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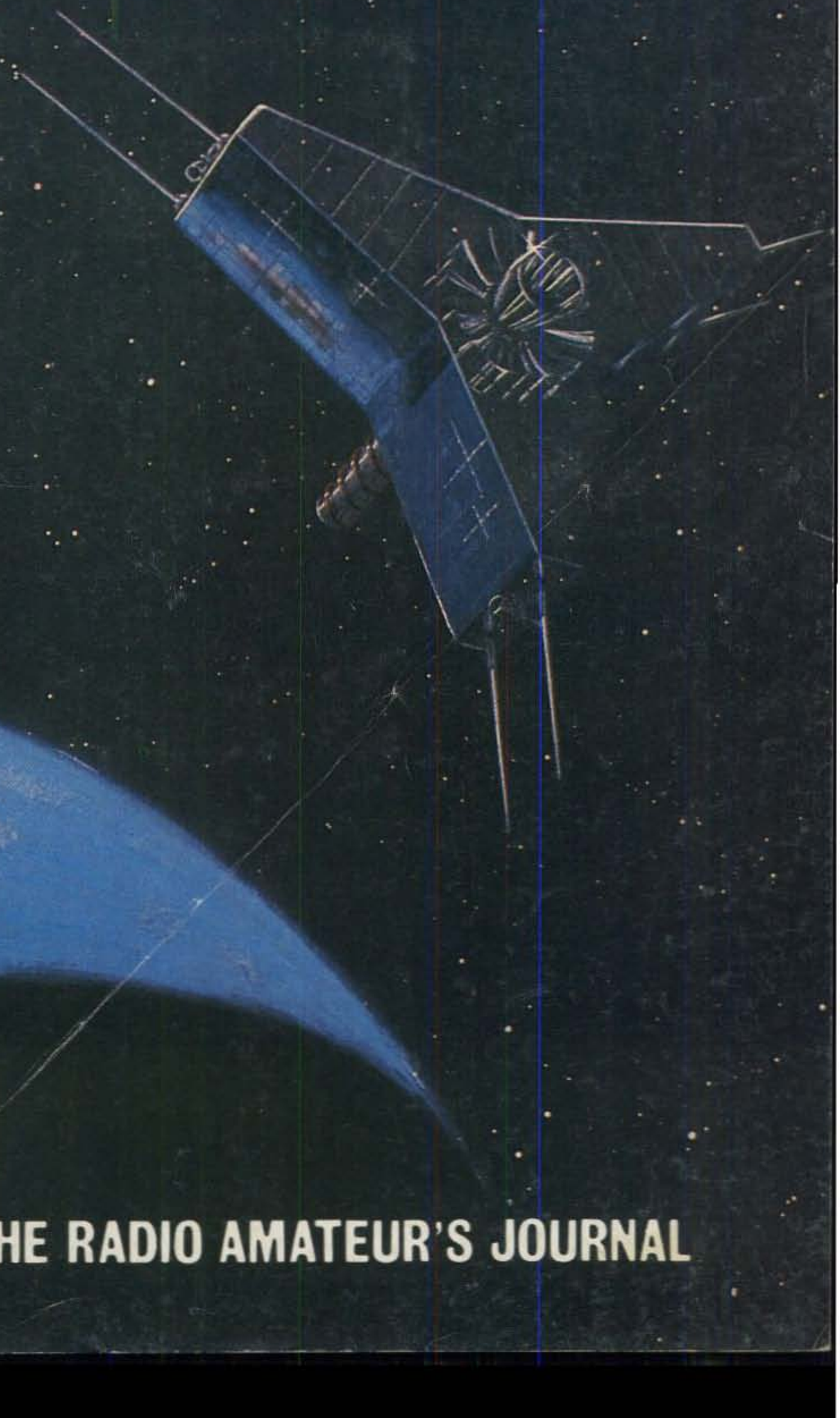

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THE RADIO AMATEUR'S JOURNAL

DXpedition...The Ultimate Fantasy

Clipper ships sailing to foreign shores. Sixteen amateurs primed for adventure, coming together as the first group in 20 years to set foot on the remote French Island, Clipperton. Their goal: 30,000 QSO's in just 7 days.

If you're like most of us, a rare DXpedition is more a dream than a reality, but the Clipperton Linear Amplifier from DenTron brings the thrill of a DXpedition to you.

The Clipperton-L™ was inspired by the famous DXpedition on which 3 MLA-2500's were used. We built the Clipperton with 4 rugged, economical, 572 B's in the final to provide a full 2KW PEP on SSB and 1KW CW on 15 through 160 meters. With features like hi-lo power selector for equal efficiencies at 1 or 2 KW, a power transformer that is vacuum impregnated, wide spaced tuning and loading capacitors, built-in ALC and an improved whisper-quiet cooling system, the excitement of crashing a pile-up can be yours.

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DenTron
Radio Co., Inc.
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SPECIFICATIONS

Frequency Coverage: 50~54MHz

Power Supply Requirements:
13.8V DC±15%, negative ground
Current drain 18A max.
(at 200W input). AC power supply speaker console is available for AC operation.

Emission Modes:
A3J SSB (USB/LSB)
A1 CW
A3H AM
F3* FM

Dimensions: 111mm (H)×
241mm (W)×311mm (D)

Weight: 6.6kg

Sensitivity: SSB/CW/AM
Less than 0.5μV for 10dB S+N/N
FM* More than
30dB S+N+D/N+D at 1μV

Squelch Sensitivity: SSB/CW/AM 1μV
FM* 0.4μV

Selectivity: SSB/CW/AM
More than ±1.1 KHz at -6dB
Less than ±2.2KHz at -60dB
Adjustable to 1KHz at -6dB
FM*
More than ±7.5KHz at -6dB
Less than ±15KHz at -60dB

*Only when FM Unit is installed.

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Please send me: ☐ IC-551D specifications sheet; ☐ full color ICOM Product Line Catalog; ☐ List of Authorized ICOM Dealers.

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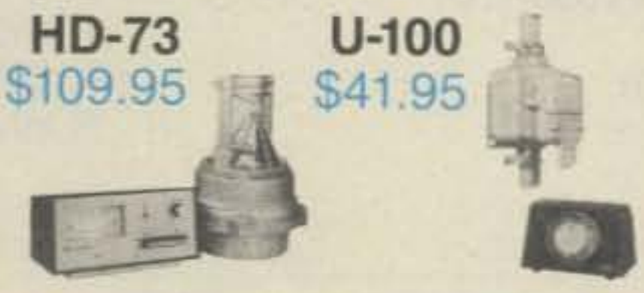

NOTE

If order placed, and $500 deposit received prior to May 10, 1980, you will receive, **free of charge**, in addition to above, **$35 Collins Service Manual** and an **$85 desk top microphone**.

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Prices/specs subject to change without notice. Calif. residents add sales tax.

Please send all reader inquiries directly.

APRIL, 1980 VOL. 36, NO. 4

CQ The Radio Amateur's Journal

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FEATURES

DEPARTMENTS

Zero Bias

an editorial

Bernie's Back

When Bernie Welch, W8IMZ, took over the helm of the *CQ* Sideband Contest (which became our WPX Contest) about ten years ago there were about 400 entries per year. Well, after ten years of just about single-handed effort Bernie brought last year's total number of entries to 2,225. This year's Contest is stacking up to be even bigger. I guess even Bernie has a right to get tired after all those years of being deluged with Contest logs and double duty chores on the Dayton Hamvention Forum. Maybe not!

I managed to get a call through to Bernie the other day after he and his wife Eleanor had returned from their vacation in Florida. Fresh and relaxed and in a receptive mood, he agreed to continue heading up *CQ*'s WPX Contest. There will be one slight change, then, for this year. First, Bernie will handle the S.S.B. portion as usual. Second, in order to give Bernie a little breathing room for his work on the Dayton Hamvention and allow some time for a few business trips, Bob Cox, K3EST, has stepped in to score and work on the C. W. portion of the Contest.

Bob is relinquishing some of his honeymoon time in the service of *CQ*'s WPX Contest. Yes, Bob finally took the plunge and got married. I hope that she's as understanding and patient as Eleanor Welch, Annie Anzalone, Michelle Entwistle and the other wives of our Contest people. At the end of each year I begin to think that they should be getting the plaques instead of the winners.

As you know, Bob and Larry Brockman head up our DX Contest each year and Bob figured that he had some time in between scoring the DX logs, a new wife and his real-life job to help out with this year's WPX C. W. Contest. You can mail your logs to Bob directly and save the turn-around time it takes to reship them from *CQ*. His address is:

Bob Cox, K3EST
5801 Huntland Drive
Temple Hills, Maryland 20031

In fact, if you haven't mailed your S.S.B. scores in yet you can mail them directly to Bernie. Not only is it faster but it also saves double postage and handling. Bernie's address is:

Bernie Welch, W8IMZ
7735 Redbank Lane
Dayton, Ohio 45424

Dayton Hamvention

Speaking of Dayton, you might consider attending one of amateur radio's great experiences. Besides Bernie's Contest Forum (which generally has well over 1000 amateurs attending) there are more amateurs per square foot, more amateur equipment on display and for sale, and more flea-market space and just plain more of everything for the amateur than anyplace else. It's an amateur radio Disneyland.

As of this writing I can't tell you exactly where our booth will be but look us up. Stop by the *CQ* booth and say hello to all of us. We won't be adverse to signing up new subscribers or renewing old ones either.

Happy Anniversary

In all the holiday rush around here I forgot to comment on the fact that George Jacobs, W3ASK, *CQ*'s Propagation Editor, began his thirtieth year with *CQ* this past March. George is a perennial favorite with *CQ* readers who count on his up-to-the-minute forecasts each month. If you want to treat yourself to some informative reading, I suggest that you pick up a copy of George Jacobs' and Ted Cohen's book *The Shortwave Propagation Handbook (*available through *CQ*). George's accomplishments and honors are legion in amateur radio and in the field of international broadcasting.

Upward And Onward

Recently I checked the calendar and had to admit that I was eligible for membership in the Quarter Century Wireless Association (QCWA). In fact, I could have joined last year. Well, I had visions of wrapping a shawl around my shoulders and setting a rig (not too heavy) next to my rocking chair, so I put it off for that year. I finally took pen in hand and filled out the application to join the Long Island Chapter of QCWA. Well, in for a penny, in for a pound. I joined that too and awaited their meeting. I didn't rush out and get the shawl though, and it's a good thing.

At the first meeting I attended I met a lot of friends I hadn't seen in a while and had the chance to make some new ones. Of the shawls that might have been worn only one was worn and that was by one of the ladies present. All in all I'm glad I joined and I'm only sorry that I didn't do so earlier. I'll let you know what it feels like when I'm eligible for the 50 year pin.

Also for the Upward And Onward consideration department is the fact that in just a few short months we've begun to outgrow our quarters. No, *CQ*'s not going to ask for donations to build a new headquarters nor are we going to move. We are taking some more space in our office building to enlarge our facilities. Bigger and better things *are* happening to *CQ*. It's just that the sounds of workmen hammering and sawing are beginning to get to me.

I Saw It In CQ

The "Say You Saw It In *CQ*" ads we've been running are beginning to show results, at least around here. Several letters that we received close with "I saw it in *CQ*" along with the traditional 73's. Let's keep it up and let everyone know that you did indeed see it in *CQ*. Spread the word.

73, Alan, K2EEK

THE OLYMPIC EDGE

During the XIII Olympic Winter Games in Lake Placid, New York, a complete amateur radio network communicates to the world emergency and personal messages for participants in the games.

HF transceivers used by the Winter Olympic Radio Amateur Network (WORAN) at Olympic Village are Ten-Tec OMNI models loaned by Ten-Tec, Inc., Sevierville, TN 37862.

The OMNI all-HF-band coverage and 100% duty cycle offers SSB, CW, RTTY, TELETYPE, and SSTV capability directly from the Olympic Village. The elaborate network, staffed by nearly 200 amateur radio operators, is one of the most extensive in recent amateur radio history.

Ten-Tec is proud to help in this exciting amateur radio venture.

Announcing

• **County Hunters and Certificate Seekers** - In honor of their annual hamfest, the Lake County Amateur Radio Association of Lake County, Ohio is sponsoring Special Events Station WD8IVL to mark the event. Operation will be from 1300 zulu to 2100 zulu on March 29th and 30th. Frequencies will be approximately 7250 kHz and 21.375 MHz. A certificate and special QSL will be issued to mark this event. Please QSL with a legal size s.a.s.e. directly to WD8IVL via the callbook address.

• **The Lake County Amateur Radio Association Hamfest** - The LCARA will hold its second annual Lake County Hamfest on Sunday, March 30, at the Mentor High School, Mentor, Ohio. The new location includes: Easy access, one mile from freeway; over 20,000 square feet indoors, heated on one floor; 200 commercial and flea-market tables available. Doors open to exhibitors at 6 am and to the public at 8 am. Auction begins at 12. Door prizes hourly. Computer raffle drawing at 3 pm. Plenty of clear paved parking. Tickets $3 at the door, $2.50 in advance. For further details, send s.a.s.e. to LCARA Hamfest Committee, 37778 Lakeshore Blvd., Eastlake, Ohio 44094, or call 216-953-9784. County hunters and other collectors of rare and exotic places: Special event station WD8IVL will be on the air from 1300-2100z Saturday and Sunday near 7.25 and 21.375 MHz. Special commemorative QSLs and certificates will be issued.

• **Wellesley Amateur Radio Society Auction** - The Wellesley Amateur Radio Society will conduct its annual auction again this year on Saturday, April 12 beginning at 11 am at the Wellesley High School Cafeteria on Rice Street, Wellesley, Massachusetts. Talk-in on -63:03, -04:64 and 52. Doors open at 10 am. For further information contact Kevin P. Kelly, WA1YHV, 7 Lawnwood Place, Charlestown, MA 02129.

• **Rochester Area Hamfest** - The Rochester Amateur Radio Club and the Rochester Repeater Society are sponsoring the Rochester Area Hamfest on Saturday, April 12 at St. John's School Gymnasium, 490 W. Center St., Rochester, Minnesota. Doors open at 8:30 am. There will be a large indoor fleamarket for radio and electronic items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/82 MHz (WR0AFT). For more information contact RARC, c/o WB0YEE, 2253 Nordic Court N.W., Rochester, MN 55901.

• **Madison Area Repeater Association Swapfest** - The Madison Area Repeater Association, Inc. will hold its 8th annual Madison Swapfest on Sunday, April 13 at the Dane County Exposition Center Forum Building in Madison, Wisconsin. Doors open at 8 am for sellers and exhibitors and at 9 am for the public. There are over 20,000 square feet of space for exhibitors and the flea market. Plenty of parking space is available as are hotel accommodations. Exhibitors and vendors will have a large variety of equipment and components for amateurs, computer hobbyists, and experimenters. Door prizes, an all-you-can-eat pancake breakfast, and barbeque lunch, as well as free movies are planned. Tickets are $3 at the door, $2.50 in advance. Tables are $4 each in advance and $5 at the door. Reserve early. Talk-in on WR9ABT-146.16/.76. For reservations or more information write to M.A.R.A., P.O. Box 3403, Madison, Wisconsin 53704.

• **Framingham Spring Flea Market** - The Framingham Amateur Radio Association will hold its annual Spring flea market on Sunday, April 27 from 10 to 3 pm (sellers admitted at 9 am) at the Framingham Police Station Drill Shed. Admission is $1, sellers $6 per table. Sellers must register in advance. Talk-in on 75/15 and 52. For more information or to register, contact Ron Egalka, K1YHM, F.A.R.A., P.O. Box 3005, Saxonville, MA 01701; tel. 617-877-4520.

• **Trenton Computer Festival** - The Trenton Computer Festival, the original Personal Computer show, will be held on April 19-20 at Trenton State College, just outside of Trenton, New Jersey. The fifth annual festival will be two full days with a 5-acre outdoor flea market and indoor commercial exhibitor area for up to 90 booths. There will be 30 speakers, user group sessions, and demonstrations. Door prizes are planned. Computer conference sessions and forums will be held on microcomputers in the home, education,

medicine, amateur radio, music, and the arts. User group sessions are on Saturday and special tutorial sessions for the general public and novice on Sunday. Saturday night banquet and free parking. Admission is $5 for the two days ($2 for students). Saturday night banquet, $10. Flea market spots are $5 per day. This is a non-profit event.

• **11th Annual FM B*A*S*H*** - The 11th annual FM B*A*S*H* will be held on the Friday night of the Dayton Hamvention, April 25, at the convention center, Main and Fifth Streets. Parking adjacent city garage. Admission is free to all. Sandwiches, snacks, and C.O.D. bar available. Live entertainment provided. Awards include a new synthesized HT. For further information contact the Miami Valley FM Association, P.O. Box 263, Dayton, Ohio 45401.

• **Amateur Radio Swapfest** - The Inland Empire VHF Club is sponsoring an Amateur Radio Swapfest on April 26 at the Spokane Interstate Fairgrounds. Plans include both commercial and noncommercial display booths and sales tables. Also included are auctions, swap tables, a snack bar, door prizes, morse code contests, tube displays, a professional Dixieland band, and more.

• **Irvington Radio Amateur Club Hamfest** - The Irvington Radio Amateur Club's hamfest will be held on Sunday, April 20 from 9 a.m. to 4 p.m. at the P.A.L. building, 285 Union Ave., Irvington (Garden State Parkway to exit 143 North or 143B South). Talk-in on 34/94 and 52. Refreshments, admission $1, tables $3. For information call Pete, WB2FAS, 201-763-8220, or write IRAC, P.O. Box 894, Union, NJ 07083.

• **3-F Amateur Radio Club Swapfest** -The 3-F Amateur Radio Club Swapfest will be held Saturday, May 3 at the Neenah Labor Temple in Neenah, Wisconsin (just off Highway 41 at the Highway 114 or 150 exit). Facilities include a large parking area, indoor and outdoor swap area with a free auction at the end of the day. Food and beverage available. Admission is $2 at the door for tickets and $2 for tables, $1.50 in advance for tickets and tables. Doors will be open from 8 am to 3 pm. Talk-in on 52/52. For reservations contact Mark Michel, W90P, 339 Naymut Street, Menasha, Wisconsin 54952.

• **21st Annual Southern Tier Amateur Radio Club Hamfest** - This event will take place on Saturday, May 3. (Route 17, Exit 65, Owego Treadway, Owego, New York) Flea market, vendors, tech talks. Buffet tickets and general admission is $8, gate $2. Reservations received after April 20th will be held at the door. Write to STARC, P.O. Box 11, Endicott, NY 13760. Hotel room accommodations: Debbie Chambers 607-687-4500.

•**Indoor/Outdoor Hamfest** - The Kishwaukee Radio Club and DeKalb County Amateur Repeater Club are having their 22nd annual indoor/outdoor hamfest, Sunday May 4, from 8 am to 3 pm, at the Notre Dame School (3 miles south of DeKalb between Hwy. 23 and South 1st street on Gurler Rd). Tickets $1.50 advance, $2.00 at the door. Indoor tables available. Bring your own table and setup is free. Talk-in on 146.13/73 and 94 simplex. For tickets & directions, send s.a.s.e. to Howard, WA9TXW, P.O. Box 349, Sycamore, IL 60178. Requests received after April 26 will be held at the door.

• **Sandusky Valley Amateur Radio Club Hamfest** - The third annual Sandusky Valley Amateur Radio Club Hamfest will be held on May 25 at the Sandusky County Fair Grounds. Doors open at 7 am. All tables free. Admission $1. Talk-in on 52/52, 146.31/91. For tickets or info send an s.a.s.e. to Ron Winke, WB8NMK, 1200 Stilwell Ave., Fremont, OH 43420.

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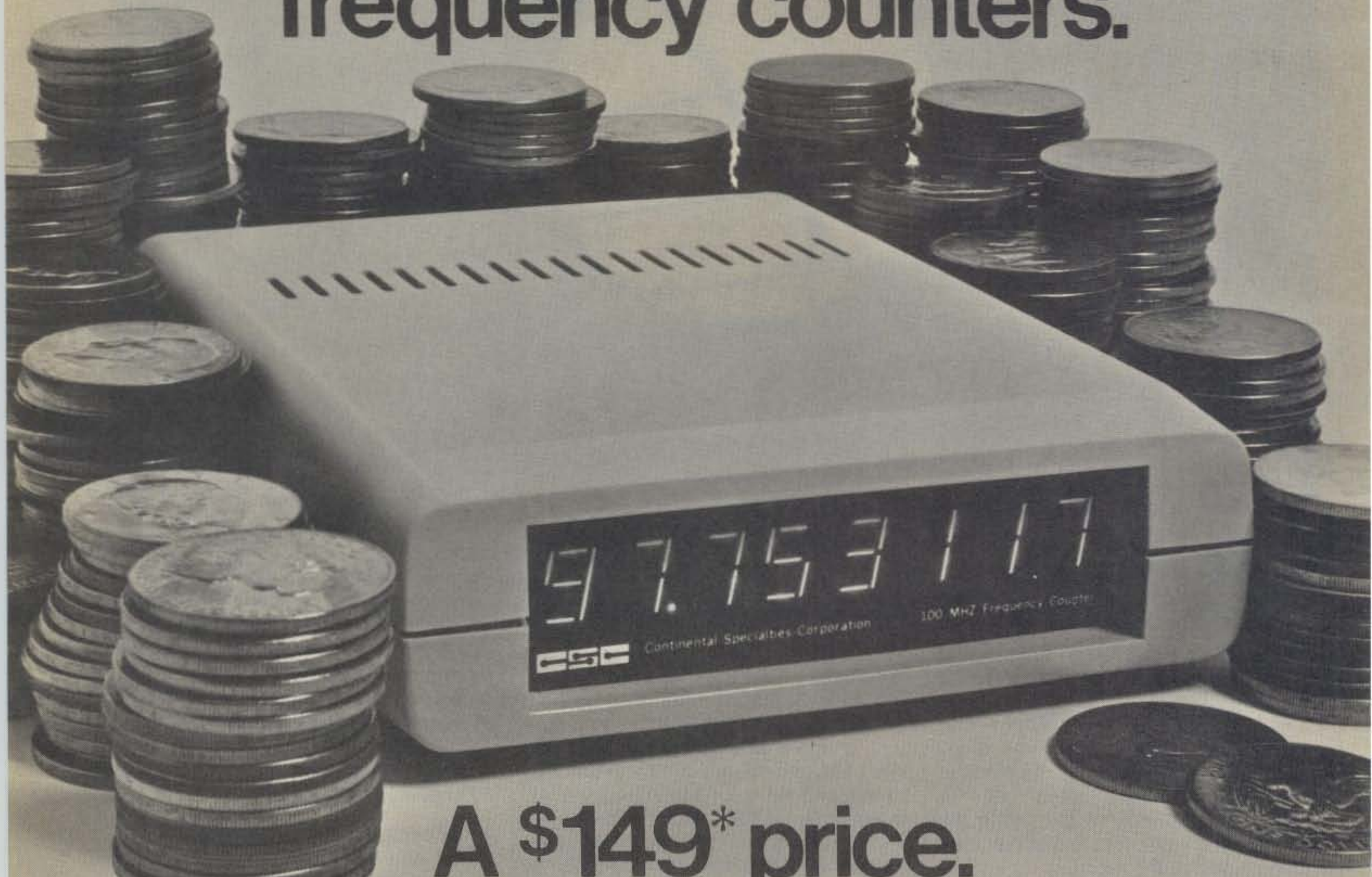

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Full 0-30 MHz coverage, with no gaps or range crystals required. Continuous tuning from vlf thru hf. State of the art a-m, ssb, RTTY, and cw. Transceives with Drake TR7.

★ Complete transceive/separate functions for use with TR7.
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- 100% solid state broadband design, synthesized with PTO.
- Covers range 0 to 30 MHz. Both digital and analog readout.
- Special front-end circuitry with high level mixer and 48 MHz 1st i-f.
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- Tunable i-f notch filter reduces heterodyne interference.
- Full electronic passband tuning system.
- Digital readout may be used as a 150 MHz counter.
- Built-in power supply: 100, 120, 200, 240 V-ac, or 13.8 V-dc.
- Built-in speaker, or external Drake MS7 speaker may be used.
- Built-in 25 kHz calibrator for calibration of analog dial.
- Low level audio output for tape recorder.
- Select up to eight crystal-controlled fixed channels. (With Aux7).
- Optional Drake NB7A Noise Blanker available.

Accessories available for use with Drake R7:

• MS7 Speaker • SL300 Cw Filter, 300 Hz • SL500 Cw Filter, 500 Hz • SL1800 Ssb/RTTY Filter, 1800 Hz • SL6000 A-m Filter, 6.0 kHz • SL400 A-m Filter, 4.0 kHz • NB7A Noise Blanker • Aux7 Range Program/Fixed-Frequency Board • R7/TR7 Interface Cable Kit • R7 Service/Schematic Book.

Drake 7-Line Accessories

Drake L7
Continuous Duty
160-10 Meters
2kW Linear Amplifier

Temperature controlled for "key-down" operation covers any WARC expanded or new hf amateur bands, MARS, etc.

• 2 kW PEP, 1 kW cw, RTTY, SSTV full rated continuous duty • Covers 160-10* meter amateur band, plus future hf band WARC expansions and MARS, embassy, government, etc. • The Drake L7 includes a pair of rugged Eimac 3-500 Z triodes. • Accurate built-in rf wattmeter. • Temperature controlled two speed high volume fan. • Adjustable exciter agc feedback. • By-pass switching. • Bandpass tuned input circuitry. • 120/240 V ac, 50/60 Hz.

Drake MN2700
2 kW Matching Network

Manages rf radiation by impedance match to antenna, measurement of rf power and VSWR, reduction of harmonic radiation, and antenna selection.

• 160 thru 10 meters frequency coverage — plus MARS, future expansions, etc. • Matches antennas fed with coax, balanced line, or random wire. (Use Drake Balun for balanced line.) • Antenna by-pass switching also selects various antennas. • Extra harmonic reduction to help fight TVI — "pi-network" low-pass filter type circuitry is a Drake exclusive. • Accurate rf wattmeter/VSWR bridge. • 2000 watts PEP, 1000 watts average. Continuous duty.

Ask about the 250W Drake MN7 and Drake B1000 Balun

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Here's another mechanical marvel from VE3QQ guaranteed to enhance your operating and building pleasure. It's even fun to read and dream about.

Aku-Touch Your Accu-Keyer

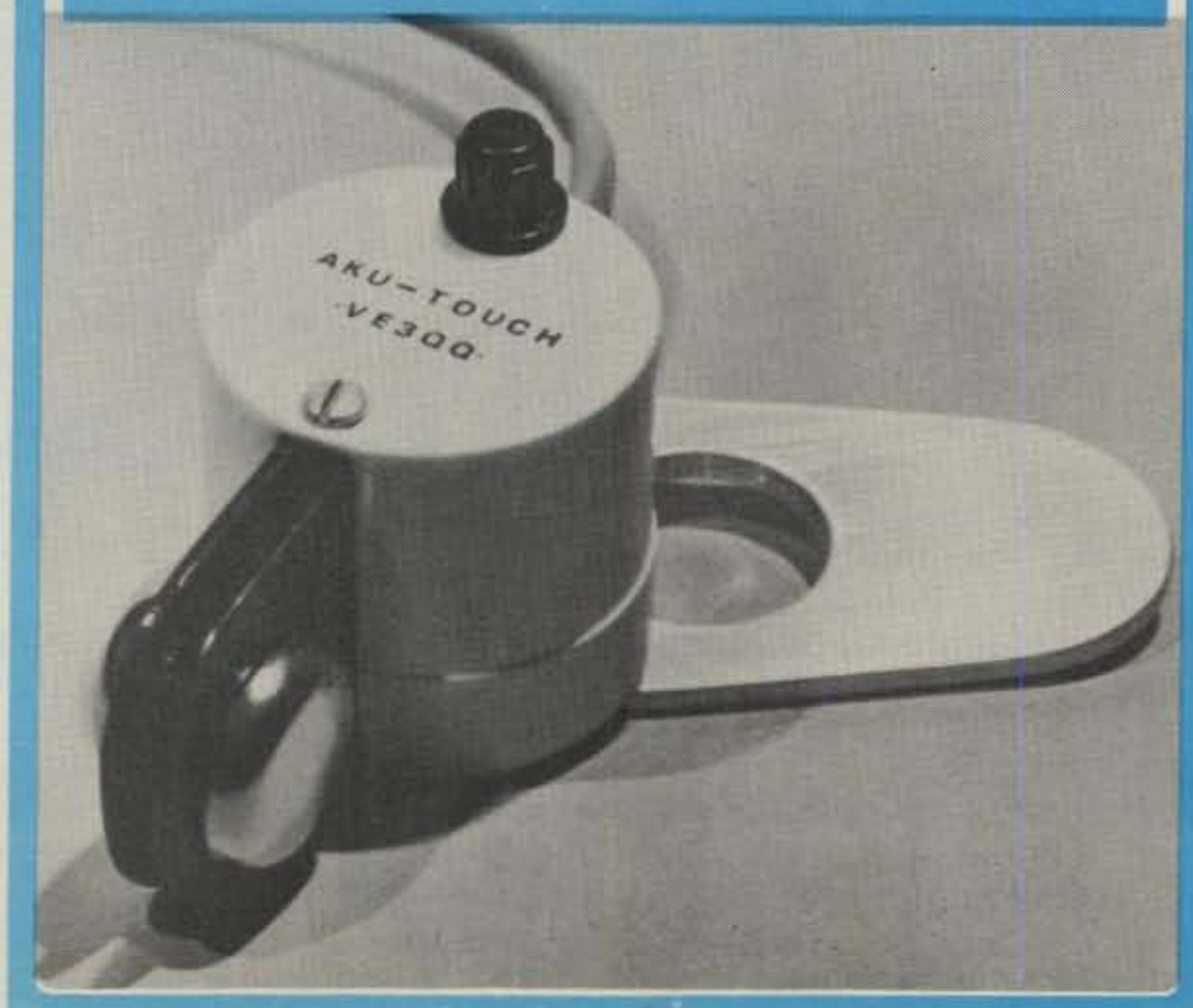
BY ALBERT H. JACKSON*, VE3QQ

Here is a three-ounce, single polarity, solid-state, body-capacity operated, "touch" paddle-control for WA5KPG's CMOS Accu-Keyer.[1] With a couple of resistance changes it should also work well with WB4VVF's very popular, higher current, 5-volt TTL original,[2] though there's been no opportunity for the writer to actually check this out. Nevertheless, the circuits are straightforward and no problems should occur.

The unit is light enough to be dropped in a pocket for Field Day, etc., yet is as steady on the table as its pound-plus cousins because of an adjustable foot-plate which slips under the most convenient piece of heavier apparatus. A tapered edge anti-teeter washer, for the opposite side of the "host" equipment, keeps things on an even keel and stores in the foot-plate when not in use.

The Aku-Touch operates from the same d.c. supply (not to exceed 12-volts) as the keyer, and additional current requirements should maximize in the 3 to 6 ma range (5- to 9-volt supply) depending on individual circuit and operating conditions. Except for a few details and the discovery of some really sub-miniature parts, the circuitry remains unchanged from that given for use with the Curtis chip keyers (positive output configuration) in an earlier construction article.[3] See the dash portion schematic, fig. 4. Set-up procedures are nearly the same as previously, but this time there are no sockets or jumpers. Instead of removing the opposite oscillator transistor while setting the first side, just leave the second section detuned until the first is adjusted, then tune the second one to the additional recommended frequency. Along with its other important functions, a good equipment ground ensures reliable touch-key operation by "completing" the capacitive triggering circuits, and should always be connected, especially where a transmitter is involved.

The Aku-Touch with its foot-plate ready to slide under the "host" equipment. It measures 1-11/16" wide, just under 3" long, and 2-1/8" high over-all.



*90 Fox St., Box 516, Penetanguishene, Ontario, Canada L0K 1P0.

No-11-12

Paddles

The paddle assembly comprises two identical circuit boards prepared with the help of *Radio Shack*'s special resist pen and etchant. Use a ball-head pin to transfer all center-marks and board edge positions through the actual size foil layout, fig. 1, to a pair of paper sheets placed under the *CQ* page. Cut the sheets and board material to size, tape together paper-to-foil, and center-punch the hole positions. Pull off the paper and use the resist pen to draw in the lines and areas to be retained. Check when dry, and scrape away any unwanted overflow. You can speed the etching process by rocking the tray in a shallow basin of fairly hot tap-water. Water rinse thoroughly on completion, wash off the resist with lacquer thinner, and drill in the usual manner.

Touch-Buttons

The touch-buttons are 7/8″ furniture sliders (prongs clipped and filed after soldering) but there is room for 1″ hole-plug buttons (*Cinch-Jones 41-G*) if these are altered and used as described in the above referenced article. Setting the buttons off the center line places one up and one down when the boards are mounted back-to-back. This allows offset thumb and finger positions which can be varied, during construction, to suit your own requirements.

Circuit Board Assembly

To ensure case shield grounding, a narrow metal channel should be placed over what becomes the top edge of each circuit board inside the case, and soldered to its own ground foil. With a knife and straight-edge, cut a 3/16″ by 2-3/4″ strip of foil along one side of a spare piece of board material. Raise a corner, pull the resulting narrow ribbon off with pliers like tape from a roll, straighten out the curl and cut into two sections 1-5/16″ long. Form these into 1/16″ wall "U" channels by clamping and bending over a bit of circuit board, shiny side out. Press the bent corners sharply, refer to the inside photos, and install as noted above.

Cut two metal studs 3/16″ in diameter by 17/64″ long, drill and tap 4-40 holes through their sidewise centers and fit into holes A, fig. 1. These will accept the base-plate and cover forward mounting screws, which are inserted between the boards. Position the studs carefully and epoxy in place on one side only.

Complete the circuit boards and gently file off protruding wire ends to prevent possible board-to-board shorts after mounting. Cement a 9/64″ high insulating spacer on the horizontal center line of one of the boards behind the button, to reinforce and maintain this distance between the assembled pair.

Determine the lengths and attach the keyer cable and board interwiring, then bolt the boards together, back-to-back, with 2-56 machine screws in holes B. Place two nuts on each between sections, and adjust to keep these parallel against the spacer.

Base-Plate

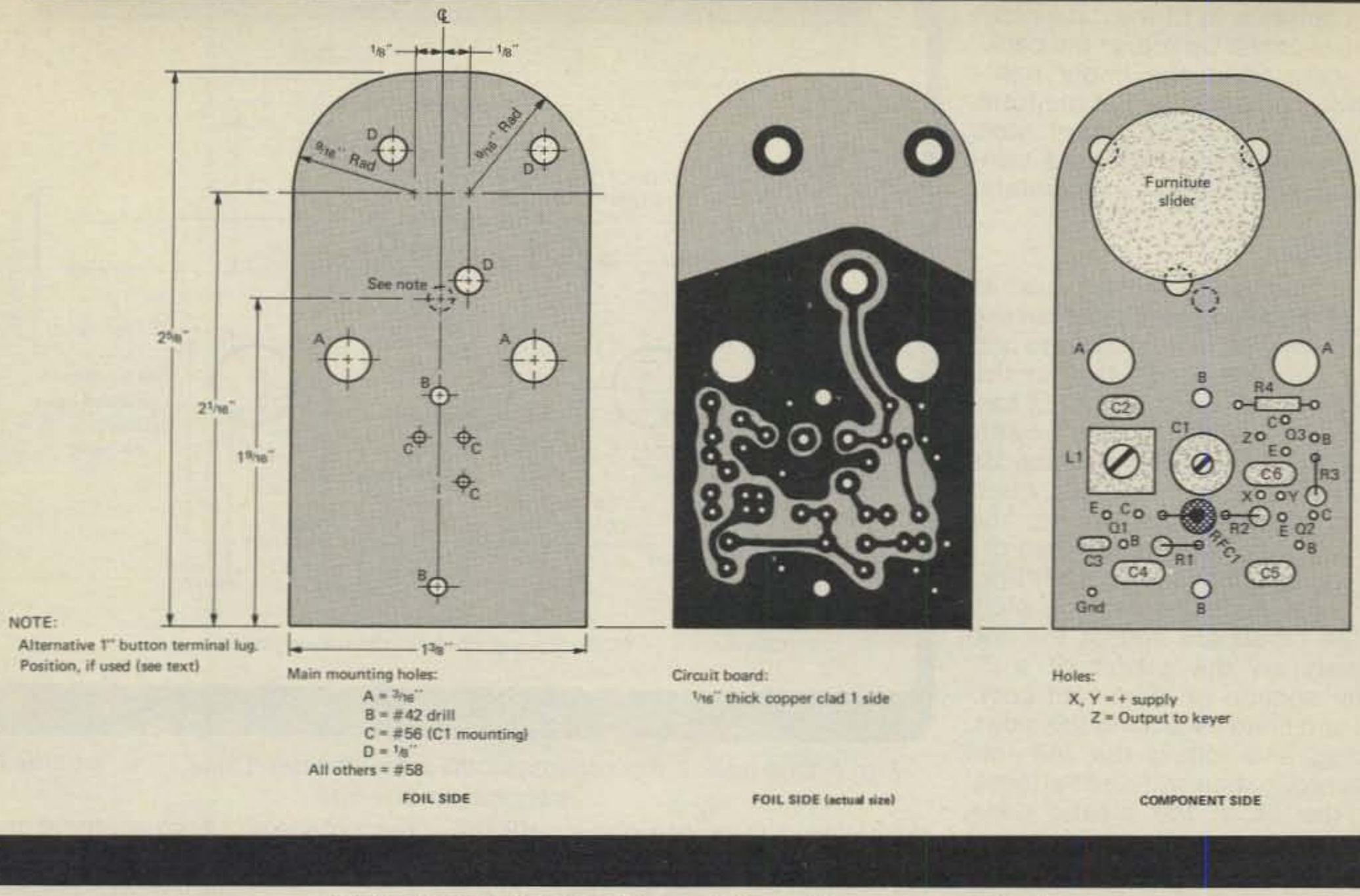
Fabricate the base-plate as shown in fig. 2. Cut a groove for the cable clamp wire about 3/64″ deep on the underside between holes C, D, by using the same drill to make shallow holes in line side-by-side, and then driving a chisel or screwdriver into the remaining divisions to complete the clearance. The clamp is a rectangular U-shaped steel wire pushed through from the bottom, its ends then formed to grip the cable on the inside; anchor the wire in the holes with epoxy. Hole B takes the board assembly front stud mounting bolt, and hole A accepts the case-to-foot-plate pivot-screw. This passes between the circuit boards at the rear and requires an external tooth lockwasher between the base- and foot-plates to prevent slippage.

See the underneath photo and cement a 1/32″ by 3/4″ by 7/8″ plastic spacer to the base-plate to support things in the closed or storage position. Attach a lug for the cable shield and board ground leads at hole E. Make the pivot-screw from a 2″ 6-32 round-head machine screw. File its head diameter to fit inside a ribbed bakelite 8-32 battery (or similar) nut, true up and epoxy in place.

Foot-Plate

Construct the foot-plate as indicated in fig. 3. It swings around the pivot-screw in hole C and may be locked in any location. Make the tapered 1″ hole B with a smaller drill and pipe reamer, chuck the cut and rounded anti-teeter washer on a bolt in a clamped down power drill, and chamfer-file its edge to fit. Thin sheet rubber cemented under these pieces will increase table-top traction.

An open view of the base and foot-plate. The latter swings back under the paddles for storage, and the large round hole accommodates an anti-teeter washer when not in use.



NOTE:
Alternative 1" button terminal lug. Position, if used (see text)

Main mounting holes:
A = 3/16"
B = #42 drill
C = #56 (C1 mounting)
D = 1/8"
All others = #58

FOIL SIDE

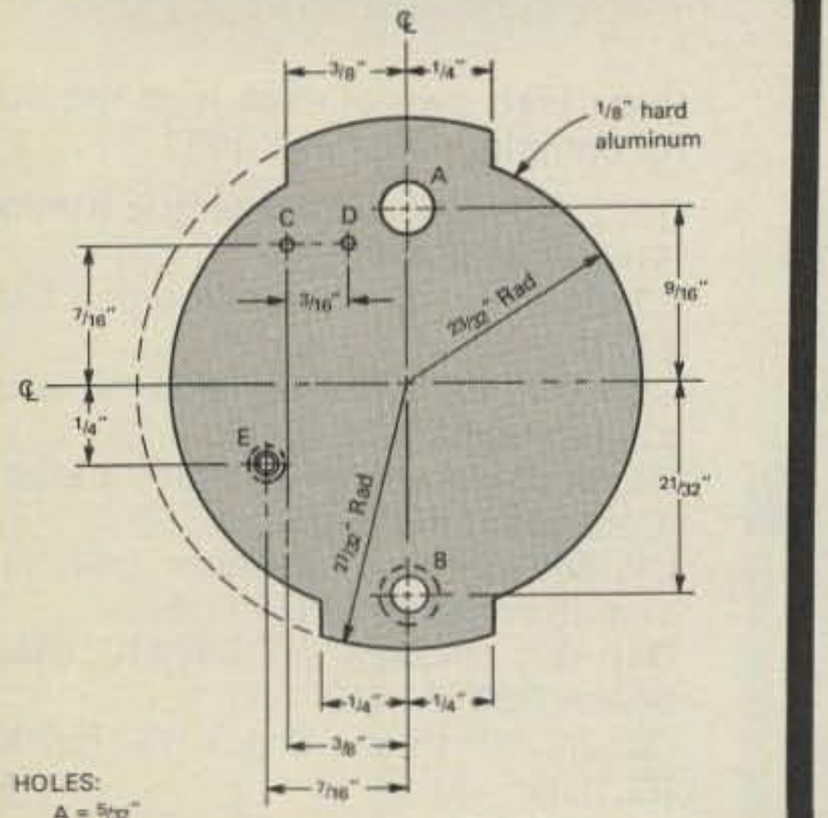
Circuit board:
1/16" thick copper clad 1 side

FOIL SIDE (actual size)

Holes:
X, Y = + supply
Z = Output to keyer

COMPONENT SIDE

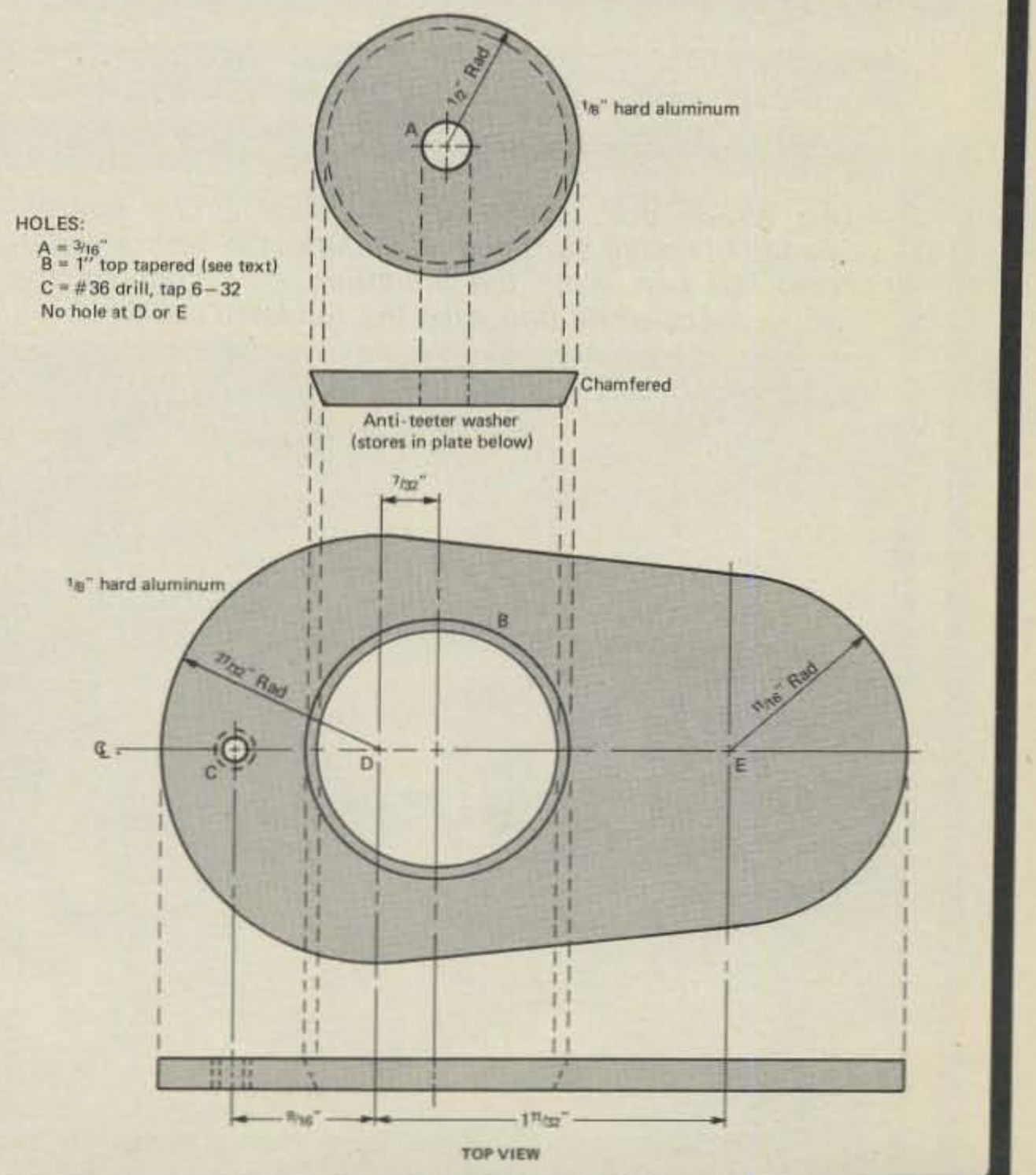
Fig. 1- The printed circuit board. Two of these are required.



HOLES:
A = 5/32"
B = 1/8" countersink bottom for 4–40 flathead screw.
C, D = #59 drill
E = #43 drill, tap 4–40

TOP VIEW

Fig. 2- The base plate.



TOP VIEW

Fig. 3- The foot-plate and washer.

Case

The case measures 1-11/16" in diameter by 1-9/16" high, and is a plastic cover cap from a *Noxzema* stick deodorant package. (No attempt here to promote the product, on which there is contrary medical opinion, but the top is exactly right for this application and comes in a choice of

colors.) Cut a slot for the paddles and file front and rear to fit the base-plate and control cable. On top, at the back, a 5/32" hole takes the finger tightened pivot, and a 1/8" one at the front accommodates the top board stud screw. Use the base-plate as a template to locate these holes accurately.

Shielding

Remove the inside center "nub" at the top of the *Noxzema* cap, clean the inner surface with methyl-hydrate and roughen with sandpaper. Overlay the bottom end of a size D flashlight battery with a close fitting disc of stiff cardboard to insulate and flatten its effective surface. Evenly wind enough layers of masking tape around the battery and disc edge to increase the diameters and make a loose-fitting, inside cover contour-matching plug. Place the cardboard end of the battery firmly on the center of a 7" diameter section of aluminum cooking foil and bend up around the sides, squeezing and rolling the foil into close conformation with the surfaces. Check the fit in the plastic case, separate, and sparingly coat its inner sides (not the top, or closer than 1/8" to the front and rear circuit board positions) with 5-minute epoxy. Press the foil and form into place until the cement has set, then remove the form. Clear the holes with a round file from inside, trim all perimeters with a razor blade and epoxy-cement any unbonded edges wherever they occur. Finish the construction according to the photographs.

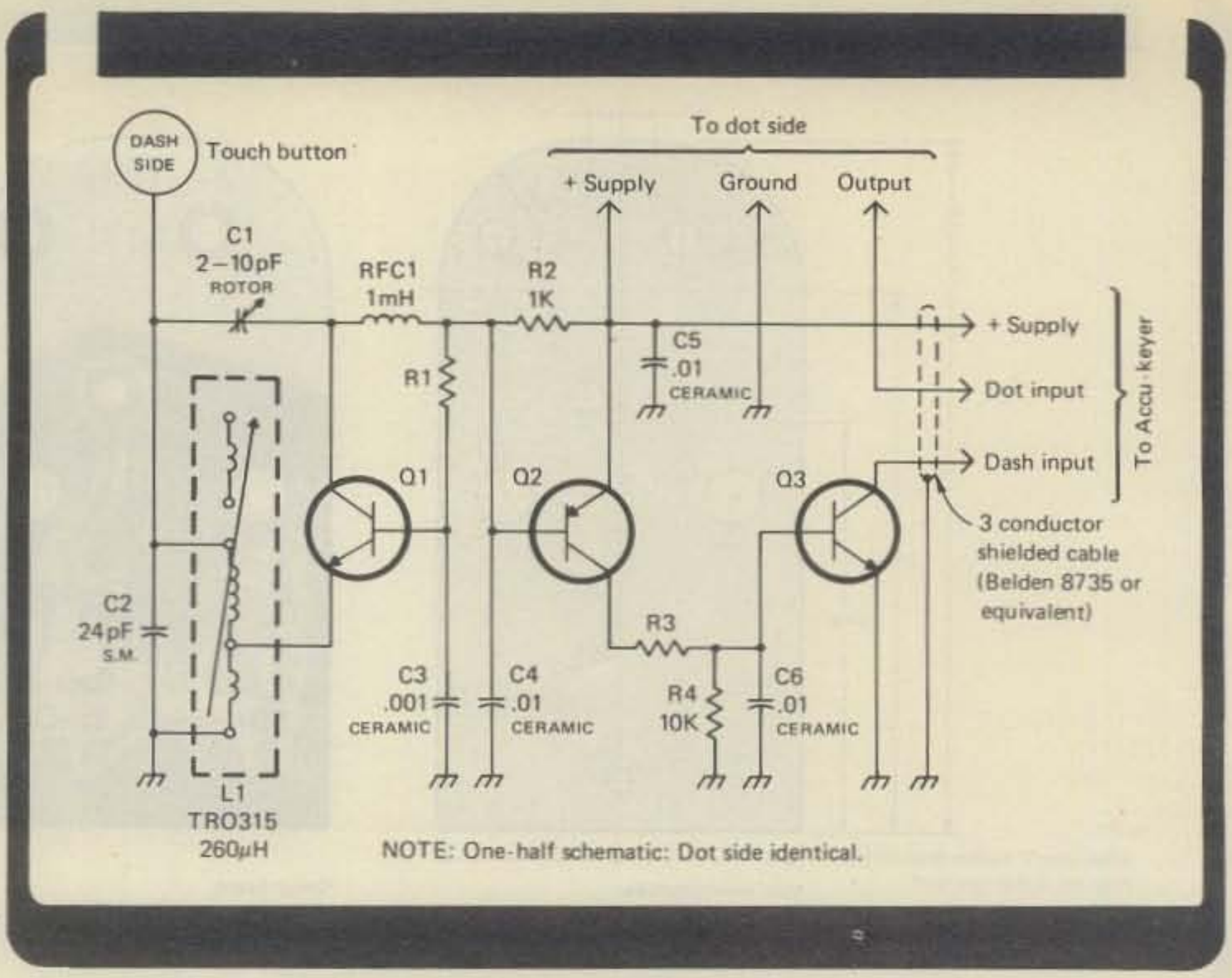
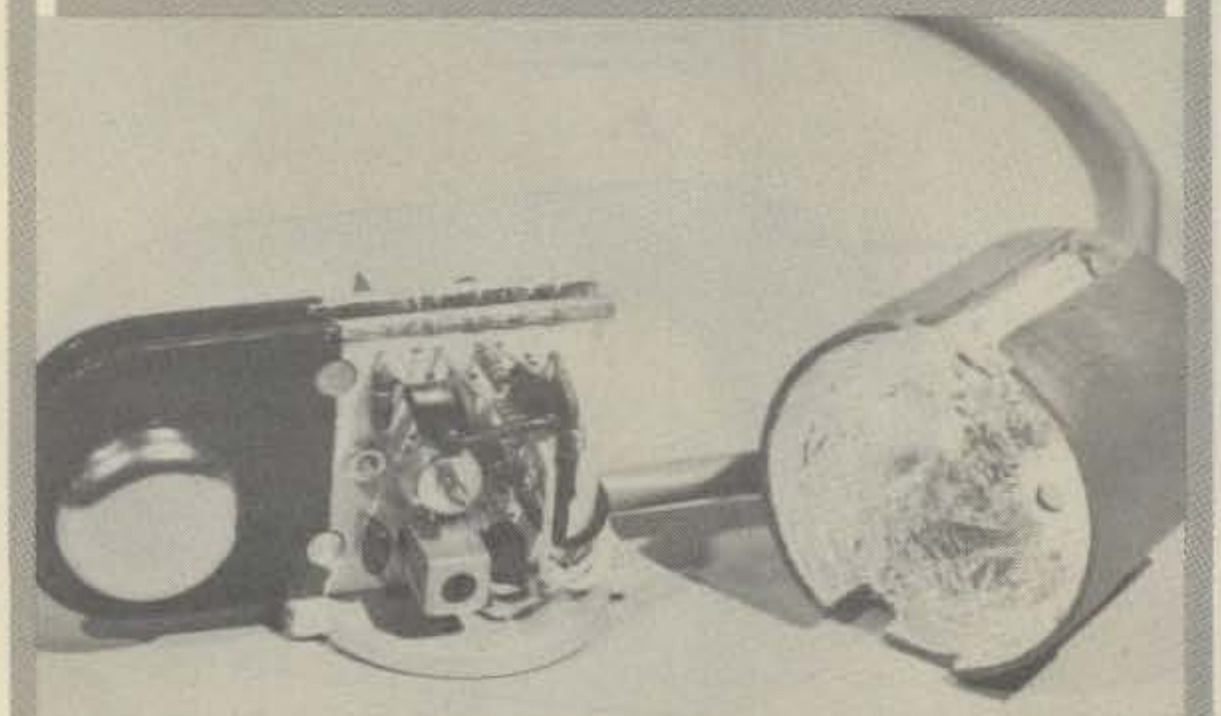


Fig. 4- One half of the schematic diagram, the dash side. The dot side is identical to this one.

This shows one of the two identical circuit boards. Beyond-the-case surfaces were darkened with a waterproof felt pen. Note the mounting stud ends on the black-white line, also the foil-lined case.



Parts List: (two of each item required for complete dot-dash unit)

C1: 2 - 10 pF plastic dielectric trimmer (Philips 010EA/10E)
C2: 24 pF silver mica (Miconics DM5-240J)
C3: .001 uF ceramic, sub-miniature (Centralab CW15C102K)
C4, 5, 6: .01 uF 16-volt disc ceramic (Centralab UK16-103)
L1: 260 uH b.c. oscillator coil, subminiature (Armaco TRO315)
Q1, Q3: 2N2484 or 2N5210 (Radio Shack RS276-2010)
Q2: 2N2605 (Radio Shack RS276-2022)
R2: 1. K
R4: 10. K

	For 9 v. ± Supply	For 5 v. ± Supply
R1:	1.5 meg.	1.0 meg.
R3:	47 K	22 K

(All resistors ¼-watt, 10%)

RFC1: 1.0 mH r. f. choke, miniature (Hammond 1530B103)

Non-*Radio Shack* parts may be obtained from:

Electro Sonic Inc.,
1100 Gordon Baker Rd.,
WILLOWDALE,
(Toronto)
Ontario, Canada.
M2H3B3

Back-to-back board assembly separates the oscillator sections and offsets the dot and dash touch-buttons. All parts, except R4, are installed in upright positions.

Other Bases

With its single pivot-screw, it's easy to transfer the Aku-Touch to other supporting bases. A half-inch depth of lead, cast, then epoxied into a trimmed 3″ diameter polished aluminum cup is one suggestion. Another is a broad plastic paddle extending under and held down by the weight of your keying hand. Both have been used here, but the foot-plate is recommended as a neat and practical means of producing a truly lightweight hand-to-electronic-key interface. What's *your* preference?

Footnotes:

[1]*Hinkle, G., "An Accu-Keyer for QRPp Operation,"* QST, *Jan. 1976, p. 24.*
[2]*Garrett, J.M., "The WB4VVF Accu-Keyer, "*QST, *Aug. 1973, p. 19, also recent A.R.R.L.* Handbooks.
[3]*Jackson, A. H., "Touch Control For The Curtis Chip Keyers,"* CQ, *July 1977, p. 17.*

Live out in the boondocks and still want to get in on working through repeaters? K3WBH just might have the answer for those 220 and 420 MHz enthusiasts. Here are two antennas that should solve the problem.

Repeater-Working Antennas For The Amateur In Rural Areas

BY T.E. WHITE*, K3WBH

The author has had several requests for help in recommending antennas for QTHs in sparsely populated areas where the operator has a long shot to a city or town repeater. The latter is often not located on a hilltop or even on a very tall building.

Here are a couple of arrays for 1¼ and 3/4 meters found to be effective in "full quieting" over considerable distances (a 2m antenna suitable for this application may be found in the author's April '78 *CQ* article).

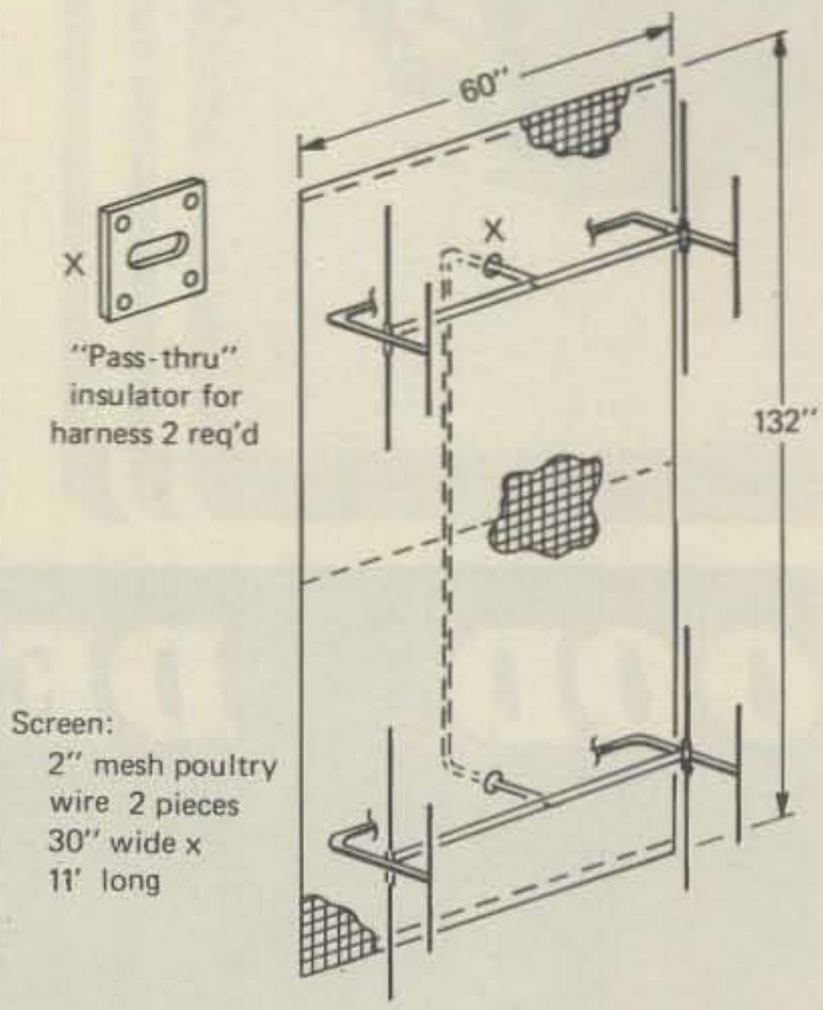
The prime parameter here is to concentrate maximum energy at or near the radio horizon, which is not necessarily the optical horizon. Thus, vertical stacking of antenna bays is mandatory. And some horizontal focusing or concentration of the received signal from the repeater is desirable. Thirdly, protection from sides and rear noise intrusion (noise is vertically polarized) is needed.

Most repeater antenna patterns are omnidirectional and signal strength is quickly dissipated. These factors legislate for a system at least two units high if not four, for low wave angle, and two units wide to "squeeze" the beam pattern. Feed systems must be simple and rugged, absorbing the worst in wind and weather. Line losses must be minimal.

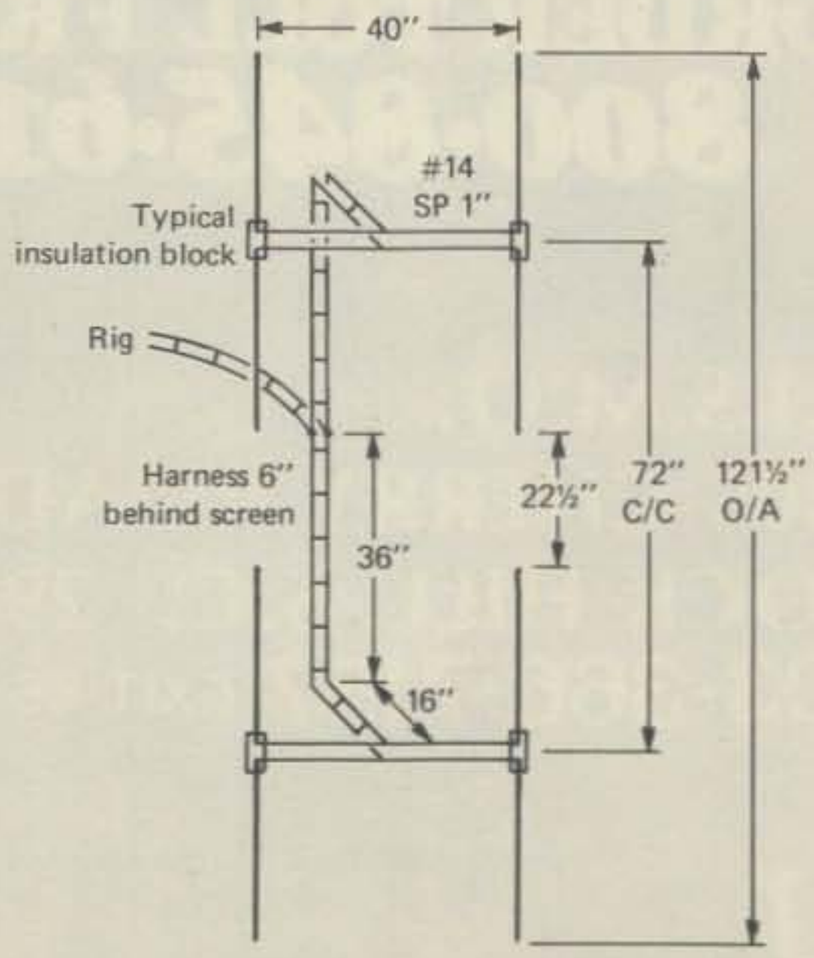
Fig. 1 shows a recommended system for 222 MHz. It is designed as a fixed array for repeater working only, from a rural location 40 miles or more removed from the metro area. A quad of DE's is fed by a straightforward

*36 Lake Ave., Fair Haven, N.J. 07701

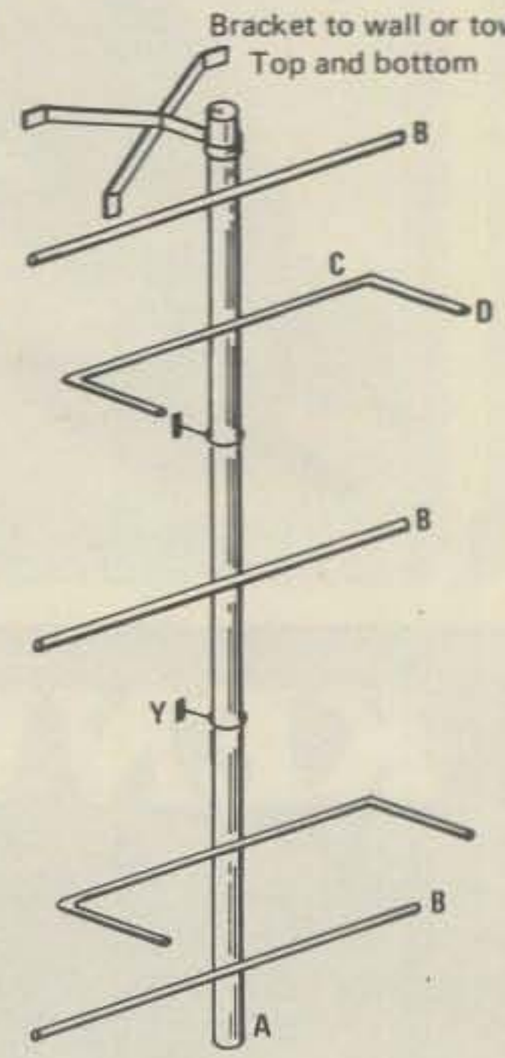
Fig. 1- A repeater working antenna for 1¼ meters.



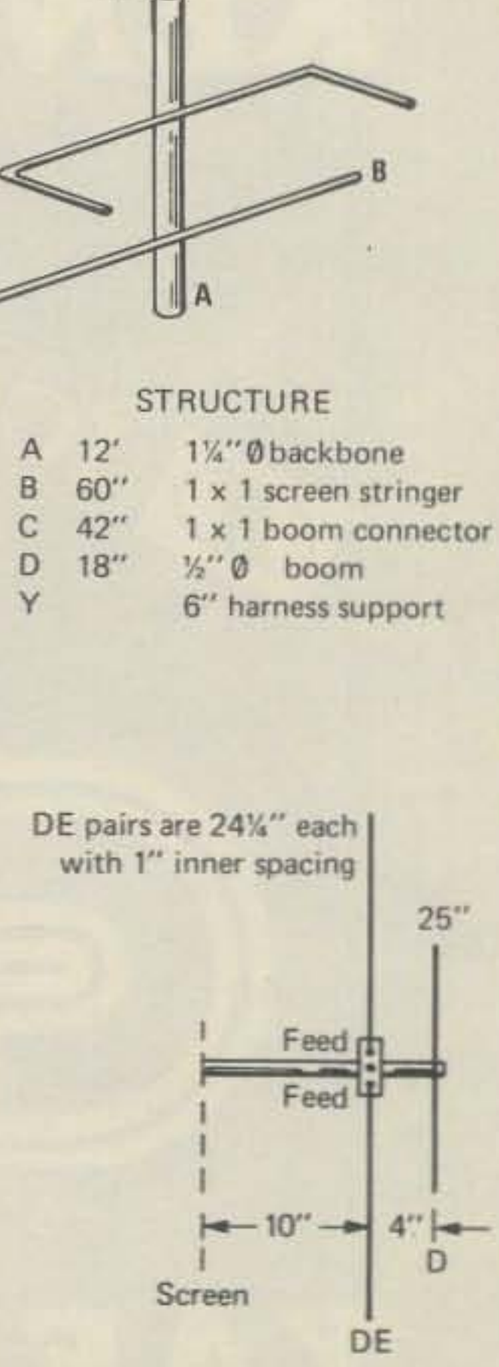
FRONT OBLIQUE VIEW



ELECTRICAL PLAN (not to scale)



REQ'D			STRUCTURE
1	A	12'	1¼"Ø backbone
3	B	60"	1 x 1 screen stringer
2	C	42"	1 x 1 boom connector
4	D	18"	½"Ø boom
2	Y		6" harness support



SIDE VIEW TYPICAL ELEMENT SET
4 required (elements are 1/8" wire or rod)

harness, with no need for gammas, trombones, bazookas, etc. A reflector screen captures maximum signal for receiving, and director sets enhance forward gain. For minimum line loss, open-wire line goes to the shack and transformation to the equipment impedance is made there.

This beam provides 14 dB (25×) gain over a dipole, and 6 dB (4×) better than the usual butt-mounted 4 element yagi hung out the side of a tower or mast.

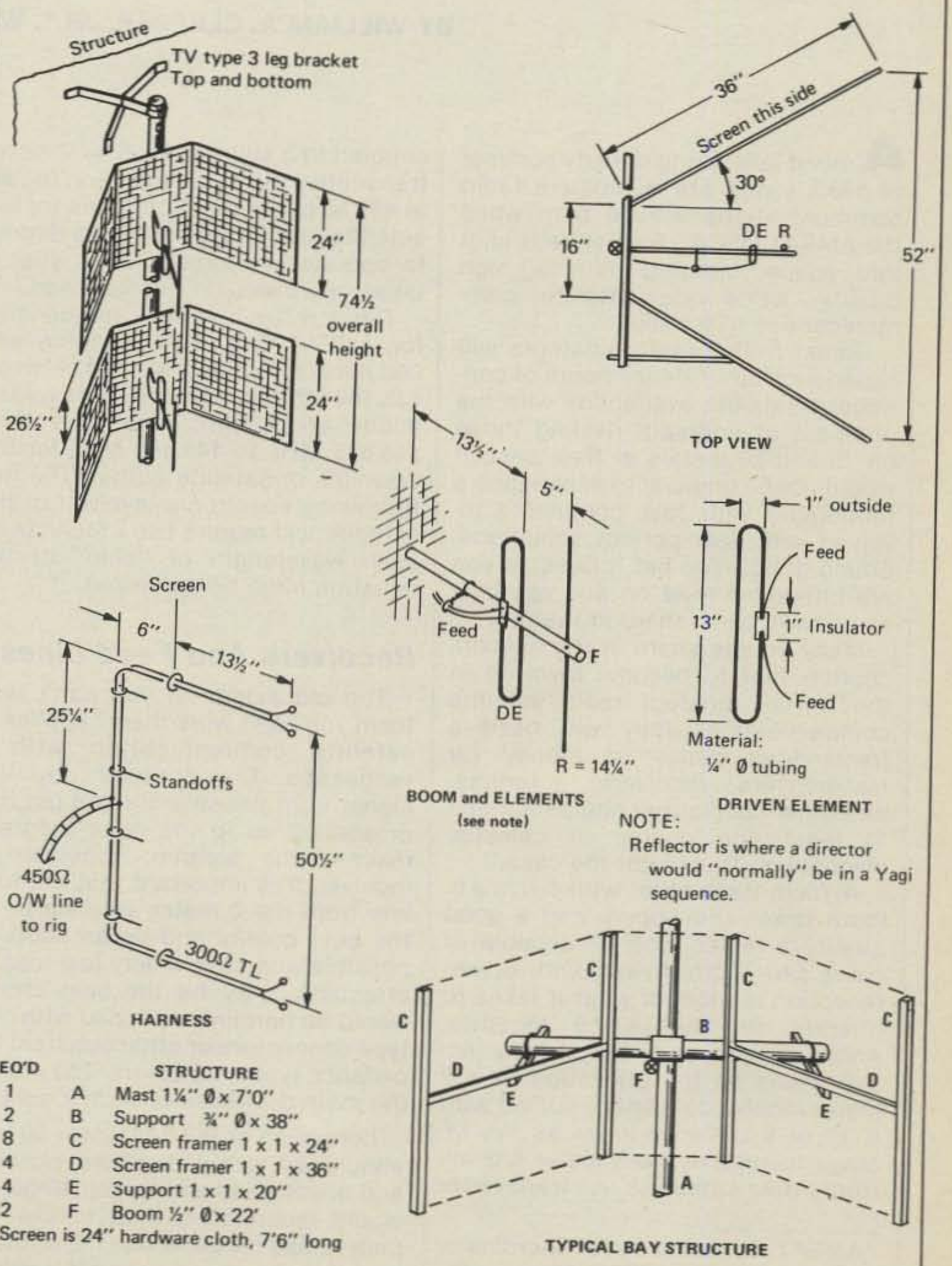
Thus even a 25 watt transceiver can have an ERP of 625 watts. Mounted near the top of a silo or windmill with suitable standoff brackets and faced toward the city, this beam will provide reliable point-to-point communication.

For those living remote from a 440 MHz repeater, the same antenna scaled by half will serve well, but an even better array is shown in fig. 2. This has a gain of up to 16 dB (40×) and will work the entire upper band segment 440 to 449 MHz. It is very important up here not to use common coax. Open wire line is mandatory on the kind of long run from tower to shack common on farms or ranches.

The modified corner reflector here uses quasi-optical principles to capture and concentrate to the DE's, all the signal intercepted. Again, it is intended for fixed-direction, point-to-point work, to trigger and receive from, a metro area repeater.

To raise the DE impedance, folded dipoles are used. Electrically full 2λ branches of 300 ohm twinlead combine at the symmetrically centered main feed point. Note that the vertical portion of the feed harness is entirely behind the screens, supported on 6" standoffs. This eliminates pattern distortion and unwanted coupling. The screen mesh should not exceed 1½". The screen frame and supports can be 1× 1 wood or square aluminum tubing. The standoff mounting structure can be TV-type eave-clearing mounts.

Great height is not as important as a clear field for 75' or so in front of the array. Not just metal structures but foliage and non-metallic objects can degrade performance at these frequencies. ▣



REQ'D		STRUCTURE
1	A	Mast 1¼" Ø x 7'0"
2	B	Support ¾" Ø x 38"
8	C	Screen framer 1 x 1 x 24"
4	D	Screen framer 1 x 1 x 36"
4	E	Support 1 x 1 x 20"
2	F	Boom ½" Ø x 22'

Screen is 24" hardware cloth, 7'6" long

Fig. 2- An antenna for working repeaters on 3/4 meters.

The Radio Amateur Satellite Corporation (AMSAT) is about to usher in Phase III A with the launch of OSCAR 9. W3HV helps to take the mystery out of the program and tells us what we'll need to know to add this communications mode to our operating enjoyment.

The AMSAT OSCAR 9 Satellite

A New Era Is Born

BY WILLIAM A. CLEPPER, JR.*, W3HV

Around late spring or early summer of 1980, a new era in amateur radio communications will be born when the AMSAT OSCAR 9 satellite is shot into space, bringing reliable, high quality, world-wide satellite communications to a reality.

United States radio amateurs will experience up to eleven hours of continuous satellite availability with the prospect of contacts rivaling those on 15 and 20 meters at their best. It would not be unusual to experience a roundtable with four continents involved with near perfect conditions. Sound good? You bet it does...if you are interested read on and see how easy it will be to share in the fun.

Many people share in the misconception that to become involved in the fun of amateur radio satellite communications they will need a tremendous outlay of money for transmitters, receivers, antennas, and other specialized equipment and at least one degree in celestial mechanics. This is not the case.

A 70cm transmitter with c.w./s.s.b. (both lower and upper), and a good quality 2 meter receiver capable of c.w./s.s.b. (both lower and upper) reception is most of what it takes to operate the AMSAT 9 satellite. Another approach to the same objective would be the utilization of a 2 meter receive converter coupled with a 10 or 6 meter receiver as the i.f. stage to receive the 2 meter signals from the satellite. A transverter coupled to a suitable 10, 6, or 2 meter transmitter will put a signal on the air at 435 MHz (the input or uplink for the satellite). As far as needing a degree to operate, we already have what it takes or we wouldn't be licensed.

The c.w./s.s.b. users frequencies for AMSAT OSCAR 9 (pending any last minute changes) will fall between **435.160 MHz** and **435.265 MHz** for the uplink or satellite input and from **145.835 MHz** to **145.960 MHz** for the downlink or satellite output. The two frequency spectrums involved in the satellite will require two antennas as each wavelength or "side" of the equation must be optimized.

Receivers And Feed Lines

The old axiom "if you can't hear them you can't work them" applies to satellite communication with a vengeance. The 2 meter downlink signal from the satellite can get lost or soaked up in the coax before it reaches the preamp, converter or receiver. It is important that the feed line from the 2 meter antenna be of the best quality and be as short as possible and have a very low loss or attenuation. By far the best choice would be hardline equipped with "N" type connectors or other constant impedance type connectors. The cost is the main drawback in such a set-up.

Long runs of RG-8A/U (over 50 feet) should be avoided where possible and needless to say forget RG-58/U! I would recommend that, unless you plan to use hardline, use the shortest possible run of coax, even if it means lowering your antenna height. If

W3HV at his operating position.

forced to use a long run of coax such as RG-8A/U, consider mounting a preamp at the antenna. The preamp will give the incoming signal a boost of near 10 to 20 dB thus negating the loss of the coax to a great extent. The loss in the long run of coax will still be there but there will be more signal available at the receiver than if there were no preamp at all.

Some 2 meter receivers of recent vintage have good to average gain and noise figures in the vicinity of 1.5 to 3 dB and should pose no significant problems in the reception of the satellites downlink signals, but the majority of 2 meter receivers in use today have noise figures less than desirable for weak signal work. To overcome a receiver noise figure of 6 dB you would need a low noise preamp with about 15 to 17 dB gain in front of the receiver to get a noise figure desirable for AMSAT OSCAR 9 operation. For those of you who desire to utilize a converter ahead of a 10 or 6 meter receiver, you would be well advised to peak up the i.f. receiver before attaching the converter. If, when you turn on the con-

*AMSAT Assistant Area Coordinator for Western PA, 1070 Alcoma St., Sharon, PA 16146

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verter, the noise floor of your receiver rises, it is a good indication that there will be no pressing need for a preamp in front of the converter but that is not to say you can't utilize a preamp if you so desire. Most of today's converters are solid state and can be built from kits or readily purchased from various companies ready to go. Nearly all offer good conversion gain and good to excellent noise figures. When shopping for a converter, check the performance specifications and look for a conversion gain of at least 15 to 20 dB and a noise figure near 2.7 dB or less. Out of band signal rejection should be at or near 50 to 60 dB. The warranty and service reputation of the company should also be a consideration in the purchase.

To summarize the receiver and feed line section refer to the chart below as to your desired route to receive AMSAT OSCAR 9.

Converter to 2 Meters

Long Coax Run	Short Run
1. Use hardline	1. Peak in receiver
2. N type connectors	2. Use N type connectors
3. Preamp at Antenna	
4. Sacrifice height for shorter coax run	
5. Peak in receiver	

2 Meter Receiver

Long Run	Short Run
1. Hardline	1. Peak in RX
2. Preamp at Antenna	2. Preamp at Ant.
3. Sacrifice Antenna height for shorter run	3. N type Connectors
4. N connectors	
5. Peak in RX	

Transmitters, Transverters And Triplers

Line loss is not just confined to received signals but also applies to transmitted signals as well. A point to remember is that the higher you go in frequency, the more power you are apt to lose in the transmission line. At 435 MHz the line losses are nearly double those at 146 MHz, but there is a difference in transmitting line losses as opposed to receiving line losses: the difference being that we can increase our output power to make up for the transmitting line losses, but on receiving, once the r.f. is lost it is gone forever. Keeping the s.w.r. as low as possible on the transmitter is important, as a high s.w.r. will also contribute to the total loss picture.

It is currently estimated that it will take approximately 500 w to 1 kw E.R.P. (effective radiated power) to maintain a good solid signal into the satellite at it's highest point or apogee. This figure may be lessened pending final adjustments to the space craft prior to launch. "ERP" is defined as the power leaving your antenna (and is equal to the power output of your transmitter less the transmission line losses) multiplied by the gain of the antenna. For example: 100 watts of output into a 10 dB gain antenna will yield (excluding line loss and s.w.r.) 1 kw ERP. A 13 dB antenna gain (3 dB increase doubles the power) coupled with 50 watts of output will yield 1 kw ERP; also a 16 dB gain antenna and 25 watts will yield the 1 kw ERP.

The current market of available 435 MHz transmitting equipment is quite limited in choice and the variety of outputs are also limited (around the 10 to 15 watt range). Hence the discussion of transmitting equipment will be limited to transmitters or transverters producing 10 watts of output to a linear amplifier producing 100 watts output coupled to an antenna yielding an ERP of from 500 to 1000 watts. The first stage, a 435 MHz transmitter/transverter capable of c.w./s.s.b. (both u.s.b. and l.s.b.) is the foundation upon which you are to build. If a heterodyne unit (transverter) is to be used it will require a driver of the proper frequency, typically 2,850,144 MHz, which should have the ability to sustain very low levels of output in the range of 50 to 500 mw. with good accuracy, as most if not all transverters will be damaged by power levels in excess of the called for amount. Varactor triplers are another means to get a signal on 435 MHz. Tripler users will have a problem with excess amounts of 2 meter

In the foreground is W3HV's KLM 16 element circular with circularity switching at the antenna. In the background is the Cushcraft 432 20 element twist also with circularity switching at the antenna. The rotor on the antenna boom controls elevation, the rotor on the mast controls azimuth.

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signal in the shack, which could desense the 2 meter downlink receiver, as the power needed to get 5 watts of signal out of a tripler at 435 MHz is usually around 15 watts at 145.1 MHz. So the desense problem could be quite a problem. Those who desire to use a tripler with a 2 meter rig for the uplink must take the desense problem into serious consideration and also the fact that a tripler can be a very high strung or temperamental device. It is fine for f.m. and c.w. but unusable on s.s.b. and hence not recommended for all around satellite use. Attenuation pads for transverters and triplers may be needed to reduce the exciter power level to acceptable limits called for by the manufacturer or instructions. The construction data for the pads usually accompanies the unit or is readily available in most radio handbooks.

In searching for a linear amplifier for 435 MHz, some people may want to try their hand at home-brewing as there are still several good tubes available at reasonable prices such as the 4CX150 and the 4CX250. The solid state enthusiast has available solid state bricks which produce 10 dB gain. The main drawback with solid state is that truly linear devices at 435 MHz producing 100 watts of output are not low in price. The *ARRL Handbook* has plans for a 435 MHz 500 watt amplifier and it would not be difficult to reduce some of the voltages to produce an amplifier capable of near continuous duty with an output near the required amount for AMSAT OSCAR 9 work.

Antennas

In choosing the antenna you will be using for the satellite, remember that with 50 to 100 watts at the end of the transmission line the approximate gain the antenna needs should be around 10 dB or better to get to the 500 to 1 kw ERP recommended. There are a wide variety of antennas available for both frequency spectrums involved with AMSAT OSCAR 9 but not all are suitable for satellite work in general. The input and output antennas on the satellite are both right hand circular in polarization. Therefore, to have optimum performmance, the ground stations antennas should both be right hand circular in sense. A strictly horizontal or vertical polarized earth station will suffer from "spin modulation" as the satellite will be spinning at approximately one revolution per second, thus causing a 3 Hz amplitude modulation of varying levels. I strongly recommend right hand circular polarization for both antennas for optimum performance.

As the satellite travels across the sky the earth stations must track its course with their antennas to maintain a good uplink and downlink signal. The AMSAT OSCAR 9 satellite will not be moving very fast as compared with OSCAR 8 and narrow beam width and high gain antennas can be used. But if you intend to use the antennas for OSCAR 7 or OSCAR 8 you may have a problem with the narrow beam width of the antennas in staying on target. If your antennas are to be used for all satellites consider lowering the gain of the antennas which will widen the beam width making tracking easier. The two antennas required for AMSAT OSCAR 9 operation can be mounted and controlled separately or mounted together on one boom; either way you will need to control both the azimuth and the elevation of the antennas to track the satellite. By mounting both antennas on the same boom azimuth and elevation, control is greatly facilitated. Standard TV type rotors with slight modifications are typically used to control elevation.

To track and find AMSAT OSCAR 9 a locator similar to the OSCAR-LOCATORS will be needed. Several private and commercial concerns will soon be introducing their versions to the market.

The new satellite will yield some new and interesting effects for beginner and veteran alike. The new satellite operator will notice that his upper sideband signal transmitted up to the satellite will be retransmitted to earth in lower sideband; also, as his transmitter frequency is increased his receive frequency will decrease. Both these effects are the result of the inversion of signals in the satellite's transponder. A totally new effect for all satellite users will be the time delay at apogee in reception of transmitted signals. For a c.w. operator who is accustomed to monitoring his downlink signal the delay will work like this..the letter "H" sent at 25 w.p.m. will not be heard by the sender until the third dot is sent. An s.s.b. operator desiring to break-in on a fast moving QSO will have to anticipate the break in transmissions to be heard. This effect is due to the extremely high altitude of the AMSAT OSCAR 9 satellite which, at it's highest point or apogee, will be nearly 35,786 kilometers. Even at the speed of light it takes time for the radio waves to reach it and return.

I hope this discussion of what will be useful in getting on the new AMSAT OSCAR 9 satellite has given the reader some insight and help that will enable him or her to be able to participate in the beginning of a new era in amateur radio.

a monthly feature by

KARL T. THURBER, JR., W8FX

Antennas

Design, construction, fact, and even some fiction

Last month we introduced this antenna column with some of the new editor's philosophy and kicked things off by providing some important, fundamental antenna and transmission line concepts. Author W8FX expands last month's basic antenna glossary with more terms in this issue.

Last month we kicked off this column under new editorship by "setting a baseline" with some of the more important antenna and transmission line terms and concepts. Again at the risk of offending our more advanced brethern, I would like to begin by expanding our set of terms to include a few dozen more that are important to acquiring a broadbased knowledge of antenna design, construction and use.

Let's add the following to last month's glossary.

* * *

Ammeter, R F — Current-sensitive device that responds to radio-frequency (r.f.) energy flowing through a transmission line.

Antenna pattern — Graphic depiction of antenna's magnitude of radiation, stated in terms of direction and distance from the antenna. Paper representation may be called a polar plot.

Attenuate — To reduce in power or strength. An electrical device that performs this function is known as an attenuator.

Bandpass filter — A selectivity-enhancing device that allows only a certain frequency range to pass through unattenuated.

Bandwidth — The range of frequencies over which an electrical circuit or antenna will work efficiently. Also refers to the upper and lower limits of a band of frequencies.

Beamwidth — Angular distance between the directions at which received or transmitted power is one-half the maximum power.

Broadside array — A driven antenna array usually consisting of two parallel elements lying in the same plane.

Capacitive reactance — Resistance offered by a capacitor to the flow of alternating current, as measured in ohms. Stated as X_C.

Characteristic impedance — The "apparent" resistance or impedance of a transmission line. Commonly represented by the symbol Z_O. See surge impedance.

Coaxial antenna — An antenna that uses coaxial cable or construction for all or part of its length. Usually vertically polarized.

Collinear array — A gain-type, directive antenna operated with its elements in phase to produce maximum radiation at right angles to the line of the antenna. A one-wavelength dipole could function as a collinear array operated as two half-waves in phases.

Collinear antenna — (v.h.f.) — Long, phased vertical whip antenna designed to produce a low angle of radiation and substantial power gain over a quarter-wavelength antenna. Usually consists of 1/4- and 5/8-wave radiating sections.

Decoupling coil — An inductance that electrically isolates one electrical circuit or device from another.

Delta match — A method of matching a low-impedance antenna such as a dipole, to higher-impedance parallel-conductor (open-wire) transmission line. The open-wire line is fanned out as it approaches the antenna element in accordance with predetermined dimensions.

Discone antenna — Very broadbanded antenna, vertically polarized and conical in shape, normally used at v.h.f. and u.h.f. frequencies. Very popular as a v.h.f./u.h.f. monitor antenna.

Driven array — An antenna in which all of the elements are driven (directly excited) elements.

Dummy load-wattmeter — Combination instrument that contains a power-absorbing device, used in lieu of an antenna, and a wattmeter to read a transmitter's output power. Primarily a servicing and test instrument.

Echelon antenna — A specialized, long parallel-wire antenna with the wires spaced one-half wavelength or more. The wires are staggered at their origins to form a parallelogram rather than a rectangle as is usual with other parallel-wire antennas.

Electrical length — Equivalent length of an antenna wire or transmission line as determined by the velocity of propagation through it. Will not correspond with the line's physical length.

End-fire array — A broad class of antenna that consists of a number of parallel elements in one plane. Maximum radiation takes place along the array's axis, and it may be unidirectional (one-way) or bidirectional (two-way).

Extended double Zepp — An antenna consisting of two collinear elements

Dummy load-wattmeter is a dual-purpose instrument that assists in servicing and tuneup. Unit shown here works over the frequency range of 2-230 MHz and handles up to 1000 watts r.f. power. (Photo courtesy Barker & Williamson)

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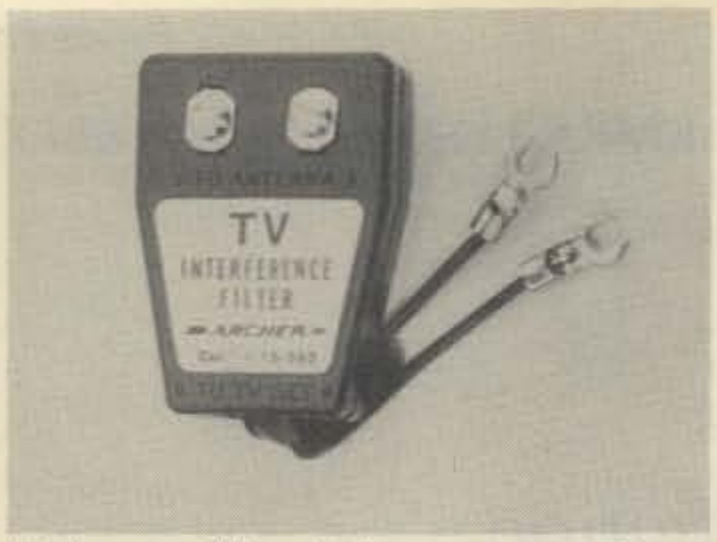


Highpass filter helps prevent TV set fundamental overload by amateur and other signals below its cutoff frequency. (Photo courtesy Radio Shack)

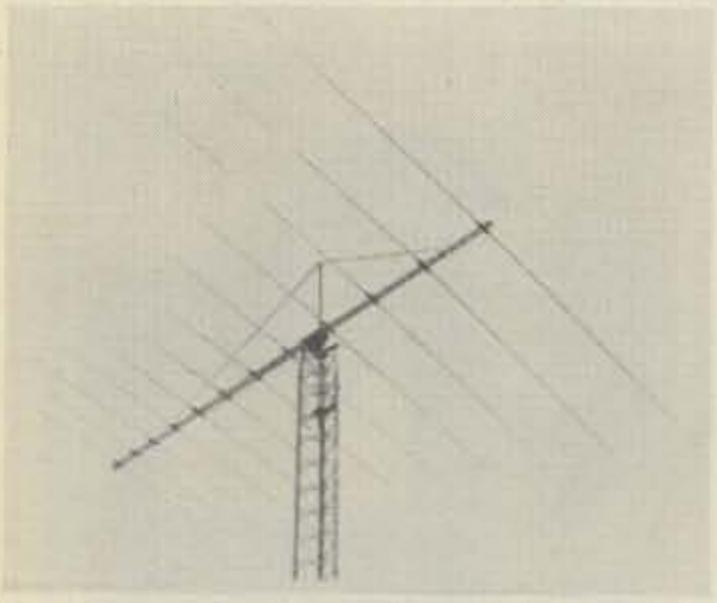
slightly longer than one-half wavelength—typically 0.64 wavelength. This antenna effectively gives more gain than its cousin, the 2 elements-in-phase collinear.

Feed impedance — Impedance, expressed in ohms, at the point at which an antenna is connected to the transmission line. Sometimes referred to as input impedance, especially as applied to the effective impedance existing at the end of a transmission line.

Flattop — Slang for a wire antenna, such as a dipole or single-wire.

Flat lines — Untuned lines, such as coaxial cables, that act strictly as transmission lines. In truly flat lines, line length does not affect the input impedance the transmitter "sees."

Folded dipole — A two-wire dipole-type antenna that has a higher feed impedance than a standard dipole. Folded dipoles are frequently used to obtain a good match to 300 ohm twin-lead transmission line. Their construction allows slightly increased bandwidth over that of a simple dipole.



The log-periodic antenna is a high-gain, usually large rotatable multiple-element beam antenna that is designed to yield consistent performance over a very wide operating range. This giant, 335 lb. Hy-Gain antenna is designed for continuous coverage across 13 to 30 MHz with a 13.5 dB average gain figure, as referenced against a standard dipole antenna. Its surface area of more than 17 sq. feet dwarfs most Quads—and the same firm sells an even larger 40- through 10-meter version that weighs in at 635 lbs. and sports a 37 ft. boom! (Photo courtesy Hy-Gain Electronics)

Halo antenna — A horizontal dipole bent into a circle. Used to attain horizontal polarization in mobile work.

Highpass filter — A circuit that rejects frequencies below a given cutoff frequency. Often used on TV receivers to reduce or eliminate TVI (television interference) from amateur h.f. transmitters.

Impedance matching — Process of adjusting ("matching") impedance so that maximum power flows through a circuit. As applied to antennas and transmission lines, minimum s.w.r. will also exist.

Inductive reactance — Resistance offered by an inductor to the flow of alternating current, measured in ohms. Stated as X_L.

"J" antenna — Consists of a half-wavelength vertical radiating element fed by a quarter-wave matching section. Often used in mobile work as it offers some gain over the usual quarter-wavelength whip.

Lazy H antenna — A four-element broadside antenna array, normally consisting of four, half-wavelength elements spaced one-half wavelength, in the form of the letter "H."

Log-periodic antenna — High-gain, usually large multiple-element beam antenna that is designed to operate over a broad range of frequencies.

Longwire antenna — An antenna, usually consisting of a single wire, at least several wavelengths long. The longer the antenna, the greater the gain. (This type of antenna is frequently confused with the single-wire. A single-wire antenna isn't a "longwire" unless it is, in fact, *long* in terms of the operating wavelength).

Loop — A "closed circuit" type of antenna, in which a conductor is formed into turns so that the ends are close together. Most loops are highly directional, and are therefore popular in certain receiving and direction-finding applications.

Lowpass filter — A circuit that rejects frequencies above a given frequency. Can be installed in an amateur transmitter's transmission line to reduce TVI-producing harmonic output.

Matching sections and stubs — Short transmission line lengths that are specially selected as to length for insertion into or connection to an antenna system to alter its impedance characteristics.

Multiband antenna — A wide-range antenna that can be made to receive and transmit satisfactorily over more than one band. In all cases, a design compromise or compromises must be made to enable multiband operation.

Multiple-dipole antenna — A system consisting of several center-fed, half-wavelength dipoles connected in parallel at the location where the transmission line is connected. Each dipole is "cut" for a specific band for optimum performance.

Parallel-wire line — R.f. transmission line consisting of two parallel conductors. Sometimes called open-wire line. TV-type twin-lead is a form of parallel-wire line.

Phase — In an a.c. circuit, the relationship between voltage and current.

Pi-network — Transmitter output ("tank") circuit or antenna coupler design, capable of handling a wide range of antenna system impedances. Consists of an inductor (coil) and two capacitors.

Lowpass filter attenuates h.f. signal harmonics that, if radiated, could interfere with local television reception. B&W unit shown here handles 100 watts r.f. and has a cutoff at 30 MHz. (Photo courtesy Barker and Williamson)

Plumber's delight — Slang term for a large heavy-duty all-metal parasitic beam antenna.

Prune — To adjust or shorten the length of an antenna to make it resonant at the desired frequency.

Random-wire antenna — An antenna, usually of single-wire construction, of any convenient length driven directly by a transmitter's or antenna coupler's output circuit. Not a "longwire" antenna unless physically long with respect to wavelength.

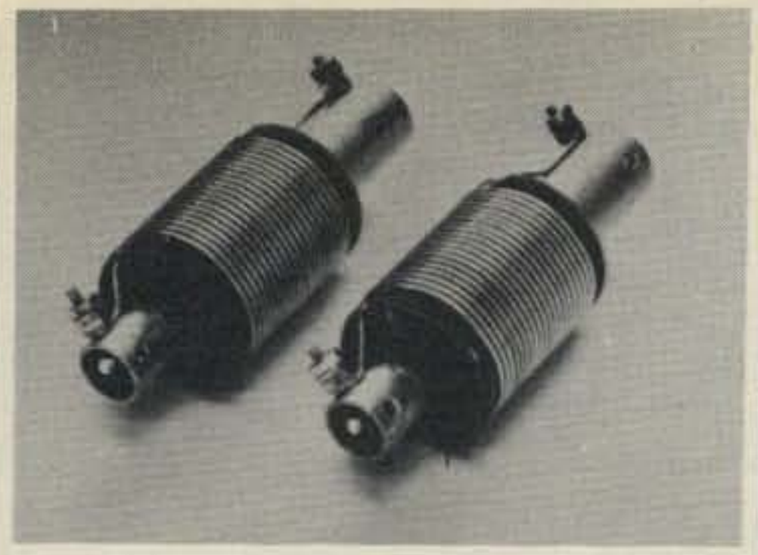
Reflected power — Power "returned" in a transmission line under mismatch conditions. In extreme cases, when the load resistance is either zero or infinity, all power is reflected back.

Reflectometer — A s.w.r. (standing wave ratio) indicator.

Resonator — An loading coil, used to make a physically short antenna of the proper electrical length for use at a given operating frequency.

Rhombic antenna — Resonant or nonresonant longwire antenna, usually diamond-shaped, in which all legs of the antenna are the same length. High directivity and effective gain figures are possible.

Single-wire antenna — Direct-fed wire



Example of Reyco dipole antenna traps to enable multiband operation with a single flattop. Addition of such traps allows low s.w.r. performance on 2 to 6 bands, depending on how many trap pairs are installed. Resultant antenna is fed with standard coaxial cable (50-75 ohm). (Photo courtesy Unadilla/Reyco)

antenna, in which the "return circuit" for the line is the earth. In effect, with this type of antenna, the transmission line and antenna are as one.

Skyhook — Slang for an antenna, especially a large, high wire antenna.

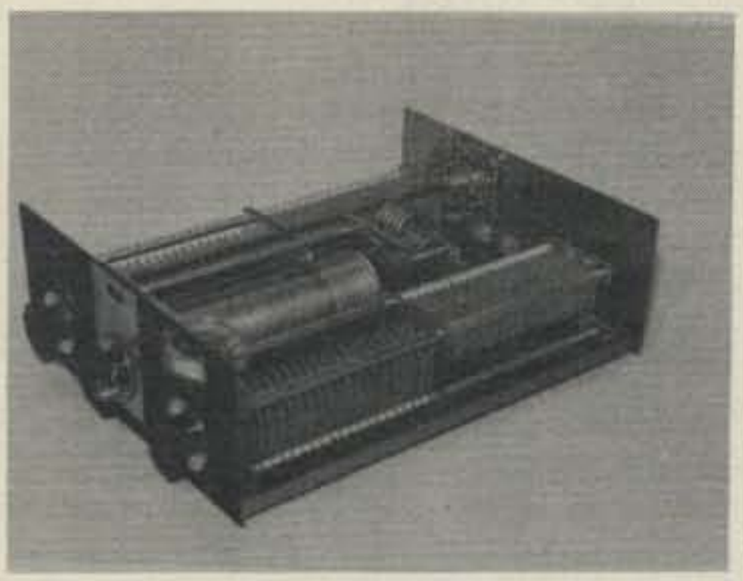
Sterba array — Large driven antenna system made up of both parallel and collinear elements.

Surge impedance — The characteristic impedance of a transmission line.

Trap antenna — Multiband antenna in which selected tuned circuits are placed in an antenna to effectively create resonances at several different operating frequencies. Commonly used in dipole, vertical, and beam antenna designs.

Turnstile antenna — Two dipoles placed at right angles to one another for the purpose of obtaining a near-omnidirectional radiation pattern.

Tuned (resonant) feeder — A transmission line that must be cut to a certain length to achieve a given input impedance for proper antenna system operation. Many multiband antennas fed with open-wire lines operate with resonant feeders.



Wide-range antenna coupler matching circuit enables various kinds of antennas to be "hitched" to the pi-network output tank which most current ham-band transmitters use. Representative tuner, innards of which are shown here, handles parallel-wire, single-wire, and coax-fed antennas of various types. (Photo courtesy Murch Electronics)

"T"-match — A matching system, similar to the Gamma match, to impedance-match a dipole antenna element to parallel-wire transmission line.

Vee antenna — Describes various antennas (longwires and dipoles, etc.) that are bent into a V-shape either for changing the antenna's directivity characteristics or for convenience in sizing the antenna to real estate. A variation is the inverted-Vee, or "drooping dipole," mounted from a high center support with the ends suspended but a few feet above the ground.

Velocity factor — As applied to transmission lines, this is the ratio of the actual velocity along the line to the velocity in free space. As a result of velocity factor, the electrical length of a transmission line doesn't correspond with its physical length.

Windom — Early multiband, off-center-fed antenna. It is made up of a half-wavelength antenna cut for the lowest frequency band to be used, with a single-wire or parallel-wire feed line.

Zepp antenna — End-fed, resonant antenna named for the trailing wire antennas of the Zeppelins. Basic configuration is a half-wave dipole that is end-fed by a parallel-wire transmission line.

This wraps up our two-part glossary of antenna and transmission line terms. Next month, we will move on to cover new material especially with the beginner in mind. 73, Karl, W8FX

Type Antenna	dB gain over half-wave dipole	dB gain over isotropic source
Isotropic radiator	- 2.1	-N/A
Ground plane vertical (¼-wave)	- 1.8	+ 0.3
½-wave dipole	-N/A	+ 2.1
5/8-wave vertical	+ 1.6	+ 3.7
.64-wave vertical	+ 2.2	+ 4.3
VHF Collinear mobile antenna	+ 3.4	+ 5.5
2-el Yagi	+ 5.0	+ 7.1
Phased VHF 5/8-¼-5/8 wave vertical	+ 6.0	+ 8.1
Phased VHF 5/8-5/8-5/8 wave vertical	+ 7.0	+ 9.1
2-el Quad	+ 7.0	+ 9.1
3-el Yagi	+ 8.0	+ 10.1
4-el Yagi	+ 10.0	+ 12.1
5-el VHF Yagi	+ 9.6	+ 11.7
3-el Quad	+ 10.0	+ 12.1
4-el Quad	+ 12.0	+ 14.1
Rhombic (5-wavelength legs)	+ 12.0	+ 14.1
Log periodic	+ 10 to + 14	+ 12.1 to + 16.1
10-el VHF Yagi	+ 12.0	+ 14.1
44-el VHF Quad array	+ 17.1	+ 19.3

Note: Gain figures are "typical." Expect to see slightly different figures quoted by different manufacturers and in various texts. Element configurations and spacing will also play a part.

Table I - Selected antenna gain figures.

No Mason/Dixon line here. It's an easy shift from North to South or back again.

As The Indicator Turns

BY ARTHUR CANDELL*, HH2A

It's probably a well guarded secret of Cornell-Dubilier Electronics, and don't ask me how I discovered it, but amazingly, here it is, Do you have a North centered meter on your Ham III or similiar rotor using the same control box and wish to convert it to a South centered meter? No need to make a homemade face or send to CDE for a South centered meter, you already have one!

Unplug the a.c. line, take off the cover, remove the one nut holding the pilot light assembly, remove the two brass nuts holding the meter contacts to the printed circuit board, loosen the screws holding the meter in its mount and slip it out. Carefully pry off the plastic meter face, and with a thin knife, remove the dial plate which is held by two tiny dabs of rubber cement, being careful not to bend the needle. Lo and behold, on the reverse of the dial plate is a South centered face! No need to add more cement; turn it over, press it on the old rubber cement, make sure the needle is not contacting the face and replace. 10 minutes and the only tools necessary are a small phillips screwdriver, a regular screwdriver and a pair of long nose pliers and you have a South centered meter.

Sorry CDE to give away your carefully guarded secret! ▣

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It's not just another power supply. K8EEG takes us beyond putting parts together and teaches us some practical design considerations.

The LM317 And LM350 In Adjustable, Regulated, High-Current D.C. Power Supplies

BY ADRIAN WEISS*, K8EEG/W0RSP

Almost seven years ago, this writer described a high current regulated power supply (*The Milliwatt,* June, 1973) which provided in excess of 4 amps output at 7-22 v.d.c. using the relatively new NE550A regulator chip. The unit required 12 components, in addition to the regulator and transformer-rectifier. Since then, the design and fabrication of IC voltage regulator chips has increased both in sophistication and power handling capacity. It is possible today to construct a d.c. power supply using one of the new IC regulators and two external components which set the output voltage level, plus, of course, the transformer-rectifier-filter capacitor components. Output currents up to 5 amps are possible with excellent load regulations of under 1%! Just a decade ago, a long list of components plus complicated design procedures were necessary to construct a supply which included all of the circuitry found on a single IC chip such as the LM317 and LM350. With units such as these, design and construction are a breeze!

This view shows the p.c.b. mounted on temporary heatsink. At right edge of board, the full-wave bridge rectifier package is the black shape, with C2 to its left. The filter capacitor C1 leads are the two light wires to the right edge of the board, while the a.c. from the transformer goes to the two black leads. At the left edge of the p.c.b., the top light lead is B+, and black bottom lead is B–/ground. The two nuts hold the mounting screws from the LM350, which is mounted underside, with the heatsink between it and the p.c.b. To the immediate left of the top nut can be seen R1, and in-line with R1 are two resistors in series to establish the exact value of R2 needed for the maximum output voltage level. The two small resistors to the left are "filed-up" values for R3-R4, with the 2 watt R5 seen at the left edge of the p.c.b. SW1 is visible below the p.c.b. with its three leads coming from the upper end of R2-3-4 pads.

LM317/LM350 IC's

The secret to the simplification of construction is the fact that all of the components formerly found in a discrete supply circuit are mounted on the IC chip itself, including the high-current carrying series pass element transistors. The LM350, for example, includes 26 transistors, 1 FET, 3 zener diodes, 26 resistors, and 3 capacitors on a single chip! Since the LM350 is intended as an adjustable output regulator, the two resistors which set the output voltage are not mounted on the chip. However, other regulator types which are designed to provide a fixed output voltage include these resistors on the chip. In addition to the basic regulating functions such as producing a reference voltage, error sampling-amplification,

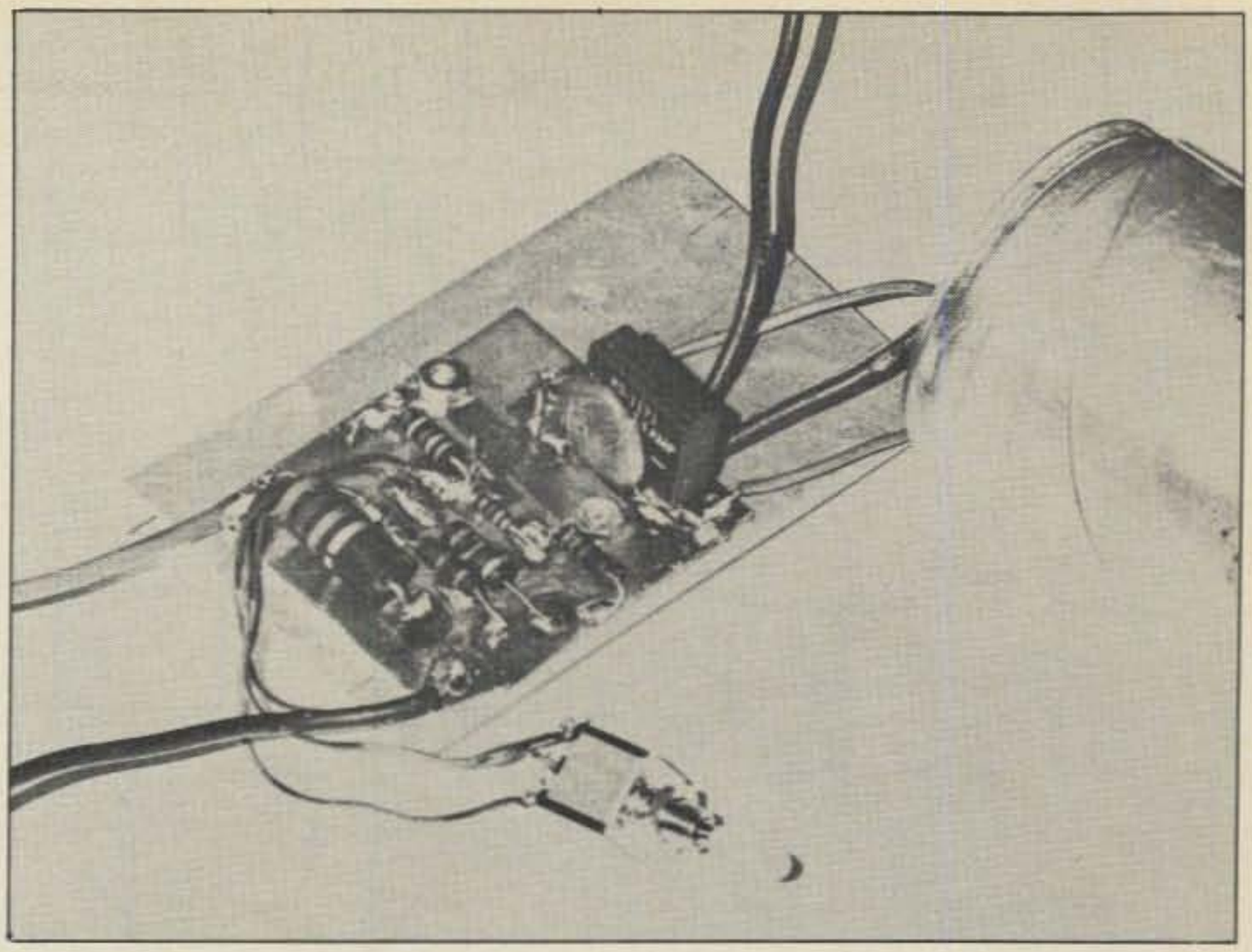
*83 Surburban Estates, Vermillion, SD 57069

and series pass element amplification, the LM317 and LM350 include a current limit circuit which internally limits short-circuit current level to 2.5 and 4.5 amps respectively, a thermal overload protection circuit which limits dissipation to rated levels, and a safe-area protection circuit for the series pass element transistors. All overload circuits remain fully functional even if the adjustment circuit is disconnected, resulting in virtually destruction-proof devices. In addition, all devices are "burned in" during manufacture, guaranteeing that the internal protection circuits are functional to rated specs. The two IC's discussed here are capable of producing a regulated output over the range of 1.2-33 v.d.c. and require a minimum input-output differential of 3 volts. While specs indicate maximum input voltage at about 35 volts, the devices have functioned properly with over 40 volts input. This means, in practical terms, that any transformer capable of producing up to 25 volts to a full-wave bridge can be used with the IC's.

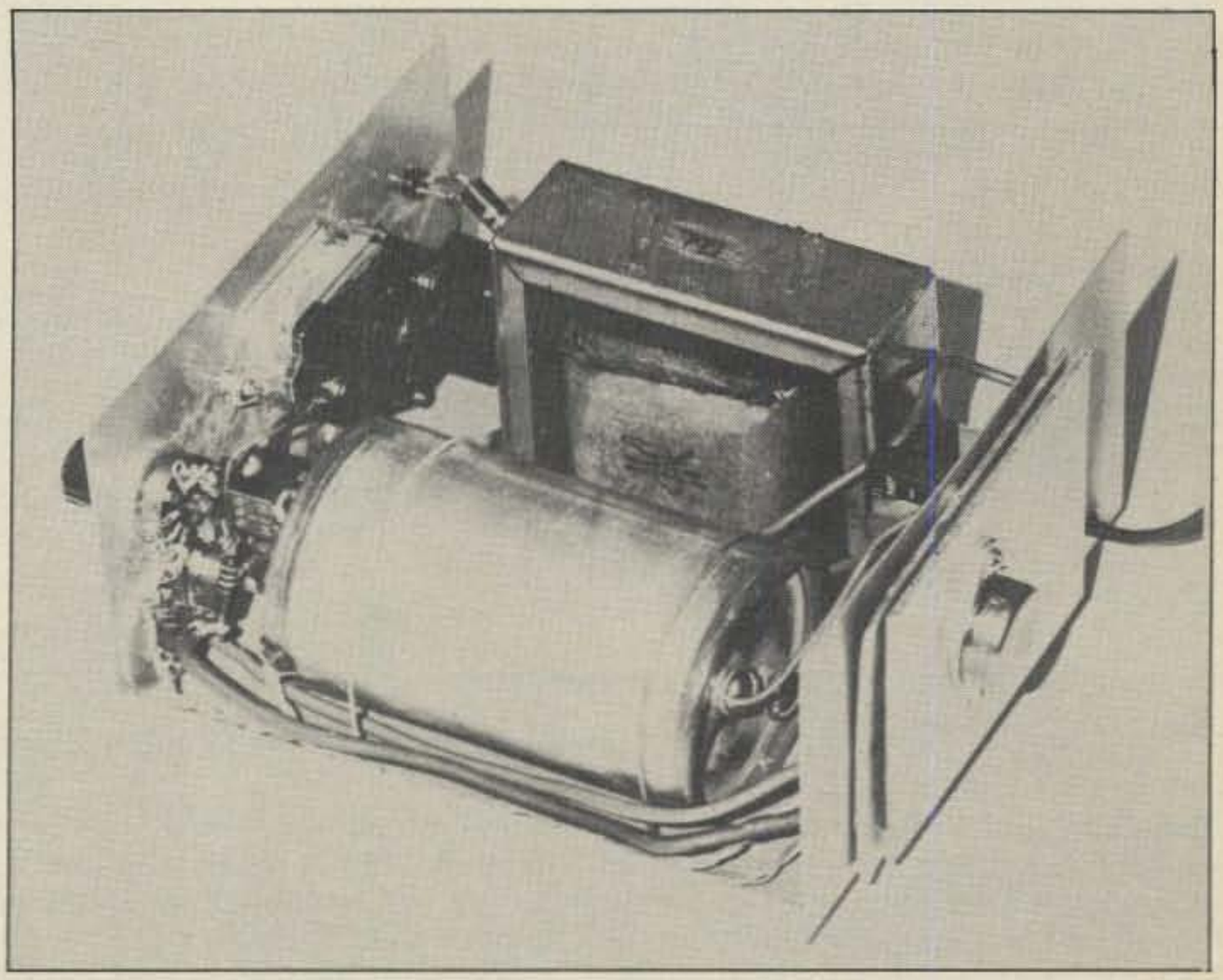
Design Considerations

1.) **Device Selection.** The selection of the IC regulator depends upon the current capability of the supply. The LM317K seems to be greatly underrated at 1.5 amp output current. The device tested here was capable of just over 2 amps with 0.4% regulation (12 Kmf filter capacitor). However, this device may exhibit maximum specs, while others fall more in line with the typical rating. On the other hand, the LM350 tested showed an absolute maximum capability of 3.1 amps. It was impossible to raise this current level while maintaining less than 1% regulation. Both devices exhibit the same maximum input voltage and input-output differential requirements. The spec sheet for the LM350 suggests that one should be able to expect closer to 4 amps at full regulation. This device may be atypical.

2.) **Transformer Selection.** The VA rating of the transformer should provide at least three volts through the rectifier more than the desired maximum output voltage. If a bridge rectifier is used, output from the transformer-rectifier-filter capacitor to the input of the IC regulator will fall between 1.35-1.65 × transformer voltage rating across the entire secondary winding. The actual output voltage will depend upon internal characteristics of the transformer itself. The above 1.35-1.65 factor is taken from actual measurements, with the IC regulator and a 220 ohm load assumed. Secondly, the current rating of the transformer should provide, at

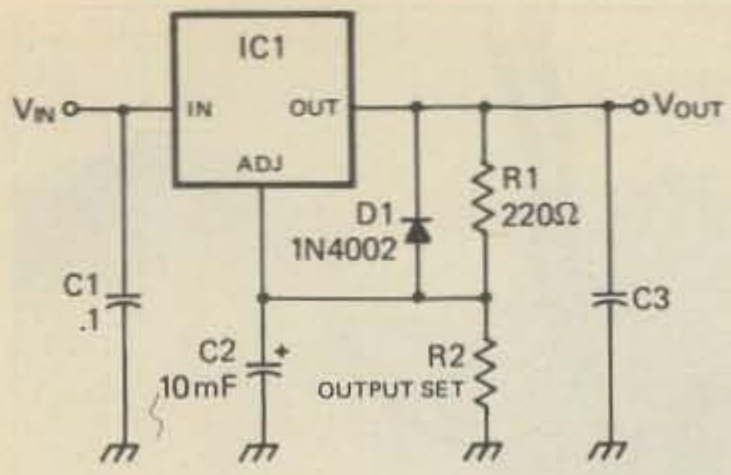


Side view of the completed unit. The LM350 is mounted on the rear chassis wall. The heatsink is two 3/32" aluminum plates 2.5" × ". Spacing is accomplished by two 1.25" × 1.5" plates cut from the same stock. The LM350K case is insulated from the sink by a mica washer, and insulator sleeves are slipped over the mounting screws and the input and adjust IC pins. The p.c. board is mounted against the inside wall with no insulation, and held in place by the mounting screws and solder connections of input and adjust terminals. The chassis enclosure was selected to accommodate the transformer and filter capacitor. The #12 copper lead for B+ and ground, as well as leads to SW1 and the adjustment potentiometer are seen at the bottom of C1. On the front panel, l-r, are the variable output adjustment potentiometer, range selection switch SW1, meter, and "on-off" LED indicator which is forced directly into a snug-fit hole.

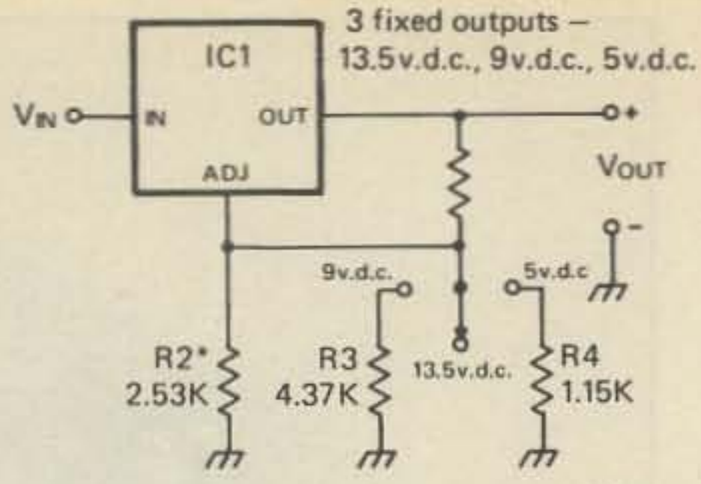


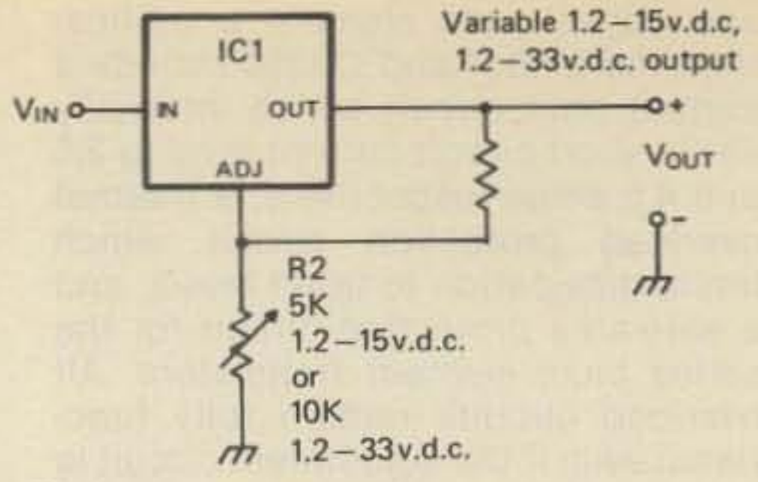
Front view of the completed unit. B+ output is taken either through two terminal posts, or through three phono jacks spread across the bottom of the front panel. SW1 can be seen midway between the recalibrated meter and the ADJ potentiometer which controls the variable output range. The a.c. on-off SW2 is at the left, with the LED on-off indicator above.

No 31-32

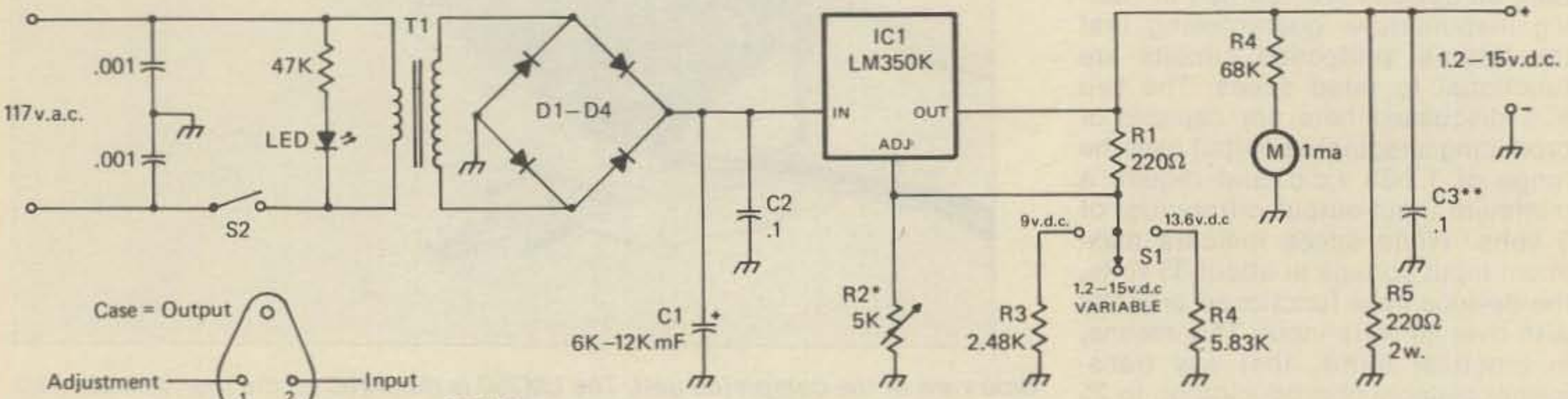


(A)





(C) Alternate R2 schemes



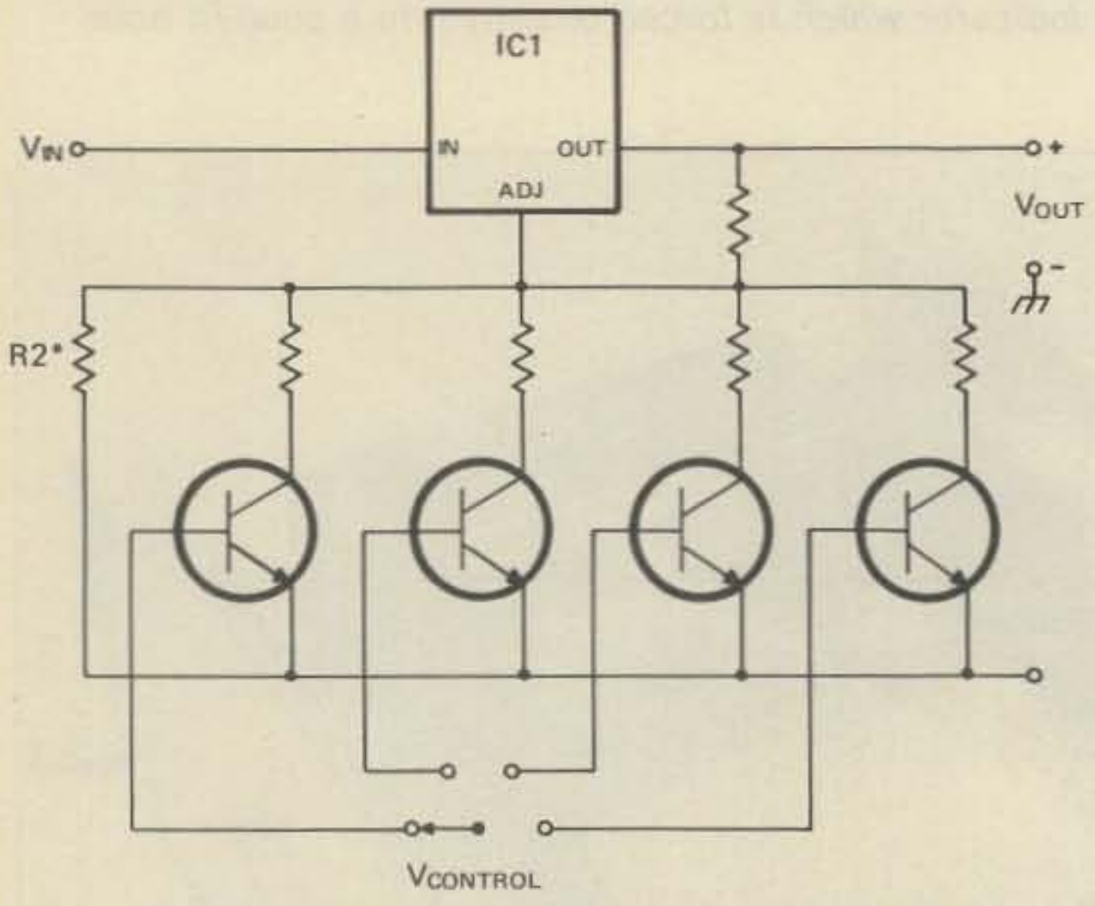
IC CONNECTIONS
BOTTOM VIEW

NOTES:

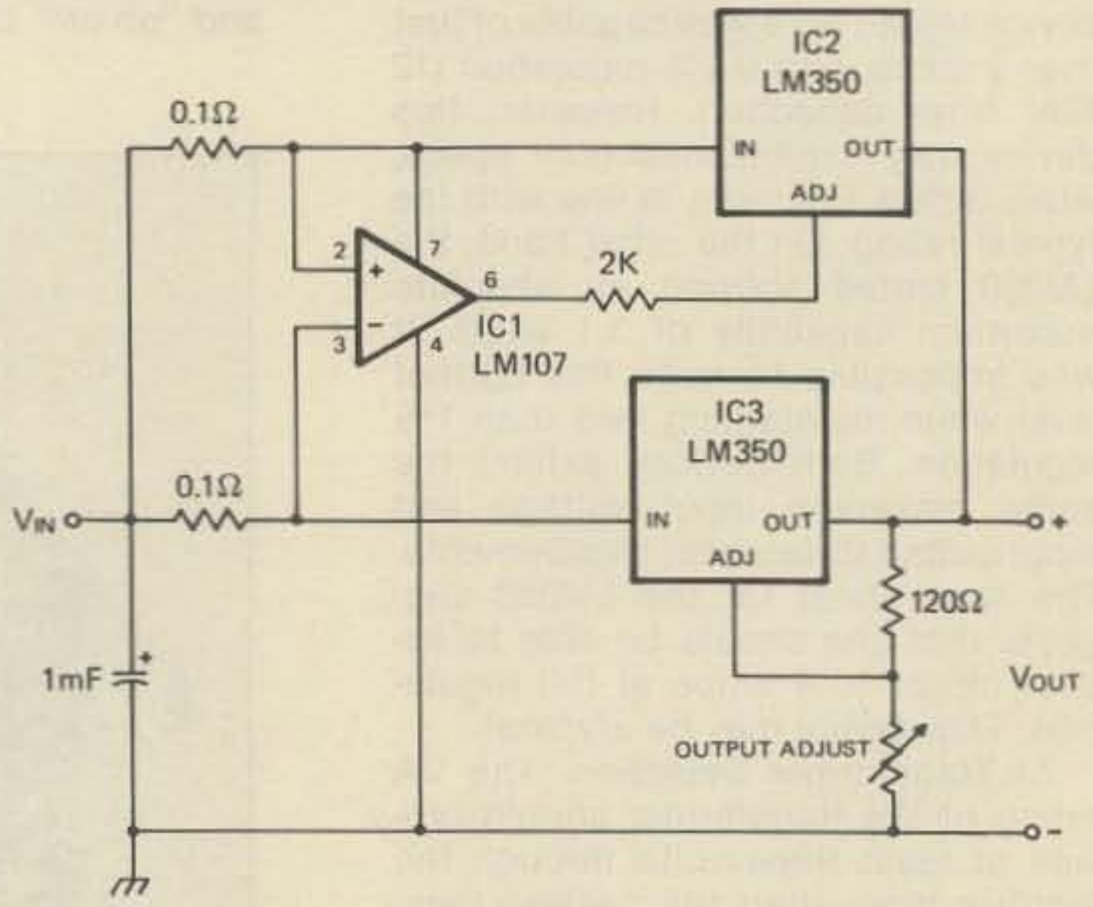
* = R2 sets maximum output voltage.
** = C3 mounts at output jack/ terminal posts.
C1 = See text for capacitor vs % regulation.
D1–D4 = 100v., 4a. bridge rectifier.
R3, R4 = Values achieved by "filing-up" standard resistors – see text or, 2 resistors in series, i.e., 2.2K and 270Ω.
S1 = SPDT "ON–OFF–ON".
R5 = See text.
T1 = 4a., see text for secondary voltage rating.

PARTS SOURCES:
LM350K = $10.95
LM317K = $ 4.99
TRI TEK, Inc.
7808 N. 27th Ave.
Phoenix, AZ 85021

(B) 1.2–15v.d.c., 3a. supply with switched 9, 13v.d.c., variable outputs



(D) Variable fixed outputs electronically or mechanically switched



(E) 6a. variable output

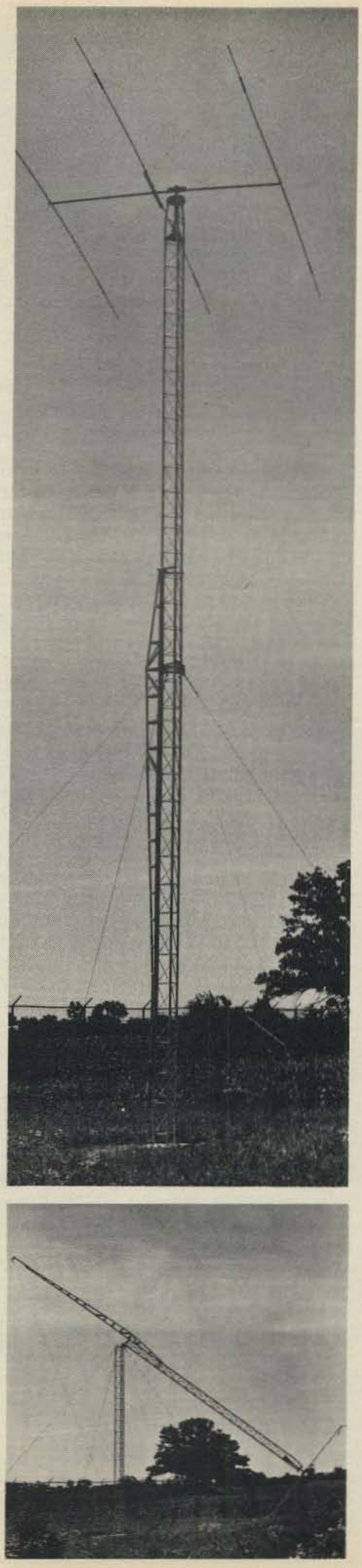
Fig. 1- The LM317K/LM350 power supply. Parts (A), (B), (C), (D) and (E) are fully explained in the text.

minimum, the desired supply output current capability. However, there is considerable variation in output from equally rated transformers. High quality units usually exceed the manufacturer's rating, while bargain types fall below it. Selection of an 18 or 24 v.d.c. 3 amp unit would provide better output current. A general rule of thumb is to select a transformer with a current rating of about 30-40% higher than needed. This is especially true if the supply is to power a load which causes wide fluctuations in current requirements, such as is the case with a c.w. or s.s.b. transmitter, where current may fluctuate between .12 and 2.8 amps in key-up/key-down shifts. The excessive current rating will permit "damping" of the transient responses due both to input voltage variations and output current variations as the current flow swings between minimum and maximum. An IC regulator, as well as any regulator, requires time for error-sampling and output voltage correction, and although these functions are performed so rapidly that they cannot be detected on a meter, they occur nonetheless and can affect the load.

For example, with the LM350, the transient response time for a 1 volt variation in input voltage is only about 2 microseconds, and for an output current variation of 1.5 amps about 6 microseconds. The transient response time is the duration required for the IC regulator to sense and correct variations in output voltage. In a typical situation, such as noted above, a swing in output current from 0.12-2.8 amps will produce a drop in input to the regulator of considerably more than 1 volt, depending upon the actual VA rating of the transformer, with the drop increasing as the maximum VA level is approached. The higher the VA rating, then, the lower the input voltage variation under a given output current swing. Now, the transient response can have a disastrous effect on high-power solid state amplifiers in several ways. First, the transient may produce a voltage spike which exceeds the rating of the transistor, destroying its junction. More commonly when ballusted emitter devices are used, which are usually unaffected by spikes, is the fact that the voltage spike will change the transistor operating conditions, such as Vcc, sufficiently, to upset the impedance matching conditions for which the stage is designed, resulting in self-oscillation and parasitics. Once the regulator corrects the output voltage, the transistor is already self-oscillating, and continues to do so regardless. Finally, if a relatively non-fluctuating load is anticipated, regulation will be excellent and the above precautions unnecessary.

3.) **Rectifier Circuit/Diodes.** The full-wave rectifier configuration is preferable to the half-wave in high-current supplies. The full-wave bridge configuration is superior, providing maximum transformer utilization. Diode PIV rating is half that required for equivalent half-wave and full-wave center-tap configurations. It provides a higher input peak to output average ratio, requires lower filter capacitance, and produces a lower ripple figure. Full-wave bridge rectifiers are available in a single package and quite economical.

4.) **Filter Capacitor.** The filter capacitor should be rated to handle maximum surge voltage from the transformer. This is usually equivalent to a 1.4 factor. The size of capacitor required to produce a given ripple figure may be calculated, but generally, low-current supplies (500 ma and under) will show good regulation with a filter capacitor of 1000 mf or so. The size of the filter capacitor must be increased significantly to produce excellent regulation at high-current levels. In the units discussed in this article, the load regulation achieved under no-load 100



ma to 3.0 amp full-load with the following filter capacitors was: 6000 mf - 1.06%, 8000 mf - 0.8%, 10,000 mf - 0.46%, 12,000 mf - 0.39%, above which level no improvement was achieved. An 0.1-1.0 amp swing shows a 0.8% regulation with the 6000 mf size.

5.) **Heatsink Requirements.** The power dissipation of the LM317K and LM350 is limited internally to safe levels. Even so, heat removal is necessary to maintain a fairly constant junction temperature so that best regulation can be achieved. Internal thermal buildup affects both the reference voltage and adjustment current with effects upon load regulation. The major source of thermal buildup is in the flow of current through the series pass transistors, which act as variable resistors which produce a drop in voltage between input and output voltages. The minimum input-output voltage differential for regulator operation is about 3 volts. At maximum 3 amp current, then, approximately 9 watts must be dissipated. Usually this amount can be handled by mounting the TO-3 package on a moderate sized chassis box, although some heat-sinking is necessary to keep the device at the "warm" level.

Sq. Inches*	Vertical Mounted Aluminum Fins Thickness†	
	3/16"	3/32"
1	6.8	6.5
5	6	6.1
8	4.8	5.1
10	4.2	4.7
15	3.5	4.2
20	3.1	3.7
25	2.9	3.45
30	2.75	3.25
35	2.62	3.07
40	2.55	2.9
45	2.42	2.75
50	2.35	2.65

**Area of one side of heat sink or chassis in square inches*

†Thermal resistance, Θ_{SA}, °C/W.

To use: Calculate the Θ_{SA} required as per 1.3. Choose thickness of aluminum sheet to be used in the sink. Find Θ_{SA} in proper thickness column, & readout necessary fin area in "sq. inches" column. Example: Θ_{SA} = 4.6°C/W. Select 3/16" thickness. 4.6°C/W falls between 8-10 sq. inches. Interpolate for about 9 sq. inches.

Table I - Estimates of heat sink size.

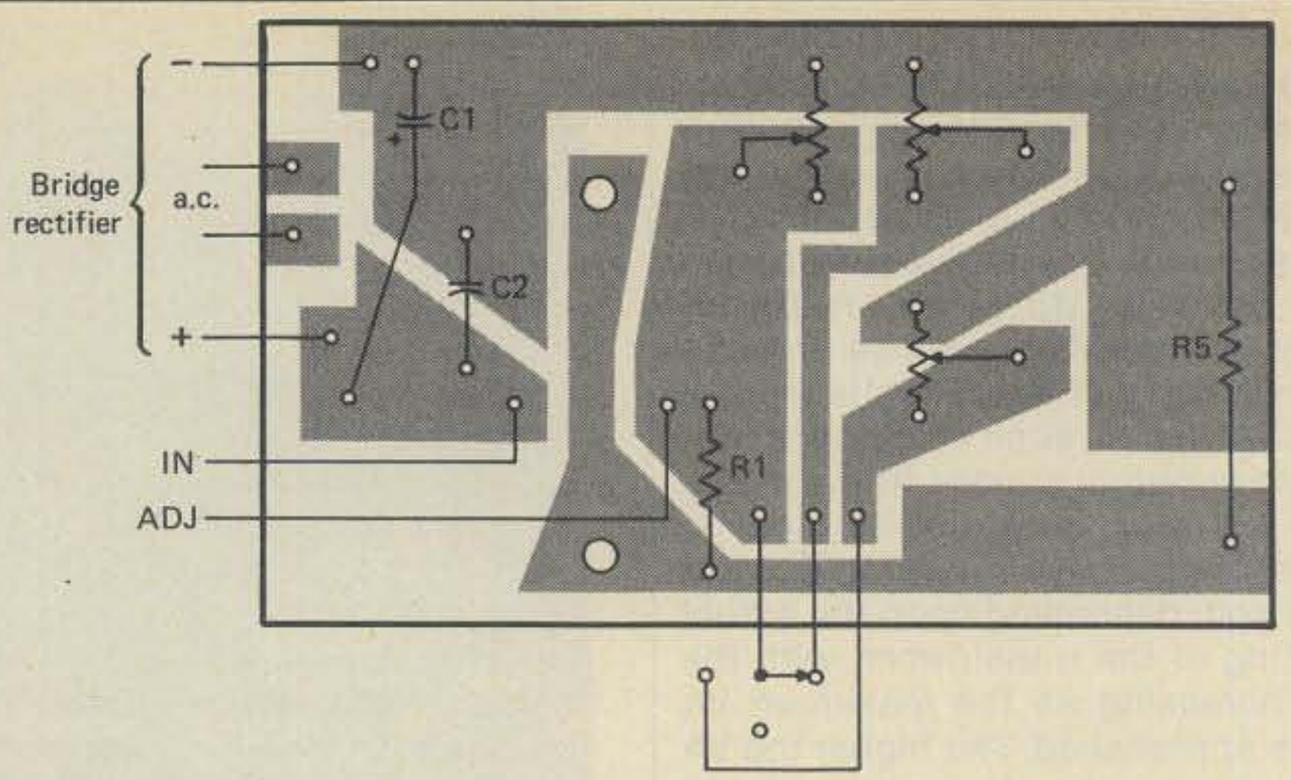


Fig. 3- An alternate PC board using 3 PCB trimmer potentiometers (vertical mounting) to set the output voltages.

However, as the input-output differential is increased at a given current level, power dissipation capability increases proportionately. For example, if the input to the regulator is 18 volts, and output is 5 volts, the difference is 13 volts times a 3 amp current, or about 39 watts. A large heatsink will be needed in this case.[1]

In designing a fixed voltage supply, the transformer VA rating can be selected that will produce input to the regulator slightly above the necessary 3 volts input-output differential under full load, including, of course, the rectifier and filter capacitor. For example, a supply with a fixed output of 13.6 v.d.c. at 3 amps is desired. If an 18 volt transformer is used, input to the regulator from the transformer-rectifier-filter capacitor will be on the order of 27 v.d.c. The input-output differential will be about 13 volts, and at 3 amps, about 39 watts dissipation. But if we aim at an input voltage just above the 3 volt differential, an input of 16.8 volts will suffice, and produce a dissipation of about 9 watts. A 12 volt transformer will fit the bill. If a variable supply is desired, the input voltage to the regulator should show the 3 volt differential at the highest desired output voltage. But at the lowest end of the desired range, the power dissipation requirements will be much greater than at the high end of the range and require more extensive heatsinking. In short, heatsinking can be minimized by selection of the transformer VA rating vs. fixed output level, but for a variable supply, this advantage will be minimized if high-current output at the lower end of the range is desired.

Circuit Description

Fig. 1 shows that basic IC regulator configuration 1(A) as well as the power supply circuit which produces two fixed and one variable output 1(B), and optional methods of setting output 1(C). In Fig. 1(A) Vin-Vout should be about 3 volts or more in order to insure proper regulation. R1 is in the 220-240 ohm range and in combination with R2, the output set resistor, establishes the output level. The value of R2 may be calculated from the formula given on the data sheet[2], or more easily discovered empirically by inserting a 10K potentiometer at R2, adjusting it for desired output, and measuring the resistance. The input capacitor is recommended, especially if adjustment or output filter capacitors are used at C2 and C3. These unit are unnecessary. The use of C2 increases ripple rejection from 65 to 86 dB. If it is included, D1 must also be used to prevent damage to the IC caused by shorting of the input terminals, in which case C2 would discharge into the output terminal and the resulting current spike would be sufficient to damage the IC internally. R1 should be mounted at the output and adjust IC terminals to minimize effects of any drop in live voltage.

Fig. 1(B) shows the practical circuit of a power supply utilizing either the LM317K (about 2.2a, ps maximum) or the LM350 (3 amps maximum for the device tested). In this version, a SPDT (on-off-on) switch is used to provide two fixed outputs of 13.6 v.d.c. and 9 v.d.c., and variable output over the 1.2-15 v.d.c. range. For the fixed outputs, the variable range potentiometer R2 is set at maximum resistance, and when either R3 or R4 is placed in parallel with it, the resulting combined resistance sets the output voltage level. Figure 1(C) shows two alternate approaches. In the first, three fixed resistors are used in the same scheme as 1(B) to produce three fixed outputs. In the other version, a single potentiometer is used for a single, variable out-

[1]*See Appendix (1)*

[2]*See Appendix (2)*

put. The values of the three fixed resistors (and the fixed resistors of 1[B])were obtained by taking a standard value resistor *below* the required value, and "filing it up" to the value needed. A triangular or square metal file is used to file a notch across the center of the resistor until the carbon composition center is exposed, and then the actual resistance is carefully measured as the filed notch cuts deeper into the carbon core. Or, one may monitor the output level as the resistor is filed until the exact output voltage is obtained. In this approach, the resistor is not soldered into the circuit, but merely inserted by touching the leads to the proper pads. An alternate circuit board shown in Fig. 2 permits the use of p.c. board trimmer potentiometers should the builder not wish to waste time filing fixed resistors. Finally, Figure 1(D) shows a method of using NPN transistors as switching elements in using an external control voltage for automatic switching. The basic principle applies to all these schemes—one resistance sets the maximum output voltage, and the others are placed in parallel to lower the value of R2 and the corresponding output voltage. Finally, fig. 1(E) shows a pair of LM350's can be combined to produce a 6 amp output capacity. R1 is fabricated by winding about one foot of #30 wire on a 2 watt resistor form. Check manufacturer's specs on the wire used for the exact amount needed for 0.1 ohm resistance.

To return to fig. 1(B), a 12 V 4 A transformer is shown in combination with a 100 V 4 A bridge rectifier unit. C1, the filter capacitor, is from 6,000 mf to 12,000 mf for the regulations mentioned above. Output from this particular transformer to the IC is about 18.2 v.d.c. Other 12 V transformers produced inputs to the IC of 16.8 v.d.c. and 20.1 v.d.c. The function of R5 should be noted. It is necessary when the Vin-Vout differential is near the required 3 volt figure at the upper end of the output range. Under no-load conditions, regulator output voltage is high; when the load is applied, the regulator begins proper operation and the voltage is lowered. R5 establishes the minimum current load necessary for proper regulation when Vin-Vout is less than about 5 volts. Beyond the 5 volts level, R5 becomes unnecessary. As noted earlier, transformers up to 24 v.a.c. across the entire secondary may be used. But, the power dissipation capacity of the IC depends directly upon the Vin-Vout differential and current level, so that the choice of a transformer which produces significantly more than the 3 volts required Vin-Vout differential at the upper end of the output range increases heatsinking requirements.

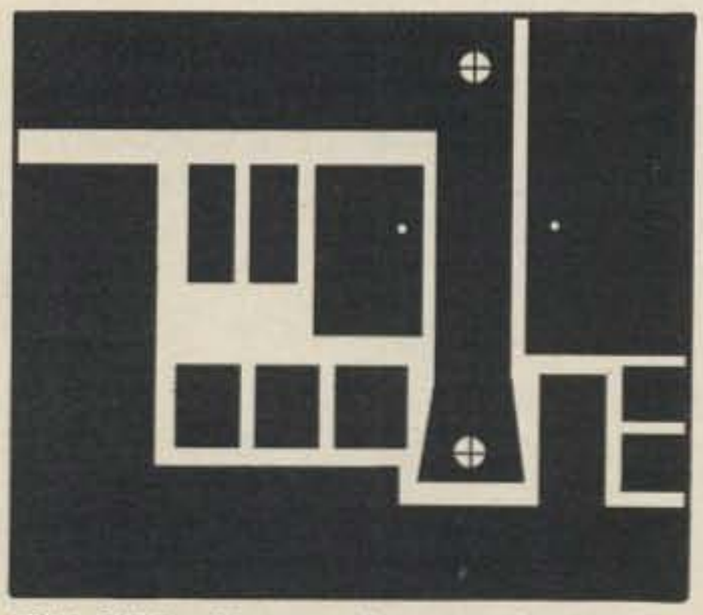
Construction

The photos show the construction approach used in the unit being discussed. Parts location is non-critical, with the exception that R2 should be directly across the output and adjust terminals. In a 3 amp supply, use #12 or #16 solid or stranded copper wire for the output leads. The heatsink consists simply of a pair of 2.5″ x 3″ x 3/32″ aluminum plates spaced by two smaller plates, and thermally connected to the IC case and chassis box with thermal grease to insure the least thermal resistance path. Disregarding the chassis box element, thermal resistance of this sink is about 4.5° C/W, and in combination with the junction thermal resistance, adequate for at least 15 watts dissipation. The inclusion of the chassis box as part of the sink raises the power dissipation capability by several watts.

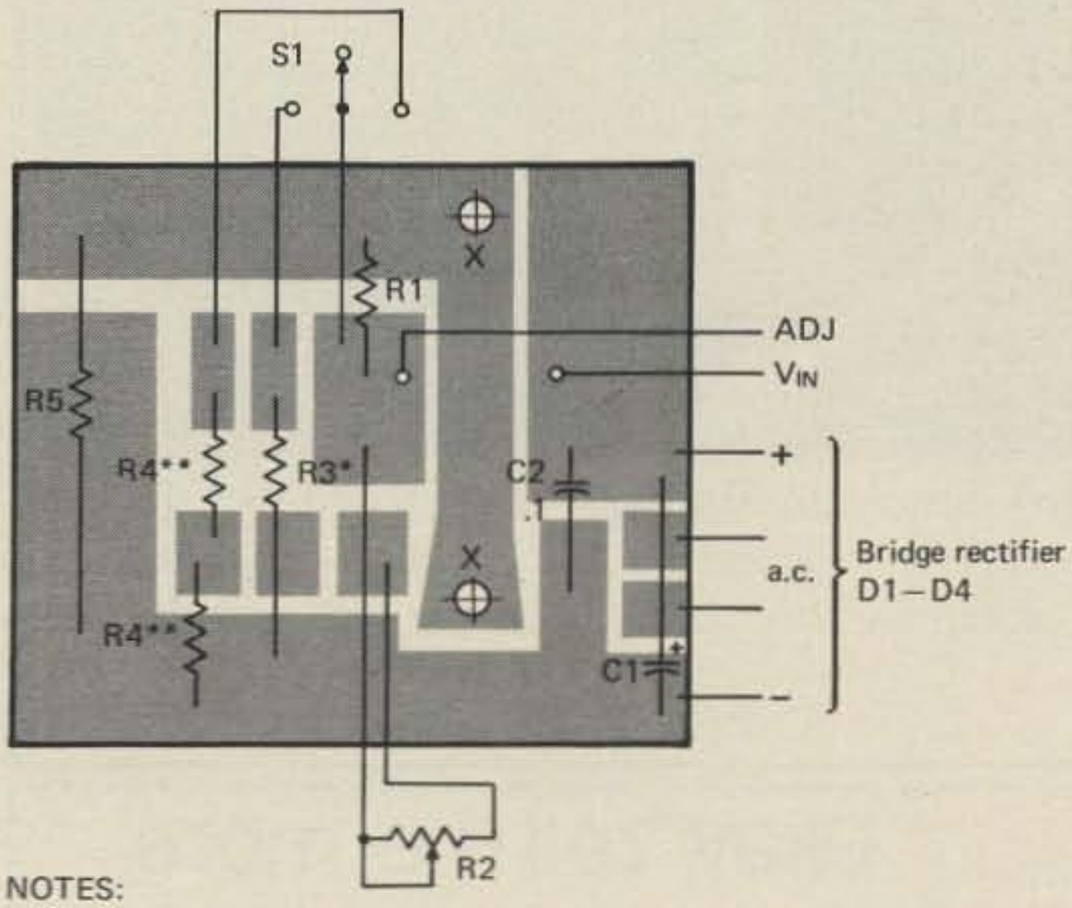
The output meter is a cheapie 1 ma surplus type, with the face cover removed, an address-label stuck on as a new face, and calibration marks from 0-15 v.d.c. ruled in. An external VTVM is used in calibrating the new meter face. The 68K series dropping resistor is selected to provide full scale needle deflection at about 18 v.d.c.

Appendix 1: Heatsink Calculations

1.1 Determine total junction to ambient thermal resistance ($\Theta_{JA(TOT)}$) required to maintain selected junction temperature (Tj) at expected ambient (room temp.) temperature (Ta) for maximum IC dissipation required by:



FOIL SIDE = IC mounted on opposite side. The IC may be mounted outside the chassis wall, the p.c.b. inside the chassis wall.
X = Mounting holes for LM350K/LM317K output-case.



NOTES:
* = Shows single "filed-up" resistor.
** = Shows 2 resistors placed in series to achieve exact value.

R2, R3, R4 show 3 ways of mounting resistors:
R2 = External potentiometer
R3 = Exact value resistor
R4 = 2 resistors in series
} Each method will work for each "pad" set. Pads may be extended to the left to increase number of switchable voltages.

Fig. 2- The PC board template and parts layout for the 1.2 - 15 v.d.c. 3 amp power supply.

$$\Theta_{JA(TOT)} = \frac{Tj - Ta}{P_D} \quad °C/W$$

where P_D = (Vin - Vout) 1 out (max), or input-output differential times maximum steady state load current.

1.2 (a) If $\Theta_{JA(TOT)}$ is greater than Θ_{JA} (junction to ambient thermal resistance for the device case style) no heatsink is required. Θ_{ja} for standard cases:

Case	Θ_{JA}
TO-39	150°C/W
TO-202	80°C/W
TO-220	50°C/W
TO-3	35°C/W

(b) If $\Theta_{JA(TOT)}$ is less than Θ_{JC} (junction to case thermal resistance), the device cannot handle the required level of power dissipation. Select another device. Θ_{JC} is from mfr. specification sheet.

(c) If $\Theta_{JA(TOT)}$ falls between Θ_{JA} and Θ_{JC}, a heatsink is required.

1.3 To determine required thermal resistance of heatsink (Θ_{SA}, or, sink to ambient resistance), calculate:

Θ_{SA} °C/W = $\Theta_{JA(TOT)} - (\Theta_{JC} + \Theta_{CS})$

where Θ_{CS} is case to sink thermal resistance. Θ_{CS} for case types =

Case	Silicone Grease Contact	Silicone Grease Mica Washer Contact
TO-3	0.3-0.5° C/W	0.4-0.6° C/W
TO-202	0.9-1.2° C/W	1.2-1.7° C/W
TO-220	0.6-0.8° C/W	0.8-1.1° C/W

1.4 Select appropriate heatsink for mfr's specs in a supply house catalogue; or, construct an adequate sink. Calculations are extremely complex — you need a PhD in math or physics. A practical graph appears in *RCA Power Circuits: DC to Microwave* (RCA, 1969), p. 82. See Table 1 reproduced elsewhere in this article for rough estimation of sink size.

Appendix 2

To calculate R2 vs Vout:

$$Vout = 1.25V_{REF}\left(1 + \frac{R2}{240(R1)}\right) + R2\ (.00005/Adjust)$$

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Amateurs victims of gigantic hoax! Sporadic E is NOT a natural phenomenon, but an international plot. CQ is proud to have scooped both Jack O'Brien and The National Enquirer to bring you this shocking expose.

Floating Mirrors And Their Use in Radio Communications

BY PROFESSOR EMIL HEISSELUFT*

Sporadic E, a so-called "summertime phenomenon" in the temporate zones, has never been adequately explained. Some observers hypothesize, for example, that ionized patches are produced sporadically at altitudes just beneath the E layer as a result of shear winds at these heights, and that these patches account for the propagation which is observed. "Not so!" says Prof. Heisseluft. "The properties many believe to result from sporadic E ionization are really attributable to the presence of wire-grid mirrors which are held in place by intense beams of radiation from the ground." In this exclusive article for *CQ* magazine, Prof. Heisseluft supports his assertion using information heretofore suppressed by the governments involved in floating mirror experiments. If what the professor says is true, amateurs and scientists worldwide have been the victims of a gigantic hoax. -K2EEK

From May through August of each year, amateurs in the northern hemisphere communicate using signals reflected from what are thought to be ionized clouds which form sporadically just beneath the E layer (90-100 km, or about 60 miles above the earth). In truth, the signals are reflected from wire grids which are supported by radiation pressure from ground-based transmitters and which act as floating mirrors.

This claim is based on information contained in recently declassified documents unearthed by an associate of mine at the Lauton Institute. Moreover, it appears that the floating mirror concept is an outgrowth of secret solar pressure studies performed by Professor Jerzy Ostermond-Tor and me in the mid-1950s! Regardless, amateurs and scientists worldwide have obviously been the victims of a giantic hoax, for there really is no such thing as a "sporadic-E cloud."

So-Called Sporadic E (Es)

For background, it is of interest to review briefly what properties are attributed to so-called sporadic E. A knowledge of these properties will make it easier to understand how floating mirrors can account for the type of propagation we experience and associate with "Es."

Sporadic E is the name given to what are thought to be patches or clouds of intense ionization which form at altitudes just beneath the ionosphere's E layer. In the temperate zones, Es is observed primarily during the late spring and summer months. For example, in the northern hemisphere, 80% of all Es propagation is observed between the months of May and August, inclusive, with most of the activity taking place during the midday and early evening hours.

Radio signals reflected from Es clouds (if that is what they truly are) can travel as much as 2200 km (about 1300 miles) in one hop (fig. 1). Further, received signals are quite strong, indicating that the reflection takes place with very little signal loss.

Propagation via so-called sporadic E ionization is very erratic in nature. In particular, the signals received appear to have been reflected from something that is drifting with time, often at very high speeds. This observation is drawn from the fact that during Es openings, signals can be observed to peak up rapidly, to hold steady for a few minutes, and then, to disappear completely into the noise.

All of these observations can be explained by the presence of "mirrors"

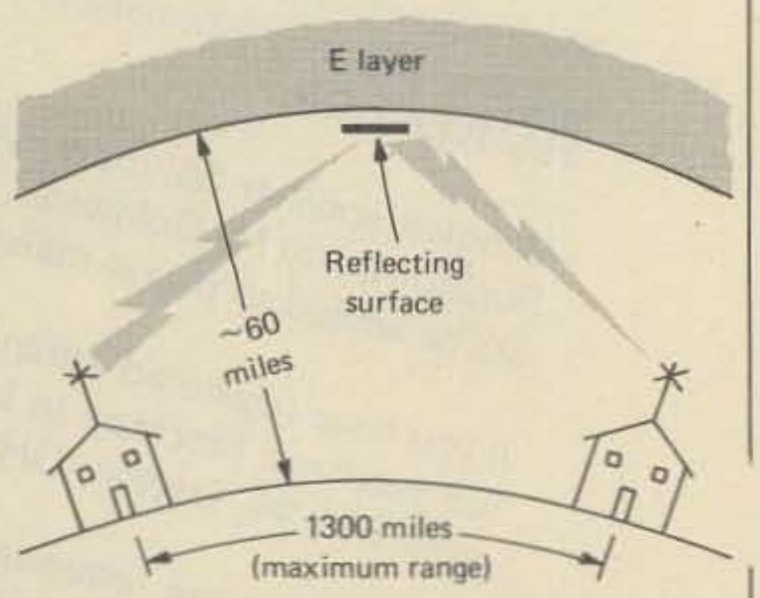

Fig. 1-Propagation via so-called sporadic E can provide communications over distances of up to 1300 miles.

**Professor Heisseluft is currently teaching theoretical mechanics at the Lauton Institute, Grossmaul-an Der Donau, Austria. Correspondence to the Professor may conveniently be directed c/o CQ, 76 N. Broadway, Hicksville, LI, NY 11801.*

which are floated at altitudes of 60 miles or so by radiation pressure from ground-based transmitters. To demonstrate that this is possible, and that radiation pressure can indeed support such mirrors, let me digress for a moment and review for you some of the analyses Prof. Ostermond-Tor and I made relative to the use of radiation pressure in space travel.

Radiation Pressure

Several years prior to the launching of Sputnik, Professor Ostermond-Tor and I received a grant from the Austrian Academy of Science to study the feasibility of using radiation pressure to propel a vehicle through space. We hypothesized that a space-

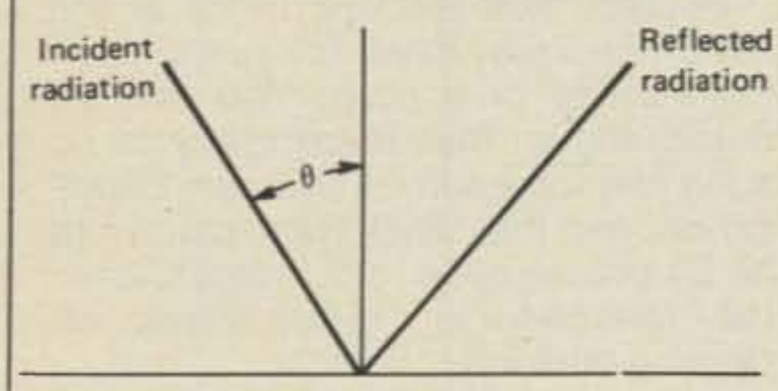

Fig. 2- For totally reflected radiation which is incident at an angle ϴ, the pressure is 2w cos²ϴ.

ship could be built and fitted with large metallic-film sails, and that solar radiation pressure could be used to "push" the vehicle through space. Our studies of theoretical physics convinced us that it should be possible to build such a solar-powered spaceship.

To see this, consider the following, simplified formulation. If we let *w* be the mean energy density in oncoming waves, the waves carry *w/c* units of momentum per unit volume (where *c* is the velocity of light). Thus, the waves bring *w* units of momentum per second to each unit area of the surface. When the waves are absorbed by the surface, it receives the momentum, and, hence, experiences a pressure equal to *w*. If, on the other hand, the waves are totally reflected from the surface, the pressure exerted on the surface is *2w*. Finally, if the radiation is incident at some angle ϴ, the pressure is reduced by a factor of $\cos^2\theta$ (fig. 2).[1]

Based on this type of an analysis, Tor and I conceived the idea of a spaceship which would be propelled through space by means of solar radiation. Basically, the spaceship had two large metallic-film "sails" which could be synchronously rotated to vary the radiation pressure on the sails (and, hence, to vary the velocity of the spaceship). In order to steer the spaceship, however, it would be necessary to mount steerable thruster rockets above and below the cabin. A diagram of the Heisseluft/Tor solar-driven spaceship is shown in fig. 3. Details of the spaceship have only recently been made available to the public after having been classified for 25 years![2]

Our analyses of solar radiation pressure apparently have led to the concept of using communication mirrors which are floated above the ground by radiation pressure. Csonka[3], in particular, has published a technical note on this subject. Below is a brief review of his work.

Radiation Supported Mirrors

According to Csonka, it should be possible to construct a lightweight wire grid using aluminum wire having a diameter of 1μ (one micron). The wires would be strung parallel to one another, and would be held together by a relatively few number of cross-wires. In this way, the radiation reflected form the wire grid would be linearly polarized.

As an example, Csonka suggests that if one were to construct such a wire grid having a diameter of 4 meters (about 13ft.), it would weigh about 0.035 grams, and it could be supported at a height of 60 miles by 50 to 150 kW of electromagnetic radiation. The mirror would be launched from a balloon, and would be "blown up" to assume its "face-down-disk" shape by the combined forces of radiation pressure and gravity. Further, the mirror presumably could be made to drift from place to place by shifting the beam of supporting radiation. It should even be possible, with a properly designed wire grid, to rotate the mirror by rotating the polarization of the radiation which is used to support the mirror! This, in turn, according to Csonka, "opens the way to selective directional transmission."

"Incredible!" you say? What is even more incredible, my dear friends, is that several governments have for many years secretly deployed such floating mirrors! Constructed in the manner proposed by Csonka, these mirrors—and *not* intense ionization—are responsible for what most people describe as sporadic-E propagation. Virtually all of the mirrors have been launched during the late morning and late afternoon hours of late spring and summer days; this is done to examine mirror behavior during the hottest time of day and at the day/night transition. By using these two launch windows, the mirrors are generally ready for use around local noon and local sunset... *just the times when so-called sporadic E is said to occur. The mir-*

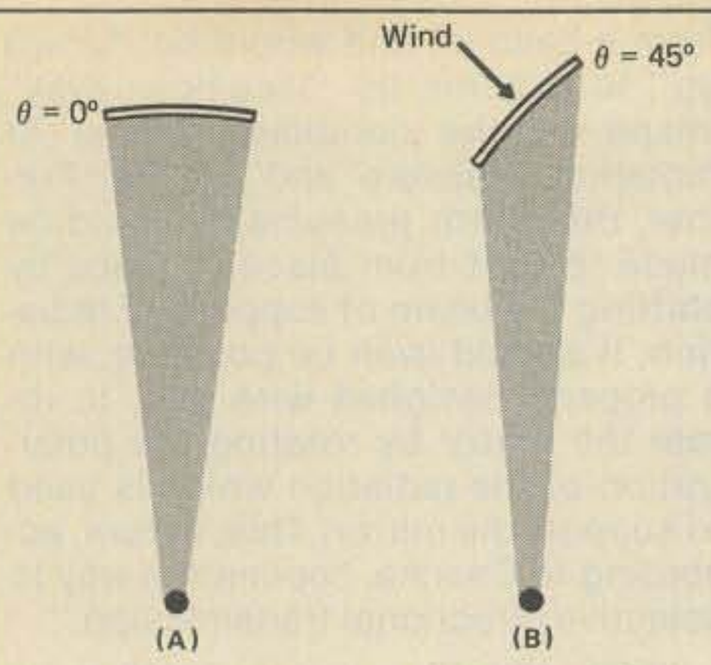

Fig. 4-(A) A stable mirror shown shortly after launch. (B) Wind effects tilt the mirror, reduce the radiation pressure on it, and cause it to go out of control.

rors are usually floated at an altitude of 60 miles, and signals reflected from them have been observed at distances of up to 1300 miles. Then, too, the reflected signals are quite strong,* as would be expected for radiation which is reflected from a metallic surface. In short, the floating mirrors have, over the years, shown themselves to be a low-cost means by which to propagate strong radio signals over great distances.

**In some cases, multi-hop propagation using two mirrors has been observed; distances covered sometimes reach 2600 miles.*

There is, however, one problem with the mirrors which must be solved before radiation-supported mirrors can provide radio wave propagation on a dependable basis.

The Problem

Simply put, the problem is that it has not been possible to control the position of the floating mirrors in a consistent manner. Perturbations in the orientation of the mirrors—usually caused by upper-atmospheric winds—change the angle with which the ground-based radiation is incident on the mirrors. Such changes reduce significantly the radiation pressure (because of the previously described $\cos^2\theta$ dependence), and result in loss of mirror control.

For example, if the supporting radiation is incident perpendicular to the plane of the mirror (fig. 4(a)), $\cos^2\theta$ 1. If, however, wind causes the mirror to tip by 45° (fig. 4(b)), $\cos^2\theta = 0.5$. That is, the supporting radiation pressure is reduced by 50%. Under these conditions, the mirror is left to the mercy of the winds, and as usually happens, it drifts off at speeds of up to 250 m.p.h. and is destroyed within an hour or so.

As a result of wind instabilities, therefore, *the signals amateurs and others receive from floating mirrors are observed to peak for only a few minutes before fading into the noise!* In addition, since the mirrors are quickly destroyed after launch, *mirror propagation is only observed for short periods of time* on those days when balloon launches are made.

Conclusions

As has been demonstrated above, all of the properties normally associated with so-called sporadic E can be explained by the presence of floating mirrors which are launched by many of the world's governments. These mirrors, which are, in reality, wire grids, are supported (albeit briefly) at altitudes just below the E layer by radiation from ground-based transmitters. Unfortunately, winds almost always destabalize the mirrors, causing them to drift away from their launch sites at speeds of up to 250 m.p.h. When first launched, however, the mirrors can be used for radio propagation to distances of up to 1300 miles.

In sum, dear readers, users of the radio spectrum have, for years, been the victims of a hoax. You see, as noted above, that there really is no such phenomenon as sporadic E ionization, and that what many believe to be Es propagation really results from the reflection of radio waves off floating mirrors!

References

1. Richtmyer, F.K., E.H. Kennard, and T. Lauritsen, *Introduction to Modern Physics,* McGraw-Hill Book Co., Inc., New York, p. 109, 1955.
2. Heisseluft, E., and J. Ostermond-Tor, "Sailing in Space by means of Solar Radiation Pressure," Lauton Institute Report LI-2-55 (SECRET, downgraded 2 February, 1980), 1955.
3. Csonka, P.L., "Technical Note on a Radiation Supported Mirror," *Microwave Journal,* p. 72, October, 1979.

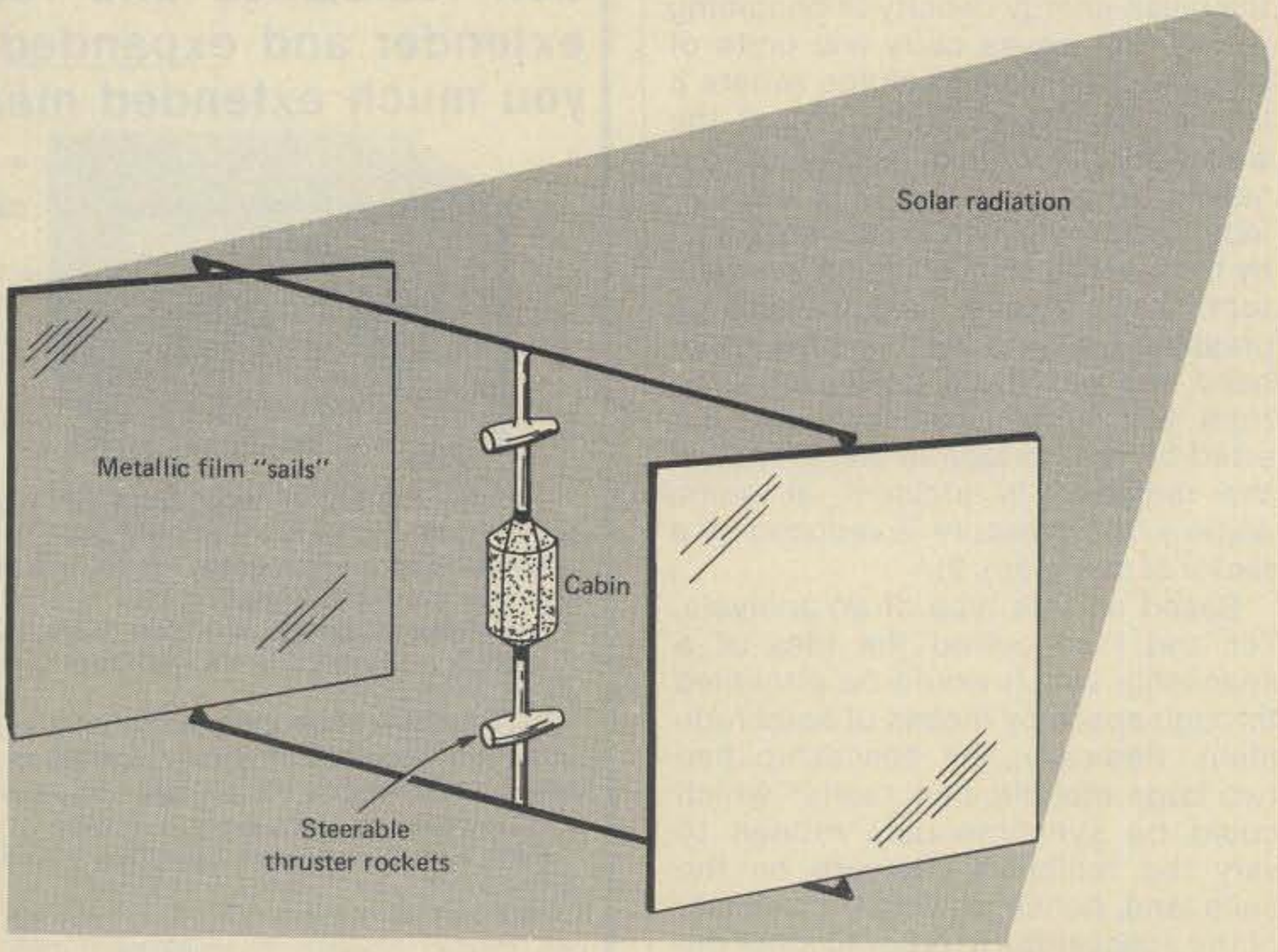

Fig. 3- Diagram of Heisseluft/Tor solar-powered spaceship (modified after Heisseluft and Ostermond—Tor ±).

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CIRCLE 31 ON READER SERVICE CARD

An ounce of protection can save your rig and maybe your house. VE3QQ's "spark-gap" arrester can limit static voltage build-up and offer protection from lightning.

A Simple Open-Wire Protector

BY ALBERT H. JACKSON*, VE3QQ

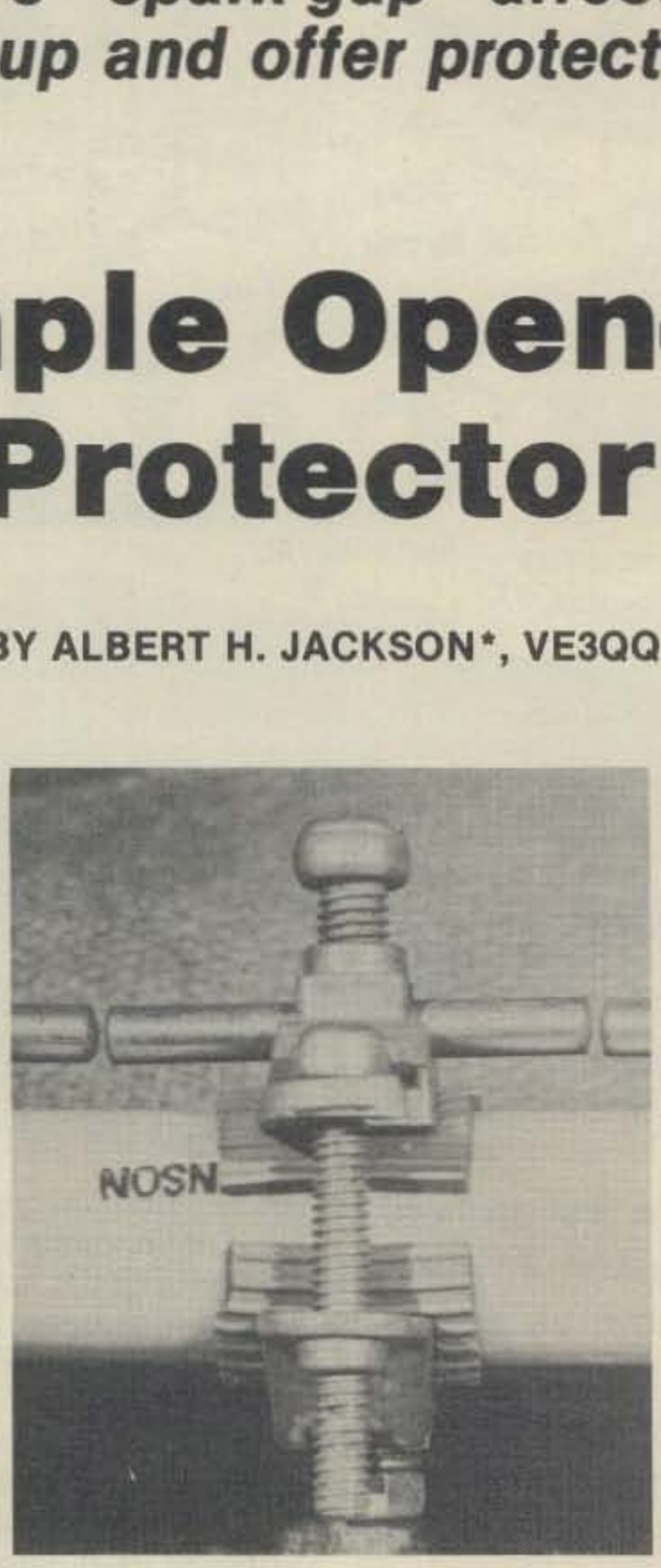
Because of the tremendous current involved in a direct lightning stroke, more than ordinary means are necessary to construct a true "arrester." Fortunately, such strikes involving equipment are relatively rare, and simple spark-gaps like the ones in the photos can limit the usual static voltage build-up to manageable levels. In the extreme case, they can make the difference between a few vaporized conductors and much more extensive damage.

Building a Protector from Available Materials

The double feeder device shown was assembled on a 1" diameter by 12" Johnson antenna insulator, using electrical power service ground-clamps as electrode supports. Cushioning half-sleeves of plastic garden-hose prevent slippage and guard the porcelain. The electrodes are sections of ¼" long-shank cad-plated bolts, their cut tips soldered over to prevent rust. Though the blunt ones pictured are a little more rugged, current-wise, these should be ground or filed to points (about 60° side-to-side) for exposed-weather locations. Doing so permits wider spacing for the same voltage breakdown, and there's much less tendency for water to remain in the gaps.

*90 Fox St., Box 516, Penetanguishene, Ontario, Canada L0K 1P0

A view of the double gap construction. The clamps are spaced to fit the feeders.



Here's a closer look at the center ground electrode assembly with its insulator protecting inserts.

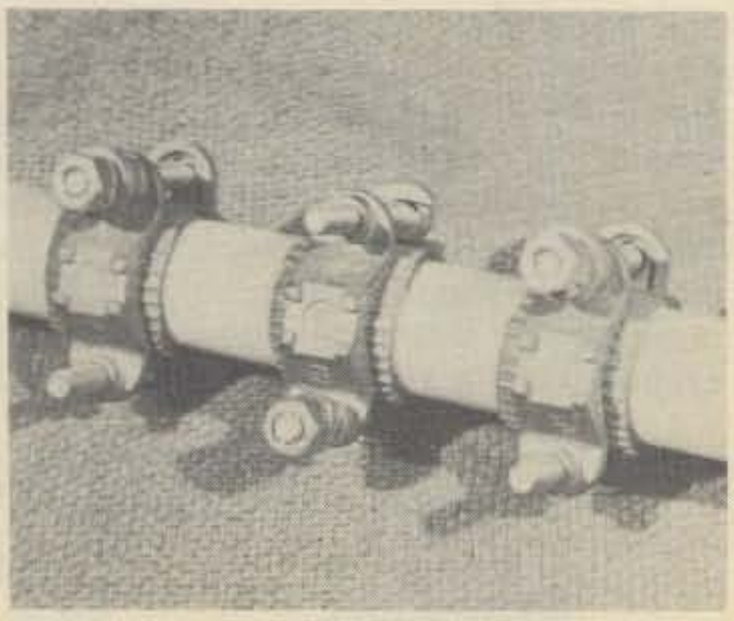
Extra washers and ¼-20 nuts were added to form terminals as needed at the ends of the ground-clamp mounting screws. Plated hardware will withstand the elements for a year or two, and stainless steel can be substituted for long-term durability. Solder-tin copper wire before connecting, to help reduce galvanic corrosion with cadmium.

Installation and Grounding

Install other insulated supports to take the feeder strain, and mount the gap assembly outwards on 2¾" or higher stand-off insulators, away from combustible material. Use metal and hose-plastic washers with ¼" bolts through the main insulator end holes. A sharp downward dip in the feed-line at the protector, and a 1½" diameter non-shorting loop in each wire on the shack side, will reduce the possibility of lightning taking this path, without changing the feeder h.f. characteristics appreciably.

Employ a good-sized screw-compression lug and heavy wire to connect the center electrode by the most direct route to the best ground you can provide; at least a 10 ft. rod, which may then be bonded to other rods and/or your local water system according to preference. Keep the gaps small: about 1/32" to 3/32", and widen only if you encounter r.f. arc-over while transmitting. Minimum spacing will be governed by transmitter power, and by the v.s.w.r. vs. device location on the line for a particular band.

Grounding and disconnecting an antenna from radio gear gives the best lightning protection, but a gap arrangement is a constant sentinel and can't be forgotten. Why not make one for that open-wire feed-line as an extra precaution?



Note the added terminal nuts and washers at the rear.

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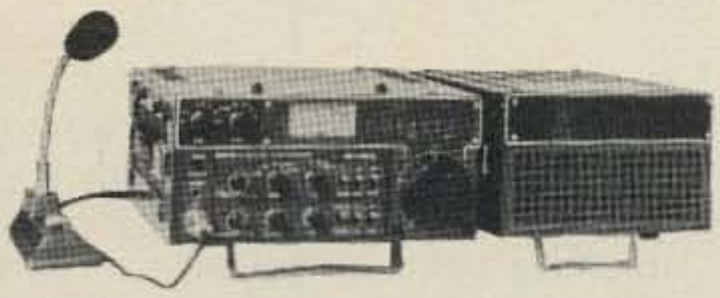

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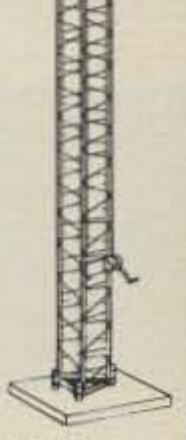

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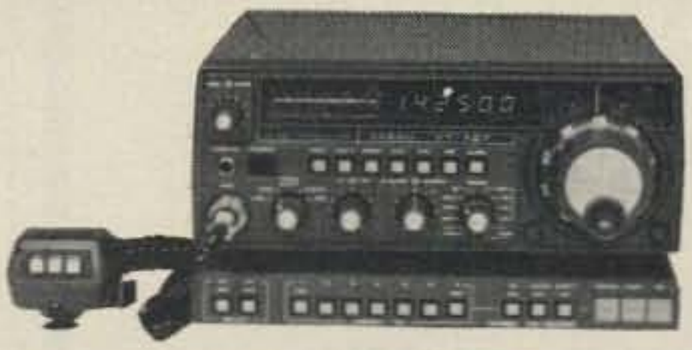

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CIRCLE 3 ON READER SERVICE CARD

Our Readers Say

Meant Mean A

Editor, CQ:

My apologies to readers of my Yurt article on page 73 of February 1980 CQ. Fig. 1 should have read "Mean A Index." A mean K Index of 10.2 would have probably prevented the propagation of any r.f. with less than 10 Gigawatts of power.

Hunt Turner, K0HT
Berthoud, CO

Give Them A Chance

Editor, CQ:

First of all let me say that I've enjoyed *CQ* Magazine from time-to-time over the past years, and now that I've joined the ranks of licensed Amateurs, I look forward to receiving my issue every month now. Continued best wishes and good luck to the new publishing staff at *CQ* Headquarters.

At the present time my only Amateur Radio operations are on 10 meters SSB with a converted 11 meter mobile QRP'er which I run from the home QTH. The results have been surprisingly good with the normal winter openings and the expected peak of the sunspot cycle both coming about the same time. But still I would like to speak out on behalf of us QRP'ers.

Though I've faired quite well in the pile-ups (and I do hope I haven't stepped on anyone's toes trying to make myself heard among the QRM), I feel that most of the other low-power stations aren't given enough of a chance to be heard. With all other things equal (propagation, antennas, band noise, etc.), the big guns still have a 6 to 9 S-unit gain over us.

I realize everyone wants to work the rare DX, and when they make themselves known on frequency it's going to cause a pile-up. But can't we let the little ones in? How about asking the DX to make a QRP-only call once in a while? The recent CQ DX WW Contest was a prime example of total and absolute bad manners with everyone trying to work everyone at once QRO. Did anyone hear the pile-up on the poor XYL from Greenland (OX)? She couldn't answer anyone because all the callers didn't give her a chance to sort out the calling stations. The way 10 sounded that weekend it almost made me wonder if we should call ourselves Amateurs, or skip-shooters.

With the availability of more and more converted CB sets this is going to be a growing problem and complaint of many hams. I hope we will soon see some QRP-only frequencies. Also a look at the contesting rules to include QRP-only days might be nice. Thanks all. See you on 10!

Al Kaiser, N1API
Meriden, Conn.

Wanted for Reminiscing

Editor CQ:

I would like to contact any hams among the Airmen who belonged to US Army 8th Aircorps stationed in England during WW II and who emergency landed in Sweden during 1943-44 and were then stationed in Rättvik for a time.

At the time I was living in Rättvik, and I knew most of the Americans who were stationed there. I now live outside Stockholm and have been a ham since 1954, working mostly on 20, 15, and 10 meters.

Look for me around 14,300 MHz at 0530-0600 GMT. I am on the air for two weeks and then off for a week. Or write to me and we can make sched-times on any suitable band. Write to: Charlie E. Jacobsson, SM0CHA, P.O. Box 2112, S-145 02 Norsborg, Sweden.

73,
Charlie E. Jacobsson, SM0CHA

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75-20 HD	75/40/20	66	$80.25
75-20 HD/A	75/40/20	66	$85.50
75-20 HD(SP)	75/40/20	66	$80.25
75-20 HD(SP)A	75/40/20	66	$85.50
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Solder Brochure. A new edition of Kester Solder's 12-page brochure covering its broad line of solders and fluxes has been published by the Litton Industries division. It covers acid and resin cored solders, flux cored silver bearing solders, and radiator solder. Also included are Kester's half-pound spools of acid-core, solid wire, and "44" resin core solders. Metal mender, TV-radio solder, aluminum repair solder, solder paste flux, and related chemical products are also featured. "Soldering Simplified" and "Questions and Answers about Soldering" are part of the brochure. Copies are available from Kester Solder, 4201 Wrightwood Avenue, Chicago, IL 60639, or circle number 109 on the reader service card.

The Thinking Cap. "The Thinking Cap" brochure is available from Continental Specialties Corp. It features the Model 3001 Professional Benchtop Digital Capacitance Meter, a full measurement system for incoming inspection, quality control, capacitance grading, and process control. Included are accessories for production line and laboratory applications. For a copy of the brochure, contact Continental Specialties Corp., 70 Fulton Terrace, P.O. Box 1942, New Haven CT 06509, or circle number 115 on the reader service card.

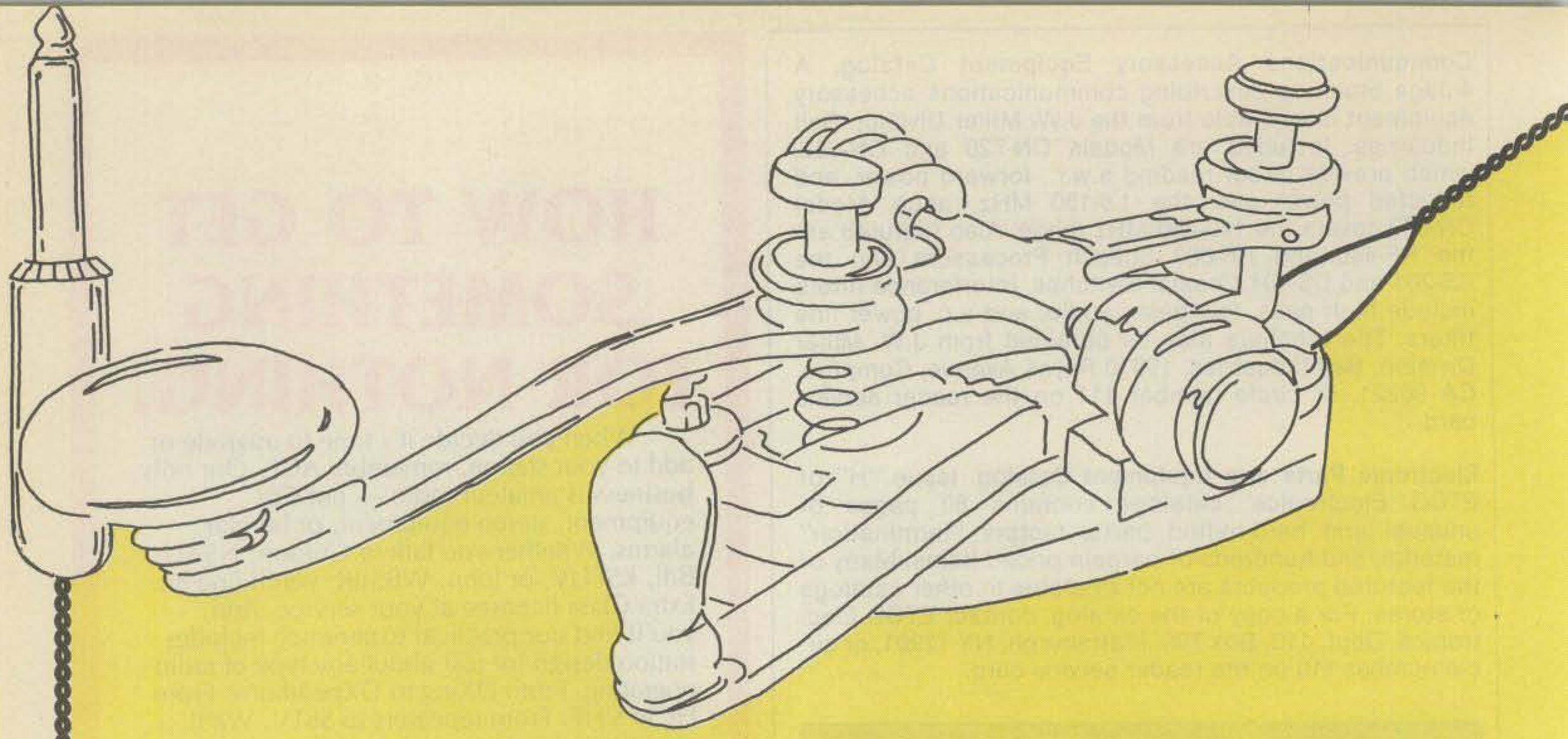
Communications Accessory Equipment Catalog. A 4-page brochure describing communications accessory equipment is available from the J.W. Miller Division Bell Industries. Included are Models CN-720 and CN-620, which provide direct reading s.w.r., forward power, and reflected power over the 1.8-150 MHz range. Model CN-630 covers the 140-450 MHz range. Also featured are the RF-440 and RF-660 Speech Processors and the CS-201 and CS-401 Coaxial Switches. Interference filters include high pass, low pass, audio, and a.c. power line filters. The brochure may be obtained from J.W. Miller Division, Bell Industries, 19070 Reyes Avenue, Compton, CA 90221, or circle number 111 on the reader service card.

Electronic Parts and Equipment Catalog. Issue "H" of ETCO Electronics' catalogs contains 80 pages of unusual and hard-to-find parts, factory "termination" material, and hundreds of bargain priced items. Many of the featured products are not available in other catalogs or stores. For a copy of the catalog, contact ETCO Electronics, Dept. 113, Box 796, Plattsburgh, NY 12901, or circle number 110 on the reader service card.

V.H.F. and U.H.F. Radio Modules Catalog. Hamtronics, Inc. has introduced their 1980 catalog, which covers their v.h.f. and u.h.f. radio modules. The catalog contains information about such products as u.h.f. and v.h.f. receiving and transmitting converters, AM and FM receivers, receiver preamps, FM exciters, a scanner adapter, a v.h.f. receiver multicoupler, multichannel adapters, test probes, replacement parts, accessories, and cabinets. For a copy of this 24-page catalog, contact Hamtronics, Inc., 65 Moul Road, Hilton, NY 14468, or circle number 117 on the reader service card.

Electronics Product Catalog. Heathkit's "Winter Kit-building Fun" catalog has 104 pages of electronic kits, including aircraft accessories, amateur radio equipment, automotive accessories, computers, home products, instruments, and much more. New kits include a 4-element tri-band yagi, self-instruction language programs, continuing education programs (descriptive and inferential statistics and IC timers), and an ultrasonic timer. For a copy of this mail-order catalog, contact the Heath Company, Benton Harbor, MI 49022, or circle number 116 on the reader service card.

Component/Hardware Catalog. A new 104-page component/hardware catalog is available from Herman H. Smith, Inc., a North American Philips Company. The edition details key product information and specifications along with technical illustrations and features of the more than 20,000 items the company produces. Typical of the products covered are terminal blocks and hardware, IC test clips, binding posts and "mil-spec" jacks, test leads, adapters, transistor sockets, spacers, and standoffs. For a copy of the catalog, contact Herman H. Smith, Inc., 812 Snediker Avenue, Brooklyn, NY 11207, or circle number 113 on the reader service card.



RESULTS OF THE 1979 CQ WORLD WIDE WPX C.W. CONTEST

BY BERNIE WELCH*, W8IMZ

This first C.W. part of the 23rd Annual WPX Contest was a great step in the right direction. Participation was good for a first time event in spite of the generally poor propagation. I agree with the many who feel that in a few years this one will definitely be a big, big one. Over two hundred congratulatory contest comments were received and what better way to celebrate the contest inauguration than to extract some for the record. "An interesting first ever WPX-C.W. Contest. Conditions not as good as the SSB. Everyone entered into the spirit of the contest. Many thanks for your FB organization"...ZL1AJU. "One of the most exciting contests"...ON4FD. "A good start of a good contest" ...PA0DIN. "I hope that the C.W. part will also be very famous like the SSB"...SP5IXI. "Excellent contest - glad you tried C.W. as a change" ...K0RWL. "Hope next year will be better. Good idea to make C.W. test." ..4Z4KX. "Very great contest - congratulations"...YX1DIG. "C.W. WPX is very fine idea"...JA2PMA. "TNX for a fantastic contest"...JA7YAA Club Group. "Thanks for organization of this contest. It is a winner." (QRPp)...PA0TA. "I like the WPX-C.W. bring it back next year"...AE4H. "The C.W. WPX was a fun contest and promises to be a big event"...VE1AJP. "A great idea to make WPX on C.W. Thanks and 73 to Contest Committee"...UK2BBB ops.

Since all data contained in these results are considered first time records, a separate WPX/C.W. All Time Records will not be compiled until after the '80 Contest. However, special recognition should be given to some, such as the prefix records and high scores. Our available information indicates that the possibility existed for a station to have contacted over 600 prefixes in this one. No one reached 500, but YZ4Z came close and is the record holder with 495, followed by HD1A - 474, 4N4Y - 468, K3EST - 448, GB2DAA - 438, UK2BBB - 434, N9MM - 425, K3QWW - 424, UK2MAF - 410, DF0RPL - 406, UK2PCR - 403, and EA2IA - 402.

Forty-eight stations acquired a 1-million plus score. Multi-Multi station HD1A was the highest with 6,052,032, while in the same category YZ4Z had 4,533,932. Next was Multi-Single station 4N4Y with 3,348,072. Chip Margelli, K7JA operating KG6SW was the top scoring Single Op with 2,848,320. In QRPp, SM0GMG was first and ahead of G4BUE by only a small margin and JA1IDY was the 3rd place All Band entry. The FB participation in this category was especially surprising for a first C.W effort. Keep up the good work - it's appreciated.

C.W. ops collect unique and rare prefixes the same as SSBers and each year this contest will produce many not otherwise available to the brass pounders. Some of this year's were: HQ1, CK7, EE3, OG6, ED3, 4N4, HD1, HD9, YX1, HB0, WH2, ED8, NN3, OI1,

*c/o CQ Magazine

OI2, ZZ4, KG6, GB2, ED2, SJ9, NP2, YT2, YT3, DFØ, ED7, SK2, LG5, ZW4, YZ4.

A record total of 2,225 logs were received for the combined C.W. - SSB Contest, of which 866 were C.W. We hope to greatly exceed this number in 1980 since the C.W. part will have received much additional publicity and hopefully, better propagation conditions will prevail.

We did not receive at least 3 different logs that qualify as "Contest Expeditions" so, in accordance with the rules, the trophy will not be awarded this year. How about more of your expeditioners giving it a good try in the next one?

Speaking of rules - Contest Chairman W1WY prepared the 1980 WPX version and made a major change. He says, "Trophy and Plaque winners may win the same award only once within a three year period". This may be OK for the CQ WW DX but its a definite step backwards for the WPX Contest. Who ever heard of a first place Gold Medal in the World Olympics being won by a 2nd or 3rd placer?

Rodrigo "Rod" Alea, CO8RA, a long time WPX contester, whose photo appeared in the '79 SSB Results became a silent key on 16 November '79. His son, Ray, KB8JF is donating a memorial trophy effective with the **1980 WPX-SSB Contest** for the high scoring Single Operator, All Band Station in the Caribbean area and to include Central America.

The next WPX-C.W. Contest is scheduled for the weekend of 24-25 May 1980 (GMT). Rules are in the Jan. '80 CQ. Log forms and summary sheets are available from the **new** CQ offices at 76 N. Broadway, Hicksville, NY 11801, USA. SASE is required for USA stations and IRCs are required for all others.

Arm twisting and great promises by 1980 Dayton Hamvention Program Chairman, Jack Mitchell, AA8Q has persuaded me to organize and moderate another big Contest Forum. As of this date (Dec. '79) we have the program partially lined up to include: Terry Appleton, FGØDYM/FS7; Tom Frenaye, K1KI; Chip Margelli, KG6SW/K7JA; Alan Dorhoffer, K2EEK (CQ Editor); Ed Moody, 9Y4FRC; Walt Rakitsky, WA3LRO/9Y5W; Scott Simpson, WB9UYY; Henry Thel, CK7WJ; Yuri Blanarovich, VE3BMV; Lars Mohlin, SMØGMG; Ron Moorefield, W8ILC; - plus Contest Trophy Awards and members of the CQ Contest Committee and ARRL Contest Advisory Group. As I've said before - if you like contests, you'll love this forum. Hamvention dates - 25, 26, 27 April 1980 - Contest Forum 9 to 12 noon, Saturday, 26 April.

That's it for this one. Many, many thanks to all who made this first C.W. a reality and success thru your encour-

Multi-Multi European Top Club Station YZ4Z. Ops: 1st row (L to R) YU4VFO, YU1OQI, YU4VPA, YU1EBC, YU3TCA, YU4WAA. 2nd row - YU1OIQ, YU1OIF.

Inaki, EA2IA, the Single Op, All Band European TF3CW Trophy winner. Does his big smile indicate a possible premonition?? Hi Hi

Rick, HC5EE operating HD9X was very popular from Ecuador. Unfortunately, he became ill and was unable to operate the entire 30 hours. All QSL's go via K8LJG.

Activity was plentiful from the U.S. Virgin Islands. Dick, KV4AA (above) was top scorer followed by KV4KV and NP2AE. Vy FB.

continued on p. 54

TS-520SE

"Cents-ability" in a quality HF Rig!

The TS-520SE is an economical new version of the TS-520S...the world's most popular 160-10 meter Amateur transceiver. Now anyone can easily afford a high quality HF transceiver, providing 200 watts PEP input on SSB and 160 watts DC on CW!

The TS-520SE is a high-quality 160-10 meter SSB/CW transceiver intended for ham-shack use. The following changes were made to produce the new "SE" model:

- Replaced the heater switch with a CW WIDE/NARROW bandwidth switch, for use with the optional CW-520 500-Hz CW filter. A big improvement for the CW operator!
- Removed DC converter terminals. Now it operates strictly on 120 VAC and is not intended for mobile use.
- Removed transverter terminals. Now it is strictly a 160-10 meter SSB/CW transceiver.

All other proven features and high quality of the TS-520S have been retained in the TS-520SE, including:

- Effective noise blanker.
- Three-position (OFF, FAST, SLOW) amplified-type AGC circuit.
- RIT control.
- Eight-pole crystal filter.
- Built-in 25 kHz calibrator.
- Front-panel carrier level control.
- Semi-break-in CW with sidetone.
- VOX/PTT/MANUAL operation.
- TUNE position for low-power tune up.
- Built-in speaker.
- Built-in cooling fan.
- 20-dB RF attenuator.
- Provisions for four fixed channels.
- Speech processor consisting of a very effective audio compression amplifier.

The TS-520SE functions with many popular accessories, including:

- DG-5 digital frequency display/counter.
- VFO-520S remote VFO.
- SP-520 external speaker.
- CW-520 500-Hz CW filter.
- AT-200 antenna tuner/SWR and RF power meter/ antenna switch.
- TL-922A linear amplifier.
- MC-50 dynamic microphone.
- SM-220 Station Monitor with BS-5 pan display module.

SPECIFICATIONS FOR THE TS-520SE

GENERAL:	
Frequency Range:	1.8- 2.0 MHz (160 m) 3.5- 4.0 MHz (80/75 m) 7.0- 7.3 MHz (40 m) 14.0-14.35 MHz (20 m) 21.0-21.45 MHz (15 m) 28.0-28.5 MHz, 28.5-29.1 MHz, 29.1-29.7 MHz (10 m) 15.0 MHz, receive only (WWV)
Modes:	SSB (USB, LSB), CW
Antenna Impedance:	50-75 ohms
Frequency Stability:	Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during any 30-minute period thereafter.
Power Requirements:	120 VAC, 50/60 Hz; 280 W (transmit)
Dimensions:	13-1/8 inches wide, 6 inches high, 13-3/16 inches deep
Weight:	35.2 pounds
TRANSMITTER:	
Input Power:	200 W PEP (SSB), 160 W DC (CW)
Carrier Suppression:	Better than 40 dB
Unwanted Sideband Suppression:	Better than 50 dB
Spurious Radiation:	Better than -40 dB
Microphone Impedance:	50 k ohms
AF Response:	400-2,600 Hz
RECEIVER:	
Sensitivity:	0.25 μV for 10 dB (S + N)/N
Selectivity:	SSB: 2.4 kHz/-6 dB; 4.4 kHz/-60 dB CW: 0.5 kHz/-6 dB; 1.5 kHz/-60 dB (with optional CW filter)
Image Ratio:	Better than 50 dB
IF Rejection:	Better than 50 dB
Audio Output:	1.0 W (8-ohm load with less than 10% distortion)
AF Output Impedance:	4-16 ohms

Ask your Authorized Kenwood Dealer about the amazing TS-520SE...and its surprisingly affordable price!

KENWOOD'S TR-2400

...synthesized, BIG LCD, 10 memories, scanning...and more!

Kenwood TR-2400...it's a synthesized 2 meter hand-held transceiver...the answer to any Amateur's operating requirements! Its many advanced features include:

CONVENIENT TOP CONTROLS

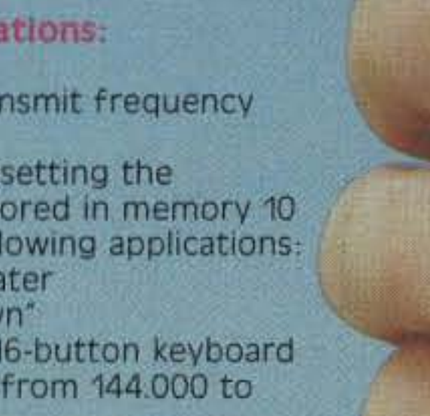
- **LCD digital readout**
- Readable in direct sunlight (better than LEDs)
- Readable in the dark (with lamp switch)
- Virtually no current drain (much less than LEDs) and display stays on
- Shows receive and transmit frequencies and memory channel
- **10 Memories** (always retained with battery backup)
- **Automatic memory scanning** (for "busy" or "open" channels)
- **Mode switch for the following operations:**
- Simplex
- Standard repeater by offsetting the transmit frequency + 600 kHz or − 600 kHz
- Repeater with nonstandard splits by offsetting the transmit frequency to any frequency stored in memory 10
- **REVERSE** momentary switch for the following applications:
- Checking signals on the input of a repeater
- Determining if a repeater is "upside down"
- **Built-in Touch-Tone generator** using 16-button keyboard
- **Keyboard selection** of 5-kHz channels from 144.000 to 147.995 MHz
- **UP/DOWN manual scanning** and operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps. Even operates on MARS repeaters within this range by using memory 10 for transmit offset frequency.
- **LCD "arrow" indicators**
- "ON AIR"
- Memory recall
- Battery status
- Lamp switch on
- **Two lock switches** to prevent accidental frequency change and accidental transmission
- **Subtone switch** (subtone module not Kenwood-supplied)
- **BNC antenna connector**
- **1.5 watts RF output**

The TR-2400 comes with the following standard accessories:

- Flexible rubberized antenna with BNC connector
- Nicad battery pack
- Battery charger

Optional accessories include:

- Leather case
- Base Stand (for quick charge and easy base-station operation)
- DC (automobile) quick charger



ST-1 BASE STAND (OPTIONAL)

SEE YOUR AUTHORIZED KENWOOD DEALER FOR MORE INFORMATION ON THE TR-2400.

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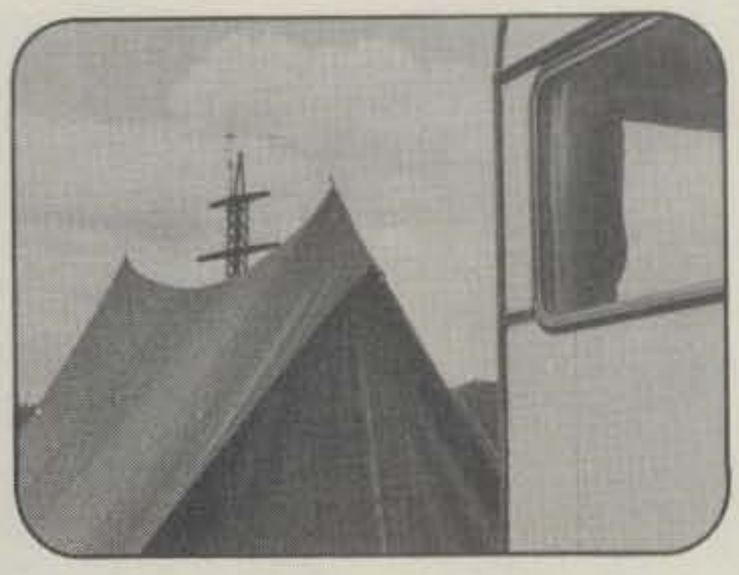
Trophies galore - CQ Contest winners (L to R) Pedro Piza, Jr., KP4RF/KP4Q; Lars Mohlin, SMØGMG; Henry Thel, CK7WJ; (W1WY); Jim Lawson, W2PV; and Ron Moorefield, W8ILC/QRPp were presented their plaques at the world's largest Contest Forum, '79 Dayton Hamvention by CQ Editor, Alan Dorhoffer, K2EEK and Contest Chairman Frank Anzalone, W1WY. (Official Hamvention photo)

The 21 MHz high score for Japan was achieved by JH3CXL.



The Multi-Single operating location of station EE3AUV. The Spanish authorities issued the new prefix especially for the WPX-C.W. Contest, according to ops EA3AIR, EA3AVV, EA3XH, and EA3XZ.

agement and participation. Please pass the word and join in the next event.

Again it was my XYL Eleanor and her dedicated clerical assistance that made it possible for me to get the job done.

Hope to work ya in the next one.

73, Bernie, W8IMZ

Random Comments

What a difference without good conditions on 10...WB6JMS. Did enjoy working TF3JB for my WAZ... WB6SHL. Not much activity on 160 but I did work 2 new countries...AE6U. Thanks for the first C.W. WPX - next year I'll give it an honest 36 hours...N7ZZ. Went hunting Novices Sunday afternoon for last few prefixes. Great Contest - how about earlier in year? (7 MHz)...K7WA. Heard a weak 9AJ station on 15 M, called him and he gave the exchange call? Answer: CR9AJ. That's what you call backing into a new country! ...N8II. Biggest thrill - calling CQ and having a 5T5 come back - nice contest...K8SIA. Are all those strange DX prefixes for real...AA8S. Worked VR3AH through a big pile-up...Ex-W7YNO, SVØWQQ...W8EAO. How about a little different scoring for Novices? Not too many countries

Number groups after call letter denotes: Band, Score, QSO's and Prefixes. Bold listings are certificate winners.

QRPp
—SECTION—
WORLD WIDE

SMØ GMG	**A**	**170,352**	**418**	**208**
G4BUE	**A**	**159,120**	**418**	**204**
JA1IDY	**A**	**120,916**	**305**	**172**
W9PNE	**A**	**62,776**	**230**	**152**
YO5AVN/3	**A**	**60,554**	**210**	**137**
PA3ABA	**A**	**57,486**	**238**	**143**
WA6POC	**A**	**52,920**	**197**	**140**
PAØ TA	"	22,236	115	102
N6UU	"	16,833	143	93
VE5JQ	**A**	**11,660**	**103**	**55**
OH2CTL	**A**	**11,544**	**89**	**74**
DM2CTL	**A**	**5,310**	**60**	**45**
OZ8E	"	1,265	39	23
JK1GDD	**21**	**83,790**	**255**	**147**
JAØ BMS/1	"	**24,402**	**124**	**98**
JH8DBDA	"	**19,747**	**115**	**91**
TF3LJN	**21**	**5,805**	**59**	**45**
JA2YAC	**14**	**52,771**	**192**	**113**
G3DOP	"	252	14	14
SJ9WL	"	228	12	12
PAØ WAC	"	91	7	7
SM7CZC	"	32	4	4
OK1DCP	**7**	**39,424**	**158**	**112**
OK2BMA	"	20,750	120	83
UR2RKF	"	6,048	64	42
WAZZWH	"	3,808	39	34
JJ1INO	"	2,068	28	22
JA1LEY	"	1,440	25	18
DM2BML/p	"	684	20	18
OK1DKW	**3.5**	**6,996**	**67**	**53**
DM2CVB	"	1,566	32	27

SINGLE OPERATOR
NORTH AMERICA

	UNITED STATES			
W1CNU	**A**	**55,806**	**169**	**131**
AA1M	"	32,742	135	107
W1OPJ	"	9,234	68	63
K1RM	**21**	**570,478**	**730**	**302**
W1PM	"	29,896	120	101
WB1ANT	**14**	**226,345**	**456**	**223**
W1WY	"	17,040	80	80
W1BB	1.8	108	6	6
K2HPV	**A**	**57,343**	**185**	**143**
W2CJX	"	5,880	47	42
WA2AUB	"	5,300	54	50
AC2U	**21**	**234,530**	**434**	**235**
WB2SJG	**7**	**58,806**	**172**	**121**
DK5AD/NN3	**A**	**899,217**	**1041**	**293**
AF3B	"	88,788	242	151
WB3HVS	"	48,144	204	136
N3KR	"	38,081	151	113
W3PYZ	"	29,945	130	113
W3ARK	"	26,832	109	86
N3RL	"	11,940	72	60
K3UA	**14**	**82,476**	**220**	**158**
AE4H	**A**	**1,288,080**	**1410**	**360**
K4PQL	"	822,900	923	324
W4EI	"	206,829	365	201
K4JRF	"	21,170	91	73
K4RV	**21**	**529,448**	**717**	**289**
WA4OML	"	59,682	200	147
N4ZC	**14**	**799,141**	**894**	**347**
N4TZ	"	451,155	647	285
WN4KKN	"	352,121	734	269
WA4DRU	**7**	**200,598**	**279**	**201**
N4WW	"	50,468	143	74
W4MGX	"	13,680	81	72
N4KE	"	12,000	52	50
N5TP	**A**	**795,553**	**889**	**341**
K5RX	"	363,492	541	276
W5OB	"	117,392	278	184
WB5UWF	"	42,456	148	116
N5HB	"	34,117	142	109
WD5ABF	"	19,928	119	94
W5NR	"	10,140	70	52
WB5OWL	"	9,048	65	52
AC5R	"	8,832	92	64
W5EIJ	"	2,448	37	34
WA5SOG	"	2,184	30	28
WD8DKJ/5	"	570	19	19
K5RC	**28**	**81,016**	**303**	**164**
			(Opr: K5ZD)	
K5MR	**21**	**554,949**	**763**	**313**
KA5Q	"	833	24	17
K5GA	**14**	**819,904**	**986**	**368**
N5JB	"	523,184	848	304
AF5K	**7**	**187,572**	**434**	**174**
K5UR	**3.5**	**13,160**	**125**	**94**

W6MSF	**A**	**1,009,632**	**1070**	**312**
		(Opr: WA6VEF)		
N6JV	"	270,270	494	250
KD6F	"	174,870	455	201
WB6JMS	"	54,458	203	146
AI6Z	"	47,712	207	142
W6LEN	"	26,832	152	104
W6BYH	"	26,522	112	89
N6UW	"	21,812	100	82
AJ6V	"	7,938	100	63
WA6VNR	"	7,812	79	62
AA6EE	"	1,219	26	23
W5YMH	**28**	**1,904**	**37**	**28**
WD6EEQ	**21**	**12,078**	**104**	**66**
WA6DBC	**14**	**398,049**	**568**	**277**
WB6SHL	"	15,825	97	75
N6JM	"	4,636	42	38
N6PE	**7**	**52,332**	**159**	**89**
N6AW	"	46,308	156	102
K6XO	3.5	7,280	69	52
AE6U	**1.8**	**1,110**	**51**	**37**
K7RI	**A**	**927,576**	**963**	**312**
		(Opr: K7TI)		
W7JYW	"	138,198	417	186
N7AM	"	32,660	112	71
N7ZZ	"	10,465	80	65
W7JKA	"	2,340	37	20
K7ZA	**14**	**20,000**	**100**	**100**
K7UR	**7**	**145,360**	**280**	**158**
K7WA	"	96,866	221	119
N8I	**A**	**651,147**	**758**	**307**
K8HV	"	261,003	434	241
K8SIA	"	95,473	256	161
WD8MOV	"	11,842	72	62
W8IMZ	"	7,039	64	49
WB8ZRL	"	2,106	28	26
K8LX	**14**	**689,196**	**871**	**316**
N8JW	"	228,528	420	207
AA8S	"	20,832	113	96
W8EAO	"	11,136	101	87
K8LJG	"	8,792	60	56
KB8EC	**7**	**13,172**	**180**	**89**
KA8AKL	"	540	47	45
W8LRL	**1.8**	**1,008**	**33**	**28**
K9BG	**A**	**161,014**	**334**	**217**
AF9C	"	40,736	234	134
W9QWM	"	22,050	121	90
WB9LHR	"	167,992	129	96
K1TH/9	"	6,864	110	66
W9TNZ	"	5,125	44	41
KA9AOD	**28**	**6,386**	**74**	**62**
W9LF	**21**	**544,104**	**724**	**297**
WD9GSO	"	700	21	20
K9RF	**14**	**176,934**	**446**	**222**
		(Opr: N9AQT)		
WD9IIX	"	11,570	137	89
W9CG	1.8	266	21	19
NØTT	**A**	**434,016**	**677**	**274**
WBØOTA	"	36,162	159	123
WDØAYT	"	7,552	74	64
WØWP	**21**	**248,860**	**422**	**230**
NØDX	"	222,306	412	237
WØJU	**14**	**61,124**	**200**	**118**
WBØGOB	"	6,525	52	45

ALASKA

KL7JER	**21**	**45,590**	**213**	**97**

CANADA

VE1AIH	**A**	**544,859**	**608**	**281**
VE1EJ	**A**	**119,350**	**312**	**155**
VE2WA	**A**	**13,120**	**71**	**64**
VE3BMV	**21**	**911,778**	**950**	**357**
CK7WJ	**21**	**669,600**	**990**	**270**
		(Opr: AH6Z)		
VE1BNN	"	6,864	57	48
VE7SV	**14**	**835,601**	**1087**	**323**
		(Opr: K7SS)		
CZ6MP	**14**	**258,750**	**539**	**207**
VE1AJP	**14**	**172,965**	**380**	**195**
VE3FRA	**14**	**58,120**	**205**	**130**
VE6APN	"	17,381	163	91
VE1AI	**7**	**305,046**	**331**	**189**
VE3KZ	**3.5**	**65,520**	**156**	**104**

DOMINICAN REPUBLIC

HI8LC	**21**	**252,306**	**497**	**214**

HONDURAS

HQ1AT	**14**	**53,020**	**208**	**110**

PANAMA

HP1AC	**14**	**27,778**	**119**	**86**

VIRGIN IS. (U.S.)

KV4AA	**A**	**307,216**	**610**	**208**
KV4KV	"	224,096	394	188
NP2AE	"	37,400	191	88

AFRICA

CANARY ISLANDS

ED8TY	**21**	**192,585**	**347**	**185**
EA8QE	**14**	**319,116**	**524**	**203**

KENYA

5Z4CW	**A**	**276,696**	**407**	**183**

ASIA

INDIA

VU2GO	**A**	**445,848**	**612**	**312**

ISRAEL

4Z4KX	**28**	**55,638**	**320**	**99**
4Z4NUT	**21**	**684,945**	**927**	**279**
4Z4XM	"	125,309	321	149
4Z4TA	**14**	**124,024**	**300**	**148**

JAPAN

JI1KUV	**A**	**773,091**	**1025**	**297**
JE1JKL	**A**	**526,663**	**704**	**283**
JA1BWA	"	445,280	664	253
JA2IVK	"	391,608	653	222
JK1OPL	"	357,304	566	236
JA5KJD/1	"	254,730	458	210
JA1JKG	"	253,795	465	193
JF3CCN	"	247,357	495	199
JF1SEK	"	201,825	417	195
JL1QDO	"	129,054	321	157
JE2TFR	"	121,720	298	170
JA2IU	"	119,394	287	162
JA2WB	"	111,339	298	139
JR3XEX	"	110,572	310	154
JA2MYA	"	64,505	212	125
JH2JEV	"	60,402	172	114
JA9CWJ	"	53,012	170	116
JH1MTR	"	47,460	162	105
JA3BQU	"	32,594	135	86
JA7FFN	"	26,207	108	73
JA3JF	"	25,200	114	80
JA1GTF	"	23,545	108	85
JA7BAL	"	22,876	103	76
JA3HUL	"	9,350	68	55
JH6WDG	"	9,177	92	69
JH3WKE	"	7,350	54	50
JR4DZM	"	6,160	57	44
JA9FT	"	6,031	58	37
JH6GHZ	"	1,026	20	19
JK1IYM	**28**	**30,660**	**190**	**105**
JA1MRM	"	10,650	99	75
JH3FYR	"	10,064	97	74
JH7UJU	"	6,305	93	65
JH1CRF	"	1,944	43	24
JH3CXL	**21**	**449,306**	**588**	**286**
JG1EIQ	**21**	**449,120**	**621**	**280**
JK1AII	"	257,631	503	211
JH7IOS	"	158,382	337	189
JA6VZB	"	143,472	346	196
JK1NAE	"	60,928	187	136
JA1HQS	"	58,692	188	134
JA7LOM	"	49,020	252	129
JR1JUR	"	40,626	149	111
JA9AQE	"	38,325	144	105
JK1OEO	"	36,366	136	114
JA2PMA	"	32,232	142	102
JA6AKW	"	30,758	127	91
JA6AKV	"	23,822	112	86
JE3TYJ	"	11,524	84	67
JI1PCN	"	11,286	73	66
JR3LAG	"	6,916	60	52
JH1KRX	"	3,162	35	31
JA7ARW	"	1,449	31	23
JA1YFL	**14**	**848,900**	**948**	**325**
		(Opr: JAØJCJ)		
JR1JFO	**14**	**828,768**	**1001**	**291**
JH2UVL	"	86,853	256	131
JK1BRR	"	73,554	220	138
JH4DRB	"	12,342	89	51
JA5MG	"	8,856	60	54
JR6LP	"	6,858	60	54
JK1LUY	"	1,232	33	22
JA6FYM	"	1,152	22	18
JG1FZG	"	672	18	16
JA5BJC	**7**	**146,640**	**242**	**141**
JE3MCC	"	111,280	216	130
JR1AOQ	"	100,122	216	123
JG3GQA	"	540	13	10
JA3BCT	"	304	8	8

KUWAIT

9K2EX	**A**	**89,424**	**264**	**138**

LEBANON

OD5LX	**21**	**130,720**	**330**	**152**

MACAO

CR9AJ	**21**	**298,000**	**800**	**200**

SINGAPORE

9V1TL	**A**	**75,264**	**310**	**128**

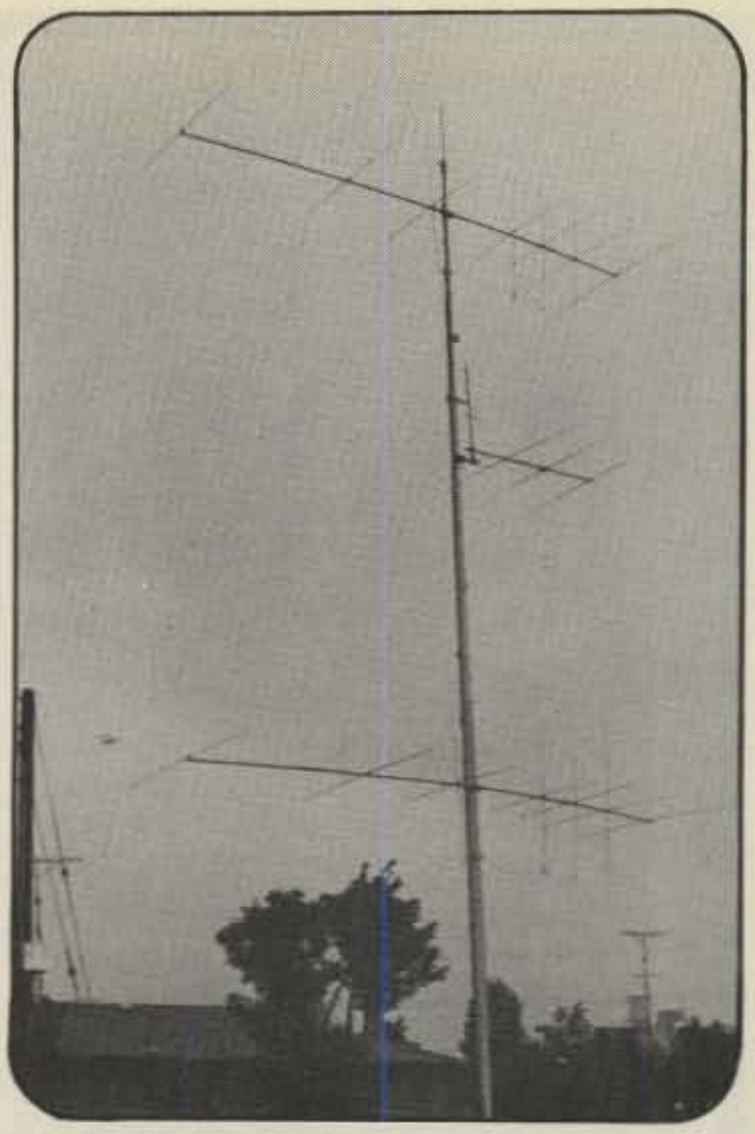
THAILAND

HS1ABD	**A**	**975,000**	**1522**	**300**

U.S.S.R.

ASIATIC

UV9AX	**A**	**1,448,000**	**1257**	**362**
UA9NN	"	73,030	227	134
UA9AAP	"	36,453	144	87
UA9UGA	"	22,922	153	73
UA9TS	"	14,575	83	55
UA9OO	"	13,440	60	56
UA9OBJ	"	9,234	61	54
UA9MY	"	8,580	70	52



These are the stacked 21 MHz VE3BMV Razor Gun Antennas built by Yuri. They must really do a great job as he is the top station on 15 meters. The single beam was featured on the March cover of CQ.

operate on 7.100 to 7.150...KA8AKL. Please consider moving the contest to Feb - old ARRL weekend (160 mtr)... W8LRL. HS1ABD for Country #88 on 1 Watt input...G4BUE. Could have operated 6½ hours longer, was confused by my time scheme. hi...PA3ABA. 75 years of age, on the air from 1927...PAØWAC. First contest with new memory keyer, too bad it couldn't send consecutive serial numbers...WB1ANT. Good to have a C.W. WPX - Great Idea - Great Contest...W1BB. Hopefully next year I'll decide to go single band 40 before the contest rather than after it. I'm sure it should make some difference in my score...WB2SJG. After the WPX-SSB I found out that I could use any "W3"-PX...DK5AD/NN3. The XYL likes the WPX contest because of the time off...N4ZC. No ten meters and too much QRN on 80...W5OB. I am very happy this contest was started but I believe it will never catch on in May. Try Jan or Feb when cond's would be better...K5RC OP: K5ZD. Many thanks for the excellent WPX contest in CW...SP5JTR. Vy gld to work in the first CW WPX Contest Edition...YO3CR. Very good contest, 73 GL for committee of WPX...YO6AFP. It was a very fine contest...YO6KNM. Lots of prefixes available, heavy competition, good contest...VE4XK. Super Contest...PA3AIC. Next time will have Quad up instead of in a box

WORLD WIDE TOP SCORES
SINGLE OPERATOR

ALL BAND

KG6SW	**2,848,320**	GU5CIA	1,695,907
LU8DQ	2,333,386	UV9AX	1,448,000
EA2IA	**2,057,034**	OK2RZ	1,364,175
YX1DIG	1,994,388	**AE4H**	**1,288,080**
ZL1ADI	1,783,140	UP2NV	1,285,160

SINGLE BAND

28 MHz		21 MHz	
JA1PIG/PZ	282,183	VE3BMV	911,778
K5RC	81,016	I4IND	876,876
LU2KAK	59,400	4Z4NUT	684,945
4Z4KX	55,638	YU1BCD	675,186
YU2CQ	31,130	CK7WJ	669,600

14 MHz		7MHz	
ZW4OD	**1,410,320**	YT2D	446,248
K0AX/DU2	1,198,080	DM3PQO	436,644
YU3ZV	1,118,304	DM4VUG	311,014
HD9X	1,013,860	VE1AI	305,046
JA1YFL	848,900	OE1DSA/3	282,528

3.5 MHz		1.8 MHz	
UB5BAT	82,748	AE6U	1,110
VE3KZ	65,520	W8LRL	1,008
UP2BCG	42,570	OL9CJB	836
YO8BNM	35,728	SP5IXI	792
YO8BQO	30,330	OL3AXS	714

QRPp

SM0GMG	**A/B**	**170,352**	JK1GDD	21	83,790
G4BUE	"	159,120	JA2YAC	14	52,771
JA1IDY	"	120,916	OK1DCP	7	39,424

MULTI OPERATOR

Single Transmitter

4N4Y	**3,348,072**	K3EST	1,900,416
GB2DAA	2,630,888	UK2PCR	1,826,396
UK2BBB	2,563,204	UK9ADY	1,653,840
DF0RPL	2,137,996	OK5TLG/p	1,599,568
UK5MAF	2,071,730	UK4WAR	1,587,848

Multi Transmitter

HD1A	**6,052,032**	K3WW	1,966,512
YZ4Z	4,533,932	JA2YKA	1,530,882
N9MM	2,124,150	JA1YXP	1,339,182

U.S.A. TOP SCORES

SINGLE OPERATOR

All Band	AE4H		1,288,080
28 MHz	K5RC		81,016
21 MHz	K1RM		570,478
14 MHz	K5GA		819,904
7 MHz	WA4DRU		200,598
3.5 MHz	K5UR		13,160
1.8 MHz	AE6U		1,110
QRPp	W9PNE		62,776

MULTI-OPERATOR

Single Xmtr	K3EST		1,900,416
Multi-Xmtr	N9MM		2,124,150

UA9FDW	"	1,003	18	17
UA9CNA	"	224	9	8
UA9QBT	28	209	13	11
UA9MAB	**21**	**115,488**	**318**	**144**
UA9MR	14	9,240	60	60
UA9WDV	**7**	**237,468**	**286**	**154**
UA9OEK	**3.5**	**29,512**	**94**	**62**
UA0 AG	**A**	**137,977**	**307**	**161**
UA0 CDM	"	2,346	30	23
UA0 LS	**21**	**49,390**	**283**	**110**
UA0 QCA	"	15,554	126	77
UA0 ZCR	"	4,692	60	46
UA0 SGN	**14**	**296,416**	**589**	**236**
UA0 IAJ	"	111,045	289	165
UA0 OAT	"	62,800	231	100
UA0 WAS	"	13,674	102	53
UA0 CBH	"	11,178	103	54
	AZERBAIJAN			
UD6CN	A	658,920	808	323
UD6BW	"	229,542	286	201
UD6DHC	"	47,724	156	123
UD5DFY	**21**	**553,382**	**821**	**271**
UD6DJJ	14	7,224	61	43
	GEORGIA			
UF6FAL	A	15,900	159	50
UF6FCZ	**14**	**101,736**	**246**	**157**
	KAZAKH			
UL7CBS	**A**	**365,822**	**552**	**202**
UL7CAZ	"	99,746	235	106
UL7GBP	"	28,608	138	92
UL7GAA	**28**	**15,498**	**182**	**63**
UL7CBO	"	5,985	102	45
UL7LAW	"	2,070	49	30
UL7TA	21	3,672	38	36
UL7LCZ	**14**	**457,920**	**661**	**265**
UL7JCB	**14**	**433,521**	**666**	**261**
UL7CBD	"	171,488	365	184
UL7CBP	**7**	**95,460**	**169**	**110**
	KIRGHIZ			
UM8NNN	**A**	**136,000**	**469**	**136**
UM8MBA	21	4,176	52	36
UM8MBN	**14**	**200,122**	**438**	**178**
	TADZHIK			
UJ8JAS	**7**	**174,445**	**243**	**139**
	TURKOMAN			
UH8BAX	**A**	**112,880**	**255**	**166**
UH8DC	"	1,848	30	24
UH8EAA	**14**	**665,000**	**913**	**280**
UH8BAW	"	34,658	157	86
	UZBEK			
UI8AFA	**A**	**264,106**	**570**	**166**
UI8ADQ	**14**	**67,034**	**212**	**121**

EUROPE

	AUSTRIA			
OE5CWL	**A**	**254,667**	**490**	**201**
OE10SA/3	**7**	**282,528**	**470**	**216**
	BALEARIC IS.			
EA6CL	**A**	**109,475**	**299**	**151**
	BELGIUM			
ON4FD	**A**	**747,864**	**1007**	**312**
ON4XG	"	175,968	416	208
	BULGARIA			
LZ2SS	A	7,884	62	54
LZ1QI	**21**	**76,112**	**224**	**142**
LZ1IA	"	21,440	107	80
LZ2VP	**14**	**287,448**	**631**	**236**
	CZECHOSLOVAKIA			
OK2RZ	**A**	**1,364,175**	**1420**	**387**
OK2YAX	"	228,528	442	207
OK2PEG/p	"	205,205	424	205
OK3CKY	"	169,222	472	211
OK1KZ	"	133,660	326	163
OK1BLC	"	126,374	328	179
OK1FCA	"	95,472	224	153
OK3CEE	"	89,517	230	159
OK3TDN	"	75,360	200	157
OK3YCA	"	66,285	220	135
OK2PBG	"	49,749	169	103
OK3TAG	"	41,610	178	101
OK1FV	"	40,082	136	98
OK1MAA	"	34,814	161	103
OK3YCV	"	31,527	120	93
OK1ADU	"	21,414	132	86
OK3BA	"	16,900	109	84
OK1AWH	"	12,660	71	60
OK1AEH	"	12,322	86	61
OK2SGW	"	9,586	72	51
OK3EQ	"	7,380	72	60
OK3CAU	"	5,876	64	52
OK2SW	"	5,616	55	48
OK1MIZ	"	4,664	53	44
OK2SOD	"	4,620	55	42
OK1AR	"	3,036	38	33
OK2BJU	"	1,188	24	22
OK2SWD	"	336	12	12
OK2PFQ	**21**	**120,836**	**297**	**164**
OK1AGN	"	105,891	304	141
OK2BBJ	"	1,242	23	18
OK1AMB	"	442	13	13
OK1ASQ	"	96	6	6
OK1ALW	**14**	**467,885**	**819**	**235**
OK1MAW	**14**	**190,440**	**440**	**184**
OK2QX	"	96,668	258	169
OK1DCU	"	93,032	300	116
OK2SPS	"	52,722	231	101
OK2SMO	"	48,093	202	123
OK1EP	"	14,160	82	59
OK1AJY	"	10,350	75	46
OK3CYU	"	10,248	85	61
OK2BEC	"	8,964	70	54
OK3YEC/p	"	6,750	67	54
OK2ABU	"	5,084	49	41
OK1CIJ	"	4,972	48	44
OK3IF	"	3,680	47	46
OK3TCK	"	3,003	41	33
OK1JST	"	2,340	43	30
OK2BCJ	"	2,016	29	24
OK1DIS	"	1,620	47	30
OK2BPK	"	969	19	17
OK1OFK	"	90	6	5
OK3TTL	"	40	4	4
OK1MSO	"	14	3	2
OK3KFF	**7**	**279,416**	**435**	**212**
		(Opr: OK3YOZ)		
OK1MG	"	182,628	361	176
OK3TEG	"	38,994	159	97
OK3TRI	"	30,336	146	96
OK1DRY	**3.5**	**18,326**	**120**	**77**
OK2HI	"	11,956	100	61
OK3CSA	"	3,175	43	37
OK1DDO	"	2,100	36	30
OK1MNV	"	1,012	25	22
OK3ZFB	"	242	11	11
OL9CJB	**1.8**	**836**	**26**	**22**
OL3AXS	"	714	25	21
OK1DWF	"	608	24	16
	DENMARK			
OZ1CTK	**A**	**194,542**	**469**	**211**
OZ1BII	"	105,138	335	162
OZ4HW	"	64,260	246	140
OZ7BW	"	19,832	100	74
OZ6KS	"	325	13	13
OZ1CMK	"	133	7	7
OZ4CG	21	2,378	32	29
OZ2PG	**14**	**133,534**	**407**	**179**
OZ1EE	"	51,706	203	103
OZ6XR	**7**	**66,402**	**270**	**119**
OZ7YL	**3.5**	**29,216**	**160**	**88**
	ENGLAND			
G5CMX	**A**	**431,475**	**753**	**275**
G3TXF	"	239,578	500	206
G3HRY	"	61,915	197	145
G2AJB	"	59,094	232	134
G3ESF	"	16,145	122	69
G6NK	"	10,557	100	69
G4CNY	**21**	**497,745**	**661**	**255**
G4FDC	14	5,280	56	48
	FAROE IS.			
OY7ML	A	344	16	14
	FINLAND			
OG6DX	**A**	**1,175,892**	**1555**	**327**
OH2BSQ	"	227,925	565	225
OH2KP	"	107,460	282	180
OH2VZ	"	93,555	216	165
OH2CZ	"	15,960	114	70
OH9TD	"	13,160	83	70
OH5KJ/7	"	4,956	48	42
OH5PT	"	3,458	40	38
OH1EB	"	2,624	38	32
OH3BX	"	540	15	12
OH6RC	28	126	11	9
OH6AC	**21**	**363,408**	**557**	**225**
		(Opr: OH6WZ)		
OH2BFJ	"	306,507	622	213
OH1LU	"	2,424	35	24
OH1FM	"	704	16	16
OH3RF	"	624	17	16
OH2DN	"	290	11	10
OI1VR	**14**	**520,964**	**1000**	**296**
		(Opr: OH3KZ)		
OH2BSL	"	255,012	645	237
OH2PM	"	94,720	326	148
OH6GD/8	**7**	**21,975**	**134**	**75**
OH7NW	3.5	2,052	35	27
OH5NG	**1.8**	**272**	**17**	**16**
	FRANCE			
F6EQV	**A**	**42,731**	**183**	**113**
	GERMANY (FRG)			
DK1II	**A**	**460,890**	**754**	**270**
DJ0 UP	**A**	**294,800**	**530**	**268**
DF2NG	"	150,066	406	189
DK8AX	"	110,979	330	171
DJ0 YZ	"	110,880	311	168
DF9SI	"	99,960	317	168
DJ0 IV	"	94,686	255	129
DJ1YH	"	89,052	269	164
DF4KV	"	86,892	270	156
DF3QN	"	73,688	245	151
DF2CH	"	65,232	210	151
DF4NW	"	17,550	117	78
DF2HL	"	14,175	85	75
DL1RB	**21**	**19,512**	**101**	**72**
DL1JF	**14**	**337,617**	**579**	**233**
DL1AM	"	25,863	123	111
DL2RM	"	17,408	106	68
DF3TP	"	15,400	129	77

DF2OF	"	15,200	153	76
DJ2YE	"	4,800	52	40
DF7FH	**7**	**201,880**	**400**	**196**
GERMANY (GDR)				
DM3NKE	**A**	**242,735**	**510**	**215**
DM2AHI/A	"	47,082	193	114
DM3VNM	"	39,022	191	109
DM4PN	"	25,947	105	93
DM4ZFM	"	14,742	86	63
DM3WBI	"	11,484	84	66
DM4ONL	"	8,820	91	60
DM2CCM	"	8,636	70	68
DM5QG	"	8,206	67	57
DM2FMH	"	7,504	70	56
DM3XM	"	7,200	51	45
DM2ADC	"	6,375	67	51
DM4TEK	"	5,612	58	46
DM3NME	"	4,704	70	49
DM2GIL	"	3,360	45	40
DM4YNE	"	3,003	39	33
DM2CKD	"	2,739	37	33
DM4VDA	"	2,448	38	34
DM4TOM	"	2,436	78	29
DM2DGE	"	2,322	34	27
DM3PFF	"	1,311	24	23
DM4TDA	"	920	26	23
DM4SDA	"	299	13	13
DM3NCJ	"	104	8	8
DM3WMJ	**21**	**77,792**	**257**	**136**
DM2BLE	"	22,800	111	80
DM3UE	"	5,504	54	43
DM3TYF	**14**	**65,550**	**242**	**138**
DM2GGL/A	"	19,608	112	76
DM2GEN/A	"	11,937	103	69
DM2FTL	"	11,454	100	69
DM3EL	"	9,577	100	61
DM2BWK	"	7,139	87	59
DM2CJN	"	4,300	50	43
DM2FWL	"	3,330	43	37
DM3ZVA	"	3,270	39	30
DM2GHL	"	3,193	41	31
DM2CJJ	"	2,695	39	35
DM4ZCH	"	264	18	12
DM3POO	**7**	**436,644**	**595**	**234**
DM4VUG	**7**	**311,014**	**520**	**211**
DM3BF	"	176,528	362	187
DM2DMF	"	91,806	286	143
DM3SBM	"	91,188	236	149
DM4UJ	"	16,256	77	64
DM5XIG	"	5,704	58	46
DM4YSL	**3.5**	**27,632**	**184**	**88**
DM4YZA	"	4,730	54	43
GREECE				
SVØAA	**21**	**82,915**	**238**	**161**
GUERNSEY (C.I.)				
GU5CIA	**A**	**1,695,907**	**1790**	**367**
		(Opr. K5MM)		
GU4CHY	**21**	**161,784**	**453**	**214**
GU3MBS	14	11,408	96	62
GU4EON	**7**	**191,868**	**426**	**179**
ICELAND				
TF3YH	**A**	**268,702**	**559**	**238**
ITALY				
I4IND	**21**	**876,876**	**1087**	**308**
I3VJW	**14**	**332,280**	**575**	**260**
I3OBO	**7**	**169,664**	**346**	**176**
NETHERLANDS				
PAØDIN	**A**	**134,551**	**348**	**197**
PAØUV	**A**	**121,930**	**322**	**170**
PA3AIC	"	85,374	257	162
PAØCF	"	6,550	65	50
PAØINE	"	3,700	40	37
PAØWRS	"	918	17	17
PAØWLN	"	52	4	4
PAØPLM	14	198	10	9
NORWAY				
LA9HW	**A**	**160,740**	**508**	**171**
LA4XX	"	35,442	184	99
LG5LG	"	30,794	136	89
		(Opr. SMØGMG)		
LA3UG	"	26,675	122	97
LA9CK	"	9,280	91	64
LA5KW	"	1,120	23	20
LA2Q	**14**	**5,341**	**71**	**49**
LA5GF	"	4,230	50	45
POLAND				
SP7ELQ	**A**	**71,345**	**238**	**138**
SP9DBA	"	57,980	215	130
SP9CAV/9	"	44,733	194	111
SP3IBX	"	25,245	143	99
SP9ADU	"	378	14	14
SP9BRP	**21**	**17,018**	**94**	**57**
SP5JTR	**14**	**79,121**	**227**	**127**
SP9EMU	"	16,576	105	74
SP7HOV	"	16,064	92	64
SP2HMT	"	12,312	91	72
SP9HWN	"	9,000	83	60
SP3XR	"	4,017	54	39
SP9AKD	7	48,396	167	109
SP5IUY	3.5	448	16	14
SP5IXI	**1.8**	**792**	**22**	**18**
ROMANIA				
YO3AC	**A**	**823,528**	**992**	**311**
YO3CR	"	223,668	505	228
YO8DD	"	191,649	385	193
YO8FZ	"	151,158	319	183
YO8BDF	"	5,670	57	42
YO6AFP	21	4,884	51	37
YO5AVP	"	2,755	34	29
YO9HP	**14**	**51,084**	**222**	**132**
YO3KSC	**7**	**126,984**	**322**	**148**
		(Opr. YO8BOB)		
YO3JG	"	23,664	120	87
YO3BYF	"	21,637	132	77
YO3CDN	"	13,824	103	64
YO8BDQ	"	198	11	9
YO6KEB	"	140	10	10
YO8BNM	**3.5**	**35,728**	**199**	**88**
YO8BQO	"	30,330	159	90
YO3JW	"	6,862	71	47
YO5BEU	"	4,472	61	43
YO6AW	"	3,780	56	35
SPAIN				
EA2IA	**A**	**2,057,034**	**1975**	**402**
ED7ALG	"	145,350	402	190
ED7AAW	"	125,538	449	183
EA1JO	"	107,275	342	175
ED7XQ	"	101,205	331	173
ED2CR	"	6,944	71	56
ED3IH	**21**	**43,290**	**239**	**130**
EA7FC	"	42,448	180	112
ED2OP	**14**	**506,600**	**973**	**298**
ED3AOS	"	16,717	108	73
SWEDEN				
SK2KW	**A**	**921,276**	**1370**	**314**
		(Opr. SMØGNU)		
SM5ADE	**A**	**756,176**	**1079**	**283**
SM5BAX	"	83,790	280	126
SM3DNI	"	78,156	278	156
SM6BXV	"	61,490	200	130
SK2IV	"	33,300	198	111
		(Opr. SM2CDF)		
SM4CJY	"	27,642	127	102
SM7DER	"	22,616	132	88
SM5CSS	"	21,565	113	95
SM5AKT	"	17,064	85	72
SM5RE	"	11,328	109	64
SM5AFE	"	8,374	65	53
SMØCGO	"	7,366	63	58
SM6AYM	"	6,336	60	48
SM6BZE	"	3,744	38	36
SM5BDV	"	3,686	43	38
SMØBDS	"	966	23	23
SM7TV	"	493	17	17
SM2HZQ	**21**	**72,027**	**236**	**151**
SM6EUZ	"	50,819	198	89
SKØLG	**14**	**343,952**	**764**	**259**
		(Opr. SMØGMZ)		
SM5CMP	"	268,515	602	255
SMØCCE	"	213,920	504	224
SMØBVQ	"	76,347	275	153
SMØFOØ	"	31,209	164	101
SM7EH	"	13,703	90	71
SM5EQW	"	11,352	101	66
WALES				
GW3NYY	**A**	**134,240**	**323**	**160**
YUGOSLAVIA				
YU1OOL	**A**	**356,524**	**620**	**238**
YU1NGO	"	120,054	287	187
YU6ZAN	"	20,636	102	77
YU2CQ	**28**	**31,130**	**154**	**110**
YU1ORS	"	4,368	55	39
YU1BCD	**21**	**675,186**	**1014**	**258**
YU3ZV	**14**	**1,118,304**	**1295**	**352**
YU1NZR	"	52,920	187	120
YU1SF	"	24,960	140	96
YT2D	**7**	**446,248**	**569**	**242**
		(Opr. YU2ROX)		
YU3DCK	"	144,578	322	161
YU4ELK	"	540	18	25

U.S.S.R

EUROPEAN				
UW3HV	**A**	**802,191**	**1204**	**307**
UA4CK	**A**	**330,870**	**590**	**246**
UA3ZP	"	202,252	394	236
UA1AGL	"	186,813	507	187
UA3DDF	"	184,295	525	205
UA6AJO	"	152,295	416	195
UA6AJG	"	20,418	103	83
UA3GO	"	19,780	109	86
UV3DN	"	14,760	103	60
UA3DNK	"	13,345	119	85
UA6PBR	"	8,968	70	59
UA3VFI	"	8,236	60	58
UA3AEZ	"	7,888	64	58
UA3IOX	"	7,728	68	56
UW3UO	"	7,614	76	47
UA3TAM	"	4,600	52	46
UA4CM	"	3,852	41	36
UA4QK	"	2,849	45	37
UA6YAK	"	1,725	31	25
UA1CQ	**21**	**335,124**	**626**	**214**
UA6XBJ	"	71,724	232	139
UA4HBP	"	19,976	110	88
UA3QEL	**14**	**384,670**	**703**	**286**
UA3AGL	**14**	**350,172**	**689**	**284**
UA4LAS	"	217,728	509	243
UA4ACA	"	117,369	366	189
UA3ST	"	102,608	270	176

TROPHY WINNERS

Single Operator-All Band

WORLD - Canadian DX Assn. Trophy. Won by: **Station KG6SW: Opr. Chip Margelli, K7JA.**
U.S.A. - Corker A. Rhines, W8EAO Trophy, Charles Rhines, W7VIU Memorial. Won by: **Thomas H. Nail, AE4H.**
CANADA - Canadian Amateur Radio Federation Trophy. Won by: **Sauli Arosankari, VE1AIH.**
EUROPE - Sigurdur Jakobsson, TF3CW Trophy. Won by: **Inaki Alcorta Goni, EA2IA.**
JAPAN - Palm Garden Contest Club Trophy. Won by: **Masami Takahashi, JI1KUV.**
WORLD - QRPp - Nevada Amateur Radio Assn. Trophy, George Hewitt, WB7OOQ Memorial. Won by: **Lars Mohlin, SMØGMG.**

Single Operator-Single Band

WORLD - Pedro Piza, Jr., KP4RF/KP4Q Trophy. Won by: **Talma Dangelo Drummond, ZW4OD.** (14 MHz)
U.S.A. - Kansas City DX Club Trophy. Won by: **R. W. "Bill" Bradford, Jr., K5GA.** (14 MHz)
SOUTH AMERICA - John Kroll, K8LJG Trophy. Won by: **Talma Dangelo Drummond, ZW4OD.** (14 MHz)

Multi-Operator Single Transmitter

WORLD - Ron Blake, N4KE Trophy. Won by: **Club Station 4N4Y: Oprs: YU1NVZ, YU1QBC, YU4VKW, YU4VFB, YU4FRS, YU4BZ, Goran & Braco.**
CANADA - Tehrahedral Contest Circle Trophy. Won by: **Club Station VE1UNB: Oprs: VE1BCZ & VE1BHA.**
EUROPE - Jonas Bjarnason, TF3JB Trophy. Won by: **Club Station 4N4Y: Oprs: YU1NVZ, YU1QBC, YU4VKW, YU4VFB, YU4FRS, YU4BZ, Goran & Braco.**

Multi-Operator Multi-Transmitter

WORLD - North Florida DX Assn. Trophy. Won by: **Station HD1A: Oprs: WA4UAZ/HC1, K7CA/HC1, K4ERO/HC1, KZ5OJ, WB4ETT, KA7AXB.**

Contest Expedition

WORLD - Northern Ohio DX Assn. Trophy. **No Winner.** A total of at least 3 different logs must be received in this category.

Club Competition (SSB & C.W.)

WORLD - Canadian DX Assn. Trophy, Bud Abraham, VE1VR Memorial. Won by: **Western Washington DX Club.**

SSB & C.W. - CLUB COMPETITION

Western Washington DX Club	**28,113,837**
Potomac Valley Radio Club	21,113,782
Rhein Ruhr DX Assn. (FRG)	16,161,988
North Texas Contest Club	15,413,663
Lithuanian Contest Group (USSR)	11,585,074
Chelyabinsk Region Club (USSR)	9,442,439
Outback DX Club (Sweden)	7,811,742
YU DX Club (Yugoslavia)	6,132,458
Yankee Clipper Contest Club	5,799,591
North Florida Amateur Radio Society	4,788,125
Ontario Contest Club (Canada)	4,686,299
Halifax Amateur Radio Club (Canada)	4,432,165
Kansas City DX Club	4,406,502
Toronto DX Club (Canada)	3,431,561
Ft. Wayne Radio Club	3,302,296
Gloucester County Amateur Radio Club	2,995,548
Scorpion DX Group (DR)	2,971,698
Northern California DX Club	2,879,294
CW Club of Minas Gerais (Brazil)	2,558,492
Southeastern DX Club	2,428,673
Frankford Radio Club	2,266,435
Danish DX Group (Denmark)	2,257,288
Saar-Pfalz DX Club (FRG)	2,148,898
Tallinn Radio Club (Estonia)	1,939,795
Voroshilovgrad Radio Club (Ukraine)	1,892,223
SP DX Club (Poland)	1,680,016
North Florida DX Club	1,482,031
Indy Dxers	1,397,874
Dayton Amateur Radio Assn	1,385,010
Cologne Contest Club (FRG)	1,320,057
Whidbey Island Dx Club	1,148,799
Northern California Contest Club	1,020,120
Southern California DX Club	962,319
Alaska DX Assn	908,858
Winnipeg DX Club (Canada)	722,953
Ill-Wind Contesters	444,557
Northern Ohio DX Assn	443,456
San Diego DX Club	398,049
Ford Tin Lizzy Club-N. Metro Chapter	344,520
Willamette Valley DX Club	322,872
Michigan DX Assn	285,256
Voice of HIDA Ham Club (Japan)	266,396
Alamo DX Amigos	262,192
Delta DX Assn	178,521
Point Radio Operating Society	126,643
Southern Sixlander Contest Group	94,989
South Jersey Radio Assn	53,110

UA6LLW	"	73,162	301	157
UA3EZ	"	68,716	292	164
UA3AAH	"	39,312	170	126
UA4NEJ	"	33,000	182	110
UA4NED	"	30,555	195	97
UA3ESN	"	10,230	75	55
UA3AAJ	"	9,504	80	66
UW3UG	"	8,694	102	63
UA4MX	"	8,260	64	59
UA6AVZ	"	6,222	86	61
UA4CDC	"	5,400	67	45
UA1DF	"	3,325	39	35
UA4SAM	"	2,496	41	32
UA3IAK	"	2,240	33	32
UA4HAN	"	1,600	25	25
UA6AVD	"	1,320	27	22
UA1WEA	"	429	13	13
UA6AKK	**7**	**137,052**	**355**	**162**
UA3PAV	"	1,000	23	20
UA3XBY	"	234	11	9
ESTONIA				
UR2QI	**A**	**837,212**	**1161**	**311**
UR2CR	"	16,600	116	83
UR2RL	"	8,910	77	66
UR2REC	**21**	**17,544**	**105**	**68**
UR2RCU	**14**	**230,790**	**506**	**245**
UR2JW	"	192,698	440	209
KALININGRAD				
UA2FCB	**A**	**169,556**	**370**	**194**
UA2DC	"	86,825	270	151
UA2FCW	**7**	**115,974**	**289**	**153**
LATVIA				
UQ2GFN	**A**	**257,881**	**600**	**239**
UQ2GDM	"	154,316	275	173
UQ2GCN	21	2,194	39	31
UQ2GCP	**14**	**40,833**	**184**	**117**
UQ2GFM	**7**	**75,920**	**235**	**130**
UQ2GEC	"	29,760	139	93
LITHUANIA				
UP2NV	**A**	**1,285,160**	**1368**	**361**
UP2BAT	**A**	**757,448**	**1022**	**292**
UP2BAO	"	666,822	932	309
UP2BZ	"	433,680	700	278
UP2PAP	"	158,004	402	198
UP2BDX	"	90,666	320	146
UP2BBF	"	60,268	215	122
UP2BFI	"	41,875	169	115
UP2NA	**21**	**107,640**	**309**	**138**
UP2BEI	**14**	**12,462**	**83**	**62**
UP2BFM	**7**	**8,520**	**72**	**60**
UP2BCG	**3.5**	**42,570**	**195**	**99**
MOLDAVIA				
UO5GDA	**A**	**64,321**	**220**	**131**
UKRAINE				
UB5ZAL	**A**	**674,660**	**1023**	**305**
UY5TE	**A**	**145,024**	**461**	**176**
UB5ZA	"	115,325	240	175
UT5HP	"	100,045	344	187
UB5HEK	"	83,490	306	165
UB5HCU	"	82,498	237	167
UB5DW	"	72,270	221	146
UB5EF	"	49,946	201	113
UB5UBU	"	38,695	170	109
UB5UCF	"	17,010	100	81
UB5UOH	"	16,704	92	72
UB5KAK	"	10,169	87	73
UB5UCH	"	3,150	35	35
RB5IWF	**28**	**6,820**	**69**	**44**
UB5VAA	**21**	**58,560**	**198**	**120**
UB5VAW	"	22,842	120	94
UB5VY	**14**	**382,284**	**692**	**287**
UB5MMJ	"	121,680	383	180
UB5MLV	"	116,765	393	193
UB5KBF	"	87,204	251	169
UB5ZBF	"	64,076	225	166
UB5EEP	"	13,840	99	80
UB5LR	"	12,638	84	71
UB5ZBG	"	8,525	67	55
UB5AAL	"	3,977	49	41
UB5QCP	"	2,242	38	38
UY5GG	"	1,032	25	24
UB5BAT	**3.5**	**82,748**	**261**	**137**
WHITE RUSSIA				
UC2OBI	**A**	**161,136**	**466**	**216**
UC2OCB	"	2,673	35	33
UC2AAM	**14**	**439,546**	**684**	**269**
UC2AFE	"	106,420	291	180
UC2WBL	"	24,206	130	91
UC2AAX	"	18,011	120	83
UC2AW	"	4,998	50	49

OCEANIA

AUSTRALIA				
VK3AHI	**A**	**539,847**	**784**	**231**
VK3AEW	"	99,180	247	145
GUAM				
WH2ABE	**A**	**277,000**	**747**	**125**
HAWAII				
KH6NO	**A**	**648,932**	**968**	**212**
MARIANAS IS.				
KG6SW	**A**	**2,848,320**	**2602**	**345**
		(Opr: K7JA)		
NEW ZEALAND				
ZL1ADI	**A**	**1,783,140**	**1539**	**339**
ZL1AJU	**A**	**1,106,954**	**1138**	**293**
ZL1BCG	**14**	**55,071**	**213**	**87**
PHILIPPINES				
KØAX/DU2	**14**	**1,198,080**	**1301**	**320**
DU1GF	"	268,272	632	144
		(Opr: JA7SGV)		
W7LPF/DU2	"	205,200	511	135
WESTERN SAMOA				
5W1BZ	**A**	**213,219**	**375**	**149**

SOUTH AMERICA

ARGENTINA				
LU8DQ	**A**	**2,333,386**	**2013**	**374**
LU2KAK	**28**	**59,400**	**188**	**108**
LU3HAZ	**14**	**368,406**	**594**	**211**
BOLIVIA				
CP5NK	**A**	**348,992**	**519**	**224**
BRAZIL				
ZZ4DD	**A**	**1,148,172**	**1183**	**326**
PY1BOA	"	134,230	254	155
PY1MGH	"	50,470	173	98
PY1ARS	"	39,144	103	84
PT7AW	"	17,934	100	79
PY2BR	21	4,340	42	35
ZW4OD	**14**	**1,410,320**	**1389**	**340**
ECUADOR				
HD9X	**14**	**1,013,860**	**1095**	**311**
		(Opr: HC5EE/W88ABN)		
SURINAM				
JA1PIG/PZ	**28**	**282,183**	**508**	**187**
VENEZUELA				
YX1DIG	**A**	**1,994,388**	**1698**	**348**

The 1.3 million plus by Jiri, OK2RZ is the Czechoslovakian big Single Op, All Band Score.

beside me...W7LPF/DU2. Managed 5 QSO's on 160 M with best DX yet to W1 area...5W1BZ. TNX nice contest ...UQ2GFN. CUAGN next year SSB and C.W....OE5CWL. Sorry about low solar activity, but nice this C.W. part of WPX...OK2SPS. I was expecting much better condx on 21 MHz to USA, only 30 from there compared to almost 500 JA's there...OG6DX. TNX fer FB contest...OH7NW. This contest is FB...F6EQV. Very good idea this CW-WPX Contest...DJ0UP. One of the most interesting CW Contests CU next year...DF7FH. Very, very good contest - congrats to all...I4IND. Sounded like a pretty fair turn-out for the inaugural C.W. Contest... GU5CIA, op K5MM. Very nice contest...JA1JKG. Very FB Contest on WPX C.W....JF1SEK. You should advertise this contest a lot more... JR1AOQ. Good condx to Europe all during the test...ZW4OD. Really nice interesting contest...UA0QCA. My QSL Mgr is K8LJG, all QSLs must go via him...HD9X. The adoption of a code to indicate duplication of con-

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

K3EST	**1,900,416**	**1491**	**448**
AB2E	**1,144,962**	**1193**	**378**
AG1C	**1,120,408**	**1247**	**344**
W2KI	1,098,531	1117	371
AA4M	**804,335**	**1024**	**335**
N4UF	743,070	1067	310
KØUK	**564,570**	**827**	**255**
KN1DPS	558,400	1047	320
KØRWL	438,914	716	293
N3GB	296,946	491	243

NORTH AMERICA

KL7HR	**1,404,309**	**1571**	**347**
VE1UNB	**1,156,765**	**1156**	**335**
VE4XK	**995,066**	**1224**	**307**
VE7CMK	**739,944**	**1021**	**258**
KL7AF	510,604	962	214
VE3OCU	**385,416**	**655**	**212**
VE3FCU	231,753	430	201

ASIA

JA4YFH	**405,720**	**670**	**230**
JAØYAK	269,165	484	205

EUROPE

4N4Y	**3,348,072**	**2849**	**458**
GB2DAA	**2,630,888**	**2230**	**438**
DFØRPL	**2,137,996**	**1966**	**406**
OK5TLG/p	**1,599,568**	**1622**	**389**
OI2AA	**1,578,818**	**2034**	**334**
YT3L	**1,495,480**	**1553**	**392**
OK1KSO	**1,487,520**	**1482**	**360**
EE3AUV	**1,090,980**	**1728**	**330**
DM3GM	**1,003,446**	**1218**	**321**
OK3VSZ	976,023	1159	333
I3OLM	**920,920**	**1202**	**286**
DA1WA/HBØ	**690,972**	**1022**	**284**
SP2ZFJ	**666,514**	**937**	**302**
YO3JX	**582,868**	**959**	**286**
OK2KMR	543,250	825	265
OK1OK/p	381,480	586	264
DM2CWB	343,000	564	245
SPØTRK	308,925	568	225
OK1KQJ	285,212	584	226
OK3KEE	235,172	542	227
OK2KOD	215,550	537	225
SP3KEY	213,514	449	202
OH5AB	164,883	427	183
OH2BSV	157,552	538	172
OK3KAP	153,664	328	224
DM3WJ	133,458	365	177
OK1KTW	107,850	314	150
LA7A	**102,560**	**417**	**160**
DL3SM	98,728	333	164
LZ2KSB	**97,552**	**289**	**182**
OK3RKA	83,148	201	169
OK1KPZ	78,780	229	156
OK1KRQ	71,725	302	151
OZ5ESB/A	**70,835**	**300**	**155**
DM3EK	65,340	213	132
LZ2KKZ	31,950	137	90
YO6KNM	11,600	90	58
LZ2KBS	9,742	80	74
SK7HW	9,150	77	61
OK2KWU	1,984	45	31
OK1KCF	372	13	12

U.S.S.R. CLUB STATIONS

ASIA

UK9ADY	**1,653,840**	**1559**	**360**
UK9HAC	**1,391,694**	**1471**	**326**
UK9CBD	1,066,388	1075	317
UK7GAA	**647,472**	**1000**	**282**
UKØFAD	**317,580**	**948**	**201**
UK6DAJ	38,359	163	89
UK9CAS	21,907	107	69

EUROPE

UK2BBB	**2,563,204**	**2430**	**434**
UK5MAF	**2,071,730**	**2209**	**410**
UK2PCR	**1,826,396**	**1873**	**403**
UK4WAR	**1,587,848**	**1755**	**376**
UK5QBE	**1,205,032**	**1494**	**344**
UK1AFA	**924,426**	**1385**	**342**
UK4WAB	898,950	1343	325
UK4LAC	727,445	1232	365
UK2ABC	**653,640**	**985**	**312**
UK5YAA	409,160	689	265
UK5ZAC	143,441	347	191
UK5IFM	53,083	228	109
UK6LTF	48,462	203	123
UK2BAT	44,520	198	105
UK2GAZ	11,346	78	62
UK3DBV	6,864	78	48
UK1NAF	3,472	122	28
UK5DAA	1,530	34	30
UK6LTG	1,311	23	19
UK2GDZ	966	21	21
UK3ABC	659	42	31

MULTI-OPERATOR MULTI-TRANSMITTER WORLD-WIDE

HD1A	**6,052,032**	**4058**	**474**
YZ4Z	**4,533,932**	**3696**	**494**
N9MM	**2,124,150**	**1772**	**425**
K3WW	**1,966,512**	**1813**	**424**
JA2YKA	**1,539,882**	**1555**	**369**
JA1YXP	**1,339,182**	**1449**	**354**
JA7YAA	1,213,615	1437	327
JA2YEF	817,869	1059	313
JA4YQO	667,656	876	297
JA3YKC	646,430	873	278
JA1YFG	442,062	686	246
OH9AB	69,580	353	140

CHECK LOGS: The following were used for cross-checking. Thank you:
DM2BTO, DM2CBB, DM2CBF, DM2FIH, DM2YLO, DM4ZA, K1KI, K6XP, SM6DJI/MM, SMØGMZ, UA1ZBP, UA3DFK, UA3SBW, UA4BI, UA4HAM, UA4HJL, UA4WAG, UA6APP, UAØAGI, UB5EAX, UB5EES, UB5UWG, UK1ADK, UK4HBB, UK5QAC, UK6AAJ, UK9AAN, UT5SI, UT5SY, UV3FL, W7TO.

DISQUALIFICATION: N4BAA: Excessive Duplicate Multipliers.

STATION OPERATORS

Multi-Operator, Single-Transmitter

K3EST: & N3TR. **AB2E:** & AA2Z. **AG1C:** & W1YN. **W2KI:** & N2CQ. **AA4M:** & KC4B. **N4UF:** K4LK, WB4JMM, WB4YEY. **KØUK:** AE1V, N7DF, NØACW, NØAFO, WØKEA. **KN1DPS:** WA1QDX, WB1CPF, WB1CWT, WB1DJG, WB1DMJ. **KØRWL:** K5GN, KØBRO, KØVBU, WØVWW, WAØZHY, WBØBMB, WBØYBC. **N3GB:** & WA3ZAS. **KL7HR;** KL7IUM, KL7IVX, KL7RA. **VE1UNB:** VE1BCZ, VE1BHA. **VE4XK:** VE4OY, VE4UO, VE4VV. **VE7CMK:** VE7CML, VE7CNY. **KL7AF:** KL7HBK, K7LR/KL7. **VE3OCU:** VE2DZE, VE3CXL, VE3KKU. **VE3FCU:** & VE3JTQ. **JA4YFH:** JA4XKL, JH4DIT, JH4MVB. **JAØYAK:** 4 Ops. **4N4Y:** YU1NVZ,YU1QBC, YU4VKW, YU4VFB, YU4FRS, YU4BZ & 2 Ops. **GB2DAA:** G3FXB, G3MXJ. **DFØRPL:** DF6RX, DK5PD, DK9PY, DL1KS. **OK5TLG/p:** OK1DFW, OK1FCW, OK1MMW, OK2BTW, OK3TPV. **OI2AA:** OH2BNP, OH2BQS, OH2BRW, OH2BSS, OH2CG. **YT3L:** YU3TEV, YU3TUF, YU3TVV, YU3TWL, YU3TYY, YU1PCF/3. **OK1KSO:** Club Gp. **EE3AUV:** EA3AIR, EA3AVV, EA3XH, EA3XZ. **DM3GM:** DM2AGM, DM2FJM, DM3BGM, DM3SGM. **OK3VSZ:** OK3FON & Club Gp. **I3OLM:** I3AWW, I3FIY, I3GNQ, I3JTC. **DA1WA/HBØ:** DJ9CB, DJØLC. **SP2ZFJ:** SP2ASJ, SP2FAP. **YO3JX:** & YO3BEJ. **OK2KMR:** OK2SEO & Club Gp. **OK1KOK/p:** Club Gp. **DM2CWB:** DM2CRB & 2 Ops. **SPØTRK:** SP9FKQ, SP9HMF, SP9HNB. **OK1KQJ:** OK1AYP & Gp. **OK3KEE:** OK3CGG & Gp. **OK2KOD:** OK2BDI, OK2OR, OK1DCW. **SP3KEY:** SP3DWQ & Club Gp. **OH5AB:** OH5BB, OH5RO, OH5UO. **OH2BSV:** & OH2BSX. **OK3KAP:** OK3CGI & Gp. **DM3WJ:** DM3TWJ, DM3YWJ. **OK1KTW:** OK1AAE & Club Gp. **LA7A:** LA6UT, LA8UL. **DL3SM:** & DL2SM. **LZ2KSB:** 2 Ops. **OK3RKA:** OK3TDP & Gp. **OK1KPZ:** OK1DCJ & Gp. **OK1KRQ:** OK1AYQ & Club Gp. **OZ5ESB/A:** OZ1DYE, OZ1DYX, OZ7LZ, OZ9EY. **DM3EK:** & DM3YEK. **LZ2KKZ:** Club. **YO6KNM:** YO6AW, YO6XU. **LZ2KBS:** Club. **SK7HW:** SM7IFK, SM7KCO, SM7MO. **OK2KWU:** *Club.* **OK1KCF:** Club. **UK9ADY:** UA9ADI, UA9ADH, UA9AFZ, UA9AFH, UA9AJA, UA9AAX. **UK9HAC:** UA9HBH, UA9HBQ, UA9-158377. **UK9CBD:** UA9CBM, UA9COD, UA9CT, UW9DW. **UK7GAA:** 3 Ops. **UKØFAD:** 5 Ops. **UK6DAJ:** 3 Ops. **UK9CAS:** UA9-1541238, UA9-1541347, UA9-1541365. **UK2BBB:** UP2BAS, UP2BCI, UP2PX, UP2-038517. **UK5MAF:** UY5LK, UB5MDC, UB5-05822, UB5-0592, UB5-058200, UA6-150262. **UK2PCR:** UP2BBT, UP2BCR, UP2BDF, UP2BEG, UP2BFL, RP2BET, UP2-038728, UP2-0381524. **UK4WAR:** UA4WPX, UA4-0957 & 2 Ops. **UK5QBE:** 3 Ops. **UK1AFA:** UA1AAF, UA1AFA, UA4NEB, UA1-169185. **UK4WAB:** 4 Ops. **UK4LAC:** UA4LAR, UA4-164213, UA4-164259. **UK2ABC:** 3 Ops. **UK5YAA:** 3 Ops. **UK5ZAC:** Club. **UK5IFM:** UB5IHO, UB5ILO. **UK6LTF:** Club Gp. **UK2BAT:** UP2-038628, UP2-038898. **UK2GAZ:** UQ2MW, UQ2-03781. **UK3DBV:** 3 Ops. **UK1NAF:** 3 Ops. **UK5DAA:** 3 Ops. **UK6LTG:** 3 Ops. **UK2GDZ:** UQ2-03727. UQ2-0371016, UQ2-037168. **Uk3ABC:** 2 Ops.

Multi-Operator, Multi-Transmitter

HD1A; WA4UAZ/HC1, K7CA/HC1, K4ERO/HC1, KZ50J, WB4ETT, KA7AXB. **YZ4Z:** YU1OIF, YU1OIQ, YU1OQI, YU1EBC, YU3TCA, YU4VFO, YU4VPV, YU4WAA. **N9MM:** & N9NB, N9NC, W9ZRX, WB9LTY. **K3WW:** & K3WJV, WA3LUY. **JA2YKA:** JA4UDP/4, JH2QNG, JR3URO, JR2GMC, JA9NFO. **JA1YXP:** JA4QNJ, JH4OWG, JK1EPL, JA5IEP, JH4KAH, JR6NJD, JAØXUF, JA4XPT, JH7JPQ, JI1HGD. **JA7YAA:** JH7IMN, JH7WTC, JG1UJD, JA7WBW, JA9PPC, JH7AEF, JR7DQN, JH7LDN, JH7LIS, JH7DAG. **JA2YEF:** JH2TBS, JH2VOR, JR2LDM, JR2VDA, JR2TWA, JR2TPD, JR2PVI, JR2UWZ, JE2ATB, JE2LDO, JF2ACB, JF2GNY, JA9QNL, JAØUEX, JF3THB, JE2RWP, JE2RDI, JE2KIH, JE2CYP, JF3EIT, JF2CKH, JE2WBH. **JA4YQO:** JH4AQA, JA5POE, JA6WSB, JH6CGU, JH6KKD. **JA3YKC:** Club Gp. **JA1YFG:** JG1CFO, JI1JMH, JI1OAE, JI1RCB, JJ1EFG, JL1OLH, JH4CQQ. **OH9AB:** OH9PH, OH9UM, OH9UW.....

Drago, YU3ZV is the top European on 14 MHz. He also won the European WB4VQO Trophy for Single Op - 21 MHz in the '79 WPX-SSB.

tact between stations is proposed, E.g. QCL meaning look up your check list...VK3AEW. So my keyer went up in smoke halfway through, so I had a brand new call, so the QRN stayed at the S6 level, so I had to convince many that my call wasn't JH2 or WB2—so I still had a great time...WH2ABE. 40 meters surprisingly poor but great Europe on 20/15...KG6SW op. K7JA. Worked 127th country - some interesting new prefixes...W9TNZ. I worked everything I heard - which was very little hi hi (28 MHz)...KA9AOD. First C.W. WPX and I enjoyed it thoroughly...K9RF op: N9AQT. Enjoyed my first - hope conditions improve for 1980 test...WØWP. I like 30 hrs operating period, brings out good op's hi...VE3BMV. Contest should be 1 month after the SSB sometime in April...CZ6MP. Delighted by amount of activity on 20 - much more than expected - hope this proves to be a big contest in future...VE3FRA. It was very exciting and wonderful to work both prefixes and countries in the contest...HQ1AT." ▣

Part IV of this series brings us to string statements and operations. Next month we'll be ready to write a short program which will search for duplicates during a contest.

INTRODUCTION TO BASIC

A Computer Programming Language

Part IV - String Statements And Operations

BY BUZZ GORSKY*, K8BG

In the previous sections of this introduction to the BASIC programming language, I have concentrated on mathematical aspects of programming. In this installment we will examine the statements which deal with the manipulation of "strings," that is, strings of alphanumeric characters having no arithmetical significance. While most machines using BASIC are quite similar in the handling of mathematics, systems differ a bit in what is available for string operations. As usual, what I present will be valid for the TRS-80 Level II system and may require modification for other computers.

Tables I and II show the operators and statements which we will deal with. Before we get to the specifics though let's make sure we know what a "string" is. For example, is there a string in the statement:

LET X= 12.5

Well, that's hard to say! If there is no previous definition of X as a string variable then there is no string in that statement. However if X was previously defined as a string with a **DEFSTR** X statement then 12.5 would need to be a string, and since it is a literal (a specific value—like a constant) rather than a variable it would have to be enclosed in quotes to be valid. That is if the LET statement above followed a DEFSTR X statement, then it would be invalid as shown and an error message would be generated. However,

LET X= "12.5"

would be valid and X would be assigned the string value 12.5. In this case the computer would file away the four characters 1,2,., and 5 and know that X is those four characters "strung" together. Since X is a string and not a number, one could not do any arithmetic with the "value" of X directly, since the value is merely the string of characters with no significance tied to them.

The string operators perform functions analogous to those for the same operators used with other variables. Thus the < sign means that one string precedes another alphabetically, while > means that a string follows another alphabetically. Equals means that two strings are EXACTLY equal and the + sign signifies string concatenation or addition. For example:

```
10 LET A$ = "MON"
20 LET B$ = "DAY"
30 LET A$ = A$ + B$
```

In this routine neither A nor B has previously been defined as a string so the variables must show as A$ and B$ to indicate that they are strings. The MON and DAY must be in quotes. In line 30 the value of B$ is added onto the end of the string A$ and the result is stored as A$. After execution of 30 if there were a PRINT A$ statement, then MONDAY would be printed. If 30 were A$ = B$ + A$ then after execution A$ would have the value DAYMON.

Now let's examine the string program statements. We have already dealt with DEFSTR which defines all variables beginning with the letter indicated to be strings. **CLEAR** is a statement which clears some space in memory for string manipulations. A CLEAR 10 (10 bytes are cleared) is executed at power up. If a program needs more space then you can put a CLEAR statement in the program (before any other string operations) to provide space. I find it's best to guess at a number and see how things go. If you run out of total memory, you can reduce the value in your clear statement. If you run out of string space then you can increase the value. If you want to be more scientific you can use the **FRE** statement which will return the number of bytes of unused string space available. So after some string operation you can have a ?FRE(X$) statement (? is shorthand for PRINT, and X$ is a dummy which is required —that is any string variable is required). This statement will print the number of bytes of space left. You can then use the values you obtain to see if more or less space is needed.

ASC and **VAL** are similar statements which provide numerical values associated with strings. ASC will return the decimal ASCII value for a single string character. Thus ASC("A") is 65. Note that the quotes are required if A is to be interpreted as a literal. If there had been a previous statement A$= "1" then ASC(A$) would equal 49, the ascii code for the numeral 1. VAL returns the numerical value of a string which has such value. Thus if A$= "1" then VAL(A$) equals 1.0. If you have assigned a value to A$ which is non-numerical then the VAL(A$) statement will generate an error message.

**CHR$** is the opposite of ASC; that is CHR$ returns the character for a specific ASCII code. Thus PRINT CHR$(49) will print the letter A. Now of

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course, PRINT A is a much simpler way to accomplish the same thing, however there are some situations in which the CHR$ function is useful. For example if you would like a line feed in the midst of a print statement in a program, you cannot hit the ENTER button since that would be interpreted as a termination of the statement, but you could do the following:

```
10 PRINT "THIS IS LINE 1"
   + CHR$(13)+ "THIS IS LINE 2"
```

When this statement is executed the literal in the first set of quotes would be displayed on the screen, then CHR$(13) would cause a line feed (since 13 is the ASCII value for line feed) and so the next literal would be printed on the next line. Granted the same thing could be done with separate PRINT statements, but this is one way to do it with a single statement.

**STR$,** on the other hand, is the opposite of the VAL function, since STR$ will return the string value for an arithmetical one. So if A has been defined to be 12.125 then STR$(A) would be the string 12.125. VAL and STR$ are useful when one wishes to enter a number of variables of one type with a single statement, then convert one or two of the values to another type.

**STRING$** is a function which is used in displays to save typing time during programming. Suppose you wish to type a line of 65 dashes. You could type PRINT"-------(65 dashes in all)-----" However you could get the same thing done by typing PRINTSTRING$(65,"-"). The statement PRINTSTRING$(65,45) would do the same thing since 45 is the ascii code for the dash. Note that the dash is in quotes to show that it is the character to be printed while the 45 is not in quotes to show that it is an ascii value.

LEN returns the length of a string. This is often useful when a given string variable will have different strings assigned to it during running of a program. For example if H$ will be various headings in a table printing routine, each of which is to be centered, the statement PRINT TAB(36-LEN(H$)/2))H$ will always print H$ at the center of a 72 character line.

LEFT$, MID$ and **RIGHT$** are statements which find a part of another string. LEFT$(A$,5) will be the 5 characters at the left edge of string A, while RIGHT$(A$,5) would be the 5 characters at the right edge of A. MID$(A$,5,3) would be the three characters beginning with the 5th character of the string. We'll look at some sample programs to see how these work.

Let's suppose that we have a program dealing with the calendar and we wish to be able to obtain the day of the week when the number corresponding to that day is provided. The following little routine will do just that:

```
 10 REM DAY OF THE WEEK
    ROUTINE
 20 DEFINT I,N: DEFSTR W
 30 PRINT "ENTER THE NUMBER
    FOR THE DAY OF THE WEEK"
 40 INPUT "THE NUMBER MUST BE
    BETWEEN 1 AND 7"; I
 50 IF I<1 THEN 30 ELSE IF I>7 THEN
    30
 60 FOR N= 1 to I
 70 READ W
 80 NEXT
 90 PRINT W
100 DATA SUNDAY, MONDAY, TUES-
    DAY, WEDNESDAY, THURSDAY,
    FRIDAY, SATURDAY
110 RUN
```

The first statement begins with REM and is thus ignored by the machine. I and N are then established as integers (this is not required) and W is established as a string (this is required unless W$ is printed everywhere where W exists now). The next two lines present information on the screen and then halt execution for the operator to enter a number. In line 50 I is tested to see if it is within

String Operators

<	Precedes alphabetically
>	Follows alphabetically
=	Equals
+	Concatenate (add) the strings

Table I - String operators

limits and if not execution returns to 30. If I is between 1 and 7 then the FOR/NEXT loop is run I times and then W is printed. That then is one simple solution to the problem. We can make some changes though. Make the following substitutions in the program:

```
 90 W=W+"DAY" :PRINT W
100 DATA SUN,MON,TUES,WEDNES,
    THURS,FRI,SAT
```

The program will run just as it did before, but we got away with typing DAY just once instead of 7 times as before. In line 90 the DAY part of each weekday's name is tagged on, just before the string is printed.

Consider this change to the program. Delete everything after line 50 (the checking for the value of I) and add the following:

```
 60 W = "SUNMON-
    TUESWEDNESTHURSFRISATUR"
 70 IF I=1 THEN J=1:K=3
 80 IF I=2 THEN J=4:K=3
 90 IF I=3 THEN J=7:K=4
100 IF I=4 THEN J=11:K=6
110 IF I=5 THEN J=17:K=5
120 IF I=6 THEN J=22:K=3
130 IF I=7 THEN J=25:K=5
140 W=MID$(W,J,K)+"DAY"
150 PRINT W
160 RUN
```

This program uses the value of I to set the values of J and K which are then used in the MID$ statement to pick out the correct letters of the original W to obtain the final W. Why use such a routine? In this case it would make no sense, but the string W in statement 60 takes much less memory than the DATA statement in line 100 of the previous version. In some instances this saving of memory might come in handy. Here the saving would be lost in the extra program statements required.

ASC	MID$
CHR$	RIGHT$
CLEAR	STR$
DEFSTR	STRING$
FRE	VAL
LEN	
LEFT$	

Table II - String statements

In the next installment, I will deal with subscripted variables, and in one of the programs we will look at, a routine like that in lines 60-150 above will be used in a program which will find the decimal value of a hexadecimal number. We will also write a short program which will search for duplicates during a contest.

Editor's Note

This series is expected to run about ten parts or installments. We would like to wrap up the series perhaps in an eleventh part which will take into account all questions or problems that you may have run into with this series. Send all of your queries to K8BG for inclusion in this last part. This exchange might help your fellow amateurs' understanding of computers and perhaps spark an interest in trying them out.

In this series as with any basic (no pun) tutorial there are bound to be readers quite conversant with the material. Some of them I'm sure would like to jump right into more advanced material on hardware and software. Rest assured. We are preparing material for you *and* the "graduates" of this series encompassing what you already know and what there is to learn.

RESULTS OF THE 1979 CAN-AM CONTEST

BY YURI BLANAROVICH*, VE3BMV
CANADX CONTEST CHAIRMAN

TROPHY WINNERS

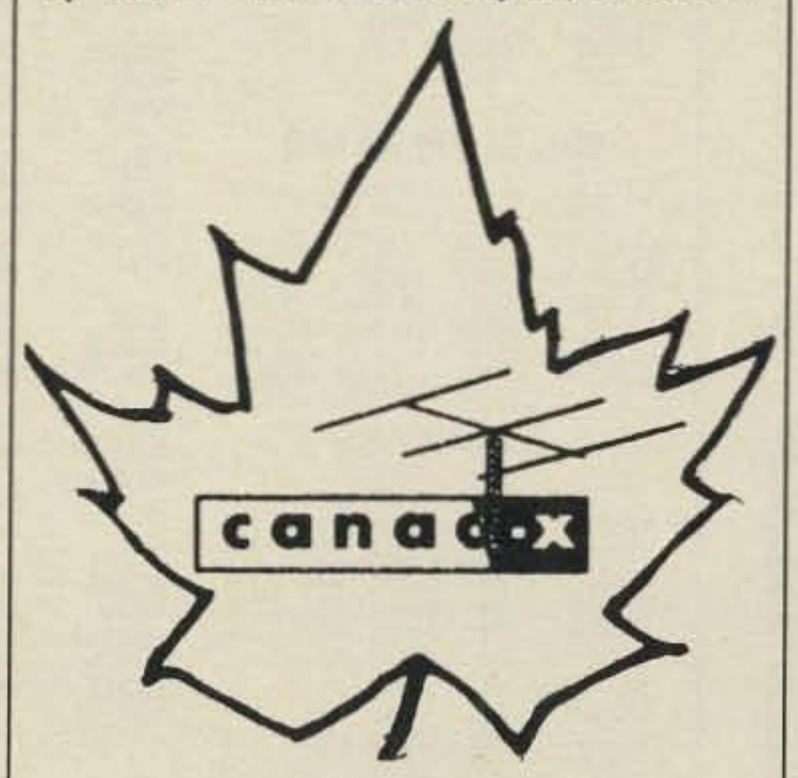
Canadian Champion Combined	VE5DX
American Champion Combined	K6LL/7
Canadian Phone Trophy	VE7BGK
American Phone Trophy	AG7M
Canadian CW Trophy	VE7CC
American CW Trophy	N4ZZ
Multi Operator Champion	VE4VV
Club Competition	Ontario Contest Club

For the 1979 CAN-AM Contest a total of 187 logs were received, 85 phone and 102 c.w., from 53 Canadian stations and 134 American stations. Thank you all for the participation and see you all in the 1980 CAN-AM.

73, Yuri, VE3BMV

Contest QRM

Thank you again for the nice contest and I sure appreciate all the work involved - VE2FU. Could hear K6LL/7 working all sorts of W1,2,3s that I could not detect. Thanks for a lot of fun and a great contest - VE5DX. Better antennas are a must next time - VE6OU, ex VE3AKG. Enjoyable, but think too late in year for consistent short skip conditions VE to W. Suggest Aug. or Sept. better time -VE3DLR. Only put in few hours, had to work - CZ6MP. Sri, I had so little time, had to go to work. Shift work sure is a drag - VE1BNN. Great Contest, should be a future classic. New time period is ideal - K1IXZ. My multi op group insisted that I run phone test, hence my first ever try at doing it with a mike. - AC2U. Lots of fun, I hope this will replace sweepstakes. I also like your class of operation requirements. - WB4OSN. 1st time in CAN-AM, enjoyed it, but know CW will be more fun - N4TO. Super contest period - leaves Sunday to recuperate -WA4NTP. Had to work on rig twice, limped through most of contest. Enjoyed it and look forward to next year. - WA4YUU. How about having low power (200 W) and high power? -WD4NNP. All OPs were courteous and friendly. It made contesting a great pleasure instead of struggle. -WB2YAW/4. ..nice dupe sheet format, Got a lots of 10m QRP mobiles. Now with the split weekend, you might consider a 24 hour out of 30 format. -WA5IYX. Friendly low pressure test, enjoyed very much, CU next time -KA5R. Great test - keep up good job -WA6TOE. My first CAN-AM using SSB -AA6EE. Great opening on 10m, 750 QSOs in 7 hours on 10m SSB -K6LL/7. New format is much better for those OPs who enjoy both modes -AG7M. Where was everyone for 10m? It was wide open and no contesters up there. -W7JYW. 3 dupes, fantastic



contest, couldn't ask for better, much, much fun. Looking forward to next year -N0JW. Enjoyed it immensely, especially since I am a transplanted VE3, in US since 1966. Nice to hear VE3s in US bands, do it often - WB0RYJ. Better time slot than first two years, seems to be growing in popularity, but needs more promotion -VE1AWN. Worked a guy on a bicycle in Missouri. Now for next year from Pacific - where will be on DXpedition! AA6DX.

Still feel Sunday is a better day for a contest like this. Too many other things to do on Saturday. Needs a better promotion not only in US but also in Canada -VE1AIH. 20m was in poor shape Sat. local time. 80m never opened up here at all. 15m was hopping sat. afternoon -VE8TM. With baseball, birthday parties and equipment breakdowns, difficult getting started -VE2HY. Golf and watching the Expos battle for a division title took precedence -VE2WA. Had great time but 160 m dead here - VE1BNN. Bands not active enough, my first effort in CAN-AM CW -VE1AIH. This is the first contest entry from The Voice of the Canadian Amateur HQ station of CARF -VE3VCA. Great contest, should have winter test too - W0IO. My 3rd CAN-AM, and at long last I heard and worked VE8 - NWT -WA1JGK. The forms are very good, thank you for sending them. The multiplier check box is handy and the check sheets are the best I have seen for recording the multiplicity of calls being issued by FCC - W1VH. Like the current format, no change please! (Except QRP?)-AC2U Enjoyed it - wish participation were more and less QRM and QRN on 160 -40m, CU next year - N4TO. Costly this year, lost amp in phone portion, lost keyer in CW portion, lost interest in middle of CW. Hard times but will be back next year - great test -WA6TOE. The new weekend is much better than midsummer, lets keep it, this contest much better than VE/W, both for US and VE operators -N7ZZ, VE7ZZ. Excellent contest. Don't change a thing, the new date is perfect - N9NO. My 1st year in and really liked it, super nice test K0VGB.

CLUB COMPETITION

Ontario Contest Club	1662754
South Florida DX Assn	1620716
Halifax ARC	1062257
Redwood Country CC	879401
BC Contest Club	872894
North Florida ARS	608628
Ill - Wind Contesters	238946
Santa Barbara ARC CG	191382
Mad River ARC	130296
West Island ARC	36979
London ARC	36820
Nova CC	26085
PVRC	13530
Poway ARS	2228

Free 1 year LONG SKIP subscription: N3RL, WA4YUU, N6AA, N7ZZ, K8MR

Box 292, Don Mills, Ontario, Canada M3C 2S2

canada-x

SINGLE OPERATOR

CANADIANS

PHONE

VE5DX	952271	K6LL/7	870177
VE7BGK	872894	AG7M	550368
CZ6OU	506106	WB4OSN	385530
VE3BVD	435860	N4TO	249291
VE3DLR	214985	AG9S	194850
VE3KZ	112922	NØ AQK	144275
VE7VX	95694	WA6TOE	139018
VE3DUS	73140	NØ JW	127310
VE1CCC	58520	KB5FU	126799
VE3DAP	52576	WAØ LKL	108675

CW

VE5DX	598000	K6LL/7	371424
VE7CC	560637	N4ZZ	324213
VE3BVD	411382	N7ZZ	313110
VE3KZ	379638	AA6DX	280692
VE1AIH	233920	KØ JW	275500
VE3DAP	178924	N4TO	265000
VE3DZV	166553	AG7M	250101
VE1BGD	129168	WB4OSN	243945
VE1ANU	117180	WAØ LKL	241428
VE8TM	105164	N4OW	220968

COMBINED

VE5DX	1550271	K6LL/7	1241601
VE7BGK	872894	AG7M	800469
VE3BVD	847242	WB4OSN	629475
VE7CC	560637	N4TO	514291
CZ6OU	506106	WAØ LKL	350103
VE3KZ	492560	N4ZZ	324213
VE1AIH	233920	N7ZZ	313110
VE3DAP	231500	NØ AQK	307084
VE3DLR	214985	AA6DX	280692
VE3DZV	166553	KØ JW	275500

MULTI OPERATOR

PHONE		CW	
VE4VV	562122	VE4VV	561144
VE2FU	526962	VE2FU	427630
VE1AWN	434076	VE1DXA	312660
AA6DX	403970	VE1AWN	302220
VE1DXA	398497	N4UF	231168
N4UF	377460	VE3UDO	185283

CANADIANS

PHONE - SINGLE OPERATOR

VE5DX	**SK**	**952271**	**1414**	**233**
VE7BGK	**BC**	**872894**	**1235**	**242**
CZ6OU	**AT**	**506106**	**932**	**186**
VE3BVD	**ON**	**435860**	**805**	**190**
VE3DLR	ON	214985	494	155
VE3KZ	ON	112922	311	131
VE7VX	BC	95694	412	82
VE3DUS	ON	73140	236	115
VE1CCC	**NB**	**58520**	**296**	**70**
VE3DAP	ON	52576	183	106
CZ6MP	AT	25288	152	58
VE3BR	ON	7172	58	44
VE2QO	**PQ**	**6636**	**78**	**28**
VE3EZU	ON	6031	62	37
VE1BNN	**NS**	**4550**	**62**	**26**
VE3CXL	ON	3168	38	32
VE3KFZ	ON	2314	32	26

PHONE - MULTI OPERATOR

VE4VV	**MB**	**562122**	**1080**	**187**
VE2FU	**PQ**	**526962**	**854**	**213**
VE1AWN	**PE**	**434076**	**839**	**183**
VE1DXA	**NS**	**398497**	**733**	**187**
VE2CUA	PQ	70512	258	113
VE3VCA	**ON**	**52124**	**221**	**83**

CW - SINGLE OPERATOR

VE5DX	**SK**	**598000**	**950**	**230**
VE7CC	**BC**	**560637**	**860**	**231**
VE3BVD	**ON**	**411382**	**711**	**206**
VE3KZ	ON	379638	656	207
VE1AIH	**NS**	**233920**	**482**	**172**
VE3DAP	ON	178924	400	164
VE3DZV	ON	166553	397	151
VE1BGD	**NB**	**129168**	**322**	**144**
VE1ANU	NS	117180	309	135
VE8TM	**NW**	**105164**	**300**	**122**
VE1AXT	NB	78645	271	107
VE3ATD	ON	61568	211	104
VE3KYP	ON	45942	184	93
VE2HY	**PQ**	**39237**	**160**	**87**
VE7IQ	BC	32364	138	87
VE3BR	ON	29648	140	78
VE2WA	PQ	26248	138	68
VO1AW	**NF**	**24480**	**128**	**68**
VE1BNN	NS	21535	108	73
VE3BMV	ON	18312	116	56
VE3LJJ	ON	13160	90	56
VE3CXL	ON	6824	63	48
VE5ACS	SK	2828	37	28
VE1BSH	NS	240	13	8

CW - MULTI OPERATOR

VE4VV	**MB**	**561144**	**884**	**227**
VE2FU	**PQ**	**427630**	**749**	**205**
VE1DXA	**NS**	**312660**	**620**	**180**
VE1AWN	**PE**	**302220**	**608**	**180**
VE3UDO	**ON**	**185283**	**433**	**153**
VE3VCA	ON	30668	162	68

AMERICANS

PHONE - SINGLE OPERATOR

K1IXZ	**ME**	**32777**	**214**	**73**
KA1EP	**NH**	**22800**	**181**	**60**
WB1ANT	**MA**	**18564**	**127**	**68**
AD1Z	MA	15343	102	67
WA1JGK	**VT**	**2241**	**37**	**27**
K1VUT	MA	32	4	4
AC2U	**NJ**	**61831**	**228**	**121**
KB2DE	**NY**	**49617**	**200**	**111**
K2POA	NY	570	16	15
WB3EKV	**PA**	**98208**	**345**	**132**
K3VW	PA	20838	141	69
N3RL	**MD**	**11220**	**89**	**55**
WA3YTI	PA	1334	26	23
WB4OSN	**FL**	**385530**	**836**	**213**
N4TO	FL	249291	617	189
WA4NTP	**VA**	**81792**	**289**	**128**
K4LQ	FL	46515	196	105
WD4JHY	VA	14332	105	59
WA4YUU	**SC**	**9630**	**92**	**45**
WD4NNP	SC	7849	70	47
N4AM	FL	2158	35	26
WB2YAW/4	**GA**	**884**	**21**	**17**
WB4WHE	**TN**	**380**	**16**	**10**
KB5FU	TX	126799	423	149
WA5IYX	TX	50460	247	87
K5DEC	**OK**	**15340**	**92**	**59**
KA5R	TX	10761	90	51
WB5PYL	**LA**	**5928**	**70**	**38**
WB5WAJ	TX	624	21	12
WA6TOE	**CA**	**139018**	**456**	**142**
K6XO	CA	42008	205	89
AA6EE	CA	728	19	14
K6LL/7	**AZ**	**870177**	**1799**	**231**
AG7M	**OR**	**550368**	**1222**	**216**
W7JYW	**MT**	**54266**	**298**	**86**
W7WSV	AZ	384	13	12
N7JB	**WA**	**75**	**7**	**5**
K8MR	**OH**	**76508**	**278**	**124**
WD8CZA	**WV**	**4847**	**56**	**37**
KA8ESD	OH	3760	87	20
AG9S	**IN**	**194850**	**617**	**150**
N9ACD	IN	8022	81	42
W9QWM	**IL**	**2610**	**40**	**29**
W9CA	IL	1924	31	26
N9AFU	IN	225	10	9
NØ AQK	**MO**	**144275**	**456**	**145**
NØ JW	**CO**	**127310**	**402**	**145**
WAØ LKL	**MN**	**108675**	**370**	**135**
NØ AFW	MN	90750	264	165
KØ VGB	**KS**	**34486**	**176**	**86**
WDØ FGY	**IA**	**15680**	**147**	**49**
WDØ HAP	KS	7540	118	29
WBØ RJJ	**NE**	**2407**	**35**	**29**
WØ CAQ	**ND**	**2162**	**40**	**23**
WDØ HWX	**SD**	**1230**	**41**	**15**
WDØ APM	MO	76	9	4

PHONE - MULTI OPERATOR

AA6DX	**CA**	**403970**	**947**	**199**
N4UF	**FL**	**377460**	**1009**	**180**
W9YH	**IL**	**209820**	**621**	**156**
K6TZ	**CA**	**191382**	**452**	**191**
WA5YJV	**AR**	**185895**	**556**	**153**
WD6EKO	CA	58560	302	96

CW - SINGLE OPERATOR

K1VUT	**MA**	**91903**	**299**	**133**
WB2THN/1	**CT**	**49504**	**200**	**112**
W1CNU	CT	22357	119	79
WA1JGK	**VT**	**19880**	**128**	**70**
WA1FCN	CT	18957	114	71
W1VH	CT	18700	120	68
KA1EP	**NH**	**6864**	**70**	**44**
AD1Z	MA	6345	64	45
K1KI	CT	3051	50	27
WA1NME	MA	630	18	14
AC2U	**NJ**	**150732**	**428**	**158**
K2SX	**NY**	**34323**	**156**	**97**
K9CW/2	NJ	7831	80	41
W2EY	NY	3894	50	33
W3ARK	**PA**	**74294**	**268**	**121**
AC3Q	PA	17487	114	67
AD8J/3	PA	14950	100	65
N3RL	**MD**	**2310**	**42**	**30**
N4ZZ	**TN**	**324213**	**716**	**210**
N4TO	**FL**	**265000**	**590**	**200**
WB4OSN	FL	243945	560	195
N4OW	FL	220968	529	186
WA4RRB	FL	129105	387	151
AA4U	**GA**	**90968**	**288**	**137**
K4LQ	FL	78207	259	131
AC4X	**AL**	**52736**	**228**	**103**
W2SR/4	FL	38088	185	92
K4ZGB	AL	33947	177	83
WD4PZN	AL	28896	144	86
WD4JHY	**VA**	**24244**	**130**	**76**
AA4GA	GA	22400	118	80
AA4GA	GA	22400	118	80
K4BAI	GA	21239	140	67
KO4C	TN	12903	109	51
W4WJ	FL	1702	32	23
K2EKM/4	VA	1365	27	21
WB5PYL	**LA**	**46600**	**205**	**100**
W5HFN	**TX**	**24016**	**126**	**79**
AG5B	TX	17010	106	70
W5NR	TX	16306	115	62
AA6DX	**CA**	**280692**	**604**	**207**
WA6TOE	CA	56721	231	111
N6AA	CA	5040	56	30
K6MO	CA	4836	52	39
AA6EE	CA	1500	34	20
K6LL/7	**AZ**	**371424**	**762**	**219**
N7ZZ	**WA**	**313110**	**672**	**210**
AG7M	**OR**	**250101**	**642**	**177**
W7TC	OR	173372	436	178
W7WSV	AZ	33945	152	93
WA7NXL	AZ	27306	150	82
W7DRA	WA	165	12	11
KB8EC	**MI**	**195317**	**501**	**173**
WB8TRW	**OH**	**44322**	**236**	**83**
WD8ALG	OH	43050	205	98
W8EAO	OH	12483	93	57
K8MR	OH	10738	79	59
N9NO	**IN**	**172229**	**486**	**167**
W9HE	**WI**	**43912**	**217**	**88**
WD9GUR	WI	11925	101	53
W9QWM	**IL**	**3706**	**46**	**34**
W9REC	IL	2806	48	23
W9WR	IL	360	20	6
KØ JW	**CO**	**275500**	**645**	**190**
WAØ LKL	**MN**	**241428**	**629**	**177**
NØ AQK	**MO**	**162809**	**460**	**157**
AGØ U	MO	121407	378	143
WDØ FGY	**IA**	**97578**	**372**	**117**

KØ VGB	**KS**	**43054**	**177**	**103**
NØ AFW	MN	8320	80	52

CW - MULTI OPERATOR

N4UF	**FL**	**231168**	**627**	**168**
W9YH	**IL**	**26320**	**172**	**70**
WØ IO	**IA**	**1200**	**26**	**20**

Multi operator stations operated by: VE4VV (+VE4RM); VE2FU (+VE2BPT); VE1AWN (+VE1LI); VE1DXA (+VE1MX, 1UG, 1AIH); VE2CUA - club; VE3VC - club; AA6DX (+WD6EQG); N4UF (+K4LK, WA4TKG, WB4YEY, WD4ITK); W9YH - Club; K6TZ - Club; WA5YJV (+WB9RKS); WD6EKO (+WD6CKT)

VE4VV (+VE4RM); VE2FU (+VE2BPT); VE1AIH (+VE1BXC); VE1AWN (+VE1LI, VE1BPY); VE3UDO (+VE3JKL, VE2DZE, VE3EKC, VE3HLB); VE3VCA (+VE3DXY, 3IDW, 3KFV, 3NF, 3CTE, 3FXZ, 3KBG, 3AUU, 3GRS); N4UF (+K4LK, WA4PUT, WD4ITK); W9YH - Clu; WØ IO - Club.

Results are listed in the following format: Call sign, multiplier area, total score, QSOs, multipliers. *Denotes certificate winners.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The present solar cycle, the 21st recorded since daily observations began during the mid-18th century, has now become the third most intense recorded, and may very likely rise to second position.

The Swiss Federal Observatory at Zurich, the world's official keeper of sunspot data, reports a monthly mean value of 182 for December, 1979. Daily values ranged from a high of 293 on December 9th to a low of 93 on the 27th. December's mean level of solar activity results in a provisional 12-month running smoothed sunspot number of 154 centered on June, 1979. The solar cycle is measured by the level of smoothed sunspot number. The present cycle has now surpassed the 152 level which marked the previously third most intense cycle. Cycle 18 reached this level during May, 1947. Only the peak values of Cycle 3 (a count of 156 in April, 1778) and Cycle 19 (201 in November, 1957) are higher than the latest recorded value for the present cycle.

While it will be several months yet before we know for sure, in all likelihood the present cycle reached peak intensity during late 1979 with a smoothed sunspot level in excess of 156. This would make Cycle 21 the second highest one on record.

A smoothed sunspot number of approximately 140 is predicted for April, 1980.

April Conditions

Solar activity this April is expected to be at approximately the same level observed last April, and h.f. propagation conditions should be quite similar.

The **10 meter** band should remain very much alive during April and the spring months for DX openings to most areas of the world. Expect considerable DX from an hour or two after sunrise, to just after sunset. While normal seasonal changes will result in fewer east-west openings, conditions towards southern and tropical areas should hold up very well. Expect peak signals to most areas of the world during the late afternoon hours.

Expect **15 meters** to be the optimum DX band during most of the daylight hours of April and the spring months. The band should be loaded with DX openings from just after sunrise to well beyond sunset. Signals should be strongest to most areas of the world during the afternoon hours, but expect good, solid openings towards southern and tropical areas to as late as Midnight, and sometimes beyond.

Twenty meters should be a 24-hour DX band during April and the spring months. Besides the usually good openings to most areas of the world during the daylight hours, this band should be optimum for DX openings during most of the darkness period. Strongest signals, with DX openings to almost all areas of the world, should take place during a two hour window after local sunrise and again during the late afternoon and through the evening hours to about Midnight. Many of the nighttime DX openings are expected to be associated with exceptionally strong signal levels.

Fewer hours of darkness and increasing static levels in the northern hemisphere will result in somewhat poorer DX conditions on the 40, 80 and 160 meter bands during April and the spring months. Nevertheless, expect strong, stable conditions to most areas of the world on **40 meters** during the hours of darkness. Signals should peak from an easterly direction about an hour or two before Midnight, and from most other directions about an hour or so before local sunrise at the USA end of the path. Fairly good DX openings should be possible to many areas of the world on **80 meters** during the hours of darkness. Propagation patterns should be similar to those on 40 meters, but 80 meter openings will be noiser and weaker. There is also a chance for some DX openings on **160 meters** during the hours of darkness, but expect to encounter seasonally high static levels.

The favorable equinoctial propagation conditions discussed in last month's column should continue through April for openings between the northern and southern hemispheres. Check *both* long and short path on inter-continental openings during the sunset and sunrise

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for April 1980

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 8, 13, 27	A	A	B	C
High Normal: 1, 5, 7, 12, 23-24, 26, 28	A	B	C	C-D
Low Normal: 2-4, 6, 9, 11, 14, 18, 21-22, 25, 29-30	A-B	B-C	C-D	D-E
Below Normal: 10, 15, 17, 19-20	B-C	C-D	D-E	E
Disturbed: 16	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 (B) on April 1st, good—fair (B-C) on the 2nd through the 4th, good (B) on the 5th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

**11307 Clara St., Silver Spring, MD 20902*

periods, on all bands between 80 and 10 meters.

For *short-skip* openings between distances of approximately 50 and 250 miles, use *80* meters during the day, *80* or *160* meters from sunset to Midnight, and *160* meters from Midnight to sunrise. For distances between 250 and 750 miles, *40* meters should be best during the day, *40* and *80* meters from sundown to Midnight, and *80* meters from Midnight to sunrise. For openings between distances of 750 and 1300 miles, *20* meters should be optimum most of the day, with *40* and *80* meters best during the hours of darkness. Between 1300 and 2300 miles, check both *15* and *20* meters during the day, *20* and *40* meters from sundown to Midnight, and *40* meters from Midnight to sunrise. Short-skip openings beyond 1300 miles should be possible on *10* meters during most of the afternoon hours.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between *6* and *160* meters for the period *April 15- June 15, 1980.* Beginning this month and continuing through the summer and early fall, the times shown in the Charts will be local *daylight* time (EDT, CDT, MDT and PDT). For detailed predictions of short-skip openings between distances of 250 and 2300 miles, see the Short-Skip Propagation Charts, which appeared in last month's column.

V.H.F. Ionospheric Openings

A seasonal decline is expected in F-2 layer 6 meter openings during the spring and summer months. Some openings should be possible during April, however, between the USA and southern and tropical locations. Openings towards Africa, the Caribbean and South America may occur from shortly before to an hour or two after Noon. Openings towards South America, the Pacific and Australasia should peak again during the afternoon hours. Openings are more likely to occur when conditions are High Normal or better.

Trans-equatorial propagation (TE) between the USA and South America often reaches a seasonal peak during April. These openings are most likely to occur on *6* meters, with some also possible on *2* meters, between 8 and 11 p.m., local time. TE openings favor the southern tier states, but an occasional one may be possible further to the north. Unlike F-2 layer openings which can produce strong signals on *6* meters, TE openings are usually very weak and often with severe flutter fading.

A seasonal increase in *sporadic-E* ionization, with associated short-skip openings on both *6* and *2* meters, usually begins during April and intensifies during the spring and summer months. While, as its name implies, sporadic-E ionization can occur at any time, there is tendency for it to peak between 8 a.m. and Noon and again between 5 and 9 p.m. local time. Occasional short-skip openings on *6* meters, ranging between 750 and 1300 miles, should be possible during April.

A major meteor shower called the *Lyrids* should take place between April 22 and 23, with a peak expected on the 22nd. Up to 15 large-sized meteors should enter the earth's atmosphere hourly when the shower is at its peak. This should produce sufficient localized ionization to permit fairly good meteor-scatter communications for short periods of time on the v.h.f. bands.

Widespread auroral activity can occur during April, producing unusual ionospheric short-skip openings on the v.h.f. bands. The best times to check for such auroral-type openings would be during periods of radio storminess. See the *Last Minute Forecast* at the beginning of this column for those days during April that are expected to be Below Normal or Disturbed. 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. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. 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.

April 15 - June 15, 1980
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	10-13 (1) 13-17 (2) 17-18 (1)	07-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-01 (3) 01-04 (2) 04-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & European USSR	10-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 22-00 (1)	06-09 (2) 09-13 (1) 13-16 (2) 16-20 (3) 20-22 (4) 22-02 (3) 02-03 (2) 03-06 (1)	19-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediterranean & Middle East	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	12-16 (1) 16-18 (2) 18-21 (3) 21-00 (4) 00-02 (3) 02-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Western Africa	10-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1) 10-13 (1)**	07-08 (2) 08-10 (3) 10-13 (2) 13-16 (3) 16-20 (4) 20-23 (3) 23-04 (2) 04-07 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-02 (4) 02-05 (3) 05-07 (2)	20-22 (1) 22-02 (2) 02-03 (1) 22-02 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-21 (1)	08-12 (1) 12-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-01 (3) 01-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	21-01 (1) 22-00 (1)*
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1) 01-03 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-01 (1) 01-02 (2) 02-04 (3) 04-05 (2) 05-06 (1) 06-08 (2) 08-09 (1)	21-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Central & South Asia	19-21 (1)	09-12 (1) 15-18 (1) 18-20 (2) 20-22 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1) 05-06 (1) 06-08 (2) 08-09 (1)	05-07 (1) 19-21 (1)
Southeast Asia	18-21 (1)	08-11 (1) 18-20 (1) 20-22 (2) 22-23 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	05-07 (1)
Far East	18-20 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-08 (1)
South Pacific & New Zealand	15-17 (1) 17-18 (2) 18-20 (4) 20-21 (2) 21-22 (1) 15-18 (1)**	09-11 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-00 (2) 00-01 (1)	19-21 (1) 21-22 (2) 22-23 (3) 23-04 (4) 04-08 (3) 08-09 (2) 09-10 (1)	00-02 (1) 02-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 02-07 (1)*
Australasia	17-19 (1) 19-21 (2) 21-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	23-00 (1) 00-03 (2) 03-05 (3) 05-08 (4) 08-09 (3) 09-10 (2) 10-11 (1) 17-19 (1)	03-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-12 (1) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-14 (3) 14-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	02-06 (2) 06-07 (3) 07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-23 (4) 23-02 (3)	19-20 (1) 20-21 (2) 21-05 (3) 05-07 (2) 07-08 (1) 21-02 (1)* 02-05 (2)* 05-06 (1)*

	10 Meters	15 Meters	20 Meters	40/80 Meters
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-10 (1) 10-14 (2) 14-17 (3) 17-19 (4) 19-20 (2) 20-21 (1) 11-15 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	05-06 (1) 06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-05 (2)	20-21 (1) 21-04 (2) 04-06 (1) 23-03 (1)* 03-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	17-19 (1)	16-18 (1) 18-20 (2) 20-21 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-07 (2) 07-08 (1)	20-01 (1) 01-05 (2) 05-06 (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	11-15 (1) 15-16 (2) 16-17 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	05-09 (2) 09-14 (1) 14-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-05 (1)	19-21 (1) 21-23 (2) 23-01 (1) 00-01 (1)*
Northern & Central Europe & European USSR		08-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1) 21-23 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-19 (2) 19-23 (3) 23-01 (2)	19-21 (1) 21-23 (2) 23-01 (1)
Eastern Mediter-ranean & Middle East	15-18 (1)	10-13 (1) 13-17 (2) 17-18 (1) 20-22 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (4) 22-00 (3) 00-01 (2) 01-03 (1)	20-00 (1)
Western Africa	10-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-19 (1) 10-12 (1)**	09-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-00 (3) 00-01 (2) 01-03 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	14-16 (1) 16-18 (2) 18-19 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-03 (1) 07-09 (1)	20-23 (1)
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-16 (1) 00-02 (1)	14-16 (1) 16-19 (2) 19-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-05 (1) 05-07 (2) 07-08 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Central & South Asia	18-21 (1)	16-18 (1) 18-21 (2) 21-22 (1) 09-11 (1)	05-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-00 (1)	06-08 (1) 19-21 (1)
Southeast Asia	18-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 17-19 (1) 19-21 (2) 21-23 (1)	23-03 (1) 03-07 (2) 07-09 (3) 09-11 (2) 11-12 (1)	05-07 (1)
Far East	17-18 (1) 18-20 (2) 20-21 (1)	08-11 (1) 15-16 (1) 16-17 (2) 17-21 (3) 21-23 (2) 23-00 (1)	23-02 (1) 02-04 (2) 04-06 (3) 06-08 (4) 08-09 (3) 09-11 (2) 11-13 (1)	03-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
South Pacific & New Zealand	11-14 (1) 14-16 (2) 16-20 (4) 20-21 (2) 21-22 (1) 14-18 (1)**	08-09 (1) 09-11 (2) 11-14 (1) 14-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	16-19 (1) 19-20 (2) 20-21 (3) 21-03 (4) 03-07 (3) 07-09 (4) 09-10 (3) 10-11 (2) 11-12 (1)	00-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-05 (2)* 05-06 (1)*
Australasia	15-17 (1) 17-19 (2) 19-21 (3) 21-22 (1) 15-18 (1)**	08-09 (1) 09-10 (2) 10-11 (1) 16-18 (1) 18-20 (2) 20-22 (4) 22-23 (2) 23-00 (1)	05-07 (3) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-05 (4)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*

April 15 - June 15, 1980 WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe & North Africa	09-12 (1) 16-17 (1)	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	01-07 (1) 07-10 (2) 10-13 (1) 13-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-01 (2)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	14-16 (1)	11-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	02-07 (1) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (3) 18-22 (2) 22-00 (3) 00-02 (2)	19-23 (1) 21-22 (1)*
Eastern Mediter-ranean & Middle East	NIL	09-11 (1) 11-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (3) 22-23 (2) 23-03 (1)	20-23 (1)
Western Africa	10-14 (1) 14-17 (2) 17-19 (1)	08-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2)	20-23 (1)
Eastern & Central Africa	15-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 21-23 (2) 23-00 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-00 (2) 00-02 (1)	19-22 (1)
Southern Africa	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-18 (2) 18-22 (1) 22-23 (2) 23-01 (3) 01-02 (2) 02-03 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	17-18 (1) 18-19 (2) 19-20 (1)	08-09 (1) 09-11 (2) 11-16 (1) 16-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	05-08 (1)
Southeast Asia	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	08-09 (1) 09-12 (3) 12-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	04-07 (2) 07-10 (3) 10-11 (2) 11-13 (1) 22-00 (1) 00-02 (2) 02-04 (3)	04-07 (1) 05-06 (1)*
Far East	13-15 (1) 15-17 (2) 17-19 (3) 19-20 (1) 15-18 (1)**	08-10 (1) 10-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	04-07 (2) 07-08 (3) 08-09 (4) 09-10 (3) 10-11 (2) 11-12 (1) 12-14 (2) 14-21 (1) 21-23 (2) 23-00 (3) 00-03 (4) 03-04 (3)	01-03 (1) 03-07 (2) 07-08 (1) 03-06 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-23 (1) 12-18 (1)**	09-10 (1) 10-12 (3) 12-16 (2) 16-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-03 (1)	06-08 (2) 08-11 (3) 11-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-06 (3)	22-00 (1) 00-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 01-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	13-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-21 (1) 14-18 (1)**	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	05-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 18-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-20 (2) 20-21 (1) 11-14 (1)**	07-08 (1) 08-09 (2) 09-13 (3) 13-19 (4) 19-20 (3) 20-22 (2) 22-23 (1)	00-03 (3) 03-05 (2) 05-06 (3) 06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-00 (4)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 11-15 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	00-02 (3) 02-03 (2) 03-05 (1) 05-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-00 (4)	19-22 (1) 22-03 (2) 03-04 (1) 20-03 (1)*
McMurdo Sound, Antarctica	15-19 (1)	15-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-01 (4) 01-03 (3) 03-05 (2) 05-07 (1)	21-22 (1) 22-00 (2) 00-05 (1) 05-07 (2) 07-08 (1)

*Indicates best times to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a Propagation Index of (2), or higher.

**Indicates best times to listen for F-2 layer openings on 6 Meters.

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

With all the concern about conserving energy we thought we would present a few ideas relating to steps our readers could take to reduce their usage of electricity without too much of a sacrifice in comfort. All of the ideas and innovations have been tried by the author and all do work quite well.

Our first energy-saving tip is the addition of silicon diodes in series with most lamps or lighting fixtures in the home. As shown in fig. 1, the diode blocks one of the a.c. half-cycles with the result that the lamp dims somewhat. This results in very long life (we have had normal 100 watt lamps last for 2 or more years) and one soon becomes accustomed to the decrease in brightness.

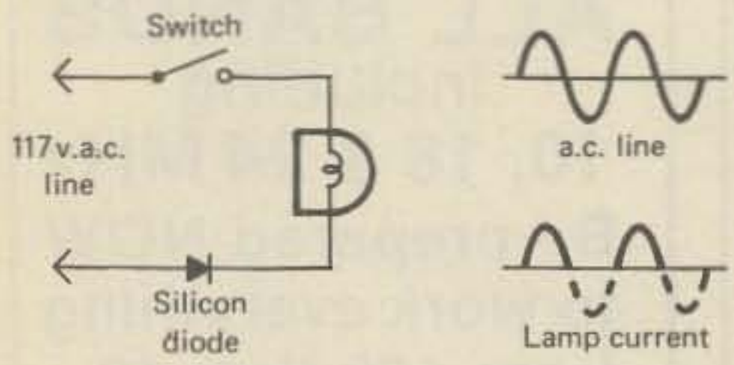
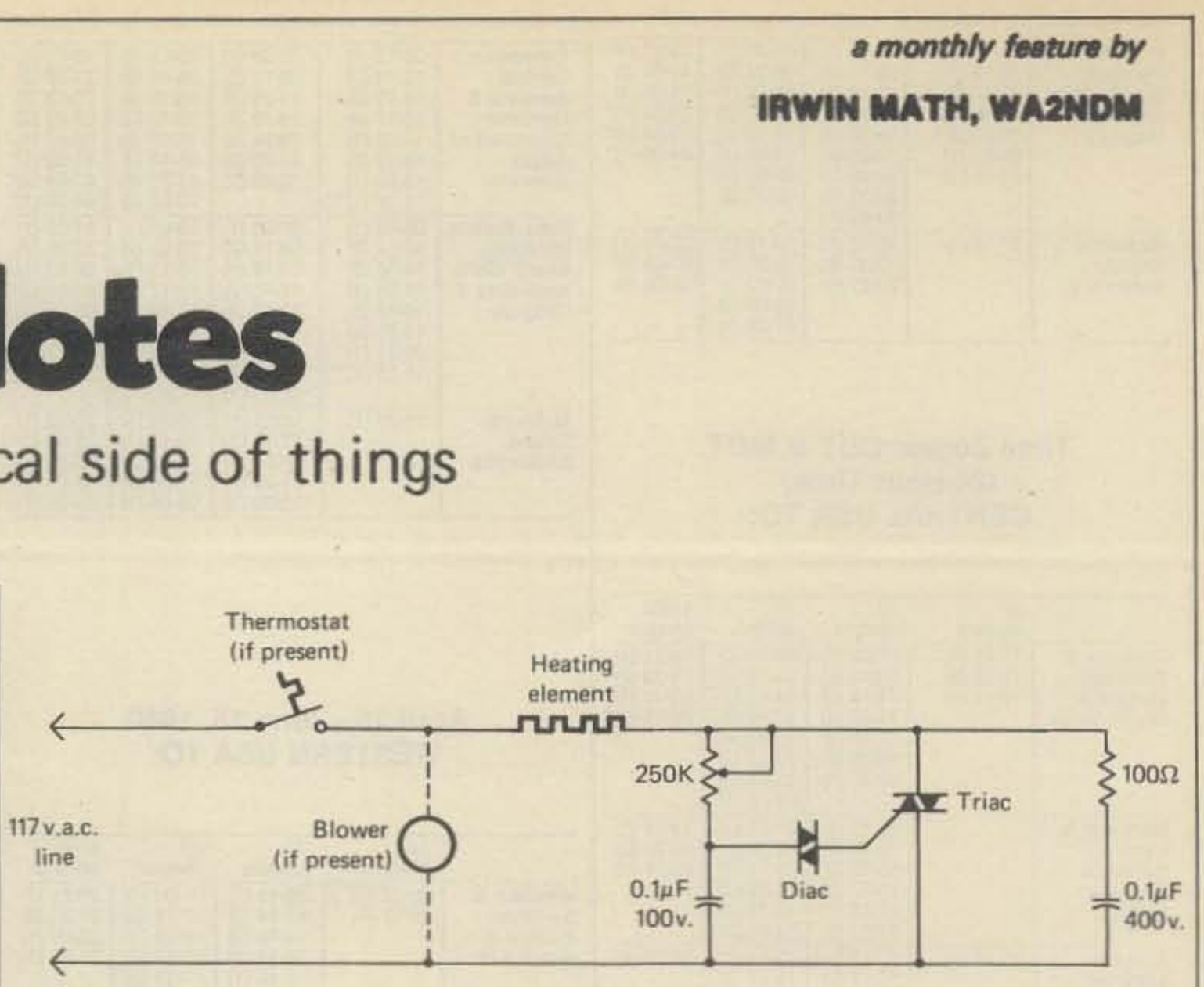


Fig. 1- A silicon diode in series with an ordinary lamp results in longer life and less energy required. On multiple fixtures alternate the polarity of the diode to make the current drain more uniform over both half cycles.

Addition of the diodes can be done right within the lamp socket making certain that the connectors are well insulated. The diodes should be rated for at least 200 v. P.I.V. and a d.c. current level no less than the normal lamp current. For example, an IN4003 or IN4004 is fine for use with 100 watt lamps.

Suggestion number two involves a similar scheme, this time with electrical heaters. In most cases, the heat produced by the heating element within the unit is much more than one actually needs to warm up a room and the thermostat on the unit therefore continuously cycles on and off producing large surges in current.



NOTES:
Diac = General Electric ST-2.
Triac = General Electric SC151D for 1000w. or Motorola MAC15-4.

Fig. 2- A triac control to limit the current through a heater to a lower value. The 100 ohm resistor and .1 uf, 400 v. capacitor are used to eliminate r.f. interference caused by the switching of the triac.

The circuit in fig. 2 is a very simple triac controller, similar to a light dimmer. It can be adjusted to cut back the average current in the heating element so that just enough heat is produced to do the job required. As in the case of the diode in our last example, the triac must have a 200-400 P.I.V. rating and enough current capacity to properly control the heater load.

When installing such a circuit, be certain that everything is very well in-

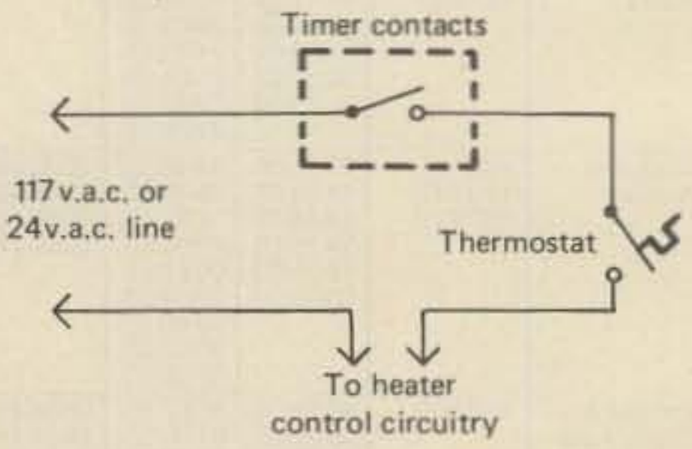


Fig. 3- The addition of a 24 hour timer, in series with the leads to the thermostat in hot water heaters, can save considerable fuel by only allowing the heater to operate during the time that hot water is actually needed.

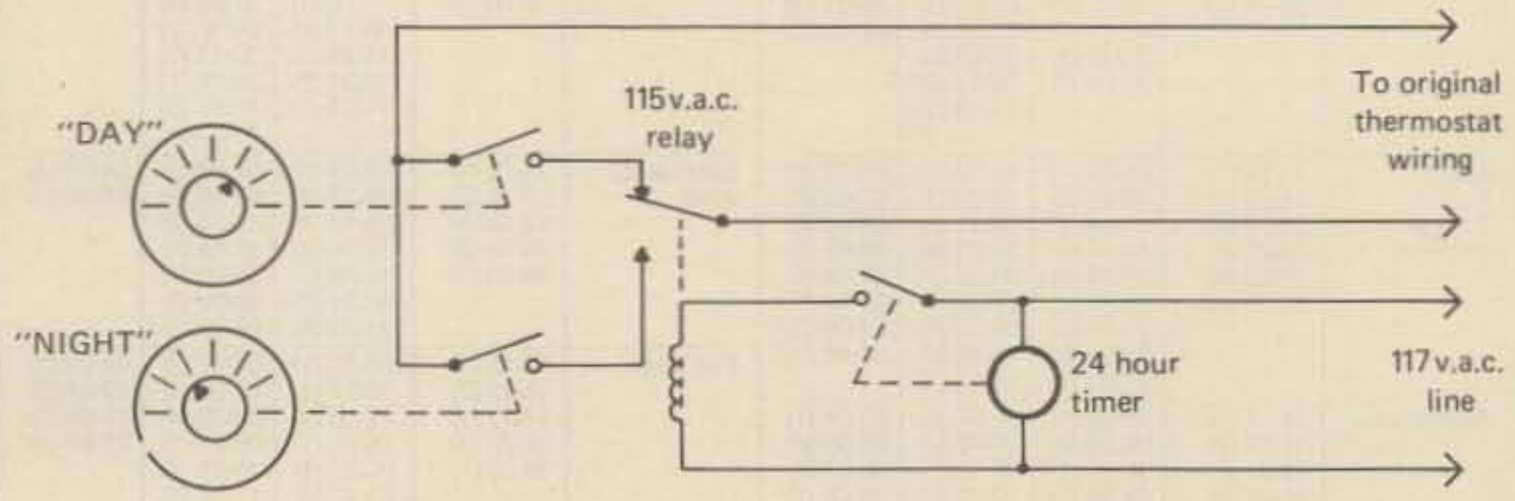


Fig. 4- This is how to implement a "clock thermostat" with two inexpensive thermostats and a 24 hour timer.

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

sulated, and that the components are not mounted near the actual heating element. Also be sure that any blower is not connected in the controlled path.

Our third innovation is unique in that it is a real fuel saver particularly in an oil heating system. It consists of simply connecting a 24 hour timer in series with the thermostat leads controlling the hot water heater in your home.

Most home hot water systems that use separate heaters operate on a 24 hour basis. Since any heating that occurs at night is wasted, the timer is set to turn off the heater during the time that hot water is not needed. At the author's QTH, we have such a system which turns off the heater from 12 p.m. to 6 a.m. — or 25% of the day—for a potential savings of that much fuel.

Our final energy saving measure is the implementation of a timing scheme on the regular home thermostat. Many people have clock-operated thermostats (which are quite expensive). These devices save fuel by reducing the temperature setting during the night time hours. Fig. 4 shows a way to implement this feature with two inexpensive $5 thermostats and a 24 hour timer. The circuit is self explanatory and can be built and installed in a couple of hours. It takes a bit of experimenting to get things to work properly, but once you "fine tune" the setup you should notice considerable savings on your fuel bill.

We hope the previous helps you as it did us. After installation of these devices we really did notice a significant reduction in our cost of heating.

If you have done similar things to conserve energy in your home, we would like to know about it and possibly pass it along to other readers. Please let us know.

In the meanwhile, have fun saving energy!

73, Irwin, WA2NDM

a regular feature by

THEODORE J. COHEN N4XX

dateline... Washington, D.C.

The ins and outs of the Washington scene

Amateur Radio Triumphs At WARC

Despite predictions that many issues pertaining to the amateur and amateur-Satellite services would be—and, indeed, were—contentious at the World Administrative Radio Conference, amateurs fared exceedingly well at the WARC. Highlights of the Conference's decisions which affect the amateur services include, but are not limited to:

- Three new h.f. bands at 10, 18 and 25 MHz
- A 50 kHz exclusive amateur assignment in Region 2 from 1800 to 1850 kHz
- A 250 kHz exclusive amateur assignment in Region 2 from 3500 to 2750 kHz
- Virtually no changes in amateur assignments at 7, 12, 21 and 28 MHz (though several countries reserved the right to operate their Fixed services in the band 14,250-14,350 kHz)
- No changes in amateur assignments at 6 and 2 meters
- Continued access by amateurs to the 220-225 MHz band (on a Primary, shared basis)
- A new band in Region 2 at 902-928 MHz (Secondary, shared)
- New amateur-satellite assignments at 1260, 2400, 3400, 5650 and 10,000 MHz
- Several new amateur-satellite bands above 40 GHz

The successes noted above would not have been possible without the excellent preparations for the WARC by the national amateur radio societies around the world, and without the dedication and professionalism exhibited by the 14-man IARU team at the WARC. Amateurs and non-amateurs attending the Conference have nothing but praise for the IARU team, who somehow managed to cover *every* working group, sub-committee, committee and plenary session which in any way addressed matters of importance to amateur radio. Members of the 14-man team are listed below. To them, and to the many supporters of amateur radio who, without fanfare or public recognition, helped to preserve our frequencies and privileges, THANK YOU FOR A JOB WELL DONE!

Members of the International Amateur Radio Union team in Geneva, Switzerland, during the 1979 World Administrative Radio Conference:

Richard L. Baldwin, W1RU — Secretary, IARU
Victor C. Clark, W4KFC — President, Region II, IARU
Noel B. Eaton, VE3CJ — President, IARU
Thomas Clarkson, ZL2AZ — Member, Region III, IARU, Exec. Committee
Eric Godsmark, G5CO — Recent retiree, U.K. Regulatory Department
Bruce Johnson, WA6IDN — IARU representative, ARRL
Wojciech Nietyksza, SP5FM — Vice Chairman, Region I, IARU
David Rankin, 9V1RH — Secretary, Region III, IARU
Shigatake Morimoto, JA1NET — Director, JARL; President JAMSAT
Pedro Seidemann, YV5BPG — Vice President, Region II, IARU
Alberto Shaio, HK3DEU — President, Liga Colombiana de Radioaficionados
Carl Smith, W0BWJ — Vice President, ARRL
Roy F. Stevens, G2BVN — Secretary, Region I, IARU
David Sumner, K1ZZ — Assistant Secretary, IARU

WARC Recognizes Need For Non-Amateur Communications With Amateurs During Natural Disasters

In a RESOLUTION set forth at the 1979 WARC, the ITU noted that in the event of a natural disaster, normal communication systems are often overloaded, damaged, or completely disrupted. Further, under such conditions, the amateur service is often sought out to assist in establishing emergency communications because of the widespread distribution of amateur stations and the demonstrated capabilities of amateur operators. This being the case, the ITU concluded that in the event of a natural disaster, direct communication between amateur stations and other (non-amateur) stations might enable vital communications to be carried out until normal communications are restored.

With the above as background, and recognizing that the rights and responsibilities for communications in the event of a natural disaster rest with the administrations involved, the ITU resolved:

- that the bands allocated to the amateur service...may be used by administrations to meet the needs of international disaster communications;
- that the use of specified bands allocated to the amateur service by non-amateur stations for disaster communications shall be limited to the duration of the emergency and to the specific geographical areas as defined by the responsible authority of the affected country;

*8603 Conover Place, Alexandria VA 22308

- that close cooperation is desirable between amateur stations and the stations of other radio services which may find it necessary to use amateur frequencies in disaster communications;
- that such international relief communications shall avoid, as far as practicable, interference to the amateur service networks.

Passage of this RESOLUTION is viewed by many as a "coming of age" by the amateur service, and as international recognition of the part this service has played—and will continue to play—in providing emergency communications following natural disasters.

Russians Continue To Violate ITU Treaty

At this writing, the Russian "woodpecker," (a high-powered, over-the-horizon, high-frequency radar system) continues to disrupt international communications throughout the h.f. band. According to a spokesman at the Department of State, however, the U.S. has not given up on silencing the Russians. Said the spokesman: "We are looking at all possible diplomatic actions which might be taken, though the issue will still have to be addressed as a matter of opportunity."

The spokesman also requested that amateurs *not* file additional complaints with the Department on the Russian h.f. radar. "We are well aware of the concern by amateurs in this matter,' said the Department of States' representative, "but nothing further would be accomplished at this time by accumulating additional reports of the woodpecker's operation."

The spokesman did, however, thank those amateurs who took time to file reports with State on the woodpecker and to express their concern for the continued treaty violations by the Russians.

FCC Continues To Move On WESCARS Interference Problems

According to Mr. Jeffrey Young, Chief, Investigations Branch (Enforcement Division, Private Radio Bureau), the Commission's Livermore, CA, monitoring station has observed over 20 amateurs who were deliberately interfering with operations of the West Coast Amateur Radio Service Network. Of these 20 operators, three have been positively identified, and are now the subject of FCC actions.

Commission moves in the matter of interference to WESCARS follows several months of intensive activity by the FCC's West Coast monitoring station at Livermore and by FCC field units. It is anticipated that the data obtained will result in the identification of other operators who have violated FCC Rules and Regulations regarding interference to other stations. The FCC's Regional Director on the West Coast is now pursuing the situation on a high-priority basis.

Amateurs identified as having caused deliberate interference could find themselves the subjects of revocation or sanction proceedings.

FCC To Propose EMI Regulations For Personal Computers

According to *Electronic Engineering Times*, the FCC will shortly propose EMI (RFI) regulations for personal and mainframe computers. Commission action, in parts, stems from complaints that several brands of personal computers are causing severe interference to home electronic entertainment equipment. Then, too, amateurs have complained that some computers used to generate ASCII for OSCAR experiments interfere with the operation of their satellite receivers.

A final FCC EMI standard is yet to be drafted for computers. And while there is general agreement within the electronics industry that a need exists for such standards, the stringency of the standards proposed in many of the petitions now before the Commission is being challenged.

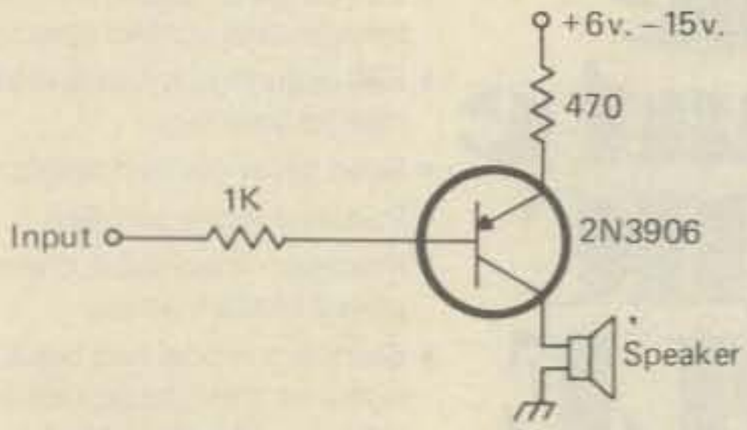
FCC Seeks Employees With Amateur Radio Experience

According to Mr. Carlos Roberts, Chief, Private Radio Bureau, the Commission is actively searching for entry-level engineers (EE) with experience in amateur radio (holders of amateur licenses are especially desired). If you are interested, contact Roberts at the FCC, 1919 M St., N.W., Washington, D.C. 20554.

CRANIUM QUERIES

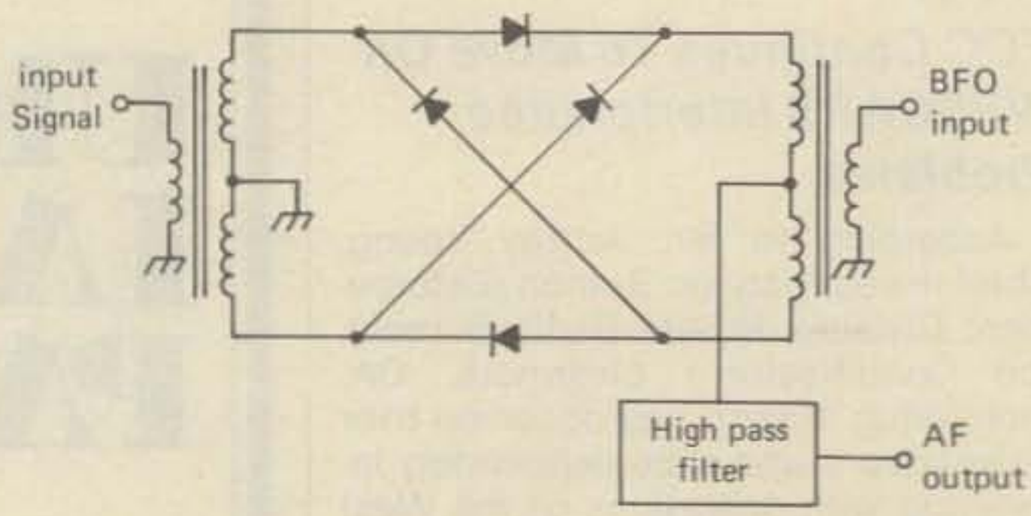
" FIND THE ERROR"

BY MARTIN BRADLEY WEINSTEIN, WB8LBV
c/o CQ



Here's What Was Wrong

The Utility Speaker and Driver was configured for a PNP transistor, not an NPN. When we substitute a 2N3906 for the 2N2222 originally shown, it speaks right up!



What's Wrong?

Some product detector this turned out to be! The balanced transformers are phased right, the BFO and signal levels are good, but I can't hear a thing. Where's the doublecross?

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

High Frequency Radio Wave Propagation Predictions Part II of II

Last month's Novice column provides explanations of wavelength, frequency, sunspots, sunspot cycles, h.f. propagation forecasts, radio wave propagation, refraction, reflection, and tropo communication. This month's column builds on that foundation to provide a reasonably complete explanation of all factors related to high frequency propagation predictions.

Ionosphere Layers

The **ionosphere** is the portion (or portions) of Earth's outer atmosphere where sufficient ions and electrons are present to affect radio wave propagation. Since we depend upon refracting h.f. signals off an ionosphere layer to accomplish long distance (DX) two-way communications, it is essential that we have a good understanding of our ionosphere layers and what they do.

Ionization is due to disassociation of atoms and molecules into electrons and/or ions. Electrically charged particles are produced by high energy radiation, such as ultraviolet light from the Sun, and by collisions of particles during thermal agitation (heating by the Sun). The ionization level generally increases with height within each ionosphere layer.

Ionospheric predictions are forecasts of future ionospheric conditions used in the preparation of radio propagation predictions.

An **ionospheric disturbance** is a variation in the ionosphere's ionization that is beyond the normally observed day-to-day random variations from average value for that specific location, date, and time of day.

An **ionospheric storm** is an ionospheric disturbance associated with abnormal solar activity and characterized by wide variations from normal ionization levels. This disturbance includes F layer turbulence and increased radio wave absorption. Ionosphere density is often decreased during these disturbances, increasing the virtual height, which can be thought of as the effective reflection height of the ionosphere layer. These effects are most noticeable further from the equator and closer to the poles.

An **ionosphere wave** is just another name for a **sky wave.** It is a radio wave that refracts off an ionosphere layer and is bent back down to the Earth's surface. If a signal is received at some distant point on its initial return to Earth, it is called a *one-hop signal.* If the refracted signal reflects off Earth's surface and is again refracted back to Earth by an ionosphere layer, it is called a *multi-hop signal.* Multi-hop signals are quite common in the h.f. range and they are usually easy to distinguish due to the distortion that occurs as such signals are alternately refracted off an ionosphere layer and reflected off Earth's surfaces.

The **solar absorption index** relates the Sun's angles to *atmospheric absorption* (weakening of radio waves) at various latitudes on Earth and throughout each day. Solar absorption is greater in the lower ionosphere layers where there is a higher percentage of oxygen than exists in the higher ionosphere layers. More heating (loss) occurs when radio waves collide with particles in a lower layer. This is why signals refracted off the (lower) E layer suffer more loss than signals refracted off the (higher) F_2 layer. Solar noise is electromagnetic radiation from the Sun at radio frequencies.

17-year-old Rick Todd, KA8AKL of Newbury, Ohio operates a Galaxy V Transceiver with a Hustler 4-BTV Antenna and an 80 meter dipole. He has already earned the Ten American Districts (TAD), Rag Chewers' Club (RCC), and Senator Dirksen awards. Rick operated the Smithsonian Institute amateur radio station (NN3SI) last July 3rd. His best DX so far have been Barbados (8P6KX) and the Canal Zone (KZ5JU).

A simple way to remember the basic letter designations of our ionosphere layers is to remember that they are fed with energy from the Sun. The layers are basically designated **F, E,** and **D** from the outermost layer to the closest to Earth.

F Layer. This ionosphere layer is strongest at night. It also exists in weakly illuminated portions of Earth's atmosphere during daylight hours

F_1 Layer. This is a daylight only ionosphere layer that exists about 175

2814 Empire Ave., Burbank, CA 91520

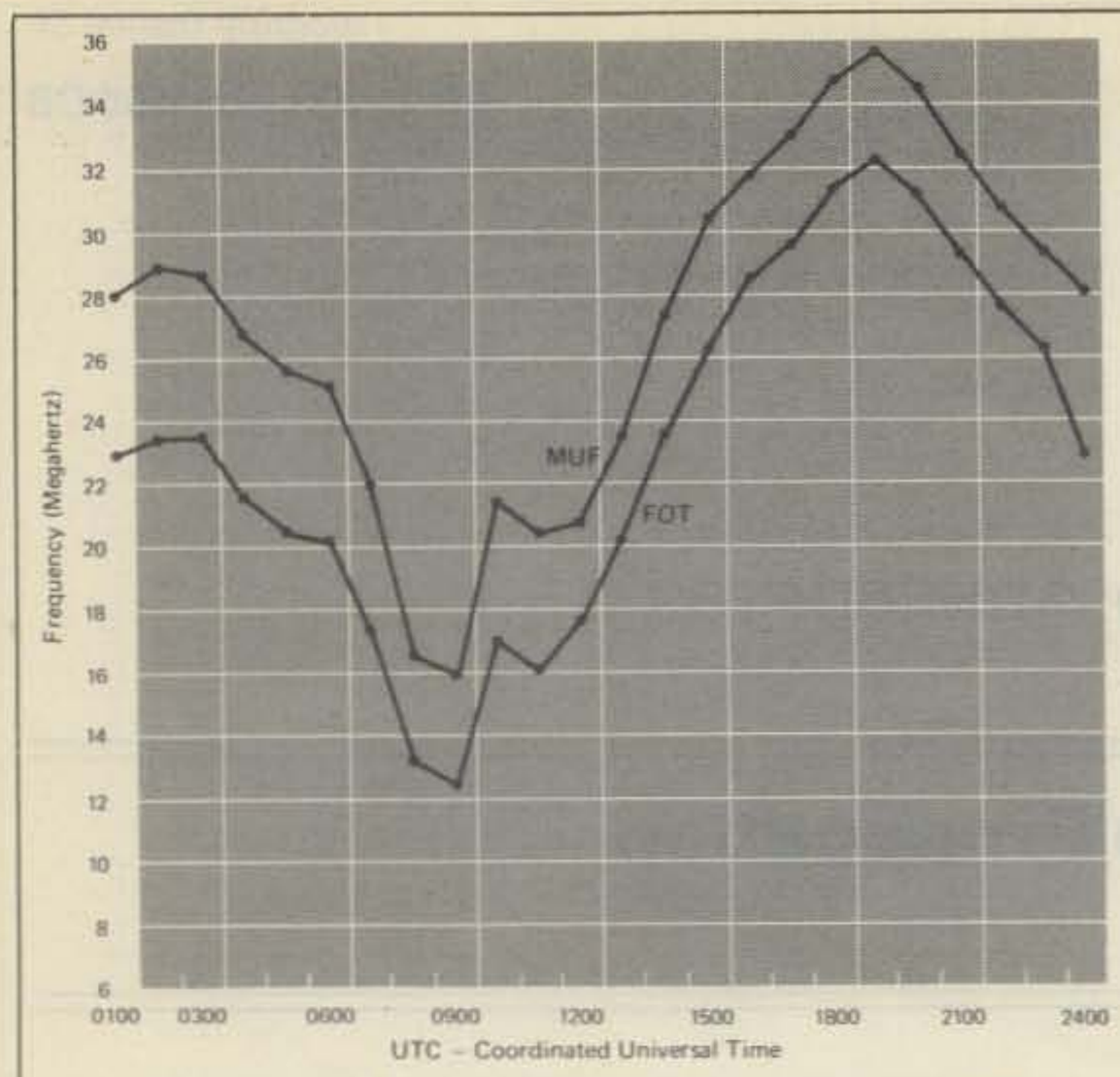


Fig. 1- Low fire angle antenna FOT and MUF for April 1980.

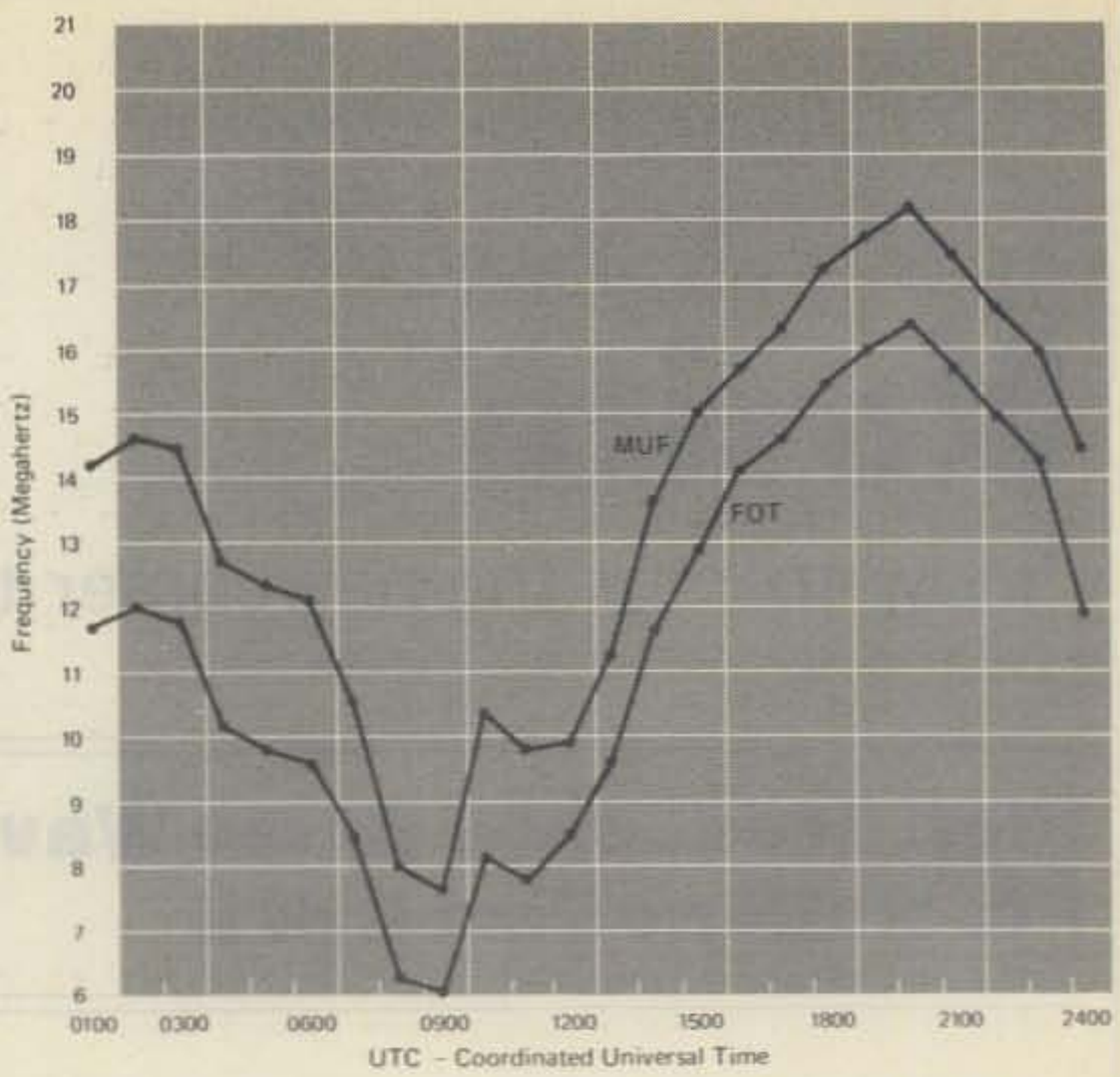


Fig. 2- High fire angle antenna FOT and MUF for April 1980.

to 250 kilometers (100 to 150 miles) above Earth at noon. This layer sometimes refracts h.f. signals, but it more commonly absorbs h.f. energy causing a reduction in the signal normally refracted by the F_2 layer. The absence of the F_1 layer at night causes signals, including atmospheric noises, to be generally stronger at night than during the day.

F_2 Layer. This is the most useful ionosphere layer for h.f. communications. It is the most highly ionized layer since it is the furthest from Earth's surface and most directly exposed to the Sun's radiations. This layer is about 400 kilometers (240 miles) above Earth at noon and about 225 kilometers (135 miles) high at night. The ionization of this layer is not critically related to the relative angle of the Sun's rays since solar energy is stored for many hours and electrons can be detached at night. This layer merges with the F_1 layer at night to form the F layer.

Here is 27-year-old Jim Noland, WB7QYU, of Mountain Home, Idaho. He enjoys restoring old equipment and using it on the air. He has worked 48 states and 4 countries with his low power (QRP) Heath HW-8 Transceiver. His antenna system consists of a homebrew vertical, a 40 meter dipole, and a beam for 10 and 15 meters. New amateurs should listen for Jim because Idaho is not an easy state to get confirmed towards the ARRL Worked All States (WAS) Award.

E Layer. This daylight only ionosphere multiple layer exists about 110 kilometers (66 miles) above Earth at noon. Its ionization level depends upon the angle of the Sun's radiation. The principal E layer roughly corresponds to what used to be called the *Kennelly-Heaviside layer.* The E layer provides daytime h.f. communication ranges of less than 1000 miles. The E layer is a relatively heavy part of Earth's atmosphere where electrons, freed by solar radiation, quickly combine to form neutral particles. The E layer just provides moderate distance h.f. propagation during daylight hours with maximum refraction occurring at noon when the Sun's rays are most direct. The E layer absorbs h.f. energy during the day, reducing the level of h.f. signals refracted off the F_2 layer and harming really long distance communication. DX signals (including noise) get stronger as the E layer fades, reducing absorption and shorter range propagation.

Sporadic E ionization occurs at the height of the E level ionosphere. It is more noticeable at higher latitudes (closer to the poles) than near the equator and it lasts throughout the entire 24 hour day, when it is present. Sporadic E is cloud-like areas of unusually high ionization which appear to be caused by particles radiating from the Sun. The sporadic E layer exhibits unusual and erratic characteristics. It sometime separates from the normal E layer. It exists more than half the time on some days and nights. Sporadic E can prevent frequencies that normally penetrate the E layer from reaching the higher layers, which means that normal h.f. DX propagation off the F_2 layer can be disrupted for extended periods. Sporadic E activity occasionally provides v.h.f. DX communication capability; this is probably primarily due to the layer being bombarded by visible and subvisible energy from the Sun.

Sporadic refractions are sharply defined intense refractions from the sporadic E layer. They are also called *abnormal refractions.* The refracted frequencies are above the E layer's normal maximum usable frequency. Sporadic refractions can occur anytime, anywhere, and at any frequency.

D Layer. This is another daytime only ionosphere layer. Its intensity is proportional to the angle of the Sun's rays, being maximum at noon. The D layer is the lowest ionosphere layer at a height of 50 to 90 kilometers (30 to 54 miles) at noon. V.l.f. and l.f. radio waves are refracted and m.f. waves are absorbed by this layer. H.f. radio waves are weakened due to partial absorption as they pass through the relatively oxygen rich D layer. 160 and 80 meter signals are almost entirely absorbed by this layer, minimizing long range daylight communications on these bands. High angle 160 and 80 meter signals sometimes penetrate the D layer and provide moderately long distance communication when they refract off the E layer.

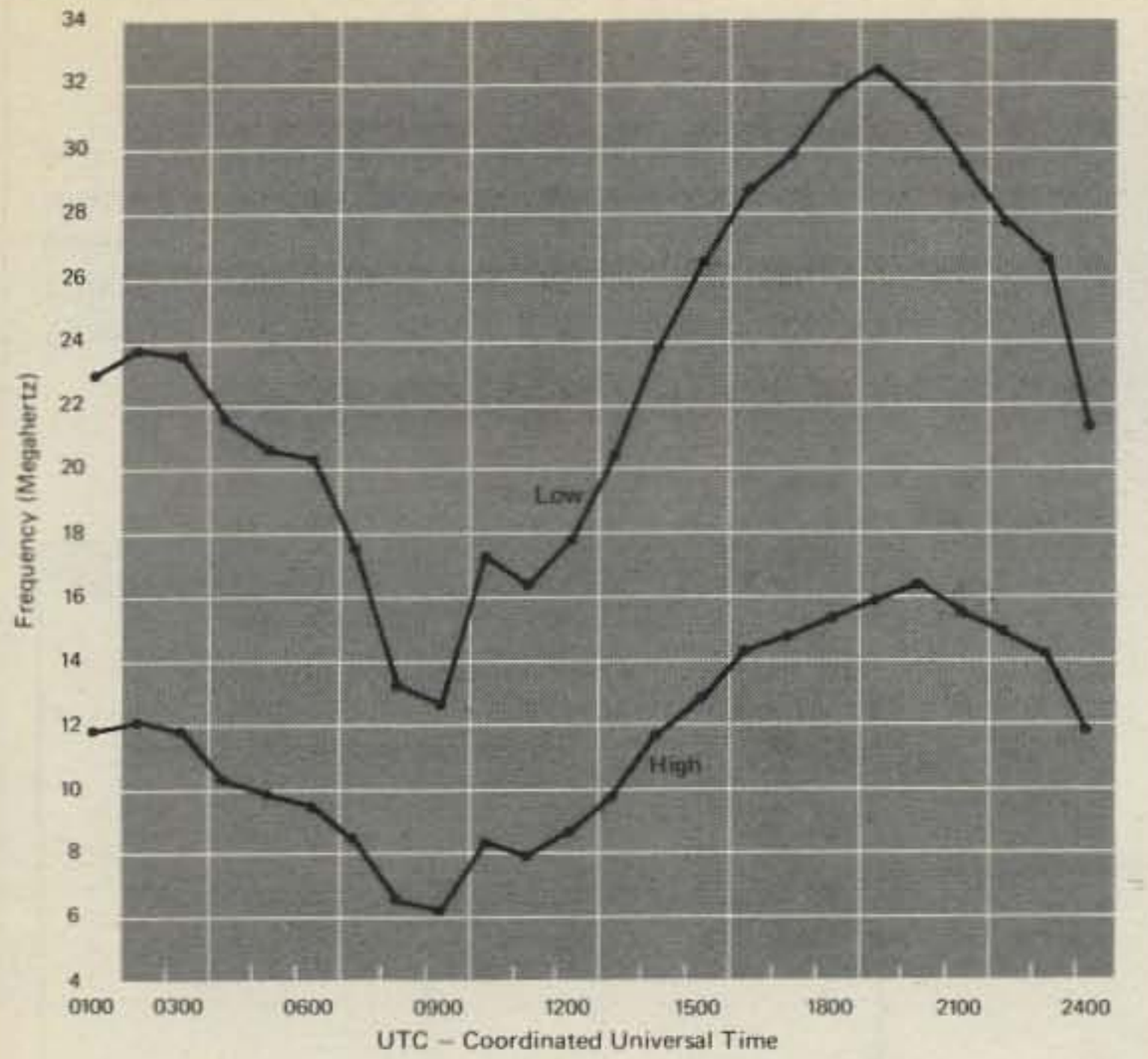


Fig. 3- Low and high fire angle antennas FOT for April 1980.

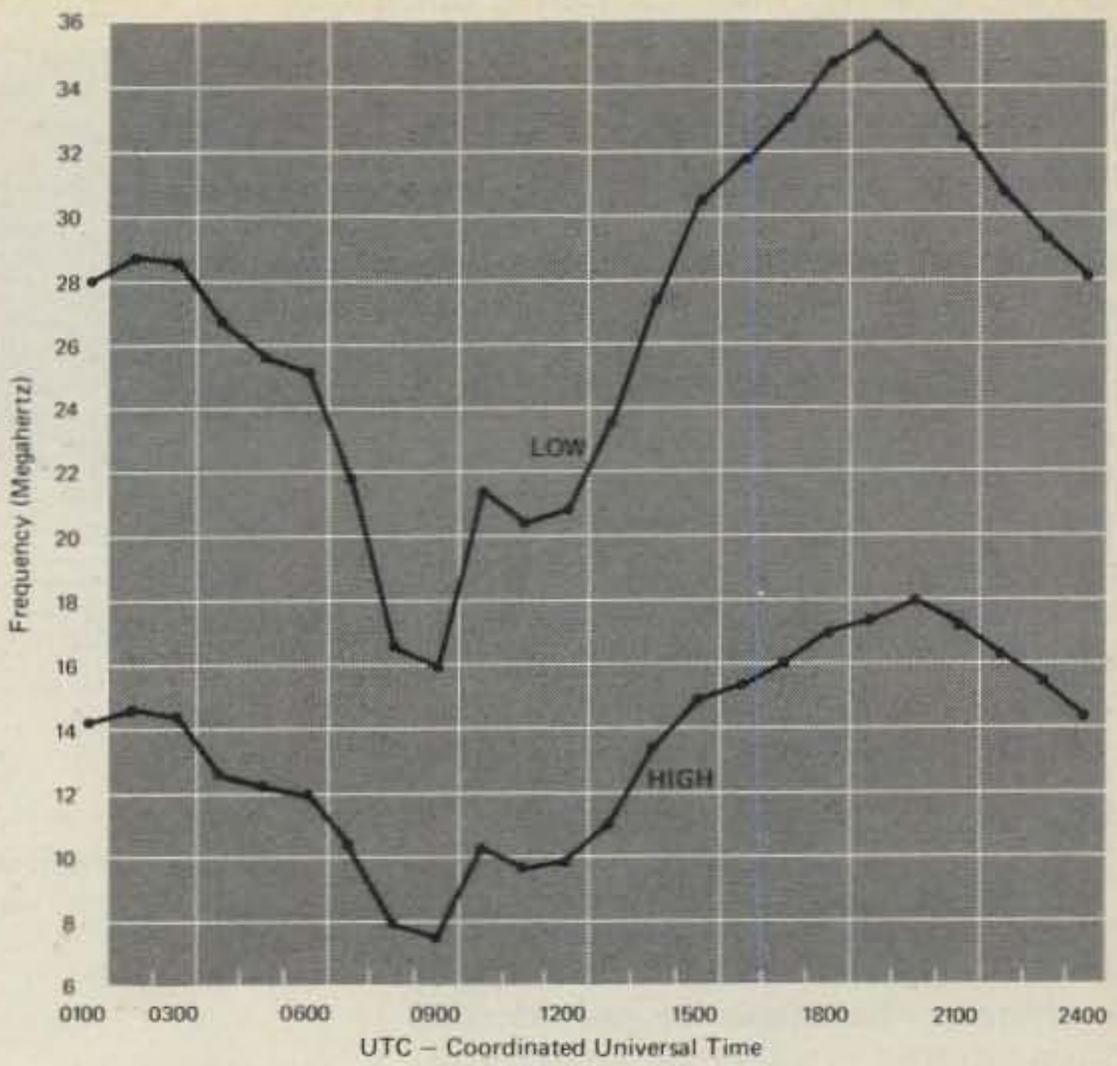


Fig. 4- Low and high fire angle antennas FOT for April 1980.

Realize that the Earth's diameter at the equator is about 7926 miles. When this fact is considered, it is easier to realize how close the ionosphere layers are to Earth's surface and how important it is to achieve low angle long distance refractions. The accompanying figure provides the true relationship between the size of Earth and the height of its ionosphere layers.

Propagation Terms

FOT. The Frequency of Optimum Transmission (FOT) is the best frequency to use to communicate between two specific points on Earth's surface at a particular time and date. The FOT is always somewhere between the Maximum Usable Frequency (MUF) and the Lowest Useful Frequency (LUF). The FOT moves up and down as ionospheric conditions change. If you have h.f. propagation prediction data, note when the FOT will pass through an amateur band for any area of the world you want to contact and get on the air at that time with a directional antenna aimed as required. FOT is of primary importance in easily working DX.

LUF. The Lowest Useful Frequency (LUF) is seldom mentioned in propagation predictions because it cannot be calculated on a general basis, as FOT and MUF can be forecast. Nevertheless, LUF exists and it should be understood. Ionospheric absorption and atmospheric noise tend to drown out radio wave signals below the LUF. Some of the variables which make it impossible to generalize the LUF values are that it is directly related to transmitted power, efficiency (gain) and directivity of transmitting and receiving antennas, azimuth and elevation capabilities of both antennas, the terrain between the two points of communication, receiver sensitivity, and noise level at the receiver site.

MUF. The maximum usable frequency (MUF) is also popularly known as the **critical frequency** since higher frequency vertical incident waves will

Table I - April 1980 High Frequency Propagation Predictions Between Burbank, California and Rio de Janeiro.

	Low Fire Angle Antenna		High Fire Angle Antenna	
UTC (Note 1)	FOT (Note 2)	MUF (Note 3)	FOT (Note 2)	MUF (Note 3)
0100	22.9	28.0	11.7	14.2
0200	23.7	28.9	12.0	14.6
0300	23.5	28.7	11.8	14.4
0400	21.4	26.8	10.2	12.7
0500	20.6	25.8	9.8	12.3
0600	20.2	25.2	9.6	12.1
0700	17.5	21.8	8.4	10.5
0800	13.1	16.6	6.3	8.0
0900	12.6	16.0	6.1	7.7
1000	17.1	21.6	8.2	10.4
1100	16.2	20.5	7.8	9.8
1200	17.9	20.9	8.5	9.9
1300	20.4	23.7	9.6	11.2
1400	23.8	27.7	11.7	13.6
1500	26.3	30.6	12.9	15.0
1600	28.7	31.9	14.1	15.6
1700	29.8	33.1	14.6	16.2
1800	31.5	34.9	15.4	17.1
1900	32.2	35.8	15.9	17.6
2000	31.1	34.6	16.3	18.1
2100	29.4	32.7	15.6	17.3
2200	27.8	30.9	14.9	16.5
2300	26.4	29.4	14.2	15.8
2400	23.1	28.2	11.8	14.4

Notes
(1) Coordinated Universal Time is 5, 6, 7, and 8 hours ahead of EST, CST, MST, and PST, respectively.
(2) Optimum Transmission Frequency, in megaHertz.
(3) Maximum usable frequency, in megaHertz.

not be refracted back to Earth, but will continue on through the layer. If a frequency above the MUF passes through the F_2 (daytime) or F (nighttime) layer, it will continue on out into space. Each existing ionosphere layer has a specific MUF at all times and the MUF moves up and down as ionospheric conditions change, just as the FOT and LUF vary. MUF values are often based on using the worst possible antenna, which is one that radiates the signal straight up from Earth. MUF values can also be stated for lower fire angle antennas, which are most commonly used working DX contacts.

Antenna Considerations

It is important to realize that radio waves are transmitted and received at different angles by different types of antennas. The **angle of radiation** is often referred to as the angle of *arrival* (reception) and *departure* (transmission). The angle of radiation is also popularly known as the **fire angle.** No matter what you call it, the radiation angle should be as low as possible to provide optimum long distance (DX) communication capability. Good DX antennas have low fire angles. If a transmitted signal is emitted vertically so that it strikes ionosphere layers directly, it is more likely to pass through the layer than if it strikes the layer at an oblique angle. Since we want h.f. signals to be refracted back to Earth, it is to our advantage to use low fire angle antennas. Basically, the level of refracted radio waves increases as the antenna fire angle decreases. The table of MUF and FOT data in this article should make it very clear to you that good low fire angle antennas are essential to dependable DX operation.

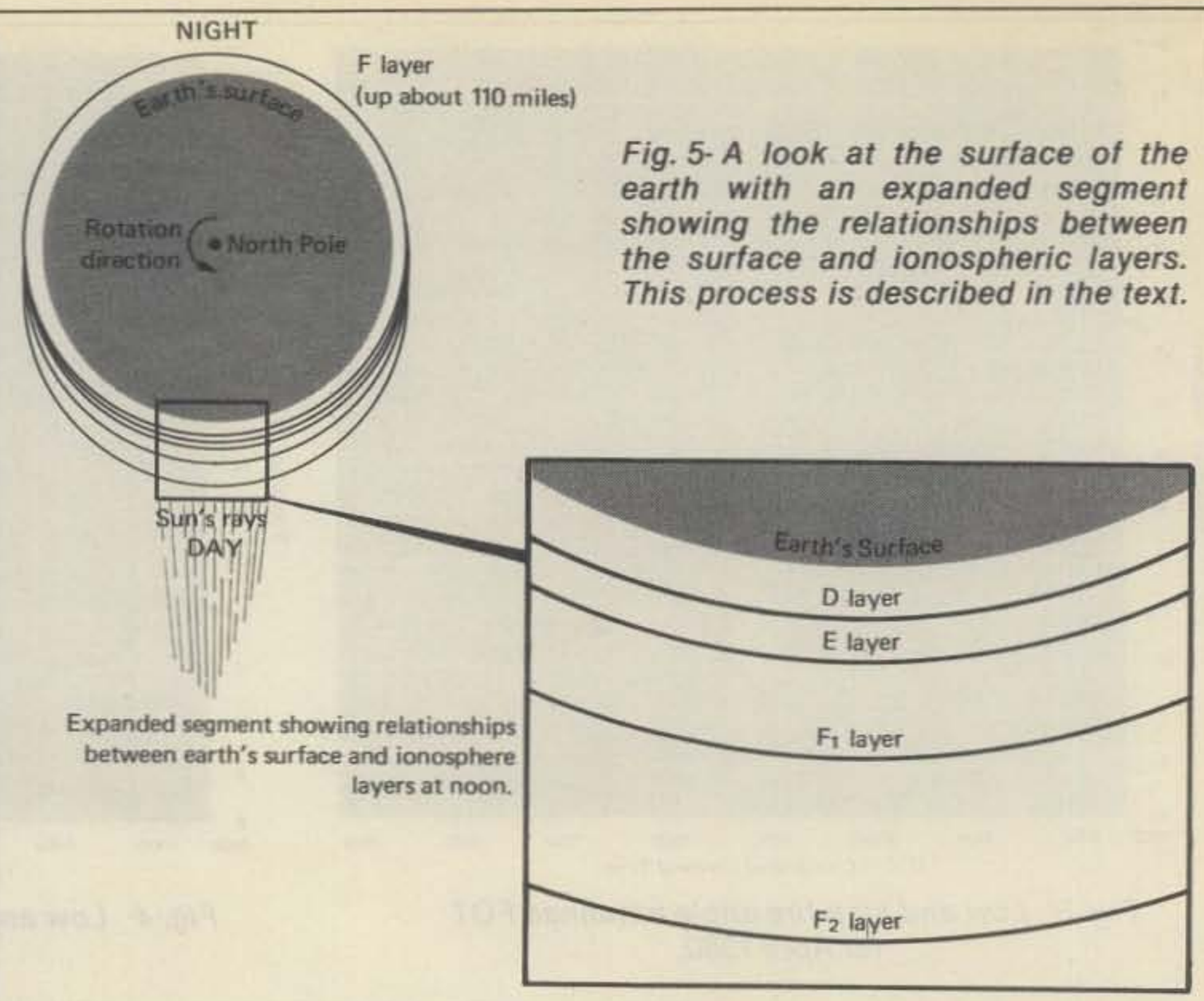


Fig. 5- A look at the surface of the earth with an expanded segment showing the relationships between the surface and ionospheric layers. This process is described in the text.

Expanded segment showing relationships between earth's surface and ionosphere layers at noon.

Here is Dave Kerl, KA9DZE, of Janesville, Wisconsin. His station consists of the Kenwood TS-520-S transceiver with the matching code filter, antenna tuner, and speaker. He uses dipole antennas on 10, 40, and 80 meters. His 15 meter antenna is a homebrew 2-element beam. Dave became licensed as a Novice March 31, 1979 and passed the 13 wpm code test for the General May 8th. He lives in an apartment and advises apartment dwellers not to give up. Dave has worked 30 states and 17 countries so far and he is just getting started. Listen for him in the bottom 10 kiloHertz of the Novice bands.

When a high fire angle antenna such as a dipole is used, transmitted radio waves enter ionosphere layers almost directly, causing less energy to be refracted back to Earth than would return from a low fire angle antenna such as a Quad. The fire angle of a dipole is often more than 37 degrees, relative to Earth's surface. When using a high fire angle antenna, the band will seem to die out since one may not hear the DX stations being worked by amateurs using low fire angle antennas. The high radiation angle signals enter the ionosphere almost straight on, allowing them to proceed into outer space without being returned to Earth.

Simply stated, when one uses a high radiation angle antenna, the useful frequencies are much lower than what are available with a low radiation angle antenna. High angle signals are more likely to penetrate the ionosphere and be lost in space. Also, there is a weaker refraction return from high angle signals than from low angle ones.

The following table shows the maximum useful frequency (MUF) and the optimum transmission frequency (FOT) for both low and high radiation antennas this month. These predictions are for conditions between Burbank, California (34.12 North latitude and 118.21 West longitude) and Rio de Janeiro (22.50 South latitude and 43.20 West longitude). The information is only directly useful to amateurs in the Los Angeles area; however, it is generally indicative of propagation predictions anticipated in other parts of the country. The data indicated in this month's column is just intended to show realistic values and to tell how they are used. These values are based on a sunspot number of 148 for April 1980 and they are specifically applicable to the 15th day of the month. The distance between Burbank and Rio is 6285.5 miles, or 10,115.1 kilometers. The direct (short path) heading from Burbank to Rio is 116.8 degrees, true. The reverse (long path) heading from Burbank to Rio is 306.9 degrees, true.

The information listed in the preceding table is illustrated in figures 1 through 4 to give you a better understanding of relationships that exist between the FOT and MUF of low and high fire angle antennas. Remember that Coordinated Universal Time (UTC) is 5, 6, 7, and 8 hours ahead of EST, CST, MST, and PST, respectively. As an example, an amateur in the Eastern time zone would be interested in the 1900 UTC predictions at 1400 (2 p.m.) EST.

If you have sets of propagation predictions for two successive months, it is reasonably accurate to plot differences throughout the time interval between the two mid-month predic-

Paul Ridley, KB5DQ, of Belen, New Mexico sent this picture of his son Randy, KA5DWL, seated at the station they both operate. Randy is a 14 year old 9th grader and an Eagle Scout. He has been a Novice since February 1979. Randy does some low power (QRP) operating with a Heath HW-8 Transceiver and he has contacted 10 states with it. As an ex-Scoutmaster, it is a pleasure to let others meet this good scout.

tion points. As an example, if lists show an FOT of 28.0 for one month and 29.0 for the next month, it is reasonably safe to assume that the FOT is 28.5 megaHertz about the time the first month ends and the next one begins.

Summary

It is hoped that this two part article has given you some understanding of what h.f. propagation predictions are and how they can be used. Explanations have been kept as simple as possible. Detailed highly technical information is available in several publications for the benefit of those who are interested in obtaining additional knowledge about this fascinating subject.

Help for Beginners

Seven readers have suggested that we compile a list of experienced amateurs who are willing to help new amateurs set up their first stations and work their first few contacts. I believe that an extensive list of this type is needed. If you are willing to help newcomers in your area, please send a note to me with your name, callsign, address, and telephone number. If you know someone who provides this kind of help, please bring this item to their attention. All information should be sent to me at 2814 Empire Avenue, Burbank, California 91504.

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to *CQ*. A brief description of operating activities and some personal background information are needed with your picture.

Some of the stations I've recently worked on the novice bands are: WA1YZB Kevin @ Shelton, Conn., KA2CRV Andy @ Hammondsport, N.Y., KA3DDT Bob @ Rockville, Maryland, KA4IFI Gene @ Tarpon Springs, Fla., KA5FJR Edmond @ Albuquerque, N.M., KA6DEC Ray @ Los Angeles, CA., KA7CYP Jay @ Tucson, Arizona, KA8DMP Merritt @ Lowell, Mich., KA9DDK Jeff @ N. Barrington, Ill., WB0UQN Hal @ O'Fallon, MO., WL7ACK Mamie @ Valdez, Alaska

73, Bill W6DDB

Say You Saw It In CQ!

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

Here is the April "Story of The Month", sent through the kindness of Mary, it was written, edited and approved by Tate just prior to his death on December 2, 1979:

Loren M. Tate, W0RP
All Counties #249, 9-17-79

"The following is a sketch as to my amateur endeavors through the years as W0BHC and W0RP.

"Early in life it was my goal to get on the air and send out that hair curling, nerve tingling CQ to the most remote corner of the world.

"After my education was completed, marriage and two children acquired, I started out afresh to achieve my lifelong goal.

In 1947 I received my first call, W0BHC (Bald Headed Charlie) and got on the air. I had attended night classes in code and theory and passed that dreaded test for a Conditional license. My rig - a war surplus rig that had been wired and rehashed over and over again.

"In 1947 I joined the Southwest Missouri Amateur Radio Club and in 1951 they elected me president of the club. Our active club sponsored Missouri House Bill #242 for the issuing of amateur license plates. To our delight and amazement the bill passed both Houses without a dissenting vote.

"In 1952 I upgraded my license to Class A and also acquired a new rig. With a Johnson Viking 2 setup, I really kept the airlanes sizzling with DX and also stateside contacts.

"Many experiences have come my way through the years - many times I have been called home from work with the Frisco Railroad to help hunt for a lost child or to transmit messages due to heavy ice storms that played havoc with the telephone lines. I have rerouted trains, relayed weather conditions when ice storms disrupted their normal way to travel. There is no greater pleasure than to see a lost child returned safely. I have had the distinct pleasure of being co-ordinator and assistant co-ordinator of the Greene County Storm Net. More than once I have loaded the travel trailer, wife and coffee pot and have been sent by the Red Cross to some tornado damaged town where I would set up an emergency network. I have received many awards which I have accepted humbly, yet prized highly and they all embellish the walls of my ham shack.

"I am custodian and trustee of amateur station WB0SVB, set up on the campus of the Baptist Bible College, where until recently college credits were given for our classes there.

"I have been active in both Army and Air Force MARS programs until illness limited my participation.

"My wife (Mary) and I for many years held our own Field Days. We selected different sites - Missouri, Wyoming, W. Virginia, N. Carolina, VE7 British Columbia and on Alaska Highway milepost 953! We both enjoyed each contact far more than the score accumulated. On some of the Field Days sites we shot our dipole antenna over the tree tops with bow and arrow and the insulators used were plastic hair curlers! On one Field Day we had a Classic 33 atop our 23 foot trailer. Needless to say, many knocked at our door to see if we were for real.

"In April, 1976 we both came down with an incurable disease - *County Hunting!* On that particular day we left for an extended tour of Alaska, towing our faithful trailer. I had just purchased a new Kenwood 520 that worked like a charm (and still does). With voice squeaky, palms sweaty and knees knocking, I sent out a feeble Morse code signal - I gave out my first county · wow - 6 contacts, what a pile up—Hi.. This was surely the thing I had dreamed about as a youth and now it had become a reality! Right then and there we both knew we had been bitten hard by that *County Hunting Bug.*

"Conditions were so bad through the Klondike, Yukon and all over Alaska that we could hardly wait until we could get back to the lower 48 and get on the air again. On this trip we racked up 15,257 miles and truly a County Hunter's dream. With my wife urging me to travel those extra miles to give someone that special rare county, we seldom traveled interstates but used country roads and byways, canyons, mountain tops and narrow tunnels, with the trailer humbly bringing up the rear.

"On our return home, my new two letter call W0RP (Roly Poly) was awaiting me and I have enjoyed using it.

"I have been very ill since July 12 and many county hunters have driven far out of their way to give me my last few counties. WB9RCY, Dorothy, WD0EWO, Harry and others have monitered and listened for the counties that I needed to finish. I truly appreciate and thank each and everyone for all their help. My *last one* was given to me by WB0MIX, Jim Roberts, now the award with all the seals hangs on my wall with WB0MIX's picture parked astride that last county line (In Missouri) hanging just below it.

"It was a great joy and pleasure to attend the Atlanta Convention and meet so many of the County Hunters that I had met on the net the past three years. They are truly a great group of people!

"As many of you know, when I returned home from the convention I went into the hospital and had a section of my colon removed, with cancer which spread to my liver. I am now taking chemotherapy for this and I am still very weak. I am hoping that I can get back on the air and give out many

P.O. Box 73, Rochelle Park, N.J. 07662

Special Honor Roll
All Counties

#259 Bruce A. Jacobs, K2QK 12-12-79.
#260 George C. Toews, W7DXN 12-14-79.
#261 Roy V. Glasscock, K0DJC 12-14-79.
#262 Robert E. Hallock, K7TM 12-19-79.

USA-CA Honor Roll

3000		1500		500	
K2QK	286	K2QK	451	OH2NQ	1413
W7DXN	287	W7DXN	452	SM4DHF	1414
KØDJC	288	KØDJC	453	GM4DKO	1415
AC2J	289	WA2JFL	454	OK1-11861	1416
K7TM	290	K7TM	455	K2QK	1417
W2MEI	291	WB9BGJ	456	W7DXN	1418
2500		G2AFQ	457	WA4OIB	1419
K2QK	352	1000		K7TM	1420
W7DXN	353	K2QK	571	WA2UDT	1421
KØDJC	354	W7DXN	572	WB9BGJ	1422
K7TM	355	KØDJC	573	N2AWM	1423
2000		K7TM	574	G2AFQ	1424
K2QK	397	WB9BGJ	575		
W7DXN	398	G2AFQ	576		
KØDJC	399				
WA2JFL	400				
K7TM	401				
WB9BGJ	402				
G2AFQ	403				

more counties to add to the over 700 that I had given prior to my illness." (Ed. I am sorry that Tate did not get to see his Plaque, but when it arrives, Mary has promised to hang it on the wall along with his many other awards.) (Note # from Ed. Although the Story of Margeret & Karel, VE7ATI/ VE7ATH was sked for April, I feel sure they will understand why I used *this story* now.)

Awards Issued

Bruce Jacobs, K2QK waited until he had them *all* and had me send him USA-CA-500 through All Counties endorsed All S.S.B.

George Toews, W7DXN also waited until he had them *all* and collected USA-CA-500 through All Counties endorsed All Phone.

Roy Glasscock, KØDJC added to his collection, USA-CA-1000 through All Counties endorsed Mixed.

Robert Hallock, K7TM another one who waited for them *all* and then sent for USA-CA-500 through All Counties endorsed Mixed.

Larry Taylor, AC2J (ex WB2PMO) picked up USA-CA-3000 endorsed All S.S.B. By the time you read this, Larry will probably have them *all*.

"Steady" Lidell, W2MEI acquired USA-CA-3000 endorsed All 2 × C.W.

Dave Allen, WA2JFL qualified for USA-CA-1500 and 2000 endorsed All S.S.B.

Sus Musashi, WB9BGJ applied for USA-CA-500 through 2000 endorsed All 2 × S.S.B.

Richard Goodall, G2AFQ gained USA-CA-500 through USA-CA-1500 endorsed All S.S.B, All Mobiles; and USA-CA-2000 endorsed All S.S.B. Obviously he had a fine time in the USA.

USA-CA-500 Certificates, endorsed All C.W., went to:

Armas Hakkanen, OH2NQ.
John Fraser, GM4DKO, this #2 certificate to Scotland.
Josef Motycka, OK1-11861.

USA-CA-500 Certificates, endorsed Mixed, went to:

Goran Ostman, SM4DHF.
William Hudzik, WA2UDT.
Harry Lersner, N2AWM (ex WB2FZE).

Lew Milligan, WA4OIB made USA-CA-500 endorsed All 2 × S.S.B.

Awards

Five-Five Thousand DX Award: Sponsored by the North Florida Radio Society and is available to any U.S. or Canadian station who logs five or more QSOs with the same DX station who is more than 5,000 miles away. Contest QSOs do not count, but there is no time limit, and mixed modes and

From the MARAC Convention, Atlanta, July 6-8, 1979.
Here are 30 of the 159 people who attended.
These are USA-CA Holders- Left to Right
1st Row: W5FS, W4HA, W4IZR, WAØYJL, W4OWY, W9GBI, K9DZG, K9DCJ, K2PBU.
2nd Row: K4IUO, W9CNG, WN5MBS, WA5YSC, N7TT, W9GBI, KØAYO, KB4IF.
3rd Row: WB9DCZ, AD8W, WØKMH, N4PN, WAØWOB, W6CCM, K1KPS, W4SSU, WØBK.
4th Row: W4MNZ, WA9OBR, K1UNN. 5th Row: W9ZD with beer can.
(Thanks to W4OWY for photo.)

bands are allowed. Skeds are also permissible. The Award is meant to recognize international friendships, and certificates are issued to both the stateside (or Canadian) applicant and their DX friend.

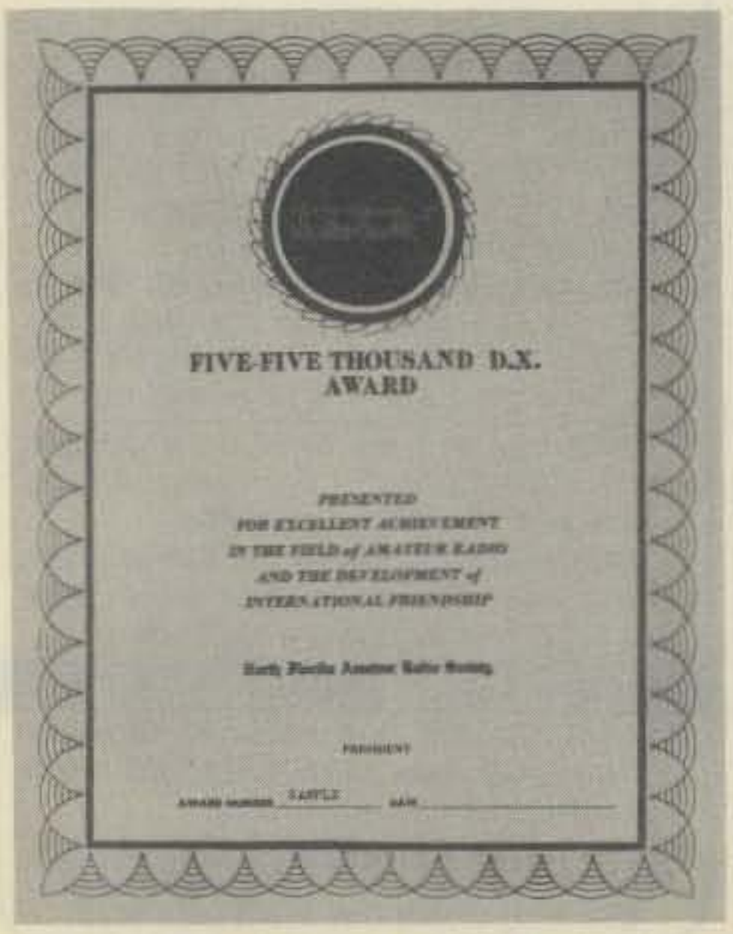
The cost of the award is $2.00 and this includes both certificates sent airmail unfolded in a 9 by 12 envelope to the DX station.

Send log information to: Dale Mann, N4AWI, 5433 Glorianne Cir., Jacksonville, Florida 32207. Be sure to include your name, QTH and names, QTHes and callsigns of the DX stations.

The NOFARS still sponsors the Wacky-Wing Dinger certificate and the new custodian for this is: Bill Barfield, KA4FYC, 4704 Princess Lane, Jacksonville, Florida 32210.

The Law West Of The Pecos Fun DX-pedition: Amateur operators worldwide again are being offered the rare opportunity of working a true, 19th-century Texas cowtown in a special, 24 hour fun DXpedition.

This year's target is Langtry, home of the infamous Judge Roy Bean, "The Law West of the Pecos".



Five-Five Thousand DX Award.

Taroh Yagi, JH1WIX, uses this FB Antenna which overshadows the neighborhood. He has #1 USA-CA-1000 to Japan.

A group of San Antonio-area amateurs - which put Luckenbach, Texas (population 3) on the air in May 1979 for more than 2,200 contacts in the first in this series of annual outings - will be on the air April 19 and 20, 1980, not far from the famous Jersey Lilly Saloon, where Judge Bean served drinks and dispensed his own brand of frontier justice in the 1980s, backed up by a six-shooter.

Call of the DXpedition will be W5TEX. Hours of operation will be from 1800 GMT Saturday to 1800 GMT Sunday. Frequencies and modes of operation will be: 7235 kHz s.s.b.; 14285 kHz s.s.b.; 21110 kHz c.w.; 21360 kHz s.s.b. - all plus or minus 5 kHz.

Some two dozen operators will man W5TEX during the 24 hour period. Antennas are being furnished by Wilson Systems Inc.

Specially printed certificates again will be sent to those stations sending QSL cards - and an s.a.s.e. or IRCs- to: Law West of the Pecos DXpedition, 2618 Rigsby Avenue, San Antonio, Texas 78222.

Langtry (population 150) is on the Rio Grande west of the border city of Del Rio. Judge Bean's combination courtroom and saloon and other buildings of the era have been preserved in much the same way as they were when he ruled the area.

This DXpedition of amateur operators will be the first known invasion of Langtry since it was a dusty way-station between New Orleans and San Francisco.

Japan Amateur Radio League (JARL): They have a fine Awards program and if you cannot wait until next month for more details, send request for data and a couple of IRCs to: Awards Manager, JARL, P. O. Box 377, Tokyo Central, Japan.

Reseau Des Emetteurs Francais (REF): Also have a fine Awards Program and if you cannot wait until next month for more details, send request for data and and IRC or two to: REF Secretary, Square Trudaine 2, 75009 Paris France.

Notes

Sad to report the loss of two more County Hunters:

Roy C Needham, ZL1KG, All Counties-#52, 3-3-71 the #1 to a station outside the U.S. 48. I had the pleasure of meeting Roy and XYL in 1971 when they visited the U.S.

Loren M. Tate, W0RP (ex-W0BHC), All Counties-#249, 9-17-79. Again thanks to Mary for sending along the data for his Story.

Also sorry to report that the *POD 26* is no more. The Postal Department has combined POD 26 and POD 65 and come up with *Stock* #030-000-00261-2, an 1851 page Publication 65 at a cost of $7.50. The reason I am sorry is because the cost has gone so high and we County Hunters are only interested in pages 1637 through 1744. These are obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

How was your month? 72. Ed., W2GT

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

Mind Boggling!!!!

Thats the only phrase to describe the potential effect of 3 new amateur bands on the world's top DX award's program.

The greatest impact will be on Five Band WAZ. Fortunately this award is still in it's infancy and we have the flexibility to make necessary changes without traumatic aftershocks. Our New York staff has already designed a beautiful certificate for those Five Band WAZ winners who cannot afford to opt for a plaque. Thanks to their foresight this certificate will permit the addition of up to 3 additional bands without adverse esthetic consequences. If anything, the appearance of the certificate may improve as new bands are added. (Note: *CQ* will furnish plaques in addition to certificates to the first five winners of Five Band WAZ. After that, certificates will be issued to all winners. Those recipients wishing plaques commemorating this achievement can obtain them through *CQ* at a cost of $30.00 each US.)

Single Band WAZ should receive a boost as we anticipate interesting races for certificate number one on 30 meters (10.1-10.15 MHz), 17 meters (18.068-18.168 MHz) and 12 meters (24.890-24.990 MHz). It is our thought at this time that the magazine will provide plaques for the first c.w. and phone (s.s.b.) winners on each of these bands. Starting times will be announced at an appropriate future date. It appears that 30 meters may be open to amateur operation by Jan. 1, 1982, but we will probably not have access to 17 and 12 meters until much later.

Unless we make some restrictions, it will be just a tad easier to earn a regular WAZ as more frequencies will be available for the task. This will be much more significant during sunspot minimums than at the present time when 10 meters is providing easy contacts with most all zones.

WPX may also come slightly easier during sunspot minimums for the same reasons, but the earliest effect to be experienced by prefix chasers will be the possibility of 3 new band endorsement stickers for your c.w., s.s.b. and mixed WPX certificates.

Country chasers will be happy to have the new bands, particularly when 10 meters closes up again. However, *CQ* does not have a five band country award for those in the CQ C.W. or CQ S.S.B. DX Award programs so the effect will be less dramatic.

Equally mind-boggling are the potential effects on the world DX championships conducted by *CQ* each autumn. Frank Anzalone's column will cover the possibilities at the proper time.

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

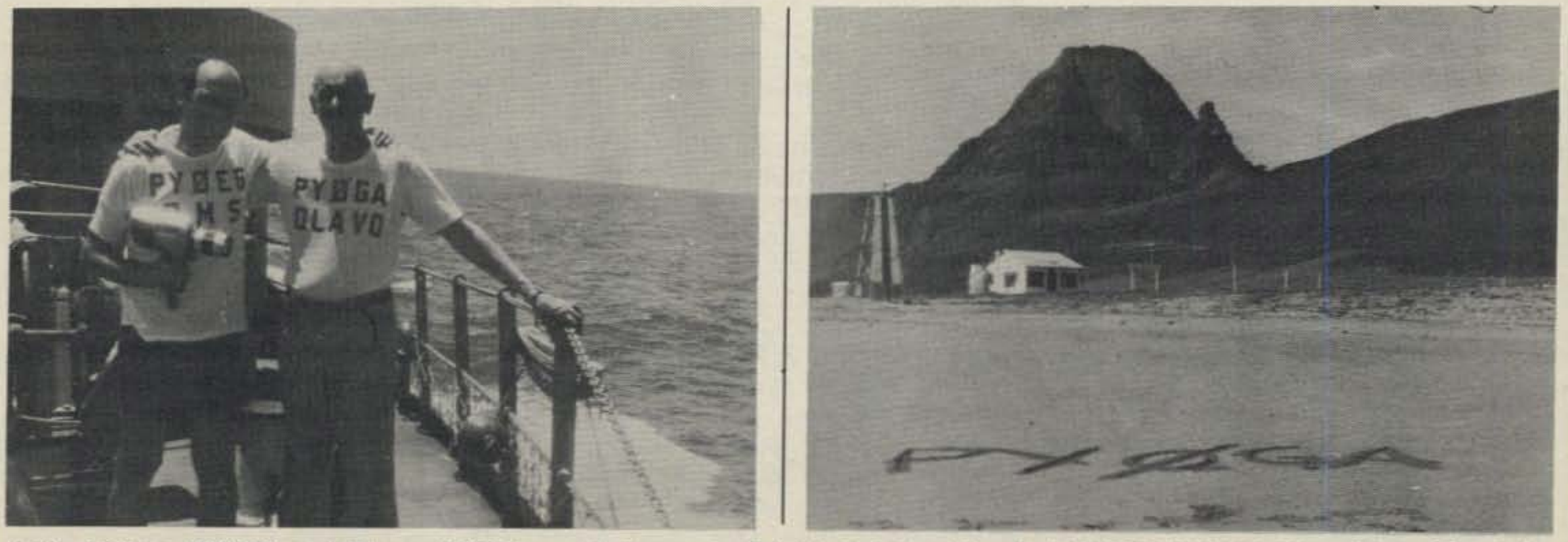
The Northern California DX Foundation (NCDXF)

The Northern California DX Foundation is probably the leading organization today in support of DXpeditions and operations from rare locations. It was organized in 1972 by Vince Chinn, K6KQN, and other outstanding DXers in the San Francisco Bay area. It's primary purpose is to encourage 2-way communications with rare countries, counties, v.h.f. locations or other spots of unusual interest. Under the direction of a 10 man Board of Trustees, the Foundation provides funds, equipment and QSL cards for special events. Some DXpeditions assisted during the 1970's include:

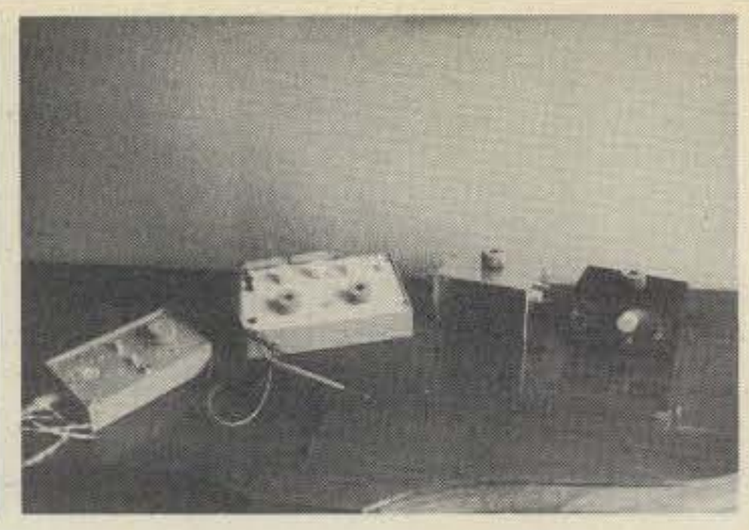
1974: VR3AG (Fanning), KP6KR (Kingman), OH2BH/OJ0 (Market), XU1AA (Cambodia), KP6PA (Palmyra) and W6WX/KJ6 (Johnston).

1975: CR9AK (Macao), 3B8DA (Mauritius), JY8DH (Jordan), CT9AT (Madeira), C5AZ (Gambia), KC4NI (Navassa), OH0AM and H0DX (Aland), SV1GA/A (Mt. Athos), and HB0BZD (Liechtenstein).

1976: A35NN (Tonga), 9N1MM/7 (Nepal), ST2SA (Sudan), ST2SA/ST0 (So. Sudan), ZK2AQ (Niue), HK0AA (Serrana Bank), TA7ABK (Turkey), YM0 (Geyser), VK9XX (Christmas), HK0AA (Bajo Nuevo), plus moonbounce expeditions and provision of a receiver to



Left, Atilano, PY5EG and Olavo, PY5GA, on their way to Trinidade Island for their PY0EG/PY0GA DXpedition. The right hand photo shows their QTH on the island with the 3-element tribander in the foreground. Their rig was an Atlas 350XL.



Here is Giulio Nardone, I0LL, the Chairman of Radio Club Ciechi d'Italia (The Italian Radio Club for blind amateurs). On the left, Giulio demonstrates some of the equipment built by the club that is used by blind amateurs. On the right are sound-tactile instruments built by the club. On the far left is a device designed to convert the reading of a moving-coil volt meter into sound-tactile information. Next is a multi-tester used to measure d.c. and a.c. plus d.c. current and resistance. The last two items are an h.f. and v.h.f. s.w.r. meter which can be used to tune up a transmitter.

a boy with a terminal illness.

1977: KP6BD (Kingman), 3B8DT (Mauritius), SU1IM/SU1MI (Egypt), KP6AL (Palmyra), VP8ON (Falklands) and 4U1UN (United Nations, N.Y.)

1978: PY0RO (St. Peter & Paul), ZL1BKL (Kermadec), K5YY/FH8 (Mayotte), D68AF (Comoros), FH8CY (Mayotte), YI1BGD (Iraq), VK9YS (Cocos-Keeling), ST0YY (Sudan), N0TG/W0RJU/KP1 (Navassa), K5YY/ST2 (Sudan), FO0XA (Clipperton), CE0AE (Easter) and LA1VC (Bouvet).

1979: KP4AM/D (Desecheo), VR6HI (Pitcairn), 1S1DX (Spratley), VS5OO (Brunei), OE6XG/A (Abu Ail), WA6EWI/TI9 (Cocos) and ZL1ADI/AMO (Manihiki).

NCDXF member equpment now on loan includes a KWM-2 in OH0-land, a Swan 500 at SU1IM, and FT-101 at FH8 and a Collins linear at CE0AE. QSL cards for the 1979 Desecheo DXpedition, KP4AM/D, cost $65.00/thousand and were bought in lots of 20,000, so it is expensive even when the only support provided is QSL cards. Perhaps your own DX club could consider a yearly donation to NCDXF from club funds.

The foundation is classed as a private operating foundation, and qualifies as a deductible contribution under IRS Code 501(c)(3). All interested parties are invited to join. A donation of at least $5.00 gets you a certificate and a receipt. There are no yearly dues or demands.

Applications to the NCDXF for assistance must come directly from the person or group involved and must be processed through P.O. Box 717, Oakland, CA 94604. Allow plenty of time as each request must be evaluated by all ten Trustees. Equipment donations are encouraged, providing the equipment donated is in good repair and trouble free.

The present members of the Board are:
Jack Troster, W6ISQ, President
Bob Ferrero, W6RJ, Vice President
Vincent M. Chinn, K6KQN, Treasurer
Merle B. Parten, K6DC, Secretary
Don L. Schliesser, K6RV
Hugh Cassidy, WA6AUD
Dr. Jim Maxwell, W6CF
Clayton (Bud) Bane, W6WB
Dr. Stan Kaisel, K6UD
Ernest Zumbrunnen, WB6UOM

Here and There

Congratulations - To Miika, OH2BAD, on his marriage, Dec. 26, 1979 to Raili Nieminen, sister of OH1QP and OH1XX.

Condolences - To the family of Takeo Hama, JA8AA, one of Asia's best known DXers who passed away on Dec. 15, 1979. Takeo was active until near the end using his favorite key from his hospital bed. Tks JA8KB.

Doc Rosen, WA2RAU - Writes that he strongly supports giving DXCC credit to a DXpedition operator for a very rare country in which he operates. He would limit this to the rarest of the rare such as BY, ZA, 8Z4, etc. If you agree please advise the ARRL DX Advisory Committee through Don, W3AZD.

QRZ DX - Is the name of an excellent new weekly DX bulletin launched by Bill Kennamer, K5FUV. For further information drop a line to P.O. Box 494, Howe, TX 75059.

1980 Officers - For the Western Washington DX Club are W7YOZ, Pres.; WA7GRE, V. Pres.; N7CY, Sec.; K7YDO, Treas.; and W7OYO and WB7WEI, Trustees, and for the North Florida Amateur Radio Society are WD4ETG, Pres.; WA4SGF, V. Pres.; WD4IGP, Sec.; WD4KKF, Treas.; N4BZH, Activities Mgr.; and N4UF, Director.

EA1JC - Is King Juan Carlos of Spain. He has been heard recently on 20 meter s.s.b.

Jack, N1DX, and Bruce, K0BJ - Completed their 10-month DXpedition on the *Yankee Trader* in December. QSLs now go to N1DX for the following calls: N1DX/HC2, VR6DX, N1DX/CE0, N1DX/AH8, 5W1BX, N1DX/H44, YJ8DX ZD7DX and KA6DX.

Agalega - 3B6CD should be on the island through most of 1980.

Mali - TZ4AQS(PE1AQS) will be in TZ-land for 2 years. His favorite frequencies include 14195, 14210, 14270 and 21270. QSL to ON6BC.

Marion Island - The Marion 36 scientific team will be there through April and into early May. If you haven't

The WAZ Program

10 Meter Phone

32...JG1FJT
33...OZ5EV
34...JA2MTM
35...JA2OTP

15 Meter Phone

36...W8CY
37...JH4PBM
38...WB0PLY
39...JK1GOO
40...W8RSW
41...JH2CJW

20 Meter Phone

273...I8UDB
274...HI8LC
275...WB0HAD
276...I8SAT
277...I6ZJC
278...KL7JCC

20 Meter C.W.

92...JH7BDS
93...N8CC

All Band Worked All Zones S.S.B.

1799...K1KTB
1800...VE1BNN
1801...KA1BU
1802...K3RX
1803...WB4UBD
1804...JA7RPC
1805...W4TAC
1806...IV3TQE
1807...I8XTX
1808...DJ7XB
1809...F6DUK
1810...WB5TED
1811...L8KCI
1812...EL3A
1813...9H1FN
1814...SV1W
1815...JH6NUR
1816...WB8WZS
1817...KL7JHI
1818...W9DOR
1819...N1ACW

C.W. and Phone

4696...JA2HMF
4697...KL7JAI
4698...K7SZN
4699...I1ZEW
4700...K4IPS
4701...WD9IIC
4702...FC2CH
4703...JI1DCW
4704...JA5MG
4705...K1VHS
4706...JA5NG
4707...DL9GH
4708...DJ5XO
4709...DJ4KF
4710...DF4FO
4711...9H1ED
4712...JH2SUV
4713...OH3SG
4714...YU3YUQ
4715...K8RWL

The complete rules for WAZ can be found in the January 1980 issue of *C.Q.* Magazine. Application blanks and reprints of the rules may be obtained by sending a self addressed stamped envelope, size 4½ x 9½ to the WAZ Manager, Leo Haijsman, W4KA, 1044 S.E. 43rd Street, Cape Coral, Florida, 33904. Applicants forwarding QSL cards direct to the WAZ Manager or to a check point should include sufficient postage for the safe return of their QSL cards. Please note that effective June 1, 1979 the processing fee for all *C.Q.* certificates was raised to $5.00. This fee must accompany all applications.

The WPX Program

Mixed

802...DL8IH
803...PA2TMS
804...WD9AHJ
805...WD0EPE

S.S.B.

1221...PT7TP
1222...VK5RD
1223...I8XTX
1224...OE8PSK
1225...EA6ET
1226...N8AGY
1227...JH0HWP

C.W.

1904...N0BGI
1905...K4IPS
1906...WB2IHN
1907...I3SYA
1908...AG5C
1909...WD8KGZ

WPNX

166...WH2AAF
167...KA7EOG

VPX

178...OE1-109976
179...DL-H20/1490960
180...DL-P42/1647130
181...JA1-20784

CQ WPX Award Of Excellence

WA2AUB

Endorsements

Mixed: 400 WD9AHJ. 450 DL8IH, WB8YQX. 500 WD4IHV. 550 JA7FFN/1. 750 DJ8WD. 800 PA2TMS, IT9LMK. 850 K8CH. 900 WA4QMQ. 950 W9KB. 1050 JH1VRQ, IN3ANE. 1100 N6FX, SP9AI. 1300 N4NO. 1350 YU1AG. 1800 YU2DX.

S.S.B.: 300 PT7TP, 18XTX, OE8PSK, N8AGY, JH0HWP. 350 VK5RD, W0ULU. 400 WB8YQX. 450 EA6ET. 500 EA3KW. 550 YS1JWD, EP2TY. 600 SP5BB. 650 I6ZJC, K8LJG, VK3SM. 800 YU1AG. 850 N4NO. 1450 K2POA.

C.W.: 300 N0BGI, K4IPS, WB2IHN, I3SYA, AG5C, WD8KGZ. 350 IT9VDQ. 450 N1RI. 550 HI8LC, SP6FER. 600 G3FVC. 650 I2BVS. 750 W1WLW, SM6BZE. 800 K9UE. 1100 N4NO.

10 meters: W4BQY.
40 meters: SP6FER.
Africa: W2NC, W2HAZ.
Asia: W4BQY, YS1JWD, HI8LC, SP5BB.
Europe: HI8LC.
No. America: HI8LC.
Oceania: HI8LC.
So. America: HI8LC.

Complete rules and applications 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.

worked ZS2MI, time is running out unless a replacement ham follows this group.

Svalbard (Spitzbergen) - JW7FD, JW1SO, JW5IJ and JW8FG should remain on the island through June. Amateur activity will decrease sharply after their departure.

Ile de Faisan's (Pheasant's Island) - Nothing new at press time. A letter had been dispatched to the ARRL DX Committee seeking a ruling on the status of this possible new amateur radio country.

Good News Contesters - In the February issue it was announced that Bernie Welch, W8IMZ, was retiring as Director of the *CQ* WPX Contests. However, he has agreed to reverse his decision and the contest this spring will again be under Bernie's able management. This is a very favorable development for contesters worldwide as the *CQ* WPX contest has become a major international event under Bernie's leadership.

New Sources - Our thanks to the following publications which provided input to this month's column: *Balanced Modulator, DX Bulletin, DXers Magazine, DX News-Sheet, DX' Press, HR Report, Long Island DX Bulletin, Long Skip,* Northern California DX Club's *DXer, QRZ DX, Southern California DX Club Bulletin* and the *Totem Tabloid.*

From the Mailbag

de Jerry, WA1ZXF: "I found your September 1979 column on QSL Managers and QSL Bureaus very interesting. I am QSL Manager for 8P6AE, J6LCT, J6LHY and KA7AXB/HC1, and the stories I could tell would fill an entire issue of *CQ*. The message just isn't getting through to the amateurs out there.

"I get about 50 cards a week, and, well, first there are the wrong dates and the wrong calls. Then, many don't even know what UTC time means, then wrong names and to add insult to injury *no SASE.* Many of these cards come from so called experienced amateurs, extra class and all that. Its odd, but I never have a problem with the DX stations. They always enclose IRC's, envelopes, the whole bit, but the U.S. amateurs don't.

"It should be stressed that QSL Managers do not get $300./week for doing the chore of sending out cards; its a labor of love. Many of the letters I

Al Leith, VE3FRA, is Editor of the Canadian DX Association (CANADX) publication "Long Skip." This bulletin has been around for many years and is the most informative monthly DX news source now available. Subscriptions are not limited to Canadians so if interested drop Al a line at 10 Fairington Crescent, St. Catharines, Ontario, Canada L2N 5W3. He can also provide QSLs for ZK2DD, ZK2DJ and ZK2YL if self-addressed envelope and IRC's are included.

receive demand to know where their card is, but an SASE, somehow that is always forgotten. Needless to say, cards without SASE, and those filled out improperly, end up in the circular file. It sounds cruel, but when you handle over 2000 cards a year you have to draw a line somewhere. Personally I pay the cost of the cards, my pleasure to do so, but if an amateur wants that card, SASE at least.

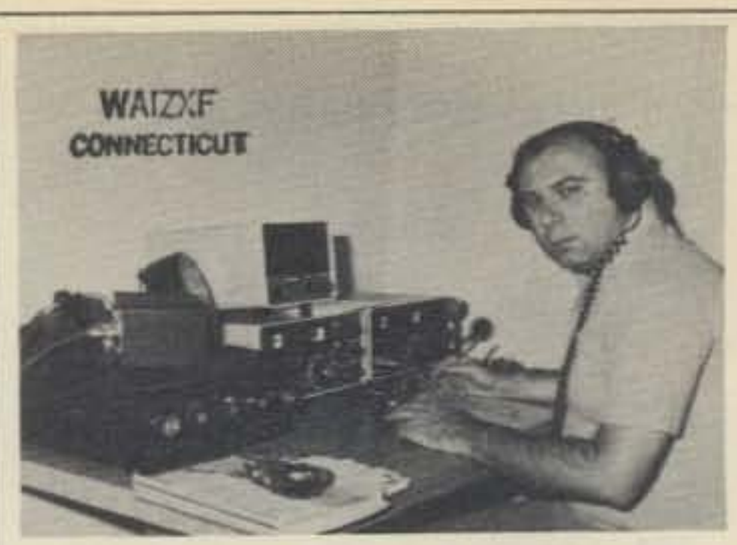
"Additional cost involves mail to the DX station, cards sent down, record keeping, correspondence, etc. I enjoy it or I wouldn't do it, but it is a responsibility. Each month when I see listings of QSL Manager volunteers I wonder if they really know what is involved.

"I agree completely that the QSL Manager is the best route for a card. I just hope the DXers are aware of the problem from the view of the QSL Manager."

QSL Information

The following are interested in becoming the QSL Manager for a DX station: Kenneth Dellinger, II., WA4WQL, Route 2, Box 69, Stevenson, VA 22656; Billy Suit, K4BUF, Rt. 1, Box 197-B3, Randleman, NC 27317.

A4XGY to K2PU
A7XA & A7XAH via DJ9ZB



Jerry Melson, WA1ZXF, of 150 Lisbon Drive, Fairfield, CT 06430, is QSL Manager for 8P6AE, J6LCT, J6LHY and KA7AXB/HC1. See his letter on QSL Managing elsewhere in this column.

AE0L/KH2 c/o K0LST
AP5HQ via N0RR
C6ACY to WB4LIP
CT4RH c/o AB1U, 85 Hacienda Circle, Plantsville, CT 06479
DU1DBT via N6ATS
EA6EU to WD5BIF
FO0DP c/o N7RO
H31LR via WB3KGY
HH2MC to WA4AKU
HK0BKX c/o WB4QFH
HL9KE via K4WSB
HL9KY to W8YGA
HL9UW c/o WA5LGR
HP1XOJ via WB3KGY
HZ1AB to K8PYD
JT1AN c/o W7PHO
JY5ZH via WB4RRJ
K1CO/PJ7 to K3RYA
K9EF/8R1 c/o K1RH
K0AX/DU2 via WB4OSN
KC6MJ to W7PHO
KH2AD c/o W6TPC
KH3BB via W7RM
KX6PP to WD4NVH
N2RM/6Y5 c/o N2MM, Eastampton Gardens F-1, Jacksonville Rd., Mt. Holly, NJ 08060

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor roll must be up-dated annually by addition to, or to confirm, present total. If no up-date, file will be placed into "inactive" until next up-date.

Mixed

1814 K6JG	1500 K2VV	1283 N6JV	1094 N6FX	900 K8LJG
1808 F9RM	1488 W4BQY	1255 N2AC	1066 WA1JMP	873 N6JM
1805 W4WV	1477 YU1BCD	1250 N6AV	1048 JH1VRQ	851 K8CH
1800 YU2DX	1462 DJ7CX	1193 WA0KDI	1023 YU1ODS	848 W6ANB
1779 K6XP	1411 K5UR	1163 YU1AG	1015 W0SFU	830 W0IUB
1610 ON4QX	1401 PA0SNG	1155 W8CNL	1010 I3ANE	811 YU3EY
1609 VE3GCO	1350 KE4I	1150 W0AUB	1008 WA2AUB	782 YU4EBL
1608 W3PVZ	1343 N6CW	1146 DL1MD	1002 PA2TMS	755 YU2CBK
1600 W2NC	1332 W9FD	1126 K5DB	1000 SM6DHU	668 N8II
1569 N4UU	1307 N9AF	1120 YU20B	938 W0SD	605 I4BFY
1536 W7LLC	1287 N4NO	1112 K6ZDL	909 PY4OD	600 12MPQ
1525 W2NUT	1286 AA4A	1109 I6SF	902 K6DT	

S.S.B.

1708 F9RM	1303 N4MM	1051 WB2NYM	908 I0MBX	805 W4BQY
1621 I0AMU	1225 ZL3NS	1050 N2SS	881 N4NO	759 ZP5RS
1606 I0ZV	1200 I4ZSQ	1017 F2MO	850 JH1VRQ	750 N2AC
1600 W4UG	1200 K2VV	1017 DL1MD	827 W2NC	722 WA2AUB
1590 K6XP	1193 PA0SNG	989 DJ7CX	825 YU1ODS	706 WA2FKF
1548 K6JG	1182 YU1BCD	957 W6RKP	822 N6FX	600 I2MQP
1452 K2POA	1181 K5UR	938 OE2EGL	821 CT1UA	
1416 I8KDB	1102 AA4A	914 W0YDB	819 YU1AG	
1400 I8YRK	1091 N4UU	909 PY3BXW	808 OZ5EV	

C.W.

1503 W8KPL	1234 W9FD	1087 W4BQY	877 I6SF	658 EA2OP
1432 ON4QX	1202 YU1BCD	1086 K5UR	802 KH6HC	650 K8LJG
1413 W2NC	1161 G2GM	1067 VO1AW	788 YU1ODS	647 W9OYZ
1382 DL1QT	1150 W3ARK	1056 WA2HZR	773 LZ1XL	628 W1WLW
1368 K6JG	1124 DJ7CX	989 K6ZDL	768 PY4OD	623 JE1JKL
1313 K6XP	1123 N4NO	955 YU1AG	756 SM0GMG	612 WA2AUB
1292 N4UU	1106 N2AC	936 IT9AGA	709 DL1MD	607 I1TLA
1251 N6JV	1100 K2VV	886 N6FX	700 JH1VRQ	

OD5FB via WA2QAU
OY9R to K2IJL
PY9CG c/o AB1U
PY9GR via WD0FNK
S2BTF to K5OA
T3PA c/o W6FBN
T4YL via K9KXA
TG9AL to K8HV
VK6HD 1979 Callbook address is reported to be incorrect. Send to M.E. Bazley, 8 James Road, Kalamunda, Western Australia 6076
VP2EEG c/o WA3HUP
VP2MBA via W7FP
VP2MEE to N8BM, 66 Randolph Rd., Rochester, MI 48063
VP2MFL c/o K5BDX
VP2MFY via W5FBM
VP2SA & VP2SX to AB1U
VP2VEQ via N6ZZ, P.O. Box 5491, Los Angeles, CA 90055
VP8QG c/o WA4JQS
VQ9PC via K9KLR, 458 W. 900 S., Hebron, IN 46341
VQ9TR to N2IT
VR6TC c/o W6HS
VU2LE via WA6OET
VU2LHO to WB2LHO
W1GNC/PJ2 c/o AB1U
W7LPF/DU2 via N2CW
WA4UAZ/HC1 to WA4QMQ
WA7JRL/SU c/o W8LZV
XT2AU via WA1ZEZ
XT2AW to KN1DPS
YB0ADI c/o WA2DWE
ZB2EO via K3MNW
ZD7HH to W4FRU
ZD8AI c/o N3WM
ZF2AD to N2ED, Box 296, RR1, Furlong, PA 18925
ZK2VE c/o W7PHO
ZS2MI via WA2IZN
ZS6BGS to WB4RIS, 8023 Galveston Ave., Jacksonville, FL 32211
3A2AH c/o N5RM
3B8DB via K5BDX
3C0AB to EA8CR
3D2ER c/o W5RBO
3D6AG via K9KXA
3D6BW to K2IJL
4Z4WE c/o W5RBO
5B4DI via K4BF
5B4EP to K2IJL
5N0DOG c/o W4FRU
7X2BK via WA3HUP
8P6MI (Feb. 25 - March 7, 1980) - to VE3JTQ, 820 Rymal Rd. E., Hamilton, Ontario L8W 1B7 Canada
9Q5DH & 9Q5WH c/o WB4CSW
9Y4FRC via K3RL, 519 E. Station Ave., Coopersburg, PA 18036
9Y4W to N2MM

The DX Quiz

Here is our second monthly DX quiz. Answers will be given in next month's DX column. Total your number answered correctly and see which of the following descriptions applies to you: 18-20 correct - On a DX Honor Roll, divorced or retired, tendency for insomnia, never made BPL; 16-17 correct - Extra Class holding original call, you read DX bulletins, work best in large crowds, despise lists; 14-15 correct - Doing OK but need a little more pizzazz in the signal, probably have a WA or WB call; 12-13 correct - You have 100 - 200 countries confirmed and are working on regular WAZ, definitely on the way up; 10-11 correct - Fair DXer but not yet one of the Deserving; 7-9 correct - 15 meter novice operator and 0-3 correct - You think DX is a disease. Who knows, maybe it is.

1.) Which of the following went on the 1977 Spratley DXpedition? a.) K4CAH b.) K1MM c.) W6KG d.) I2FGP e.) F6ARC

2.) The "Family Hour" is a DX Net operated principally by _____? a.) W4OO b.) W6AM c.) K5OVC d.) W7PHO e.) W7OK

3.) Which of the following prominent DX writers originated the Islands-On-The-Air Award (IOTA)? a.) Don Chesser b.) Geoff Watts c.) Jerry Hagen d.) Rod Newkirk e.) Gus Browning

4.) The IOTA Award is now administered in cooperation with the following organization _____. a.) CANADX b.) ARRL c.) RSGB d.) REF e.) DARC

5.) In 1979, "Slim" visited many rare countries. Which of the following calls was *NOT* used by "Slim?" a.) 8Z7T b.) 8X8AA c.) KL8AA d.)UA1AA/3W8 e.)4W2AA

6.) The first DX Editor of *CQ Magazine* was _____. a.) W6QD b.) KV4AA

Nic Prinsloo, S8AAP, has provided a Transkei contact for many lucky DX-ers. Nic uses an FT DX 400 to a dipole for 15, 20 and 40 and a ground plane on 10 meters. His address is P.O. Box 821, Umtata, Republic of Transkei, Southern Africa.

Richard Thurlow, G3WW, recently earned CQ SSTV DX Award Certificate #3 for working 100 countries on Slow Scan TV. His TV equipment includes the Robot 70a, 80a and 61,400 plus a WB9LVI s/f and W3LY f/s converter with Pye and Sony cameras.

c.) W2NSD d.) W2DEC e.) K4IIF

7.) Which famous QSL Manager was recently inducted into the DX Hall of Fame? a.) DJ9ZB b.) WA3HUP c.) W4KA d.) W3HNK e.) W5MYA

8.) The following station is in Zone 18. _____. a.) UA9ALK b.) UA0ALK c.) UH8DM d.) UK6AAD e.) UA0YT

9.) Which of the following countries does *NOT* border on OE, Austria? a.) OK, Czechoslovakia b.) DM/YZ, E. Germany c.) HB0, Liechtenstein d.) HB9, Switzerland e.) YU, Yugoslavia

10.) How many DXCC/CQ DX Award countries use the VP8 prefix? a.) 2 b.) 3 c.) 4 d.) 5 e.) 6

11.) What is the special callsign of the Italian Blind Radio Club? _____

12.) Name the new prefix for VR3, Christmas Island _____.

13.) List at least 3 prefixes in areas surrounded by ZS, South Africa _____.

14.) Which country has permitted its amateurs to use the prefix ED8?

15.) The stateside QSL Manager for 8Z4A is _____.

16.) In which DXCC/CQ DX Award country is R6F located?

17.) How many prefixes can be listed on one CQ 1051 WPX application form? _____.

18.) The new prefix for KW6, Wake Island is _____.

19.) Name 3 DXCC/CQ DX Award countries all or partially located in Zone 23 _____.

20.) John Devoldere was the first winner of the 5-Band WAZ award. What is his callsign?

CQ DX Awards Program

S.S.B.

792 . . . . . JA7BJS
793 . . . . . K8RD
794 . . . . . I8INW
795 . . . . . N8AGY
796 . . . . . WA6OUA
797 . . . . . W6TPC
798 . . . . . WD9IIC
799 . . . . . VE3KQS
800 . . . . . WD4GCE
801 . . . . . HK3DDD
802 . . . . . HK3AXT

C.W.

408 . . . . . WA8KEM
409 . . . . . K7EC
410 . . . . . WD9IIC

S.S.B. Endorsements

310 . . . . . I0ZV/317
310 . . . . . SM6CWK/316
310 . . . . . DJ9ZB/311
300 . . . . . I3LLD/304
275 . . . . . N6AW/297
250 . . . . . K8RD/270
250 . . . . . AI8S/258
250 . . . . . JA7BJS/257
28 MHz KB8JF
250 . . . . . 9G1JU/252
200 . . . . . 9G1JI/203
200 . . . . . WB0SNG/200
200 . . . . . HK3DDD/200
150 . . . . . W6TPC/175
150 . . . . . HK3AXT/170
150 . . . . . I8INW/160
150 . . . . . WB0LXM/150

C.W. Endorsements

300 . . . . . K4CEB/303

For more information on the CQ DX Awards Program, send a business size, No. 10, SASE to CQ DX Awards; 911 Rio St. Johns Dr.; Jacksonville, Fla. 32211 U.S.A.

Answers To Last Month's DX Quiz

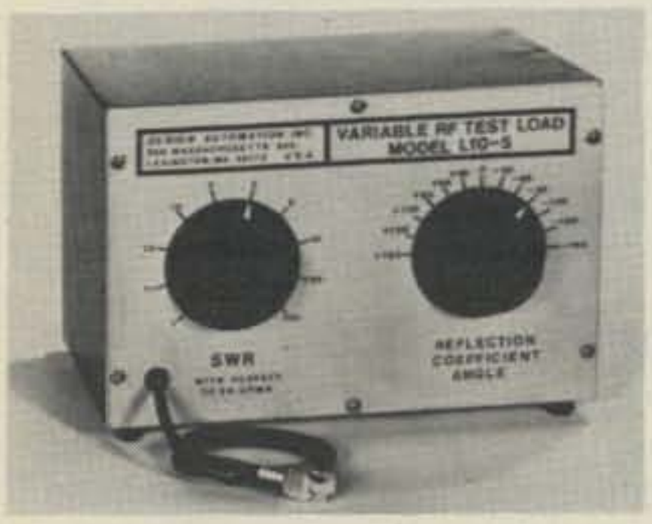
1. Gus Browning, W4BPD
2. VP2VB
3. Hugh Cassidy, WA6AUD
4. Nepal, 9N1MM
5. John Devoldere, ON4UN
6. ZP, Paraguay
7. J7
8. Yes
9. 15 of the following: C6, CM/CO, FG7, FM7, FS7, HH2, HI, HK0, J3, J6, J7, KC4, KG4, KP2, KP4, KV4, PJ6, PJ7, PJ8, VP2, VP5, YV0, ZF, 6Y5, 8L2 & 8P6.
10. UA0
11. Five zones
12. 300 prefixes
13. Either zone 29 or zone 31, there are 2 Christmas Islands.
14. Yes, RA0
15. KC4AAA at south pole
16. False
17. British Virgin Islands
18. Navassa Island & Antarctica
19. Saudi Arabia/Iraq Neutral Zone
20. Wake Island, Wallis Island and the Eastern Caroline Islands

73, John, K4IIF

CQ Showcase

Variable Test Load

A new, variable test load for r.f. power amplifiers and radio transmitters has been introduced by Design Automation, Inc. The Model L10-5 is a 10.5 MHz variable test load that lets you determine if an r.f. power amplifier or radio transmitter can withstand arbitrary mismatched output loads without damage or spurious oscillation. Other standard test loads from 1 to 100 MHz are also offered.



With a 50 ohm nominal transmission-line impedance, the Design Automation Model L10-5 provides 10 switch-selected values of s.w.r. from unity to infinity (greater than 40), and continuously variable coverage of all 360° of reflection coefficient. Depending on s.w.r. value, the test load can dissipate 5 to 20 watts. Model L10-5 is priced at $285. For more information, contact Design Automation, Inc., 809 Massachusetts Ave., Lexington, MA 02173, or circle number 6 on the reader service card.

Amateur Greeting Cards

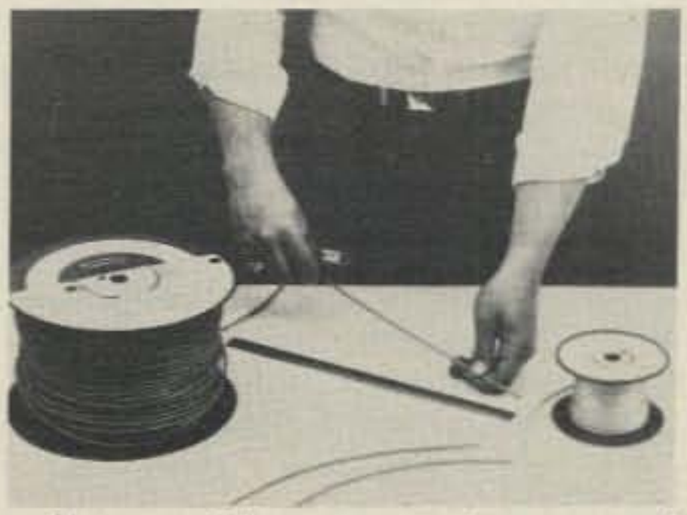
Hundreds of thousands of amateur radio operators have exchanged special ham greetings via QSL cards. Now, there are new amateur greeting cards available for special, more personal occasions like birthdays, congratulations for conquering the license exams, etc. These cards more closely resemble the greeting cards found in a typical card shop, except for one striking difference—these cards are made specifically by amateur operators, for amateur operators.

Subject matter for the cards covers a variety of topics, with most cards designed for new license congratulations and gifts of any kind.

They are available for $3.95 for an assorted set of six (including envelopes) from Better Life Products, 421 N. Pleasant Hill Blvd., Des Moines, Iowa 50317. For more information, circle number 7 on the reader service card.

"Lossyline" Flexible Filter Wire

CAPCON'S "LOSSYLINE" flexible filter wire and cable is a new concept in e.m.i./r.f.i. suppression for high-frequency and microwave applications. The filters are engineered for the suppression of noise and e.m.i. in the various applications caused by radio-frequency interference, harmonics, resonance, intercoupling, unwanted oscillation, thermal noise, uneven cathode emission and spurious energy.



It provides a unique and economical approach to e.m.i. suppression. Unwanted radio-frequency energy is forced into the "LOSSYLINE" material where it is absorbed and dissipated, thus eliminating mismatch, reflections, high v.s.w.r., and the need for grounding. In most applications two to five inches of the flexible filter provides more than the required attenuation. The short length, small diameter and high flexibility permit easy installation and eliminate the need for special fittings, connectors and housings. This wire and cable is sold by the foot, with prices starting at one dollar per foot. For more information, contact CAPCON, Inc., 147 West 25th Street, New York, NY 10001, or circle number 8 on the reader service card.

Amateur Radio Receiver With CW Transmitter

Heath's new HX-1681 c.w. transmitter combines solid-state technology with vacuum tube finals to give a transmitter said to be capable of 100 watts minimum output on 80 through 15 meters, and 75 watts out on 10. It features full break-in c.w. operation (QSK), built-in v.f.o., solid-state TR switching, sidetone output with adjustable tone and level and receiver muting. Keying is provided for the addition of an external power amplifier.

The matching solid-state HR-1680 receiver covers the 80 through 10 meter amateur bands, plus the lower 1 MHz of the 10 meter band. It is said to feature a preselector-tuned dual-conversion front end for .05 uV sensitivity. Also featured are solid-state diode band-switching, built-in 100 kHz calibrator and switchable wide/narrow active audio circuitry for s.s.b. or c.w. operation.

Both transmitter and receiver are offered in kit form, and include instruction manuals. The transmitter sells for $239.95 (requires separate power supply) and the receiver is priced at $209.95, both f.o.b. Benton Harbor, Michigan. For more information, write for the latest free Heathkit Catalog at: Heath Company, Department 570-260, Benton Harbor, MI 49022, or circle number 85 on the reader service card.

QSL Card Organizer

A specially designed QSL Card Organizer is now available from Mil Industries. The QSL Organizer contains heavy duty plastic pages with roomy 4" × 6" slip-in pockets. Each page holds 6 QSL's (back to back), enhancing their appearance by its crystal clear clarity. The slip-in pockets allow cards to be arranged or re-arranged quickly and easily.

The QSL Organizer Album is specially designed to hold the slip-in pocket pages. It's a 9" × 14" three-ring binder, padded in long-lasting 'Brown-Hide' vinyl, with gold printed inscription on cover and spine.

The clear vinyl-pocketed pages are sold for $.47 each with a 40 page minimum. The QSL Organizer Album is included free with every 40 pages ordered. Larger quantity prices are available on request. The QSL Organizer comes with a full money back guarantee. For more information, contact Mil Industries, P.O. Box 44457, Panorama City, CA 91402, or circle number 84 on the reader service card.

Curtis Keyer Add-On

An add-on accessory provides both random code practice and message storage for the Curtis Electro Devices EK-480 series. Called the IM-480, this device will automatically send Morse code in random groups at speeds from 6 to 50 wpm. And it allows variable extra spacing between letters and groups to allow slow speed copy with letters being formed at higher speed. This feature enhances learning in the 6-10 wpm beginners range. A meter display of code speed allows accurate speed settings.

The IM-480 also includes a message memory function yielding four messages of approximately 32 characters each with an automatic repeat function. The messages are programmable from the paddle key on an asynchronous basis.

The IM-480 is the same size as the EK-480 (7" x 4½" x 2½") and the two units attach via a short length of 14 pin DIP plug terminated ribbon cable. Use of the Curtis 8046 and 8047 LSI IC's allows the compact packaging. The IM-480 is priced at $179.95. A code practice function only model, called the I-480 (InstructoMate) is available at $124.95. Similarly, the M-480 (MessageMate) containing only the message storage function, is available at $124.95.

For further information, contact Curtis Electro Devices, Inc., Box 4090, Mountain View, CA 94040, or circle number 79 on the reader service card.

Mobile Rapid Charger

With the current trend towards using hand held transceivers for mobile operation, keeping the hand held batteries charged has become a problem. DebTed Engineering has solved this problem with a new line of 12 volt operated rapid chargers for amateur and commercial use, available exclusively through Debco Electronics.

The rapid charger units are equipped with a cigarette lighter plug on the input side and the appropriate charging plug on the output side. Models currently available for the Temp S1, Wilson Mark II and Wilson Mark IV with direct plug-in capabilities. Models also available for other manufacturers.

The charger will rapidly charge a fully discharged good battery in 4-6 hours and may be used during transmit, receive and off periods. It will not damage batteries if left connected for prolonged periods of time due to automatic shut-off circuitry. Cord lengths will allow convenient use of radio while charging. Further applications include rapid charging in motor homes and during emergencies from 12 volt power supplies.

The unit is $29.95. For more information, contact Debco Electronics, P.O. Box 9169, Cincinnati, OH 45209, or circle number 82 on the reader service card.

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

I was somewhat concerned about the low number of contest activities for this month. However checking last year's Calendar for the month of April I found that four activities usually scheduled in April had moved to earlier dates, and three have not been heard from.

Again I must remind you contest managers that I must have your material at least three months before the date of your activity if it is to appear in the issue of that month. The 10th of the month is the absolute deadline.

The WPX S.S.B. results story in the February issue indicated that W8IMZ our WPX Contest Director was calling it quits after more than 10 years of dedicated service. However as you read Zero Bias in this issue you will see that Bernie has reconsidered and will continue to handle the contest. This indeed is good news for now we know that it will be administrated in the same professional manner it has been handled in the past.

Bernie has again been appointed Moderator of this year's Contest Forum at the Dayton Hamvention so his work load will be tremendous. To ease this burden we have persuaded Bob Cox, K3EST to handle the C.W. section of the WPX Contest. Bob is an old hand with contest matters also being one of the Directors of the World Wide classic, so he is well qualified to handle the job. He will have his hands full but being a member of the contest oriented PVRC he should have no trouble organizing a working group.

Trophies and Plaques

CQ Contests have always had a wide selection of Trophies and Plaques thanks to the generous donations by contest minded clubs, individuals and memorials. The photo of the scene at last year's Dayton affair shown in the WPX results will prove our point. Hopefully this scene will again be repeated later this month. (Why is it that I always end up holding my empty hands while the other guys take home the goodies?)

73 for now, Frank, W1WY

**14 Sherwood Road, Stamford, CT 06905*

Calendar of Events

Apr. 5-6	Polish "SP" C.W. Contest
Apr. 5-7	ARCI QRP QSO Party
Apr. 8-9	DXYL To N.A. YL Phone
Apr. 12-13	County Hunters S.S.B. Contest
Apr. 15-16	DX YL To N.A. YL C.W.
*April 19-20	ISSB Phone QSO Party
Apr. 19-20	Polish "SP" S.S.B. Contest
Apr. 26-27	Swiss "H 26" Contest
May 17-18	Florida QSO Party
May 24-25	**CQ WW WPX C.W. Contest**

* Covered last month

Polish "SP" DX Contest

C.W.: April 5-6 S.S.B.: April 19-20
Starts: 1500 GMT Saturday
Ends: 2400 GMT Sunday

The SP DX Contest is now a two week affair, c.w. and phone, each independent of the other.

There are three catagories, single operator, single band and all band, and multi-operator, single transmitter, all band only. Also s.w.l.

Exchange: RS(T) plus a 3 figure QSO number starting with 001 for foreign stations. Polish stations will send RS(T) and their province. (Wojewodztwo) i.e. 579KA or 57KA.

Scoring: Each QSO with an SP/SQ/3Z station on each band is worth 3 points.

Multiplier: Each different province (WOJ) worked. Counted once only. (max. of 49)

Final Score: Total QSO points multiplied by number of provinces. The same station may be worked on each band for QSO points but not for a multiplier.

Awards: Certificates to the top scoring stations in each category and each mode. In each continent, each country and each call area of Australia, Canada, Japan, USA and USSR.

S.w.l. entries must report the call of the Polish station as well as the call of the station being worked. Scoring same as above.

Contest contacts may be credited for the PZK awards in lieu of QSL cards, providing an application is made and the contact is logged by the SP station.

A summary sheet is requested showing the scoring, a signed declaration and your name and address in Block Letters.

Entries must be postmarked no later than April 30th for c.w. and May 15th for phone. They go to: PZK Contest Committee, P.O. Box 320, 00-950 Warszawa, Poland.

ARCI QRP QSO Party

Starts: 2000 GMT Saturday, April 5
Ends: 0200 GMT Monday, April 7

This is the Spring edition of this QRP activity sponsored by the QRP Amateur Radio Club International. It is open to both members and non-members.

Exchange: RS(T), state, province or country and QRP number for members. Non-members will send their power input.

Scoring: Contacts with a member 3 points, non-members 2 points, stations other than W/VE 4 points. The same station may be worked on each band for QSO and multiplier credit.

There is also a power multiplier as follows:

Over 100 watts input - 1.
25 to 100 watts input - 1.5.
5 to 25 watts input - 2.

continued on p. 94

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To complement the exceptionally wide dynamic range front end.

MIC Gain
Also sets CW for tuning power output (even to QRP levels)

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"Variable Rate Scanning" allows you to tune up or down at any rate with only a "twist of the wrist!" No more knob cranking to get from here to there. VRS™ does all the work for you with no effort, and incredible precision!

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In high intensity orange with non-glare smoke filter for superb day or night visibility without eye fatigue. During synthesizer lock-up, audio is muted and a full series of decimals appear.

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Selects full primary "HAM" bands (all of ten meters) PLUS the extended ranges detailed in the specifications. A unique feature remembers the last tuned frequency on every band. For example if one operated 7141.2 MHz and switched to 20 meters, when switched back to 40M, you would still be tuned to 7141.2 Hz.

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To provide full or semi-break in, noise blanker, on-off, VOX or PTT and a standby position to remember the LAST TUNED FREQUENCY on each band with only milliamps of power drain.

Dual Scale Meter
Calibrated in watts for true PEP output, and "S" units in receive (60 db over S-9)

Provides for continuous coverage between 100 Hz steps for critical frequency setting.

RIT Control
provides approximately ± 500 Hz tuning independent of transmitter frequency

Mode Select
Gives you USB, LSB, CW normal filter AND a narrow XTAL filter for optimum CW performance — standard!

Tuning Mic
Allows the operator to change frequency up or down in PRECISE 100 Hz steps, independent of VRS™ Constant pressure allows frequency scanning at a fixed rate.

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CIRCLE 57 ON READER SERVICE CARD

1 to 5 watts input - 3.
Less that one watt - 5.

Final Score: Total QSO points × (state + provinces + countries per band) × power multiplier.

Frequencies: C.W. - 1810, 3560, 7060, 14060, 21060, 28060, 50360. S.S.B. - 1810, 3985, 7285, 14285, 21385, 28885, 50385. Novices - 3710, 7110, 21110, 28110.

Awards: Certificates to the highest scoring station in each state, province and country. Additional awards depending on activity. And a certificate to the station showing three "skip" contacts using the lowest power.

Include a summary sheet showing the scoring, equipment description and other information.

Logs must be received by April 30th and go to: QRP ARCI Contest Chairman, Edwin R. Lappi, WD4LOO, 203 Lynn Drive, Carrboro, NC 27510. Include a large s.a.s.e. for copy of the results.

DX YL to N.A. YL Contest

S.S.B.: April 8-9 C.W. : April 15-16
Starts: 1800 GMT Tuesday
Ends: 1800 GMT Wednesday

This is strictly a YL affair in which DX YLs will be working YLs on the North American continent. KH6, KL7, KP4, KV4, etc. are considered DX. Contacts with OMs do not count.

All bands may be used but cross-band contacts are not permitted. The same station may be worked on each band for QSO credit. Avoid contacts on Net frequencies. Phone and c.w. are separate contests and require separate logs.

Exchange: RS(T), sequential QSO no. and QTH. ARRL section for the U.S. and Canada, country for DX.

Scoring: One point per QSO. Multiplier is number of ARRL sections or DXCC countries worked.

There is a power multiplier of 1.25 for stations using 150 watts or less input, 300 p.e.p. on s.s.b.

Final Score: Total QSOs × ARRL sections or country multiplier × power multiplier if any.

Awards: Plaques to 1st place W/VE, and 1st place DX YL, both on phone and c.w. Certificates to 2nd and 3rd place winners.

Submit separate logs for each section, include a summary sheet showing the scoring and other information, and a signed declaration. Stations making 100 or more contacts should also include a dupe sheet.

Logs must be postmarked no later than May 3rd and received no later than May 17th. This year they go to the new YLRL V.P.: Ione O'Donnell,

WA2DMK, Newcomb, N.Y. 12852. (All YLRL contest logs go to Ione for 1980)

1979 "H 26" Results
North America

*N1NA	16,983	*W6UA	1,581
K1EM	10,080	N6ZZ	540
W1CNU	3,200		
W1BWS	1,500	*K7CU	495
*K2SX	351	AA7T	12
KB2GP	180		
		*W8DA	13,500
W3ARK	7,371	W8IRT	369
W3EVG	3,780	WB8DWP	240
AD8J/3	429		
WA3ENM	420	W0BMM	1,104
		W0BQ	648
*W4OEL	17,013		
N4TO	15,228	KP4V	5,202
N4OL	10,575		
WA4OML	1,674	*VE2FGL	10,209
N4YB		*VE3DMC	7,437
WA4VEK	336	VE3KOT	4,611
		VE3IVT	1,980
*W5EIJ	330		
		*VO1AW	4,059

*Certificate winners.

Swiss "H - 26" Contest

Starts: 1500 GMT Saturday, April 26
Ends: 1500 GMT Sunday, April 27

The dates of this contest have now been established for the last weekend of the month. It is hoped that they will remain fixed.

Contacts may be made on all bands, 10 thru 160 meters, phone or c.w. The same station may be worked on each band for QSO and multiplier credit but only on one mode, either phone or c.w.

Exchange: RS(T) plus a three figure contact number starting with 001. Swiss stations will include two letters indicating their Canton. (579001/ZH)

There are now 26 Cantons: AG, AI, AR, BE, BL, BS, FR, GE, GL, GR, JU, LU, NE, NW, OW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each HB QSO is worth 3 points. Sum of Cantons worked on each band is your multiplier.

Final Score: Total QSO points multiplied by the sum of Cantons worked on each band. (A possible multiplier of 26 on each band.)

Awards: Certificates to the top scorers in each country and each W/K and VE/VO call areas.

Indicate a Canton in a separate column for each band the first time it is worked. Check your log for duplicate contacts, include a summary sheet showing the scoring etc., and your name and address in Block Letters. The usual signed declaration is also requested.

Mail your log within 30 days to: USKA Traffic Manager, K. Bindschedler, HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

Applications for the "H - 26" Award (only for contacts after January 1st 1979) go to: Walter Blattner, HB 9ALF, Post Box 450, 6601 Locarno, Switzerland.

County Hunters S.S.B. Contest
Three Periods (GMT)

0001 to 0800 Saturday, April 12
1200 Sat. Apr. 12 to 0800 Sun. Apr. 13
1200 to 2400 Sunday, April 13

This is the 9th annual contest sponsored by Mobile Amateur Radio Awards Club to increase activity for the County Awards program.

Emphasis is on mobile operation. Fixed stations may work other fixed stations but once only regardless of the band. Mobiles may be worked for each county or band change. Mobiles contacted on a county line count as one contact but two multipliers.

Exchange: Signal report, county and state, country for DX stations. (Mixed mode contacts permitted provided one station is on s.s.b.)

Points: Contacts with a fixed W/K or VE, 1 point. If it's a DX station, 5 points. (KH6 & KL7 are DX) Contacts with a mobile, 15 points. (The portable designation has been dropped and portables will be considered as fixed stations.)

Multiplier: Each U.S. county and each VE station worked.

Final Score: Total QSO points times (counties + VE stations) worked.

Frequencies: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28575-28595. And there is a "Mobile Window" as follows: 3925-3935, 7225-7235, 14280-14290. This space as been set aside for working mobiles only.

Awards: Certificates to the Top 10 fixed and mobile stations in the U.S. and in Canada, and to the highest scoring station in each DX country. There are four plaques, overall winning U.S. or Canadian, DX station, and 1st and 2nd place mobiles. Only single operator stations are eligible.

It is suggested you write to W0QWS for detailed rules and log and summary sheets. Include a large s.a.s.e.

All entries must be received by June 1st and go to: John Ferguson, W0QWS, 3820 Stonewall Ct., Independence, MO 64055.

No - 95 - 96

HAM SHOP

FREE TO CQ SUBSCRIBERS

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. 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.

ANTENNA TRIPOD — Install tubular masts single-handed in vertical position $34.95 up. Details, SASE to: Antena, 5316 Fairfax St., Shreveport, LA 71108.

WANTED: HT 220 or HT 200 portables. Must be 150.8 to 162 MHz Spread. G.L. Dawson, RD #2, Newbrighton, PA 15066; 412-847-2288.

QRPers - Get details of the G-QRP-Club and free sample magazine from Rev. G.C. Dobbs G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham. B37. U.K.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts. Small Quantities, free catalog. Elwick Dept. 268, 230 Woods Lane, Somerdale, NJ 08083.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept C. Berwyn, IL 60402.

VERTICAL USERS: Which installation's best—roof, ground or pole mounted? Our copyrighted detailed report explains. We've tested them out on 5 bands. $5. Allow 3 weeks. Danrick Enterprises, 213 Dayton Ave., Clifton, NJ 07011.

THE 11th ANNUAL FM B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 25, 1980, at the convention center, Main and Fifth Streets. Parking in adjacent City garage. Admission is free to all. Sandwiches, snacks and C.O.D. bar available. Live entertainment provided for a super social evening. Don't miss it. Awards include a new synthesized HT. For further information contact the Miami Valley FM Assn., P.O. Box 263, Dayton, Ohio 45401.

SALE: Heathkit HW-8 with power supply—$95; Ten-Tec Century 21 digital with SWR/Tuner—$353; Hustler 4ATB (5 bands)—$65. All items like new. KA4AIY, 6201 N. 30th Street, Arlington, VA, 22207.

WANTED: DX-100 or DX-40 with manual. State price and condition. Gene Statler, WB0OFY, Box 254, Union, Iowa 50258.

TRS-80 HAM PROGRAMS Dup search and log contests... DXCC, WAS tracking, Antenna Math, much more. $1.00 brings list, refundable. WA4PYF; Box 145-C, Lithonia, GA 30058.

CIPHERS FOR SECURITY!!! Possess the capability to communicate with encrypted messages!! Military proven countermeasures to signal surveillance. Free information. Write: TAC-COM, Inc., Dept. 210, P.O. Box 3255, York, PA 17402.

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.

QSLs with Class! Unbeatable quality, reasonable price. Samples: 50 cents, refundable. QSLs UNLIMITED, POB 27553, Atlanta, GA 30327

WANTED: TV502, Joseph Schwartz, 43-34 Union St., Flushing, NY 11355, (212) 461-5933.

ATLAS 180 with NB $335., & SST Ultra Tuner 160-10 Meters $25; Audio Freq Stand $115. WB6VNR, (213) 346-5872.

NEED QSL PRINTER to print small lots of QSLs of simple design to complete QSLing of DX operations for requests from years ago. Many QTHs—can anyone print under 100 quantities for under 100 prices? Mitchell-Box 1003, Fairfield, CT 06430.

ICOM-701 International Users' Club. Details S.A.S.E. Pohorence N8RT, 9600 Kickapoo Pass, Streetsboro, OH 44240.

RTTY FOR SALE: 28ASR table-top compact (1); 28KSR (2), w/gearshift (1); M28 ROTR (2), w/gearshift (3); M28 LXD stand-alone TD (10); 28KSR compact w/gearshift (1); 28RO compact w/gearshift (2); 34ASR (1); M28 keyboard typing reperf (2); M28 triple LXD (2); M28 underdome typing reperf (1), w/gearshift (2); 2-shaft reperf for 28ASR (2); 60-75-100 wpm gearshifts for 28KSR, RO NEW (5); M28 motorized paper winders (10); self-contained answerbacks (3); 35KSR (1); 35ASR (1); 33ASR TWX (1); gears and parts for all machines. Send SASE for full list and prices. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301.

ATTENTION Certificate Hunters. Free information on beautiful operating awards. S.a.s.e. to HAROAA, P.O. Box 341, Hinckley, OH 44233.

WANTED: Manual/Schematic for E.F. Johnson Viking II transmitter and HQ-140-XA Hammarlund Rec. P.O. Box 427, Seaside, CA 93955 408-375-2722

PRINTED CIRCUIT boards from your sketch or artwork. Affordable prices. Also fun kit projects. Free details. DANOCINTHS INC. Dept. CQ, Box 261, Westland MI. 48185.

SELL—Collins Package - Round Emblem - 75S-3B, 32S-3, 516F2, 312B4 - $1600. K9GM, 404 S. Pershing St., Howards Grove, WI 53081 (414) 565-2810.

RADIO BOY BOOKS by Chapman wanted R.W. Randall, 1263 Lakehurst Rd., Livermore, CA 94550.

BUNNELL GOLD BUG and Bunnell double speed wireless key wanted. R. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

1941 Hammarlund Navy Communications Receiver. Type CHC-46140. $250. WA91YF; RR#1, Box 109A, Madison, IN 47250.

FREE ELECTRONICS SURPLUS CATALOG Bargain Packed. Fascinating items. Many never before advertised. ETCO-003, Box 762, Plattsburgh, NY 12901. SURPLUS WANTED

QSL CARDS: 500/$10. 400 illustrations. Free Catalogue. Bowman Printing, Dept. CQ, 743 Harvard, St. Louis, MO 63130.

WANTED: Pre-1925 Wireless Gear, books, magazines, spark transmitters, and tubes. Jim Kruezer, 1428 Main Rd., Corfu, NY 14036.

CLUB CALL PINS 3 lines 1¼ × 3¼ $1.55 each call, first name and club. Colors blue black or red with white letters. (CATALOG) Arnold Linzner, 2041 Linden Street, Ridgewood, NY 11385.

WANTED: Old issues of CQ magazine, especially 1950-1970. Send list to John Battle, N4OE, P.O. Box 96, Norcross, GA 30091.

WANTED: Hallicrafters S-36 Receiver in very good working condition, Michael Stasiak, 3819 White Ave. Baltimore, MD 21206

DIAGRAM FOR TRUETONE MODEL D2663, by Western Auto supply, wanted R. W. Randall K6ARF, 1263 Lakehurst Rd. Livermore, CA 94550.

WANTED: NavShips 92175 and SAMS TR-46 & TR-28 manuals and case enclosures for GRC-27 units (3). C.T. Huth, 146 Schonhardt Tiffin, OH 44883.

SEND SASE FOR LIST OF AMP PARTS, power supplies, tubes, Xfmrs etc, etc. Basham 735 Caves Hwy, Cave Junction OR 97523.

HEATHKIT HW 101 Scvr. with matching Power supply & mic, mint $360 Dan Murrish WB9UIO (608)-845-9186.

DRAKE T—4XC Transmitter, R-4C Receiver Noise Blanker, A.M. Filter, 2 c.w. filters, MS-4 speaker, AC 4 supply, 10 extra crystals, Reasonable offer. Drake T-4SB Transmitter, R-4B receiver Ms-4 speaker, AC-4 supply $725.00 YAESU FL-101- Transmitter, processor, FR-101- digital receiver, all extras, plus crystals, matching speaker & mike $925.00 sell separately. YAESU 101-E, processor, unused, checked out $625.00 YAESU 620-B $300.00 Kist - 6 meter 100 watt Linear $120.00 Kachina, 11 meter, 10 meter, 6 meter, 40 watts output, S.S.B., Shure Hnd Mike $320.00 WB7AOV-503-761-0006.

ITT 3010C Rx (0.7 - 30 MHz) $695. NCX 1000 $595. R390A $350. Rotator System (Large converted Prop - pitch). Control console, cable $395. NEW: 3051 H.V. Transformer. $250. RG-11 500' $55. Kenwood KPS7 $65. Icom 245/SSB $489. James Craig Box 615 Portsmouth, NH 03801 (207) 439-0474. (603) 436-2884.

SALE: SWAN 55C Mobile ant. remote control $100. HP23A PWR supply $50. HD-11 Q-mult $15. W2CVW, 343 Catherine St., S. Amboy NJ 08879, 201/721-6579

HP525C Frequency Converter 100-500 MC Like new $70. G.E. 30-50 mc Mobile Receiver $10. K6KZT 2255 Alexander, Los Osos, CA 93402.

CLIFF DWELLER: 80/40 Mtr. motorized rotatable dipole needs repair $30. (Pickup only!) Detroit area W8VO Clem (313-268-2467).

WANTED: In good condition, Heath SP-600 speaker (companion to Heath SB-101). TNX contact Bill Lorton KA7ERZ, 2672 Broadview; Medford, OR 97501.

SELL: Mint Hallicrafters KA-10 for SX-117, $40.
WANT: Any national receiver Tim Colbert, WA8MLV, 1800 Rhodes #612; Kent, Ohio. 44240.

ZENITH RADIO 1938 Model 5R312 $50.00 Postpaid, Exc. Conx. H. Anderson, 816 No. Cedar St., Colo. Springs, CO 80903.

WANTED: SSR-13 Receivers any condition. Wrote WB3ILM. 101 Second St., Wyoming, DE 19934.

K5YY and OH2BH are coming to the International DX Convention at the Fresno, California Holiday Inn on April 19 and 20, 1980. Are you?

TEN-TEC RX-10, four band receiver wanted. State price and condition, McMichael VE3CGU, Box 231, Goderich Ontario.

SPECIAL NARROW 250Hz. CW Filter for TS-520's brand new - K8AQ - $45.00 postpaid 949 Havensport Cincinnati, Ohio 45240.

SELL: Drake TR4 AC4 MS4 $450.00 Drake TR-22-C with VHF engineer Synthesizer II & mobile bracket $175.00. Realistic DX-160 General coverage RCVR $90.00 all with manuals WB2QJY Mark Levy, 1356 Lombardy Blvd.,Bayshore, NY 11706 516-666-3965.

FOR SALE: Excellent Viking 2 Transmitter & VFO $80.00 Will ship collect. Dick Mills 6 30-W Jacinto, Tucson, AZ 85705.

YAESU OWNERS—I'm cleaning shack - lots of Yaesu parts boards - meters - crystals - etc. What do you need? Len Malone K8AQ, 949 Havensport Dr., Cincinnati, Ohio 45240.

WANTED: Need schematics for Hallicrafters S20R and Sky Challenger. KA6ICU, 872 Bernardo Ave, Sunnyvale, CA 94087.

SELL: Meters, Like new in all respects: Triplett #601 $75, Sencore FE20 $100, RCA WV-500B $75. W. Marti, Bx 6113, Hilton Head, SC 29928.

RESISTORS ¼W, ½W, 5%CF .03¢ ea. Send for free std. value list and info. JR Ind., 5834-E Swancreek, Toledo, OH 43614.

SELL: 6M SSB - Clegg Venus - 90W PEP, W/PS VOX, and Patch. Clegg Apollo, 6M Linear, IKW PEP, manuals included. Best offer. WA0IWF, 3120 'U' Street, Omaha, NE 68107.

COMPLETE STATION: Factory checked 570 Century/21 Transceiver with breaker. 277 Antenna Tuner. 14AVQ vertical with 80 coil. 18V Vertical for portable use. Omega Iambic Keyer with paddle $350 fob. SASE for info. K7BD, 103 E. Bartlett, Selah, WA, 98942.

MOTOROLA F.M. Test Equipment, SASE for list. Want Bird 43 Elements. K6KZT, 2255 Alexander, Los Osos, CA 93402.

WANTED: Recent issue of Callbooks, old military keys. Merrill, 138 Middle Street, Oakland, Maine 04963.

SELL: DX60 XMTR W/HG10 VFO $120, HR1680 RCVR $185, both $275. You ship. W2EZ, 9 Whitney Farms Circle, Fairport, NY 14450.

FOR SALE OR TRADE: Tempo 2020, Midland 13-510 2 meter xceiver, Palomar 350Z 10-15 meter linear, Siltronix 90-1 VFO, Triad 20 amp power supply. Gary Castellini, 3567 Lincoln Ave., Vineland, NJ 08360.

SELL: Hammarlund Navy Receiver, $250. Two antique wall telephones, $500. 1941 Hartzell airplane propeller, $150. WA9IYF, 812-273-5379.

SPLIT SCREEN RTTY Machine lang program for TRS80 (LII, 16K)/M80. $10 from B. Gorsky, 2449 Derbyshire, Cleveland, OH 44106.

WANTED: Collins 51S-1 receiver, 55G-1 preselector. John White, Mabel, MN 55954.

20 METER SSB CLASSIC: HW32-A, HP23C, mike, fan, calibrator, spares; mint: $140. MFJ Processor, Tentec case: $42. RME DB-23, spares: $28. 100 Watt ARC-5 Ultimate Transmatch: $38. Hank, WA2OVG, 212-796-8617, eves. 490-2160, days.

WANTED: Novice cw xmtr, need not be working. WA2PCL, 101-23 Lefferts Blvd., Jamaica, N.Y. 11419.

FOR SALE—HW - 101 Station and other items. SASE for list. Herbert W. Hatton, WA4BWZ, 720 North Park St., Carrollton, GA 30117.

CALL PINS - 2 lines $1.25, 3 lines $1.50, 4 lines $1.75. Assorted Colors. AC2P, Richard Tygar, 5 Chelmsford Dr., Wheatley Hts. NY 11798.

SELL: QSK Triton IV digital and power supply, mint $700. A/R-2 with RTTY, mint, $300. I ship. Cleveland, WA6WJU, 12585 Jones Bar Rd., Nevada City, CA 95959 (916) 273-4913.

FOR SALE: Varactor Tripler 432 to 1296, about 7 W out -$30. Receiving type tubes, new for KWM2 - SASE for list. $4 each. W2CVW, 343 Cath. St., S. Amboy, NJ 08879 (201) 721-6579.

SELL: Pair W.E. 242 tubes brass base make offer (circa 30's). Mart Grace, 4 Autumn St., Norwalk, CT. 06850.

WANTED: Facsimile Equip. RC-120( ) or set AN/TXC-1. 7" & 17½". Military or similar. D. TESTA, Box 9064CQ, NWK., NJ 07104.

WANTED: Used amateur equipment. State condition, make, model and price. H. F. SCHNUR, 115 Intercept Avenue, North Charleston, SC 29405.

WANTED: Swan Cygnet (any model any condx) Need parts - Price & condx 1st letter pls. WB6LZX, 366 S El Monte, Los Altos, CA 94022.

COLLINS 51S1F (rd #7390) with matching 55G1 VLF/Speaker. Complete that S-Line. Bob, WA6ERB. Call book or 415-461-3209.

HEATH HR-1680 Receiver with manual $165. Dean Haworth, AC0S, 14368 West Bayaud Ave., Golden, CO. 80401.

WANTED: Icom IC-551, IC-211, Johnson 6 & 2 Thunderbolt, Rohn 25G section, BN-86 balun, and 3/16" guy wire. K0MK/WA0GGU, 690 Vermillion Trail, Gilbert, MN 55741; 218-865-6541 evenings.

FREE! EINSTEIN SUPERCEDED! Trajectory C+ Unifield Relativity reforms aether addicts! Thomas, 408 Vermont, Daytona, FL 32018.

SEND SASE: For list of parts, tubes, power units, scopes, RTTY, antennas, etc. Basham, W7TCT, 735 Caves Hwy, Cave Junction OR 97523.

WANTED: Ranger II and Drake 2C. WA2PCL. 101-23 Lefferts, Jamaica, NY 11419.

TELETYPE MODEL 33 KSR exc. conditjon - needs cover & band gears. Asking $175. Len, K8AQ, 949 Havensport, Cincinnati, Ohio 45240.

FOR SALE: New HEATHKIT SB-200 with 10 meters, still in box, $375 postage paid. To order call 501-777-3220.

SELL: MFJ-941 Versa Tuner II, Mint, $50. Conar Model 452 synthesized 2 meter transceiver, mint, $190. David Mitchell, 1620 Young Rd., Lithonia, GA 30058.

WANTED: National NC101X, Breting 12, and other old radios, parts, etc. Troe, Skyline Dr., Morristown, NJ 07960.

WANTED: Rohn 25G Fold-over Conversion Kit. Bill, KB4TV, 206 Alderman Dr. Greenville, TN 37743, (615) 639-4774.

WANTED: Manuals for Hallicrafters SW-500 & S-38 EM. Edward O'Connor, 12845 Ada, Calumet Park, IL 60643.

SELL: Hammarlund HQ-170 Ham Band Receiver, A-1, $170. You pay shipping. C Klawitter, 4627 N. Bartlett, Milwaukee, WI 53211.

NOVICE ALL-AMERICAN Certificate: Work a Novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

OLD Majestic 7, Mod 70, MD-7&MT-7 ARC-5 Gregsby-Grunow, Ballentine Dynamotor, Nichols, 1105 Dallas St, Plainview, TX, 79072.

Do You Know This Man?

He is a leader in the community, at home, at work, and in Ham Radio. He could be a Brass Pounder, a dyed-in-the-wool phone man, an avid DXer, a staunch VHF'er or maybe he's just nuts about RTTY or ATV. Maybe he or she is lurking in your household, posing as a husband, wife, father, brother, sister, or even your next door neighbor or someone just down the block. This shadowy unknown person is sought to join an impressive group of 26 formerly unrecognized hams including such notables as Ed Tilton, W1HDQ and Senator Barry Goldwater, K7UGA.

Have you guessed who we're searching for? Right...It's the "Ham of the Year" to be honored at the Dayton Hamvention on April 26, 1980. If you know this person, why not grab a pen and turn him or her in for a great reward. Get all the facts — fully detailed — and send in your nomination NOW. This award is not for one-time achievement, but for continued all-around outstanding performance and contribution to civic and Ham activities.

There is a separate award for one-time special achievements including DX-peditions, emergency work, or excellence in some technical area of Ham Radio. So if you feel you know some worthy Ham who should be recognized for his work, why not give him a chance and send in a nomination now to the Dayton Hamvention. Up to now there have been no winners from W5, KL7 or Hawaii. Surely there are outstanding Hams in those areas. All that's needed is someone to nominate them. Who knows, you may have a winner in your own backyard...Hurry...deadlines for all nominations have been extended to April 11, 1980. ALL NOMINATIONS AND CORRESPONDENCE FOR FURTHER INFORMATION SHOULD BE SENT TO:

Dayton Hamvention

ATTN: AWARDS CHAIRMAN

P.O. BOX 44, DAYTON, OHIO 45401

WANTED: RME 9, 9D, and 69, and other early b'cast and HAM equipment. TROE, 111 Skyline, Morristown, NJ 07960.

SCANNER OWNERS! IT'S HERE! THE "TOP SECRET" REGISTRY OF U.S. GOVERNMENT RADIO FREQUENCIES 25 to 470 MHz, by K2AES. First and only book of its kind ever published! Lists 2,250-plus freqs. of Military, FBI, Treasury, FCC, Border Patrol, Customs, Secret Service, NASA, FAA, CIA, Federal Prisons, U.S. Marshals, satellites, National Park Service, Fish/Wildlife, and much more! Only $4.95 postpaid (U.S.A., APO, FPO orders only, please); from CRB Research, P.O. Box 56-CQ, Commack, NY 11725.

CQ AND QST 1950-1975 ISSUES FOR SALE. Send SASE if ordering 73, Ham Radio, or other CQ and QST issues. One dollar minimum order and all issues cost 25 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

CERTIFICATE FOR PROVEN TWO—WAY RADIO CONTACTS with Amateurs in all ten (10) USA call areas. Award suitable to frame and proven achievements added on request. SASE brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

FOR SALE: Complete set of Time-Life camera books, 17 volumes plus master index and Photographers Handbook, $125. A. Dorhoffer, K2EEK, CQ Magazine, 76 N. Broadway, Hicksville, NY 11801.

LOOKING FOR old Lionel Trains. Interested only in "0" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Dick Cowan, WA2LRO, call 516/883-6200.

BE FIRST TO KNOW precisely when and where to work all the choice DX. Bi-weekly LI DX Bulletin has: Hot DX News -Time and Frequency of each goodie - QSL info-Propagation Forecast - and more... Send business size SASE for free sample or $10 for 1-year domestic subscription to: LONG ISLAND DX BULLETIN, P. O. Box 173, Huntington, NY 11743.

FOR SALE: Old issues of Ham Radio, 73, CQ, QST. Some complete runs. Send SASE for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 76 N. Broadway, Hicksville, New York 11801.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SALE: Sony ICF-5900W multi-band receiver. Designed for SWL's. Like new condition w/manuals. $100. Schultz, W4FA, Box "L", FPO New York 09544.

SELL: Excellent Drake R4B-$325. Data-Tone 3 TT pad for FM-DX $35. Heath HDP-21A and Turner 454X desk mikes, $15 each. K0MK/WA0GGU, 690 Vermillion Trail, Gilbert, MN 55741; 218-865-6541 evenings.

WISH TO CONTACT anyone who has opeated from a deleted country as designated on ARRL DXCC country list. Research important, Thank you. WA1GXE, P.O. Box 1003, Fairfield, CT 06430.

WANTED—Used amature equipment. State condition, make, model and price. H. F. SCHNUR, 115 Intercept Avenue, North Charleston, SC 29405.

WANTED—New P A tubes 813 linear. What can you offer? Write KL7EGE Box 105, Saint Paul Island, AK 99660

WANTED—INFO on short 75-meter yagi. Expenses refunded. KP4AM Box 50073, Levittown, PR 00950

SELL: Yaesu FL210OB Amplifier 10-80 meters, 1200 W pep., retubed and totally overhauled, $325. Condx mint! FT101B and Matching Spkr, recently overhauled and retubed, puts out 160 W on all bands including 160 meters, $500. All prices firm! Manuals available. WA2VOS (212)739-3230.

WANTED: RCA VICTOR Service Data, Vol 1, 2, etc. National SW4,5 and other old radios, etc. Troe, Skyline Dr., Morristown, NJ, 07960.

WANTED: Swan VOX, noise silencer, 210 VFO, 2M Transverter. Joe Bedlovies, 30 Ridge St., Milford, CT 06460.

WANTED: Schematic and operating data for electronic controls of General Electric tractor, model E2ODA. W3GOG, 2507 SE 20th Pl, Cape Coral, FL 33904.

WANTED: Collins 51-R receiver (VHF). Bill Orr, W6SAI. Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Antique Glass. Looking for old milk glass-Purple, slag, carmel, and Greentown. Tell me what you have. I pay the highest prices. Write to: Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

SALE: Heath IM-28 VTVM Kit. New, perfect. Ordered by mistake. $40. Schultz, Box "L", FPO New York 09544.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906. 617/233-1234.

DAHDIDAHDIT DAHDAHDIDAH vinyl bumper stickers $1. Name & call sign badges, $1.50. D. Mollan, 7805 NE 147 Ave., Vancouver, WA 98662.

ATLAS 180 with N.B., clean $300, SST T2 Ultra Tuner $25., Audio Freq. Stand. $15, WB6VNR, (213) 346-5871.

SELL: DX 60 XMTR w/HG10 VFO-$110, you ship. W2EZ, 9 Whitney Farms Circle, Fairport, NY 14450.

GR 650A Impedance Bridge. Reconditioned and calibrated, with manual. $85 plus UPS on 30 lb. Ph.D., 5220 Carlingford, Riverside, Ca 92504.

WANTED: Swan ICAF Notcher-Peaker and Swan I.F. Noise Blanker (NB-500) N4ATM, 938 Grove Park Dr. N., Orange Park, FL 32073.

SELL: Swan FM2X with AC & xtalled for 8 channels, $100 FOB. Les Basham, 735 Caves Hwy, Cave Junction, OR 97523.

SELL: Mint 75S3C/500 HZ Filter, 8 SWL, xtals, 312B3, manual, rnd emblem. $800. Sever, 248 Sheraton Drive, North Canton, OH 44720.

LOOKING FOR Davco DR-30, Regency ATC-1 Surplus BC-454 or 455 at reasonable prices. W1PQ, 264 Old Sib Rd., Ridgefield, CT 06877, 203-438-3228.

WANTED: Swan 410C VFO. Send postcard with condition, price & Phone No. Dave Klaiber, 5621 Brahma Rd., Roanoke, Va. 24018.

SELL: Realistic DX300 (mint) $300.00 plus postage. Chris Read, RR #1 Box 97J, Morristown, IN 46161, (317)763-6973.

HALLICRAFTERS HA-10 PRESELECTOR FOR SX-117, mint $50. Wanted: any National receiver working or not. T.N. Colbert, 1800 Rhodes Rd 612, Kent, OH 44240.

CALL BOOKS: 1979 foreign with 3 supplements $9. Also U.S. with 3 supplements $9. Please include SASE in case sold. Art Johnson, K2POA, 29 Boone St., Bethpage, NY 11714.

Please send all reader inquiries directly

WANTED: Pre-1940 Broadcase Radios, Horn type and other speakers. B. Smith, 601 E St., Taft, CA 93268, Ph. 805-765-5897.

FOR SALE: VHF 152A, National HRO5AI, Kenwood Comm. Rcvr. R-300. No ship. make offer. W7FIM, 206-362-6661.

FOR SALE: Knight KN-2585 CB/10 M XCVR, speech comp. $60 KA9CIM, 204 Sequoia, Glen Ellyn, IL 60137.

CONVERT YOUR RECEIVER To 6 meters with a Hallicrafter HA-6 Transverter complete with Power Supply and cables, $175. Central Electronics GC-1 Gated Compression Amplifier $20. Gold Line Signal Hunter (new). $6.50. Gonset Noise Clipper $5. Shield ignition noise with a Hallett Ignition Shield for sparkplug wires and regulator $30. All prices FOB. T.K. Brown, RD 1 Box 102, Forksville, PA 18616.

SELL: FCC Style, 13 wpm cassettes, 90 minutes, 10 QSOs, questions, answers, pp. $4.95. J. Haerle, R2, Frisco, Texas 75034.

HEATH HR-1680 recr w/spkr New Cond $150. J.R. Bowers, RR#1. Box 43B, Walkerton, IN 46574.

HAMMARLUND HQ-110A $95, SBE-34 80 thru 15 $195. Both units A-1. Irv Better, 2500 Channing Rd., Cleveland, OH 44118.

NEW COAX ANTENNA Relays with R.F. connectors. Magnecraft No. 122RX-16. Antenna connector is type 83-1R, teflon insulated, with gold plated center contact. Coil is 12 VDC. Contacts are S.P.D.T. with a pair of N.O., S.P.S.T. side mounted extra contacts. Good for at least 500 watts PEP. Shipping Wt. about 2 lbs. Price only $5.00 Ea. W4JGO 643 Diamond Rd., Salem, VA 24153.

Q.S.L. — Q.S.L. — Q.S.L. — Q.S.L. Please send Q.S.L. Cards to: Philip Steven Kurland, Post Office Box 1686, New Haven, CT 06507.

WANTED: Pre-War issues of Short Wave Craft magazine. Bill Orr, W6SAI. Eimac, 301 Industrial Way, San Carlos, CA 94070.

WILL TRADE BUILDING LOT in Northern Fla. for TS820S or equiv. FOR SALE: Viking 2 with VFO-manuals W7RQJ 503-981-4142.

GENUINE ROTRON WHISPER FAN with Grill, 1600 RPM, 7 watt, 115VAC, like new, $10. BC 453 (ARC-5) 190-550 KHz, new, in orig. Box, $20. Prices include shipping. J. Hoffer, W1DL, 24 Cherry Road, Framingham, MA 01701 617-872-5084.

SELLING MY HQ 170A 160-2 meter Triple conversion SSB/CW/AM slot filter product dectoro selectable AVC 100 KC calibrator BFO control $150.00 A. Jones, S-16 R Menendez, pidal El Senorial, Rio piedras P.R. 00926.

SELL HY GAIN 14AVQ vertical ISHIP $60 Gulick, 613 Washington, Quincy, ILL 62301.

NOVICE ALL-American certificate: work a novice in all 10 call areas. Send list and $1. K6AS1, 25 Rudnick Av., Novato, CA 94947.

TRAJECTORY RELATIVITY solves Brillet & Hall! Refr./Vel. E. Bal. returns C+ Phtns. to normal! FREE! Thomas, 408 Vermont, Daytona 32018.

SELL: FT101E, CW filter, Fan, MFJ 16010 tuner and CWF2 filter. $630. Jerry (201) 574-9897.

BARLOW-WADLEY XCR-30 receiver, like new cond. and fb for SWL/monitor use, $190. Used but like new Heath test equipment and a variety of transmatch and linear amp. components available at low prices. Send for free list (SASE appreciated). Schultz, US Consulate, APO NY 09108.

WWV Receiver model 550 very clean $85., COMCO 220 mc transceiver $30. K6KZT 2255 Alexander, Los Osos, CA 93402.

WANTED: National SW2, SW4, AGS, Scott Special, Collins 30, 32, etc. Troe, Skyline, Morristown, NJ 07960.

SALE: Homebrew Varactor Tripler, 432 to 1296MHz, about 1 watt - $25. W2CVW, 343 Catherine St., S. Amboy, NJ 08879, (201) 721-6579.

TI-59 USERS: Would like to swap programs for SR 52/TI-58, 59. What have you? Mike Brame, 121 N. Market, McArthur, OH 45651.

WANTED: TD-687/URR demux, AN/FRA-86 demods, and bulkhead type coaxial lighting arrestors w/"N" conn. C.T. Huth, 146 Schonhardt, Tiffin, OH 44883.

EINSTEIN, OBSOLETE E.S. AETHER ADDICT REFORMED! C+ U.F. Trajectory Relativity!! Free! Thomas, 408 Vermont, Daytona Beach, FL 32018.

KENWOOD INTERNATIONAL USERS' CLUB: Is now operational. S.A.S.E. for details. N8RT, Rob Pohorence, 9600 Kickapoo Pass, Streetsboro, OH 44240.

ZENITH Model 7F04 antique AM/FM radio. Good Condition. $35 Postpaid. H. Anderson, 816 N. Cedar, Colo. Springs, CO 80903.

FOR SALE: 312B5 $500. 75A4 #4491 (0.5, 1.5, 3.1) $525. CX7A $950. NCX1000 (new!) $1100. 32S1, 516F2, 312B4, 75S3, $1095. 32S1, 516F2 $400. Apelco Marine Transceiver (SSB, AM), new 2-9 MHz $500. TR4, AC4, MS4 $395. ITT-McKay 3010-C $600. NCX3, ACPS $200. TEK535, $195. Kenwood BS-5/BS-8 $40. James Craig, Box 615, Portsmouth, NH 03801, 603-436-2884.

CRYSTALS: S.A.S.E. for my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

GERTSCH FM-3 and DM-1 Frequency and Deviation Meter 1 to 1000 MHz range, very clean condition $175. K6KZT, 2255 Alexander, Los Osos, CA 93402.

SELL. RTTY Model 26 with dsk and Electrocom FSC-250 Converter. Joseph Schwartz, K2VGV, (212) 461-5933.

COLLINS Receiver 75A-2, excellent, $150 (local pickup preferred). Att: DRAKE TR-4C owners: Noise Blanker 34-PNB, new complete set matched tubes, (2) ten-meter accessory crystals; package $95. I ship UPS. DS, Box 48, Ballardvale, MA 01810.

WANTED: Manufacturers service manuals for amateur radio and test equipment. W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

HEATH SB-610 Monitor Scope. Excellent condition with manual. $95. N5UX, 1432 Pamela, Hurst, TX 76053.

SWAP: HW 101 new supply in original cartons checked by Heath. For FT1200B. W9MYM, Rt 5 Box 192, Lake Geneva, WI 53147.

FREE: Identify parts, etc., with my pre-cut tapes. Card full-SASE; (1,000) address labels, heavy stock, w/call $2. Pstpd. D. Testa, Box 9064-CQ, Newark, NJ 07104.

FOR SALE: Drake transceiver TR4-CW-RIT is only 10 months old including: power supply, speaker, 34-PNB noise breaker installed, Shure Microphone Model 444, optional crystals 42.5 & 43.6 MHz installed for 28.0-29.7 MHz segment of 10 meter band, & three spare 6JB6 Sylvania matching tubes. $900 shipping prepaid. Wm. D. Shevtchuk, 1 Lois Avenue, Clifton, NJ 07014; Phone: 201-471-3798.

SELL: Improve your reception with CE Gated Compression Amplifier—works on all bands, $20. 26AV Hy-Gain 6 mtr Vertical Ground Plane, $20. HW-6 Mark 6 mtr Fiberglas Mobile Whip, $6. Mosley 10-75 mtr Mobile Whip with loading coils and folding mast, $45. HF-62 Newtronics 6 and 2 mtr mobile whip, $7.50. M103 AS AM-CB mobile whip, $9.50. Universal bumper mount with SS spring, $5. all FOB in excellent condition. T.K. Brown, RD 1 Box 102, Forksville, PA 18616.

SELL: Argonaut 509,405, 251—$535. Wilson 1405 SM with extras—$300. Kenwood 7200G—$200. Wanted TRS 80 Level II. Dan 919-447-7878.

HELP: Need QSL info on 5A1TZ ('66), 7Q7RM ('67), PY0BLR ('68). AA1K, 72 Oronoque Tr., Shelton, CT 06484

SALE: Swan accessories, FP-1 phone patch, new, $45; FC 76 digital freq counter, new, $95; 14A DC converter, used, $25. Midland 13-520 Handi-talki, with charger, .94/.94,.16/.76 .34/.94, .28/.88, .04/.64, mint condx, $145. KA4H, Jim Gaither, 5006 Bonnaside Drive, Hermitage, TN 37076; Phone 615-889-2800.

DENTRON MLA2500: Excellent condition, $750. Heathkit SB200, $350. Call KA0BCW, 913-383-2322, evenings.

WANTED: Oscillator Tube or # of it for Polarad Model 1208 Signal Source. W4LRR, 234 Elden Drive N.E., Atlanta, GA 30342.

CQ AND QST 1950-1978 ISSUES FOR SALE. Send SASE if ordering 73, Ham Radio, or other CQ and QST issues. Two dollars minimum order and all issues cost 35 cents each, except 1976 and newer ones, which cost 50 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

CERTIFICATE FOR PROVEN TWO-WAY RADIO CONTACTS with Amateurs in all ten (10) USA call areas. Award suitable to frame and proven achievements added on request. SASE brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

SELL: NCX3 W/PS $240., Also other surplus Robot 70 and 80 W/1.4 macro $450. CQ, QST, 73, Ham Radio, 25¢ each. W4PRC, Cooper City, FL, 305-434-4245.

HEATHKIT: Battery Eliminator Model BE-5 6/12 volt outputs variable $30. Clem, W8VO, 33727 Brownlea, Sterling Hgts., MI 48077 313-268-2467.

VIKING VALIANT, Linear Amplifier, and power supply. All in 5-foot black crackle closed rack. Includes 5 panel meters. Linear has Ampex 4-250A final. $150 for whole set. Jim Cooper, W2JC, 651 Forest Avenue, Paramus, NJ 07652, 201/265-7075.

Q.S.L. — Q.S.L. — Q.S.L. — Q.S.L. Please send Q.S.L. Cards to: Philip Steven Kurland, Centuck Post Office, Post Office Box 407, Yonkers, NY 10710.

YAESU XF-92A SSB 9.0 MHz filter for FT-301 or FT-7, New, Never Used. $25.00 plus $2.00 shipping. G. Alfred Dodds, Jr., 874 Pepperwood Lane, Brunswick, Ohio 44212.

SELL-SX101 A - $90 pick up - 6 El. Telrex 6 mtr beam - $20 pick up. Various - power tubes. M.E. Knowles, No. Billerica, Mass. 01862, 1-617-663-3743.

SELL: Hallicrafters SR400. Includes MJF CW filter and power for mike. $550. WD8DDZ, R2 Box 155, Clifton, TN 38425.

SELL: Factory aligned Heath HR-1680, $200. HW-16, $150—both recently and professionally wired. Used 3 hrs. W3YFI, P.O. Box 69, Milford, DE 19963.

CLEANING HOUSE: Wilson 1402SM handi-talkie, accessories; Heath Micoder I; Yaesu FRG-7; IC-22S; Bearcat 210. All in good condition. Write Karl Thurber, W8FX, 631 N. Overbrook Drive, Fort Walton, FL 32548.

20M SSB CLASSIC: Heath HW-32A, HP-23C, mike, fan, spares, mint; $140. MFJ processor, Tentec case; $49. RME DB23, spare tubes; $25. 100W Ultimate Transmatch, HB; $35. More. WA2OVG, Hank, 212-490-2160, day 796-8617, eve.

SEARS AM/SSB Raodtalker 40 converted for 10 mtrs 80 channels AC/DC. Unit $130. Clem Duval, 33727 Brownlea, Sterling Hts, MI 48077.

WANT: HEATH LINEAR HA14 also HP14 DC Pwr Supply WB6ALC F. Kurth, Box 332, Covina, CA 91774.

FOR SALE: REGENCY ACT-T-16 Scanner $259 and Hallicrafters SX-28 Receiver $135.00, M. Donovan, 3504 Dove, Dubuque, Iowa 52001.

SELL: Knight T-50 with crystals $40.00, HT-44 transmitter $100.00 & DX-160 Receiver $100.00. Seth, KA2FCU 516-371-0568 Eves.

WANTED: Ten-Tec 405 Linear/ps.
SELL: Vomax Speech Processor with ac/ps, mint. Tim Cook, WA2LZZ, Box 2012, APO NY 09127.

MORSE-A-LETTER unit complete (Cabinet; all data) cost $127. Alphanumeric LED readout; Brand-new. $70 FOB. W1JSS, 9 Winter Terr., Westwood, MA, 02090.

TI-58/59 USER, would like to trade software. Mike Brame, WB8EQQ, 121 N. Market, McArthur, Ohio 45651.

DUMONT DUAL TRACE SCOPE Model 322A Diagram or manual needed. Will dupe & return with extra copy. Vince Luciani K2VJ RD1 Box 111H, Eggharbor, NJ 08215.

TRIPLE 365mmfd small BC variable, suitable PI net, $3.00; BC221 freq meter, internal modulation, PS $35 VIBROKEYER Chrome unused $40; TR4/34NB $325 Art Ford 2903 Emory St. Melbourne, FLA 32901.

ADVERTISER'S INDEX

For additional information on a particular ad in this issue, tear out the Reader Service postcard bound in this issue and circle the numbers on the card which correspond with the Reader Service numbers listed on the INDIVIDUAL ADS.

FT-707 is shown with optional FV-707DM VFO & Scanning Microphone

THE FT-707 "WAYFARER"

The introduction of the "WAYFARER" by Yaesu is the beginning of a new era in compact solid state transceivers. The FT-707 "WAYFARER" offers you a full 100 watts output on 80-10 meters and operates SSB, CW, and AM modes. Don't let the small size fool you! Though it is not much larger than a book, this is a full-featured transceiver which is ideally suited for your home station or as a traveling companion for mobile or portable operation.

The receiver offers sensitivity of .25 uV/10 dB SN as well as a degree of selectivity previously unavailable in a package this small. The "WAYFARER" comes equipped with 16 poles of IF filtering, variable bandwidth and optional crystal filters for 600 Hz or 350 Hz. Just look at these additional features:

FT-707 with Standard Features

- Fast/slow AGC selection
- Advanced noise blanker
- Built-in calibrator
- WWV/JJY Band
- Bright Digital Readout
- Fixed crystal position
- 2 auxiliary bands for future expansion
- Unique multi-color bar metering—monitors signal strength, power output, and ALC voltage.

FT-707 with Optional FV-707DM & Scanning Microphone

- Choice of 2 rates of scan
- Remote scanning from microphone
- Scans in 10 cycle steps
- Synthesized VFO
- Selection of receiver/transmitter functions from either front panel or external VFO
- "DMS" (Digital Memory Shift)

Impressive as the "WAYFARER" is its versatility can be greatly increased by the addition of the FV-707DM (optional). The FV-707DM, though only one inch high, allows the storage of 13 discrete frequencies and with the use of "DMS" (Digital Memory Shift) each memory can be band-spread 500 KHz. These 500 KHz bands may be remotely scanned from the microphone at the very smooth rate of 10 Hz steps.

The FT-707 "WAYFARER" is a truly unique rig.
See it today at your authorized Yaesu Dealer.

Come See Us At The Dayton Hamvention

CIRCLE 48 ON READER SERVICE CARD

YAESU
The radio.

YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007

YAESU ELECTRONICS Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

EIMAC's 3-500Z is first choice for Henry's 1KD-5 linear amplifier.

Henry 1KD-5 Amplifier

A winning combination since 1965.

The 1KD-5 is one of the most popular amplifiers in the series of equipment that continues the fine tradition established since 1965 by Henry Radio.

This reliable 1200 watt PEP linear amplifier uses the EIMAC 3-500Z to provide the user with a winning combination of reliability and long tube life.

Reliable, high-mu power triode.

In 1965 Henry Radio knew all about EIMACs reliable power grid tubes and the first amplifier used EIMAC high-mu power triodes. That's why 15 years later EIMAC still powers the new generation Henry Radio Amplifiers.

Complete data available.

For more information on the 1KD-5 amplifier write to Henry Radio, 11240 West Olympic Boulevard, Los Angeles, CA 90064. And for a data sheet on the 3-500Z and more informationon EIMAC power grid tubes, write to Varian, EIMAC Division, 301 Industrial Way, San Carlos, CA 94070. Telephone (415) 592-1221. Or contact the more than 30 Varian Electron Device Group Sales Offices throughout the world.

CIRCLE 22 ON READER SERVICE CARD

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