	"	396,675	1112	34	89
K6XV	"	277,104	1032	28	64
KK6C	"	162,108	722	25	54
W6BSY	"	119,004	438	27	67
N6QW	"	88,270	348	28	63
K6SMH	"	20,119	124	20	39
W6YA	**14**	**251,856**	**555**	**38**	**121**
					(Opr. N6NI)
W6XI	"	79,422	228	36	86
WB6NHV	"	58,707	221	32	67
W6CN	"	43,456	162	30	67
W6HXW	"	40,800	148	32	68
W6OK	"	30,976	130	30	58
WA6KKM	**7**	**30,745**	**166**	**24**	**41**
W6YMH	"	2,288	35	12	14
K6SE	**1.8**	**540**	**28**	**9**	**11**
K7RI	**A**	**2,972,846**	**2674**	**127**	**256**
W6RR/7	"	**2,250,600**	**2116**	**117**	**255**
W7CB	"	**624,780**	**833**	**102**	**165**
W7BUN	"	**480,648**	**985**	**56**	**112**
K7ZA	"	444,744	607	90	171
W7NG	"	292,842	552	63	124
WB7EEI	"	190,032	316	76	138
W7LXR	"	173,580	542	35	75
K7NW	"	139,755	315	61	104
WA7DRP	"	130,928	240	67	129
W7GUR	"	118,159	245	52	121
WA7CYP	"	114,700	223	63	122
W7AEP	"	112,948	206	69	118
K7UU	"	125,550	259	51	84
WAØHJU/7	"	108,936	240	53	100
W7WW	"	91,448	204	60	101
KA7CDD	"	79,779	395	29	60
WB7RFC	"	75,640	233	51	73
WA7JWC	"	69,906	204	44	78
W7JNC	"	69,154	173	51	91
N7AM	"	65,205	200	45	70
WB7TAZ	"	50,750	157	51	74
W7QK	"	40,260	134	48	84
N7MW	"	35,392	129	46	66
K7YDO	"	33,077	125	35	62
K7WQO	"	32,032	90	67	76
K7KD	"	31,944	90	53	79
WB7QFI	"	31,137	118	34	63
WA7TTM	"	30,000	105	28	72
W7KSA	"	14,475	67	26	49
N7AKQ	"	13,216	80	21	38
KD7C	"	12,738	72	24	42
K7WA	"	10,286	117	18	19
K7RS	"	9,790	69	24	31
AK7F	"	3,157	28	16	25
N7DD	**28**	**754,536**	**1730**	**36**	**113**
W7ISX	"	**608,495**	**1596**	**38**	**93**
W7WA	"	551,152	1407	34	99
K7HCD	"	474,938	1138	37	109
N7RT	"	177,968	625	30	68
N7ABJ	"	89,001	335	29	64
W7MLJ	"	51,450	241	25	50
W7FGT	"	36,448	223	22	45
W7KT	"	30,804	157	21	47
K7IDX	"	24,453	90	28	71
W7ZI	"	24,357	125	21	48
K7LAY	"	17,958	80	25	57
WA7OBH	"	17,484	101	19	43
KA7DHU	"	7,945	158	16	19
W7AYY	"	6,750	86	9	18
WA7QCD	"	6,230	68	14	21
KB7HG	"	2,368	51	8	8
WB7PTZ	**21**	**223,301**	**887**	**27**	**62**
WB7CAO	"	73,347	453	22	47
WB7FFF	"	71,568	350	23	48
K7LZJ	"	70,587	390	21	48
K7AMW	"	50,730	200	25	64
K7CVL	"	48,453	179	25	68
K7JCI	"	11,550	99	15	27
K7XX	**14**	**141,491**	**421**	**35**	**84**
W7MB	"	70,896	219	35	77
W7KKR	"	25,974	121	26	48
K7AA	"	10,458	58	27	36
W7RIR	"	2,070	26	14	16
K7UR	**7**	**28,028**	**197**	**19**	**30**
N7RK	**3.8**	**11,200**	**100**	**18**	**32**
N7EA	"	6,480	144	16	29
K8MN	**A**	**1,163,790**	**1031**	**113**	**289**
K8GL	"	**1,138,742**	**1041**	**103**	**279**
K8SS	"	**636,219**	**706**	**95**	**222**
WB8VPA	"	**550,456**	**603**	**98**	**234**
KB8SZ	"	479,277	573	79	212
KB8PK	"	458,100	711	66	159
K9NS/8	"	441,928	536	89	207
N8ATR	"	431,472	592	87	180
W3IWG/8	"	259,234	412	69	158
W8UPH	"	206,206	407	52	130
N8AHK	"	184,500	368	52	128
K8TMK	"	172,466	318	60	134
KF8K	"	160,820	336	45	125
N8TN	"	140,715	322	50	109
K8CV	"	138,908	289	54	110
N8AKF	"	135,036	271	62	124
K8IQQ	"	135,000	345	41	94
K8EF	"	134,676	277	55	117
K8CMO	"	128,240	319	38	102
K8US	"	123,552	279	42	114
W8QGP	"	122,464	261	57	115
N8ARA	"	98,058	200	56	121
AA8S	"	94,120	261	40	90
K8WW	"	89,046	219	49	104
WD8MOV	"	71,965	145	69	116
KD8V	"	68,092	263	34	82
N8BRQ	"	67,032	212	33	81
WD8EOL	"	65,201	199	32	81
WD8JBB	"	63,845	198	34	79
W8ANM	"	60,759	170	39	90
W8SQ	"	59,704	165	44	92
WB8ZRL	"	59,670	170	42	93
K8CW	"	56,721	177	32	79
K8DJC	"	54,536	145	44	92
W8GV	"	53,628	176	27	82
KC8W	"	50,808	162	34	82
KA8BIZ	"	48,204	171	35	68
K8PUJ	"	47,343	135	43	86
W8HNI	"	46,170	162	38	76
W8BTD	"	43,384	140	36	80
K8JK	"	40,098	115	47	76
WD8ECA	"	37,728	186	19	53
KB8IO	"	32,810	141	24	61
W8YGR	"	30,855	93	43	78
KB8RT	"	30,186	93	47	70
KA8HJG	"	29,652	202	30	54
N8BTT	"	29,184	114	33	63
N8BKX	"	24,768	130	27	45
KB8JD	"	21,700	108	24	46
K8HF	"	21,576	96	30	57
WA8LRW	"	19,096	93	30	47
AF8O	"	10,244	69	16	36
WD8NZR	"	10,089	63	17	40
K8RSH	"	10,088	68	17	35
W8DXT	"	9,372	59	30	41
N8AXA	"	7,560	75	20	36
WA8WFX	"	2,088	27	10	19
W8TWA	**28**	**307,088**	**792**	**32**	**104**
WA8TNO	"	**177,952**	**531**	**31**	**103**
N8BKB	"	93,304	290	29	80
K8IP	"	85,696	299	27	76
WB8JSQ	"	70,406	269	23	71
KB8UF	"	68,769	343	25	56
WB8WMS	"	62,759	226	26	71
WB8SCD	"	31,950	154	22	53
WA8CAE	"	28,704	147	17	52
WD8IDE	"	27,300	166	18	47
WD8JUB	"	15,340	102	17	42
WB8WFS	"	2,130	24	9	21
N8BN	"	924	22	3	11
N8AJF	**21**	**85,012**	**281**	**26**	**80**
KB8LH	"	77,272	256	32	72
K8RWL	"	37,362	165	22	56
W8UA	**14**	**268,280**	**605**	**39**	**113**
AD8C	**7**	**32,153**	**153**	**24**	**55**
W8JWN	"	23,384	119	23	56
K8PCZ	"	2,430	34	12	18
W8ZF	**3.8**	**19,992**	**144**	**23**	**45**
K9BGL	**A**	**1,009,372**	**973**	**100**	**264**
W9OP	"	**813,792**	**853**	**91**	**245**
N9AFY	"	**803,862**	**855**	**95**	**238**
WD9IIX	"	621,516	654	100	243
WD9DEE	"	621,356	684	100	226
K9MDO	"	546,650	598	99	226
K9LWT	"	545,824	653	86	210
AI9J	"	451,164	628	77	185
KB9OF	"	382,382	498	85	201
W9GIL	"	330,832	495	60	172
WA9BHH	"	321,735	429	77	190
K9SD	"	316,602	583	75	159
W9EQP	"	291,060	415	75	170
K9IW	"	284,574	398	77	181
W9NA	"	228,054	398	59	140
WA9TGL	"	224,910	403	53	136
W9AMM	"	203,928	318	70	162
N9ER	"	170,704	267	72	155
K9CJK	"	164,560	320	56	120
K9BQL	"	150,909	289	54	133
KB9JF	"	150,054	299	55	123
KB9OC	"	147,744	304	53	118
KB9AW	"	146,757	266	70	143
K9IZT	"	133,692	303	45	111
N9AW	"	132,528	275	57	119
WA9EKA	"	123,954	214	70	149
N9RC	"	80,907	207	55	94
W9RF	"	79,296	244	35	83
WA9JWL	"	78,864	218	37	87
N9BEM	"	69,052	195	39	83
K9JDV	"	67,203	175	43	88
W9MYG	"	59,328	148	51	93
W9TNZ	"	56,840	155	48	92
WD9IIC	"	53,410	169	34	75
WB9OJE	"	45,741	216	24	55
KA9FXB	"	44,137	176	32	69
N9BBM	"	42,826	165	30	68
W9GXR	"	40,891	139	29	74
KA9GWL	"	21,520	96	27	53
N9AKE	"	19,136	79	35	57
W9RW	"	4,816	43	20	23
AI9F	**28**	**225,862**	**659**	**31**	**88**
KA9DOO	"	**197,145**	**588**	**27**	**90**
AG9S	"	194,310	530	30	97
N9ACP	"	126,730	386	28	87
K9SM	"	73,390	314	21	61
WB9SBD	"	64,728	251	27	66
W9VNE/M	"	47,872	201	24	64
WB9EBO	"	43,560	170	23	65
WA9BZW	"	27,384	119	23	61
K9GM	"	9,360	87	8	28
W9YYG	"	9,328	60	15	38
KA9AZF	"	7,626	71	12	29
K9DX	**21**	**690,228**	**1442**	**39**	**127**
W9RE	"	**430,400**	**929**	**36**	**124**
WD9GYY	"	203,112	635	31	95
W9OFV	"	129,150	357	33	93
K9BG	"	91,476	270	32	89
W9MCR	"	49,894	174	28	73
KA9CQM	"	43,344	182	25	61
K9QVB	"	21,021	101	23	54
AK9N	"	5,617	50	12	29
K9RF	**14**	**312,050**	**681**	**38**	**120**
K9CLO	"	147,742	463	31	91
KA9GRL	"	37,168	142	31	61
VE3CDP/W9	"	36,162	157	22	60
W9RKP	"	24,253	107	26	53
K9YNF	"	15,708	80	24	44
K9XJ	"	14,746	74	21	52
WB9QPN	**7**	**31,200**	**155**	**23**	**52**
W9CH	"	18,620	98	21	49
K9PQG	"	11,655	73	22	41
K9WZB	**3.8**	**10,620**	**80**	**18**	**41**
WD9ETM	"	1,771	32	8	15
KØRWL	**A**	**702,450**	**841**	**108**	**207**
WØEJ	"	**627,575**	**678**	**99**	**226**
KDØQ	"	**595,602**	**655**	**100**	**226**
KBØPR	"	553,308	674	84	210
KØVM	"	436,278	588	73	185
KBØRC	"	403,971	543	73	194
WØIUB	"	386,081	604	71	162
ACØN	"	319,124	584	66	155
WDØCHW	"	264,740	435	67	150
KØIFL	"	230,572	358	75	161
WDØBNC	"	221,190	368	74	145
WØMJN	"	191,760	336	69	135
WAØWBU	"	174,730	319	60	142
AKØM	"	159,278	284	79	138
WØPPF	"	146,300	325	65	125
KØAL	"	138,972	259	73	149
KBØV	"	138,446	263	72	131
KFØA	"	119,652	296	56	113
WØFF	"	117,623	215	55	132
ACØA	"	111,600	292	70	116
WØSR	"	107,450	224	55	120
KØUR	"	95,985	254	43	92
WAØDCB	"	94,401	235	51	102
WØRT	"	80,178	184	58	103
WDØGSY	"	75,168	154	52	122
WØCDC	"	71,240	182	45	92
KØBJ	"	61,202	163	56	86
KØWA	"	54,050	202	40	75
AGØU	"	49,856	129	59	93
WBØIEL	"	43,008	143	39	73
WBØFCS	"	42,465	163	32	63
WDØAWL	"	37,695	172	34	71
WDØBKT	"	36,375	131	33	64
WØIYR	"	36,006	134	34	68
WØBWJ	"	35,375	111	50	75
WØWUU	"	34,800	140	33	54
WBØWNG	"	29,393	129	30	61
NØBAR	"	24,900	119	23	52
NØCAY	"	24,682	107	31	55
KBØKK	"	21,204	90	41	52
WØHBH	"	17,548	83	29	53
WBØPDN	"	14,137	77	26	41
KBØEY	"	12,264	68	33	40
NØBZE	"	8,008	61	23	33
KAØP	"	5,130	44	24	30
KBØBH	"	1,984	26	15	16
WØYK	**28**	**665,379**	**1592**	**37**	**106**
KØZX	"	493,885	1241	33	104
WAØMTM	"	228,656	730	30	94
WAØMHJ	"	166,068	459	29	97
ACØS	"	77,644	298	23	71
WBØLFY	"	70,564	272	25	67
WBØVHH	"	24,288	146	22	47
WBØYJT	"	22,815	136	21	44
AKØA	**21**	**284,811**	**760**	**36**	**103**
WBØCMM	"	263,934	729	33	98
NØAT	"	227,821	609	32	107
KBØC	"	113,826	336	31	91
NØAFL	"	38,400	145	27	73
KØKX	**14**	**266,000**	**625**	**37**	**115**
KØDD	"	**256,795**	**559**	**38**	**123**
KØGT	**7**	**13,930**	**76**	**23**	**47**
KBØU	"	6,042	40	18	35
WØZV	**3.8**	**7,696**	**65**	**19**	**33**

ALASKA

KL7AF	**A**	**262,965**	**833**	**58**	**83**
KL7D	**28**	**236,359**	**1392**	**27**	**44**
KL7BV	**14**	**256,476**	**890**	**35**	**81**

BAHAMAS

WA1CDO/C6A	**A**	**413,088**	**853**	**69**	**139**
C6ADV	**21**	**307,914**	**1211**	**27**	**84**

BERMUDA

VP9AD	**28**	**765,328**	**2579**	**31**	**93**
G4CNY/VP9	**21**	**839,927**	**2427**	**33**	**106**
G3ZGR/JP9	**3.8**	**34,716**	**530**	**10**	**23**

BRITISH VIRGIN ISLANDS

VP2VDH	**28**	**1,106,631**	**3731**	**28**	**95**
					(Opr. N6CW)

CANADA

VE3IQ/1	**A**	**868,927**	**867**	**94**	**267**
VO1AW	"	154,344	309	42	135
VE1TG	**28**	**464,256**	**1479**	**28**	**96**
VE1OU	"	136,752	655	24	64
VE1BNN	**1.8**	**5,160**	**107**	**8**	**16**
VO2CW	**A**	**1,964,112**	**2290**	**97**	**251**
VE2AYU	"	702,552	970	77	215
VE2FMH	28	47,904	185	25	71
VE3ICR	**A**	**1,278,846**	**1138**	**117**	**297**
VE3HD	"	949,696	1083	80	224
VE3UOT	"	676,872	852	93	213
					(Opr. VE1BCZ)
VE3DUS	"	334,884	467	71	187
VE3FEA	"	201,474	390	50	132
VE3MV	"	91,184	203	52	112
VE3EZU	"	44,226	147	44	82
VE3BMV	**28**	**1,102,206**	**2561**	**36**	**125**
VE3HGN	"	6,480	43	21	33
VE3KZ	**14**	**562,906**	**1279**	**38**	**128**
VE3FRA	"	**513,888**	**1266**	**39**	**120**
VE3BSJ	"	37,728	138	28	68
VE3GCO	**7**	**89,225**	**513**	**21**	**62**
VE3IKN	**3.8**	**24,087**	**396**	**11**	**20**
VE3BBN	**1.8**	**5,590**	**231**	**6**	**7**
VE3MFA	"	4,491	264	4	5
VE3OCU	"	1,539	95	4	5
					(Opr. VE2DZE)
VE4RP	A	81,204	243	46	88
VE5ZU	A	3,300	30	18	26
VE5AAD	28	9,051	220	11	10
VE5RA	**21**	**421,590**	**1208**	**34**	**104**
VE5AAO	**14**	**113,776**	**469**	**30**	**74**
VE6MP	**A**	**242,022**	**416**	**65**	**144**
VE6CGH	"	70,854	288	32	66
VE7BTV	**A**	**2,237,985**	**2317**	**127**	**242**
VE7WJ	"	**1,250,565**	**1665**	**114**	**203**
					(Opr. VE7BWK)
VE7CVM	"	541,144	1685	55	81
VE7CC	"	430,272	908	76	116
VE7DXC	"	173,715	323	64	121
					(Opr. VE7WJ)
VE7AZG	"	32,896	514	33	31
VE7FAO	**28**	**304,332**	**1502**	**28**	**56**
VE7CYT	"	51,156	445	20	29
VE7IN	**21**	**780,692**	**2384**	**35**	**86**
VE7AVU	14	41,184	280	24	42
VY1AC	**A**	**201,960**	**652**	**50**	**86**

CAYMAN ISLANDS

ZF2DT	**A**	**203,604**	**852**	**47**	**67**

COSTA RICA

TI2JMT	**A**	**258,840**	**553**	**54**	**126**

DOMINICAN REPUBLIC

N2BA/HI8	**A**	**5,071,046**	**5406**	**108**	**293**
HI8GB	"	619,000	1249	54	146
HI3XRM	"	435,064	739	74	164
HI8MRF	**28**	**279,300**	**1170**	**24**	**71**
HI8PGG	**21**	**131,930**	**788**	**25**	**57**
HI8LC	"	93,457	519	22	57
HI8JAG	**3.8**	**80,136**	**750**	**14**	**42**

GREENLAND

OX3ZM	**28**	**48,314**	**483**	**14**	**35**
OX3AI	**14**	**80,262**	**319**	**29**	**69**

GUATEMALA

TG9EW	**A**	**310,233**	**606**	**63**	**124**
TG9SO	**21**	**48,384**	**287**	**18**	**54**

MEXICO

XE2MX	**A**	**4,182,528**	**4585**	**130**	**259**
			(Opr. N6AA)		
XE1HGJ	"	450,116	1560	41	90
6J8RF	**28**	**762,248**	**2316**	**39**	**112**
XE1VV	"	6,419	50	16	33
4A9J	**21**	**518,000**	**1341**	**35**	**113**
6D7LCH	**14**	**915,040**	**1960**	**40**	**150**
XE1LLS	"	75,000	302	30	70

MONSERRAT

VP2MPB	**21**	**871,125**	**2924**	**31**	**94**
			(Opr. W5STI)		

PUERTO RICO

WP4API	**A**	**333,762**	**1035**	**44**	**99**
WP4ADA	"	150,722	364	53	90
NP4AT	**28**	**203,616**	**1012**	**23**	**61**
NP4A	**21**	**1,431,000**	**3750**	**37**	**122**
KP4WI	7	16,848	85	22	56

U.S. VIRGIN ISLANDS

KP2A	**A**	**5,254,080**	**5661**	**116**	**300**
			(Opr. N6ZZ)		
KV4FZ	**21**	**1,097,096**	**3251**	**35**	**108**

AFRICA

CANARY ISLANDS

EA8AK	**A**	**8,996,673**	**5261**	**133**	**430**

CEUTA

EA9IE	**14**	**852,900**	**1903**	**37**	**113**
EA9GT	**3.8**	**19,780**	**147**	**10**	**36**

LIBERIA

EL2AV	**A**	**378,700**	**732**	**68**	**107**
EL2AR	"	343,070	584	65	138

MAURITIUS

3B8RS	**A**	**3,334,880**	**3057**	**117**	**263**
			(Opr. DJ6QT)		

NAMIBIA

ZS3AM	**A**	**378,120**	**940**	**67**	**70**
ZS3HL	**28**	**331,590**	**1062**	**30**	**75**

PANTELLARIA ISLAND

I8GZQ/IH9	**28**	**242,847**	**851**	**26**	**73**

REPUBLIC OF SOUTH AFRICA

ZS6AF	**A**	**1,061,856**	**1252**	**92**	**196**
S83T	"	**782,600**	**1318**	**63**	**137**
ZS6ARG	28	25,011	136	22	41
ZS6HZ	**21**	**652,689**	**1557**	**36**	**105**
ZS6AAR	**14**	**150,995**	**514**	**30**	**71**
ZS6DW	3.8	512	22	5	3

SOUTHERN SUDAN

K5LBU/ST0	A	14,490	69	26	44

UGANDA

WN4FVU/ 5X	**A**	**1,079,400**	**1739**	**58**	**152**

ASIA

ASIATIC U.S.S.R.

ARMENIA

UG6LT	**21**	**63,851**	**375**	**19**	**48**
UG6GAF	**14**	**408,036**	**1058**	**38**	**110**
UG6LQ	"	243,090	810	30	81

ASIATIC S.S.R.

UA9FDL	**A**	**911,018**	**939**	**87**	**259**
UA9QBS	"	422,688	734	76	183
UA9AED	"	323,979	519	69	168
UA9XWU	"	296,595	659	65	104
UA9MR	"	293,509	312	97	252
UA9CCI	"	284,544	463	68	179
UV9PP	"	273,581	422	65	185
UA9UUN	**28**	**206,793**	**894**	**30**	**81**
UA9YE	"	183,077	729	30	77
UA9CMS	"	141,790	501	29	81
UA9OIE	"	107,129	462	26	73
UA9COI	"	34,255	193	17	48
UA9CFC	**21**	**64,602**	**315**	**19**	**55**
UA9FCI	"	32,880	193	13	47
UA9UTF	"	18,000	136	14	36
UA9CBM	**3.8**	**12,760**	**118**	**8**	**32**
EZ9QAA	**1.8**	**1,520**	**37**	**3**	**13**
UA0SAU	**A**	**1,294,975**	**2234**	**85**	**192**
UA0QWB	"	367,290	875	71	139
UA0IAA	"	172,501	812	60	73
UA0CCW	"	17,764	184	31	65
RA0CCM	**28**	**169,929**	**798**	**27**	**52**
UA0ABC	"	37,772	212	18	53
UA0FCL	"	33,072	314	21	27
UA0LCM	"	25,204	170	21	32
UA0QCL	"	8,250	143	9	24
UK0QAA	**14**	**201,253**	**675**	**34**	**79**

AZERBAIJAN

UD6CN	A	61,105	191	40	81
UD6DER	21	5,831	86	21	28
UD6DJH	**14**	**267,096**	**2154**	**35**	**89**

GEORGIA

UF6VAG	**A**	**2,202,018**	**2322**	**78**	**249**
UF6QAC	**28**	**121,230**	**527**	**25**	**75**
RF6FEU	"	17,766	145	7	35
UF6FKK	"	7,290	111	8	19

KAZAKH

UL7LAW	**28**	**305,286**	**1031**	**31**	**92**
UL7EAF	"	**227,836**	**1089**	**28**	**75**
UL7GCU	"	28,200	149	25	50
UL7TAC	"	1,479	35	3	9
UL7LEZ	**21**	**607,035**	**2012**	**38**	**103**
UL7QF	14	4,120	43	18	22
UL7LA	7	45,890	335	17	48
UL7TAY	3.8	2,508	53	5	14

KIRGHIZ

UM8MAA	14	48,025	216	24	61

TADZHIK

UJ8JCQ	**28**	**412,800**	**1311**	**34**	**94**
UJ8JGJ	**21**	**472,044**	**1298**	**35**	**104**

TURKOMAN

UH8HAI	**28**	**83,412**	**456**	**14**	**49**
RH8EAA	"	70,702	259	30	76

HONG KONG

VS6JR	**A**	**350,448**	**924**	**72**	**124**

ISRAEL

4X0U	**28**	**1,187,200**	**2555**	**37**	**123**
			(Opr. 4X4UH)		
4Z4LG	"	**922,054**	**2385**	**36**	**98**

JAPAN

JR1AIB	**A**	**1,955,860**	**1769**	**133**	**247**
JA1ELY	"	**1,909,415**	**1645**	**135**	**280**
JH1EDB	"	**1,466,676**	**1603**	**102**	**209**
JH1EAQ	"	**1,462,918**	**1793**	**99**	**190**
JF1SEK	"	**902,097**	**1195**	**87**	**172**
JA1IDY	"	650,608	874	87	172
JA6CNL	"	630,421	978	76	147
JA1DQT	"	623,007	779	88	191
JA1PCY	"	589,725	897	81	144
JA1JKG	"	585,024	1153	63	113
JH2CJW	"	351,860	510	85	156
JR3XEX	"	346,821	632	68	125
JA8SW	"	341,316	524	84	144
JA4ESR	"	220,886	438	73	106
JI1LLD	"	169,120	362	56	104
JH5AUE	"	160,515	269	65	140
JA7JND	"	151,368	379	36	100
JAQUH	"	137,471	341	59	80
JH1UUT	"	117,000	385	40	64
JA1BUI	"	99,000	305	31	59
JA6CM	"	97,875	257	48	87
JA6QZ	"	95,770	276	50	72
JA6IP	"	85,995	213	52	95
JA7KCD/1	"	84,872	289	44	59
JA0ECZ	"	76,214	253	39	67
JA7KM	"	75,348	224	42	75
JR1JUR	"	67,221	246	29	70
JA6AZQ	"	61,160	194	43	67
JA7FMZ	"	59,570	181	49	68
JF3CEC	"	58,203	240	37	50
JI1PCN	"	56,055	179	48	63
JA4AQR	"	50,386	207	34	52
JL1DBI	"	44,704	175	33	55
JA9XBW	"	36,876	160	33	51
JK1TLP	"	30,090	128	34	51
JA5PEE	"	26,312	107	39	49
JA0FMB	"	25,245	101	33	52
JA1ALX	"	15,675	95	22	35
JA1RDP	"	6,873	81	16	13
JH1MTR	"	2,432	26	15	17
JH1FJK	"	2,310	26	18	17
JA1HQS	"	2,050	28	12	13
JH1AJT	**28**	**1,005,822**	**2225**	**35**	**118**
JE2HCJ	"	**626,501**	**1536**	**34**	**103**
JA1NID	"	**390,310**	**1196**	**32**	**83**
JA7BSK	"	381,027	1213	31	76
JA3EQC	"	245,280	870	30	66
JH1ARC	"	213,324	833	28	59
JH1KRC	"	210,573	725	33	66
JH3GRE	"	206,988	749	31	63
JA1EF	"	123,800	432	29	71
JL1BLW	"	109,840	472	26	54
JA2DSF	"	105,452	442	31	51
JH7UJU	"	93,396	397	29	57
JA2YVK	"	86,978	320	29	67
			(Opr. JE2UPL)		
JM1ABP	"	84,096	396	25	48
JR3RVO	"	68,094	297	24	54
JA6EFT	"	63,758	270	25	59
JA3HTT	"	51,088	314	19	43
JA1CQT	"	47,685	197	29	56
JR3CVJ	"	43,200	169	30	60
JA1JGH	"	41,574	182	32	50
JA3BBG	"	36,424	212	19	39
JA7CUK	"	29,640	197	24	41
JA1EHK	"	28,993	127	28	51
JH4KED	"	26,904	168	20	37
JA1FO	"	26,536	146	22	40
JI3BFC	"	26,520	146	23	42
JR7CDL	"	24,735	170	21	30
JA4GXS	"	23,320	122	22	33
JA1JGP	"	20,298	137	18	33
JA1NTK	"	18,972	104	23	39
JR4HBE	"	18,045	138	15	30
JA3BRB	"	15,920	134	18	32
JH5AAK	"	14,716	100	19	33
JE3FUN	"	14,625	111	17	28
JE1PJR	"	13,892	108	17	29
JH1DHI	"	13,294	98	17	29
JA4KWU	"	12,644	77	21	37
JR1OYL	"	11,520	122	14	18
JA2EZA	"	11,184	83	18	30
JH2ORJ	"	10,593	107	14	19
JA2OJ	"	10,500	84	16	26
JR7HNF	"	9,756	94	14	22
JH6YAH	"	7,650	88	13	17
JA2DHL	"	6,825	65	14	21
JR3CVO	"	6,424	51	16	28
JA1AAT	"	5,762	45	16	27
JR3QCT	"	3,276	43	12	16
JA8ERG	"	2,976	63	8	8
JA4DXT	"	2,400	40	9	11
JA4HPO	"	900	20	8	7
JE3FAB	"	858	26	6	5
JM1LGL	"	429	12	6	7
JA7ZTI	"	6	1	1	1
JH1JGX	**21**	**569,840**	**1426**	**36**	**100**
JE3TBM	"	**469,238**	**1310**	**35**	**86**
JA2APA	"	**329,989**	**856**	**33**	**98**
JR1DZA	"	161,952	491	34	78
JR3RIY	"	131,435	463	30	67
JA1DCO	"	111,504	417	29	63
JA6ERV	"	100,058	351	31	67
JH2VNY	"	84,224	300	32	62
JH1QDB	"	70,640	304	28	52
JI1QLB	"	65,040	286	26	54
JJ1NUB	"	53,040	214	27	58
JJ1LBJ	"	47,728	221	25	51
JJ1XBQ	"	36,960	183	26	44
JF3EGT	"	35,840	195	23	41
JF1WGX	"	30,900	184	23	37
JA1SJV	"	24,453	93	32	67
JA3FZI	"	21,168	130	19	30
JR3LFP	"	16,254	109	22	32
JA1BBA	"	15,180	112	18	28
JF2HGP	"	13,992	116	19	25
JR7ROC	"	11,385	92	16	29
JA1IT	"	10,793	87	18	25
JH2AGC	"	9,850	67	14	36
JI1IXW	"	9,515	62	21	34
JA6ABG	"	7,888	85	10	22
JH2XTV	"	7,585	65	17	24
JA0BQB	"	6,808	67	15	22
JF3NRT	"	5,589	71	9	18
JA3UV	"	4,284	51	11	17
JA6QDU	"	4,020	47	14	16
JF3GEP	"	3,120	44	10	16
JR4ISI	"	2,574	38	12	14
JH1XIT	"	2,080	23	9	23
JH1HER	"	1,900	30	12	13
JM1ACW	"	1,598	36	7	10
JH7HJF	"	1,218	23	10	11
JG1CRM	"	986	20	8	9
JR7ASO	"	121	6	5	6
JA1YFH	"	75	5	5	5
JA9YHB	"	16	2	2	2
JA0JHA	**14**	**394,605**	**1008**	**39**	**96**
JA6BZI	"	248,360	620	37	106
JA9AQE	"	80,240	204	37	81
JA7BAL	"	19,890	88	30	55
JA8SPZ	"	12,006	66	27	42
JA3AOL	"	2,210	33	12	14
JA2BAY	**7**	**161,568**	**593**	**32**	**64**
JA6IEF	**3.5**	**26,619**	**164**	**22**	**35**

KOREA

HM1PW	**A**	**593,024**	**1099**	**80**	**146**
HL9KW	21	36,480	292	19	41

KUWAIT

9K2DR	**A**	**592,138**	**933**	**50**	**164**
9K2FX	21	132,790	498	29	69

MACAO

CR9B	**28**	**262,530**	**1563**	**27**	**63**

MONGOLIA

JT1AN	28	660	24	6	5

OGASAWARA ISLAND

JD1ALU	A	51,492	399	36	48
JD1AEV	3.8	196	49	2	2

CIRCLE 5 ON READER SERVICE COUPON

SAUDI ARABIA

HZ1HZ	A	1,372,927	1520	81	236

WESTERN MALAYSIA

9M2KG	A	211,939	1146	48	89

EUROPE

AALAND ISLANDS

OHØAM	21	1,043,178	3074	33	94
		(Opr. OH2BBM)			
OHØNA	1.8	117	13	2	7

AUSTRIA

OE7SHI	A	30,175	275	19	52
OE5CWL	"	13,930	145	15	20
		(Opr. OE5CUL)			
OE6EUG	28	17,424	105	19	47
OE1LPW	3.8	5,358	135	5	33

AZORES

CT2QN	14	132,048	626	25	87
CT2CE	7	173,826	797	22	65

BALERIC ISLANDS

EA6GP	A	299,761	819	57	172
EA6ET	28	809,958	2719	35	87
EA6HF	14	10,856	101	15	31

BELGIUM

OR7KA	A	369,044	1018	30	121
OR6IT	"	127,680	322	53	107
OR7FD	"	21,567	191	19	72
OR4XG	28	97,356	442	23	61
ON5EU	14	7,614	122	16	39
OR5UM	7	89,760	537	18	67
OR6JG	3.8	33,600	443	10	50

BULGARIA

LZ13CPR	A	113,564	415	49	129
LZ1CW	28	223,872	896	33	95
LZ1EP	"	4,210	32	7	15
YO9CFR	14	330,372	1341	35	103

CRETE

SVØBC	28	534,699	2328	32	89
SVØAW/9	14	75,466	317	31	88

CZECHOSLOVAKIA

OK2BLG	A	949,560	1198	100	310
OK1MSN	"	737,804	1163	64	204
OK2YAX	"	647,235	1102	71	214
OK3CJC	"	470,872	928	69	215
OK2ABU	"	429,419	990	68	168
OK2BJU	"	345,345	647	64	207
OK3CEM	"	302,560	624	68	176
OK2BQL	"	254,687	546	69	188
OK1KZ	"	132,770	459	45	142
OK2BWH	"	102,330	484	40	95
OK1AYQ	"	98,658	365	56	106
OK1IBL	"	69,822	197	55	107
OK1EP	"	67,942	189	52	109
OK1KIR	"	59,388	247	45	102
OK2YN	"	54,014	214	42	71
OK1DIE	"	37,125	238	29	96
OK2BPJ	"	17,670	186	18	39
OK3YCA	"	17,654	171	21	76
OK1FCA	"	9,486	81	19	32
OK2BSA	"	8,896	69	23	41
OK1AAE	"	8,322	55	30	43
OK2PDE	"	8,280	62	25	35
OK3YDP	"	8,156	101	15	41
OK1FBH	"	5,371	70	12	29
OK1AOU	"	1,127	35	7	16
OK1TA	28	955,472	2248	37	115
OK3CFA	"	352,452	1004	35	103
OK1ZL	"	224,812	735	31	93
OK1ATT	"	218,270	781	28	87
OK1AFB	"	83,494	309	31	78
OK1AVD	"	42,525	230	22	53
OK1AYN	"	34,374	142	26	76
OK2BJR	"	25,641	120	23	40
OK3CIS	"	20,930	94	25	66
OK1ALQ	"	17,556	195	12	32
OK3CFP	"	9,212	76	18	29
OK2SPS	"	2,576	47	10	18
OK3JW	21	162,006	607	33	101
OK1ASQ	"	98,610	404	32	82
OK1DLA	"	61,875	289	24	75
OK1JCH	"	19,372	182	13	45
OK1PCL	"	18,630	132	18	51
OK1IMP	14	210,980	866	35	105
OK3YK	"	49,470	420	21	64
OK3CKF	"	33,668	287	17	59
OK2BEM	"	17,286	191	15	52
OK3CGI	"	9,454	152	12	46
OK1AXB	"	3,772	82	6	35
OK1KJP	"	3,432	41	6	22
OK2PBG	"	3,397	68	9	34
OK2KOD	"	897	33	6	17
OK2QX	7	1,302	37	6	25
OK2HI	3.8	26,733	450	10	47
OK3YCL	"	20,332	385	9	43
OK2PGG	"	9,143	222	6	35
OK1AYE	"	8,280	210	5	35
OK2SMO	"	4,386	128	5	29
OK1MKD	"	1,334	57	4	19
OK2LN	"	266	19	3	11
OK2BBQ	"	50	10	2	3
OK1AWQ	1.8	7,844	212	6	31
OK1KPU	"	4,392	120	6	30
		(Opr. OK1JDX)			
OK1MGW	"	2,288	108	3	19
OK1AXD	"	1,176	52	4	17
OK3PQ	"	525	37	3	12

DENMARK

OZ5EV	A	985,574	1177	95	263
OZ2BM	"	295,160	609	62	172
OZ4MD	"	238,542	576	62	187
OZ1EE	"	132,667	336	61	146
OZ6OG	"	129,035	349	62	135
OZ4HD	"	112,095	369	47	112
OZ5EDR	"	90,368	331	37	91
OZ1ZE/A	"	81,829	232	52	121
OZ1FRR	"	39,060	188	31	62
OZ2TH	"	36,765	177	35	94
OZ9OL	"	26,402	152	26	60
OZ7DX	"	3,038	44	12	19
OZ1DM	"	2,704	46	12	14
OZ6XR	28	81,400	425	23	51
OZ1FTE	"	69,736	321	26	66
OZ8BZ	"	19,458	106	22	41
OZ3FC	"	6,615	67	14	21
OZ1FAO	"	1,540	25	12	16
OZ1CCB	21	7,906	75	15	44
OZ3KE	"	1,075	23	9	16
OZ1DTF/A	14	308,220	997	34	98
OZ5VT	7	20,300	229	16	54

ENGLAND

G3FXB	A	3,770,819	3263	109	322
G3VAO	"	298,158	736	58	171
G3MWZ	"	54,900	261	33	89
G3MXJ	28	1,182,880	2642	37	123
G3SNN	"	423,472	1203	35	98
G3TXF	"	31,570	154	22	60
G3NFV	21	264,513	982	28	83
G3ZHL	"	54,796	404	17	59
G3VPW	14	659,492	1859	36	122
G3TKR	3.8	8,404	166	7	37

FINLAND

OH6JW	A	4,582,048	3724	134	362
OH1IJ	"	2,501,870	2938	97	250
OH3YI	"	2,355,780	2193	111	315
OH2BTI	"	475,280	890	64	196
OH2FS	"	208,236	318	71	197
OH2JQ	"	82,008	232	46	155
OH7NW	"	79,736	226	48	146
OH2PJ	"	77,679	233	48	89
OH6UM	"	77,480	422	26	39
OH2LP	"	68,992	190	52	144
OH2BEN	"	49,104	176	39	105
OH2VZ	"	42,828	144	43	86
OH5RZ	"	33,345	210	29	66
OH1FM	"	32,148	106	45	96
OH3HY	"	19,278	123	24	39
OH2BPE	"	15,840	83	31	49
OH5PA	"	15,600	75	37	63
OH1PY	"	13,735	71	26	41
OH6EI	"	5,568	54	18	40
OH1MQ	"	2,028	36	12	27
OH3XZ	28	802,746	2025	38	123
OH4PW	"	32,640	209	20	60
OH1TD	"	27,436	186	18	58
OH1KF	21	457,968	1427	31	85
OH2OT	"	373,692	1400	28	86
OH1KB	"	148,785	589	28	81
OH1KA	"	143,468	691	24	65
OH1OR	"	78,001	416	19	58
OH7XU	"	7,076	59	15	46
OH1ZE	"	6,930	116	11	31
OH6DH	"	6,726	90	12	26
OH7TO	"	2,592	54	7	25
OH8SR	14	830,088	2036	40	122
W6EUF/					
OH3	"	179,924	658	34	90
OH1IO	"	167,490	948	20	70
OH3BX/2	"	53,072	229	33	74
OH2BVF	"	20,191	233	17	44
OH3HS	"	7,097	133	9	38
OH1PG	"	3,492	89	7	29
OH2BCD	"	1,924	48	13	23
OH2YY	3.8	25,312	447	9	47
OH2BAZ	"	8,568	203	6	36
OH5NG	1.8	1,679	73	4	19

FRANCE

F9GL	A	1,428,108	1710	96	245
F8WE	"	709,137	1515	36	211
F6FMT	"	184,920	420	53	131
F6FSX	"	101,871	320	41	106
F6GPG	"	1,170	28	9	9
F6EMA	28	286,520	1037	29	75
F6BVB	"	130,152	572	24	63
F6GCP	"	38,157	258	19	50
F6GKC	21	13,400	107	16	51
F6FNA	"	10,450	99	15	35
F6BRK	14	4,756	84	11	30

GERMANY (FRG)

DJ4PT	A	4,182,321	3884	113	316
DK8NG	"	2,871,176	2342	121	351
DJ3HJ	"	2,686,608	3059	87	237
DK8AX	"	997,500	1242	98	282
DK4OO	"	525,576	634	96	263
DL7PD	"	275,200	606	67	189
DJ8UV	"	173,818	517	62	171
DJ9MH	"	162,846	335	71	178
DJ9UU	"	126,996	306	61	167
DL2FAG	"	120,228	408	35	138
DL9EY	"	118,482	363	42	140
DF4YG	"	92,316	275	55	92
DF8AN	"	83,955	387	45	90
DF6AT	"	68,256	264	30	78
DK3QJ	"	48,246	227	42	87
DL7YG	"	40,194	154	39	60
DK3BJ	"	35,244	139	44	88
DJ4AX	"	30,573	119	28	101
DL1ZC	"	29,738	157	34	75
DK5KJ	"	20,703	135	28	78
DK1YU	"	19,360	120	26	62
DF7IF	"	9,802	107	14	44
DF8MB	"	2,232	26	19	17
DF8XC	28	551,616	1406	36	100
DF4FR	"	438,250	1267	33	92
DLØKF	"	338,040	1027	35	85
DF9RL	"	291,213	951	32	85
DK2XX	"	124,660	416	31	84
DL9YC	"	119,064	618	24	42
DF3AX	"	95,128	442	25	63
DL4MBE	"	85,822	443	27	67
DL1KAV	"	37,145	240	28	87
DL9JL	"	18,980	123	21	44
PY5XPP/DL	"	7,807	101	14	23
DL8QS	21	746,320	1805	36	116
DF9YY	"	614,042	2096	30	83
DJ5TH	"	364,320	1211	31	84
DL9SN	"	110,740	405	29	84
DL1MD	"	44,100	225	23	61
DK5EF	"	17,536	108	21	43
DF7UC	"	14,760	176	17	28
DLØPG	14	805,812	2081	39	120
DL8PC	"	790,500	1941	39	131
DK3FB	7	123,018	776	25	76
DK6PY	"	42	3	3	3
DK5EZ	1.8	585	43	3	12

GERMANY (GDR)

Y43ZI	A	522,522	852	80	206
Y31ZE	"	383,326	729	71	203
Y22JJ	"	344,064	674	71	175
Y23IL	"	332,352	799	70	218
Y38YK	"	283,926	698	54	183
Y35YE	"	226,920	584	65	185
Y39QA	"	216,027	616	58	185
Y43XO	"	215,152	527	61	165
Y47ON	"	176,118	553	56	141
Y59YN	"	154,574	549	47	134
Y22RK/P	"	132,675	444	47	136
Y39XO	"	121,992	323	53	151
Y47XF	"	113,058	285	54	144
Y45SA	"	61,194	219	43	98
Y47VN	"	56,750	225	39	86
Y36ZM	"	54,230	216	38	107
Y36YC	"	54,051	291	30	99
Y41WM	"	53,592	233	37	95
Y41ZH	"	49,572	201	40	68
Y26HO	"	43,050	181	42	81
Y33TA	"	43,018	186	34	103
Y21XC	"	33,924	208	35	97
Y26BN	"	33,394	187	33	85
Y44XI	"	13,345	106	21	64
Y48ZF	"	13,140	91	24	66
Y62ZH	"	9,737	96	24	67
Y59ZF	"	7,442	85	19	42
Y51YF	"	2,832	31	17	31
Y31YE	"	840	16	13	15
Y79ZL	28	503,880	1608	32	82
Y37XJ	"	186,276	654	31	83
Y22WF	"	85,448	414	23	65
Y45RN	"	73,707	368	24	55
Y27FN	"	46,215	278	24	55
Y32ZF	"	45,333	277	20	53
Y49RO	"	31,512	169	21	57
Y48SL	"	29,868	209	20	37
Y26DO	"	27,542	293	27	67
Y56XA	"	21,359	167	16	37
Y53UA	"	16,873	178	16	31
Y56WG	"	14,285	112	19	41
Y57WJ	"	14,040	87	22	50
Y41SJ	"	12,948	158	13	26
Y26BM/a	"	12,138	137	15	27
Y53WL	"	10,890	130	12	21
Y53SA	"	9,216	107	14	34
Y27GL	"	7,400	67	14	36
Y51ZE	"	2,688	50	8	13
Y56ZA	"	2,656	49	10	22
Y23EE	"	2,370	41	12	18
Y64YH	"	1,972	36	11	18
Y32WC/P	21	182,466	863	23	70
Y78XL	"	132,288	642	26	78
Y22TO	"	91,549	427	22	61
Y42UD	"	64,042	379	20	62
Y37ZE	"	23,162	165	21	53
Y57TH	"	7,644	95	13	36
Y26HG	"	5,863	85	9	32
Y37WE	"	4,576	53	13	31
Y37UF	14	88,528	723	21	67
Y26LN	"	16,638	206	13	46
Y39ZC	"	10,521	87	18	45
Y55XG	"	9,275	153	12	41
Y32UC/P	3.8	39,590	535	14	60

GREECE

SVØAU	A	499,673	1630	51	130
SVØAB	28	72,960	352	26	69
SVØAD	14	221	7	6	7

HUNGARY

HA5NP	A	2,287,200	2314	111	369
HA1ZD	"	200,568	546	48	135
HA7PQ	"	67,144	286	39	115
HA5KF	"	56,736	227	43	101
HA9RU	28	844,085	2122	37	112
HG8KWT	"	197,379	732	32	85
HAØHW	"	106,650	555	26	64
HG8KAZ	"	104,544	449	25	74
HA1ZH	"	38,048	276	18	40
HA5CE	"	19,900	178	15	35
HA4XH	14	385,760	1161	39	121
HA6KNB	"	109,203	726	21	68
HA9RT	"	36,972	309	19	60
HA5KHE	3.8	7,160	169	6	34
		(Opr. HA5LZ)			
HA9PN	"	2,664	113	4	20
HA5KLR	"	494	26	4	15
HA5KLF	"	21	4	3	4

ICELAND

TF3US	14	75,609	418	26	67

IRELAND

EI1DH	A	304,500	1138	33	92
EI7CC	28	171,360	808	25	77
EI4DN	"	79,182	510	22	61
EI8DE	21	48,600	239	24	66

ISLE OF MAN

GD4HOX	28	7,222	67	14	32

ITALY

I1POR	A	3,493,368	3059	96	320
I6FLD	"	3,202,850	3323	89	261
I2MQP	"	486,898	748	87	187
IV3GQL	"	179,237	528	43	108
I4CSP	"	123,456	643	53	139
IØKHY	"	13,200	60	28	60
IØMGM	28	1,318,966	2930	38	129
I5SDG	"	1,279,314	3067	37	112
I2PJA	"	1,061,161	2850	38	116
IØGPP	"	379,300	1446	30	70
I2VYR	"	339,836	1148	33	73
IØWKS	"	256,608	961	26	73
I5JFG	"	105,336	446	26	62
I5VXG	21	863,185	2262	37	108
I1YBM	"	762,216	2060	37	119
I6ZJC	"	376,794	1187	37	84
IØUZF	"	11,284	170	9	43
I5NPH	14	1,062,936	2429	37	134
I2VRN	"	944,415	2497	37	118
I1ZEU	"	704,773	1860	38	119
I6NOA	7	233,996	972	28	94
I4AVG	3.8	66,598	651	16	55

JERSEY

GJ5DPU	A	50,544	337	27	90
		(Opr. PAØINE)			
GJ5DPV	"	9,576	99	21	51
		(Opr. PA3ABA)			
GJ5DPW	21	52,195	589	17	48
		(Opr. PAØKHS)			
GJ5DPX	14	59,012	526	17	59
		(Opr. PA3AIR)			

LIECHTENSTEIN

HBØBOE	A	1,220,394	1854	73	221
		(Opr. DJ9ZB)			

LUXEMBOURG

LX1GG	28	223,665	199	15	31

NETHERLANDS

PA2TMS	A	3,421,856	2889	113	375
PAØCOR	"	83,190	357	35	106
PAØLIE	"	51,783	251	37	86
PA3AIK	"	31,930	181	31	72
PA3AOG	"	14,280	105	20	50
PA3ASK	"	3,915	43	17	28
PA3AEB	28	117,947	550	20	59
PAØMIR	"	74,100	303	25	75
PAØHTR	"	26,791	146	19	54
PAØRRS	21	51,755	230	29	80
PA3AXU	14	9,918	82	13	45
PAØIJM	3.8	23,940	403	11	46

NORWAY

LA1NG	A	422,604	800	67	185
LA6ZW	"	371,535	684	65	170
LA3JAA	"	76,415	292	42	113
LA7FD	"	58,463	170	52	129
LA6UL	"	43,848	167	47	121
LA2AD	"	36,562	196	36	65
LA2IR	"	18,795	101	36	69
LA4NL	"	13,053	180	13	44
LA3EX	"	12,099	271	9	28
LA5YV	"	6,090	75	20	50
LA2IJ	"	4,565	37	23	32
LA1RN	"	1,044	24	7	11
LA9ZV	28	85,000	281	35	101
LA9ML	"	67,240	360	24	58
LA4HH	"	6,669	40	22	35
LA5HAA	"	2,900	56	12	13
LA3JT	21	37,128	170	19	59
LA4RQ	"	22,506	268	15	37
LA8KV	"	3,280	36	11	30
LA2ZN	14	31,683	385	16	43
LA7JO	7	17,696	146	16	40
LA4YW	"	1,710	50	5	25
LA5OK	3.8	9,870	199	7	40

POLAND

SP5XM	A	365,160	703	72	183
SR9HWN	"	237,634	570	67	195
SP3DAH	"	228,712	558	64	189
SR9BDQ	"	192,517	472	63	188
SR9BQJ	"	174,363	712	34	99
SR7AWA	"	163,440	502	61	166
SR9AKD	"	131,016	327	64	142
SP2KAE	"	122,450	556	25	122
SP9JRZ	"	98,271	334	44	135
SP9ADK	"	77,816	374	34	103
SPØPBW	"	75,440	394	39	106
SP2JJU	"	66,464	260	42	82
SP9HWS	"	56,072	128	30	71
SP1HNH	"	26,390	148	30	40
SP1GHW	"	25,568	171	34	74
SR5ES	"	17,342	75	45	57
SR9ZD	"	9,504	125	32	40
SP9HNB	"	9,106	80	22	36
SP6JZB	"	7,776	121	12	42
SP2LOB	"	6,250	70	16	34
SP9IKN	"	2,589	81	13	24
SR7CMR	"	1,692	39	10	26
SP5ENA	"	874	18	11	12
SP5BT	28	40,140	190	28	65
SR7FTP	"	27,898	180	17	41
SP5AD	"	17,700	122	21	39
SP6ECA	"	13,770	70	29	52
SP6AOI/6	"	11,223	123	13	30
SP2AYC	"	9,050	105	17	33
SR1FPG	"	8,448	99	16	28
SP9PZD	"	8,040	61	19	41
SP2UU	"	6,885	67	16	29
SP5HHV	"	6,250	49	18	32
SR6AGD	"	3,795	61	9	14
SR9EM	"	2,822	48	11	23
SP9AOA	"	2,556	33	16	20
SR6AYP	"	144	6	6	6
SP9EVP	21	279,625	1175	33	92
SR9BQJ	"	172,900	712	34	99
SP6DXG	"	114,456	469	28	86
SR8HZZ	"	102,564	559	21	56
SP9CTW	"	80,256	282	34	94
SP6DNS	"	66,400	262	30	70
SP9IGY	14	86,835	553	28	77
SR8IGY	"	45,560	428	21	64
SR9UO	"	34,113	228	26	57
SP2PIK	"	30,176	195	26	56
SP7ETG	"	18,590	207	13	52
SP3GVX	"	17,010	193	15	55
SP9FSH	"	9,918	140	17	40
SP2EP	"	9,360	125	12	40
SP2AGM	"	5,289	110	7	34
SR7EJS	"	4,704	45	16	26
SR6DMJ	"	4,462	95	8	38
SP5CJQ	"	3,852	57	14	20
SP9IKZ	"	990	30	7	15
SP3DOI	7	281,970	879	34	96
SP5KMB	"	105,680	697	20	60
		(Opr. SP5GIQ)			
SR9EMI	"	1,566	46	7	22
SP5PBE	3.8	30,177	436	11	52
SP9KMM	"	17,904	362	8	40
		(Opr. SP9IJX)			
SR4CUF	"	14,617	319	6	41
SP4JSO	"	10,994	230	7	39
SP9LLE	"	6,845	184	5	32
SP9HZF	"	3,840	130	4	26
SR6EQZ	"	3,816	103	5	31
SR8EMO	"	2,755	93	5	24
SR5LM	"	1,680	59	5	23
SP9HZR	"	1,196	53	4	19
SR6DVP	"	234	20	3	10
SP9DH	1.8	1,364	63	4	18

PORTUGAL

CT4MS	A	23,332	135	26	50
CT1AFW	28	443,818	1903	25	74
CT1ACW	21	297,654	1178	28	86

ROMANIA

YO6AWR/P	A	678,634	1267	80	203
YO7ARY	"	87,450	326	46	119
YO7APA	"	83,868	289	47	124
YO3CR	"	54,108	202	54	113
YO2BKK	"	34,632	394	38	84
YO4KCC	"	30,918	253	33	70
YO4KRR	"	25,788	217	25	67
YO7ARZ	"	24,119	110	29	60
YO8BDA	"	8,235	121	21	40
YO2BPM	"	7,952	92	18	48
YO9CBZ	"	3,660	129	16	36
YO4BMJ/9	"	1,834	34	7	20
YO3KWJ	28	644,250	1747	37	113
		(Opr. YO3JW)			
YO6OO	"	9,653	101	12	37
YO4BZB	"	1,350	31	6	12
YO5AMN	"	594	15	9	13
YO6AZM	21	60,900	538	22	48
YO4AYE	"	21,574	216	16	51
YO8FR	14	34,196	269	22	67
YO3FU	"	19,516	164	19	49
YO3KSC	7	33,634	438	12	55
YO3AAQ	"	19,745	227	12	43
YO2CGZ	"	8,858	160	10	33
YO3JG	"	1,425	31	6	19
YO2AQO	3.8	15,075	321	8	37
YO6LV	"	9,056	190	7	39
YO2BWW/3	"	8,514	249	6	27
YO6KEB	"	7,888	221	6	28
YO8BVS	"	882	44	5	16
YO6KED	"	840	43	4	16
YO8BDQ	"	266	20	4	10
YO6KEU	"	169	14	13	13
		(Opr. YO6ADP)			

SARDINIA

IS0MVE	**A**	**85,840**	**354**	**38**	**107**
IS0QDU	**28**	**113,700**	**558**	**27**	**73**
IS0KNG	**21**	**119,700**	**646**	**26**	**64**
IS0QDV	"	52,546	423	26	60
IS0WON	**14**	**148,932**	**743**	**30**	**78**

SCOTLAND

GM3BCL	**A**	**667,224**	**1153**	**68**	**148**
GM5AXY	**3.8**	**5,400**	**139**	**6**	**30**

SICILY ISLAND

IT9HLO	**28**	**743,808**	**1968**	**36**	**113**

SPAIN

EA2IA	**A**	**3,004,068**	**2791**	**106**	**311**
ED3AZW	"	**2,437,614**	**2720**	**102**	**267**
EA1PT	"	1,526,252	1915	88	276
EE7TV	"	1,082,120	2041	70	190
EE1QH	"	770,112	1333	69	183
EA7VE	"	87,704	302	41	111
EA2DT	"	76,544	287	37	91
EA1JO	"	47,750	203	37	88
EA4CN	"	43,360	143	36	124
EA7BF	"	43,092	219	37	77
EA7AIY	"	29,165	197	29	66
EA5NT	"	27,807	147	30	63
EA2CR	"	11,390	113	14	53
EA5AFQ	"	7,783	89	18	25
EA7AFV	"	5,640	94	20	40
EA3KW	**28**	**476,154**	**1474**	**32**	**94**
EE1TA	"	131,776	586	29	87
EA5ANR	"	122,056	584	23	65
EA3ADE	"	81,488	401	23	65
EA2CQ	"	45,980	306	22	54
EA3AB	"	25,728	220	18	49
EA7ATE	"	5,664	63	8	40
EA3ARX	"	1,176	26	10	11
EA2OJ	**21**	**93,925**	**460**	**20**	**65**
EA7AJN	"	4,104	54	11	27
EA7AKQ	**14**	**207,376**	**772**	**27**	**77**
EA4APG	"	11,098	126	13	49
EA3BSA	"	4,181	91	10	27
EA1QF	**3.8**	**4,176**	**84**	**10**	**36**

SWEDEN

SM0DJZ	**A**	**1,003,068**	**1265**	**89**	**285**
SM3BIZ	"	**887,470**	**1112**	**86**	**244**
SM4DHF	"	672,586	1061	73	225
SM7AIO	"	98,464	400	34	102
SM5BDV	"	67,782	213	47	96
SM4BTF	"	48,125	176	37	88
SM0CHA	"	33,402	305	21	17
SM7TV	"	32,436	223	26	76
SM5CAK	"	26,568	87	37	71
SM0CGO	"	12,348	84	19	65
SM6EOC	**28**	**695,808**	**1710**	**37**	**107**
SM3EVR	"	**442,250**	**1140**	**36**	**109**
SM6INC	"	300,039	1074	26	77
SM6LGW	"	280,126	993	27	80
SM2JUR	"	119,340	596	29	79
SM0BDS	"	88,470	386	25	65
SM0LEA	"	44,640	381	18	44
SM6KQK	"	29,680	277	18	36
SM6JNA	"	26,164	181	18	44
SM5BRW	"	24,444	120	24	60
SM5BRG	"	20,230	121	21	49
SM5ARG	"	17,043	141	18	39
SM0GYG	"	16,954	162	15	34
SM7JUQ	"	15,104	96	17	46
SM4KAJ	"	13,832	113	17	39
SM0BWM	"	13,596	206	21	45
SM5AQJ	"	12,194	78	21	46
SM0TW	"	12,036	90	17	34
SM5BDA	"	10,117	65	19	48
SK2IV	"	8,476	106	15	36
SM0LPO	"	8,130	139	10	20
SM3DXQ	"	7,785	79	15	30
SM5CBM	"	6,909	58	16	31
SM0FM	"	3,458	45	13	25
SM5EUF	"	882	22	8	10
SM3DMM	"	532	32	5	9
SM4CNN	**21**	**575,795**	**1634**	**34**	**111**
SM5HPB	"	328,356	977	31	95
SM6CKS	"	145,658	1087	36	98
SM0KV/0	"	100,320	382	33	81
SM0DNL	"	67,510	302	26	60
SM7HSP	"	47,926	307	16	46
SM0CXM	"	33,539	254	18	59
SM7GGK	"	9,794	106	15	44
SM7ABL	"	6,125	65	15	20
SM5AD	**14**	**313,426**	**1037**	**34**	**100**
SM2CEW	"	**127,720**	**505**	**33**	**91**
SM0JNF	"	105,380	603	25	85
SM6JY	"	8,840	140	11	41
SM5CCH	"	7,236	62	15	39
SM0EJM	"	170	18	4	11
SM4BNZ	**7**	**50,982**	**415**	**20**	**67**
SM4CAN	**3.8**	**13,988**	**204**	**13**	**39**

SWITZERLAND

HB9KC	**A**	**122,200**	**447**	**41**	**59**
HB9NN	"	7,191	79	16	35
HB9DX	21	28,122	99	33	96

EUROPEAN U.S.S.R.

BYELO-RUSSIA

UC2AFE	**A**	**309,400**	**667**	**61**	**199**
UC2ACL	"	6,625	85	16	37
UC2WBJ	**28**	**44,232**	**259**	**25**	**68**
UC2RZ	"	31,710	255	18	52
UC2AFA	**14**	**140,832**	**678**	**30**	**78**
UC2ACA	**1.8**	**9,920**	**185**	**9**	**31**

ESTONIA

UR2RBM	**A**	**169,680**	**384**	**59**	**143**
UR2HB	"	25,334	197	25	81
UR2RKS	"	198	6	5	6
UR2RSA	"	162	6	3	6
UR2QD	**28**	**1,079,298**	**2561**	**37**	**121**
UR2TAX	"	388,500	1263	33	92
UR2RKB	"	194,235	670	32	83
UR2RAM	"	45,984	223	26	70
UR2RES	"	28,470	167	20	58
UR2RBR	"	17,120	102	23	57
UR2RHF	"	14,308	105	20	53
UR2RGJ	"	7,695	79	16	29
UR2RER	"	5,264	52	16	40
UR2PL	"	5,100	43	17	33
UR2RL	**21**	**175,455**	**655**	**29**	**76**
UR2REC	"	9,870	97	14	33
UR2RWA	14	6,816	92	13	35
UR2FQ	**7**	**85,023**	**273**	**36**	**141**
UR2RHK	**3.5**	**7,161**	**206**	**5**	**28**
UR2RFK	**1.8**	**3,472**	**100**	**6**	**25**
UR2RCU	"	1,320	59	4	18

EUROPEAN RUSSIA

UA6AZA	A	1,365,436	2187	84	232
UA3QDW	"	925,840	1548	83	243
UA4NAA	"	310,596	641	71	215
UA3AKC	"	269,161	526	51	125
UA3TN	"	228,726	513	52	210
UW1AE	"	176,358	485	59	188
UW3RR	"	131,768	452	52	129
UA3TAG	"	70,200	403	43	77
UV3MM	"	50,040	360	44	95
UA3HH	"	39,330	242	36	78
UA4CK	"	37,275	225	32	73
UA3AGG	"	35,568	216	22	122
UA3TAM	"	33,915	257	22	83
UA4CH	"	10,614	122	19	42
UA1TT	"	4,662	63	29	45
RA3LAL	**28**	**114,804**	**545**	**27**	**81**
UA3ALE	"	67,540	319	27	83
UA6LIA	"	65,892	389	21	55
UA6LHU	"	65,175	492	23	56
RA3DKE	"	56,808	238	27	81
UA6PAT	"	34,260	250	19	41
UA4FCL	"	32,588	165	19	78
UA3DAT	"	29,665	178	24	61
UA6AJG	"	22,011	319	18	51
UA3DNV	"	13,468	259	16	36
UA3MBQ	"	4,961	73	11	30
UA3QDA	**21**	**282,204**	**910**	**36**	**98**
UA6LAX	"	86,850	441	24	65
UA6UDB	"	74,592	367	38	106
UA4CZ	"	57,526	347	29	69
UA6LLT	**14**	**362,551**	**1101**	**37**	**114**
UA3AEW	"	56,277	546	30	81
UA3DFK	"	39,032	269	22	60
UA3DR	"	14,652	85	26	40
UW4CI	"	8,326	139	12	34
UW4CW	"	5,566	91	11	37
UA1DZ	**7**	**119,034**	**797**	**28**	**74**
UW6LI	"	21,915	234	10	35
UA6LGX	**3.5**	**52,976**	**315**	**28**	**60**
UA3EAL	"	22,464	354	9	45
UA4PMK	"	21,960	261	13	48
UA3XAW	"	10,045	111	9	32

KALININGRAD

UA2EC	**28**	**111,561**	**374**	**30**	**93**

LATVIA

UQ7GDQ	**A**	**3,248,180**	**3351**	**103**	**300**
RQ2GAI	**28**	**61,710**	**375**	**19**	**47**
UQ2GEI	"	48,032	308	18	58
UQ2GCP	"	10,752	126	13	29
UQ2GAG	**3.5**	**37,524**	**528**	**12**	**47**

LITHUANIA

UP2NK	**A**	**3,509,110**	**3288**	**120**	**317**
UP2NV	"	**2,931,684**	**2342**	**121**	**355**
UP2CY	"	780,492	1018	86	251
UP2BBX	"	754,868	1232	72	217
UP2OU	"	622,480	1099	83	255
UP2BAR	"	457,272	806	55	161
UP2BFE	"	290,598	649	62	176
UP2BCS	"	206,682	528	63	159
UP2BAS	"	192,221	676	44	167
UP2PCB	"	133,956	507	47	136
UP2PBW	"	106,030	385	43	137
UP2BDO	"	99,919	350	42	121
UP2BFB	"	92,240	354	37	143
UP2NA	"	70,165	266	38	97
UP2BHI	"	24,882	190	19	47
UP2NO	"	13,764	158	17	57
UK2BBF	"	12,900	156	14	46
UP2BEB	"	4,182	80	10	41
UP2DM	**28**	**255,516**	**934**	**31**	**76**
UP2PAD	"	192,080	680	30	82
UP2PAQ	"	153,720	538	32	88
UP2BEL	"	120,161	461	28	79
UP2BFR	"	98,649	443	26	71
UP2BHT	"	69,003	312	32	67
UP2CV	"	11,685	85	19	38
UP2AV	21	25,024	265	17	47
UP2PAP	**14**	**106,708**	**541**	**25**	**78**
UP2OQ	3.5	15,635	132	17	42

MOLDAVIA

UO5GR	**A**	**125,404**	**354**	**64**	**150**
UO5DN	14	32,922	183	27	66
UO5OAK	"	20,904	139	20	47
UO5QCL	3.5	1,224	39	5	13

UKRAINE

UB5MCS	**A**	**3,754,543**	**3341**	**117**	**316**
UB5LAW	"	**1,704,285**	**1986**	**90**	**273**
UB5MFY	"	258,060	678	63	213
UB5FDF	"	244,161	1478	25	57
UB5CE	"	217,752	571	52	159
UY5TE	"	141,083	515	41	152
UB5QCK	"	128,128	423	54	154
UB5MFR	"	35,208	233	24	84
UB5EAX	"	28,896	232	26	70
UB5ABZ	"	2,275	35	35	65
UT5HP	"	672	28	11	13
UB5VAZ	**28**	**409,625**	**1400**	**31**	**94**
UB5LAN	"	274,968	1094	32	82
UB5TAZ	"	245,248	853	32	96
UB5CDF	"	193,500	699	33	92
UB5DAG	"	133,001	536	29	78
UB5KAN	"	121,396	463	33	91
UB5PBA	"	112,136	409	32	99
UB5WCW	"	91,910	400	25	76
UB5EDM	"	90,546	455	28	70
RB5CCO	"	88,740	550	25	62
UB5MIZ	"	60,434	462	20	56
UB5ICS	"	15,808	118	17	47
UB5VCD	"	13,359	101	18	43
UB5WCV	"	1,450	18	12	17
UY5HF	**21**	**172,988**	**1093**	**30**	**88**
UB5ABK	"	81,627	447	24	67
UB5MDI	**14**	**321,314**	**1280**	**35**	**83**
UB5UCJ	**7**	**81,795**	**448**	**25**	**70**
UB5VBY	**3.5**	**13,272**	**280**	**7**	**35**
UB5MDA	**1.8**	**6,075**	**163**	**6**	**21**
RB5IOV	"	1,792	58	6	22

YUGOSLAVIA

YU3EA	**A**	**2,121,795**	**1787**	**114**	**351**
YU2OM	"	227,448	628	50	112
YU1NZW	"	197,496	443	58	153
YU3VM	"	73,542	368	31	71
YU2LM	"	44,604	222	42	84
YU7AJD	"	28,800	170	25	50
YU7NZR	"	12,069	63	32	49
YU1OON	"	6,432	48	27	40
YU3EW	**28**	**971,542**	**2649**	**38**	**105**
YU3FK	"	737,380	1910	36	104
YU3TXU	"	594,780	1540	35	103
YU2CT	"	549,524	2059	27	67
YU1FJK	"	549,376	1564	34	94
YU1OBA	"	456,672	1339	32	102
YU3TZT	"	435,456	1460	30	82
YU2OG	"	202,000	704	33	92
YU2RVL	"	83,664	340	29	83
YU7SF	"	11,088	100	17	31
YU3EY	**21**	**1,235,675**	**2817**	**37**	**124**
YU3RM	"	**627,309**	**1720**	**36**	**105**
YU1NUF	**14**	**741,244**	**2010**	**39**	**122**
YU1AST	"	60,984	370	25	74
YU3TCM	7	1,620	54	5	22
YU2BOP	**3.8**	**74,568**	**732**	**17**	**61**
YU4VBR	"	52,950	552	15	60
YU3MY	"	49,421	596	15	58
				(Opr. YU3TVI)	
YU5RU	"	34,456	352	14	59
YU3EF	**1.8**	**10,305**	**228**	**8**	**37**

OCEANIA

AUSTRALIA

VK4VU	**A**	**1,544,620**	**1709**	**108**	**200**
VK6FS	"	166,246	298	73	129
VK5MF	"	115,866	389	53	70
VK6JS	"	37,788	142	45	49
VK4LX	**28**	**562,275**	**1586**	**32**	**87**
VK6AJW	"	169,488	552	29	78
VK6NE	"	96,720	407	24	56
VK5NVW	"	44,616	390	16	23
VK8BE	"	7,371	92	11	16
VK3SM	21	28,260	168	22	38
VK50U	**14**	**203,320**	**606**	**34**	**81**
VK5RX	"	16,368	95	23	39
VK1LF	"	726	22	7	4
VK6IR	**7**	**8,695**	**86**	**17**	**20**

FRENCH POLYNESIA

FO0DX	**A**	**3,703,203**	**3307**	**121**	**266**
				(Opr. K1MM)		
FO0GMM	"	143,564	642	33	43

GUAM

AH2E	**A**	**3,385,836**	**3532**	**110**	**216**
KB7IJ/KH2	**28**	**618,120**	**2077**	**30**	**71**
KG6DX	**21**	**1,213,940**	**3588**	**33**	**82**

HAWAII

KH6ND	**A**	**1,830,516**	**2048**	**119**	**190**
KH6IJ	"	4,875	43	20	19
KH6XX	**28**	**1,762,332**	**4212**	**37**	**106**
KH6NO	**14**	**316,657**	**915**	**35**	**86**

KINGDOM OF TONGA

A35FB	**A**	**1,154,026**	**1952**	**84**	**118**
				(Opr. JA7SGV)		

MARSHALL ISLANDS

KX6PI	**14**	**625,548**	**1630**	**34**	**98**

NEW GUINEA

P29CH	**A**	**139,780**	**356**	**54**	**91**

NEW ZEALAND

ZL4BO	**7**	**108,970**	**1282**	**31**	**54**
ZL1BUS	**3.8**	**11,451**	**131**	**16**	**17**

PHILIPPINES

W7LPF/DU2	**28**	**42,462**	**680**	**9**	**12**

REPUBLIC OF INDONESIA

YB2SV	**A**	**216,904**	**492**	**59**	**93**

WESTERN SAMOA

5W1DA	**A**	**1,895,886**	**2596**	**98**	**151**
				(Opr. K7LXC)		

SOUTH AMERICA

ARGENTINA

LU1TAB	A	67,456	200	49	75
				(Opr. W3KHQ)		
LU5FGG	**28**	**359,520**	**1436**	**27**	**57**
LU2KAK	"	167,200	740	21	59
LU7MAL	**21**	**1,142,248**	**2939**	**37**	**105**
LU4MEE	**14**	**655,980**	**1580**	**36**	**109**

BRAZIL

ZZ4DD	**A**	**812,838**	**1264**	**68**	**153**
PP2ZDD	"	**772,837**	**1188**	**68**	**153**
PY1NEZ	"	658,630	1149	60	134
PY1ZBJ/PY8	"	588,753	954	61	143
PY3CFP	"	58,972	220	33	59
ZY4OP	"	28,728	138	23	53
PT7WP	"	4,242	39	18	24
PY3CGN	"	2,700	52	9	9

I1ZEU with fine 14 MHz effort.

PY2FND	"	1,736	24	13	15
PY2CPU	**28**	**308,475**	**785**	**34**	**101**
PY3LIM	"	19,440	190	11	25
PY2ZTH	**21**	**24,494**	**224**	**16**	**21**

CHILE

CE5CN	**A**	**1,279,927**	**1766**	**83**	**170**
CE3OE	**28**	**245,160**	**917**	**27**	**63**
CE4EM	"	137,936	636	21	53
CE3GN	**21**	**111,650**	**500**	**23**	**54**

COLUMBIA

HK4DKR	**21**	**180,960**	**640**	**25**	**71**

ECUADOR

HC1FF	A	1,462	23	18	16

GUYANA

8RIK	**A**	**2,366,378**	**2518**	**89**	**233**

(Opr. K9EF)

PERU

OA8AX	**A**	**1,179,714**	**1394**	**93**	**198**
OA4SS	**28**	**217,490**	**806**	**27**	**64**
OA4PQ	"	3,741	58	19	24
OA4AWD	**7**	**220,719**	**923**	**27**	**60**

REPUBLIC OF SURINAM

PZ1CC	**A**	**243,740**	**584**	**44**	**96**

TRINIDAD & TOBAGO

9Y4VU	**28**	**1,281,635**	**3151**	**32**	**105**

URUGUAY

CX9CO	**A**	**397,635**	**570**	**85**	**160**
KA6ISE/CX	**28**	**256,956**	**1136**	**22**	**54**

VENEZUELA

YX2AMM	**A**	**4,898,361**	**4373**	**104**	**273**
YV2IF	"	977,284	1266	78	188
YV3BKA	**28**	**1,099,288**	**2716**	**33**	**103**
YV5EED	"	192,318	576	28	86
OA1A/YV1	"	7,506	96	12	15
YV4ACY	**21**	**106,559**	**339**	**30**	**83**
4M3AZC	**3.8**	**181,794**	**760**	**19**	**63**

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

N1TZ	**2,739,083**	**1800**	**140**	**401**
K1RX	**2,252,536**	**1607**	**125**	**359**
K1RU	1,669,695	1298	120	351
W1YN	1,599,750	1234	124	326
K1RQ	1,596,320	1288	117	323
W1OO	**1,571,752**	**1176**	**126**	**350**
K1UU	930,402	848	108	273
K1GSK	879,744	886	103	245
K1IK	521,002	562	94	243
K1MM	481,948	626	75	209
W1YNE	449,934	627	64	182
K1MEM	347,424	409	98	210
W1BK	179,136	348	56	136
AA4MW/1	128,925	207	69	156
WB2FZO	**3,028,525**	**2017**	**131**	**398**
WB2ITR	1,737,546	1370	118	320
K2FL	1,615,860	1201	128	342
W2NSD	1,060,689	1060	106	265
K2OY	803,396	836	96	245
W2UI	482,257	611	73	204
K3LR	**3,574,664**	**2144**	**147**	**437**
W3BGN	**3,280,200**	**1897**	**151**	**449**
K3HPG	1,359,792	1055	122	334
W3GG	1,335,418	1085	127	307
K3UC	1,172,448	1005	113	301
W3RJ	1,134,835	1001	109	286
K2PLF/3	1,020,756	1000	98	265
WB3EKV	700,396	739	91	240
K2ITG/3	670,461	673	112	251
AG8Z/3	586,131	747	75	198
WA3EKL	413,100	475	88	225
KB3HE	372,798	462	86	212
W3MA	370,476	534	73	173
KB3EI	334,884	524	67	169
K3IE	226,625	341	74	171
K3CR	204,102	354	62	145
W3IQS	202,137	342	62	151
N4ZC	**3,411,725**	**2111**	**144**	**427**
N4WW	**2,690,014**	**1702**	**144**	**419**
W4QAW	2,260,027	1453	140	399
N4HB	2,242,654	1548	140	369
KA4S	1,465,966	1151	130	324
N4KG	1,145,076	938	130	314
W4PRO	1,082,172	1021	102	262
KC4B	1,075,590	1242	98	235
WA4QQV	906,857	923	103	250
K4HEX	763,524	815	98	236
WB4FOT	703,680	870	94	226
WB4KXF	487,816	691	70	178
WD4FIG	437,325	606	69	186
WA4WQH	416,016	634	65	178
WB4AJS	43,561	119	43	84
K5KG	**1,542,024**	**1221**	**136**	**336**
N6SV	**2,533,642**	**1882**	**147**	**319**
N6BT	**2,500,496**	**1881**	**141**	**323**
W6TPH	1,301,831	1352	108	229
K6DC	924,265	991	117	218
W6GO	830,944	836	120	248
W6BIP	534,612	696	92	184
AK6T	521,710	718	89	168
AF6S	403,452	564	92	160
W6FQF	367,030	516	91	163
N6BFQ	305,102	516	81	136
AC6V	276,689	465	66	137
AK6P	271,264	430	73	151
N6ST	239,760	395	81	141
AJ6V	101,850	214	68	107
WB6RWJ	98,580	219	60	99
WA6OEY	86,400	211	52	92
K6YK	83,025	240	41	82
WA6MZQ	28,421	186	38	58
W6ZYC	12,246	57	33	45
K6FO	11,400	57	37	39
N7KA/6	6,930	65	18	24
K7MX	**1,008,576**	**1174**	**108**	**198**
KB7W	**993,188**	**1121**	**102**	**214**
KB7G	915,420	1422	80	148
KB7ND	419,184	593	76	170
WA7YCZ	287,369	603	64	99
KB7KE	274,060	507	71	122
WB7CLU	189,476	352	78	124
W7DK	132,924	422	39	75
K7EY	112,009	399	29	72
W7NI	13,400	113	18	22
K8NA	**3,353,544**	**2103**	**150**	**414**
K8GG	**1,803,386**	**1291**	**139**	**360**
WB8ZUY	1,189,218	1074	117	276
AI8S	1,173,036	1015	112	290
K8TL	844,580	663	102	247
K8DD	659,112	709	95	253
WD8PNF	420,292	454	129	229
W8NGO	396,123	510	81	192
W8CCI	229,138	442	55	127
W8LQZ	98,787	233	47	102
W9DUB	**2,337,768**	**1512**	**146**	**402**
K9KA	1,747,568	1325	129	349
KA9A	1,418,400	1202	124	326
K9HWU	553,002	640	103	215
KB9J	260,510	428	66	152
WB9PVI	213,153	308	72	155
KØUK	**4,097,840**	**2513**	**159**	**407**
WØSD	1,606,950	1342	130	320
KØAT	1,419,204	1110	122	332
WBØOYA	419,748	546	78	188
NØBIJ	324,346	474	83	170
KEØA	233,916	452	66	136

ALASKA

KL7Y	**4,525,458**	**4816**	**116**	**255**

BAHAMAS ISLANDS

K2ON/C6A	**3,297,020**	**3937**	**102**	**251**

BERMUDA

VP9IB	**2,872,119**	**3492**	**95**	**252**

CANADA

CZ6ZT	**6,642,405**	**5461**	**135**	**362**
VE1DXA	**4,700,361**	**3553**	**137**	**400**
VE3EDC	**4,208,581**	**3311**	**135**	**388**
VE7ZZZ	**2,781,669**	**3876**	**101**	**190**
VE1UNB	2,624,556	3115	86	251
VE4XK	**2,127,092**	**3038**	**98**	**221**
VE3KKB	1,539,371	1715	108	265
VE4TU	316,305	862	36	99
VO2BF	**289,648**	**735**	**56**	**116**
VE5AE	186,850	453	65	120
VE2CUA	153,465	298	57	138
VE3KUD	112,009	460	27	74
VE7AFY	22,764	97	35	52

CAYMAN ISLANDS

ZF2DA	**845,196**	**1928**	**56**	**153**

CUBA

CO2FRC	**1,436,956**	**1879**	**87**	**211**

MARTINIQUE

FM7AV	**5,710,096**	**4521**	**113**	**363**

REPUBLIC OF PANAMA

HP1XRK	**4,417,918**	**4441**	**127**	**295**

ST. MARTIN

FGØGBL/FS7	**683620**	**1439**	**60**	**130**

TURKS & CAICOS ISLANDS

VP5WW	**8,741,677**	**7317**	**126**	**385**

AFRICA

CANARY ISLANDS

EA8ND	**678,110**	**1366**	**47**	**119**

REPUBLIC OF SOUTH AFRICA

ZS6BPL	**2,960,784**	**2867**	**115**	**233**

ASIA

JAPAN

JA2YKA	**3,146,991**	**2381**	**144**	**309**
JH7YJA	**2,593,004**	**2954**	**104**	**222**
JA7YAA	1,582,308	1497	119	245
JA4YFH	1,361,094	2028	107	215
JA7YAB	900,900	1129	92	183
JA7YCQ	670,983	1171	74	117
JA4ZQA	580,419	852	90	169
JF1YID	524,226	745	91	155
JR3YXT	310,080	508	74	116

SAUDI ARABIA

HZ1AB	**3,215,160**	**3062**	**97**	**263**

ASIATIC U.S.S.R.

ASIATIC RUSSIA

UK9AAN	**7,115,220**	**3900**	**155**	**475**
UK9SAD	974,618	1259	67	207
UK9UAA	910,188	1454	81	181
UK9FER	835,677	1256	64	179
UK9SAY	730,158	925	80	206
UK9SBI	4,760	45	12	28
UKØLAK	**860,684**	**1054**	**105**	**236**
UKØAAB	512,960	826	67	162

KAZAKH

UK7PAL	**1,818,112**	**1734**	**109**	**315**
UK7GAA	**1,754,250**	**2014**	**105**	**270**
UK7AAH	998,000	1479	61	188
UK7LAF	280,992	1233	81	194

KIRGHIZ

UK8MAF	**1,217,010**	**1397**	**101**	**238**

EUROPE

AUSTRIA

OE4SZW	**3,248,091**	**3020**	**116**	**357**
OE2VEL	2,981,664	2746	111	348

BELGIUM

OT5JE	**2,396,068**	**3150**	**92**	**210**
OR7AX	**1,323,395**	**1913**	**82**	**223**
OR7WR	19,893	168	22	35

BULGARIA

LZ1KSN	**935,295**	**1432**	**94**	**251**
LZ2KPB	292,981	1008	40	134
LZ2KKZ	264,032	689	66	163

CRETE

W6KG/SV9	**1,552,848**	**2167**	**77**	**269**

CZECHOSLOVAKIA

OK1KCU	**1,583,322**	**1914**	**98**	**285**
OK3VSZ	**1,444,026**	**1729**	**107**	**279**
OK3KII	567,850	1015	69	208
OK2KZR	505,720	1007	65	170
OK3RMW	33,915	225	31	102
OK1KYS	30,475	111	46	69
OK1ORA	20,038	179	21	65
OK1KTW	11,023	90	30	43
OK1KCF	7,400	76	21	51
OK2KVI	5,368	80	17	44
OK3KPN	4,560	100	10	28

DENMARK

OZ5DD/A	**282,492**	**1033**	**30**	**84**

ENGLAND

G6UW	**4,188,716**	**3325**	**123**	**374**
G3HTA	**3,077,212**	**2673**	**117**	**337**
G8JC	2,278,516	2596	93	239
G6CW	1,583,301	2131	87	224
G3KMI	755,730	1379	68	175
G4CVZ	589,893	1278	59	178

FINLAND

OH2AA	**6,268,170**	**4351**	**138**	**417**
OH7AB	1,528,590	1884	106	300
OH1HS	60,060	212	39	115

FRANCE

F3TV	**6,070,766**	**4640**	**123**	**371**
F6KAW	1,546,896	2252	89	223
F5OJ	305,626	803	59	143

GERMANY (FRG)

DLØUE	**2,568,470**	**2464**	**112**	**307**

Ramon, YV5EED.

OHØAM operated by OH2BBM.

Y24UK multi-operator single transmitter: Y23EK, Y24UK, Y21YK, and Y24TK (not shown).

DJ4GL	2,109,066	2274	82	265
DK@CC	1,577,612	1920	91	207
DL8DC	1,240,500	1376	96	279
DL@IU	980,605	1173	88	251
DL@UR	637,639	921	90	217
DK@KU	488,628	781	75	202
DL@PE	338,390	934	55	82
DA2CF	135,900	333	51	100

GERMANY (GDR)

Y24UK	**7,331,586**	**5702**	**111**	**360**
Y23DL	2,531,620	2361	110	318
Y31ZA	788,877	1473	78	231
Y67ZL	649,062	1253	76	245
Y31ZJ	241,500	661	54	156

HUNGARY

HG6V	**4,751,919**	**4188**	**118**	**353**
HA5KKC/7	**2,861,040**	**3133**	**93**	**271**
HA5KFL	2,459,952	2689	100	296
HA@KLE	2,106,286	2767	87	239
HA4KYH	1,365,510	1786	87	258
HA5KKB	885,976	1316	90	274
HA3KNA	770,542	1135	78	268
HA1KZZ	599,549	1235	55	136
HA3KHC	358,140	820	63	172
HA5KDB/P	291,250	782	60	173
HA2KRZ	206,078	604	48	119
HA9BVK	204,572	623	50	149
HA2KMR	150,337	550	42	131
HA8KAX	127,327	472	39	118
HA5KJD	46,172	273	31	88
HA7KRK	2,310	38	15	27

ICELAND

TF3IRA	**2,778,117**	**3642**	**92**	**301**

IRELAND

EI9CB	**9,364,212**	**6331**	**132**	**440**

ISLE OF MAN

GD5DPA	**182,410**	**692**	**46**	**139**

ITALY

I4RYC	**9,918,368**	**5997**	**139**	**453**
IV3PRK	8,365,761	5079	150	447
I1KN	6,795,763	4404	122	437
I1POR	3,493,568	3059	96	320
I4OJT	1,680,990	2529	92	214
I2CZ	1,678,619	2051	84	229

NETHERLANDS

PA@GN	**1,569,911**	**1773**	**88**	**255**
PI1IRC	1,025,468	1539	78	214
PI1ARS	9,291	91	24	33
PI1PT	6,688	142	9	35

NORWAY

LA5X	**3,572,902**	**3352**	**111**	**331**
LA1H	846,564	1255	79	237

POLAND

SR9PDF	**2,234,220**	**2139**	**111**	**348**
SR7KTE	185,614	523	59	183
SP9PEZ	163,300	421	59	171
SP3ZAU/3	19,500	156	28	72
SP3ZAC	16,901	262	23	88
SP9KAD	10,860	126	17	35
SP9PBH	9,176	86	24	50

ROMANIA

YO8KGH	204	14	6	11

SARDINIA

IS@DTK	**801,336**	**1328**	**80**	**266**

SPAIN

EE7TH	**2,938,026**	**3483**	**94**	**270**
EA5ADI	1,654,044	2136	76	218
EA3AIN	1,018,112	1843	64	192
EA3CBQ	1,008,899	1471	71	218
EA2QU	856,064	1211	83	221

SWEDEN

SM5AOE	**3,519,900**	**3198**	**115**	**335**
SM5AZU	159,399	427	43	156
SM@GMZ	2,845,153	2785	104	275

WALES

GW6GW	**8,641,050**	**5784**	**127**	**423**
GW4BRS	1,536,080	2721	71	189

YUGOSLAVIA

YU3BC	**963,846**	**1172**	**94**	**257**
YU1HFG	233,892	547	65	154
YU2CRM	161,298	574	50	156

EUROPEAN U.S.S.R.

BYELO-RUSSIA

UK2OAA	**315,315**	**1077**	**70**	**125**
UK2IAJ	141,120	855	27	113
UK2AAX	28,512	243	25	71
UK2AAF	8,178	161	9	38

ESTONIA

UK2RDX	**3,611,322**	**3046**	**121**	**385**
UK2RAQ	252,252	624	56	140

EUROPEAN RUSSIA

UK6APA	**4,761,432**	**4007**	**116**	**352**
UK6LAZ	**4,317,149**	**3036**	**155**	**462**
U4W	**4,134,078**	**3447**	**133**	**377**
UK4FAV	1,946,430	2083	103	302
UK6LEW	1,764,465	2395	103	292
UK6LTG	1,598,670	2096	98	284
UK3SAB	1,477,230	1719	107	303
UK4WAB	1,393,975	1778	104	303
UK3AAO	859,206	1468	73	194
UK3DAH	768,810	1145	83	211
UK3AAC	602,962	1317	61	145
UK6LAI	564,575	1122	77	198
UK4CBL	402,000	969	63	205
UK6HCZ	395,776	589	70	164
UK1TAV	225,451	980	38	93
UK3ABO	223,930	542	68	177
UK1TAR	177,000	540	50	127
UK3WAF	167,728	610	46	130
UK3TAG	140,270	527	30	100
UK4ABZ	106,892	952	49	90
UK3EAO	91,048	416	37	115
UK3IAR	40,618	181	22	57

KARELIA-FINNISH

UK1NAD	**146,347**	**700**	**51**	**158**

LATVIA

UK2GBL	**495,400**	**1368**	**41**	**159**
UK2GJT	5,276	188	14	30

LITHUANIA

UK2BAS	**5,571,512**	**3817**	**141**	**427**
UK2PCR	**5,462,464**	**3808**	**134**	**414**
UK2BBB	**5,342,443**	**3717**	**136**	**441**
UK2BAG	885,712	1439	74	207
UK2PAP	615,350	842	78	232
UK2BCC	587,047	1044	64	167
UK2PAT	344,399	763	66	173
UK2PRC	343,052	802	67	211
UK2PAO	265,823	700	58	183
UK2BBM	235,672	737	44	134
UK2BBX	122,247	590	31	123
UK2BCM	96,049	444	28	111
UK2BCG	79,255	516	24	107

UKRAINE

R5M	**5,402,017**	**4755**	**131**	**378**
UK5MDF	3,410,562	3413	109	337
UK5MAG	2,117,880	2351	101	323
UK5QBE	1,817,554	2032	110	312
UK5UDX	610,690	1110	81	265
UK5WAA	552,828	1045	73	203
UK5MCO	452,998	1034	65	197
UK5FAB	418,946	971	67	211
UK5MCP	362,370	693	77	205
UK5MBQ	166,173	545	50	143
UK5UBF	142,128	526	70	118
UK5MDI	86,562	687	35	91
UK5EAQ	39,336	242	27	61
UK5PAA	16,660	110	24	46
UK5EFW	5418	98	10	33

OCEANIA

AUSTRALIA

VK2DHT	**1,047,228**	**1908**	**86**	**110**
VK5UB	666,570	1325	59	111

EASTERN CAROLINE ISLANDS

KC6ZR	**7,605,360**	**6197**	**137**	**283**

NEW ZEALAND

ZL2AH	**383,922**	**1289**	**37**	**62**

SAIPAN

KH@AC	**3,040,152**	**3074**	**115**	**224**

Brooke, N2BA/HI8.

SOUTH AMERICA

BRAZIL

PY3FJ	**1,344,248**	**2012**	**79**	**147**

COLOMBIA

HK3AXT	**5,649,820**	**4433**	**113**	**308**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

N2AA	**10,687,196**	**4906**	**171**	**575**
K8LX	**7,425,600**	**3943**	**161**	**502**
K2UA	**6,607,288**	**3596**	**155**	**491**
K9XR	**6,580,175**	**3526**	**161**	**504**
W3MM	**6,430,168**	**3368**	**156**	**512**
K3WW	6,372,093	3456	160	503
W3LPL	6,242,430	3177	161	529
N5AU	**6,162,977**	**3582**	**159**	**472**
W4DR	**5,535,829**	**3162**	**162**	**467**
K1CC	**5,277,888**	**3072**	**155**	**461**
AB0I	**5,160,050**	**3541**	**158**	**417**
W6RDF	**5,042,072**	**3558**	**152**	**351**
W3FA	4,694,400	2588	159	481
KN6M	4,038,749	3145	137	326
K3ND	3,689,748	2129	149	463
K3ZJ/4	3,685,281	2172	149	448
K6MEP	3,047,527	2468	124	289
W9LA	2,287,998	1776	128	346
N2RM	2,086,928	1726	119	305
K6RU	2,080,335	1720	126	293
N3LR	2,020,208	1440	126	370
N7RO	**1,862,133**	**1811**	**117**	**242**
W2VJN	1,702,688	1440	116	300
AD3V	1,525,016	1094	107	401
W2OW	1,287,163	1174	113	292
K3II	869,836	825	104	269
K3IU	855,569	761	117	286
W3DHM	752,095	748	99	250
N4TJ	629,770	638	100	255
KB2EZ	609,102	903	77	197
AA4S	424,080	541	81	198
WB3EAG	337,610	488	71	174

ALASKA

KL7RA	**6,355,104**	**6676**	**120**	**266**
KL7R	5,202,162	5275	124	275

ASIA

ISRAEL

4Z4EC	**478,728**	**800**	**57**	**161**

JAPAN

JA3YBF	**5,335,440**	**3930**	**139**	**331**
JA3YKC	**5,329,908**	**3985**	**136**	**323**
JA7YRR	4,363,775	3241	142	321
JA2YEF	3,304,524	2962	120	263
JA1YXP	1,341,230	1675	92	182
JH1YDT	1,074,502	1304	101	188
JA6YAI	523,370	924	70	129
JA6YCU	521,234	841	81	136
JA6YDH	413,056	641	80	144
JA3YQD	349,920	667	65	115
JA9YAV	313,272	633	64	107
JA2YDC	220,908	483	64	100

EUROPE

BELGIUM

OR6AH	**1,127,996**	**1485**	**80**	**212**

BULGARIA

LZ7A	**10,165,332**	**7698**	**150**	**502**

CZECHOSLOVAKIA

OK1KSO	**3,832,086**	**3090**	**115**	**343**

ENGLAND

GB4ANT	**9,727,179**	**7115**	**145**	**416**

GERMANY (FRG)

DJ1BC	5,050,734	3918	125	382

I.T.U. (GENEVA)

4U1ITU	**2,121,070**	**2808**	**95**	**291**

LUXEMBOURG

DA1WA/LX	**2,319,140**	**2858**	**93**	**287**

NETHERLANDS

PA0RCA	135,900	524	42	138

NORWAY

LA9K	**1,823,730**	**2391**	**73**	**237**
LA1K	677,160	1973	28	104

POLAND

SR6PAZ	53,620	226	40	100

SPAIN

EA5RCM	**3,203,712**	**3145**	**103**	**309**
EA1VG	538,076	1357	77	231
EA3NA	230,271	1152	91	262

SWEDEN

SK2KW	**10,224,864**	**6814**	**152**	**472**

SWITZERLAND

HB9H	**7,204,912**	**6312**	**133**	**403**

YUGOSLAVIA

YU7BCD	6,948,924	4064	152	529
YU4FRS	6,830,448	4669	124	405

SOUTH AMERICA

BRAZIL

ZZ50W	**11,049,401**	**7431**	**135**	**368**

CURACO

PJ2CC	**37,760,742**	**15940**	**168**	**632**

EDUADOR

HD1QRC	**18,846,176**	**10523**	**152**	**456**

WORLD QRP

G4BUE	**A**	**493,884**	**905**	**62**	**207**
TG9GI	"	**398,198**	**816**	**59**	**147**
SP2FAP	"	**197,750**	**430**	**65**	**185**
AI6V	"	**194,040**	**417**	**66**	**102**
W8ILC	"	161,102	271	66	152
AJ7S	"	145,666	303	62	111
WA4FHQ	"	131,296	268	49	127
N2GC	"	129,850	280	52	123
DK5EZ/EA8	"	**127,872**	**342**	**38**	**90**
N2US	"	127,302	312	37	110
G3FTQ	"	99,495	506	34	131
WA7KLK	"	89,320	236	56	84
DK8FS	"	**83,589**	**244**	**49**	**100**
OA8V/4	"	**68,400**	**216**	**51**	**69**
YU3FO	"	**66,330**	**247**	**41**	**124**
SM5CCT	"	59,920	234	40	100
WA3FNK	"	55,146	193	36	65
G3WFL	"	48,811	222	37	96
WD0CLL/7	"	41,586	245	31	56
GM3RFR	"	39,697	287	24	83
WB5PYL	"	36,162	148	31	67
OE1SBA	"	22,032	152	21	47
I0SKK	"	14,181	124	27	60
K1BH	"	14,070	79	21	49
Y27EO	"	4,223	106	7	34
Y23QJ	"	2,160	36	14	31
UM8MAO	**28**	**237,380**	**920**	**31**	**79**
K3ZR	"	**106,272**	**348**	**26**	**82**
ON7EH	"	**75,480**	**391**	**23**	**51**
I5JHW	"	**60,258**	**302**	**25**	**58**
PA0GG	"	**56,012**	**302**	**19**	**57**
K2OQA	"	44,772	188	21	61
W6VYK	"	44,162	255	19	42
ZS6BRZ	"	34,992	149	29	52
UB5MLP	"	28,609	234	16	51
K1MNR	"	28,050	154	16	50
UA0SH	"	27,108	222	17	47
JI1HHX	"	23,460	137	23	37
OK1HCH	"	22,632	139	24	45
PA3AEG	"	18,505	168	16	31
UR2OI	"	18,309	183	13	38
WA2ZWH	"	18,126	113	17	40
W5SYB	"	16,544	141	16	28
OK3CM	"	13,545	128	15	30
Y27JL	"	12,446	120	15	34
VK4VFF	"	9,600	97	16	24
N4BP	"	8,306	61	15	33
UB5UCF	"	7,482	99	12	31
WB4BBH	**21**	**42,152**	**174**	**24**	**64**
WB2ULI	"	**32,830**	**163**	**20**	**50**
AC8C	"	22,464	116	19	53
OH6DO	"	7,776	126	11	37
JH8DEH	"	5,181	62	15	18
N3UN	**14**	**43,968**	**164**	**29**	**67**
Y23UA	"	**10,384**	**160**	**11**	**48**
PA0NRD	"	1,680	35	7	35
OK1AIJ	**3.8**	**6,624**	**182**	**5**	**31**
OK1MNV	"	903	44	2	19
SP5FKW	"	768	26	5	19
OK1DKW	"	110	12	2	8
UT5DK	**1.8**	**648**	**41**	**4**	**14**

CHECK LOGS

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No-29-30

Here's some sound advice and helpful suggestions on how to put up that big stick and have it stay up.

Put That Tower Up To Stay

BY JOHN HAWKINS*, K5NW

This year three towers that I know of came down. One was an unguyed 40-foot stick of Rohn 20 with only a 2-meter antenna on it. Another was an unknown "lightweight aluminum" tower with a tri-bander and 2-meter antenna, and the third was a Tri-Ex W-51 crankup with a Rohn 25 top section welded on at the top. This "hybrid" tower supported a 204-BA, 155-BA, and a 105-BA, all on a 20-foot steel mast. The tower was *unguyed* and fully extended at the time of failure.

All of these tower failures occurred during typical Texas spring thunderstorms. These storms occur throughout the southwest regularly every spring, and everyone here knows about them. Most area amateurs have attended some form of weather spotter school and are generally aware of the mechanisms by which these storms create the winds associated with them. In short, anyone would acknowledge that 50 m.p.h. wind gusts are not at all uncommon in this part of the country in the spring. Severe thunderstorms often produce winds in excess of 50 m.p.h. sustained over several minutes with gusts up to 80 m.p.h. Occasionally, these storms produce winds in excess of 100 m.p.h. A storm as severe as this is not likely to strike you or me, but one must recognize the fact that such a storm *can* strike at any place. Consequently, I can't imagine anyone installing an antenna system rated for less than 75–80 m.p.h., when in fact, ideally, it probably should be designed to withstand 100+ m.p.h. winds.

Since summertime is also antenna time, and some people may be thinking about a new tower or a bigger tower, I thought a few pointers might be in order.

First, **Know Your Tower**. If you are planning to buy a brand new tower, make sure you know and understand the manufacturer's rating and what it means. If you are not experienced in these matters, take time before you buy to consult with other people who are experienced. They will advise you if the manufacturer's rating is reasonable and if they concur with your choice of tower to support your choice of antenna. You cannot rule out the possibility that the tower manufacturer may have distorted that rating or that the actual rating is disguised within some other meaningless number. This has been known to happen, but generally the name-brand towers are rated properly.

*1723 Shufords Court, Lewisville, TX 75067

Length of Guys (assuming level terrain)

$A^2 + B^2 = C^2$

where: A = Tower Guy Level Height
B = Distance from Base of Tower to Anchor
C = Length of Guy

Example: Tower Level Height = 100 ft
Distance from Base of Tower to Anchor = 75 ft

$100^2 + 75^2 = C^2$

$10{,}000 + 5625 = C^2$

$15625 = C^2$

125 ft. = Length of Guy

Table I– How to compute the amount of guy cable needed for a typical installation. The chart was supplied by Philadelphia Resins Corp., manufacturers of Phillystran®, a non-metallic guy cable.

If you didn't get your tower down at the radio store and you don't know what it is or who made it, once again, ask around. Those same "other people" will give you good, honest (and usually correct) advice about your tower's capability. Ask several people, though, and weigh all the answers. My advice on towers is to beware of off-brand towers. You usually get what you pay for.

Most crank-up towers are rated for only 50 m.p.h. winds. Be very cautious with crank-up towers, for they can be fragile and often fraught with problems that are of *your* making. My friend who lost a crank-up said he would crank it down each time the wind blew, but he soon *got tired* of cranking and started leaving it up. Well, you can imagine what happened.

Free standing (unguyed) towers are generally in the same category as crank-up towers. Either of these towers can be very unforgiving of mistakes, but a guyed tower can be abused beyond belief and still remain standing.

When installing tubular towers always provide a drainage path for moisture which forms inside the tubular legs. If you put the tubular legs into the concrete base, you must make sure that the legs do not become filled with concrete from underneath. This is done by placing a 4-inch layer of small gravel in the bottom of the hole and allowing the tower base to rest on the gravel prior to pouring the concrete.

Aluminum towers that have been in place for some time and then dismantled may show an elongation of the bolt holes where the sections have been bolted together. This is generally attributed to the fact that the aluminum tower leg is softer than the steel bolt, so when the tower flexes under load, the holes can become deformed.

Second, **Don't Scrimp On Guy Wire**. The strongest tower in the world will fall over if it is improperly guyed. A rule of thumb for the distance out from the tower base a guy wire must extend is 0.8 times the tower height. If you have a moderate antenna on a substantial tower (such as a TH-3 on a Rohn 25), then the guy distance might be reduced slightly, maybe to 0.65 times the tower height. When you move the guy anchor in toward the tower, you should note that the guy wire becomes more vertical and the tendency for the anchor to pull straight up out of the ground is increased. Another rule of thumb for guy wires is that the vertical separation between the guy wires along the tower should not exceed 30 feet. If the tower is heavily loaded, this distance may need to be reduced.

I have seen installations using a four-guy-wire arrangement in place of the traditional three-guy setup. This can be used where space is short on one side of the tower. It is my *opinion* that two steep guy wires can effectively replace a single wire of proper angle if the two guy wires are exactly symmetrical. When symmetry does not exist, unusual forces may be applied to the tower.

The same rule which applies to buying towers also applies to buying guy wire. **Know What You Are Buying And Understand Its Limitations**. Once again, beware of bargain guy wire. A type of aircraft cable was

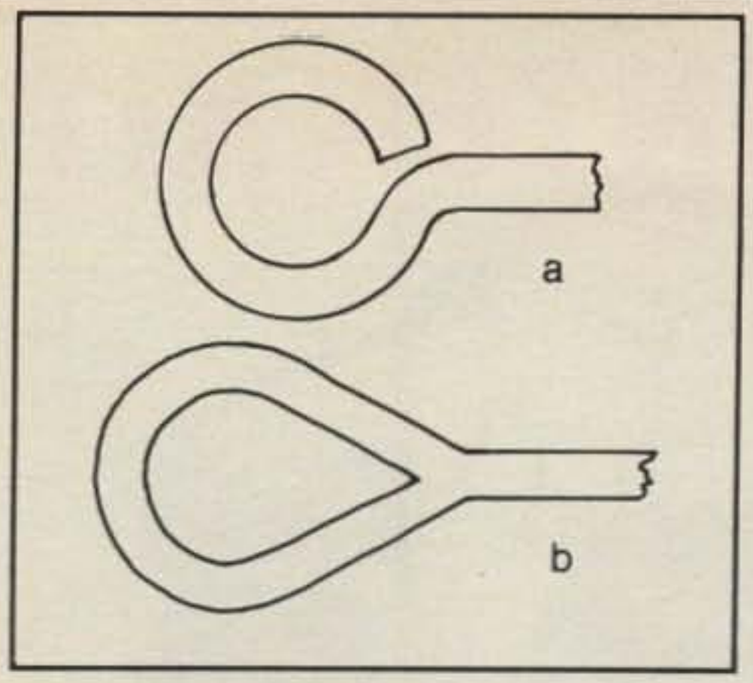

Fig.1- The right and wrong kind of turnbuckle (eye-bolt) for use in a tower guy system.

being sold here as guy wire some time back and may still be.The sales pitch was that it was just as good as the name-brand product. It was said that it was *almost* as strong as the real stuff, *but* it might begin to rust in a few years. I have no quarrel with the seller of this product, as he appeared to be open and honest, but how many people would really inspect their guys, top to bottom, on a regular basis to see if any rust had formed? How would the average amateur know when the rust had progressed to the point where it was time to replace the cable? A rusty guy can spell early doom for an otherwise well designed setup. Stick with a name brand product which was designed to do what you want it to do. Also, you might do well to check out non-metallic guy wire that is now available on the market.

House brackets are sometimes used to substitute for or to augment the normal guy system. However, a theory exists that says the vibrations caused by wind can affect structural damage to the house over the long term. Plus, unless you actually saw the house being built, how can you be sure of the structural integrity of the spot where you intend to mount the house bracket? Wind noise and other mechanical noises will be resonant through the house due to the mechanical coupling. Watch out for house brackets; they may do more harm than good.

Third, the hardware. You took everyone's advice and bought an excellent tower. You got good quality EHS (extra high strength) galvanized or synthetic guy wire. Then you stopped by the local hardware store and picked up some cable clamps and turnbuckles. Now your beautiful new tower and beam are lying in your neighbor's backyard. What happened? Cheap hardware, most likely.

Next time you are in your favorite hardware store, pick up a turnbuckle and examine the eye. The eye-bolt part of the turnbuckle was once a piece of straight rod which was curled back on itself to form the eye. The end is *not* attached to the shank at all; it just sits there. You can

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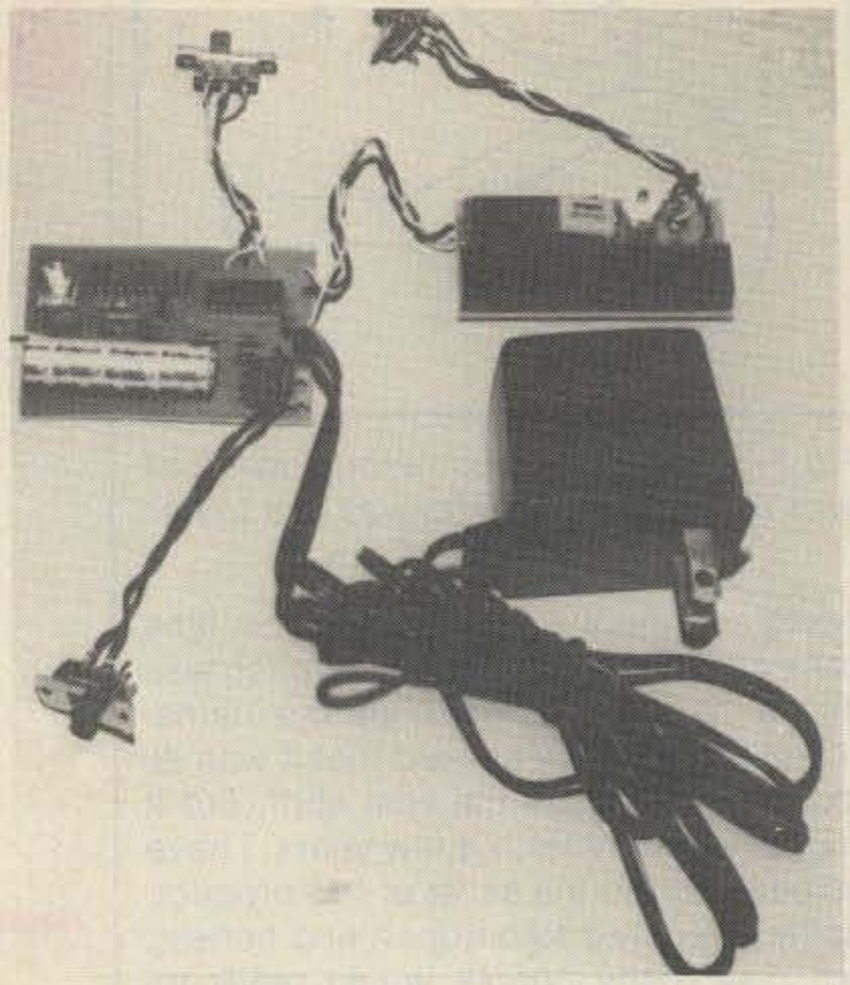

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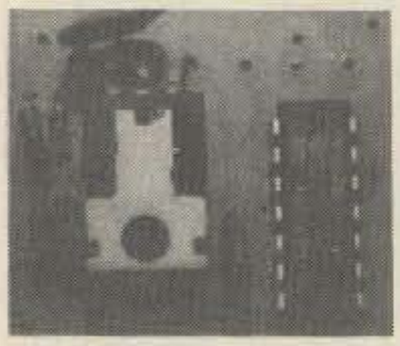

Increase the range of your 6 or 60 MHz frequency counter to 600 MHz. Divides incoming signal (50mV req'd) by 10 or 100 (selectable) and increases signal strength to TTL (2.5V) levels which will drive any counter. PC Board approximately 1½ inch square. Requires 7-14 VDC at 120 mA. Not a kit, assembled and tested.

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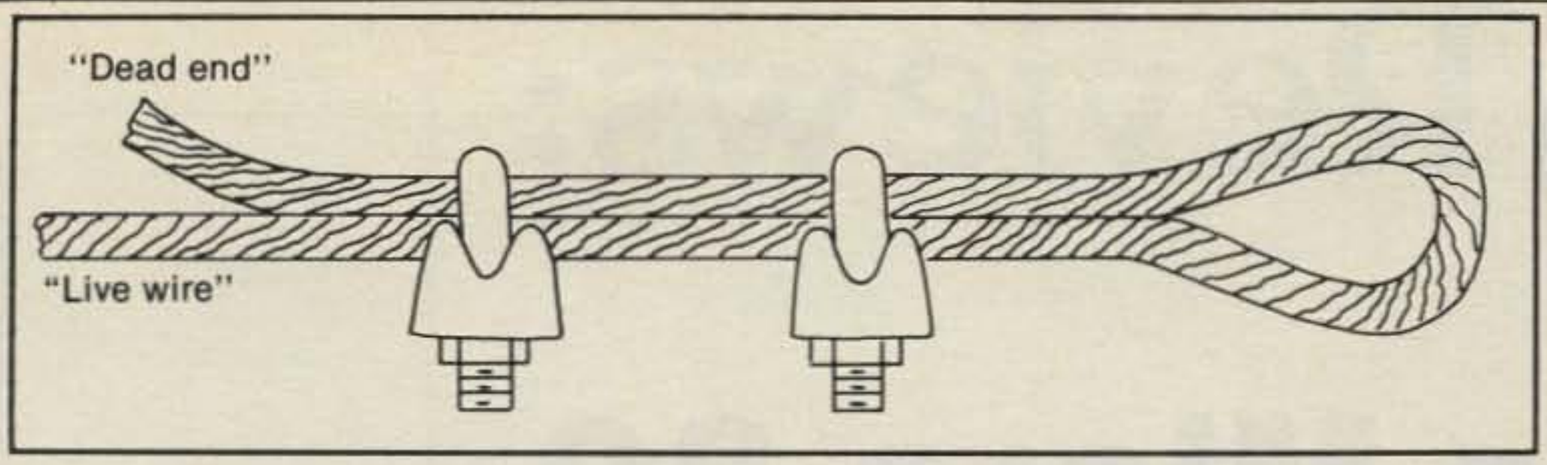

Fig. 2– The u-bolt part of the clamp bears on the "dead end" of the guy wire.

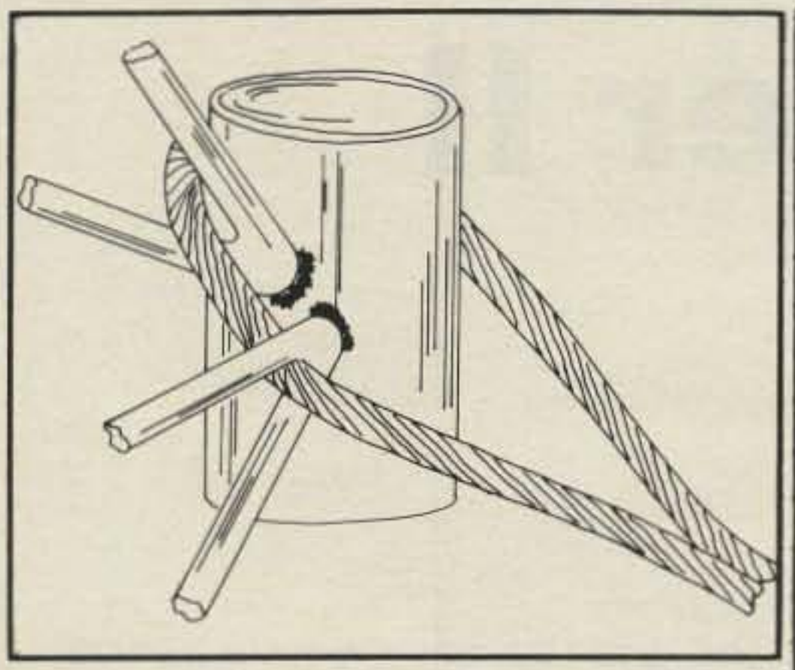

Fig. 3– Guy wire tension should compress tower welds rather than place them in tension.

always tell this type of eye-bolt by the small gap at the end of the eye portion as shown in fig. 1(A).

When pull is exerted on this type of eye-bolt, it will simply uncurl and release the guy wire. The proper kind of turnbuckle (or any eye-bolt in the system) is the so-called "drop forged" kind where the eye-bolt is cast from molten metal, thus forming a continuous solid eye, as shown in fig. 1(B).

Guy-wire (cable) clamps also come in two types—the drop forged and "malleable." The malleable clamps are made by bending a steel rod into a "u-shape" requiring the steel to be relatively soft. The drop forged clamps are made just as the forged eye-bolts, resulting in a very hard and durable clamp. The softness of the malleable clamp can result in a shearing effect to the surface of the u-bolt where it bears against the cable if severe strain is applied to the guy wire. The shearing of the clamp could allow slippage of the guy wire and possible disastrous consequences. While these comments are true, it is my observation that many people have used the malleable clamps with no problems, but one should never use any turnbuckle (eye-bolt) except the forged kind.

The installation of the clamps is very important. When installing guy-wire clamps, the u-bolt part of the clamp must always bear against the "dead end" of the cable, as shown in fig. 2. There should be at least two clamps at each end of each piece of guy wire. The spacing between the clamps should be equal to at least six times the cable diameter.

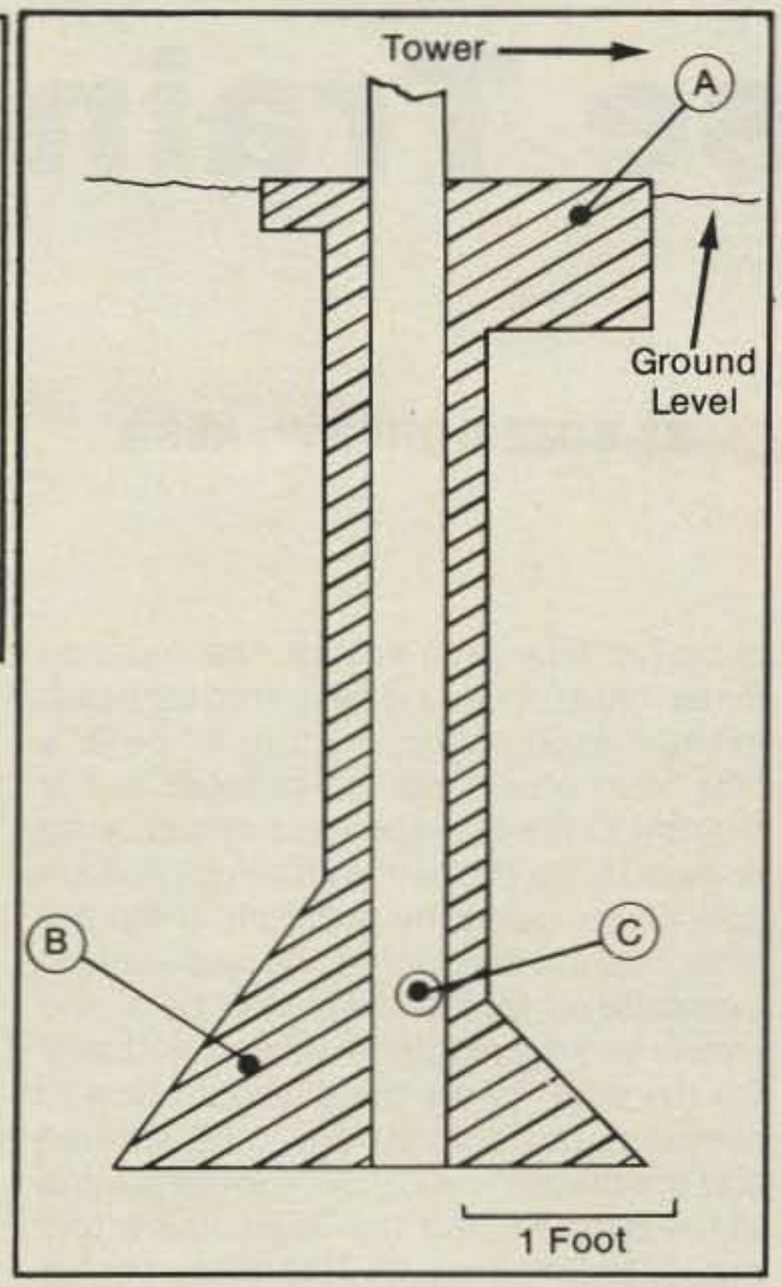

Fig. 4– This type of elevated guy anchor has been used by the author on more than one tower installation with good success. The present setup being used by the author is 90 feet of Rohn 25-G with 10, 15, and 20 meter monobanders along with a 40 meter rotary dipole. The anchor pipe is 4 inches in diameter, ¼-inch wall structural steel. The pipe is essentially buried 5 feet into the ground with 5 feet out of the ground.

An alternative to cable clamps is the so-called "guy-wire pre-form." It is a device which acts in the same way as the old Chinese finger-torture device. One end wraps around the guy wire, loops through the appropriate eye, then interlocks back on itself by wrapping its other end around the guy. The more the tension, the tighter the grip. Some say that pre-forms are stronger than clamps.

When attaching the guy wire to the tower, always make sure that the guy-wire tension places the tower welds into *compression* and not *tension* as shown in fig. 3. It is a good idea to use thimbles wherever the cable makes a sharp bend. It is also a good idea to use equalizer plates on the guy wires, and it is mandatory that you use a safety wire on the turnbuckles.

Screw anchors and concrete anchors offer the best guy-wire termination points, with the concrete anchor being preferred. However, both offer the distinct possibility of having your wife or an already irrate neighbor hang themselves on a dark night. Many small, city lot installations use the elevated guy point to alleviate this problem. This also aids in meeting the 80 percent criteria on guy distance mentioned earlier. The guy distance now becomes a function of tower height minus guy-point height.

Remember, however, that when using elevated guy points the compressive forces in the earth which support the guy pole must be substantially greater than with a buried anchor due to the lever arm multiplication of the guy forces by the pole height. Thus, the effectiveness of the elevated guy point is somewhat reduced.

When installing elevated guy points, there is no substitute for hole depth. The deeper the better. My experience and observation indicates that a rule of thumb is to use at least 1.75 feet of depth for each 30 feet of tower height whenever the guy point is no more than 6 feet above ground. If the guy must extend beyond 6 feet in height to clear a roof line, etc., then even more depth is required. Fig. 4 shows a sketch of the shape of the holes which the author has successfully used to support elevated guy points for two different tower installations. The area marked "A" in fig. 4 acts as a "dead man" giving a large flat (not round) surface of concrete to push agains the earth when tension is placed on the guy wire. Area "B" also acts as a dead man, keeping the bottom of the anchor from moving back in a pivoting motion about the area "A." All the area at the bottom of the hole is "belled out" to provide a vertical bearing surface to prevent the guy point from being pulled straight up out of the ground. Point "C" shows a hole about two inches in diameter in the pipe itself which allows the concrete to flow into the pipe, thus creating a somewhat unified structure.

These tips are based on personal experience and observations. They have not necessarily been scientifically nor analytically substantiated and should be treated as such. So, if you do follow these tips, I cannot guarantee that your tower won't blow down because sometime the wind just blows harder than we want it to, or sometime something just breaks. But, if you do follow the tips, then the odds that your tower does stay up are far greater than if you had ignored them. So whatever your tower plans include, don't pinch pennies and don't take short cuts. It's like the television commercial—you can pay now or you can pay later—and you can bet that if you pay later, you will pay more.

CQ Reviews:

The Micro-80 Morse Trainer II

BY BUZZ GORSKY*, K8BG

The Micro-80 Morse Trainer II is a computer program designed for the Radio Shack TRS-80 16K computer whose function is to teach Morse code. This program is supplied by Micro-80 on a single cassette. The program is intended to provide Morse instruction and practice and has features which would make it useful both for the individual who knows the code but wants to increase speed, as well as for someone who needs to start from scratch. As supplied, the tape actually has three programs, each written in Basic. On one side of the tape is a Basic program full of *print* statements which provide instructions for using the program. This part of the program could have been written quite simply, but rather, things are done with a bit of panache. The instructions are printed on the screen inside a box and erased from the box just before new material is written. While the effect is pleasing, I for one would prefer written instructions. I could have read them in less time than it takes to load the routine.

After reading the instructions, the first program on the other side of the tape is loaded. It turns out that this program is an advertisement for Micro-80. The program does give you the option of bypassing the advertising so that you can proceed the load the "real" program.

Once the training program is loaded, the user must either enter a previously created data tape or create one. Up to 200 items can be put on an individual tape, and clearly this will provide enough variation so that the user will not remember what has been saved. The routines for saving and loading data from tape permit near maximum use of the computer's 500 baud speed, so the process is not lengthy. Once the tape has been entered or generated, the user can select various options for using the program. If the beginner option is selected, the user can enter whatever Morse characters he or she knows and the machine will drill on those. On the other hand, the user can type in some characters that are to be learned and the machine will drill on these. Drill is at 5 w.p.m. with the individual characters presented at 13 w.p.m. This speed configuration is preferred by most instructors, since students learn to recognize characters at a normal speed, and the space between the characters provides the time to think about what has been heard.

Once the entire code is learned, the student can select practice with random 5 character letter, number, or mixed letter and number groups. Commonly used punctuation is included with the numbers. The student can also be drilled using the data groups provided from tape. During the drill process the student can speed up, slow down, or stop the process by pressing the appropriate key. Speed changes occur in 2 w.p.m. jumps, and by holding down the speed key, the change continues to occur to make larger speed changes.

The program loads and runs flawlessly. Speed can be selected from 5 to 25 w.p.m. (speeds below 13 have characters presented at 13 w.p.m. with the spacing between letters used to generate the slower speed). The program provides sufficient variation that a student should be able to put in a reasonable practice session without becoming bored. The beginner section provides a nice feedback routine. When the machine sends a character, the student must type the character. If the correct character is typed, the machine continues with the next character. If a mistake is sent, the machine prints "I sent" and then the letter is repeated in Morse audio and on the screen. It then prints the character that the student keyed while sending it in Morse to reinforce the difference. This is a good teaching technique and should help any student learn the correct responses quickly.

I found only a few negative features. The program requires some code practice oscillator. A parts list totalling about $13 is provided in the instructions for individuals who do not own an oscillator. While an oscillator is clearly needed for learning the code, someone who purchased the program not knowing that an oscillator is required might be disappointed. I have already mentioned that my preference would be for printed instructions and advertising with only the program provided on tape. Finally, the routine uses the TRS-80 (R) cassette relay for sending Morse. These relays have had a history of wearing out under normal tape use. It might have been better to generate audio using the machine's **CSAVE** routines and have the user pick up this audio from the tape "aux" lead and amplify it. A simple audio amplifier would probably be even cheaper than the code oscillator.

Even with these few flaws, I can heartily recommend the program to anyone interested in learning the code or building speed. The routines are well thought out, appropriately interactive, and should accomplish the goal for anyone who will put in the time and **PRACTICE**.

The Micro-80 programs are available from Micro-80 Inc., 2665 No. Busby Rd., Oak Harbor, WA 98277.

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Here's an operating table that is relatively inexpensive and can be built to your own particular specifications.

A Novel Table For The Ham Station

BY RODERICK K. BLOCKSOME*, KØDAS

The foundation of the home ham station is the operating table or desk. Over the years I have seen and used a great variety of supports for the station equipment. In my opinion, many fail to meet some of the basic requirements of a good operating table. Adequate room to arrange equipment for maximum operating convenience is probably the prime requirement. Many commercial desks and tables simply do not have sufficient depth for operating a c.w. key or writing in front of the radio equipment. Secondly, the table or desk must be sturdy enough to support the equipment weight safely. Low cost is the third consideration, since most of us would rather use the ham radio budget on better equipment or antennas. I recently came upon an idea which accomplishes all three goals.

Many hardware and lumber stores that sell kitchen cabinetry occasionally have formica counter tops that are slightly damaged, unpopular colors, or unclaimed orders which they are willing to sell at reduced prices. The "island piece" can be used as a table top, as it has a finished, spill-proof edge on both front and back. Various widths are available that are sufficient for a radio table. The tops are very rigid and the formica makes an ideal surface for writing as well as holding heavy equipment. I was able to buy an "island piece," which had been dropped on one end, for $1.85 per lineal foot. It was 8 feet long and 36 inches wide. Six inches of the damaged end were cut off, leaving 7½ feet for the table.

The legs and frame for the table are shown in fig. 1. Construction is all 2″ × 4″ lumber except for the lower leg braces which are 1″ × 4″ lumber. Dimensions are not given, since they depend upon the particular counter top obtained. The attachment of the legs and frame are important. Screws and lag bolts are preferred over nails. Drill a small pilot hole for the screws and lag bolts, and then soap the threads to facilitate turning them in. The holes should be counter-bored for the screw and bolt heads. Use woodfiller to hide the heads for a more finished look. Fig. 2 is a detail of the leg and frame attachment. The frame is cut so the 2″ × 4″ cross pieces at the ends are flush with the edge of the counter top. The top is attached by six evenly spaced "L" brackets on the inside of the frame. Be sure to use the proper length screws so they don't penetrate the formica top. The raw wood may be sanded smooth and a nice

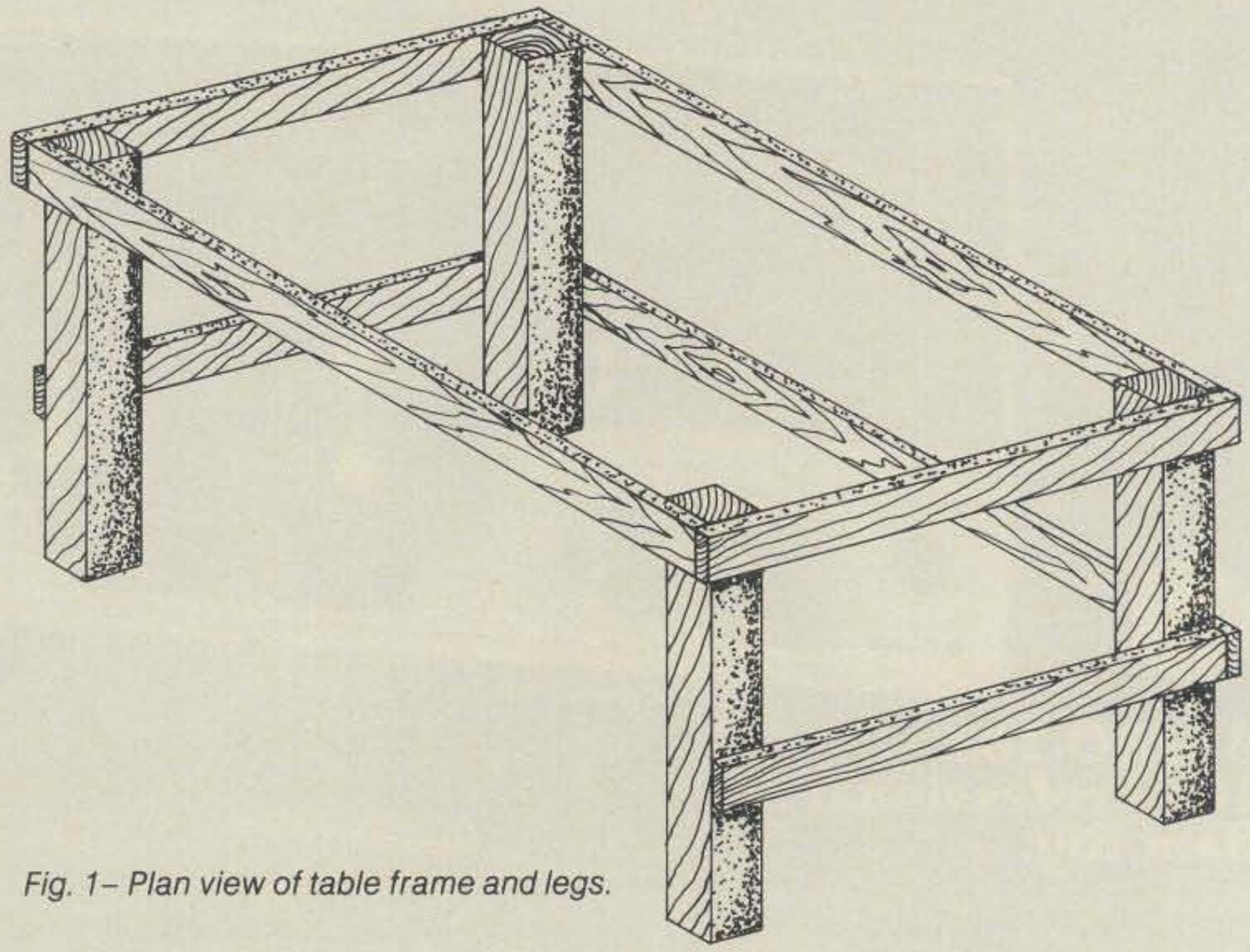

Fig. 1– Plan view of table frame and legs.

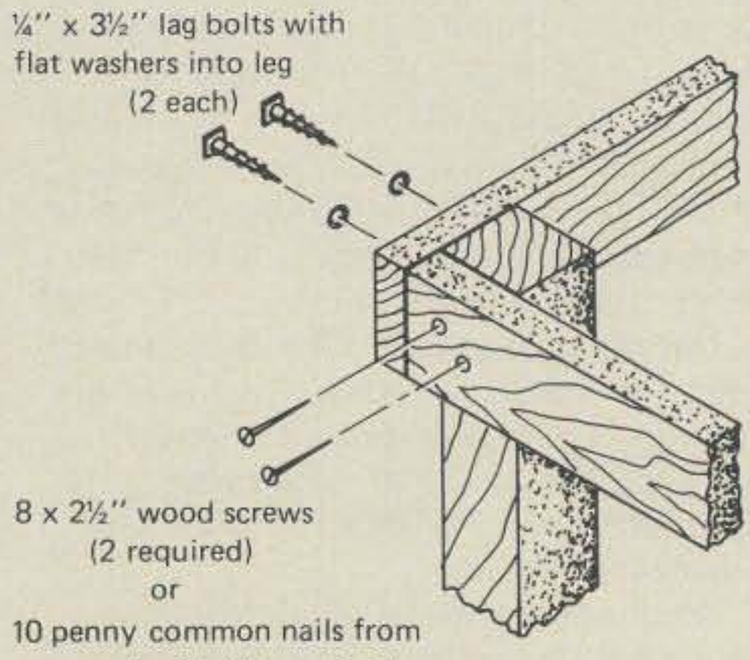

Fig. 2– Detail of front-left corner.

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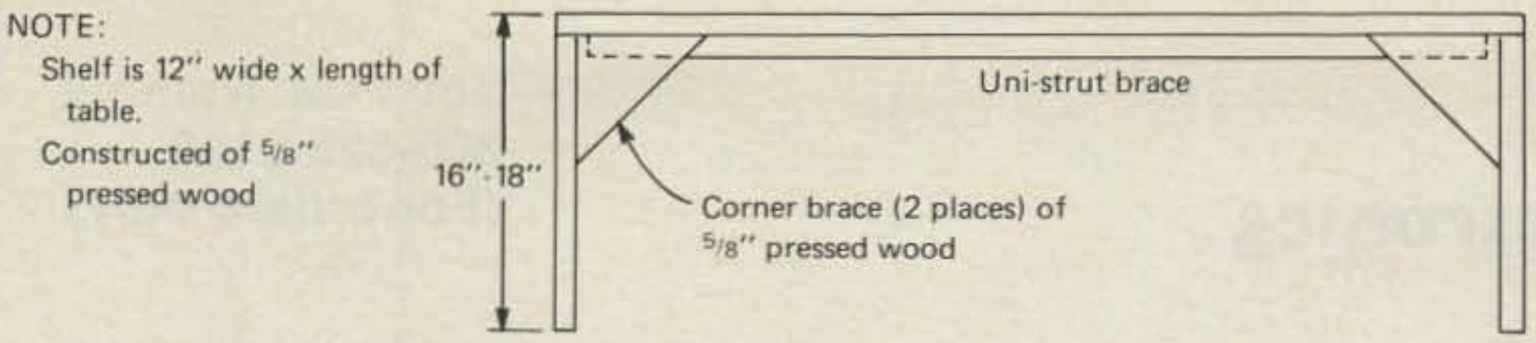


Fig. 3– Equipment shelf details.

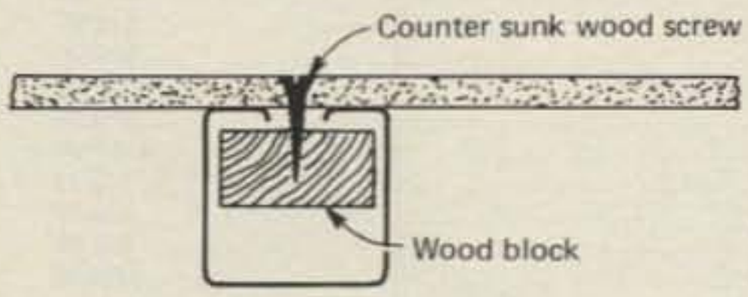


Fig. 4– Detail of fastening uni-strut channel to shelf.

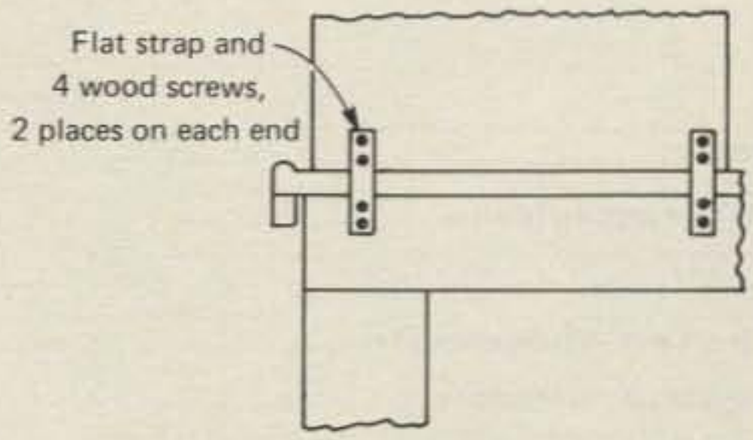


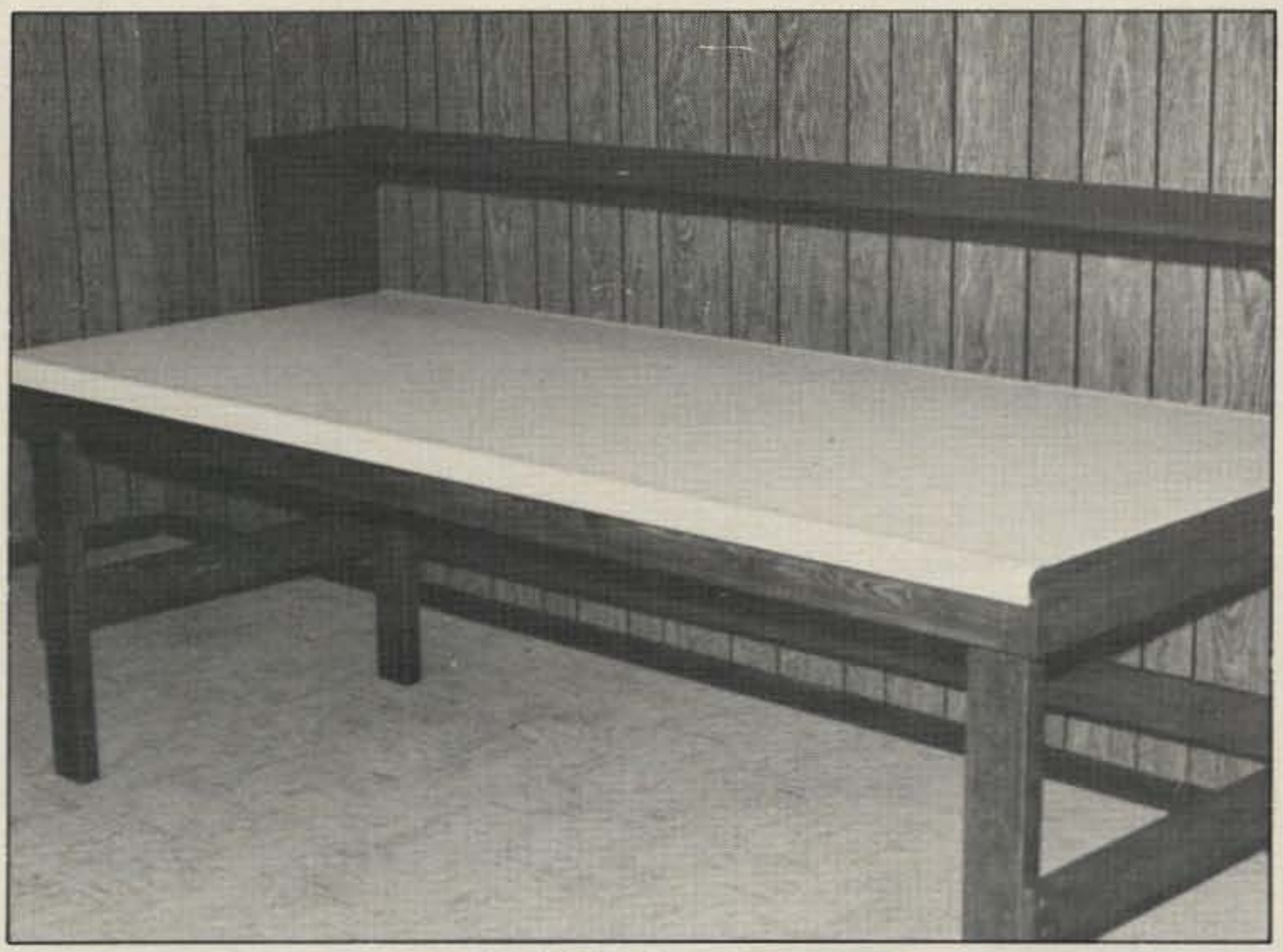
Fig. 5– Shelf attachment to table.

wood stain wiped on. After the stain dries, two coats of clear varnish will give your table a nice luster.

I have always liked a shelf above the operating surface to hold less frequently used equipment at eye level and within arm reach. Rotator controls, clocks, speakers, and wattmeters are some of the items suitable for the shelf. A shelf that spans the length of the table usually requires one or two supports from the table to prevent sagging in the middle. These supports limit the placement of equipment under the shelf and are therefore undesirable.

I designed a shelf for this table which is very rigid and yet requires support only at the ends. It was constructed of ⅝-inch thick pressed wood, or particle board, reinforced by a piece of "uni-strut" as shown in fig. 3. Uni-strut has a "U" shaped cross section and may be found in contractor supply houses or large hardware stores. A piece of 1½-inch angle iron could be substituted. The uni-strut and corner braces are placed along the center of the shelf. The shelf should also be sanded, stained, and varnished to match the table. The uni-strut may be coated with a metal paint of some complementary color. Fig. 4 details the method of securing the uni-strut to the shelf. It should be attached every 18 to 24 inches. Fig. 5 shows how the shelf is secured to the table at the ends.

After using this table for two years, I can say I'm truly pleased. It has worked out so well I would recommend building it even if the kitchen counter top must be purchased new. The table will cost more, but then you can choose your own formica color and dimensions. 73



The finished product.

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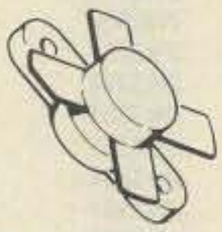

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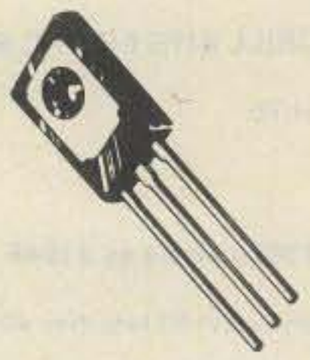

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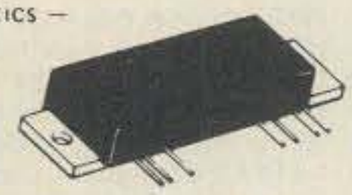

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CIRCLE 83 ON READER SERVICE COUPON

Our concluding part takes up with the sweep circuit and takes us through completing the scope. The step by step mechanical aspects are left to the individual builder.

A Step By Step Approach To Constructing An S.S.B. Monitor Scope

Part II—Completing The Monitor Scope

BY JOHN J. SCHULTZ*, W4FA

The Sweep Section

Once you have the power supply and CRT circuitry adjusted so a clean, sharp dot is displayed approximately in the center of the CRT, a sweep voltage has to be generated and applied to the horizontal deflection plates. The absolute easiest way to do this is by using the circuit of fig. 3(A). In this case the a.c. line voltage is used as the sweeping voltage by connecting the capacitor to the hot side of the a.c. line. The ground used in the monitor circuit then also has to be connected to a separate external ground connection. Using the a.c. line voltage as the sweep voltage does cause some distortion in the display, but the display is still quite suitable for basic monitoring work. Since the a.c. voltage is most linear in its center portion (zero crossing), a high sweep voltage amplitude should be used so only the center portion of the sweep appears on the CRT. Therefore, the potentiometer shown should normally be set near maximum consistent with a good monitoring display.

If you later desire a more linear horizontal sweep, the circuit of fig. 3(B) can be used. It uses inexpensive components but will produce a linear sawtooth voltage with a very fast return time. The time is short enough so that blanking of the return trace is not necessary so the circuitry is further simplified. With the values shown, the sweep frequency will be adjustable over about the 20–200 Hz range. If more ranges are desired, the .033 mf capacitor shown in the collector lead of Q2 can be replaced by other values (e.g., .01 mf for a 60–600 Hz range, etc.). The coil shown across the 2.2 K resistor is for r.f.i. purposes and should be experimented with if any interference is noted in the station receiver due to the high harmonic generation inherent in the circuit. Construction of the circuit in a separate metal enclosure is advisable. The two trim-potentiometers are adjusted for the symmetrical trace of the sweep across the CRT face. The circuit only requires about 15 ma for operation. Therefore, one simple way to obtain the required voltage is to use a voltage doubler/rectifier circuit on the 6.3 volt filament supply for the CRT. This can be done as long as you do not use a CRT circuit where one side of the CRT filament is connected to the negative high voltage supply.

R.F. Coupling Section

Some of the r.f. output of the transmitter must be coupled to the vertical deflection plates of the CRT. Usually the easiest way to do this is by some tap-off arrangement in the transmission line. One such simple circuit is shown in fig. 4(A). Two SO-239 connectors are mounted close together and joined by a short length of wire. The fixed 10 pf capacitor and variable 150 pf capacitor then form a variable voltage divider network. The r.f. voltage is coupled directly to the vertical deflection plates. Two points that you must watch are to keep lead lengths as short as possible and not to disturb the s.w.r. on a transmission line. The required components should be mounted as close to the base of the CRT as possible with an extension shaft for the variable capacitor extending to the front panel of an enclosure, if desired. The variable capacitor is used to adjust the display height for different power levels. The range of power levels that can be displayed with usable height depends on the sensitivity of the CRT used, but will generally range from 50 to 1000 watts with the coupling scheme shown. There should be no problem with the capacitor network affecting the s.w.r. on a transmission line on any h.f. band. However, as you get into the v.h.f. range, you have to juggle the value of the capacitors used in the voltage divider network to obtain a good display height and yet not affect the transmission line s.w.r. Usually most CRT's can be used for monitoring purposes up to the 2 meter band.

The circuit of fig. 4(A) provides an unsymmetrical voltage sample to the CRT deflection plates. A circuit that will provide a symmetrical voltage sample for a better display and that will also improve the sensitivity of the CRT somewhat is shown in fig. 4(B). This is the r.f. coupling scheme used in the Heathkit SB-614 Station Monitor. Basically, it is an updated version of what some old-timers will recognize as an Alford transformer circuit. The coil is a broad-band ferrite-core transformer. The unbalanced input is

*c/o CQ Magazine

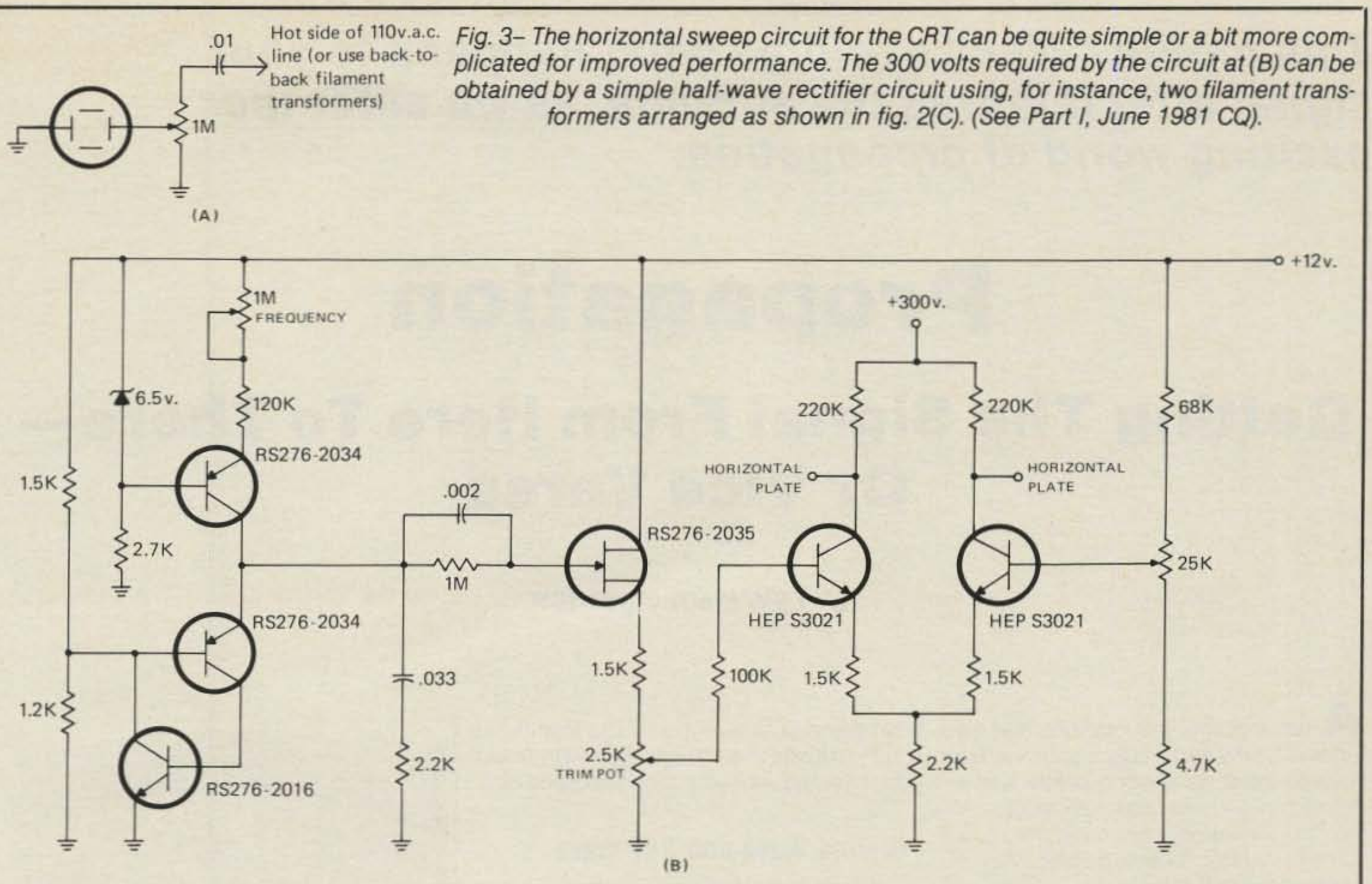

Fig. 3– The horizontal sweep circuit for the CRT can be quite simple or a bit more complicated for improved performance. The 300 volts required by the circuit at (B) can be obtained by a simple half-wave rectifier circuit using, for instance, two filament transformers arranged as shown in fig. 2(C). (See Part I, June 1981 CQ).

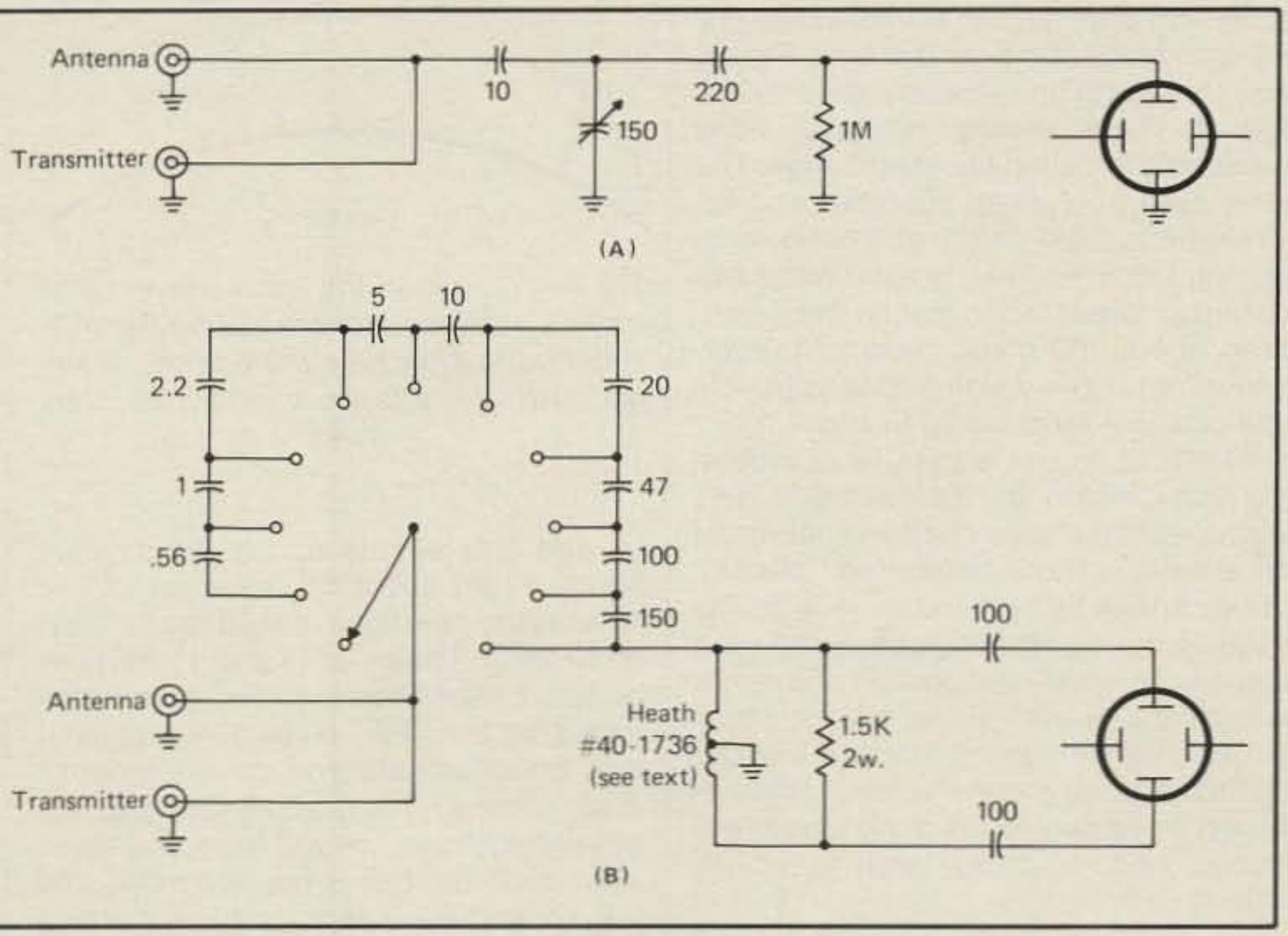

Fig. 4– Unsymmetrical but simple r.f. coupling circuit (A) and a better symmetrical one (B) as used in a Heath monitor.

transformed into a balanced signal to be coupled to the vertical deflection plates. The circuit is broad band over the 80–6 meter range. The input capacitor switching arrangement allows for the accommodation of a range of transmitter powers from approximately 10 to 1000 watts. The Heath part number is given for the transformer coil but it can also easily be home-brewed. An Amidon T-50 toroid core is used and wound with as many turns as can comfortably be accommodated on the core of two lengths of #26 enameled wire which have first been twisted together along their entire length. The ends of each length should be separately identified, such as A/B on one wire and C/D on the other wire. At the juncture of the four ends, any two oppositely marked ends such as A/D or B/C are soldered together and form the center tap. Again, when constructing this circuit, lead lengths to the CRT should be kept as short as possible.

Summary

By choosing the three sections of the monitor scope to suit both your needs and your available components, almost anyone can put together a satisfactory unit. Probably the best way to start is to build a basic unit first, get it working, and then add features such as a variable sweep oscillator and improved r.f. coupling later.

The overall housing of the monitor depends upon the size of the components used and, of course, upon your taste in enclosures. Unfortunately, an elaborate enclosure can cost as much as the components for a simple monitor scope. One inexpensive approach that is recommended is to use one of the larger Bud CU series of Miniboxes. Those enclosures come in favorable depth to width ratios to house a CRT. Also, by using a bit of contrasting color on the two halves of the enclosure, such as light gray/dark gray, light brown/dark brown or blue/white, you can produce quite a good-looking piece of equipment.

This month "Mac" explores what happens to your signal after it leaves the antenna, as we enter the exciting world of propagation.

Propagation

Getting The Signal From Here To There—Or Vice Versa

BY LEW McCoy*, W1ICP

A large part of the vagaries and mysteries of how radio signals travel from point to point have been pretty well explained in articles and handbooks. We say "pretty well" because there are some remaining facts to be discovered—more about that later.

When a newcomer enters amateur radio, there are a few things he or she must know about radio signal propagation in order to pass the test. However, the required information is a bare minimum and leaves much to be desired if one wishes to be well informed on the subject. In this article we will treat the subject of how your signal gets to where it is going, and we will try to do it in simple, easy-to-understand terms.

As you will quickly discover, each amateur band has its own propagation characteristics. For example, if you are a Novice operating the 80-meter band, you'll find that during the daylight hours the distance one can cover is greatly reduced from that which can be covered during darkness. On the other hand, 10 meters would prove just the opposite!

For the purpose of explaining radio signal propagation, visualize your antenna as radiating light waves. In fact, consider your antenna the same as a light bulb, radiating light in all directions. In real life an antenna will concentrate (beam) more energy in one direction than in another. To get off the main subject for a moment (but this is still pertinent), there is an antenna similar to a light bulb, and it is called an "isotropic" radiator. This is not a real antenna, but rather is a theoretical one—one that radiates equally well in all directions. In any case, our light source will have components or rays of the signal going in all directions. The signal, like light, travels in a straight-line path until it is reflected, refracted, or absorbed.

*200 Idaho St., Silver City, NM 88061

Ground Wave and Sky Wave

There are two primary methods whereby a signal is propagated—ground wave or sky wave. When the signal leaves our big light bulb, some of the light travels along the earth until it is absorbed or dissipated. These signals that travel along the earth are called the **ground wave**. The earth itself acts as an absorber and severely limits the distance of ground-wave signals. Until recently, ground-wave signals (in amateur radio, that is) were limited to about 100 miles maximum. However, on v.h.f. (very high frequencies) it is now possible for a signal to travel many hundreds of miles via the use of repeaters. This is not to say that the basic laws of propagation have changed; let's just say amateurs have "stretched" them!

We can see that ground wave limits the distance our signal will reach. So how is it possible to work stations on the other side of the world? If we give it some thought, we will realize that some of our signal that is leaving the antenna towards the sky is somehow reaching longer distances. And, of course, that is exactly what is happening.

The Ionosphere

Encompassing the earth, starting at a height of about 35 miles and going up to 250 miles, is a region called the "ionosphere." Fig. 1 is a graphic illustration of a section of the earth's surface showing the ionosphere. During daylight hours the ionosphere is divided into four distinct layers. The first of these layers is called the "D" layer—or in this case, the "D" region. It exists from about 35 to 70 miles

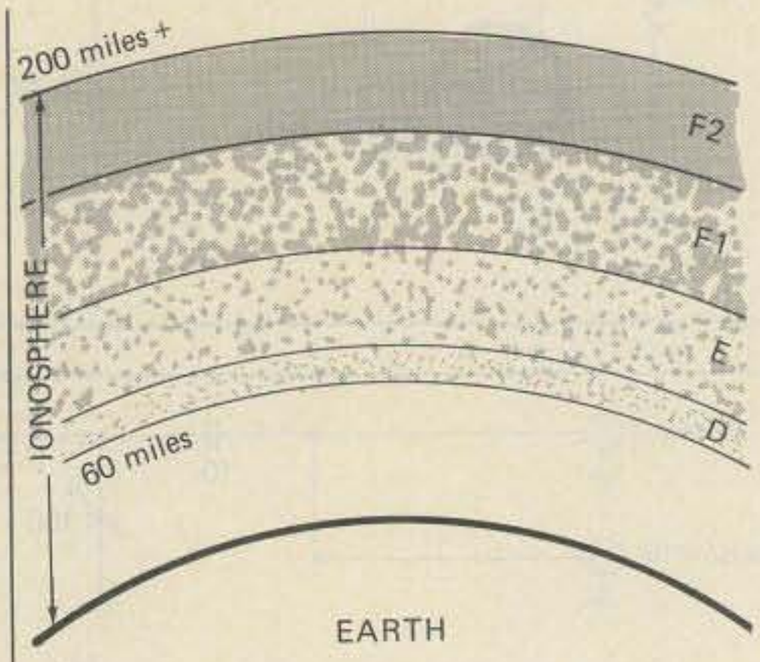

Fig. 1– This shows the various layers that make up the ionosphere during the daylight hours. After dark there is only a single layer, the F layer, at about 200-plus miles.

up and only occurs during the daylight hours. From about 70 miles up to 140 miles is the next layer, called the "E" layer. From 140 miles up to about 200 miles or so we then have the "F1" layers, followed by the "F2" layer. Keep in mind that these are daytime conditions only. After sundown the D and E layers disappear (sometimes we will have an E layer after dark, but this is not common), and the F1 and F2 layers combine forming just the "F" layer at about 200 to 250 miles.

Let's take a look at daytime conditions first and see how our signal travels. One other point though: How come no A, B, C layers? Well, the early scientists figured they might find something below the first layer in the future, so to play it safe, they called the first one the E layer!

Suppose we get on 80 meters at noon and transmit a signal. Some of the signal will travel along the earth, but ground-

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415/451-5757
Santa Barbara
HEMEC
805/963-3765
San Diego
Ham Radio Outlet
714/560-4900
San Jose
Quement Electronics
408/998-5900
Shaver Radio
408/998-1103
Tele-Com Electronics
408/377-4479
Van Nuys
Ham Radio Outlet
213/988-2212

COLORADO

Denver
C.W. Electronics
303/832-1111

FLORIDA

Clearwater
AGL Electronics
813/461-4267
Ray's Amateur Radio
813/535-1415
Ft. Lauderdale
Crane Amateur Radio
305/525-0103
Orlando
Amateur Elec. Supply
305/894-3238

GEORGIA

Symrna
Britt's Two Way Radio
404/432-8006

IDAHO

Preston
Ross Distributing
208/852-0830

ILLINOIS

Chicago
Erickson Communication
312/631-5181, 800/621-5802

INDIANA

Evansville
The Ham Shack
812/422-0231

IOWA

Des Moines
G & K Amateur Supply
515/262-1745

KANSAS

Hillsboro
Ben Franklin Electronics
316/947-2269
Wichita
Amateur Radio Equipment
316/264-9166

MARYLAND

Laurel
The Comm Center
301/792-0600
Wheaton
EISCO
301/946-1088

MASSACHUSETTS

Medford
Tufts Electronics
617/395-8280
W. Springfield
Norbill's Elec.
413/733-6648

MISSOURI

St. Louis
Ham Radio Center
314/993-6060, 800/325-3636
Mid Com Electronics
314/961-9990, 800/325-3609

MONTANA

Billings
Conley Radio Supply
406/259-9554

NEVADA

Las Vegas
Amateur Elec. Supply
702/647-3114, 800/634-6227

NEW JERSEY

Somerset
Radios Unlimited
201/469-4599

NEW YORK

Jamestown
VHF Communications
716/664-6345
New York
Barry Electronics
212/925-7000
Oriskany
Ham Radio World
315/337-0203
Rochester
J.R.'s Amateur Radio
716/235-7540

NEW MEXICO

Roswell
Pecos Valley ARS
505/623-7388

NORTH CAROLINA

Otto
Slep Electronics
704/524-7519

OHIO

Reynoldsburg
Universal Amateur Rad.
614/866-4267
Wickliffe
Amateur Elec. Supply
216/585-7388

OKLAHOMA

Oklahoma City
Kryder Electronics
405/789-1951

OREGON

Albany
Oregon Ham Sales
503/926-4591
Ashland
Siskiyou Radio
503/482-4555
Hillsboro
Antronics of Oregon
503/648-7373
Eugene
Eugene Radio Supply
503/689-8818
Portland
Portland Radio Supply
503/228-8647

PENNSYLVANIA

Scranton
La Rue Electronics
717/343-2124
Trevose
Hamtronics
215/357-1400

SOUTH CAROLINA

Rock Hill
G.I.S.M.O.
803/366-7157

TENNESSEE

Bristol
Rush Electronics
615/764-0831
Madison
A.R.S.O.N.
615/868-4956
Memphis
Germantown Amateur Supply
901/452-4276

TEXAS

Dallas
AGL Electronics
214/699-1081
Electronic Center, Inc.
214/526-2023
Houston
Madison Electronics
713/658-0268
San Antonio
Kennedy Associates
512/333-6110

WISCONSIN

Milwaukee
Amateur Electronic Sup.
414/442-4200, 800/558-0411

WASHINGTON

Seattle
Amateur Radio Supply
206/767-3222
C-Comm
206/784-7337
Spokane
Wanzer Company
509/928-3073
Tacoma
Northwest Radio Supply
206/572-8570

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CIRCLE 74 ON READER SERVICE CARD

wave absorption is high for these frequencies, so even running maximum permitted power, we'll only reach about 10 miles or so. Some of our signal shoots up into the ionosphere and enters the D region, which does not reflect or refract the signal, but just weakens it. What gets through strikes the E layer and is reflected back down. However, what is left of the signal takes a real beating when it hits the D region on its return path. One doesn't have to be a whiz in geometry to realize that a low-angle signal travels a longer path getting through the D region. Hence, much greater absorption takes place, so any propagation via the sky wave has to be a high angle and therefore a short distance for the overall path. Usually, and this is only a ballpark figure, we can expect something up to 100 miles—with luck (for 80 meters)! See fig. 2.

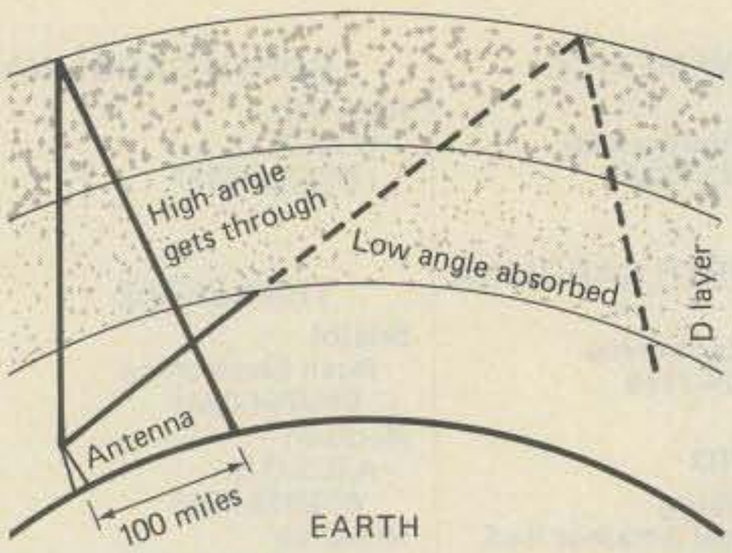

Fig. 2– The D layer or region heavily absorbs any 80-meter signal, particularly low-angle signals that must travel a farther distance through the region. To emphasize, this region exists only during daylight hours.

The D region has a strong effect on all signals up through 7 MHz. The effect is not as pronounced on 40 meters, but nevertheless, it is still present. The broadcast band is our best example, showing strictly local coverage during the day and wide open at night. After dark the D and E layers disappear, and our 80-meter signal goes all the way up to the F layer before being reflected and refracted back to earth. Note that we say "refraction" because there is some oblique transfer of the signal through the ionosphere.

Sunspot Cycle

Let's digress for a moment from how the signal travels in order to cover the all-important factor governing wave propagation—the sun. We don't have the space in this article to cover the subject the way it should be covered, but mention must be made of the sunspot cycle.

The sun goes through periods of very active to very quiet times. During periods of high solar activity (numerous sunspots and high solar flux), the ionosphere is more heavily ionized than during the sun's quiet periods. With strong ionization, radio conditions are usually excellent, particularly on the higher frequencies—20 through 10 meters—and even on 6 meters.

A solar cycle is somewhere near 11 years, and at the present time we think we are at a peak. I say "we think," because even with all our modern science we cannot accurately predict just how high or low, or even when, the sun is going to act up. For example, many prognosticators predicted that the present sunspot cycle would be one of the lowest on record, when just the opposite is true!

Critical Angles, Etc.

If we go back to our light-bulb analogy, we find that rays of light are radiated at all angles. As far as the ionosphere is concerned, for any given frequency there is a point of no return, and this is called the **critical angle**. At some point, or angle, the radio signal entering the ionosphere will not be reflected back to earth, but rather will pass on through into space, never to be returned (we think!). Any signal below the critical angle will be propagated either by ground wave or sky wave.

Another point to bring in is a factor called **the maximum usable frequency** or **MUF**. Depending on the solar conditions and amount of ionization, there is a "cutoff" in frequency beyond which signals will not travel. Many times you hear amateurs mention that 10 or 15 meters is "dead," and in most of these cases what they mean is that the MUF is lower than 10 or 15. In quiet sun periods the MUF can drop as low as the 40-meter area. As you probably have begun to realize, there are many, many factors that control your signal propagation.

Single and Multihop Transmissions

Referring to fig. 3, we can see that a signal can arrive via the ionosphere by several paths or "bounces." Some of the signal will arrive via one hop, or it could take several hops. In fact, with the F layer at 200 miles up and even a very low angle from the antenna, getting halfway around the world would take several hops.

Because the ionosphere is a very flexible and tenuous area, the signal bouncing back and forth tends to go through strong and weak areas as it travels from one point to the other. This in turn causes fading or QSB. In addition, your signal can go through "rotation" from vertical to horizontal polarization as it passes through the ionosphere, causing very severe QSB.

It is a generally accepted fact, although many amateurs are not aware of it, that once the signal enters the ionosphere, the polarization changes back and forth from horizontal to vertical. Therefore, if you are going to be working stations via skywave, it really doesn't matter if your antenna is horizontally polarized or not! (This does not hold true for v.h.f., of course.)

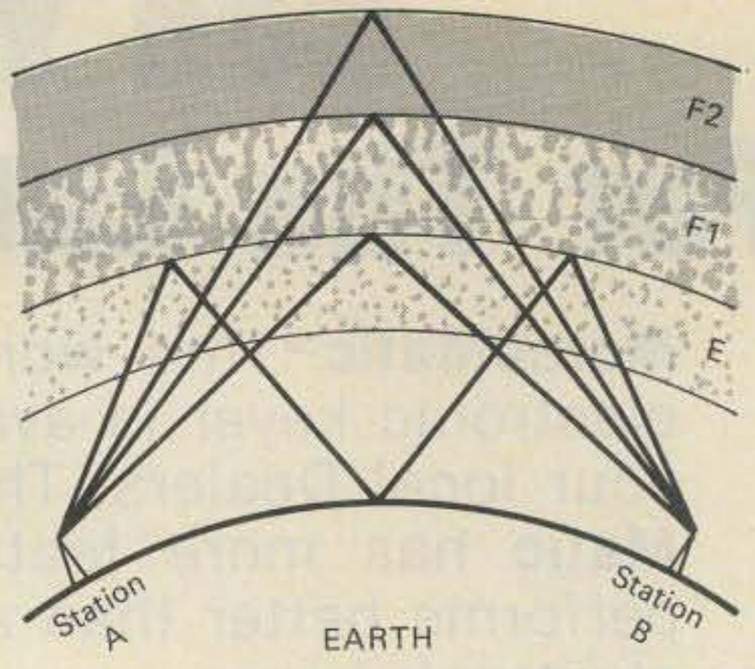

Fig. 3– Only a few of the possible signal paths are shown. In actual practice they could be practically countless. In discussing phenomena such as "one-way skip," one must consider that in most cases the two stations are using antennas that have different angles of radiation. That is, one station may have a strong lobe at 20 degrees, while the other could be stronger at 10 degrees, for example.

The E Layer

We kind of glossed over the E layer up to this point, so let's cover it now. When the E layer exists, during daylight hours, it serves to reflect signals along with the F1 and F2 layers. As fig. 3 shows, a signal can be reflected by all three layers, resulting in a wide variety of signal paths. Earlier we mentioned that there are things still not known about wave propagation. I was taught there was no such thing as "one-way skip." This is the classic (and frequent) case in which someone calls CQ again and again, and he is so strong that he blocks your receiver. No matter how much you call him, he doesn't hear you! Supposedly, there is always a reciprocal path between you and the other station, and no doubt there is. However, this path could be much different for him than for you. Fig. 3 is a good example of this. Although many antenna experts will argue, for all practical purposes this is a one-way skip, and it happens every day.[1]

Sporadic E—Or What Keeps CBers Alive

A long time ago it was discovered that clouds (as they are sometimes called) of E-layer material exist after sundown. For example, many times when the MUF is below 10 meters (or 11 meters), an E-layer cloud will appear, opening up the bands.

If you are a newcomer and have never experienced a normally dead band sud-

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[1]*Editor's Note: To our knowledge, the subject of one-way skip has never been treated in amateur publications in any great detail. To us, it is a fascinating aspect of amateur radio that could stand investigation.*

denly busting open, then you are in for a thrill, because sporadic E opens whole new areas of contacts. You can guess what happens when this occurs on the Citizens Band!! One more point about wave propagation and dead bands: Never assume that a band is dead. Call CQ a couple of times, because you might be in for a big surprise.

What Bands Do What

There are a few more items to consider concerning a basic knowledge of wave propagation. For example, each amateur band has different characteristics for the various seasons of the year. Again, the amount of sunlight is the controlling factor, so what you experience in the winter doesn't necessarily hold true in the summer.

Let's look at the various amateur bands and what we can expect.

160 meters: Poor daytime, good nighttime, also a better winter band. In fact, winter can be considered best for most bands—excluding v.h.f. and u.h.f.

80 meters: Same as 160, except very long distance is possible at night. In order to obtain low-angle radiation (horizontal), very high antennas are required—100 feet above ground.

40 meters: Good daytime and nighttime communications. During the day 500 to 1000 miles possible, and worldwide after dark.

20 meters: Excellent day and night at this time of the present cycle. Worldwide communications possible at any time.

15 meters: On this and **10 meters** there is very little signal absorption when the bands are open, making low-power, worldwide contacts possible—even with just fair antennas. Antenna heights of 30 to 60 feet are excellent.

We haven't treated 6 meters and higher, because these are usually considered line-of-sight bands. However, what with OSCAR, repeaters, remote bases, and so forth, very long-distance contacts are possible.

Conclusions

This article by no means covers the subject completely. More is being learned each year.[2] The only advice we offer is not to tie yourself to a single band. It may be some amateurs' cup of tea to spend their amateur days on the low end of 40 handling traffic, or killing themselves working DX. The trouble is, you never get to find out what you may be missing just over the horizon.

---

[2]*For a full discussion of propagation, send for a copy of* The Shortwave Propagation Handbook, *by George Jacobs, W3ASK, and Theodore J. Cohen, N4XX. It is available from CQ Bookshop, 76 N. Broadway, Hicksville, NY 11801 at a cost of $7.50.*

a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

Here is the "Story of The Month" for September, as told by Betty:

Edith M. Coleman, W4EHN
All Counties #297, 8-25-80

After Betty got down off Cloud 9 and was discharged from the hospital in mid October 1980, after serious surgery for arthritis, she wrote:

"My son John, W9HAT, started me in Ham Radio in 1956. My OM, Clem, and I were moving to California and John wanted us to be able to keep in touch.

"I went to night school in California and a General Class, Paul Lonnerke, gave me my Novice examination. Later K6JFP gave me my Tech test, and a General Class license was later obtained at the FCC office in San Diego, California.

"I got my first 500 certificate from K6BX in December 1962.

"At Christmas times while visiting John, W9HAT, and family in Wisconsin, I would get on the 40 meter CH Net and later on the 20 meter net. While traveling mobile, I got a big kick out of giving several Tennessee counties to KA9ZZ, Japan.

"On our trip 17 May to 13 December 1965 from California to Florida, I gave out many, many counties under my call, K6UHI/M, while the OM, Clem, patiently did the driving. My last entry in my mini-mobile log was dated 26 August 1970, and Clem passed away 27 February 1972.

"In May 1977 I had a severe blackout and had to give up driving and conventions—what a let down.

"My last 5 counties were the hardest, and I have to thank W4SSU/M for Jenkins, Georgia; WD4HRN/M for Monroe, Oklahoma; W5XX/M for Lawrence; and Jeff Davis in Mississippi and WB5GRI/M for Winston, Mississippi.

"I was born in Evanston, Illinois 21 October 1897 where I attended school through high school. Then we moved to Madison, Wisconsin where I met my wonderful Clem. We were married 10 January 1920.

Betty Coleman, W4EHN, who will be a young nearly 84 when you read this.

"Our son John, W9HAT, born in 1921, married Maizie 25 March 1944, and they now have 3 lovely children, Debbie, Steve, and Nancy.

"Clem, who had a broken back when only 19, fully recovered, and helped me build my first equipment—DX100. Later we got an NC 300 and a Johnson Valiant. Still later we built an s.s.b. converter, and then turned it all in for a Collins KWM2 and 30L1 linear.

"Clem put together and installed a Gonset tower in California. When we moved to Florida we had lots of willing helpers to raise a Hy-Gain Thunderbird 6-element beam and a nice tower.

"I'm also active on 2 meters with an IC21A and a Ringo Ranger, and I like to help in emergencies.

"I sure miss driving after 50 years of independence and also miss the conventions. Oh yes, my first call was KN6UHI received in September 1956 and I got W4EHN in December 1965 when we moved to Florida, where I became Floridora #265, CHC #546, YLISSB #42, and 10-X #28515. Later I became QCWA #14703 and QCWW #129 in Chapter 120 in January 1981.

"I'm a Pink Lady at a local hospital, play bridge, and belong to DAR and our local Church Circle.

"I want to thank everyone for helping me make All Counties, especially Arnie, K9DCJ, the many mobiles, NCs, and Hal, WB5GRI, who drove way out of his way for a needed county and even took a picture of the county line in color for me."

P.O. Box 73, Rochelle Park, NJ 07662

Awards Issued

Clay Schlenker, W4XT (ex-W4AZU), who received USA-CA-500 in July 1975, found time to acquire USA-CA-2000 through All Counties, endorsed Mixed.

Ken Williams, W7LQT, waited until he had them All and picked up USA-CA-500 through USA-CA-2500 endorsed All S.S.B., All 14, All Mobiles; USA-CA-3000 endorsed All S.S.B., All 14; and All Counties endorsed All S.S.B.

"Kittie" Shipes, WB7OHB, also waited until she had them all before sending for USA-CA-500 through USA-CA-3000 endorsed All S.S.B., All 14, All Mobiles; and All Counties endorsed All S.S.B., All 14.

Avon Anderson, WB7WBZ, also waited until she had them All before claiming USA-CA-500 through All Counties endorsed All S.S.B., All 14.

George Parker, K9CSL, who received USA-CA-500 in April 1965, revived his interest and found time for USA-CA-1000 through USA-CA-2000 endorsed All S.S.B., All Mobiles; USA-CA-2500 and 3000 endorsed All S.S.B.; and All Counties endorsed Mixed.

Barry Brewer, WA5DTK, added to his fine collection USA-CA-3000 and All Counties endorsed Mixed.

Ruel Samuels, 6Y5RS, (foto in July *CQ*) became #16 non-U.S. 48 states to make All Counties. The other 15 in the order received were: ZL1KG, TG9UZ, G4JZ, VE7ATI, GW3NWV, VE4QZ, VE4EL, VE1RQ, VE1DI, VE4XN, VE3IR, VE3RN, SM4EAC, KL7MF, and VE4ZX. Oh yes, Ruel has the only USA-CA certificate issued to Jamaica.

Special Honor Roll
All Counties

#325 Clayton N. Schlenker, W4XT, 5-8-81.
#326 Ken Williams, W7LQT, 5-11-81.
#327 Geraldine Shipes, WB7OHB, 5-13-81.
#328 Avon Anderson, WB7WBZ, 5-16-81.
#329 George W. Parker, K9CSL, 5-26-81.
#330 J. Barry Brewer, WA5DTK, 6-1-81.
#331 Ruel Samuels, 6Y5RS, 6-6-81.

Don Conrad, N4CCJ, obtained USA-CA-2500 endorsed Mixed.

"Ace" Burdett, KA9AHH, was issued USA-CA-2500 endorsed Mixed.

Ernest Gutermann, K6CR, won USA-CA-2500 endorsed All A-1.

Joe Reisert, Jr., W1JR, added USA-CA-1000 and 1500, endorsed Mixed, to his collection.

Werner Brill, DL9YC, collected USA-CA-1000 endorsed Mixed.

Frank Roney, W2YWK, qualified for USA-CA-500 and 1000 endorsed Mixed.

Bill Hatcher, N5BDY, had me send him USA-CA-1000 endorsed All 20 Phone.

Gordon Schulze, Jr., KE5J, came up with the proper data for USA-CA-500 and 1000 Mixed.

Shirley Neddo, WB1ACS, was sent USA-CA-500 endorsed All A-1.

The City Students Radio Club of Sofia, LZ1KDP, got #4 Award to Bulgaria, USA-CA-500 endorsed Mixed. The others were LZ1KAA and LZ1XL.

USA-CA Honor Roll

3000		2000		WB7OHB	670
W4XT	352	W4XT	473	WB7WBZ	671
W7LQT	353	W7LQT	474	DL9YC	672
WB7OHB	354	WB7OHB	475	W2YWK	673
WB7WBZ	355	WB7WBZ	476	N5BDY	674
K9CSL	356	K9CSL	477	KE5J	675
WA5DTK	357			K9CSL	676
		1500			
2500		W7LQT	530	500	
W4XT	416	W1JR	531	W7LQT	1615
W7LQT	417	WB7OHB	532	WB7OHB	1616
N4CCJ	418	WB7WBZ	533	WB1ACS	1617
WB7OHB	419	K9CSL	534	WB7WBZ	1618
WB7WBZ	420			W2YWK	1619
KA9AHH	421	1000		KE5J	1620
K9CSL	422	W7LQT	668	LZ1KDP	1621
K6CR	423	W1JR	669		

Awards

Hamfesters WAHM Award.

WAHM Award: Offered by the Hamfesters Radio Club Inc. under the following rules:

1. Illinois hams must contact *ten* Hamfester members in Illinois.

2. Other U.S. hams must contact *five* Hamfester members located in Illinois.

3. Other hams must contact *three* Hamfester members in Illinois.

4. On net operation—contact (exchange of signal reports) must be made with *five* members.

5. Applicants must submit a list of contacts containing call, frequency, date, and handle of the Hamfester member to: HRC, Inc., P.O. Box 42792, Chicago, Illi-

nois 60642. *Do not send QSL cards* if you wish them returned.

Note: From 1700 UTC October 10 to 1700 UTC October 11, The Hamfesters Radio Club will be operating on the general phone portion of 10 and 40 meters and the Novice portion of 10 meters for any amateur wishing to receive a Worked All Hamfester Member Award. Exchanges need only be calls, RST, and state or country. Hamfesters will call "CQ WAHM."

Minnesota—Land of the Loon Award.

Minnesota - Land of the Loon Award: Requirements: U.S. stations need to work 35 Minnesota stations. DX stations need to work 25 Minnesota stations. No date, mode, or frequency restrictions. Send log data and $1.00 and two 18-cent stamps. Overseas stations send $3.00 U.S. Do not send QSLs or IRCs. Apply to: Custodian: WA@WNV, Ron Heruth, 321 Wyandotte Road, Hoyt Lakes, Minnesota 55750.

Gateway to the West Award.

Gateway to the West Achievement Award: Revised rules—Work stations in states through which the Lewis and Clark expedition passed. Work one station in each of the following states: Idaho, Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, and Washington, plus one station in St. Louis, Missouri. Send list showing calls and log data and $1.00 to: W@CJG, Dean Cowden, 2317 Lee St., Poplar Bluff, Missouri 63901.

Center of Population Award.

Center of Population Award: The geographical population center of the U.S.A. (subject to change, Hi) is close to St. Louis, Missouri. To achieve this award work one station in each state which borders Missouri. Work one station in Arkansas, Illinois, Iowa, Kentucky, Kansas, Nebraska, Oklahoma, and Tennessee, plus one station in St. Louis, MO. Send list showing calls and log data and $1.00 to W@CJG, Dean Cowden, 2317 Lee St., Poplar Bluff, Missouri 63901.

The Kauai Amateur Radio Club Awards: The Kauai ARC is pleased to announce the establishment of five awards which are available to amateurs world wide. They are:

A. The Worked Kauai Award (WK)
B. The Worked Hawaii Award (WH)
C. The Worked Hawaiian Islands Award (WHI)
D. The Worked All Hawaiian Islands Award (WAHI)
E. The Worked All Hawaiian Counties Award (WAHC)

1. All contacts must be dated 1 January 1980 or later and any band and/or mode may be used. Contacts through repeaters not allowed.

2. General certification rule applies. Submission of QSL cards is not required. The cards must be checked, and the list certified by, an officer of any recognized Amateur Radio Society or Club.

3. The calls on the certified lists should be in alphabetical order with the times in GMT.

4. Specific Award requirements are as follows:

a. WK—For all 50 U.S. states and Canada, contacts with five KARC members. DX stations need only three.

b. WH—For all 50 U.S. states and Canada, contacts with 50 Hawaii stations, including five KARC members. DX stations need only 15 contacts, including one KARC member.

c. WHI—Contacts with five Hawaii stations on *each* of the following islands: Hawaii, Kauai, Maui, and Oahu.

d. WAHI—Contacts with at least one Hawaii station on *each* of the following islands: Hawaii, Kahoolawe, Kauai, Lanai, Molokai, Maui, Niihau, and Oahu.

e. WAHC—Contacts with at least one Hawaii station in *each* of the following counties: Hawaii, Honolulu, Kalawao, Kauai, and Maui.

5. Applicants should state which award is being applied for and if specific band/or mode endorsements are desired.

6. The KARC will furnish a current membership list upon request—include s.a.s.e. or IRCs.

7. All correspondence should be addressed to Awards Manager, KARC, P.O. Box 548, Kalaheo, Hawaii 96741 U.S.A.

Worked All Chile Award (WACE): New rules as of December 1980:

1. This WACE Award is being issued by the Radio Club de Chile to all amateur radio stations who can submit evidence of having established 2-way contacts with stations in each of the 10 zones in which the Chilean territory is divided.

2. The application must contain a list of the stations worked, including the date, time, signal report, and mode.

3. It is not necessary to send the QSLs if the list is verified and signed by a recognized Radio Club or National Amateur Radio organization.

4. All contacts must be made from the same "country."

5. The cost of the award is 8 IRCs.

6. Apply to: Awards Manager, Radio Club de Chile, Casilla N 13630, Santiago de Chile, South America. (Thanks to CE3GN for this data.)

Karel Karmasin, OK2BLG, USA-CA-500 #1283. Note the FT-101 Transceiver.

Notes

By now, most of you have heard that as of June 20, 1981, about two-thirds of Valencia County, New Mexico will become Cibola County. Thanks to Fred, W5FS for full data. As of that date, credit will be given for QSOs with Cibola County, but it will *not* be required for All Counties until 1 January 1982. Due to the many changes in counties since the start of the USA-CA Program, a long time ago we stopped mentioning the number on All County Awards and Plaques. They read just "All Counties." Thus, for those of you who already have All Counties, even though it will be fun to work the new county, it will have no effect on your All Counties Award/Plaque.

Sorry that many are still sending mail for *CQ* to their old QTH. Please note the new QTH is 76 North Broadway, Hicksville, NY 11801—*not* Port Washington.

73, Ed, W2GT

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CIRCLE 146 ON READER SERVICE CARD

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

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Improved Receiver Performance

Most current solid-state communications receivers are a far cry from those offered the listener of 10, 15, or 20 years ago. Virtually gone are annoying tube-set characteristics such as drift, microphonics, barn-wide selectivity, sensitivity drop-off, and images. The use of solid-state circuitry has enabled most of these problems to be conquered one way or another, with the result that even lower-priced portables are stable enough, for example, to be used to receive 10-meter s.s.b. signals and sensitive enough to monitor the 13-meter s.w. band.

Nevertheless, after a short period of operation, you will almost certainly find some small drawbacks in your set that you'll want to compensate for, or you'll seek to increase your receiver's flexibility by adding an antenna coupler, outboard active audio filter, an i.f. converter, or other performance-boosting device. I assume that your radio is basically a *good* one; while some deficiencies can be rectified by means of add-on accessories, others require tearing into the set's insides to the extent that it's not practical to correct them. Basic flaws such as serious mechanical or electrical instability, inadequate bandspread, lack of a beat-frequency-oscillator (BFO), and the like may make adding expensive accessories a marginal proposition.

A particularly useful accessory is the receiving antenna tuner. Not really different from a transmitting tuner except for lighter-duty components, the device is particularly handy to let you match your antenna to your receiver for maximum signal development and transfer. The tuner is a near-must for really effective use of randomwire or tuned-feeder antennas, or for resonating very short antennas on the lower bands. Most any transmitting tuner design can be adapted for receiving use. MFJ makes an inexpensive 1.6 to 30 MHz coupler that includes an optional 20 dB preamp/attenuator. Several low-cost MFJ units can be used for receiving, or you can build your own from junkbox parts for next to nothing.

MFJ-1040 receiver preselector is an excellent accessory for enhancing performance of low- to medium-priced communications receivers, especially portables. Low-noise MOSFET unit boasts up to 20 dB gain over the range 1.8 to 54 MHz. Circuit improves weak signal reception, helps reject out-of-band signals, and reduces image response. The lightweight unit can handle two antennas and two receivers, includes an r.f attenuator, and can be used with transceivers with automatic bypass up to 350 watts input. (Photo courtesy MFJ Enterprises)

Adding a low-noise preamp between the receiver and antenna can do wonders to improve reception, especially with lower-priced, older sets that may lack pep on the higher ranges. Several commercial transceiver/receiver preamps are available from manufacturers such as Ameco, MFJ, and Palomar Engineers. Typically, these units cover about 1.8 to 55 MHz in several bands. They can materially improve weak signal reception, help to reject strong out-of-band signals, and cut down on image response. Some of them are also "bi-linear." That is, they include an r.f. sensing device to allow use with transceivers as well—the preamp is bypassed when transmitting. Some include an attenuator to help reduce intermodulation from strong local signals that might otherwise mar reception of weak ones.

If you want to extend downward the frequency range of your existing receiver, you may want to construct or purchase a v.l.f./l.f. converter. This is a device that up-converts the low, say 10 kHz to 500 kHz band, to a range or ranges that can be detected on an ordinary communications receiver and then processed like other signals. Probably the best-known such converter is made by Palomar Engineers (though there are others on the market); the unit uses a crystal-controlled mixer that up-converts the low-band signals to 3510–4000 kHz. This process allows the receiver's basic specifications such as selectivity, bandspread, reception modes, etc., to be harnessed when receiving low-band signals.

If your problem is that you don't even *own* a communications receiver, an h.f. up-converter may be what you need to explore the popular m.w. and s.w. bands. Clegg made an interesting unit, the AB-144 Allbander, which converts your present 2-meter multimode transceiver (such as the Yaesu FT-221R, KLM 2700, Kenwood TS-700SP, etc.) into a continuous coverage receiver that spans the spectrum from 100 kHz to 30 MHz in eight tuning ranges. These bands are heterodyned by the unit to the 144–148 MHz range. The rationale behind the device is that to many hams who are primarily ham-band-only users, the purchase of an expensive, high-quality, all-wave communications receiver is of perhaps marginal value. I own one of the Clegg up-converters and use it nearly every day with my TS-700SP for general coverage monitoring. It really works!

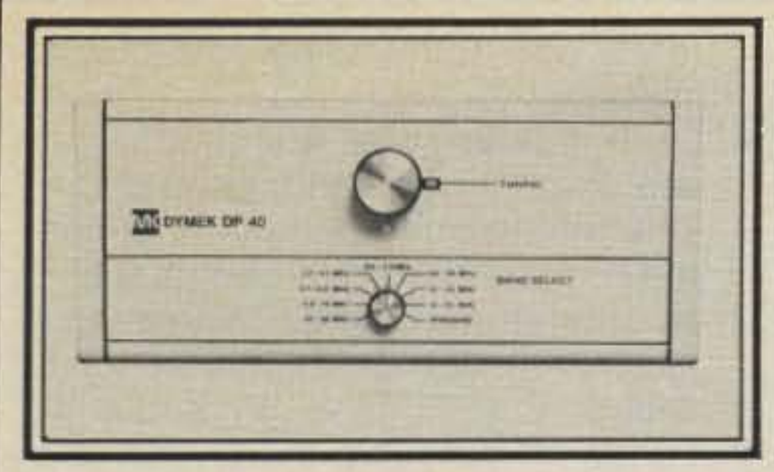
Other devices such as active audio filters and narrow-response i.f. strip filters can go a long way to make listening and DXing more enjoyable. But then, this is supposed to be an *antenna* column.

Questions and Their Answers

Several months ago we ran a two-column review of h.f. vertical antennas. We didn't say much about the protection of passersby—particularly children—from the possibly dangerous effects of coming into contact with a ground-mounted antenna. The question arises, what are the safety hazards associated with someone inadvertently touching your antenna while you're transmitting?

It goes almost without saying that any antenna (and feedline) should be installed

*317 Poplar Drive, Millbrook, AL 36054



R.f. preselector shown here is non-amplified. *Its purpose is to act passively to shape the input selectivity curve of the receiving system to eliminate undesirable signals. Its nine band-select positions provide a five-element lowpass filter for 0 to 0.15 MHz, dual-track tuned circuits for 0.15 to 30 MHz, and a wideband bypass position to remove the preselector from the antenna circuit when not needed. There is some insertion loss with such a unit, which may run as high as 7.5 dB on some ranges, but this may be offset by the advantages of elimination of cross-modulation interference and receiver desensitization when working near high-powered transmitters. (Photo courtesy McKay Dymek)*

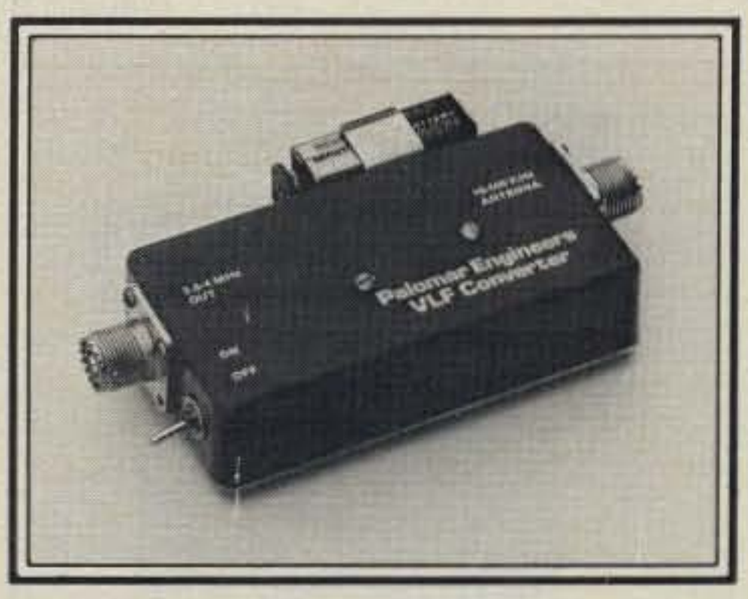
so as to preclude or at least minimize the possibility of physical contact. The two main concerns relate to **(1)** r.f. burns to one's flesh from touching the antenna while transmitting, and **(2)** electrical shock from the antenna caused by its being above a.c. or d.c. ground potential.

While it's a rare case that r.f. energy would be present on an antenna to such a degree that contact would be fatal (even when running a full gallon), a very serious, painful, and penetrating flesh burn can occur. In some cases the flesh can actually be cooked. This would be an extremely unfortunate incident to have occur in your backyard, especially when it would likely involve small children playing in the vicinity of the antenna. It doesn't take much power to do a job on one's hand. In my Novice days, I received some nasty pin-prick r.f. burns fooling around with the tank and antenna circuitry of my 25-watt 40-meter c.w. rig.

An even more serious problem is the possibility of d.c. or a.c. voltages being present on the antenna. Given sufficiently high voltage and lowered skin or body resistance, with the potential for lethal currents to flow through one's body, the antenna can easily kill. Tube-type pi-network rigs that use a d.c. blocking capacitor to connect the tank circuit with the final amplifier tube's plate can cause full transmitter h.v. to be placed on the antenna if the capacitor fails. This creates the potential for electrocution of anyone coming in contact with the antenna. (The possibility can be reduced by connecting an r.f. choke between the r.f. output terminal "hot" lead and ground to short the d.c. to ground and blow the transmitter's power supply fuse, should capacitor failure occur.)

A second "hot antenna" hazard occurs if the antenna is not at a.c. ground potential. This is a rare occurrence in a well-designed amateur station, since care is usually taken to ensure that the equipment cases, chassis, accessories, coaxial transmission lines, etc., are all well grounded. However, in some temporary lashups, such as might occur under vacation or portable conditions, the same care might *not* be taken. Also, many tube-type s.w.l. receivers of the transformerless kind (of which there are still many around today) can put the antenna system at a potential of 120 volts (the powerline voltage) above ground under certain conditions. These could include forcibly inserting a polarized plug the wrong way, failure of a bypass capacitor in the receiver, misconnection of the antenna ground lead at the set, etc. I'm leary of using this kind of receiver with *any* kind of external antenna or ground due to the shock hazard—one that's present whether the set is turned on or not.

So, if you plan to install a ground-mounted vertical, consider how you're going to protect it. A small fence around the antenna may do the trick, or possibly your completely fenced-in and locked yard would be adequate. Before installing the antenna, it's a good idea to make a routine check of things such as your homeowner's or renter's liability insurance coverage and your rental agreement or lease, as well as local electrical and building codes.



If you might like to try out the radio spectrum below 500 kHz, a special low-band converter is required in most instances, since the typical communications receiver does not cover the range, nor does most amateur equipment. Palomar Engineers VLF converter allows coverage of the range 10–500 kHz by up-conversion for reception on any shortwave receiver (or transceiver) covering 3.5 to 4 MHz; normal 80-meter signals are blocked by the unit during l.f. reception. The converter shown in the photo has a crystal-controlled oscillator for frequency stability and accuracy, low-noise r.f. amplifier, and a double-balanced mixer for freedom from strong local signal interference. (Photo courtesy Palomar Engineers)

Always play it safe when erecting and using your antenna system, whether it be for s.w.l.'ing, amateur, CB, scanning, TV, f.m., or whatever use. Consider the following guidelines, any one of which may save your life:

- Don and use a safety belt when climbing your beam tower.
- Disconnect the feedline from your equipment before working on the antenna.
- Never allow anyone to turn your equipment on while you're working with the antenna and thus highly vulnerable to shock.
- Don't try to install an antenna when you're dog-tired.
- Avoid bodily contact with metal surfaces—especially grounded ones—when working on the antenna.
- Don't place antennas anywhere near power lines and never use a power pole for a support.
- Use a wooden, fiberglass, or plastic ladder for outdoor work if one is available; metal ladders are, of course, good conductors of electricity.
- Don't assume power lines are insulated; most are not.
- Don't work alone. Use the buddy system, preferably with someone who knows first aid for electrical shock.
- Don't erect the antenna on a windy day or if the lawn is wet or muddy; watch for threatening weather.
- Tie off tall masts with rope and secure the free ends to prevent a toppling antenna pole from falling onto power lines.
- Once in position, be liberal with your use of guy wires and base support. This will minimize sway and reduce the possibility of the antenna falling on your own home or that of your neighbor under severe weather conditions.
- Fence off easy-to-climb towers and exposed "hot" vertical antennas to prevent accidents involving neighborhood children. Don't rely on warning signs!
- Wire antennas should be strong enough to withstand winds twice as strong as expected local wind gusts. Use no. 12 or 14 for long spans to minimize the possibility of breakage.
- Use three-wire safety grounded a.c. connectors in your shack whenever possible.
- Bear in mind that lightning surges can enter your station via the a.c. lines as well as transmission lines.
- Protect all outdoor antenna installations against lightning strikes, either by disconnecting and grounding the feedline when not in use, or by using a lightning arrestor specifically designed for the transmission line in use.
- Don't forget the rotator control box: a lightning discharge can enter through its control cables.
- If possible, configure your antenna so that the entire antenna and its supporting structure are at d.c. ground potential.

Fig. 1– Playing it safe with antennas.

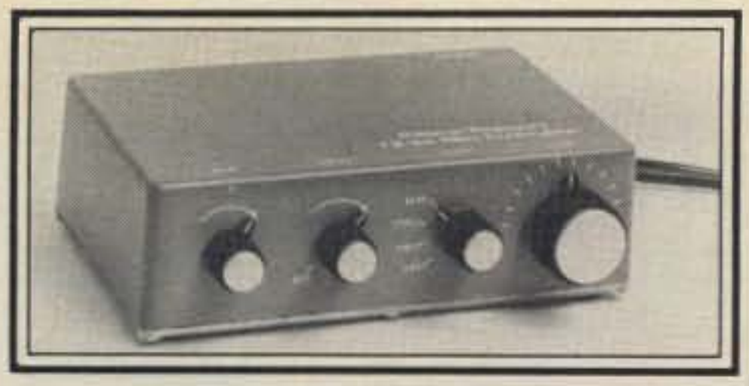
DA5 ferrite rod antenna is a directional a.m. loop with frequency and sensitivity controls. The system contains an FET two-stage amplifier; the shielded ferrite rod can be rotated and tilted to null out undesirable signals. The system covers the standard BC band from 540 to 1600 kHz and has an output impedance of 50 ohms. Especially designed for enhanced a.m./m.w. reception in marginal signal areas, the antenna checks in at under seven pounds. A desktop unit, the cabinet is finished in teakwood and a contrasting textured black enamel. (Photo courtesy McKay Dymek)

With open season on antenna construction close at hand, it's a good time to stress safety. The risks are there: electrocution by a power line, falling out of a tree or off of a tower or ladder, or losing your grip on a slippery roof. Minimize the risks by using the buddy system—having a friend, the XYL, or a neighbor over to assist you, if for no other purpose than to hold a ladder, rescue you if you get stuck, or summon aid if you become injured. As is always the case with accident prevention, exercising a healthy measure of common sense goes a long, long way.

Fig. 1 presents some useful guidelines for antenna safety.

Wrap-up

That's it for receiving antennas for now. We gave the whole subject a broad-brush treatment; it's obviously one that's yards wide and miles long, too much to cover adequately in a column or two. But we pointed out many considerations involved in basic antenna selection, described some tuning aids and receiver performance-enhancing accessories, and mentioned some new and compact antennas for urban dwellers, as well as some that get high marks for portability.



Low noise-figure Palomar Engineers preamplifier helps pep up receivers that are poor performers on the higher amateur or shortwave bands; up to 20 dB gain is available over the range 1.8 to 54 MHz, or 160 meters through 6 meters. Designed for use with both receivers and transceivers, the added r.f. selectivity introduced by the unit reduces receiver image response and spurious signal reception as well. (Photo courtesy Palomar Engineers)

In the future, we'll dig deeper to cover indoor antennas, antennas for the traveler, and other specialized receiving and transmitting antennas that are far removed from classic designs.

Until then, 73, Karl, W8FX

Bibliography

Listed below are selected sources that amplify and support the antenna and related subjects discussed in this month's column. They're in addition to the antenna and radio handbooks—also good sources for receiving as well as transmitting design information. (Previous *CQ* Antennas columns, though primarily written for amateur transmitting purposes, contain a wealth of s.w. and m.w. antenna information as well.)

1. Bauer, F.J., Jr., W6FPO. "Compact BCB DX Antennas," *Popular Electronics*, January 1965.
2. Blakeslee, Douglas, N1RM. "A Very Short Receiving Antenna," *Ham Radio Horizons*, June 1979.
3. DeMaw, Doug, W1FB. "Beat the Noise with a Scoop Loop," *QST*, July 1977.
4. Drumeller, Carl, W5JJ. "What About an Active Antenna?" *73 Magazine*, April 1979.
5. Genaille, Richard A., "V.L.F. Loop Antenna," *Electronics World*, January 1963.
6. Haskett, Thomas R., "Broadcast Band DX—Getting Started," *Popular Electronics*, November 1964.
7. Helms, Harry L., "Chasing Foreign DX on the Broadcast Band," *Popular Electronics*, June 1977.
8. Thurber, Karl T., Jr., W8FX. "Ham Shack Accessories: What You Really Need," *Ham Radio Horizons*, December 1979.
9. Thurber, Karl T., Jr., W8FX. "RF Test Equipment," *Modern Electronics*, August 1978.
10. Thurber, Karl T., Jr., W8FX. "Station Design," in three parts, *Ham Radio Horizons*, August, October, and November 1978.
11. Turner, Thomas M., K8VBL. "Four-Band SWL Antenna: Resonant Dipoles, for 60-, 41-, 19- and 13-meter Bands," *Popular Electronics*, November 1968.

If you're about to get "into" the serious aspects of listening—whether it be on longwave, mediumwave, shortwave or higher—there are a number of books and other publications you may want to add to your library. Some of these are:

1. Bennet, Hank, W2PNA. *The Complete Shortwave Listener's Handbook*, 282 pages, 1974, $6.95.
2. Ferrell, O.P. *Confidential Frequency List*. 104 pages, $6.95.
3. Jacobs, George, W3ASK, and Theodore J. Cohen, N4XX. *The Shortwave Propagation Handbook*, $7.50.
4. Orr, William I., W6SAI, and S.D. Cohen, W2LX. *Better Shortwave Reception*. 156 pages, 1976, $4.95.
5. Orr, William R., W6SAI. *Simple Low-Cost Wire Antennas*, 192 pages, 1972, $5.95.
6. Schultz, John, W3EEY. *Shortwave Listener's Handbook*. 146 pages, 1975, $5.00.
7. Turner, Rufus P. *The Antenna Construction Handbook for Ham, CB and SWL*. 237 pages, $6.45.
8. Woodruff, Charles. *Shortwave Listener's Guide*. 144 pages, $5.45.
9. *World DX Guide*. $8.75.
10. *World Radio-TV Handbook*. Published annually by Billboard Publications, about 584 pages, $14.95.

Many of the publications listed above can be obtained from the larger amateur equipment suppliers. Or, they may be obtained from specialized mail-order firms such as Gilfer Shortwave, Box 239, Park Ridge, N.J. 07656, or Ham Radio's Bookstore, Greenville, N.H. 03048. Some are available through *CQ's* own Book Shop. (Prices listed are approximate.)

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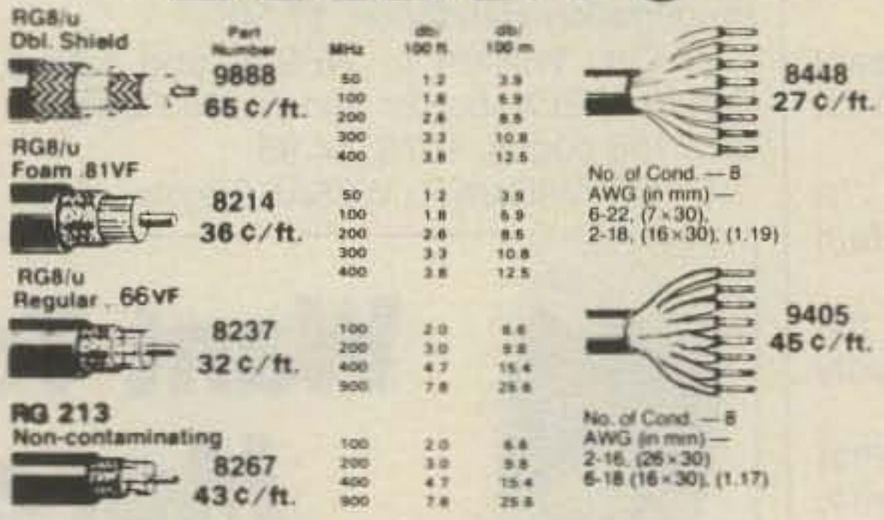

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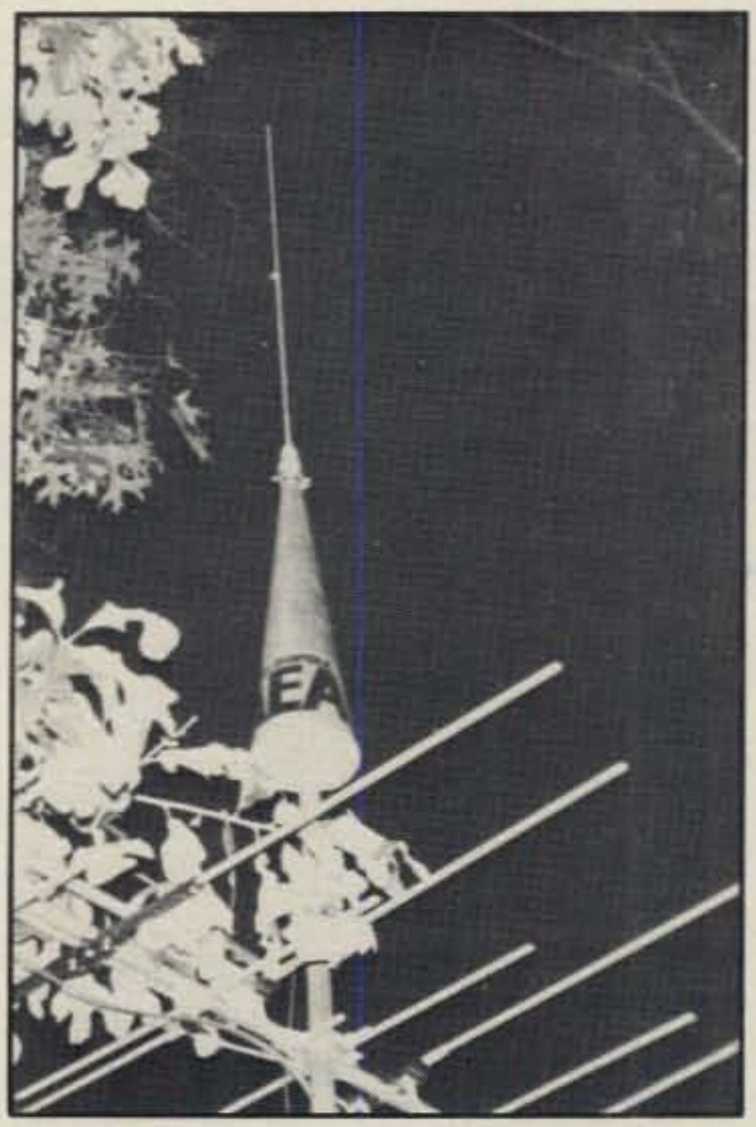
The AEA Isopole 144 Jr. antenna's low profile and adaptability for portable installations make it well worth considering if you're looking for a new 2-meter antenna.

The AEA Isopole 144 Jr. Antenna



The AEA Isopole antenna.

BY DAVE INGRAM*, W4TWJ

Every so often a unique item comes along which truly captures one's particular taste or needs at that time. A period of investigation and pondering may follow, with a resultant purchase soon being instigated. One such item in my own situation was the recent addition of AEA's Isopole 144 Jr. Antenna for 2-meter operations.

My older ⅝-wave antenna, with its weather-exposed connections, was producing an exorbitant s.w.r. during every springtime rain. The f.m. rig, in turn, kept protecting itself by reducing r.f. output to zero. An alternate situation to clear this dilemma was becoming necessary. Since my house already looked like a porcupine (tower/beam, verticals, longwires, OSCAR array, etc.), a relatively inconspicuous 2-meter antenna with reasonable gain was desirable. Enter the Isopole Jr.: weatherproof, attractive, and it could be placed atop my TV antenna mast (with coax routed down through that mast).

The antenna went together without a hitch and in a very few minutes time. The decoupling sleeve was slipped over the supporting mast and clamped into position, and then the coax connector was plugged into the top antenna section which also fitted over and clamped to the sleeve and mast top. Although all connections were fully protected from the weather, and it seemed unnecessary, I took time to mold a small amount of the new "Coax Seal" around that connection just for security (an item you'll despise and appreciate at the same time). Rains might wash away the neighborhood, but this antenna will continue working!

The Isopole took power beautifully right from the start. My f.m. rig produced full power output and both items have continued working like a champ since that time.

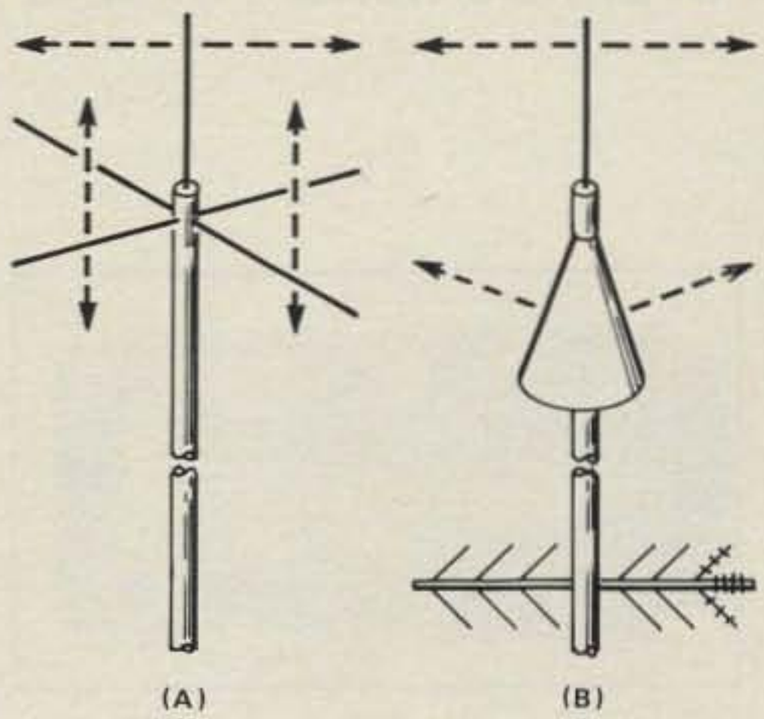


Fig. 1– Comparison of radiation fields emanating from antennas with (a) horizontal plane radials/decoupling, (b) vertical decoupler. Lack of r.f. energy below Isopole's cone allowed simultaneous use of TV antenna. Dotted lines indicate r.f. radiation.

Due to various physical locations, local terrain, etc., iron-clad gain figures for "smaller" 2-meter antennas such as the Isopole Jr. are difficult to accurately relate in a home installation. Indeed, height above ground and proximity to nearby objects may produce positive or negative effects that overshadow actual antenna performance.

Since omnidirectional radiators should necessarily concentrate all available r.f. energy at low angles (toward the horizon) rather than skyward (where it's lost rather than used), and since r.f. energy emanates at right angles from a radiator, the Isopole's vertically polarized conical sleeve has a decided advantage over horizontally positioned base networks found on other antennas. I observed that effect for myself, with the aid of a simple pickup loop and pilot lamp sensor as described in AEA's booklet "Facts About Proper VHF Vertical Antenna Design." The resultant "null" of r.f. energy below the Isopole eased my concern of mounting a regular TV antenna lower on that same mast (see fig. 1). In fact, both the TV and the 2-meter rig can now be used simultaneously without any problems whatsoever—a welcomed relief. While the antenna is mounted in exactly the same location as its ⅝-wave predecessor, it performs slightly better than the ⅝-wave antenna, particularly on "fringe area" repeaters. Apparently, this results from the Isopole's major lobe being situated at a very low angle and effectively utilizing all available r.f. energy.

All aspects considered, the AEA Isopole Jr. shapes up as an outstanding antenna for its class and price range. Its low profile and adaptivity for portable installations make it a real winner, particularly when one doesn't have available room for the two-cone Isopole Sr. Personally, I appreciate the antenna's weatherproof assembly—and an occasional laugh when watching birds trying to gain footing on that slippery aluminum cone. The antenna is manufactured by Advanced Electronic Applications, Inc., P.O. Box 2160, Lynwood, Washington 98036.

*Eastwood Village #1201 South, Route 11, Box 499, Birmingham, AL 35210.

No-61-62

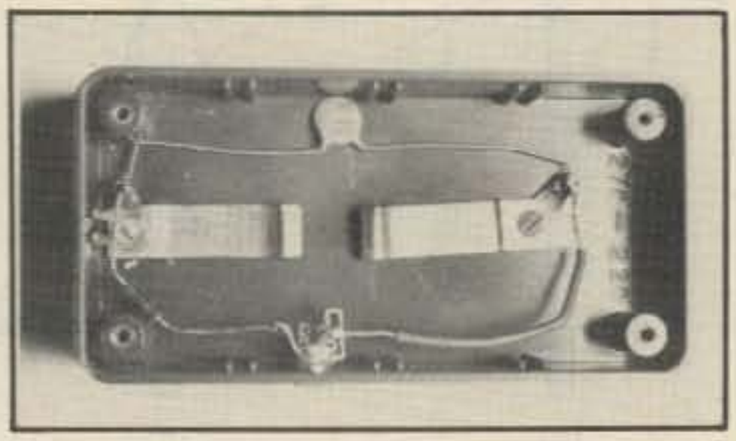
A little ingenuity and a few bucks go a long way to solve a problem. WA4NAG's solution just may help you out, too.

A Simple, Inexpensive Slow Charger For The Yaesu FT-207R

BY DAVID C. SWAIM*, WA4NAG

Ever since I first began operating two-meter f.m., I have wanted a hand-held transceiver—a "handi-talkie." When I went to hamfests, I always looked with envy at the other guys who were walking the flea markets with their talkies strapped to their belts. When I went on hikes or back-packing trips in the mountains, I would look out from the tops of the peaks and think, "If only I had a talkie, think of the repeaters I could hit from here!" Well, I finally mustered the cash and purchased a Yaesu FT-207R. At last I would not longer be shackled to the car battery or a.c. power while operating. I could hike to the tops of the local hills and talk to my heart's content. I could operate while jogging or bicycling, or riding the elevator up to my office. Not only did I have more mobility, but for the first time I had my choice of 800 two-meter channels! Naturally, I was anxious to try out my new rig. I chose a family outing to Stone Mountain Park east of Atlanta for the big test. I monitored the local repeater from the car on the trip to the park, visualizing myself on top of the mountain with my talkie working all the local repeaters. When we arrived at the park, I shut the rig off and rode the tram to the top of the mountain. I positioned myself at a comfortable spot and, with trembling hands, turned on the Yaesu and called my first CQ. Nothing happened. The repeater didn't even come on. I grabbed the squelch and turned it off. No receiver noise. My batteries were dead!

In the weeks following this incident I discovered some interesting facts concerning the operation of this rig using the battery power. First, it takes about fifteen hours for the wall charger supplied with the rig to recharge a completely dead battery. Second, recharging is done with the battery inside the rig. This means I cannot use the rig while the battery is being charged. Also, under my normal operating schedule the battery runs down about every two days. I decided one thing that would help my situation would be a second battery. I could just pop in the spare battery when the one in the rig ran down. Since the battery in the rig normally lasted for two days of operation, there was plenty of time for the spare battery to recharge using the slow charger. With this in mind I bought a second battery. Then came the dilemma. Since all I had was the wall charger that came with the rig, I could only charge the battery while it was inside the transceiver. Clearly a means of charging the battery outside the rig was needed. Since my pocketbook was depleted from the purchase of the hand-held rig and my dentist had just informed me that I needed to have two teeth capped, purchase of an additional charger was out of the question. I would have to build one. As I was hauling a box of old magazines out of the closet to begin my search for a charger project, I happened to glance at my talkie which was lying on its back with the charger plugged into its charging jack. Then it hit me. If I duplicated the charging circuit inside the rig I could use the wall charger to charge the other battery. This is just what I did. Although the resulting charger is still slow, it works and it is possibly the cheapest charger I could have constructed.



An interior view of the author's slow charger for the FT-207R. The top of the box has been removed to show how the wiring has been spread out so that it will not interfere with insertion of the battery. The battery makes contact with the dimples on the ends of the recycled battery clips.

The "wall charger" that comes with the Yaesu rig is really just a transformer with a 117 volt primary and a 13 volt secondary. Rectification is accomplished by the circuit in fig. 1. This circuit is contained inside the FT-207R. As you can see, there is practically nothing to the circuit.

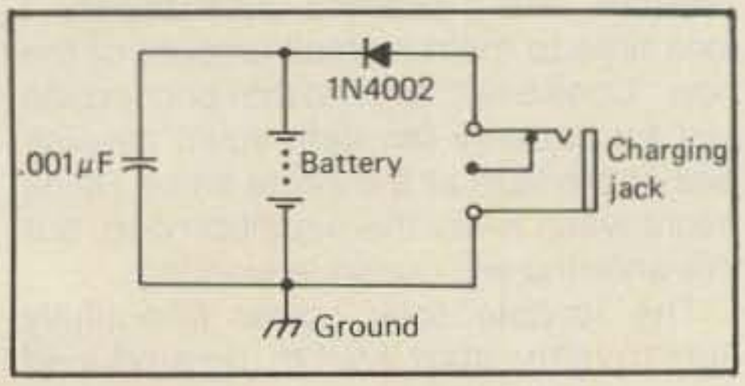
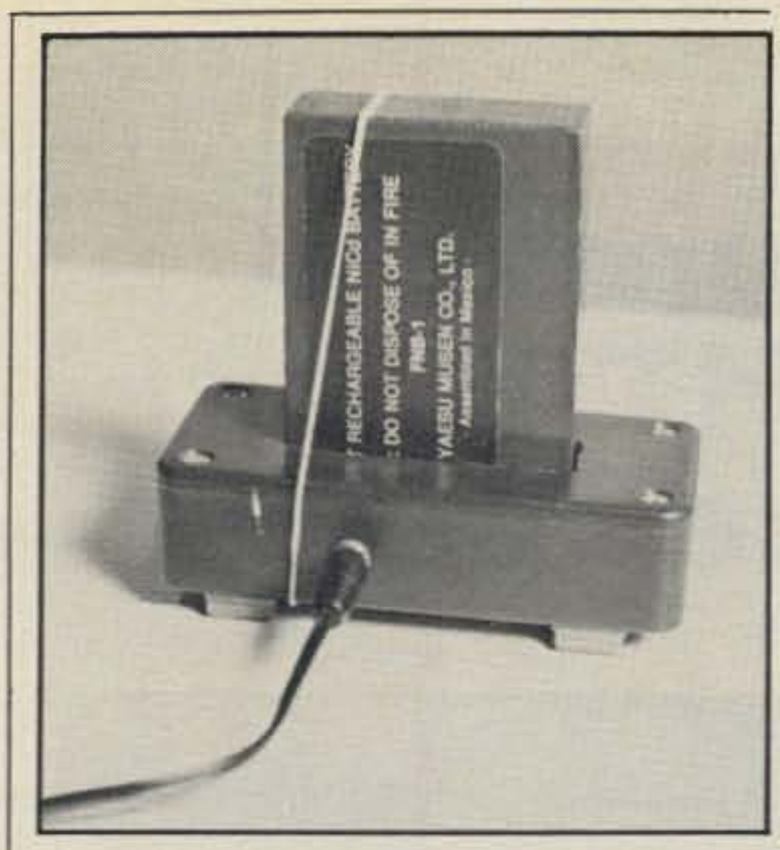


Fig. 1– The FT-207R charging circuit. This simple circuit is contained inside the rig. The wall charger delivers 13 v.a.c. at the charging jack.

*P.O. Box 720126, Atlanta, GA 30358



The subminiature plug on the "wall charger" is plugged into the jack on the box. The battery is placed through the slot cut in the top of the box. The rubber band is used to ensure that the battery is making contact with the charger.

My junk box is extremely meager, but it did contain the diode and capacitor required for this circuit. The only other items needed to complete the project were a suitable enclosure, a subminiature phone jack, and some sort of pins to make contact with the battery terminals. The box I used for the enclosure was a 1 × 2 × 4 inch plastic box from Radio Shack. This was the only item I had to purchase for this project. Make sure the wiring will not interfere with inserting the battery (see interior view). I cut a hole in the box just large enough for the end of the battery to fit through and positioned the battery contacts so contact was made when the battery was inserted in the hole. I used the battery clips from an old code practice buzzer to make the battery contacts. The only critical part of the construction was adjusting the battery clips so both of them made contact with the battery terminals. Since the terminals on the battery are off center and recessed, the weight of the battery tends to cause it to lift up off the positive terminal. To make doubly sure that the battery makes contact I use a rubber band to hold the battery in place. The charger in operation complete with the rubber band is shown in the photograph. The little rubber feet add a little class to the appearance of the charger and also keep the box from sliding around.

This project can be completed in one night, and for the investment in both time and money it is the most useful accessory I have. I have seen no need to purchase or build another battery charger, and I don't charge the batteries in the rig anymore. I am sure that there are other hand-held units that come with similar chargers that could be adapted in the same manner as this one. The idea is definitely worth pursuing if you need a charger and your budget is a little tight.

CQ Reviews:

The Stewart Quad "Battery-Beater" HT D.C. Power Source

BY MARC STERN*, N1BLH

There's probably a fear hidden in the heart of every radio operator who has ever used a hand-held 2-meter rig. That fear is of the dreaded "battery gone away."

It usually hits without warning right in the middle of a QSO somewhere on a drive home. You've been using your rig heavily during the day, and you are suddenly confronted with the possibility your batteries will go flat. You can tough it out and chance running your rig flat in mid-sentence, or you can go into a listening mode to preserve the batteries, only answering when you are called directly.

Well, there's a cure available for this syndrome. The prescription is simple: Take one Battery Beater, made by Stewart Quads, a soldering iron, and a drill, install a battery bypass jack, and you've cured the problem.

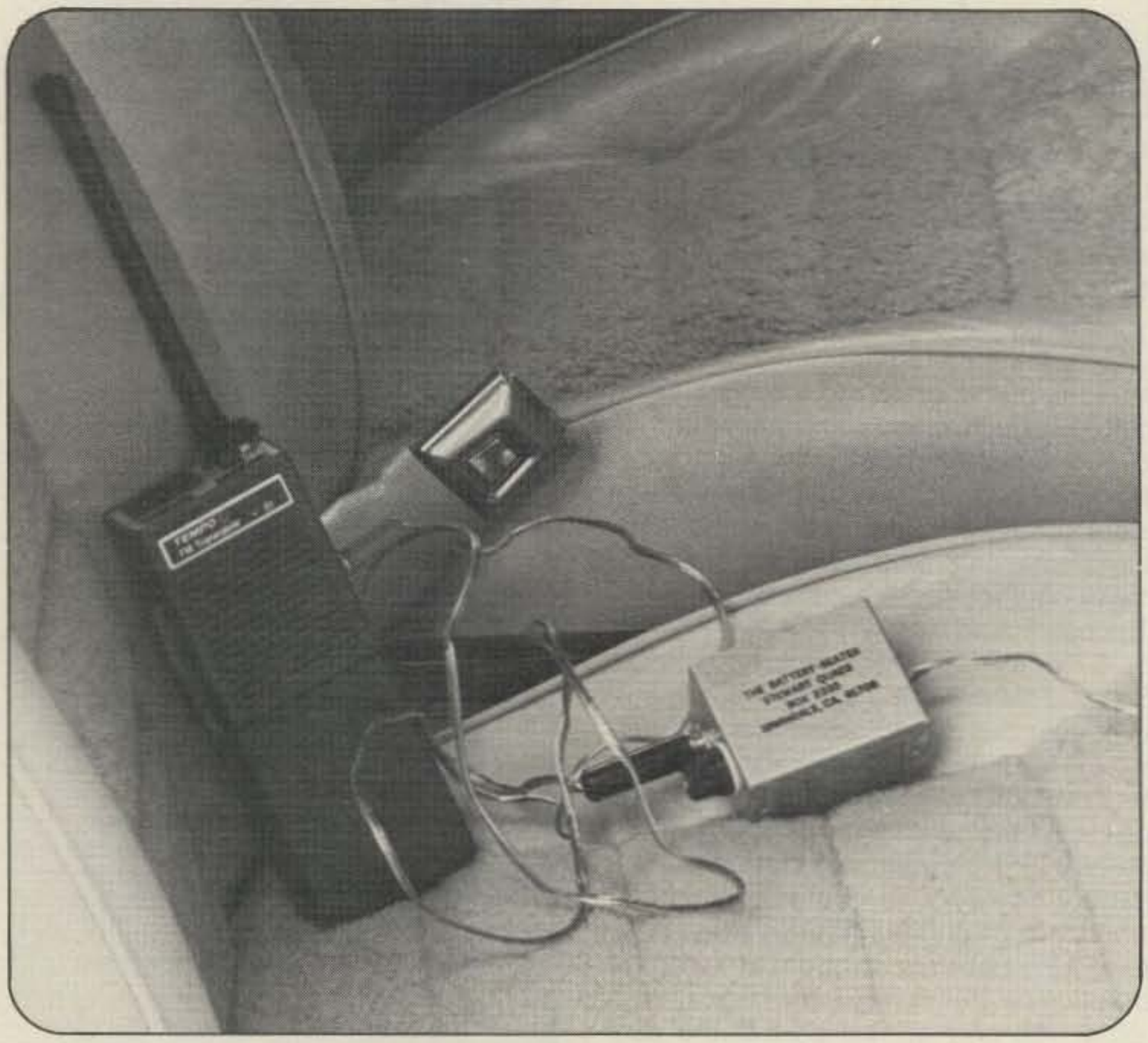
The Battery Beater is a surprisingly simple item which will work on any 13 to 30 volt d.c. current source. It comes in a very plain-looking gray box. The innards are simple, too, consisting of a voltage regulator and two electrolytic capacitors.

About the most complicated thing an operator has to do to install the Battery Beater is hooking up the battery bypass jack. In reality, it is nothing more than a three-connector mini-earphone jack.

When opening the Battery Beater, the first thing you notice is the packing. Glenn Stewart, KH6HIF, protects his devices with more than enough packing material. The device inside the packing material is unlike most battery helpers on the market. Instead of feeding a continuous charge to your handie-talkie's nicad pack, this unit bypasses the batteries altogether and acts as the "battery," feeding current directly to the rig.

The heart of this bypass is the jack. Connected in series with the power leads from the battery pack, it cuts the voltage from the nicads. The current flow is then provided by the Battery Beater.

This device is connected to any 13 to 30 v.d.c. power source, such as the cigarette lighter in a car. The circuit then drops the voltage down to a level that will be usable by your HT—9.6 volts.



The Battery-Beater in use in the author's car powering a Tempo S-1.

In turn, the voltage is fed directly to the handie-talkie, bypassing the batteries. If the batteries are fully charged, they can maintain that charge while you continue using the Battery Beater. On the other side of the coin, this device can also keep you on the air if your batteries are totally depleted.

One minor criticism of this device is its lack of cross-polarization protection. A zener diode on the input side of the device would take care of this problem. To be truthful, I was the over-zealous victim of such a boo-boo. However, true to his word, Glenn replaced the voltage regulator I had fried for free. For the *careful* operator, this should present no problem. All you have to do is make sure that the copper-colored wire goes to the positive terminal and the silver-colored wiring goes to ground.

All of this aside, the Battery Beater, available for most hand-held 2-meter transceivers, is fairly easy to install. The rig I'll be describing here is a Tempo S-1, since that's my hand-held. In the S-1 the first step is removing the rear cover. Once this is exposed, the next step is removing the hot lead from the nicad pack, leaving the ground lead connected. The next step is installing one of the two prewired hot leads from the bypass jack back to the battery pack. There is another prewired hot lead from the jack, and that is connected to the B+ input to the rig. The ground wire from the battery pack is then removed and the short ground wire from the bypass jack is run through the ferrite bead inside the rig. These are then reconnected. That is all there is to the basic installation.

The next step is locating the spot to drill a hole in the walkie's case for the plug itself. Since the S-1 is so crowded with circuitry, it is a must to follow KH6HIF's directions closely. He recommends using a slow-speed drill to drill the hole in the plastic case. The reason, by the way, that

*555 Worcester Road, Framingham, MA 01701

the instructions have to be carefully followed is that the spot where the jack will be installed is about the only clear area inside the rig that is big enough to accept the extra input jack. Even then you have to gently bend a crystal to make sure it fits correctly.

Once all of this is done, and the neck of the input jack is installed, with the locking ring, the next move is closing the rig up, which is an art in itself. Since the new input jack sits just below the line of the case, you have to close the case much as you would open or close a book. It isn't hard to do, but it does take some perseverance to get it just right.

All that's left to do is replace the four screws and give the rig a shakedown. This consists of plugging in the mini-plug which comes with the device and turning on the power with the squelch open. If everything is done correctly, what you'll hear is nothing, and that's as it should be.

Once all of this has been taken care of—it should take about two hours, give or take a minute—the final step in the whole process is simply installing the cigarette lighter plug, unless you want to rig it differently. Whether you do or not is really up to you.

The operation of the Battery Beater is simplicity in itself. Just placing the cigarette lighter plug in the receptacle on the dash provides all the energy you'll need to power this rig.

With the capacitors and the voltage regulator handling all the chores, you should find you have a voltage of about 9.6 and a current flow of about 250 ma. This is more than enough to drive an S-1.

How does it work? The answer is excellently. In more than two months of continuous use, the Battery Beater never failed. It helped provide me with power even when the rig's batteries were nearly depleted. Voltage regulation was excellent, but there was one minor problem—my rig picked up a little alternator whine. However, this is probably a function of the fact that I was using the lighter plug.

The Battery Beater is available for just about every handi-talkie made. It will even provide enough current for memory protection in some rigs. KH6HIF assures us that overvoltage protection is available, so you don't have to worry about harming your rig.

One other added benefit of the Battery Beater is that because of the input jack, there is a ready way to supply an external power supply for times when you're away from your car. Just put eight 1.2 volt nicads in series, charge them up, and you're off. This is an added convenience in a rig such as the S-1, which really doesn't feature interchangeable battery packs.

The Battery Beater, a true power source and not just a mobile charger, is available from Stewart Quads, P.O. Box 2335, Irwindale, CA 91706. And for an investment of $30, it is more than worth it.

a monthly feature by
IRWIN MATH, WA2NDM

Math's Notes

A LOOK AT THE TECHNICAL SIDE OF THINGS

In recent months we have received a great deal of mail regarding microwave TV as well as direct satellite reception by home-built equipment. Due to the possibility of potential "theft of services" accusations, however, we have been very reluctant to publish information pertaining to circuitry or frequency allocations. Nevertheless, a good deal of equipment, converters, receivers, and antennas are being offered for sale to experimenters, and we thought it would be a good idea to at least look at some of what is being offered.

The current interest is actually in two different services—the MDS, or Microwave Multipoint Distribution Service, and the direct reception of commercial satellite signals. We will look at each in turn over the next couple of months.

The MDS is usually employed in metropolitan areas to distribute first-run movies, sporting events, and the like, to hotels, private homes, and apartment-house complexes. This service operates between 2000 MHz and 2500 MHz. Included within this spectrum is also the 2300 MHz amateur band and the ITFS, or Instructional Television Fixed Service, which transmits educational information and programs to schools.

The MDS and ITFS usually employ high-power microwave transmitters at a central, high location, and omnidirectional antenna arrays so that large areas can be covered. Signals in the 2000 MHz region are normal composite video signals, identical in all respects to commercial u.h.f. and v.h.f. TV, but, of course, at a different carrier frequency.

People who live within the range of those transmitters can, theoretically, receive these signals with simple "down converters" such as that shown in fig. 1.

5 Melville Lane, Great Neck, N.Y. 11023

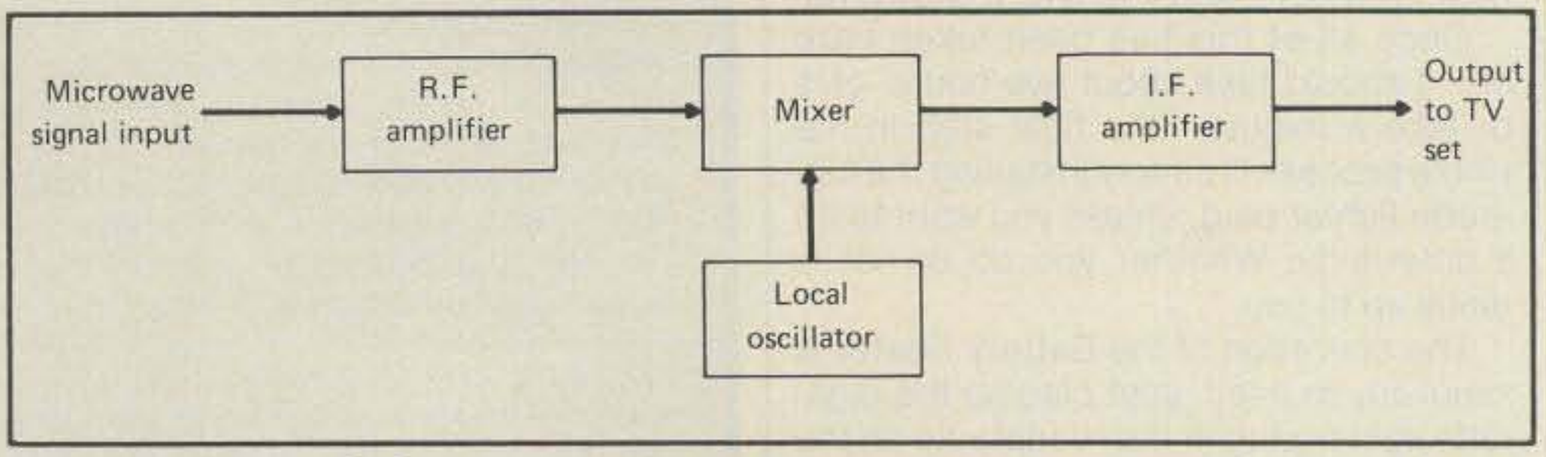


Fig. 1– Block diagram of a typical down converter.

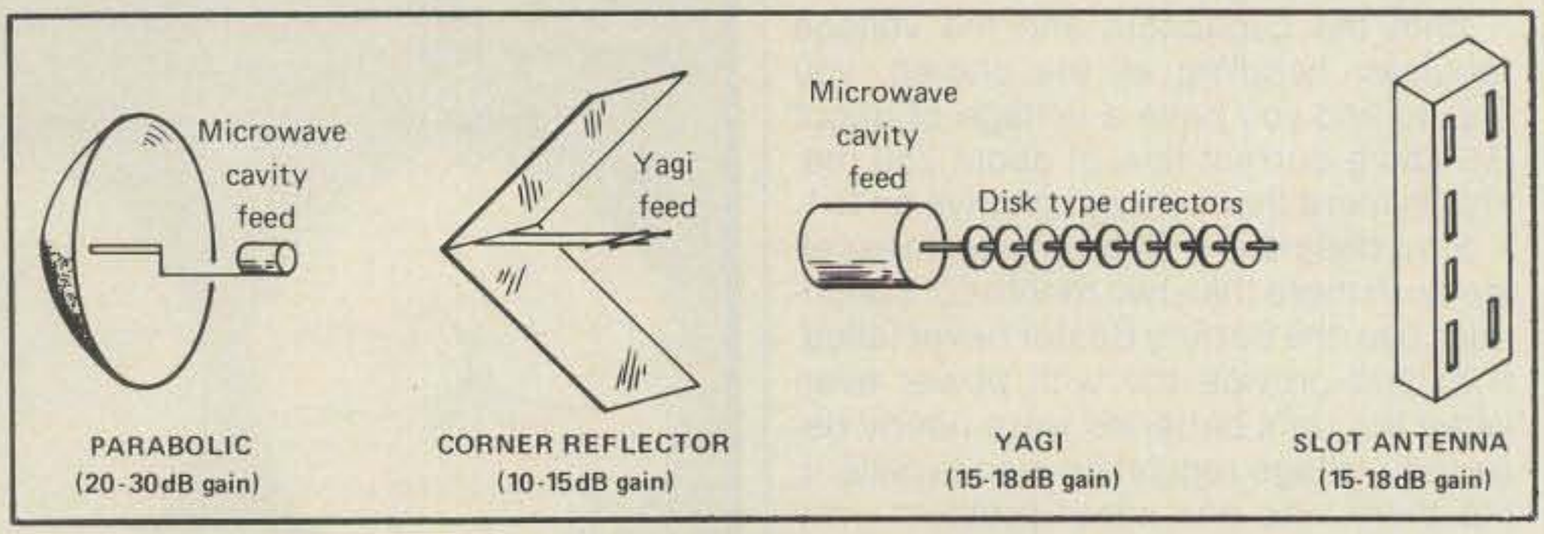


Fig. 2– Typical microwave antennas.

Such converters are identical in operation to the ones used on the amateur v.h.f. bands. The problem, however, is that 2000 MHz is a line-of-sight band. Anything in the way of the transmitter, such as trees, buildings, hills, etc., will effectively block the signal. In addition, rain, fog, or other atmospheric disturbances will also cause weak signals with the result that high-gain antennas (10 dB or more) are a must. This is fortunately not too great a problem, since microwave antennas are not too difficult to construct. Fig. 2 shows some types that are currently in use, and next month we will look at ways in which some of these can be built.

The converter presents another problem. At 2000 MHz most conventional electronic components will not work properly due to excessive impedance. As a result, special leadless (chip) capacitors, resistors, and tiny "pill-type" transistors are employed. Printed circuit "strip-line" inductors are used for tuning, and teflon or other special laminates are required for circuit boards. The common G-10 material is simply not usable, nor are most connectors such as u.h.f., BNC, type F, and phone jacks. Only the type N or SMA types with short lengths of large diameter coax will work without excessive losses.

If all of the previous tends to make you wonder, it is not quite so bad. There are a number of manufacturers who currently sell printed circuit board converter kits, and some even sell complete units. Assembly of such kits should only be attempted by someone reasonably skilled, but final alignment for best noise figure or gain requires specialized equipment. You can, of course, "tune-up" a unit with an on-the-air signal, but you will probably not get optimum results.

If your signal path is from 0 to 6 or 7

miles and in direct line-of-sight with the transmitter (absolutely nothing in the way), you will probably not have any problems with a simple antenna of 10 to 12 dB gain and a converter with a reasonable 6 to 10 dB noise figure.

If you live within 5 to 10 miles of the transmitter, with some moderate obstruction such as trees or occasional buildings, a 15 to 20 dB antenna gain coupled with a 5 to 6 dB noise figure converter is a must. At further distances, or with more obstructions, you have problems. Antenna gains of 25 dB or more which require 5- to 10-foot diameter parabolic antennas, and converters approaching the state-of-the art with noise figures of 2 to 3 dB are necessary, and you still may not have "full quieting" signals. At best, the 2000 to 2500 MHz band is one where you will gain a good deal of experience in microwave techniques, and if you are fortunate, even some interesting programs. If you do "listen-in" to MDS or ITFS, you might consider the potential legal situation.

Next month we will look at the type of equipment that can be fabricated by the experimenter with a general examination of circuitry to at least enable you to understand the current techniques in use.

73, Irwin, WA2NDM

This month by
ROD LINKOUS, W7OM

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

One DX contest season is just closing. Preparation for this year's CQ World Wide DX Contests has many working on antennas. Others are upgrading the shack. Yet, there are a few who are going at the coming season like General Motors attacking the automobile marketplace. Energy and monies fly in the pursuit of excellence. One of the most interesting aspects comes up again.

The Hired Gun

Seems like this might be a more appropriate item for the contesters column. However, my mail is split, and there are two sides to this little-known facet of DXing. Using visiting operator(s) for a contest—The Hired Gun—isn't anything new.

What is behind the scenes on this one? The real question is, who really gets the credit for a fine job during the contest. Unfortunately, the station licensee—the call used. The call is recognized by the multitudes long after the contest is over. With recognition comes fame. If the station is in a much needed country, the DXers benefit, for it is an easy one to put in the log.

For the DXer chasing a new country, most do not care who is at the controls, just as long as they make the log and get a card. Anyone chasing DX for more than one season will tell you that there are two things they like in a DX contest when a DX station comes on for that 48-hour period. One is that the operator is skilled, and two he QSLs.

Skill in DX contesting is gained through experience, yet many seem born to handle a pileup. If China comes on, most of us pray—Chip, Danny, Erik, Herb, Jim, Marty, Nob, Ron, or another of their class is at the controls. Those 3 to 5 a minute rates are a Godsend. It's like money in the bank. They'll work the pile down, and we will all get in the log eventually. And we don't care what call is used, just as long as the DXCC desk accepts the cards.

So why all the fuss about using expert operators at the controls of the fabulous, well-honed, contest-quality stations? The question is whether the operation is truly single operator. If it is the only station on in a given country, the point is moot. It is in almost *all* cases a one-man show. In most cases the station owner (licensee), whose call is being used, provides the station *only!* But, what about fetching logs, fixing a piece of failed gear while the operator goes on the backup gear, serving meals, and some forms of duping, logging, spotting, etc.? And in some cases, paying for the plane fare and expenses for the import of the best? The mysterious doubt remains.

A call recognized around the world—CP6EL. Alfredo "Al" Pauker has given Bolivian contacts to many via the DX contest route. An extremely capable DXer who handles his own QSLing via computer is easy to work for those with patience.

To most, who cares? If you get a new one, a new zone, a new band country or zone, it seems like a point not worth thinking about. But if you are competing against the hired gun at a top notch station, it is a case in point.

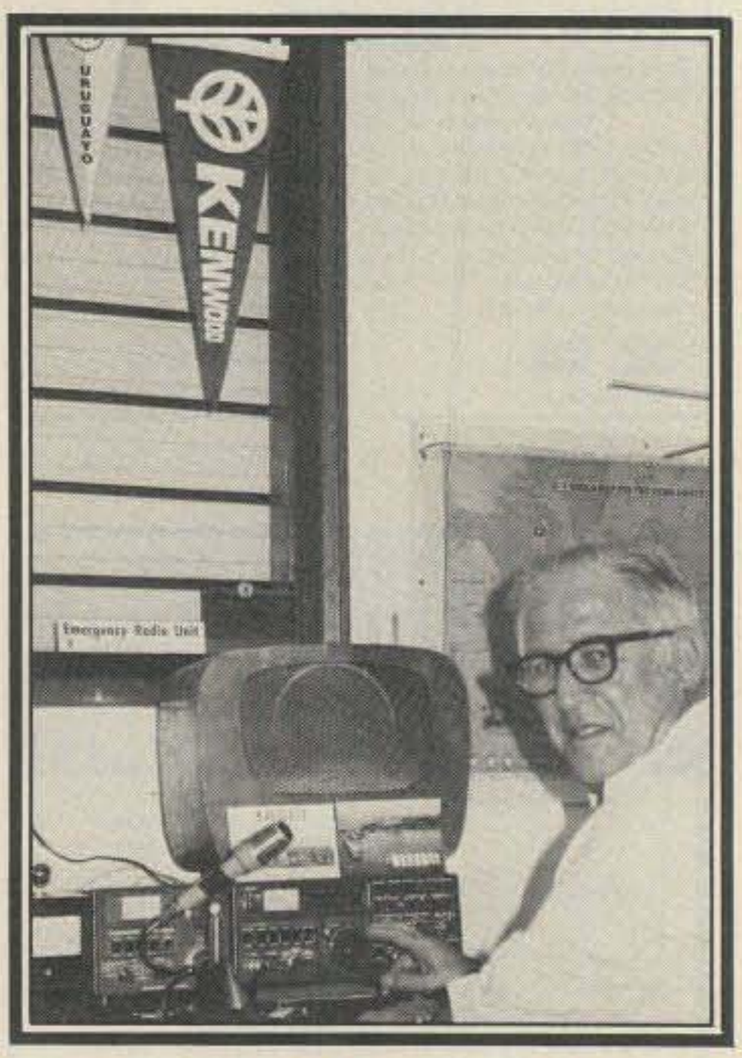
What is in it for the station owner? Many DX calls both in the U.S. and abroad are known by the call, not the operator. *Sad but true!* The operator was a quick series of dots and dashes or a rapid-fire voice. The call and station belong to an amateur who gets his enjoyment from building the finest station possible. These amateurs get on periodically to chat with friends, but they leave the pileups to the pros. Without much effort, most can think of a few such calls.

So what is a possible course of action such that we all reap the benefits of the great stations using a hired gun? *The* solution—I'm not sure. *A* solution might be to class only those stations operated by the licensee as single operator. All guest operators using other than their own call must operate and enter as a multi-single transmitter class.

From a DXer's point of view, the one key to getting a new country remains. The call isn't important. The thing that is deleted is the incentive to build a top-quality contest or DX station, for the recognition goes with the call. But then the trophies go to the true winners—the operators.

Some might ask, "Can a true single operator compete in a multi-operator class?" Many have. Many have won. Some single operators have beaten superior stations with a crew of operators. A true accomplishment.

There are two reasons why I have included this item this month. One is to acquaint the DX newcomers with a little-known facet of our hobby. The other is to air a lot of mail. My desire is to protect the DX contest as a media for many to work a new one. Last time I wrote about DX contesting in a provocative way, the only mail I got was disputing who was the best. That still remains too close to call. Whichever hired gun is the best, I hope and trust



Herb, W6KBD/CX at the rig of Jim, KA6ISE/CX in Montevideo this year. Herb is Jim's QSL manager when in California. Jim is very active on 15 and 10. (Photo via KA6ISE/CX)

**5632 47th Avenue S.W., Seattle, WA 98136*

he'll always have a station to operate and in the rarest of spots. Better yet, may he be a guest operator in China, Albania, South Yemen, Malpelo, Crozet. . . .

Taking the hired gun out of the single operator class will maintain the incentive for other operators in rare countries to compete during a contest. But today many won't even try to compete when they know they can't. Above all, it removes that doubt. Most of the really great operators I know who have operated under another's call take great pride in their professionalism and operate *unassisted* as truly single operators. *(If you have an opinion on this topic, write Frank Anzalone, W1WY. See the Contest Calendar column for his address—Ed.)*

The WAZ Program

10 Meter Phone

135	VE2FGO	137	W9IGK
136	VK3NXX	138	KA5ASD

15 Meter Phone

95	K4KJZ

20 Meter Phone

365	VE2OG

40 Meter Phone

8	ZL4BO	9	ZL1BOQ

80 Meter Phone

11	ZL1BIL

10 Meter C.W.

24	N5US	25	EA2IA

15 Meter C.W.

49	JE3EPK	51	JA8TRT
50	EA2IA		

20 Meter C.W.

145	SP2FBC	147	K2PK
146	AA4AK	148	K4NV

40 Meter C.W.

24	EA2IA	25	K5UR

All Band WAZ

S.S.B.

2220	DK4CR	2231	WA1WNN
2221	DK2OY	2232	WD8PUG
2222	DF7XY	2233	VK6NAT
2223	W9CZI	2234	DJ8EM
2224	PA3ABW	2235	N7BES
2225	VK5RD	2236	NC4U
2226	AK4E	2237	N6PV
2227	K8TUY	2238	WD6ADH
2228	G3SVH	2239	VE6SL
2229	W8KBZ	2240	N7ASL
2230	K8CDM		

C.W. and Phone

5137	W2IQZ/7	5145	K2PK
5138	IØMMI	5146	4Z4DX
5139	DK8KC	5147	EA7AAW
5140	KC4CT	5148	WB4PAB
5141	KC7E	5149	K4ZIN
5142	N6HK	5150	N3ARK
5143	K4IR	5151	WB3JVU
5144	JE3EPK	5152	DL8IH

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 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.

If you have worked any of the 3B countries in the Indian Ocean, especially on c.w., you have probably worked this DXer—Jack Mandary, 3B8CF of Mauritius. Jacky shown here from the operating position of 3B9CF on Rodrigues. QSL to his 3B8CF address.

DX Awards Checkpoint

Welcome aboard to Don Murray, W4WJ, as our new checkpoint in the Miami, Florida area. The checkpoints can facilitate your application for *CQ* awards by checking your QSL cards locally. This saves you time and money, while speeding up the submittal through the award-program managers.

Easter Island—Well Done

Like some steaks, Easter Island, CEØA, used to be very rare. Only Father Dave, CEØAE, kept it out of the top 50 needed countries in the world, but it was still rare.

Last February and March, Jim Wise, W4PRO and Terry Appleton, W4GSM burned the bands. Now, after their efforts as /CEØA, Easter Island is definitely no longer rare; it's more like well done or burned out. Jim wrote about the trip, so his note follows:

"Cesar, CEØCOJ is the Port Captain and is in the Chilean Coast Guard. As with other Chileans who operate on Easter, he has a CE3 call which is used with a Ø in place of the 3 while he is on Easter. Cesar is a very charming person, and he and his XYL, Lapita, are excellent hosts. Cesar was acting Governor of the Island while we were there.

"Marcos has a call of his own but operates the Air Force station using their call, CEØAC. There is at least one more operator at CEØAC.

"Chad Harris, WA1SQB/CEØ was there with a group from the University of Wyoming working for "Earthwatch." They are doing anthropological research to determine the origin of the people on Easter. Chad helped us during the contest and used our rig to run pileups into the U.S.A. at other times.

"Also active while we were there was Elliot, G3MUV/CEØ, who was there while working for a company that installs aircraft navigational equipment at the airport. His present home is in Florida.

"A radio club on Easter Island is in the works, with Cesar as President. It already exists on paper, and the Radio Club of Chile will be playing a big role in supplying the equipment.

"As for our operation, Terry, W4GSM and I have been planning CEØA for a long time. We were surprised to learn that the NØNO group was going there, too. Dave arranged the same home for them to stay in as we used.

"We took a 60-foot tower along, and after the operation was over, we put it up at Father Dave's with a TH3 on it. The NØNO group left the beam. We had a quad on it, but we thought the tribander would be easier to keep up. We also worked on Dave's linear and hope it is now okay. Dave really was enjoying having a good signal again. He was QRT for quite a while during the last six months.

"We totalled about 11,000 contacts with the bulk being on 10 meters. The 160-meter band was very poor, and we made only about 20 contacts there. We enjoyed the sights on Easter Island with Dave and Cesar. They were both a lot of help to our DXpedition."

(A job well done!—Ed.)

International Postal Procedures

The following tidbits appeared in the "Station Update," written by Jack L. Jenkins, NI4B, which is the printed voice of the Pentagon Amateur Radio Club.

International rules for mailing were revised recently. **Addressing**—Reserve at least the entire right half of the address side for the address of the addressee, the stamps, and the service labels and notations. Address legibly and completely, using Roman letters and Arabic numerals placed lengthwise on one side of the article only. Give house number and street or box number when mail is for towns or cities. Show names of post office and country of destination in *capital letters*, and include postal code if known. Foreign postal codes are to *precede* the name of the country of destination. The country name should *not* be abbreviated and must be the last item in the address. An address in a foreign language is permissible provided the names of post office, province, and country are in English, or (if English form is not known) are in Roman characters. The sender's name and address should be shown in the upper left corner of the address side.

Dimensions—Letters: A surcharge of 9 cents per item will be added to the applicable postage and fees on all air and surface letters weighing one ounce or less that **(1)** do not have a spec ratio (length divided by height) between 1 to 1.3 and 1 to 2.5, inclusive, *or* **(2)** exceed any of the following size limits: (a) maximum height—6.125 inches; (b) maximum length—11.5 inches; and (c) maximum thickness—0.25 inch. Post cards: maximum size, 6 by 4.25 inches; minimum size, 5.5 by 3.5 inches.

The WPX Program

Mixed

929	W4XC	932	NF4F
930	VE2FOU	933	JJ1SOE
931	DA2DC		

S.S.B.

1403	JA9DDM	1407	SM2AHP
1404	DL4YAH	1408	WA4LWL
1405	Y78XL	1409	J6LOU
1406	JR6LDE	1410	HC2RG

C. W.

2082	EA5QR	2085	WD8IFX
2083	WD9IIC	2086	VE2FOU
2084	DJØLC	2087	SM6HCJ

WPNX

199	KA6LCI

Endorsements

Mixed:	400 W4XC, VE2FOU, NF4F, JJ1SOE. 450 KQ4M. 500 K9TI, K7CU. 650 VE3DUS. 700 AA4NC. 750 I5AFC, WB8ZRL. 800 N3RL, DA2DC. 850 I2DMK, I2MQP. 950 ONL-4003. 1050 JA1BN. 1100 YU3EY. 1700 W4BQY. 1800 K2VV.
S.S.B:	300 JA9DDM, DL4YAH, WA4LWL, J6LOU. 350 JR6LDE, K7CU. 400 Y78XL. 450 SM2AHP. 500 I2SYG, HC2RG. 550 WØIUB. 600 AC6V. 650 AC2J, WB8ZRL, DK3EG. 700 N3RL. 750 I5AFC, I6CCI. 850 I2MQP, I1HAG. 1000 WD8MGQ. 1050 W2CC. 1400 I4ZSQ. 1500 K2VV.
C.W.:	300 VE2FOU. 350 DJØBC, WD4RAF, SM6HCJ. 400 K9TI, WA4YCI. 450 WD9IIC. 500 N3RL, WD8IFX. 550 EA5QR. 600 SP6FER. 650 F8PM. 700 I2DMK, DJØLC, I3MLD. 800 SM6AYM. 1150 W1WLW. 1300 K2VV, W4BQY, N2AC.

10 meters:	WD9IIC, DA2DC, WØIUB.
15 meters:	DA2DC, WØIUB.
20 meters:	JA2KVD, WD9IIC, DA2DC, WØIUB.
40 meters:	W2CC, DA2DC, W1WLW, WØIUB.
80 meters:	DA2DC.
Asia:	WB8ZRL, WØIUB.
Europe:	K9TI, JA2KVD, AF7M, N8BJQ, WØIUB, WD8IFX, WD4RAF, SM6HCJ, K7CU.
No. America:	KQ4M, K9TI, WØIUB.
Oceania:	WB8ZRL, WØIUB.
So. America:	K2VV, WØIUB.

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, 5014 Mindora Dr., Torrance, Calif. 90505 U.S.A.

Sealing—Registered letters *must* be sealed; ordinary letters *may* be sealed.

Endorsements—The words "Letter (Lettre)" should be added on the address side of letters or letter packages. Airmail articles should be plainly endorsed "PAR AVION" or have a "PAR AVION" label affixed.

Where and When

The comments in the June DX column relative to the USSR and Australian operations on 75/80 meters might have confused you. The typical band report shown in Fig. 1 was edited. Thus, about half the stations, including all the U.S. and VKs, were not listed. Quoting from John, ON4UN, the frequencies allowed to some countries on 75/80 restrict them from the normal band windows. John explains the situation quite well in his excellent thesis "80 Meter DXing" available from Communication Technology, Greenville, NH 03048. Chapter 4 does a good job of answering the generic question, where and when on 75/80.

QSL Strays

Thanks to Bob Nielsen, K9RN, we received info on FQ8HA (59), VP2VEH (78), and 5A2TY (58). Bob took them right off

the QSL cards. One reply to G4CZJ/VP2VEH netted a return that stated he had moved from the 1981 CB address. Barrie, G4CZJ, where are you now? Thanks Bob!!

From the Pileup

When I got back from three weeks in W4 land, the stack was bigger than usual. The hot news on the Burma XZ operations was in all kinds of forms. The sources are given in parentheses. *Congratulations* to Kamchai "Kam" Chotikul, HS1WR on his recent promotion to Brigadier General. **(QRM)** Herick, FR0FLO has a new 2-element 40-meter beam. He plans to concentrate on 40-meter s.s.b. for awhile. **(QRZ DX)** VK9NS on Norfolk likes to operate on 7.062 MHz around 0730Z and he now has split frequency capability. Also look for him on 7.005 around 1230Z. **(The DXer)** I am now back in Australia and miss the good old days on Norfolk as VK9NW aka VK9NNW. **(VK2AZV)**

Keith, VP1GK and Martha, VP1MK are now back in the U.S. after being in Belize with an archeological expedition. Dale, WA4JTE would be happy to handle any outstanding QSL request. **(QRZ DX)** See the June *QST* for an article on DX QSL card forgeries. Watergate W6 style. **(QRM)** Burma finally came on after many years of silence. XZ5A and XZ9A appear to be legit. Per JA8BMK, the licenses exist and the legal operation is underway. They have been teaching Burmese to operate, so it looks like they will be around for some time to come. **(KI7I)**

Bob Reed, 9K2FF, who works for an American electronics contractor, will be working on a contract for the Chilean government during September and will activate CE0X, San Felix. **(QRZ DX)** Definition of an Analytic DXer: Works DX only after calling Don Search of the DXCC desk to

The two calls on the wall tell the story. Fred Maior, PY7ZZ and Andre Sampaio, PY7CW operated from Fernando de Noronha Island to the delight of thousands. They made over 7,000 contacts in their brief stay.

be sure the papers are in. Also runs reams of data through his computer in an effort to determine when the optimum time is to call. Typically misses out and makes his call after the DX station goes QRT or leaves the island. **(AC6V)** Jim Smith is still heading for VK0JS on Heard this fall—U.S.A. fall, that is, as that makes it a summer landing. **(VK9NS)** The power of QRP is the ability to work DX low power. To make the contact takes all the DX skill plus some good antennas. The G-QRP Club has over 1,000 members and publishes a great little magazine with some very informative articles. The editor of SPRAT is G3RJV, with G4DVW taking care of circulation. **(QRM)**

Kenya, 5Z4YV says that he operates frequently on 3.795 HMz on weekends, sometimes around 0300Z, or as early as 2100Z. He prefers c.w. on 40 meters, in about the same time frame. **(QRZ DX)** Benin, N4HX, operated with the funny call which is a commercial call, TYA11, and will be there for about a year. **(Long Skip)** Bernie, ex-3D2BM, has moved to Trinidad and is now 9Y4B. **(QRZ DX)** *Hint*—Works lots of JAs; it flushes out the buro. **(The DXer)** John, FK8DJ is active most mornings from Noumea. He is using a TS-130 to a TL-922 amplifier with a 3-element tribander. He hopes to be QRV from FW8 land for a short while this fall. **(QRZ DX)** More activity from Franz Josef Land again with YL operator Rita on from EK1P. Also, UK1PGO a big signal on 20 s.s.b. **(QRZ DX)**

Mike, GU4EON states W3HNK is *not* my QSL manager. QSL via the CB or buro. **(GU4EON)** Tom, VE7BC, after literally years of working toward this goal, has announced that he has been told by the Chinese that he will be the first to operate from China when ham radio is reopened there. Tom is Chinese, and has made usually two trips each year to China as a food consultant. During these trips he has made contact with government officials and the China Radiosport Federation, and has been instrumental in getting technical books and material for future Chinese amateurs. The operation is expected next spring, when the new building to house the Radiosport Federation is completed. However, it may come on Tom's next trip to BY in September. **(QRZ DX)**

DXing versus QSLing

In some recent DX bulletins there have been some items on where did DXing go when QSLing took over. One point is that DXing waned as the DX QSLer came into the game. The fact is that DXing, more than any other facet of amateur radio, has grown tremendously with the evolution of the transistorized transceiver. So with the large group of new DXers, the pileups became larger and the pursuit of

5 Band WAZ

Standings as of June 1, 1981

All 200 zones worked:

1. ON4UN, John Devoldere (Belgium)
2. K4MQG, Gary Dixon (U.S.A.)
3. SM4CAN, Kent Svensson (Sweden)
4. AA6AA, Steve Orland (U.S.A.)
5. W8AH, Albert Hix (U.S.A.)
6. W6KUT, E. A. Andress (U.S.A.)
7. EA8AK, Fernando Fernande (Spain)
8. LA7JO, Stig Lindblom (Norway)
9. EA3SF, Fernando Blenert (Spain)
10. OH1XX, Hannu Nieminen (Finland)

The top 10 contenders for 5 Band WAZ:

1. K5UR, 199
2. W8GT, 195
3. LA9GV, 191
4. N6DX, 191
5. DL3RK, 190
6. WA4JTI, 190
7. W8UVZ, 190
8. OK1AWZ, 190
9. W1NG, 190
10. ZL1BIL, 190

CQ DX Awards Program

S.S.B.

1027	W7FP	1031	G4EJA
1028	VK3NDY	1032	GI3ZCK
1029	G3OLU	1033	GI3YDH
1030	VK2NHV	1034	WD4GSG

S.S.B. Endorsements

300	K1UO/300	250	ZL1BOQ/254
300	YV5DFI/308	250	JH4PRU/251
275	JA5PUL/292	200	JA9DDM/217
275	W7FP/279	200	WB3IGR/201
28 MHz	WD4GSG	150	GI3YDH/180

C.W. Endorsements

200	WD9IIC/204

The total number of active countries is 318. 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.

On hand to meet the flying pair from Bellingham, Washington at the Blackburn Airport on Montseratt was Bobby, VP2MO. Tony Santos, VP2MS on the left is the aircraft owner who is better known as W7ISX, and Al Johnson, VP2MEK (aka W7EKM) was the copilot. The roundtrip to Barbados via the VP2s took 35 days and covered 12,000 miles. (Photo via W7EKM)

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. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00. The basic award fee is now $4 for *CQ* subscribers and $10.00 for non-subscribers. Please attach your latest *CQ* mailing label to qualify for the $4.00 rate.

C.W.

W6PT	318	W6ID	314	W1NG	305	WA8DXA	294	JH1VRQ	281
ON4QX	317	N6AV	314	W2GT	304	K1MEM	289	K9QVB	281
DL7AA	316	K4CEB	311	W4OEL	300	DJ7CX	287	4Z4DX	280
W3GRS	316	K6JG	311	DL3RK	299	JA1GTF	285	WØIZ	278
K6EC	315	K9MM	310	N6FX	298	SM3EVR	284	W1WLW	276
N4PN	315	W4BQY	310	N4MM	298	K3FN	283	W4BV	275
W9DWQ	315	N6CW	309						

S.S.B.

W6EUF	318	IØZV	315	YV5AIP	311	K9SM	301	K9HQM	284
W4UG	318	F9RM	315	W6RKP	310	WØSR	300	I8LEL	283
W3NKM	317	K6YRA	315	K6XP	310	W2CC	300	I3OBO	283
W9DWQ	317	W4SSU	315	K5OVC	310	HP1JC	300	W8IMZ	282
DL9OH	317	K6JG	315	W8ILC	310	9H4G	300	KA8T	282
K8DYZ	317	K9LKA	315	N4MM	310	K1UO	300	WB1DQC	282
W6REH	317	DJ9ZB	315	WØSFU	310	XE1J	299	W6DN	281
XE1AE	317	ZL3NS	314	K9RF	310	JH1VRQ	298	N3RL	281
W4EEE	317	VE3GMT	314	K8LJG	309	AI8S	297	W2FGY	280
W2TP	317	SM6CWK	314	I3LLD	309	WA4JTI	296	IV3YRN	280
IØAMU	317	I8YRK	314	OE3WWB	309	LA7JO	296	WD8MOV	279
K6WR	317	I4ZSQ	314	N4KE	309	I6PLN	295	W7FP	279
K2FL	317	F2MO	314	N6AV	309	DJ7CX	294	WD8MGQ	278
W9JT	317	OZ3SK	314	W9SS	308	G4CHP	294	K8HV	278
WA2EOQ	317	K4MQG	314	YV5DFI	308	VE3FJE	293	XE1NI	278
W9QLD	317	SM6CKS	313	N6AW	307	K5DUT	293	K3MWV	277
ZS6LW	317	EA4LH	313	WØYDB	306	K9BWQ	293	WA4LOF	277
W3GRS	317	N4WF	313	XE1KS	305	JA5PUL	292	WD9IIX	277
VE3MR	316	YV1KZ	313	LU1BAR/W3	305	W7OM	291	WA6TOO	276
TI2HP	316	K9MM	313	WA4WTG	305	ZL1BIL	291	K1WJ	276
VE3MJ	316	W4DPS	313	W2SUA	304	IØMBX	289	WA4TLI	276
I8AA	316	OE2EGL	313	W1NG	304	YU2RTW	288	XE1CI	276
W9KRU	316	W6YMV	312	OK1MP	304	W4BQY	286	KB8KW	276
I8KDB	316	I5WT	312	DL6KG	303	WB3HAZ	286	K9QVB	275
W3AZD	316	W3GG	312	N2SS	302	AE5B	285	W8ILC/QRPp	275
W3CWG	316	ZL1AGO	312	K8PYD	302	CT1UA	285	WAØTKJ	275
K6EC	316	DK2BL	312	VK2VC	302	WA4DAN	285	K9UAA	275
VE2WY	316	WØSD	312	W6FET	301	N5FG	284	I5BDE	275

The send-off committee at the airport is (l-r) Cesar, CEØCOJ, Jim Wise, W4PRO/CEØ, and Father Dave, CEØAE. Considering the piles of QSLs waiting on Jim's pool table at home, he might have extended the DXpedition on Easter Island for another month. (See item.)

a QSL is once again important especially to the newcomers. Fortunately, there are a lot of DX stations who will work the pileup rapidly to give the multitude a new country and eventually a QSL. It is hard for many to realize that we are not all old timers with 200-plus countries, so we can chat with a TN8 for an hour without someone hearing the QSO who needs the TN8 for a new one. It is a great hobby, since it allows us to share our wealth without costing you a cent.

Repeater DX

A new class of DXer has been reported on the DX repeaters of late. *The DXer* reports several interesting QSLs.

DXer A: This is W6---/lunchtime mobile. Is the Abu Ail operation on?
DXer B: He's on 21.299 working up.
DXer A: How strong is he? Is it worth going home for lunch?
DXer B: I don't know . . . how hungry are you?

and

DXer C: I understand in some countries hams don't have to take a code test.
DXer D: (A well known phone man) Yeah, some of those guys don't even know that DAH-DIT means "A".

and

Voice 1: This is K6---/TI (long pause)
Voice 2: Are you in downtown San Jose, OM, this is AC6---.
Voice 1: Nope, on Treasure Island in San Francisco Bay.
Voice 2: Far out . . . I don't have that isle confirmed, ur 59 Sunnyvale.
Voice 1: Ur 59 TI . . . QSL with 5 IRCs and 3 green stamps.
Voice 2: Shucks, I was hoping you could QSL via the AC6 buro.

Now I feel like the DXpeditioner on a rare isle figuring he could QRX the pileup and get a laugh all at the same time.

DXer: QRZ the eleventh call area only.
Distant weak station: This is Y11DX over!!

73 and the best of DX, Rod, W7OM

QSL Information

Our thanks to the following QSL sources: Long Skip, The W6GO/K6HHD List, and QRZ DX.

A7XE to DF4NB
A22ZM to KA2GNJ
A35UW to ZL2UW
AEØL/KH2 to KØLST
AH2L to WA4EHS
AN3SF to EA3SF
C5ADR to DK9KD
C5ADZ to DK9KD
C31IU to W8JAQ
C31VM to EA3BKZ
C31WK to KB9AW
CEØAE to WA3HUP
CEØCJA to CE5CN
CN8EA to CN8EI
CT2DQ to W4PKM
D4CBC to KA1CY
DF3NZ/ST2 to DARC
DJ5RT/6W8 to DK9KD
DJ6SI/6W8 to DK9KD
DK5BD/ST2 to DF1BP
DL7NS/HBØ to DL7NS
EF6BDX to EA6CE
ED2DSB to EA2OS
EF8AK to EA8CR
EL5G to K3RB
EL6A to K4SE
EL9A to K4WSB
EN3D to UK3DAU
FB8YH to F3KH
FB8YI to F3KH
FGØFOO/FS to N6RA
FH8OM to DJ1TC
FK8CW to W7OK
FO8GW to K6FM
FR7AI/G to FR7AI
FR7BP to WØAX
FR7BY to ISØIFA
FR7CE to DF2OU
FWØAA to NØRR
G3MUV/CEØ to WD4HMG
G3PQA/5NØ to G3RPB
GD5BLG to DL4FF
GJ4JVD to GJ2LU
H44RW to ZL1AMO
HG1W to HA1KVM
HG6V to HA6KVB
HG9HB to HA5PP
HL9DX to W3HNK
HM1AQ to JA2AUV
HP1XEK to DL1HH
J5AG to SM3CXS
HC9A to K8LJG
HL9TU to K2KSY
HZ7JZ to K4GXY
J3AE to J3AAG
J28AZ to I8JN
J73D to W2OD
J88AQ to W2MIG
JY9RC to W1CKA
K6LPL/CEØZ to W6ORD
K6SAD/KG6 to VE5QY
KA1AA to KA6CWR
KA4DQR/TI to KA4FHG
KC6BS to JH7LMZ
KH3AB to KB7MO
KH6D/KH3 to KH6D
KS6DV to WB6FBN
KN5N/VP2A to K9MK
LJ2Z to LA6ZW
N4ADJ/KH2 to WB4CCT
N6YK/VP2A to N6NK
OH3XT/OHØ to OH3XT
OHØXX/OJØ to OH2BBM
OHØXZ/OJØ to OH2KI
OX3KM to OZ4KM
P29GT to KØBTH
P29MM to K4MQG
PP2ZDD to W4BAA
SVØAO to KA2FRP
T32AB to W7OK
TL8RC to F6EZV
TU2DP to KC4IR
TYA11 to ON5NT
VK2DCO/LH to K2UO
VKØJS/VK9 to VK9NS
VP1GK to WA4JTE
VP1MK to NØBNY
VP1RY to KØBJ
VP1TKJ to WAØTKJ
VP2ARS to OH2BH
VP2M to W1CDC
VP2MCL to K1ZZ
VP2MFC to K1ZZ
VP2MLB to W2IRS
VP2MM to W1CDC
VP2MO to KA4BOT
VP2MU to VE3HD
VP2VGS to WØJRN
VP2VHK to N6ZV
VP2VIA to WØANZ
VP2VJR to VE3MJ
VP5KPS to W2NSD
VP5RFS to N5BET
VP5TDX to W1HCS
VP8AEN to G3ITN
VP9CB to VP9 QSL Bureau (*not* VE3MPZ)
VP10A to KBØU
VQ9AA to AJ3N
VQ9XX to K6OZL
VS6CT to KB9N
W2BBK/PJ3 to W2BBK
W5JMM/SU to KA5AZT
W5JW/KX to W5JW
WA1SQB/CEØ to K1RH
WB9TIY/VP2A to WB9TIY
WD9IHC/HK4 to WD4PTO
XT2AU (Enno) to WA1ZEZ
XT2AU (Karl) to W2TK
YBØACL to W4LCL
YJ8NPS to KB2KN
YTØR to YU7BCD
YTØRA to YU1EXY
YZ3F to YU3TAQ
ZF2EC to WA4OBH
ZF2GK to W8TN
ZF2EO to KØCS
ZF2EX to K4PJ
ZK1AR to AA6Z
3A8EE to 3A2EE
4A9LCH to WD8NKT
4K1B to UA3XBP
4N7NS to YU7BPQ
4NØRA to YU1ELM
4V2BM to KA2MRE
4X6BL to N2BQL
4Z4WH to DJ5SQ
5N6ATT to K4PVZ
5T5AZ to KB7HB
5V7HL (Rod) to KB7HB
5W1DF to KL7CQ
5Z4YV to JA2KLT
6Y5DA to VE4JK
8P6CQ to W2LZX
8P6JW to W3HNK
8P6M to VE3JTQ
8P6OL to VE3AMJ
8P6PF to VE3LVK
8P7A to WB4RRK
8Q7BF to JA1ITE
9K2AH to JA8BI
9K2FF to SV1JG
9L1GA to N1AGK
9Q5AB to DL7AH

QSI Manager volunteers: N7RO and W7BUN

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

Ham Radio's most popular antenna tuner. Improved, too.

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Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+$4), like 941C less balun. **MFJ-945, $79.95** (+$4), like 941C less antenna switch. **MFJ-944, $79.95** (+$4), like 945, less SWR/Wattmeter. **MFJ-943, $69.95** (+$4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER

MFJ-900

$44.95 (+$4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient air-wound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $54.95 (+$4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $34.95 (+$4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B

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Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7"

MFJ-962 VERSA TUNER III

MFJ-962

$199.95 (+$4)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

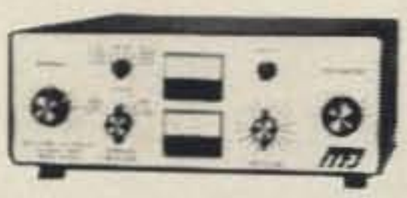
Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

6 position antenna switch handles 2 coax lines, direct or through tuner, plus wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $179.95 (+$10), similar but less SWR/Wattmeter.

MFJ-984 VERSA TUNER IV



MFJ-984

$299.95 (+$10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $209.95 (+$10), like 984 less ant. switch, ammeter. **MFJ-982, $209.95** (+$10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $179.95** (+$10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989

$319.95 (+$10)

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf-6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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Phone: October 24-25 & C.W.: November 28-29 Starts 0000 GMT Sat. Ends 2400 GMT Sunday

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 through 28 MHz.

III. TYPE OF COMPETITION:

1. Single Operator (Single band, and all band). Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. The use of DX spotting nets or any other form of DX alerting assistance places the station in the Multi-Operator category.

2. Multi-Operator (all band operation only).

a. Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception:* One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier. *Logs found in violation of the ten-minute rule will be automatically reclassified as multi-multi to reflect their actual status.*

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

c. *All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must be physically connected by wires to the transmitter.*

3. QRPp (single operator only) Power must not exceed 5 watts output. Stations in this category will be competing only with other QRPp stations for awards.

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e., 5705). C.W.: RST report plus zone (i.e., 57905).

A station in a zone or country different than that indicated by its call sign is required to sign portable.

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, and Asiatic USSR.

All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates and plaques will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES (Donors)

PHONE

Single Operator, All Band

World - Bill Leonard, W2SKE
World - QRPp - Adrian Weiss, K8EEG/0
U.S.A. - Potomac Valley Radio Club
*Canada - Jack Baldwin, VE7RG
Carib./C.A. - Jim Neiger, N6TJ
Europe - W4BVV Operators
Africa - Gordon Marshall, W6RR
*Asia - Japan CQ Magazine
*Japan - Palm Garden Contest Club
Oceania - No. California DX Club
So. America - David Novoa, KP4AM

Single Operator, Single Band
World - K2HLB Memorial, No. Jersey DX Assoc.
U.S.A. - 28 MHz - Don Thomas, N6DT
*World - 21 MHz - Lee Wical, KH6BZF
World - 3.8 MHz - Fred Capossela, K6SSS
U.S.A. - 3.8 MHz - Arnold Tamchin, W2HCW
U.S.A. - So. California DX Club
*Canada - Gene Krehbiel, VE7KB
Carib./C.A. - KP4ES Memorial, Pedro Piza, Jr., NP4A
Oceania - 14 MHz - VK3JW Memorial, Pacific DX Net
*So. America - Rafael Ponce de Leon, CX3BR

Multi-Operator, Single Transmitter
World - Don Wallace, W6AM
*Canada - Calgary Amateur Radio Assoc.

Multi-Operator, Multi-Transmitter
World - Radio Club Venezolano
U.S.A. - Dale Hoppee, K6UA
Europe - Bob Cox, K3EST

Contest Expeditions
World - Single Opr. - Stuart Meyer, W2GHK
*World - Multi-Opr. - "The Yasme Award."

Special - Single Operator, All Band
World - Phone/C.W. - John Knight, W6YY

C.W.

Single Operator, All Band
World - W2AB Memorial, Albert Kahn, K4FW
World - QRPp - Gene Walsh, N2AA
U.S.A. - Frankford Radio Club
*Canada - Canadian DX Association
Carib./C.A. - Jim Neiger, N6TJ
Europe - W3AU Operators
Africa - Gordon Marshall, W6RR
*Asia - Japan CQ Magazine
*Japan - Palm Garden Contest Club
Oceania - Maui Amateur Radio Club

Single Operator, Single Band
World - W2JT Memorial, No. Jersey DX Assoc.
World - 3.5 MHz - Fred Capossela, K6SSS
World - 1.8 MHz - KP4ES Memorial, Chip Margelli, K7JA
U.S.A. - No. Illinois DX Association
*Canada - Canadian Amateur Radio Federation
Carib./C.A. - DX Club of Puerto Rico
*Europe - 14 MHz - G2LB Memorial (From Friends)
*So. America - Rafael Ponce de Leon, CX3BR

Multi-Operator, Single Transmitter
World - Anthony Susen, W3AOH
U.S.A. - Douglas Zwiebel, WB2VYA

Multi-Operator, Multi-Transmitter
World - Hazard Reeves, K2GL

Contest Expeditions
World - Single Opr. - Yankee Clipper Contest Club
World - Multi-Opr. - Bill Schneider, K2TT

Clubs
World - Phone/C.W. - CQ Magazine
*Special - Phone/C.W. - Southeastern DX Club

**Trophy supplied by Donor.*

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the Club or *CQ* Special Awards.)

A station winning a World Trophy will not be considered for a sub-area award. That Trophy will be awarded to the runner-up of that area.

The Canadian, Carib./C.A., and the African awards are for residents *only*. A resident is defined as one living in that country with an established Post Office address.

X. CLUB COMPETITION:

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area (except for DXpeditions especially organized for operation in the contest and manned by members).

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

XI. LOG INSTRUCTIONS:

1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers. Submitted logs must have duplicate contacts clearly shown. The *original* log may be requested by the Contest Committee if further cross-checking of the log is necessary.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

6. Sample log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRC's must accompany your request.

If official forms are not available, make up your own 80 contacts to the page on 8½" × 11" paper.

7. All entrants are required to submit cross-check sheets for each band on which 200 or more QSO's were made. All other entrants are encouraged to submit cross-check sheets.

8. For each duplicate contact that is removed from a log by the committee, a penalty of three additional contacts will be exacted.

9. QRPp stations must indicate same on their summary sheets and state the actual maximum power output used, with a signed declaration.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest; unsportsmanlike conduct; taking credit for excessive duplicate contacts; unverifiable QSO's; or unverifiable multipliers will be deemed sufficient cause for disqualification. (Incorrectly logged calls will be counted as unverifiable contacts.)

Disqualification can also result in the disqualified operator(s) being barred from competition in all *CQ* contests for a period of up to three years.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1981 for the Phone section and January 15, 1982 for the C.W. section. An extension will be given if requested. Indicate phone or c.w. on envelope.

Logs should be sent to **CQ Magazine, 76 North Broadway, Hicksville, NY 11801 U.S.A.**

Like an artist who never quite finishes a painting, W3RJ has added a deft touch to his previous article. It's a simple and worthwhile addition designed to enhance your operating pleasure.

Improved Spot Capability For The Drake T-4XC and R-4C While Using The Vacuum Relay QSK

BY RICHARD KLINMAN*, W3RJ

A previous article described how to incorporate full break-in, or QSK, with the Drake C Line.[1] Operation of the "spot" function of the T-4XC is not optimum with the interconnections called for in that article. The spot signal is inaudible in the s.s.b. mode because the receiver is muted by the QSK circuit when the transmitter is in "spot." In the c.w. mode the spot note is often too weak because of the large isolation of the vacuum antenna relay.

Correction of these difficulties is simple. Furthermore, an auxiliary "C.W. Spot" control that functions similar to the convenient spot control on the Collins 32S-3 can be easily added. The necessary connections are shown in fig. 1. A coaxial cable with phono-plugs at both ends is used to connect the mute jacks of the R-4C and T-4XC. This cable is wired in parallel with the mute line between the QSK and T-4XC via a phono-plug "Y" adapter. Remote spot for c.w. is achieved by connecting a cable in parallel with the key line between the QSK and T-4XC which is also done using a phono-plug "Y" adapter. Shorting this cable by pushing the auxiliary spot switch, S-1, which is equivalent to grounding the key line, generates the spot signal. No signal is actually transmitted since the QSK has the T-4XC (screen voltage zero) and linear amplifier (bias control relay open) in cut-off.

Auxiliary spot switch S-1 may be mounted in a convenient place, for example on the key, bug, or paddle frame. A desirable location is adjacent to the T-4XC tuning knob, as is the case on the Collins 32S-3, so that both the auxiliary spot and PTO can be controlled with one hand. This may be done by using a small bracket as shown in fig. 2. The bracket is easily formed from 1/16-inch thick aluminum sheet and is held in place (above my DX-Engineering speech processor) by the two 6-32 screws securing the top and bottom cases (and processor) to the chassis. No additional holes are drilled in the T-4XC.

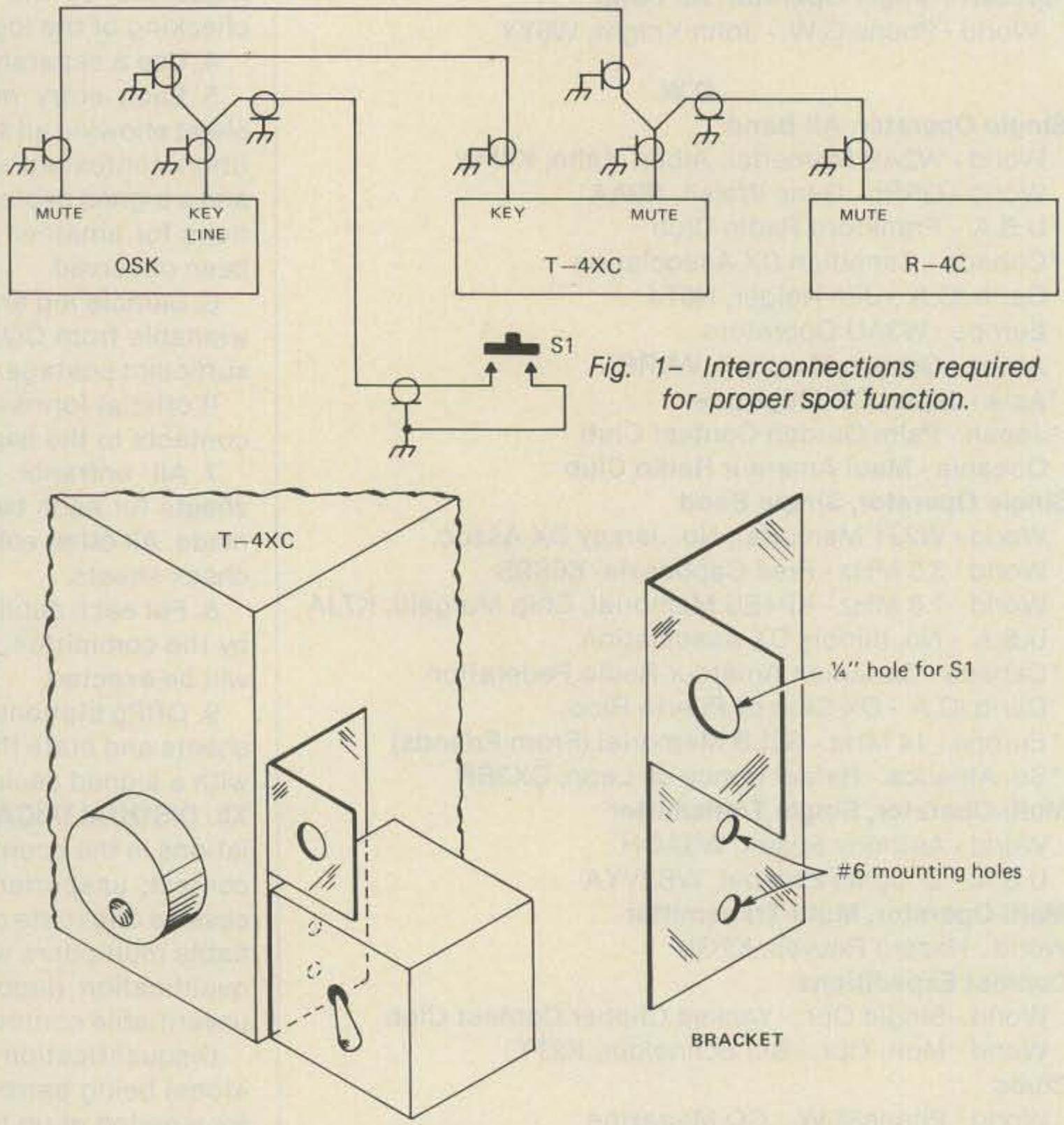

Fig. 1– Interconnections required for proper spot function.

Fig. 2– Convenient location for new spot switch. A simple design for a mounting bracket is shown in relation to the author's DX Engineering speech processor.

*RD 1, Flint Hill Road, Coopersburg, PA 18036

[1]*R. Klinman, "Full Break-in with the Drake T-4XC R-4C Using the Vacuum Relay QSK," CQ, vol. 36, no. 3 (March 1980).*

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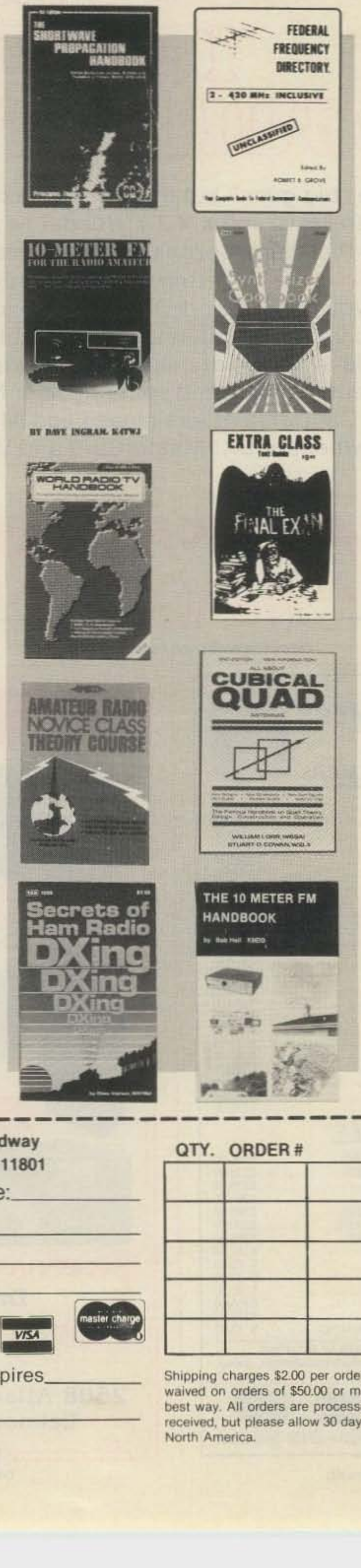

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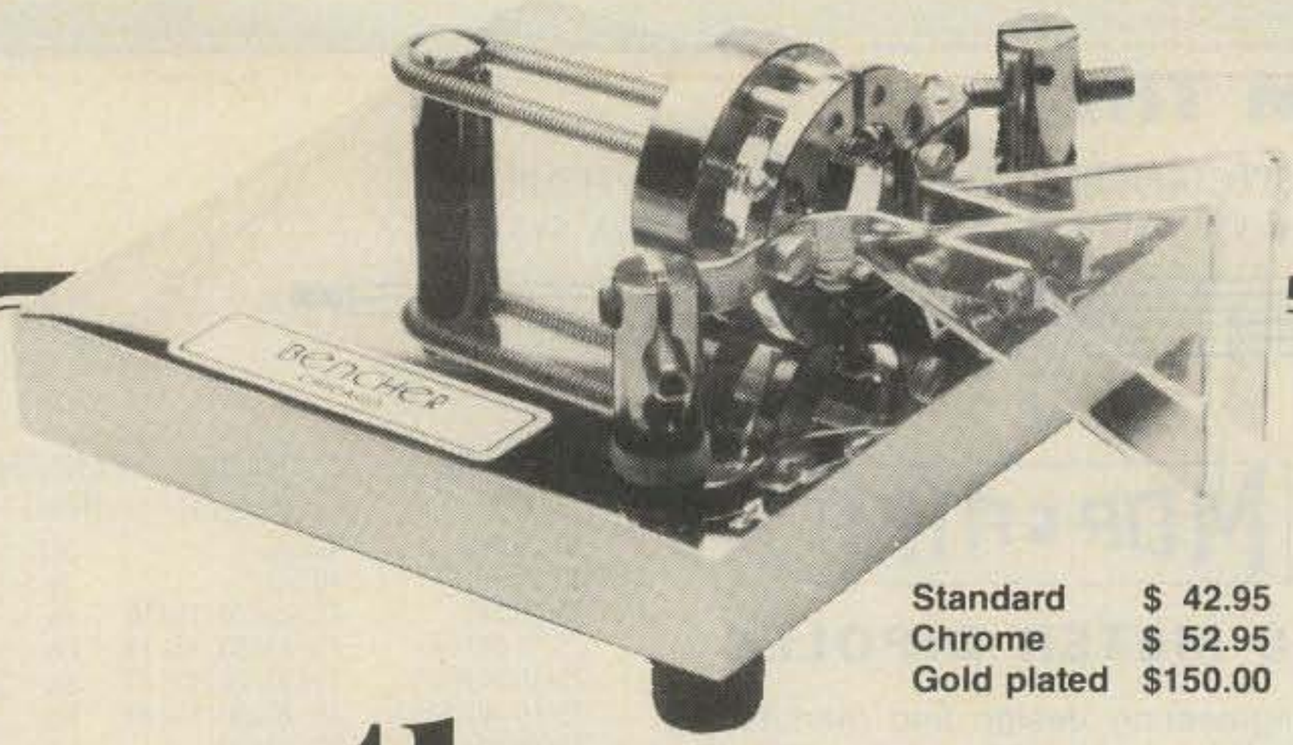

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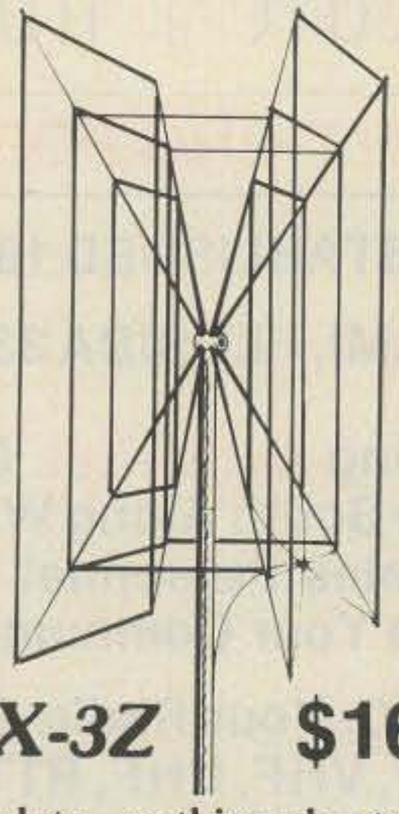

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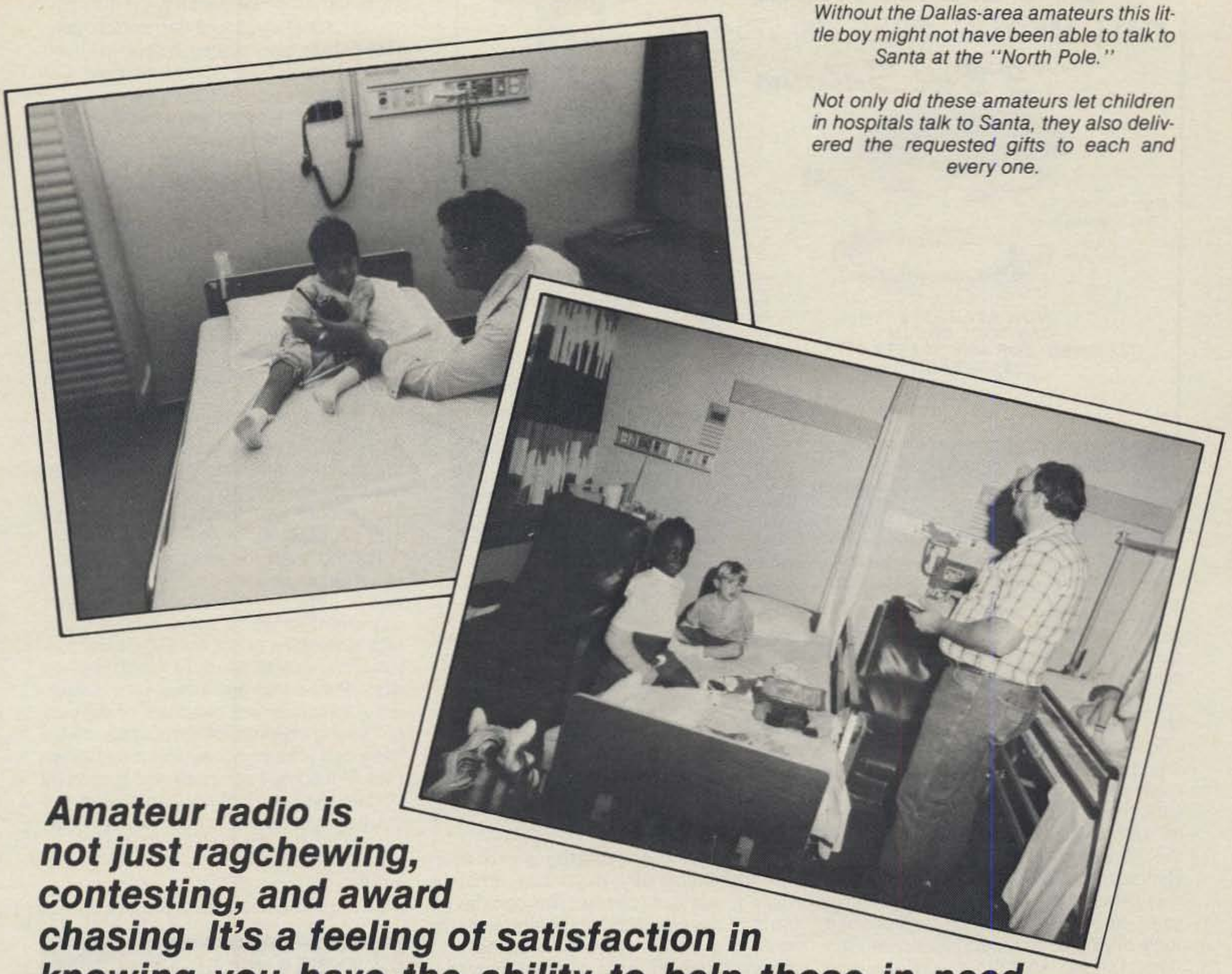

Without the Dallas-area amateurs this little boy might not have been able to talk to Santa at the "North Pole."

Not only did these amateurs let children in hospitals talk to Santa, they also delivered the requested gifts to each and every one.

Amateur radio is not just ragchewing, contesting, and award chasing. It's a feeling of satisfaction in knowing you have the ability to help those in need—and then doing it!

A Story Of Amateurs Who Care

BY JIM TURNER*, WA5EWB

In our hobby a fair amount of operations fall into the Public Service or Public Interest categories. Everyone knows of emergency or disaster nets, health and welfare, traffic nets, and the like. Anyone who has ever been a participant in such activities knows they are usually interesting, sometimes quite hectic, always a great deal of work, and mostly quite rewarding to the operators, knowing their efforts have been of benefit to someone, somewhere.

During this past Yuletide season several Dallas-area hams added a bit more to this category. The idea germinated just before 1979's Christmas, when following a visit to the Scottish Rite Crippled Children's Hospital, a small group of hams conceived a plan to add a bit of cheer to some of these childrens' Christmas. Recruiting a few others, this bunch set up a Santa Claus base and sent portable 2-meter units to the hospital, letting some young ones talk to Santa over the radio.

This idea grew and blossomed in an incredibly short time. While the original intention was merely to let the kids talk to Santa, suddenly cash donations began arriving from other ham and non-ham listeners. A fund was established, and, as the children spoke to Santa and expressed a desire for some particular toy or gift,

*6909 Fischer Rd., Dallas, TX 75214

No - 83 - 84

the originators of this group saw to it that each child received exactly the item requested. The news spread like wildfire; a second visit to handicapped and terminally ill children in another hospital followed and was covered by local TV stations.

Following the phenominal success of this spur-of-the-moment idea, plans were made to do the same this past year. However, this time the ball began rolling earlier. With the donations not used in 1979 the Dallas Amateur Radio Operators Handicapped Children's Christmas Fund was established. Donations trickled in all year, and as the season approached, fund raising events such as benefit dinners, raffles, and the like were held; these, plus donations from other hams and non-hams (some of which were quite substantial), enabled the fund to collect several thousands of dollars.

Radio visits with Santa began in early December, this time not only with those children confined to hospitals but also with out-patients at their homes. This activity covered about 300 children this past season. Santa's helpers around Dallas were very busy last year, not only in going portable all over the Metroplex, but in buying, wrapping, and delivering presents. Again, the exact item requested was obtained, as nearly as possible. And again, TV news coverage of some of these events was aired by the local TV stations.

This effort was not put together or even sponsored by any organized amateur club. It was put together through the efforts of several individual hams working only to provide some joy to those who normally would have a lonely season. Several clubs did donate to the fund and provided the use of repeaters, links between repeaters, etc. Response to this effort was great. Local hams kept off the repeaters "linked" to the "North Pole"; parents of the children involved were very grateful. Traveling hams passing through during the Santa Claus QSO's were very complimentary in their remarks. Hopefully, some carried the message to their own locales; maybe in future years we may hear "CQ North Pole, CQ Santa Claus" from other cities.

Many, many hams were active in this effort, too many to list all the names and calls here. However, special recognition should go to Bob Allen, WB5ZQT, and his wife Helen, WB5ZQS, who essentially started the whole thing. Recognition is also due to Tommy Donald, KB5HQ, and XYL, Patsy, Dave Logan, K5CYB, Luke Davis, KJ5U, and Bill Adamson, WA5SKY. These folks did the lion's share of organizing the fund-raising activities, recruiting help, and spending much of their personal time keeping the snowball rolling.

Recognition is also due Rob Tubbs, WD5OQG, who, being handicapped himself and the father or four handicapped children, was able to provide a list of the out-patients due to past close association with the hospital.

Having been an "elf" myself this year, and having departed after some visits with a lump in my throat and eyesight somewhat misty, I have discovered a new dimension of our hobby not encountered in the other forms of Public Service work. Public Interest, in this case—interest in handicapped, retarded, or seriously ill young children, who would otherwise have had little or no joy this past Christmas. But some happiness was spread by certain Amateurs Who Cared, and the story should be told. ■

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Reporting fifteen events for this month leaves little or no space for any additional comments from me. With upward of four different events going on each weekend, there are bound to be some conflicts and confusion. Operating on the suggested frequencies where indicated will be helpful in reducing some of this congestion. Be mindful of the non-contester whose operating time is limited to weekends.

73 for now, Frank, W1WY

Alabama QSO Party

Starts: 0000Z Saturday, August 29
Ends: 2400Z Sunday, August 30

The Chattahoochee Valley A.R.C. is reviving this one, which has not been active for some years.

The same station may be worked once on each band and each mode, mobiles on each county change, and Alabama to Alabama contacts are permitted.

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

Scoring: One point per QSO. Alabama stations multiply total by sum of states, provinces, and countries worked. All others multiply total Alabama contacts by sum of Alabama counties worked (max. of 67).

Frequencies: C.W.—3565, 7065, 14065, 21065, 28065. Phone—3965, 7265, 14285, 21365, 28565. Novice—3725, 7125, 21125, 25125.

Awards: Certificates to top scorers in each state, VE province, and DX country. Also to top Novice/Tech. in Alabama and out-of-state. Plaques to the overall Alabama and out-of-state winners.

Mailing deadline is October 31 to Johnny Royster, WA4VEK, P.O. Box 494, Fairfax, AL 36854. Include a large s.a.s.e. for copy of the results.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	Aug.	29-30	Occupation Contest
	Aug.	29-30	Alabama QSO Party
	Sep.	5-7	FOUR Land QSO Party
	Sep.	6	North American Sprint
	Sep.	6	Bulgarian DX Contest
	Sep.	5-7	SSTV WAS Contest
	Sep.	9-11	YLRL "Howdy Days"
	Sep.	12-13	ARRL VHF Contest
*	Sep.	12-13	European Phone Contest
	Sep.	12-13	New Mexico QSO Party
	Sep.	12-14	Wash. State QSO Party
	Sep.	19-20	CAN-AM Phone Contest
	Sep.	19-20	Maryland/DC QSO Party
	Sep.	19-20	"College Scrimmage"
	Sep.	19-20	SAC C.W. Contest
	Sep.	26-27	SAC Phone Contest
	Sep.	26-27	CAN-AM C.W. Contest
	Sep.	26-27	Maine QSO Party
	Sep.	26-27	Delta QSO Party
	Oct.	3-4	California QSO Party
	Oct.	3-4	VK/ZL Phone Contest
	Oct.	10-11	VK/ZL C.W. Contest
	Oct.	11	RSGB 21/28 MHz Phone
	Oct.	18	RSGB 21 MHz C.W. Contest
	Oct.	17-18	Pennsylvania QSO Party
	Oct.	17-18	Minnesota QSO Party
	Oct.	17-18	Boy Scouts Jamboree
	Oct.	21-22	YLRL Anniv. C.W. Party
	Oct.	**24-25**	**CQ WW DX Phone Contest**
	Nov.	4-5	YLRL Anniv. Phone Party
	Nov.	8	Czechoslovakian Contest
	Nov.	14-15	European RTTY Contest
	Nov.	**28-29**	**CQ WW DX C.W. Contest**

* Covered last month.

FOUR Land QSO Party

1800Z Sat. Sept. 5 to 0600 Sun. Sept. 6
1300Z Sun. Sept. 6 to 0100 Mon. Sept. 7

The Brightleaf A.R.C. is again sponsoring this, the 11th annual QSO Party to make the many counties in the eight 4th district states available to the county hunters.

The same station may be worked on each band and mode, and again if operating portable or mobile from each county change. Stations in the 4th area may work each other for QSO and multiplier credit.

Exchange: RS(T) and QTH. County and state for the 4th district; state, province, or country for all others.

Scoring: *4th call area*—One point per QSO. Multiply total by number of states, provinces, and countries worked.

All others—Two points for each 4th area station worked times the total 4th area states and counties worked.

Frequencies: C.W.—3575, 7055, 14070, 21070, 28090. Phone—3940, 7260, 14340, 21360, 28600. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to top scorers in each state, VE province, and DX country, 2nd and 3rd place when warranted. Also county awards to 4th call area states. Special awards to Novices.

Mail logs within 30 days to: Contest Chairman, Bob Knapp, W4OMW, 105 Dupont Circle, Greenville, NC 27834. Include a large s.a.s.e. for results.

North American Sprint

0100 to 0500 GMT Sun., September 6

There are two "Sprints" held each year, one in February and the other in September. As the name implies, it's a real shorty—four hours only.

North American stations will be working stations on other continents as well as other North Americans. Single operator, c.w. only.

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

Scoring: Multiply total QSOs by sum of states, VE provinces, and N. American countries worked. USA and VE not countries, KH6 not a state. There are 8 VE provinces, Maritime plus VE2-VE8.

Frequencies: Three bands only, 3530–3550, 7030–7050, 14030–14050. Same station may be worked once on each band.

Awards: A Trophy to the top scorer. Certificates to the winners in each U.S.A. call district, Canada, and each country, and also to the top 10 scores, the winning team, and each operating member.

Club competition is limited to a total of 10 members as a single unit. A club may enter more than one unit. To qualify each member in the unit must be registered with the contest coordinator, W6OAT, at least 24 hours before the contest.

Special QSY Rule: Any station calling CQ or soliciting contacts is permitted only one QSO as a result of that call. He must thereafter move at least 1 kHz before working another station, or at least 5 kHz before again soliciting other calls.

Use a separate log for each band, indicate the multiplier the first time it is worked and include a summary and check sheet with your entry.

Entries must be received no later than 30 days after the contest and go to: Rusty Epps, W6OAT, 948H Kiely Blvd., Santa Clara, CA 95051.

Bulgarian C.W. Contest

0000 to 2400 GMT Sunday, September 6

Organized by the Bulgarian Federation of Radio Amateurs, this contest is open to all amateurs.

Classes: Single operator, both single and all bands, multi-operator/club stations, and S.W.L.

Bands: 3510–3590, 7005–7040, 14010–14090, 21010–21125, 28010–28125 kHz (c.w. only).

Exchange: RST plus your ITU Zone.

Scoring: Six (6) points for contacts with an LZ station, 1 point with stations in the same continent (including own country), and 3 points with all other areas. S.w.l.'s score 3 points for reporting both calls in an exchange, 1 point if only one call.

Multiplier: Sum of ITU Zones worked on each band.

Final Score: Total QSO points multiplied by sum of ITU Zones worked on each band.

Awards: Cups and Medals to the top 3 single-operator all-band scores, and top 3 multi stations. Medals to the top 3 scorers on each band. And medals to the top 3 s.w.l. scores. The top 3 continental winners will also receive medals.

A separate log is required for each band. A summary sheet showing the scoring and zones worked on each band and the usual signed declaration are also requested.

Contest contacts may be used for the many Bulgarian awards: the W-100-LZ, 5 Band LZ, W-25-Z (ITU), and the Black Sea Award. Include your application with your contest entry.

Mailing deadline for contest entries is 30 days after end of the contest. They go to: BFRA Contests, P.O. Box 830, Sofia 1000, Bulgaria.

WAS SSTV Contest

Starts: 9AM EST Sat., September 5
Ends: 9PM EST Mon., September 7
Corresponding times in other time zones

The object of the contest is to contact as many of the 48 continental states and Alaska and Hawaii as possible via Slow Scan TV.

All contacts must incorporate the video/signal report in "video" as well as the call letters of the station worked. A bonus factor of 10 may be added to those SSTV contacts on nonpopular bands as designated by the (*) on the bands indicated under frequencies.

For example, you may end up with a total score of 39 states + 40 points (4 contacts on 40 meters). Additional contacts within the same state count only as bonus points. Other than suggested frequencies may be used as long as the frequency used is legally authorized for SSTV operation.

Frequencies: *3845–55, *7220–30, 14230–40, *21340–50, 28680–90, *50200–10, *144.230–.240 s.s.b. or 146.43 f.m.

Awards: A one-year subscription to *A5 Magazine* to the entry with the most states worked plus the bonus points; certificates to 2nd and 3rd place. Stations working all 50 states will be given special consideration. Results, of course, will be covered in the Nov./Dec. issue of *A5 Magazine.*

Would suggest you write to Contest Mgr. WB0QCD for more details and a WAS SSTV map.

Send your entries to: A5 Contest Manager, Mike Stone, WB0QCD, P.O. Box H, Lowden, Iowa 52255. Mailing deadline is rather short—September 10th.

YLRL "Howdy Days"

Starts: 1800Z Wed., September 9
Ends: 1800Z Fri., September 11

This activity is for YL's and scores will be based on contacts between YL's only. All licensed women operators throughout the world are invited to participate.

All bands and modes may be used, however crossband and Net contacts do not count. Only one contact with the same station is permitted regardless of the band.

Score 2 points for each YLRL member worked, and 1 point if it's with a non-member. There is no multiplier; just add the QSO points.

The top scoring YLRL member will receive her choice of a YLRL pin, a charm, or stationery. The highest scoring non-member receives a one-year membership to the YLRL.

Indicate if you are a YLRL member and submit your signed original log, not a carbon, to: Kay Eyman, WA0WOF, R.R. 2, Garnett, KS 66032. Same must be received by October 12th.

New Mexico QSO Party

Starts: 0000Z Sat., September 12
Ends: 2400Z Sun., September 13

This is a new one organized by the Albuquerque DX Assn. Efforts are being made to activate all 33 New Mexico counties, including the new Cibola county.

The same station may be contacted on each band and each mode for QSO and multiplier credit, and New Mexico mobiles in each county change.

Exchange: QSO no., RS(T), and QTH. County for NM stations; state, province, or DX country for others.

Scoring: One point per QSO. NM stations multiply total by total number of states, provinces, and DX countries worked on each band and each mode.

All others multiply QSO points by total number of NM counties worked on each band and each mode (max. of 33 per band).

Frequencies: C.W.—63 kHz from low end of each band. S.S.B.—3900, 7265, 14285, 21365, 28650. Novice—3705, 7105, 21105, 28105.

Awards: Certificates to top scorers in each state, VE province, and DX country. Plaques to the top scorer in New Mexico and outside the state. A special award to all stations working all 33 New Mexico counties.

Stations reporting 100 or more contacts are requested to include a dupe sheet with their logs.

Mailing deadline is October 15th to: Albuquerque DX Assn., P.O. Box 997, Corrales, NM 87048. Include a large s.a.s.e. for copy of results.

Washington State QSO Party

0100Z to 0700 Sat., September 12
1300Z to 0700 Sat./Sun. Sept. 12/13
1300Z to 0100 Sun./Mon. Sept. 13/14

This is the 16th annual party sponsored by the Boeing Employees A.R.S. (BEARS). The same station may be worked on each band and mode for QSO and multiplier credit. Wash. stations may work other in-state stations for QSO points.

Exchange: QSO no., RS(T), and QTH. County for Wash.; state, province, or country for others.

Scoring: Phone contacts are worth 2 points; c.w. contacts 3 points.

Wash. stations multiply total QSO points by number of states, VE provinces, and DX countries worked. Others use Wash. counties for their multiplier (max. of 39).

There is an additional multiplier of 1 or each group of 8 contacts with the same Wash. county for non-Wash. stations.

Frequencies: C.W.—1805, 3560, 7060, 14060, 21060, and 28160. Phone—1815, 3925, 7260, 14280, 21380, 28580. Novice—3725, 7125, 21150, 28160.

Awards: Certificates to the top scorers, both single and multi-operator, in each state, VE province, DX country, and Wash. county. Additional awards where warranted.

The Worked Five Bears Award is available to anyone working 5 club members before, during, or after the party. The Worked Three Cubs Award is available for working 3 Novice Club members.

Include a check sheet with your entry if you made 200 or more contacts. Results will be mailed to all entries, no s.a.s.e. required.

Mailing deadline is October 15th to: Boeing Employees A.R.S., Contest Committee, Att: Willes D. Propst, K7RS, 18415 38th Ave. S., Seattle, WA 98188.

CAN-AM Contest

Phone: Sept. 19-20 C.W.: Sept. 26-27
Starts: 1800Z Sat. Ends: 1800Z Sun.

This is the fifth running of this contest sponsored by the Ontario Contest Club and the Canadian DX Assoc.

Contacts may be made on all bands, 1.8 through 28 MHz. It is recommended that operation be confined to the General portion of each U.S. band. QSO exchange will be between the two countries as well as within each country.

Multi-operator stations can operate the full 24 hour period. Single operator is limited to 20 hours, with a maximum of two rest periods totaling 4 hours.

Categories: Single operator, both single and all band. Multi-operator, single transmitter. And Club competition. Also QRP.

Exchange: RS(T), QSO no., and multiplier area. Postal abbreviations for the 50 U.S. states; "CN" for U.S. possessions in the Caribbean; "PC" for Pacific possessions; and provinces for Canada (59001 CT, 599001 PQ, etc.).

Points: W/K to W/K and VE to VE QSOs, 2 points. W/K to VE QSOs, and vice-versa, 3 points.

Multiplier: 50 U.S. states, 2 U.S. possessions (Carib. and Pacific areas), 10 Canadian provinces, 2 Can. territories (NWT and Yukon), 1 Can. Island (Sable, St. Paul). Total of 65 per band, max. of 390 from all bands.

Final Score: Total QSO points from all bands multiplied by the sum of multipliers from each band.

The same station may be worked on each band for QSO and multiplier credit. Stations operating outside their own area must identify their location.

Multi-operator stations must stay on the same band at least 10 minutes before switching to another band.

Phone and c.w. are separate contests. However, combined phone and c.w. scores will be used for overall competition.

Awards: Certificates to single operator station winners in each multiplier area, and the top five combined phone and c.w. scores for multi-operator stations.

There are 10 Trophies and Plaques.

Phone: Canadian and American Champion.

C.W.: Canadian and American Champion.

Phone & C.W.: Canadian and American Champion.

Multi-Operator: Canadian and American Champion.

Highest Club score, Phone and C.W.

And a one-year subscription to "Long Skip," the CANADX monthly bulletin, to the top 5 U.S. scorers.

A disqualification clause will be strictly observed. Violation of amateur regulations, rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification, so check your log carefully before submitting it.

Do not use separate log sheets for each band. Indicate the multiplier only the first time it is worked on each band. A summary sheet must accompany each entry, showing the scoring and other pertinent information. Entries with over 200 contacts must also include a check sheet for each band.

Sample log forms, summary, and check sheets are available from the contest chairman. A large s.a.s.e. will bring you sample. (Do not glue U.S. stamps to the envelope.)

Mailing deadline for all entries is 30 days after end of contest to: CAN-AM Contest, VE3BMV, P.O. Box 292, Don Mills, Ont., Canada M3C 2S2.

Maryland/D.C. QSO Party

1900Z Sat. to 1900Z Sun., Sept. 19/20

This year's party is being sponsored by the Columbia A.R.A. After 15 years, "Andy" Andersen, W3XE, and the Maydale Club have phased out their sponsorship. (A job well done Andy.)

The same station can be worked on each band for QSO credit, and MD/DC stations may work other in-state stations.

Exchange: QSO no., RS(T), and QTH. County for MD/DC; state, province, or country for others. (Baltimore and Washington are independent cities.)

Scoring: MD/DC stations multiply total QSO's by MD counties, states, provinces, and DX countries worked.

Others multiply total MD/DC contacts by MD counties and independent cities worked (max. of 25).

Multiply your final score by 1.5 if you run 200 watts or less.

Frequencies: C.W.—60 kHz up from low end of band. Phone—3950, 7250, 14290, 21390, 28590. Novice—3720, 7120, 21120, 28120.

Awards: Plaques and certificates to winners in each category.

Mailing deadline is October 20th to: Columbia A.R.A., Att: Robert K. Nauman, WA3VUQ, 4017 Font Hill Drive, Ellicott City, MD 21043.

"College Scrimmage" Contest

2200Z Sat. to 0400Z Sun., Sept. 19/20

A novel activity. The idea is to put long lost Alumni in touch with their Alma Mater.

Exchange: Name of College, Jr. College, or University you last attended and the last number of the year you graduated or will graduate (for example, Penn State '72).

Club stations substitute "Amateur Radio Club" in the exchange; non-collegians "High School."

Stations may be worked once per band.

Scoring: Multiply total QSO's by the number of different colleges, etc., worked.

Frequencies: C.W.—60 kHz up from low end of band. S.S.B.—1815, 3895, 7230, 14280, 21355, 28560. Novice—25 kHz inside Novice bands.

Logs must be received by November 1st, and they go to: Penn State A.R.C., K3CR, 202 Engineering Unit E, University Park, PA 16801.

Scandinavian Activity Contest

C.W.—Sept. 19–20 S.S.B.—Sept. 26–27
Starts: 1500 GMT Saturday
Ends: 1800 GMT Sunday

It's the world working the Scandinavians in this, the 23rd running of the S.A.C. Phone and c.w. are separate contest. The same station may be worked once on each band, 3.5 through 28 MHz, for QSO and multiplier credit.

It is suggested that the following sections of the bands be used. C.W.: 3505–3575, 7005–7040, 14010–14075, 21010–21125, 28010–28125. S.S.B.: 3600–3650, 3700–3790, 7050–7100, 14150–14300, 21200–21350, 28400–28700.

The prefixes used in Scandinavia are: LA/LB/LG/LJ Norway, JW Svalbard & Bear Is., JX Jan Mayen, OF/OG/OH.OI Finland, OHØ Aaland Is., OJØ Market Reef, OX Greenland, OY Faroe Is., OZ Denmark, SJ/SK/SL/SM Sweden, TF Iceland.

Classes: Single operator, and multi-operator both single and multi-transmitter. Multi-transmitter stations must use a separate series of serial numbers for each band. Club stations are considered as multi-operator.

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

Points: European QSOs count 1 point on any band. DX contacts are 1 point on 14, 21, and 28 MHz, 3 points if on 7 or 3.5 MHz.

Multiplier: Each *call area* in the above list of Scandinavian countries worked on each band (LA1, LB1, LJ1 are in the same call area, as are SM3, SK3, SL3). Portable stations in Denmark or Norway count as the 10th area. OHØ is the 10th area for Finland, OJØ is also separate, and SJ9 is the 9th area for Sweden.

Final Score: The sum of QSO points from all bands times the sum of the multiplier from each band.

Awards: Certificates to the highest scoring station in each class, both s.s.b. and c.w., in each country and each U.S. call area. Additional awards depending on the returns. Plaques will be awarded to the top scoring stations in each continent, both on s.s.b. and c.w.

Use a separate log sheet for each band. Include a summary sheet showing the scoring, your name and address in block letters, and a signed declaration that all rules and regulations have been observed.

The usual disqualification criteria will be observed and strictly enforced.

Mailing deadline for all entries is October 15th. This year logs go to: NRRL Contest Manager, Alf Almedal, LA5QK, N-4052 Royneberg, Norway.

Maine QSO Party

2300Z Sat. to 2359Z Sun., Sept. 26/27

The Portland A.W.A. is sponsoring this one on this busy weekend in September.

The same station may be worked on each band and each mode, and ME stations may work other ME stations for QSO and multiplier credit.

Exchange: QSO no., RS(T), and QTH. County for ME stations; state, province, or country for others.

Scoring: Each contact is worth 3 points. ME stations multiply total by ME counties + states + VE provinces + DX countries worked.

Others use ME counties for their multiplier (max. of 16).

Frequencies: C.W.—1805 and 55 kHz up from low end on other bands. Phone—1815, 3930, 7280, 14280, 21380, 28580. Novice—3720, 7120, 21120, 28120.

Awards: None were mentioned. However, probably the usual certificates will be awarded to the winners in each of the areas indicated in the exchange.

Applications for the Worked All Maine Counties Award may also be sent to the address below.

Mailing deadline is December 1st to: Portland A.W.A., P.O. Box 1605, Portland, ME 04104.

Delta QSO Party

1800Z Sat. to 2400Z Sun., Sept. 26/27
(Rest period 0600Z to 1200Z Sunday)

This is the 12th annual QSO party sponsored by the Delta Division of the ARRL.

Delta stations (Ark., La., Miss., Tenn.) may contact stations both in and outside their boundaries. Others only Delta stations.

The same station may be worked on each band and each mode, portable and mobiles in each county change.

Exchange: QSO no., RS(T), and QTH. County and state for Delta stations. ARRL section for others.

Scoring: *For Delta*—Total number of QSO's multiplied by ARRL sections worked (max. of 74).

Outside Delta—Total QSO's multiplied by the Delta counties worked (max. of 316). DX stations may be worked but for QSO points only.

Frequencies: C.W.—50 kHz up from low end of each band. S.S.B.—3990, 7290, 14290, 21390, 28590. Novice—3725, 7125, 21125, 28125.

Certificate Awards:

A. Achievement: To all stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 Delta states, 4th and 5th place awards if warranted.

C. Others: To the highest scoring station in each ARRL section and each country, 2nd and 3rd place awards if warranted.

D. Plaques: To the top scorers in and outside the Delta division. Top portable and mobile Delta stations. Highest scoring Delta Club station.

(For more detailed information and sample log forms send an s.a.s.e. to W5XX.)

Mailing deadline for logs is October 21st to: Malcolm P. Keown, W5XX, 213 Moonmist, Vicksburg, MS 39180.

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Operating Tips—Part II of IV

Last month's Novice column started this article about operating tips. It covers band and frequency selection, speed, sending, keying devices, and dit-to-dah relationships. Each part of this article provides useful information if read by itself; however, maximum benefit is derived from reading all four parts.

Calling and Answering

Hesitancy to Operate. New amateurs are usually hesitant to transmit and most of them spend a lot of time listening to contacts in progress between other amateurs. This is called "reading the mail," and it is a source of code receiving practice. However, nothing matches on-the-air two-way contacts for increasing code proficiency rapidly while having fun. When you are involved in an actual contact, the information you copy is much more important to you and you try harder to copy everything correctly. The Novice bands provide a higher degree of compassion and understanding than the other amateur bands. Don't be afraid to get on the air and operate. The initial feeling of sheer terror soon eases off to panic and that changes to enjoyment and great expectations as one continues operating.

Directional Calling. When a new amateur goes on the air, the locations of contacted stations do not matter very much because most contacts will be first contacts with other states and countries. After a while, the newcomer starts listening for amateurs in places not previously contacted. This type of contact selection is natural, but it can be carried to the extreme where one listens too much and does not engage in enough two-way contacts. If one simply works as many amateurs as possible, the states get confirmed faster and with less effort. The best way to get results is to make calls. It is useless to make directional calls (such as CQ Utah) unless you are hearing the area you want to contact on the band you are using. It is common to hear local amateurs cluttering up the band making hopeless directional calls in attempts to raise stations in areas that are not being heard. The only possible benefit derived from such unproductive directional calls is that the operator has some sending practice, but this type of practice is really unnecessary interference that should be avoided.

2814 Empire Ave., Burbank, CA 91504

This is 17-year-old Richard Clark, KA9HTW, of Monmouth, Illinois. He is in the second year of the electronics class at Galesburg High School. Richard first became interested in radio in 1976 when he started using the citizens radio service (CB) 11-meter band. He expanded his radio interests in 1978 when he started shortwave listening with a 1948 RCA receiver. He picked up a copy of the November 1978 CQ, and that got him started towards becoming an amateur. He obtained his Novice license in May of 1980, and he has had about 300 contacts, including several with amateurs in other countries. He uses dipoles and a vertical with the Heath gear shown in the photograph. Richard is interested in contest activity. He had the top Novice score in the last Illinois QSO Party.

Calling Versus Answering. The station that transmits the CQ call often has several amateurs respond to that call, providing a choice of contacts for the person initiating the QSO (contact). It is more productive to have several stations answer your CQ call, than for you to be one of many amateurs answering someone else's CQ. If you operate QRP (low power), it is much better to call than it is to answer; your peanut whistle can easily be drowned out by high power signals.

Short Versus Long Calls. Calling procedures are varied to meet existing conditions, but they are always short to be most effective. The difference is just between short calls and shorter ones. Newer operators usually go through a phase when they try long CQ calls in an attempt to get more answers. However, most of them quickly learn that this is not productive, and they are less likely to get a reply to a long CQ call than to a short one. Short and frequent CQ calls are more likely to get replies than long CQ calls. It is irksome to wait a long time for someone to finish sending a long CQ call, and many amateurs do not wait; they simply tune for some other station.

Calling Procedures. Many amateurs use the triple 3 by 3 calling procedure, which is as follows:

CQ CQ CQ DE W6JEP W6JEP W6JEP
CQ CQ CQ DE W6JEP W6JEP W6JEP
CQ CQ CQ DE W6JEP W6JEP W6JEP K

The preceding triple 3 (CQ) by 3 (callsign) calling system is quite satisfactory, but I have determined that the following sequence is more effective in the Novice bands:

CQ CQ CQ CQ CQ DE W6JEP
CQ CQ CQ CQ DE W6JEP W6JEP
CQ CQ CQ DE W6JEP W6JEP W6JEP K

In the preceding calling sequence, the fact that one is calling all stations is emphasized at first, whereas the callsign is sent the greatest number of times (3 in this case) at the end of this sequence. This shortens the overall call because CQ is shorter than any callsign. As always, DE means from and K means answer. From (DE) is just sent one time in each group and answer (K) is only sent one time at the end of the complete calling sequence.

It is good to shorten the calling sequence even more when the band is crowded or when you are operating in a contest. A single 3 by 3 or 2 by 2 call is usually appropriate and effective in such situations.

Varying Speed During CQ Calls. When code proficiency increases, it is important to remember that one can send too fast for some of the other amateurs to copy. It is a good practice to give the responding amateur a choice of code speeds for use during the contact. This choice can be indicated by sending each part of your CQ call at a different speed. As an example, if your top receiving speed is 12 wpm, you could vary the speed of your general call as follows:

CQ CQ CQ CQ CQ DE W6JEP (at 12 wpm)
CQ CQ CQ CQ DE W6JEP W6JEP (at 8 wpm)
CQ CQ CQ DE W6JEP W6JEP W6JEP K (at 4 wpm)

If you hear someone using this varied speed system, simply answer at the speed you want to receive. You do not have to match one of the 3 speeds; the other operator is simply letting you know that you have your choice of code speed, as long as you do not exceed the top speed at which the CQ call was sent.

Do not assume that every higher class (General, Advanced, or Extra) licensee you hear on a Novice band is using slow code for your benefit; that slow rate is often their top speed.

Calling on a Busy Frequency. It is poor practice to make a CQ call on a busy frequency. This often happens when one hears just the last part of a callsign while tuning across a band. When the entire callsign is not known for sure, an operator may send a CQ call in an attempt to have that station respond. However, if the other amateur is already involved in a contact (and was not calling CQ when heard), the subsequent CQ is very likely to cause unnecessary interference. Even if the other station was just calling CQ when part of the callsign was heard, she/he is using that frequency, and it is bad manners to take it over. The station initially using a frequency also retains priority to continue using it even when a contact is completed. If you answer another amateur's CQ and subsequently complete a contact with that amateur, remember that she/he retains the right to continue using that frequency at the conclusion of the contact. If another amateur calls you at the end of such a contact, it is proper to tell her/him to shift to some other adjacent unused frequency. Do not usurp a frequency that is being used.

QRZ? Use. When I am busy doing other things, I usually leave my receiver set to some frequency and listen while not operating. It is not unusual to hear someone come on a frequency that has been quiet for a long time and ask who is calling them (QRZ?). These operators usually make a transmission such as QRZ? DE W1COL. If you want to contact someone, do it correctly; either send a CQ call or answer someone else's CQ. In addition to using this subterfuge calling system, these QRZ? types usually shift across a band repeating this routine, often interfering with contacts already in progress. If you believe a station really did call you, but you missed their callsign, the correct way to ask who is calling you is to send DE WA6FNM QRZ? K (as an example). There is no station in the world with a callsign that begins with the letter Q; sending QRZ? DE WA6FNM K (as an example) is incorrect.

QRL? Use. A similar incorrect procedure that is also used as a subterfuge CQ call is the use of the Q-signal which asks if one is busy (QRL?). This is often sent to ask if a frequency is in use and to fish for a reply, such as QRL? DE WA6FNM K. It is a good practice to make sure that a frequency is not already in use before sending on it. However, a correct example of how this transmission should be sent is DE WA6FNM QRL? K. The thoughtfulness of considerate operators who check to find out whether or not a frequency is already in use is greatly appreciated and everyone should do so, but it may as well be done the right way. Do not use a Q signal in lieu of a CQ call.

Answering. When answering another station's CQ call, it is important to answer as close as possible to the other person's frequency. If more than one amateur responds to a CQ, the amateur who sent that general call to all stations will most likely hear the strongest signal that is closest to the same frequency. An additional benefit derived from this good operating practice is that the resultant contact essentially uses one frequency, instead of two. This factor is very important when the band is crowded with many stations. The response to a CQ call should be brief, using no more than a 3 by 3 transmission, such as:

WA6FNM WA6FNM WA6FNM DE W6LS W6LS W6LS K

Under contest conditions, this response should be shortened to 1 by 1 or 1 by 2 to save time. The response should not be faster than the speed at which the CQ was sent, and under no circumstances should you answer at a speed that is faster than you can receive.

Identification. Keep station indentification to a minimum. Once the contact has been established, the callsigns are known to both operators and there is no need to use each callsign more than once at the beginning and ending of each transmission. Station identification is required at the start and end of each transmission that is at least 3 minutes long, plus within each 10-minute interval of long transmissions. If a series of transmissions are made in which none is at least 3 minutes long, station identification is just required within each 10-minute span of these short transmissions. In such cases, one just uses the break sign (BK) at the start and end to signify that

identification is not desired. Break operation is suitable for exchanging brief bits of information. As an example, if you missed the other amateur's name, the exchange could be as follows:

$\overline{BK}$ WAT IS UR NAME? $\overline{BK}$
$\overline{BK}$ CARL ? CARL $\overline{BK}$

There is no limit to the variety of brief exchanges that can be handled faster and easier without station identification at the start and end of each transmission.

Novice Identification. One thing a Novice can do to assure more patience and understanding on the part of the other amateurs is to add the Novice indicator (N) to his callsign, such as KA6NEG/N. The FCC has stated that such additional identification is acceptable, and it is especially beneficial for new Novices to use this system because they no longer have distinctive prefixes which identify them to other amateurs as Novices. Poor sending, mistakes, and procedural errors are easier to forgive and accept when a beginner is doing the sending. Compassion and understanding are needed by most new operators and both are readily extended to newcomers, so let them know if you are a Novice.

Listening

The single most important capability one must develop to become a fine operator is that of listening. Good operators develop superb listening practices and patience.

A major difference between good and poor operators is that the good ones expect replies to their CQ calls and listen very carefully for those answers. When you complete a CQ call, quickly check the frequencies immediately above, below, and on your transmitting frequency. Most responses are within about 2 kiloHertz of

the same frequency, so do not tune too far nor too fast. Sweep receiving frequency slowly as you listen for a reply. If you hear someone send even one character that is not part of your callsign, leave that station and listen for someone else. Tune slowly about 2 kiloHertz above and below your frequency; if no reply is heard, tune a bit faster about 5 kiloHertz above and below your transmission frequency. If no answer is heard when tuning within 5 kiloHertz of your frequency, simply repeat your CQ call. Repeat this calling-and-listening sequence until a contact is established, or until you decide to shift to a different band or frequency. New operators tend to stop tuning for an answer when they hear another station; they stop and listen in on the conversation, which is called reading the mail. There is nothing wrong with this type of eavesdropping, but do not do it immediately after sending a CQ call; listen for a reply. It requires self-training to make yourself tune past a station that is close to your frequency but not answering your CQ, but you owe it to other amateurs to listen for their answers to your CQ calls. You can quickly develop the knack of picking out answering stations, and you will spend more time in contacts with less time used sending CQ calls. Listen on a frequency before transmitting. Take pride in not causing unnecessary interference to contacts already in progress. As detailed previously in this article, use QRL? correctly to determine if a frequency is already in use before you transmit.

Frequency Shifts. Some amateurs shift frequency whenever they do not hear a reply to their CQ call. This practice made sense years ago when many amateurs were rock bound (crystal controlled) at fixed frequencies. This constant shifting is no longer advisable, since almost all amateurs can shift frequency very easily and they do so as they are tuning for a contact. Frequency shifts following unproductive CQ calls are very likely to cause interference. A series of short CQ calls on the same open frequency almost always brings a reply.

Transmission Frequency Retention. It is natural to move the main tuning dial as one listens for an answer to a CQ call. This is the correct procedure if one has separate frequency controls for receiving and transmitting, such as when operating a receiver and transmitter instead of a transceiver. However, most new amateurs operate transceivers in which the main tuning dial adjusts both receiving and transmitting frequencies. If you are using a transceiver, do not move the main tuning control after you send a CQ call.

If you make the mistake of moving the main tuning, the other operator will not be listening on your resultant changed transmission frequency when you respond to his reply. If you did not shift frequency very far, the other amateur will probably hear you and be able to continue the contact, but the two of you may continue leap-frogging to different frequencies each transmission, which could cause eventual transmissions outside the assigned band segment.

Receiver-Only Tuning. Most transceivers include a feature that allows us to move the reception frequency (only) a few kiloHertz above and below the transmission frequency without disturbing the transmitting frequency. This feature is known by terms such as BFO (beat frequency oscillator), Clarifier, OT (offset tuning), Pitch, RIT (receiver incremental tuning), and Tone. No matter what it is called on your gear, it is important to know the correct way to use RIT. When tuning for a clear frequency to use when calling CQ, or tuning for a station to call, the RIT should be set to the zero offset point, or it can be turned off with most sets. If this is not done, you are not listening on the frequency where you will be transmitting. If you have made a CQ call, leave the main tuning control untouched and use the RIT to tune for responding stations. Obviously, this is not a consideration when operating a receiver and transmitter (instead of a transceiver) with separate frequency controls.

If you are running a transceiver that does not include receiver offset tuning (or some other tuning control that is separate from the transmitter tuning), you will note that it is better for you to answer CQ calls than to send them. This is true because your transmitting frequency has to be close to the other station's frequency for you to be hearing that station well, and your response should be heard with little or no tuning required by the other operator. However, if you call CQ and the other station answers too far away from your frequency, you have no way to tune that signal in without changing your transmission frequency.

When you have completed a contact with another amateur, tune your receiving frequency above and below the transmitting frequency you have been using and listen for stations that may be calling you. Listen for tail end callers just as if you had just sent a CQ call. Some operators meet this obligation by sending a very short (about one by one) CQ call at the conclusion of the previous contact to let any listening amateurs know that they are going to tune for anyone waiting for a contact. This is an efficient system which gives anyone who has waited an excellent chance to work the station she/he waited to contact.

Summary

This completes the second part of this four-part article. Part III will cover two-way contacts. The last part covers codes and signals, unusual types of operation, special interest organizations, operating violations, code practice, printed material, and related interests.

73, Bill, W6DDB

a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

Commission Cracks Down On Amateurs

In an action considered unprecedented by many, the Commission, in June 1981, ordered Leonard K. Boucher, K4MME, and Gerard J. Morin, W1GM, to show cause as to why their Extra Class amateur licenses should not be revoked or *modified* because of the intentional interference they have caused to the Maritime Mobile (MM) Net. Specifically, the Order to Show Cause and Suspension Order issued by the Commission proposes: **(1)** revocation of the amateur licenses of the two operators; and **(2)** suspension of their operator licenses. According to James McKinney, Chief, Field Operations Bureau, if revocation or suspension is not warranted, the Commission, citing Section 316 of the Communications Act of 1934 (as amended) will seek to modify the licenses of Boucher and Morin by prohibiting them from operating between 14293 and 14333 kHz for the remainder of their license terms.

The action taken by the FCC results from the interference Boucher and Morin are alleged to have caused to the MM Net in August 1980 and in February and May 1981. In May, for example, these operators are alleged to have used a split frequency scheme which interfered with U.S. Coast Guard attempts to obtain the assistance of the MM Net.

Boucher and Morin can request a hearing before the FCC, but the hearing, if held, will be in Washington, D.C.

Congress Admonishes Commission On Closure Of Field Offices

In its report to the Congress on appropriations for the FCC, the Committee on Commerce, Science, and Transportation, U.S. Senate, had harsh words for the Commission on recent actions taken to close numerous field activities. In the matter of the Federal Communications Commission Authorizations Act of 1981, the Report stated:

"The Committee admonishes the Commission to reverse its decision to close existing field offices, not adequately staff others, and its failure to open additional offices needed to provide better enforcement, particularly against malicious and repeated violations of FCC regulations, or the Communications Act."

The Committee unfortunately did not provide the funds needed to prevent closure of many FCC field activities. In fact, the Committee's adoption of the authorization level at almost $400,000 below that recommended by the administration means that the FCC will have to reallocate its resources if it is to place more emphasis on maintaining a viable field operation throughout the contiguous U.S., Alaska, and Hawaii.

AMRAD Reports Packet Radio And Spread Spectrum Progress

According to Paul Rinaldo, W4RI, President of the Amateur Radio Research and Development Corporation (AMRAD), "History was made in May on both the packet radio and spread spectrum fronts." Early in the month, William Moran, W4MIB, became the first amateur in the greater Washington, D.C., area to transmit packets. This success was soon followed by the first two-way amateur spread spectrum contact between Richard Kessler, K2SZE, of Rochester, NY, and Paul Rinaldo, of McLean, VA. These two operators used frequency hopping techniques in the 40 and 20 meter bands.

Packet radio and spread-spectrum modulation techniques are but two of many advanced communication techniques treated monthly in the AMRAD Newsletter. For more information on this newsletter, and on AMRAD, contact: Mr. Paul Rinaldo, W4RI, 1524 Springvale Avenue, McLean, VA 22101.

Packet Radio And Computer Networking Conference Announced

The ARRL is sponsoring a conference on Amateur Radio Computer Networking on October 16, 1981, at the National Bureau of Standards, Gaithersburg, MD. The event will be hosted by AMRAD and by the Radio Amateur Satellite Corporation (AMSAT). (Note that AMSAT will hold its annual meeting on October 17 at the nearby Goddard Space Flight Center.) The purpose of the ARRL conference is to explore the possibilities of implementing an integrated amateur computer network using h.f., v.h.f., and satellite packet radio as primary transmission means. The network would consist of amateurs in both the U.S. and Canada, and it would provide a means by which to service the public's third-party traffic needs.

Subjects to be discussed include network structure, protocols, message handling, equipment design and selection, software, integration with the National Traffic System, and interconnection with computerized bulletin board systems.

For more information on the conference, write the ARRL, 225 Main Street, Newington, CT 06111.

FCC Chairman Fowler Pledges Deregulation Of Telecommunications Industry

In his first speech after joining the FCC, Chairman Mark Fowler pledged to perform "radical surgery" on the agency, proposed to scrap FCC rules, and promised to "unregulate" the telecommunications industry.

Speaking at the 1981 National Cable Television Association convention in Los Angeles, CA, Fowler indicated that he would place much emphasis on deregulation, something which is likely to lead to considerable controversy during his term. Regardless, Fowler stated that "we will eliminate all unnecessary regulations

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and policies. The continued enforcement of pointless rules and policies imposes *costs on business, discourages individual* initiative, and weighs down the government."

Oak Industries Wins Case Against TV Pirates

A federal appeals court overturned a lower court decision in Los Angeles, CA, in May 1981 and supported Oak Industries' contention that the Communications Act of 1934 prohibited the interception of Oak's subscription TV service. Earlier, Judge Lawrence T. Lydick had dismissed a suit brought by subsidiaries of Oak against several individuals who allegedly produced and sold devices which could be used for receiving Oak's signals.

The basis upon which Oak won its case, according to Carl J. Bradshaw, vice president and chief legal officer of Oak Industries, was that subscription television signals are not for the general public's use, and therefore, are not exempt from federal laws which prohibit signal interception. Simply put, subscription TV services do not operate in the Broadcast service, and so, they are protected by Section 605 of the Communications Act.

The defendents in the case won by Oak could, of course, appeal to the Supreme Court. It appears unlikely that they will do so, however, and as such Mr. Bradshaw predicted that the appeals court ruling *would be "pretty much the end" of the piracy* issue. At the least, the appeals court ruling will strengthen claims by subscription TV operators around the country that manufacturers of devices which are used to intercept their signals are violating federal law.

Two Views On Owning The Airwaves

Earlier this year *The Washington Post Magazine* published an article entitled "Television Was Never Like This," by Ray Lane. The article detailed the benefits to be achieved through ownership of a television-receive-only (TVRO) earth station, and generally implied that it was legally, socially, and morally acceptable to intercept programming from satellites which was intended only for those willing to pay for the service.

In response to the article, Mr. Jack Valenti, President of the Motion Picture Association of America, Inc., took issue with Lane in this matter. "The author made no attempt to discuss the legal issues concerning satellite signals interception, most significantly Section 605 of the Communications Act, and thereby encouraged his readers to break the law unknowingly."

Mr. Valenti noted that in October 1978 the FCC issued a public notice stating *"that material submitted over domestic* satellites is not broadcast for (general) reception and that use (of such signals) must be given by the sender."

In his article Lane contended that "test cases have established that radio and television signals belong to the public." This statement was made before Oak Industries won its case on a similar matter (see above), although, as Mr. Valenti pointed out, unauthorized interception of over-the-air "pay TV" signals has already been held to be a violation of the law (see, for example, U.S. v. Westbrook).

Mr. Philip M. Ordway, in a letter to *The Washington Post Magazine*, however, supported Lane. Ordway took the position that he had the right to receive signals which penetrated his body and home. And if the satellite broadcasters didn't like it, he suggested that (1) they cease broadcasting to his property; and (2) that they code their broadcasts.

Valenti indicated that they just might take Ordway up on his suggestion, for he noted that "many satellite signals may be scrambled in the near future, and that earth stations purchased to intercept these signals may become worthless for that purpose."

It's safe to say that we have yet to hear the last word in this matter!

a monthly feature by
GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

After remaining more or less constant for the past three months, the present sunspot cycle again has begun to decline slowly. The *Royal Observatory of Belgium* reports a monthly mean sunspot number of 126 for May 1981. This results in a provisional smoothed sunspot number of 147.7 centered on November 1980. This is a drop of 2½ points from the plateau level of approximately 150 which lasted from August through October 1980.

A smoothed sunspot number of 125 is forecast for September 1981. While the present cycle is expected to continue its slow decline, solar activity forecast for September will remain well in the "high" range.

September is generally a month of change for h.f. radio propagation conditions. On some days conditions may seem much the same as during the summer months; on other days the first signs of wintertime conditions should be noticeable. For this reason, this month's column contains both Short-Skip and DX Propagation Charts. The DX Charts are valid for the period from mid-September through mid-October; the Short-Skip Charts are valid for the entire months of September and October.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for September 1981

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 4, 22, 31	A	A	B	C
High Normal: 2-3, 9, 15, 19, 21, 23, 29-30	A	B	C	C-D
Low Normal: 1, 5-6, 8, 13-14, 18, 20, 24, 27-28	A-B	B-C	C-D	D-E
Below Normal: 7, 10, 12, 16-17, 25-26	B-C	C-D	D-E	E
Disturbed: 11	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on Sept. 1st, good (B) on the 2nd and 3rd, excellent (A) on the 4th, good-to-fair (B-C) on the 5th and 6th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, David D. Meisel, Editor, 54 Westview Crescent, Geneseo, NY 14454.

September Conditions

During September expect a considerable increase in the number of DX openings during the daylight hours on *10*, *15*, and *20* meters. Of the three bands, conditions on *15* meters should be best most of the time, with *10* and *20* meters not far behind. Improved nighttime DX propagation conditions are forecast for *40*, *80*, and *160* meters as a result of the increasing hours of darkness and a seasonal decline in static levels. Nighttime conditions on *40* meters should be optimum, with conditions on *80* meters somewhat weaker and noisier. While improved DX conditions are expected on *160* meters, signals will continue to be relatively weak and noisy.

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With decreasing hours of daylight, September should see a decline in post sunset openings on *15* and *20* meters. Fairly good conditions, however, should continue, with *15* meters remaining open through the early evening hours on many days, and *20* meters available for DX through midnight, and on many days throughout the entire period of darkness.

The fall, or *autumnal, equinox* will occur on September 22 as the sun crosses the plane of the equator on its apparent travel from northern to southern skies. On this day the hours of daylight and darkness are equal in length throughout the world. The effects of the equinox are felt on h.f. propagation conditions from about mid-September through October. During this period, the characteristics of the ionosphere are similar over large areas of the world, and this is usually the best season for DX openings between the temperate regions of both the northern and southern hemispheres. A similar period occurs during the spring equinox, which is centered on March 21. Look for an improvement in conditions between the U.S.A. and South America, to the South Pacific area and Australasia, to southern Asia, and to southern Africa and Antarctica. This improvement should be noticeable on all bands *10* through *160* meters. The best times to look for equinoctial-type openings should be the twilight periods around local sunrise and sunset, but they will occur at other times as well. Many of these inter-hemispheric openings may follow either the *long* or the *short* great circle path, so be sure to check both directions. The expected improvement in equinoctial propagation is reflected in the DX Propagation Charts appearing in this month's column.

V.h.f. Ionospheric Openings

Solar activity remains high enough to support some F-2 layer DX openings from the U.S. to many areas of the world on the 6meter band. During September and early October it may be possible to take advantage of equinoctial propagation for 6 meter DX openings between the U.S. and the temperate areas of the southern hemisphere. The best times for such openings are during the daylight hours, and they are shown with a ** in the DX Propagation Charts.

Conditions are expected to improve during September for trans-equatorial (TE) type openings on 6 meters. The best time to look for such openings is between 8 and 11 p.m., local standard time. TE openings favor locations in the southern tier states, and they generally extend across the magnetic equator into the temperate areas of South America. While F-2 layer openings on 6 meters are often steady and strong, TE openings are usually characterized by very weak signals and strong flutter fading.

Although summertime sporadic-E ionization should fall off considerably during

September, an occasional 6 meter short-skip opening may still be possible over distances ranging between approximately 1000 and 1300 miles. Best time to check for these short-skip conditions is before noon and again during the early evening.

While no major meteor showers are expected during September, some minor activity may be possible on September 1, 21, and 29. Check for meteor-type ionospheric openings on both 6 and 2 meters on these days.

Auroral activity tends to increase during the equinoctial period, so some auroral-type ionospheric openings are likely on both 6 and 2 meters during September. The best possibilities for such openings should coincide with periods of expected radio storminess. Check the Last Minute Forecast at the beginning of this column for those days during September that are expected to be Below Normal or Disturbed.

CQ DX Contest Special 1981

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 24–25—Phone Section
November 28–29—C.W. Section

As during the past 30 years, next month's Propagation column will be devoted to a special, comprehensive forecast which will focus on both sections of the Contest.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location, The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

September 15 - October 15, 1981
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-16 (1) 09-11 (1)**	08-09 (1) 09-11 (2) 11-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	02-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-21 (3) 21-02 (2)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European USSR	09-10 (1) 10-13 (2) 13-14 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-16 (1)	03-06 (1) 06-08 (2) 08-11 (3) 11-13 (2) 13-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-04 (2) 04-06 (1) 21-04 (1)*
Eastern Mediterranean & Middle East	09-10 (1) 10-12 (2) 12-14 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-09 (2) 09-15 (1) 15-17 (2) 17-21 (3) 21-23 (2) 23-01 (3) 01-03 (2) 03-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-21 (4) 21-00 (3) 00-03 (2) 03-05 (1)	20-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
Eastern & Central Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	08-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-17 (2) 17-22 (3) 22-02 (2) 02-03 (1)	20-02 (1) 00-01 (1)*
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 14-15 (1) 10-12 (1)**	08-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	09-11 (1) 19-22 (1)	08-09 (1) 09-12 (2) 12-13 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	05-07 (1) 20-23 (1)
Southeast Asia	11-14 (1) 18-21 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-18 (1) 20-21 (1) 21-00 (2) 00-02 (1)	06-08 (1)
Far East	09-11 (1) 18-20 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-20 (2) 20-22 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (1) 18-20 (1) 20-22 (2) 22-00 (1) 00-03 (2) 03-04 (1)	05-08 (1) 18-19 (1) 05-07 (1)*
South Pacific & New Zealand	09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 16-18 (1)**	08-09 (1) 09-11 (2) 11-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	12-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3) 04-08 (2) 08-10 (3) 10-12 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	10-12 (1) 14-16 (2) 17-18 (3) 18-19 (2) 19-21 (1) 17-19 (1)**	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-17 (1) 17-18 (2) 18-20 (4) 20-21 (2) 21-23 (1)	07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1) 04-05 (1)* 23-02 (3) 02-04 (2) 04-07 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 09-12 (1)**	06-07 (1) 07-08 (2) 08-11 (4) 11-13 (3) 13-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	03-05 (2) 05-07 (3) 07-10 (4) 10-14 (2) 14-16 (3) 16-23 (4) 23-03 (3)	19-20 (1) 20-21 (2) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	08-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-20 (1) 09-16 (1)**	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	11-16 (1) 16-17 (2) 17-20 (3) 20-01 (4) 01-04 (3) 04-06 (2) 06-08 (3) 08-11 (2)	21-00 (1) 00-05 (2) 05-07 (1) 01-06 (1)*
McMurdo Sound, Antarctica	16-19 (1)	12-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-04 (2) 04-08 (1) 08-10 (2) 10-11 (1)	23-01 (1) 01-05 (2) 05-07 (1) 05-07 (1)*

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1) 11-13 (2) 13-14 (1) 10-11 (1)**	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-18 (3) 18-23 (2) 23-03 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern & Central Europe & European USSR	09-13 (1)	08-09 (1) 09-11 (2) 11-12 (3) 12-13 (2) 13-15 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-17 (3) 17-19 (2) 19-21 (1) 23-04 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)
Eastern Mediterranean & Middle East	10-13 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	20-23 (1) 21-23 (1)*
Western Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-02 (2) 02-05 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	11-13 (1) 13-16 (2) 16-17 (1) 09-11 (1)**	09-10 (1) 10-13 (2) 13-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-23 (2) 23-00 (1) 07-09 (1)	21-00 (1)
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 13-15 (1) 10-13 (1)**	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-22 (2) 22-01 (3) 01-05 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	06-08 (1) 19-21 (1)
Southeast Asia	10-12 (1) 12-13 (2) 13-15 (1) 17-18 (1) 18-19 (2) 19-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 18-19 (1) 19-20 (2) 20-22 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-13 (1) 16-20 (1) 20-23 (2) 23-02 (1)	05-09 (1)
Far East	15-17 (1) 17-19 (2) 19-20 (1)	10-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-19 (2) 19-21 (1) 21-23 (2) 23-00 (3) 00-01 (2) 01-03 (1)	03-05 (1) 05-08 (2) 08-09 (1) 06-08 (1)
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 11-14 (1)** 16-18 (1)**	08-09 (1) 09-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	04-08 (2) 08-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3)	00-01 (1) 01-06 (3) 06-08 (4) 08-09 (2) 09-10 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 16-18 (1)**	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	06-08 (2) 08-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-20 (2) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-08 (1) 08-09 (2) 09-11 (4) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-10 (4) 10-12 (3) 12-14 (2) 14-16 (3) 16-23 (4) 23-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-22 (3) 22-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-07 (1)*

Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Urguay	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 09-15 (1)**	06-07 (1) 07-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	10-16 (1) 16-17 (2) 17-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-10 (2)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-19 (1)	11-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-23 (1)	16-17 (1) 17-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 07-09 (2) 09-10 (1)	23-01 (1) 01-05 (2) 05-07 (1) 04-06 (1)*

* Indicates best time for eighty meter openings. Openings on 160 Meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2), or higher.

** Indicates best times to listen for F-2 layer openings on 6 meters.

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 23-01 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	09-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-17 (2) 17-18 (1) 21-23 (1)	20-21 (1) 21-22 (2) 22-23 (1)* 21-22 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (3) 11-12 (2) 12-13 (1) 20-22 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (3) 16-20 (1) 20-23 (2) 23-01 (1)	20-23 (1)
Western & Central Africa	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-23 (3) 23-01 (2)	21-00 (1)
Eastern Africa	11-13 (1) 13-15 (2) 15-16 (1)	09-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	20-23 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-09)1) 09-11 (2) 11-14 (3) 14-16 (2) 16-17 (1)	01-07 (1) 07-09 (2) 09-10 (1) 12-16 (2) 16-20 (3) 20-01 (2)	19-22 (1)
Central & South Asia	09-11 (1) 17-19 (1)	08-11 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-01 (1)	02-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-21 (2) 21-02 (1)	06-08 (1) 19-21 (1)
Southeast Asia	09-10 (1) 10-11 (2) 11-12 (2) 16-17 (1) 17-18 (2) 18-19 (1) 15-17 (1)**	07-10 (1) 10-13 (2) 13-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	03-07 (2) 07-09 (3) 09-12 (2) 12-13 (1) 21-22 (1) 22-01 (2) 01-03 (3)	01-03 (1) 03-06 (2) 06-08 (1)
Far East	15-16 (1) 16-17 (2) 17-18 (3) 18-19 (2) 19-20 (1) 14-16 (1)**	09-11 (1) 14-15 (1) 15-18 (2) 18-19 (3) 19-20 (4) 20-21 (2) 21-22 (1)	04-07 (2) 07-10 (4) 10-13 (3) 13-15 (2) 15-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	01-03 (1) 03-07 (2) 07-08 (3) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
South Pacific & New Zealand	10-12 (1) 12-13 (2) 13-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 10-13 (1)** 15-18 (1)**	07-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (3) 16-21 (4) 21-23 (3) 23-01 (2) 01-02 (1)	14-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-04 (3) 04-08 (2) 08-09 (3) 09-11 (4) 11-12 (3) 12-14 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-21 (2) 21-22 (1) 15-17 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-17 (3) 17-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	08-10 (4) 10-12 (3) 12-13 (2) 13-15 (1) 15-18 (2) 18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-08 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distances column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occurr on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. On the Short-Skip Chart appropriate *daylight time* is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to covert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone, 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters; a half-wave length above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Department of Commerce, Boulder, Colorado, 80302.

Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-15 (4) 15-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-08 (1) 08-09 (3) 09-11 (4) 11-13 (3) 13-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (3) 07-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-23 (4) 23-02 (3) 02-06 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (2) 06-08 (1) 20-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	07-08 (1) 08-09 (2) 09-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-14 (1)**	06-07 (1) 07-08 (2) 08-10 (3) 10-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (1)	21-23 (1) 23-03 (2) 03-05 (1) 00-03 (1)*
McMurdo Sound, Antarctica	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-16 (2) 16-20 (3) 20-21 (2) 21-23 (1)	08-10 (1) 15-17 (1) 17-19 (2) 19-22 (3) 22-00 (4) 00-03 (3) 03-08 (2)	22-00 (1) 00-05 (2) 05-06 (1) 03-05 (1)*

CQ Short-Skip Propagation Chart September & October, 1981 Local Daylight Time At Path Mid-Point (24-Hour Time System)

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	10-19 (0-1)	08-10 (1) 10-12 (1-2) 12-14 (1-3) 14-15 (1-4) 15-17 (1-3) 17-19 (1-2) 19-22 (0-1)	08-09 (1-2) 09-10 (1-3) 10-12 (2-4)** 12-14 (3-4)** 14-15 (4) 15-17 (3) 17-19 (2) 19-20 (1-2) 20-22 (1)
15	*Nil*	08-10 (0-1) 10-14 (0-2) 14-15 (0-3) 15-17 (0-2) 17-21 (0-1)	08-10 (1-2) 10-14 (2-4) 14-15 (3-4) 15-17 (2-4) 17-20 (1-3) 20-22 (1-2) 22-08 (0-1)	08-09 (2) 09-10 (2-3) 10-17 (4) 17-20 (3) 20-22 (2-3) 22-23 (1-2) 23-01 (1) 01-08 (1-0)
20	12-14 (0-1) 14-17 (0-2) 17-22 (0-1)	08-10 (0-3) 10-12 (0-4) 12-14 (1-4) 14-17 (2-4) 17-18 (1-4) 18-22 (1-3) 22-03 (0-2) 03-08 (0-1)	06-08 (1-2) 08-10 (3-4) 10-18 (4) 18-22 (3-4) 22-01 (2-3) 01-03 (2) 03-06 (1)	06-08 (2) 08-10 (4) 10-14 (4-2) 14-16 (4-3) 16-22 (4) 22-00 (3-4) 00-01 (3) 01-03 (2) 03-06 (1-2)
40	08-10 (2-3) 10-12 (3-4) 12-18 (4) 18-20 (3-4) 20-23 (1-2) 23-06 (0-1) 06-08 (1-2)	08-10 (3-4) 10-12 (4-3) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-01 (1-4) 01-06 (1-3) 06-08 (2-3)	08-10 (4-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-01 (4) 01-04 (3-4) 04-06 (3) 06-08 (3-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-04 (4) 04-06 (3-4) 06-08 (4-3)
80	07-09 (3-4) 09-11 (4) 11-19 (4-3) 19-00 (4) 00-05 (3-4) 05-07 (2-4)	07-09 (4-2) 09-11 (4-1) 11-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-07 (4)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (4-3)	07-09 (1-0) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (4-2) 06-07 (3-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

HAWAII September & October, 1981 Openings Given In Hawaiian Standard Time —

TO:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	06-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-16 (2) 16-18 (3) 18-20 (2) 20-22 (1)	11-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Central USA	06-08 (1) 08-11 (2) 11-14 (4) 14-16 (2) 16-17 (1) 12-14 (1)**	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-04 (2) 04-06 (3) 06-09 (2)	18-20 (1) 20-22 (2) 22-01 (3) 01-03 (2) 03-04 (1) 21-22 (1)* 22-00 (2)* 00-02 (1)*
Western USA	07-09 (1) 09-11 (2) 11-14 (4) 14-16 (3) 16-18 (2) 18-19 (1) 12-14 (1)**	06-07 (1) 07-09 (2) 09-14 (3) 14-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	10-15 (2) 15-17 (3) 17-19 (4) 19-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*

ALASKA September & October, 1981 Openings Given in GMT —

TO:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	18-20 (1) 20-23 (2) 23-00 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	14-16 (1) 21-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	08-12 (1)
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	15-17 (1) 21-23 (1) 23-00 (2) 00-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-13 (2) 13-14 (1) 11-13 (1)*
Western USA	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-23 (2) 23-02 (4) 02-03 (3) 03-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.

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.

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CUSHCRAFT ANTENNAS

A-3, 3 el. Tribander	$171.00
A-4, 4 el. Tribander	$205.00
A-743, 30-40m Kit (A-3)	$ 54.00
A-744, 30-40m Kit (A-4)	$ 54.00
20-4CD, 4 el. 20 mtr. Mono	$235.00
20-3CD, 3 el. 20 mtr. Mono	$160.00
15-4CD, 4 el. 15 mtr. Mono	$ 96.00
15-3CD, 3 el. 15 mtr. Mono	$ 89.00
10-4CD, 4 el. 10 mtr. Mono	$ 82.00
10-3CD, 3 el. 10 mtr. Mono	$ 69.00
32-19, 2m SSB Boomer	$ 75.00
214B, 2m SSB Jr Boomer	$ 61.00
214FB, 2m FM Jr Boomer	$ 61.00
ARX-2B, 2m Ringo Ranger II	$ 38.00

ROHN TOWERS & ACCESSORIES

25G Section	$ 38.50
45G Section	$ 87.60
HDBX48	$305.00
Self supporting tower	
HBX56	$335.00
Self supporting tower	
3/16 EHS guy wire, 500 ft.	$ 63.00
3/16 CCM cable clamp	$ .29
3/8 Turnbuckle, eye & eye	$ 5.39
M200H 10 ft. H.D. galv. mast	$ 36.99

TOWER HARDWARE

3/16 EHS Guywire, 500 ft	$ 56.00
3/16 CCM Clamps	$ .29
1/4 TH Thimble	$ .24
3/8 E&E Turnbuckle	$ 5.39
3/16 Preformed Guy Grip	$ 1.45
GAS-604 4' Screwanchor	$ 11.50
M-200H, 10 ft MD Mast	$ 35.00
500D Guy Insulator	$ .85
502 Guy Insulator	$ 1.85

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TH6DXX	$ 244.00
TH5DXX	$ 201.00
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TH2MKIII	$ 118.84
TH3JR	$ 137.00
105BA	$ 98.00
155BA	$ 150.00
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204BA	$ 188.00
402BA	$ 172.00
DB1015A	$ 127.00
18AVT	$ 83.00
14AVQ	$ 49.00
18HT	$ 279.00
BN86	$ 13.00

HY-GAIN CRANK-UP TOWERS

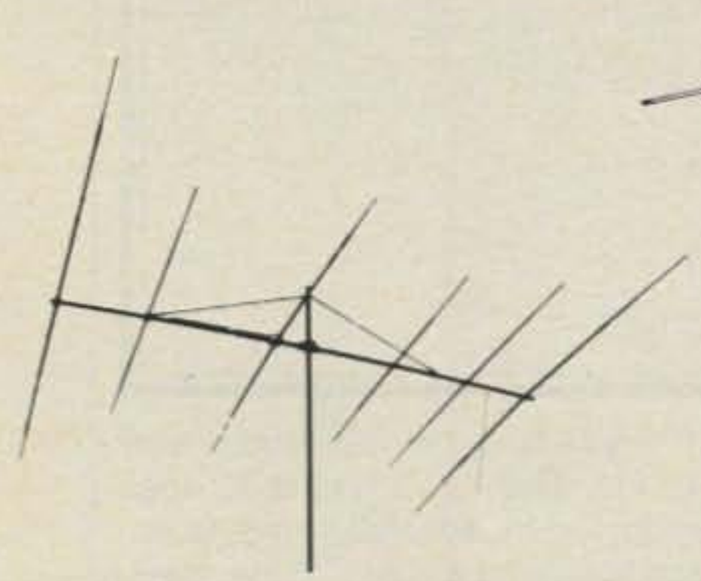
HG-52SS	$ 777.50
52 ft. self supporting. 9 sq. ft. at 50 mph. Nested height: 20½ ft.	
HG-50MT2	$ 669.00
50 ft. side supported. 6 sq. ft. at 50 mph. Nested height: 20½ ft.	
HG-54HD	$1513.00
54 ft. self supporting. 16 sq. ft. at 60 mph. Nested height: 21 ft.	
HG-70HD	$2187.00
70 ft. self supporting. 16 sq. ft. at 60 mph. Nested height: 23 ft.	

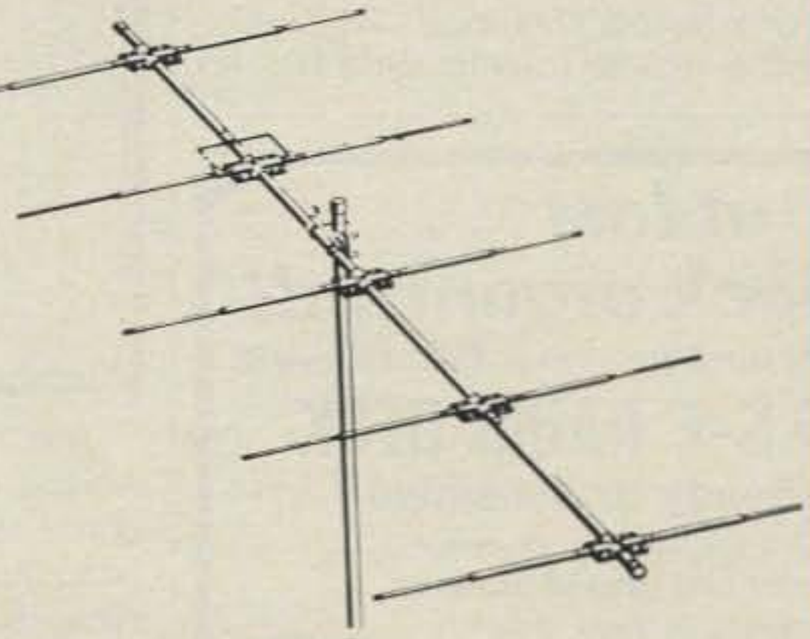
CABLE

RG-213/U, 50 Ohm Coax	$ .29/ft
8 Cond. Rotor (2 #18, 6 #22)	$ .18/ft
8 Cond. HD Rotor (2 #16, 6 #18)	$ .36/ft

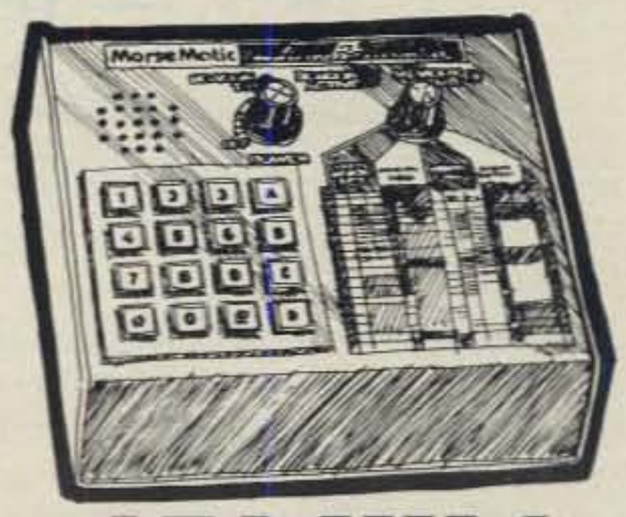
ROTORS

HyGain HDR300, 25 sq ft	$395.00
CDE Ham IV, 15 sq ft	$167.00
CDE T2X, 30 sq ft	$231.00



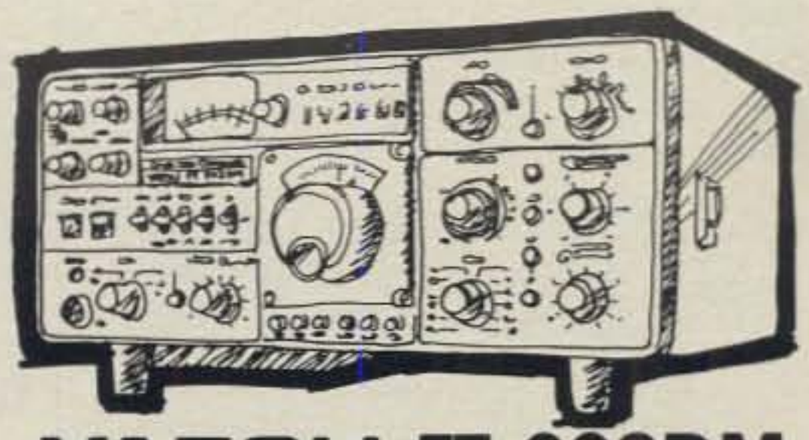


Prices subject to change without notice.



AEA MM-1

Contestor's Delight, 10 memories, with automatic serial number generation.



YAESU FT-902DM

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CQ SHOWCASE

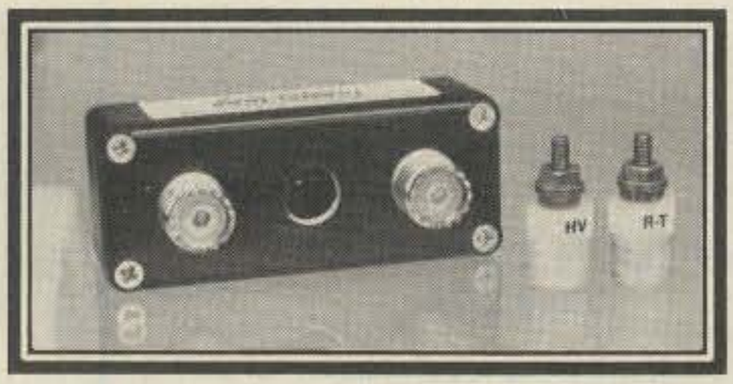
Xantek's The DX Edge

The DX Edge is a new operating aid for DXers and contesters. It consists of a world map in the form of a slide case and 12 monthly transparent slides showing areas of daylight and darkness throughout the world. By moving the slides across the map, the user instantly sees the position and shape of the Gray Line (the terminator). Sunrise and sunset times for any QTH in the world can easily be seen. A double map of the world permits the user to see either the short or long path between any two QTH's.

The DX Edge can be used anywhere in the world without modification. Only one purchase, not an annual renewal, is necessary. Construction is of durable plastic. The DX Edge is priced at $14.95 and is produced by Xantek, Inc. For more information, contact the DX Edge, P.O. Box 834, Madison Square Station, New York, NY 10159, or circle number 104 on the reader service card.

Alpha Delta Transi-Trap Surge Protectors

Transi-Trap Surge Protectors are gas surge arresters designed to protect sensitive electronic equipment from damage due to excessive voltages or currents generated by transient phenomena. The elements in the Arc-Plug™ Cartridge are constructed of two metal electrodes hermetically sealed in a gas-filled, ceramic cylinder. In operation, application of a sufficient voltage across the element causes an arc to form between the electrodes, changing its impedance from greater than 10,000 megohms to a few milliohms in less than 10 nanoseconds.



Models available are the R-T Low Level Protector for use with units running up to 200 watts at 50 ohms ($29.95 plus $4 shipping and handling) and the HV High Voltage Protector for linear amplifiers running up to 2 kw at 50 ohms ($32.95 plus $4). Replacement cartridges are $9.95 and $12.95, respectively, plus $2 shipping and handling each. For more information, contact Alpha Delta Communications, 116A North Main St., Centerville, OH 45459, or circle number 108 on the reader service card.

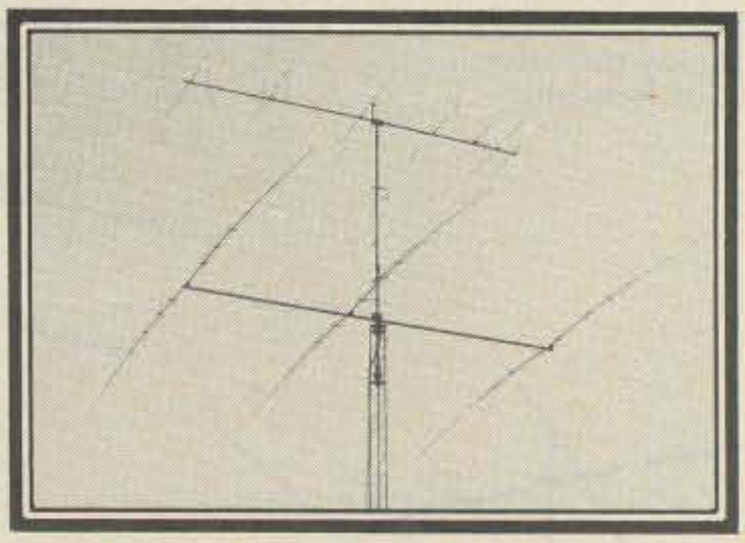
Macrotronics RTTY TRS-80 System

The disk-based "Mailbox" RTTY system for the TRS-80 transforms a TRS-80 disk system into a sophisticated RTTY communications terminal. Features include disk-based WRU with "Mailbox" storage and retrieval of messages; disk-based programmable messages; disk-based storage and replay of received text; transmission and reception of BASIC programs; auto 10-minute ID timer; user-programmable end-of-line sequence; word mode editing; on-line buffered ASCII printer-driver; and more.

The M8000 disk-based RTTY system requires the Model I TRS-80. The M8300 requires the Model III TRS-80. Both systems come complete with customized program on disk, a user's guide, quick reference card, and conversion module. For more information, contact Macrotronics, Inc., 1125 N. Golden State Blvd., Turlock, CA 95380, or circle number 109 on the reader service card.

KLM 2 and 3 Element 40 Meter Monobanders

KLM's 2 element 7.2-2 and 3 element 7.2-3 monobanders are based on the company's 4 element "Big Sticker" but require less air space and are usable with most standard amateur rotators. Lossless linear loading keeps element length to 46 feet and permits stacking within 4 feet of 20 meter beams.



The 7.2-2 sits on a 16 foot boom and weighs 45 lbs. The 7.2-3 has a 32 foot boom, supported by stainless steel overhead guy cables, and weighs 70 lbs. Both have 6063-T832 aluminum alloy elements and boom, Lexan insulators, and all stainless steel hardware (except u-bolts). Each is supplied with KLM's 1:1 4 kw p.e.p. ferrite balun. For more information, contact KLM, P.O. Box 816, Morgan Hill, CA 95037, or circle number 102 on the reader service card.

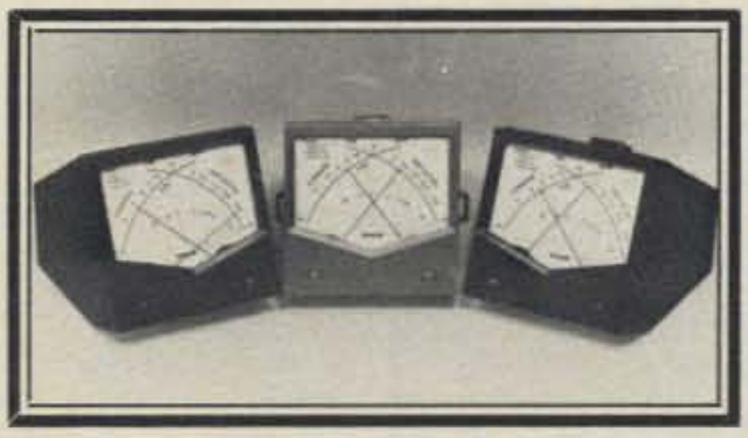
Grove Enterprises Scanner Filter

The Scanner Filter is designed to tune out TV and f.m. broadcast interference, eliminate receiver images, reject shortwave i.f. feedthrough and receiver desensitizing from front-end overload. Gone will be the aircraft images on high-band police and fire channels, 2-meter amateur repeaters being heard in the federal government spectrum, and mobile telephone tones and signals paralyzing reception.

The Scanner Filter requires no power source; it plugs directly into the antenna jack of a scanner. A frequency-calibrated dial allows the user to adjust the unit to any signal frequency he desires to reject. From 80–180 MHz, a selective notch filter does the rest. The unit sells for $39.95 plus $1.75 shipping and handling. For more information, contact Grove Enterprises, Dept. W, Brasstown, NC 28902, or circle number 101 on the reader service card.

MCM SWR/Power Meters

The CN-520, CN-540, and CN-550 SWR/Power meters each feature cross needle metering in a compact package (72W × 72H × 95D mm). Forward power, reflected power, and resultant SWR can be read on one meter. No sensitivity adjustments are required. Each meter is equipped with SO-239 connectors.



The CN-520 covers the frequency range 1.8–60 MHz, power range forward 200/2 kw, reflected 40/400 w. The CN-540's frequency range is 50–150 MHz, power range forward 20/200 watts, reflected 4/40 watts. The CN-550 covers 144-250 MHz, power range forward 20/200 watts, reflected 4/40 watts. For more information, contact MCM Communications, 858 E. Congress Park Dr., Centerville, OH 45459, or circle number 110 on the reader service card.

Announcing *(from page 9)*

● **October/November 81 Shortwave Meeting** - For details send a No. 10 s.a.s.e. to S.C.A.D.S., Don Schmidt, Director, 3809 Rose Ave., Long Beach, CA 90807.

Sept. 5-6, **12th Annual Danville Area Hamfest**, Georgetown, Illinois Fairgrounds. Contact Lowell Wells, WD9AFG, RR 3, Box 215, Danville, IL 61832.

Sept. 6, **Bloomington Area Hoosier Backyard Hamfest**, 2335 Vernal Pike, Bloomington, Indiana. Contact Chuck Kraus, KA9EYM, Bloomington ARC, P.O. Box 73, Bloomington, IN 47401.

Sept. 12, **Sussex County ARC Hamfest 81**, Sussex County Farm and Horse Show grounds, Plains Road, Augusta, New Jersey. Contact Sussex County ARC, P.O. Box 11, Newton, NJ 07860.

Sept. 13 (rain date Sept. 20), **Suffolk County Radio Club 4th Annual Electronics Fleamarket**, Odd Fellows Hall, Jayne Blvd., Port Jefferson, Long Island, New York. Contact Floyd Davis, 516-234-9376.

Sept. 13, **Hall of Science ARC 6th Annual Hamfest**, Municipal Parking Garage, one block north of Queens Blvd., 80-25 126th St., Kew Gardens, New York. Contact Tom Doyle, KA2DTB, 212-738-8887, or 212-641-1700.

Sept. 13, **Central Alabama ARA 4th Annual Hamfest**, Civic Center, Montgomery, Alabama. Contact Hamfest Committee, P.O. Box 3141, Montgomery, AL 36109.

Sept. 18-19, **Ham-O-Rama 81**, Erie County Fairgrounds, south of Buffalo, New York. Contact Nelson Oldfield, 126 Greenway Blvd., Cheektowaga, NY 14225, or Mike Merrick, 419 Sommerville Ave., Tonawanda, NY 14150.

Sept. 19-20, **Peoria Superfest 81**, Exposition Gardens, W. Northmoor Rd., Peoria, Illinois. Contact Superfest 81, 5808 N. Andover Ct., Peoria, IL 61615.

Sept. 20, **Candlewood ARA Fleamarket and Auction**, Essex House, Rt. 6, Newton, Connecticut. Contact George, WB2THN, 914-533-2758, or Ken, KA1GDS, 203-744-6953.

Sept. 20, **L'Anse Creuse ARC 9th Annual Swap and Shop**, L'Anse Creuse High School, Mt. Clemens, Michigan. Contact Mike Cocoran, 650 Chippewa, Mt. Clemens, MI 48043.

Sept. 22-27, **11th Annual Greater Louisville Hamfest and 1981 Great Lakes Division Convention**, East Hall of the Kentucky Fair and Exposition Center, Louisville, Kentucky. Contact Greater Louisville Hamfest, P.O. Box 34444, Louisville, KY 40232, phone 502-634-0619.

Sept. 26-27, **ARRL Roanoke Division Convention, 6th Annual Tidewater Hamfest-Computer Show**, Virginia Beach Pavillion. Contact TRC, P.O. Box 7101, Portsmouth, VA 23707, phone 804-587-1695.

Sept. 26-27, **Calhoun County ARA 2nd Annual Hamfest**, Municipal Auditorium, 1128 Gurnee Ave., Anniston, Alabama. Contact Dale Boothe, KA4LRL, c/o CCARA, P.O. Box 1624, Anniston, AL 36202.

Sept. 27, **8th Annual Lanierland Hamfest**, Holiday Hall, Holiday Inn, Gainesville, Georgia. Contact Paul Watkins, Jr., W4FDK, Route 11, Box 536, Gainesville, GA 30501.

Sept. 27, **Sangamon Valley Radio Club 6th Annual Hamfest**, Sangamon County Fairgrounds, New Berlin, Illinois. Contact S.V.R.C., c/o Red Cross Bldg., 1025 S. Sixth, Springfield, IL 62703.

Sept. 27, **7th Annual CVARC ARRL Hamfest**, Hawkeye Downs Exhibition Building, Cedar Rapids, Iowa. Contact CVARC Hamfest, P.O. Box 994, Cedar Rapids, Iowa 52406.

Sept. 27, **5th Annual Connecticut Valley FM Assn. Hamfest/Fleamarket**, King Ridge Ski Area, New London, New Hampshire. Contact Connecticut Valley FM Assn., Box 173, E. Wallingford, VT 05742.

Sept. 27, **7th Annual Cleveland Hamfest**, Cuyahoga County Fairgrounds, Berea, Ohio. Contact Cleveland Hamfest Assn., Box 27211, Cleveland, OH 44127.

Zero Bias *(from page 6)*

turn. There has always been that core who took up the challenge and asked, "What if?" or "I wonder if this will work?" They have been the providers of technology and wonder that most of us admire if not envy. It is this *unique* amalgam, however, that has always set us apart from any other service. It is this *uniqueness* that has mandated our examination program, a process that many of us would not change and some of us would make harder.

It is not being paranoid to feel threatened by what appears to be the dissolution of our *uniqueness*, albeit our individual identity. In this atmosphere of deregulation and simplification, the logical extension of the "Plain Language" rules, since they will no longer feature and protect our *uniqueness* or provide for our traditional technological choices, is simple. If this be so, then the next mandate should be for a classless, examless, all encompassing license which is applied for. For if we are to become no different in principle from the Citizen Band enthusiast, the radio control devotee, or the police officer who operates a radar unit, then we should, as they, simply apply for a license for the amateur service. Everyone should by this logic have free and complete access to the amateur bands merely by filling out a form.

No one can charge that the old rules were ineffective or didn't serve their purpose. It is quite apparent that Washington has lost sight of this particular constituency, its history, traditions, and accomplishments.

73, Alan, K2EEK

Ham Shop

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Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non subscriber) will be printed unless accompanied by full remittance. Non-commercial ads free to CQ subscribers (maximum 3 lines per month). All ads must be typewritten double spaced. Recent CQ mailing label must accompany ad. **Closing Date:** The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 76 N. Broadway, Hicksville, NY 11801.

ROHN TOWER: Available direct to you from worldwide distributor, all products available. Sample prices: 25 G sections $40.54 each; 45 G sections $91.85 each; BX48 Tower $231.00 each. HILL RADIO, Box 1405, 2503 G.E. Road, Bloomington, IL 61701, (309) 663-2141.

HEATH TEST INSTRUMENTS. All new, assembled and calibrated. Send SASE for details. George Konya, 3067 North 2450 West, Salt Lake City, Utah 84116.

BUILD ANTENNA TUNER for power levels up to 500 watts and from 160 through 10 meters using brand new ARC-5 transmitters, conversion data included, priced at $18.95. Send for gov't surplus catalog for equipment, tubes and parts, 50¢. G & G Radio, 45W Warren St., New York, NY 10007.

FOR SALE: Collectors item General Radio 1100A Frequency Standard Serial 590 with 5 units to 1000 MC in GR 75 inch cabinet. Make offer. Also older Hewlett-Packard and Tektronix collectors items. Joe F. Keese, W8VSK, 47270 W. Main, Northville, MI 48167. Phone 313-349-5893.

WANTED: Hallicrafter S-1 through S-7, DD-1, 8 HPA, SX-10, SX-12, and other early Hallicrafter gear, parts, manuals, and accessories. Any condition. For my collection, please write, even if in doubt on Model No. Chuck Dachis, WD5EDG, 4500 Russell Dr., Austin, TX 78745.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept C, Berwyn, IL 60402.

CODE PRACTICE: Computer generated Cassette Tapes, you specify speed 4–25 wpm, $3.95 ea. Two for $7.50. Send check or money order. Fast delivery. K-Tron Sales, Box 912, Shawnee, OK 74801.

TRS 80 OWNERs: The Ultimate Code Practice Program. Adjust speed 4–25 wpm, sound, machine language, Level II 16K. Send $12.95 check or money order. Fast delivery. K-Tron Sales, P.O. Box 912, Shawnee, OK 74801.

HEATH HW-8 FOR SALE. $95. Wm. Barden, 28182 Palmada, Mission Viejo, CA 92692, (714) 951-0129.

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WE NEED ARC-51BX, ARC-94, ARC-102, ARC-105, ARC-115, ARC-116, RT-823/ARC-131 or FM-622, Wilcox RT-857/ARC-134 or 807A, ARC-164, RT-529A/APN-133, APN-171 or Honeywell HG9050 Radar Altimeter Transceivers, APX-72, Collins ARN-82, ARN-83, 618T, Antenna Couplers 490T, CU-1658A or CU-1669A, Instruments ID-663/U, ID-883/U, ID-998/ASN, ID-1103, ID-1351/A, C-6H, 331C-4F.

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deluxe metal case

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33 elements. Stronger than the loop Yagi, equal in gain.

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complete with hardware.

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SUPERVERTER ATV TRANSMITTER FOR 2300 MHz AND SATELLITE TV RECEIVERS WITH A COMPLETE LINE OF HIGH PERFORMANCE ACCESSORIES.

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OLD RADIOS, ham gear, literature, etc. Send 2 stamps. Ed Howell, Box 73CQ, Folly Beach, SC 29439.

WANTED: April 1958 and January 1963 back issues of CQ. Conrad Mang, K8GAK, 2368 Rustic Rd., Dayton, OH 45406.

FINDLAY HAMFEST: The 39th Annual Findlay Hamfest will be held on Sunday, September 13, at the Hancock Recreational Center, just east of I-75 exit 161, on the north edge of Findlay, 40 miles south of Toledo. Prizes will include a deluxe low-band rig, two ICOM IC-2A handhelds, a memory keyer, and many more items. Tickets will be $2.00 in advance and $2.50 at the gate. Tables will be $2.50 per ½. Open Saturday from 5 p.m. to 9 p.m. for setup, Sunday at 6 a.m. For tickets, information, and reservations, send s.a.s.e. to P.O. Box 587, Findlay, OH 45840.

TOWER: 54 foot, self-supporting, crank-up, tilt-over, hot dip galvanized, one-man installation. TRISTAO, tower TWS-70-354G, Base BCS-7054, 10 foot steel mast. $1800 or best offer. Norm Atlas, 11416 Harrisburg Rd., Los Alamitos, CA 90720, phone 213-430-8379.

WANTED: CW Transceiver like TenTec Model 570. Box 226, Rockefeller Univ., 1230 York, NY, NY 10021.

CQ's: April 1978 to March 1981, $20.00. Paul J. Skinner, 4815 Elm Street, Skokie, IL 60077.

FOR SALE: HQ180AX. Precise GM-EM Tube Tester. E. Erickson, 343 Catherine St., So. Amboy, NJ 08879.

TR9000 MEMORY SCAN, Installed, $25. N6HI, 8701 MacAlpine, Garden Grove, CA 92641, (714) 539-6555.

YAESU filter XF-92A, XF-32A, XF-30C. Each is new. $28 each postpaid. G.A. Dodds, P.O. Box 25, Brunswick, OH 44212.

WANTED: GRC-27 rcvr, xmitter, and mod. equip. enclosures and crossover/transfer coaxial relays w/"N" conn. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

WANTED: ARRL Handbooks, QST, CQ, 73, HR, State Price and Condition. HF Schnur, 115 Intercept Ave. N., Charleston, SC 29405.

FOR SALE: Kenwood 700SP all-mode 2-meter rig, Ten-Tec 509 QRP rig, BC 250 Scanner. Send SASE to P.O. Box 518, Whitehouse, FL 32220.

WILSON System One Tribander, $195; CDE Ham III Rotor, $115; Antenna Thrust-bearing (hvy dty), $30. All items new, original cartons, plus UPS shipping. Write: DS, Box 48, Ballardvale, MA 01810.

95% COMPLETE HEATH HM-102 RF Power Meter with manual. Best offer. W9TNZ, 9501 Lorel, Skokie, IL 60077.

WANTED: New 572B Tubes. Larry Kleber, K9LKA, 922 Whitney Blvd., Belvidere, IL 61008.

Yaesu FT-227R Synth. 2m, TT mike, mint, $240. P.S. $15 extra. Progline FI-33 VHF base, 30W, $125. KA1ETQ, P.O. Box 382, Putney, VT 05346 sase.

WANTED: Hallicrafters HT-7, R-44/ARR-5, S-35 Pan Adapter, manuals for same. G. Barber, P.O. Box 31654, Aurora, CO 80041.

SATELLITE TV . . . HOWARD/COLEMAN TVRO BOARDS . . . Build your own satellite TV receiver. For more information write . . . Robert Coleman, Rt. 3, Box 58-ACQ, Travelers Rest, SC 29690.

WANTED: Gold plated connector pins, scrap. Paying $1.00 per ounce and up. Ron Guard, W6TWT, 10105 Stern, Cupertino, CA 95014, (408) 252-5067.

TAPE DECK: 7" open, stereo, Realistic (teac) TR-3000, 3 motors, 3 heads. Two months old, used 2 hours, mint. List $499. $300, you ship. R-390 A-VRR, $250 plus shipping. E. Delorme, 615 Stuart, Green Bay, WI 54301, phone 1-414-435-0960.

PREMIUM PRICE for Tempo 2010 VFO. Write Mark Yeast, Apartado 100, 2350, San Francisco de Dos Rios, Costa Rica, C.A. or call 011-506-24-30-28.

PRINTED CIRCUIT BOARDS Quick. Also Circuit Artwork Supplies. Free Samples, information. CIRCUIT WORKS, 1118 7th (CQ), Neptune, NJ 07753.

ANTENNA RESTRICTIONS? Don't settle for 2 meters! Rejoin friends and nets with our highly efficient compact radiator for your particular needs within the 3.5 to 50 MHz spectrum. Send stamp for free brochure. W1HGZ, COM-RAD INDUSTRIES, 1635 West River, Grand Island, NY 14072.

NEED MINT CONDITION ARRL HANDBOOKS FOR 1947, 1952, 1955, 1961, 1962, 1966, 1967, 1975, 1977, and 1979. Top dollar paid. Norton K. Earle, 6421 Burgundy Way, Las Vegas, Nevada 89107.

LINEAR AMPLIFIER PLANBOOK: Fourteen complete transistor amplifiers from 2-400 MHz, 15-1000 watts. 96 pages, $11.95 plus $2.00 shipping. New one and two stage microwave to antennas, cable to converters, 30 and 40 channel, and cable inverters. Free flyer. $1.00 for full catalogue, refundable. MC/VISA. (401) 846-5627. AP Systems, P.O. Box 263CQ, Newport, RI 02840.

AMATEUR RADIO REPAIR: Professional service, reasonable rates, ALL BRANDS. U.S.A. KDK repair center! Amateur Radio Repair Center of I.E.C., Inc., 1020 Brookstown Avenue, Winston-Salem, NC 27101, (919) 725-7500.

FREE AD with subscription (25 words free, extras $.10 each)! Ham Buy, Sell, Trade, Want ads. 12 issues, $3.00. WA4OSR's Rigs & Stuff[tm], Dept. C9, Box 973, Mobile, AL 36601.

INTERESTED IN QRP? Full information for s.a.s.e. QRP/ARCI, Box 12072, Capitol Station, Austin, Texas 78711.

RTTY CLOSEOUT: 50% off of all RTTY equipment listed on my January, 1981 list. Send SASE for six-page list and prices of Model 14, 15, 28, 33 and 35 Teletype equipment, parts and supplies. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301. Phone 612-255-9794.

SOCIETY OF WIRELESS PIONEERS, INC. (SOWP) Professional R/T operators invited to join our non-profit historical/scientific organization. IFN free or send dollar for sample SPARKS JOURNAL to cover mailing costs. QTH: Box 530, Santa Rosa, CA 95402.

CREATIVE QSL CARDS: Imaginative designs. New and antique type styles. Send $1.00 for catalog and samples. WILKINS CREATIVE PRINTING, P.O. Box 787, Atascadero, CA 93423.

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ANTIQUE RADIO SOFTWARE. Recent find. "Radio Broadcast" complete in bound volumes. Hundreds of old radio magazines, books, catalogs, and pamphlets from the early twenties and before. Listings two dollars, refundable. Worcester, R.D. 1, Frankfort, NY 13340.

WANTED: CQ Surplus Conversion Handbook. Advise edition, condition, price. M. Potter, RR 1, Box 43, Limoges, Ontario, Canada K0A 2M0.

IMAGE INTENSIFIER TUBES (night vision) and assemblies and other high-quality optical lenses, mirrors, and parts wanted for scientific applications. Call or write with description and price: Advanced Technology, 735 Loma Verde, Palo Alto, CA 94303, 415-493-5930.

ARRL ROANOKE DIVISION CONVENTION September 26 and 27 in the Virginia Beach, Virginia Pavillion. Free transportation to the oceanfront where the Neptune Festival also is taking place. FCC Amateur Exams given to those sending form 610 request in advance. Admission $3.50. Advance ticket drawing for FM transceiver. Flea market tables $5 day, $7 both days. TRC, P.O. Box 7101, Portsmouth, Virginia 23707, 804-587-1695.

INTERESTED IN COMPUTERS? We sell many books covering computer-related topics. SASE for details, or $1 for full list. SYSTEMS Documentation, Box 1390, West Chester, PA 19380.

AMATEUR RADIO OPERATING PROGRAMS for your TRS-80 (16k, level II) Models I and III. Dupe Checker ($8), WAS ($8), DXCC ($10), 5BWAS ($12). CASSETTE ONLY. Master Gator Software, P.O. Box 10, Alachua, FL 32615.

FOR SALE: YAESU FT-101 MARK I XCVR, excellent condition with original manual, $450. HEATHKIT SB-301 RCVR also in excellent condition, $230. EICO 722 VFO, $25. HEATHKIT Electronic Keyer, HD-1410, LN, $45. Jack Thompson, 2504 Beaverbrook Dr., Greensboro, NC 27406, 919-274-8831.

Advertiser's Index

We'd like to see your company listed here too. Contact Jack Gutzeit, W2LZX, our Advertising Manager at 516-681-2922 to work out an advertising program tailored to suit your needs.

The FT-107 Series with "DMS"

"It's A Cut Above The Rest"

FEATURING DIGITAL MEMORY SHIFT

12 discrete memories. Stores individual frequencies or use as 12 full coverage VFOs (500 kHz each)

- **All Solid State**
- **240 watts DC Input SSB/CW**
- **160-10 Meters, WWV** (includes new 10, 18, 24 MHz bands) *
- **RF Speech Processor**
- **SSB, CW, AM, FSK**
- **Built-in SWR Meter**
- **Excellent Dynamic Range**
- **Audio Peak/Notch Filter**
- **Variable IF Bandwidth**
- **Full Line of Accessories**

* WARC Installation on Serial #060001 and up DMS Unit included on WARC models effective immediately.

The FT-107 has been created as a result of a blending of technologies — computer, solid state and RF design. By careful utilization of these disciplines and the experience gained from our FT-301 series, YAESU has achieved an HF transceiver which offers unique features (e. g. "Digital Memory Shift"), efficient operation and a level of performance that has been previously unattainable.

(Receiver Section) FT-107 TRANSCEIVER SPECIFICATIONS (Transmitter Section)

Sensitivity: 0.25 uV for 10dB S/N, CW/SSB, FSK
1.0 uV for 10dB S/N, AM
Image Rejection: 60dB except 12/10 meters (50dB)
IF Rejection: 70dB
Selectivity: SSB 2.4 kHz at —6dB, 4.0 kHz at —60dB.
*CW 0.6 kHz at —6dB, 1.2 kHz at —60dB.
*AM 6 kHz at —6dB, 12 kHz at —60dB
Variable IF Bandwidth
20dB RF Attenuator
Peak/Notch Audio Filter
Audio Output: 3 watts (4-16 ohms)
Accessories: FV-107 VFO (standard not synthesized)
FTV-107 VHF/UHF Transverter
FC-107 Antenna Tuner
SP-107 Matching Speaker
FP-107 AC Power Supply
(specify internal or external)

* AM/CW Filters Optional

Power Input: 240 watts DC SSB/CW
80 watts DC AM/FSK
Opposite Sideband Suppression: Better than 50dB
Spurious Radiation: —50dB.
Transmitter Bandwidth 350-2700 hz (—6dB)
Transmitter: 3rd IMD —31dB neg feedback 6dB
Transmitter Stability: 300 hz after 10 min. warmup
less than 100 hz after 30 min.
Antenna Input Impedance: 50 ohms
Microphone Impedance: 500 ohms (mic optional)
Power Required: 13.5V DC at 20 amps
100, 110, 117, 200, 220, 234V AC at 650 VA *

* with optional power supply

YAESU
The radio.

481

Price And Specifications Subject To Change Without Notice Or Obligation

CIRCLE 48 ON READER SERVICE CARD

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007
YAESU ELECTRONICS Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

ICOM Presents the Minicom IC-25A

Imagine..25watts/5 memories/2 scanner systems in a 2"H x 5½"W x 7"D 2 meter transceiver!

A *very* small package with a 25 watt punch, the IC-25A is a full featured FM transceiver for the space conscientious operator. Nearly the same size as an automotive AM radio, the IC-25A will fit in places usually considered impossible for a one piece 2 meter transceiver. The IC-25A is no lightweight when it comes to features:

- 5 memories. Store your favorite frequencies.
- Priority channel. Monitor your most important frequency.
- 25 watts high/1 watt battery saving low power.
- Touchtone™ mic standard..no extra cost...to work your favorite autopatch repeater.
- Full band scan/programmable scan (set your own limits)/memory scan....all with automatic resume after preset delay or carrier drop.
- 2 VFO's with data transfer standard.
- 2 tuning rates 5KHz (A VFO) or 15 KHz (B VFO).
- Nor/Rev switch for instant monitoring of repeater inputs.
- Memory back up power supply option holds memory when attached.

Actual Size.
(Clip this actual photo out and try it in your car.)

2112-116th Avenue NE, Bellevue, WA 98004
3331 Towerwood Drive, Suite 307, Dallas, TX 75234

ICOM

All stated specificatins are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations, limiting spurious, emissions.

CIRCLE 3 ON READER SERVICE CARD