CQ

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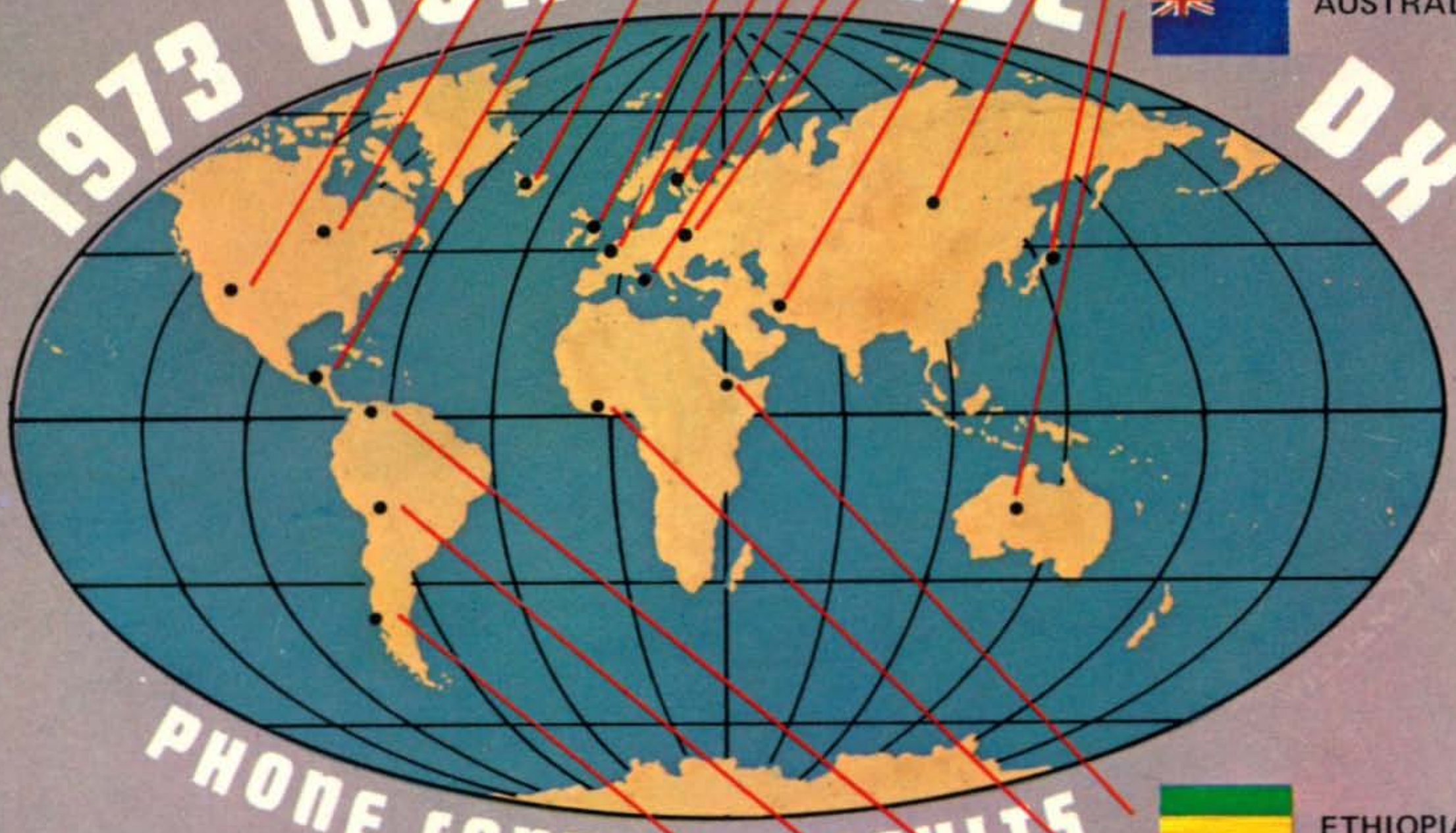

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8240

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4 lbs.
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HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5W in, 30W @ 7.5W in, 40W @ 10W in, 50W @ 15W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30°F. to +140°F. **Dimensions:** 3" H x 4¼" W x 5½" D.

Tune-up with maximum precision

The Heathkit VHF/SWR Bridge tes transmitter output in power ranges 1 to 25 watts and 10 to 250 watts ±10 of full scale. 50 ohm nominal impe ance permits placement in transmi sion line permanently with little or no los Built-in SWR bridge for tuning 2-met antenna for proper matc has less than 10-wa sensitivity.

Kit HM-2102,
4 lbs.
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HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **meter accuracy:** ±10% of full-scale reading.* **Power capability:** To W. **SWR sensitivity:** Less than 10 W. **Impedance:** 50 ohms nominal. **bridge:** Continuous to 250 W. **Connectors:** UHF type SO 239. **Dimens** 5¼" W, 5¼" H and 6½" D, assembled as one unit.

*Using a 50 Ω noninductive load.

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's an all solid-state design that you can build and ompletely align without special instruments. And this ompact little beauty gives you independent pushbutton election of 6 transmit and 6 receive crystals. 10 watts inimum output into an infinite VSWR without failure. nd for the ultimate in convenience there's the optional one burst encoder for front panel selection of four resettable tones. The HW-202 kit includes two crystals r set-up and alignment and simplex operation on 46.94; push-to-talk mike; 12-volt hook-up cable; heavy uty clips for use with temporary battery; antenna coax ck; gimbal bracket, and mobile mounting plate.

-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5 μV or less. **Squelch eshold:** 3 μV or less. **Audio output:** 2 W at less than 10% total harmonic distortion (THD). **Operating frequency bility:** Better than ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious rejection:** Greater than 60 dB. **IF re-tion:** Greater than 75 dB. **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequency:** 455 kHz (adjustable). **eiver bandwidth:** 22 kHz nominal. **De-emphasis:** −6 dB per octave from 300 to 3000 Hz nominal. **Modulation eptance:** 7.5 kHz minimum. **TRANSMITTER — Power output:** 10 watts minimum. **Spurious output:** Below −45 dB n carrier. **Stability:** Better than ±.0015%. **Oscillator frequency:** 6MHz, approximately. **Multiplier factor:** . **Modulation:** Phase, adjustable 0-7.5 kHz, with instantaneous limiting. **Duty cycle:** 100% with ∞ VSWR. **High VR shutdown:** None. **GENERAL — Speaker impedance:** 4 ohms. **Operating frequency range:** 143.9 to 148.3 MHz. **rent consumption: Receiver** (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. **Operating perature range:** −10° to 122° F (−30° to +50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VDC inal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD = $\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

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HA-201, os., mailable 95*

01 SPECIFICATIONS: Frequency Range: 143-149 MHz. **Power Output:** 3.6 VDC input): 8 W @ 1 W in; 10 W @ 1.5 W in. **Power Input (rf):** 1-3 W. **Input/Output Impedance:** 50 ohms. **Input VSWR:** 1.5:1 max-. **Maximum Load VSWR:** Infinite. **Power Supply Requirements:** 12-16 2.2 A maximum. **Dimensions:** 5⅛" L x 3⅜" W x 2¾" H. **Net Weight:**

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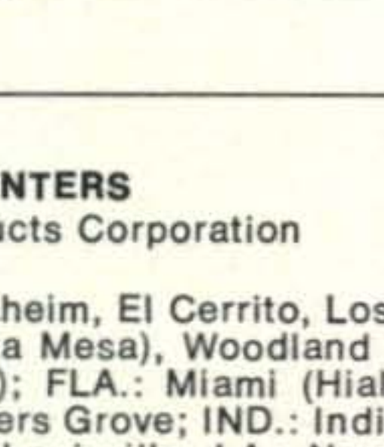

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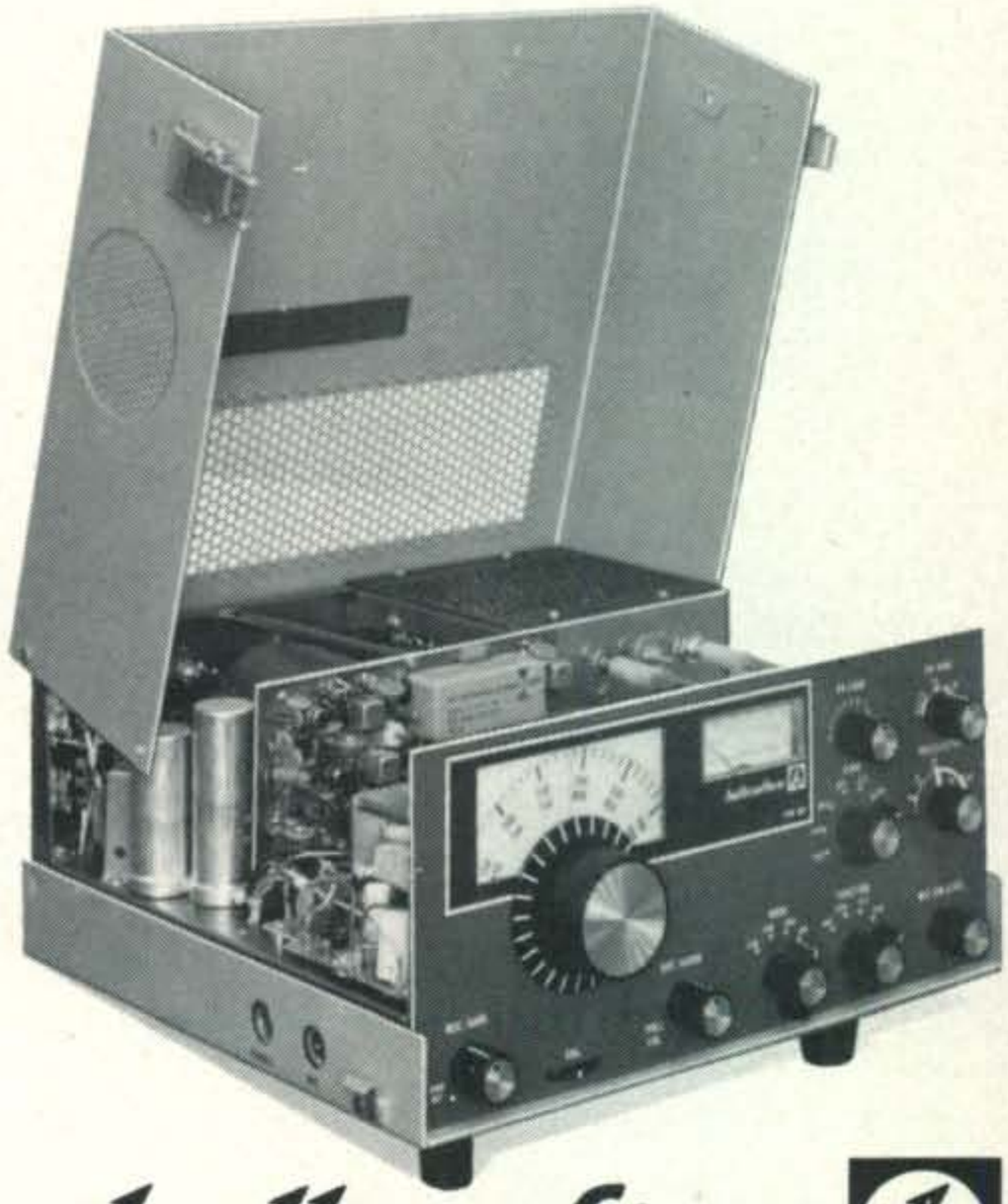
- Optional Accessories: MR-300 Mobile Installation Kit; HA-60 Blower Fan Kit, works on AC or 12VDC



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JULY, 1974 VOL. 30, NO. 7

The Radio Amateur's Journal

FEATURES

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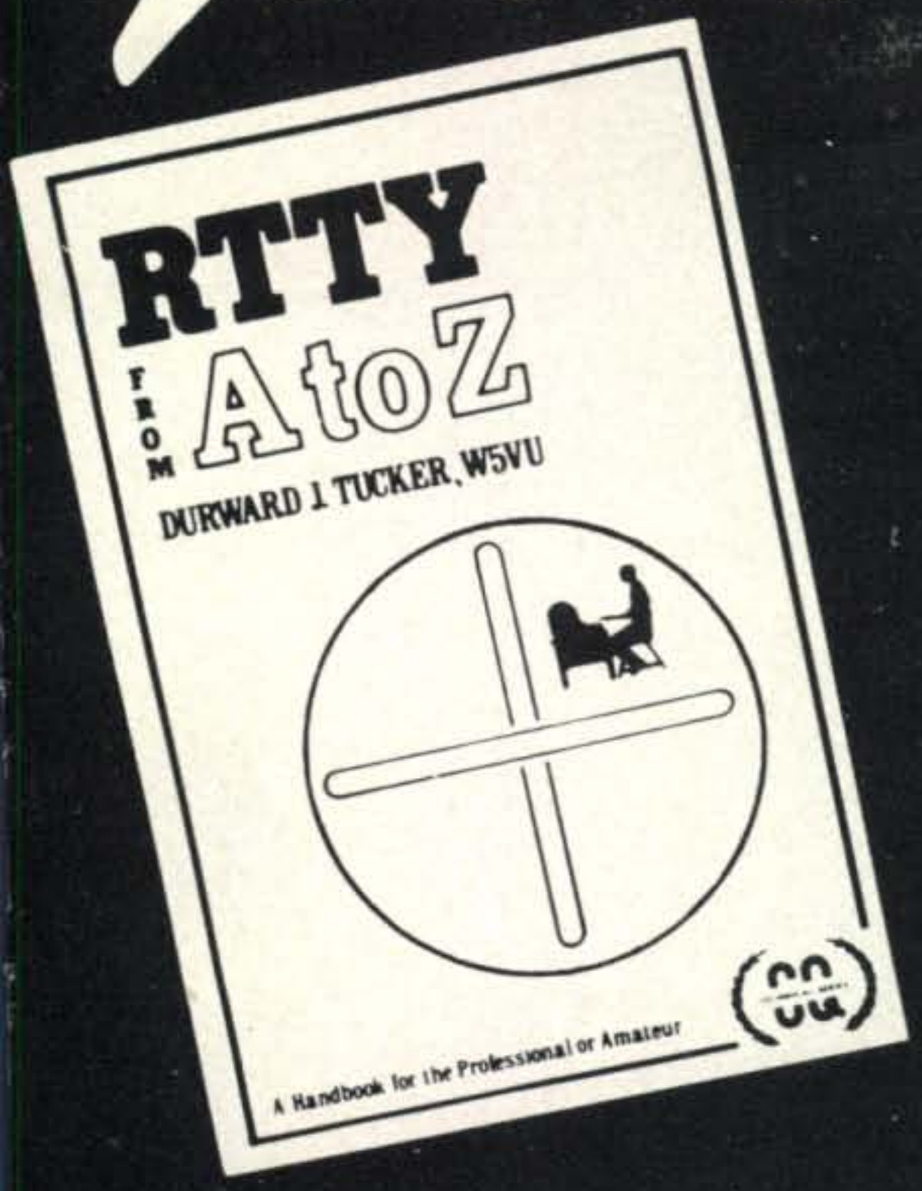

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DURWARD J. TUCKER, W5VU

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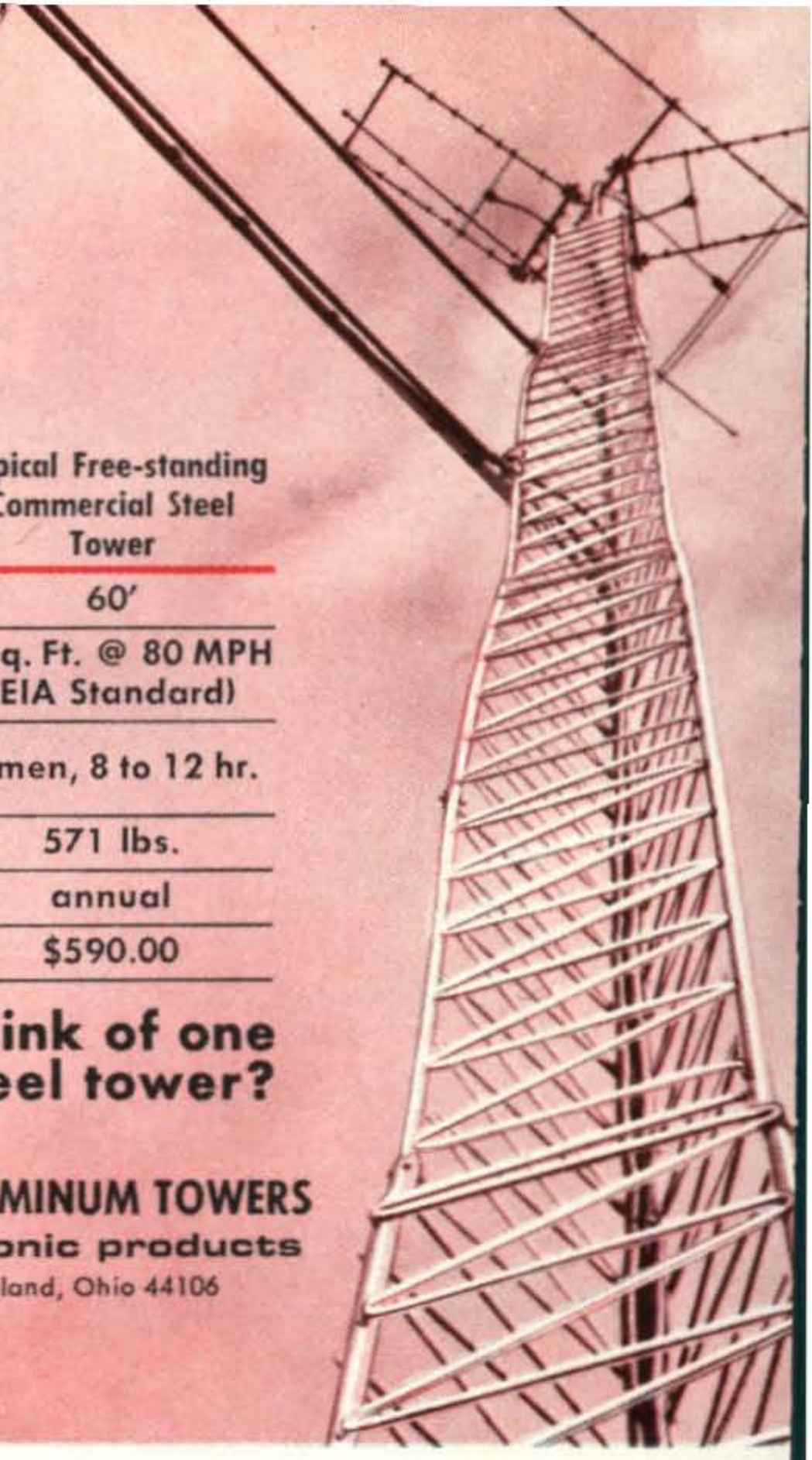

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OUR READERS SAY

Zero Bias

Editor, *CQ*:

I have just read your "Zero Bias" editorial in the April issue concerning a TVI lawsuit against W2OVC. In it you say the lawsuit concerns "allegedly preventing W2OVC's neighbors from watching Lucy re-runs on the boob-tube" and state that the concept of filing a TVI lawsuit is "hardly less immoral than a kidnapper demanding ransom in exchange for permitting his victim to live."

Come on, now! It seems to me that you've gotten carried away in the interest of being "clever" and "preaching to the choir" (us hams). Too bad, since it detracts from your credibility, and you do make some good points later on about the idea for "legal defense insurance". I almost didn't get that far, after the first part, thinking: "this is Zero Bias?

I don't know W2OVC, what he's running or the nature of the complaint. Wonder if he accused the neighbor of "watching Lucy re-runs on the boob-tube"?

G.S. Wren, DA1GS/K5EAT
NATO School
APO New York 09172

Apparently, reader Wren missed one of the points we attempted to make in our April Zero Bias. What we said is, "demanding monetary compensation for an alleged inconvenience or annoyance is, we feel, hardly less immoral than a kidnapper demanding ransom in exchange for permitting his victim to live." The point is that certain things are without price and to attempt to place dollar value on such "commodities" as life or the persuit of happiness is to debase those "commodities. We take no issue with the right of W2OVC's neighbors to enter suit for the alleged annoyance. We do object to their attempt to place a dollar value on that annoyance.

Re: Zero Bias, there are two possible interpretations of the title. One is that the views presented therein are without bias; the other is that no attempt is made to restrict or restrain our feelings, harking back to vacuum tube days when "zero bias" often suggested a tube's plate current flowing without restriction. More often than not, we choose the second interpretation. Page 5 in *CQ* is our page of opinion, which by definition means a belief based on one's own judgement of the situation. In cases such as the W2OVC TVI suit, the general public is adequately represented by its own strongly biassed press. It is the duty of the amateur press to similarly promote the amateur's interests.

If the day ever dawns when our newspapers can achieve entirely objective reporting of news such as this, perhaps the amateur press will be able to do the same, but that will be a very dull day indeed. Until then, it is our opinion that an amateur press strongly and obviously biassed towards amateur radio is essential to our existence.

—K2MGA

Sloping Quad

Editor, *CQ*:

I would like to submit the following corrections and changes to my article "A Sloping Quad for 80 Meters" which appeared in the April, 1974, issue of *CQ*. Between submission of the article and publication, I learned to my regret, that the noise bridge which I used to take impedance measurements of the quad, was defective and gave me readings which were approximately twice the true values. I have since acquired an antennascope and measured the correct impedance (radiation resistance) values of a horizontal quad at various heights above a good conducting electrical ground. I again used a small quad cut for 10 meters suspended at various heights above my backyard swimming pool to obtain my basic figures. I then substituted the heights for 80 meters to develop the revised table below.

Impedance in Ohms	Height in wavelength above Electrical Ground	Height in feet at 3.8 mHz
146	1.0	259
140	.75	195
146	.5	130
185	.4	104
170	.3	78
140	.25	65
112	.2	52
78	.15	39
70	.125	32
50	.1	26

Also, on page 47, first column, fourth paragraph lines 5 and 6, change the 5:1 s.w.r. and 260 ohms to read 2:1 and 120 ohms respectively.

The radiation patterns for Figure 1, were unfortunately omitted in the printed article. The pattern for fig. 1 (A) is a flattened circle (or egg shaped) with the flat sides in the horizontal plane and the lower flat side at the 1/4 wavelength level. The half power points are at approximately 45 degrees from the horizontal. The radiation pattern for fig. 1 (B) is the same flattened circle tilted approximately 30 degrees and with the lower half power point at about 15 degrees. The artists rendering in the printed article for fig. 1 (B) is an over simplification and can bring about a misconception of the actual radiation pattern.

Joseph D. Liga, K2INA
Eatontown, New Jersey

Coax Fed Trio

Editor, *CQ:*

I am an avid reader of *CQ* and therefore must commend you on W.H. DeWitt's article in the April issue - "A Coax Fed Trio for 160, 80, 40 and You." This is about the most lucid, common-sensical 2 1/2 pages that I have ever read.

How about some more contributions from W2DD?

Leslie F. Fultz
Pomeroy, Ohio

Announcements

Dunseith, North Dakota

The Eleventh Annual International Hamfest will be held July 13 and 14 at the Canadian Pavilion in the International Peace Garden between Dunseith, North Dakota and Boissevain, Manitoba. For more information, contact: Ken Larson,- KØPVG, 807 Kelly Ave., Devils Lake, ND 58301.

Palmyra, Illinois

The Quad-Co. Amateur Radio Club, Inc. will sponsor the 17th Annual Hamfest of the "Breakfast Club" on July 20 & 21 at Terry Park, 3/4 mile east of Palmyra, IL. For more information write: "Hamfest", c/o Quad-Co. ARC, Box 81, Chatham, IL 62629.

Maple Ridge, British Columbia

On July 13, at 9 am the "Maple Ridge Century '74 Hamfest", will take place at the Exhibition Grounds, Maple Ridge, British Columbia. For more information contact: Bob Haughton, at 20623------ 114 Ave., Maple Ridge, B.C. V2X 1J7.

Santa Barbara, California

The Tri Counties Council of Amateur Radio Radio Clubs (TRICAR) will hold its 2nd annual Santa Maria Style Barbeque picnic at the Union Oil Orcutt Hill Picnic Grounds on Saturday, July 27, 1974. For additional information contact: Arnie Dalhman, W6UEI, 3022 Las Positas Road Santa Barbara, CA 93105.

Terre Haute, Indiana

The 27th Annual Turkey Run Hamfest and VHF Picnic will be held Sunday, July 28, 1974 at Turkey Run State Park near Rockville, Indiana. For details send SASE to WVARA Hamfest, Box 81 Terre Haute, IN 47808.

South Milwaukee, Wisconsin

The South Milwaukee Amateur Radio Club's 4th Annual Southeastern Wisconsin Swap-Fest will be held Saturday, July 13, 1974 at Shepard Park, 9327 South Shepard Avenue, Oak Creek, Wisconsin. For more details write to: S.F. Schreiter W9AKF, 104 Brookdale Drive, South Milwaukee, WI 53172.

Cary, North Carolina

On July 20, 1974, at 10am The Cary Amateur Radio Club will hold the annual Swap-Fest. It will be held at the Lions Club Shelter, Cary North Carolina. For more information, contact: K4FBG, 1022 Medlin Dr., Cary, NC 27511.

Pomona, California

On August 4th The TRI-COUNTY Amateur Radio Association will have its annual Hamfest-Picnic held at Westmont Park in Pomona, California. For more information contact: John Goodreau, P.O. Box 142, Pomona, CA 91769.

McKeesport, Pennsylvania

The Two Rivers Amateur Radio Club will conduct its Tenth Annual HAMFEST on Sunday, July 21st, 1974, at the Green Valley Fire Department grounds, off Route 30 and near East McKeesport. For more information contact: John Roberts, 2823 Bowman Ave., Mckeesport, PA 15132.

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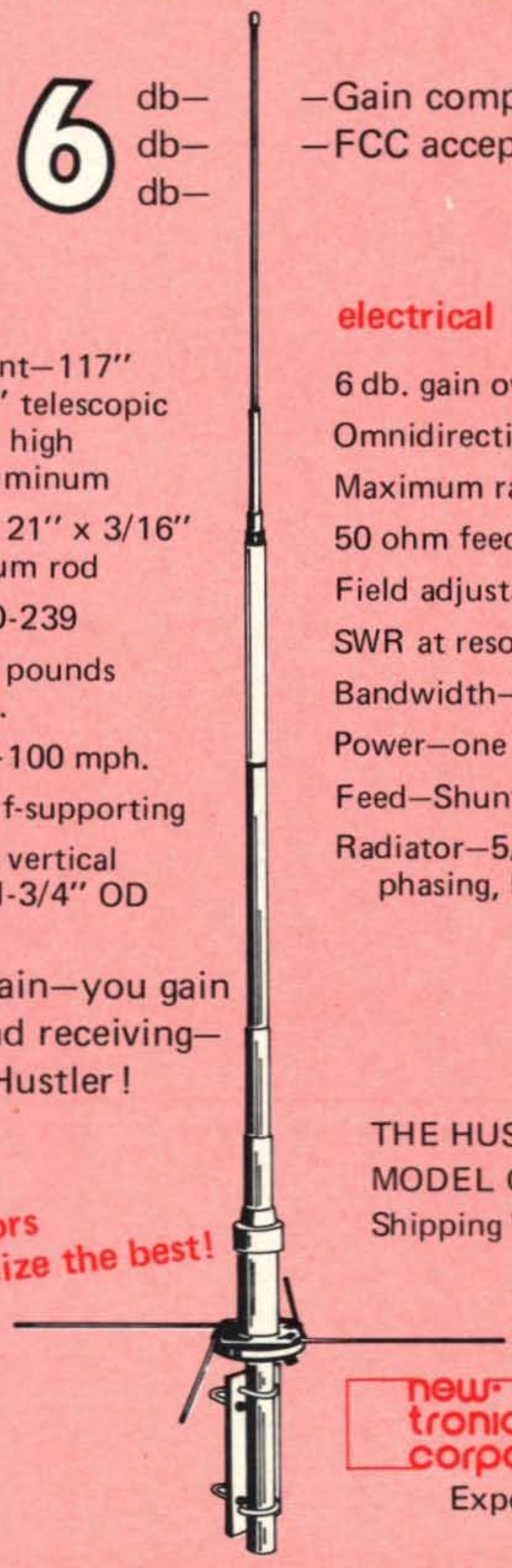

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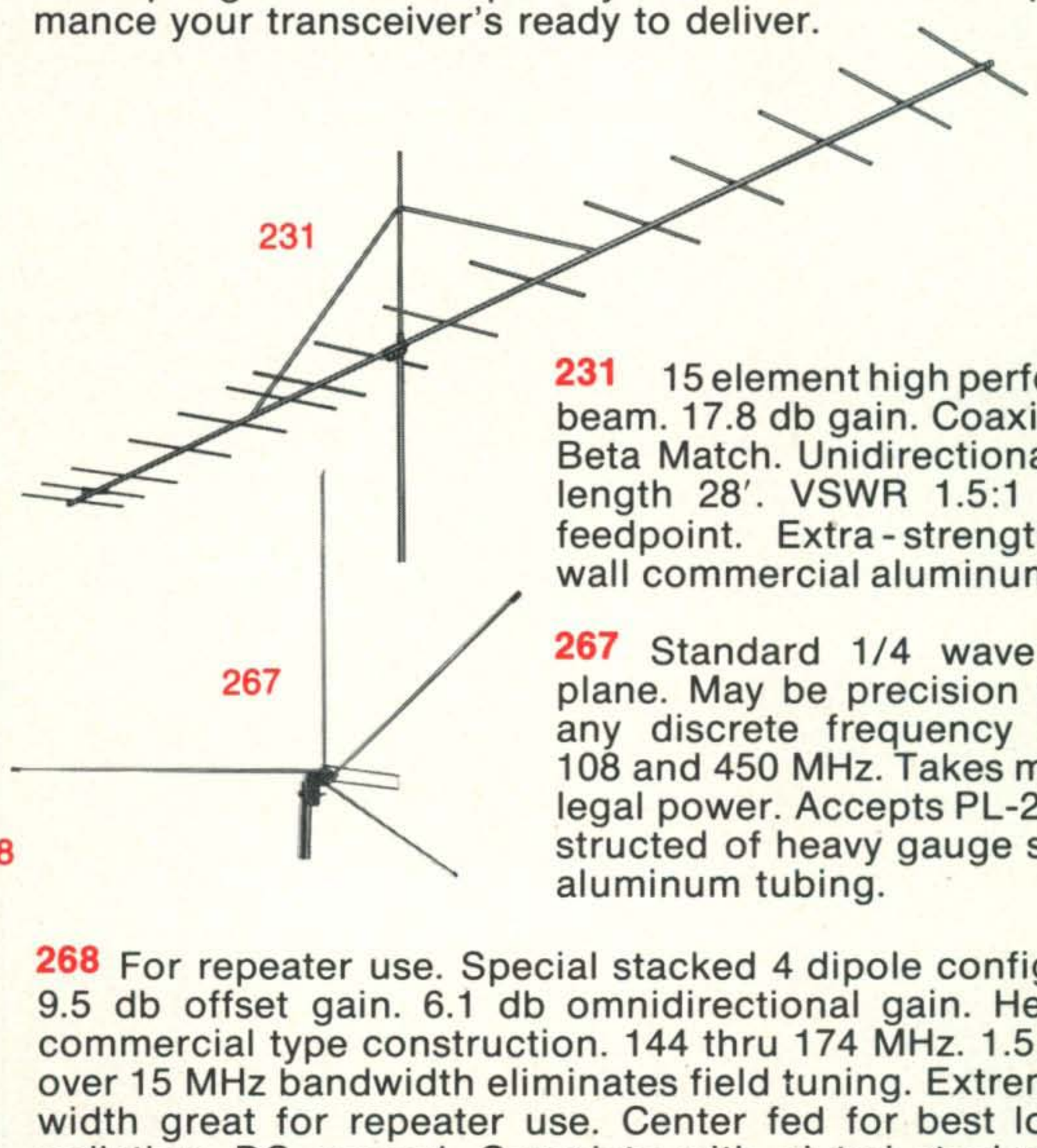
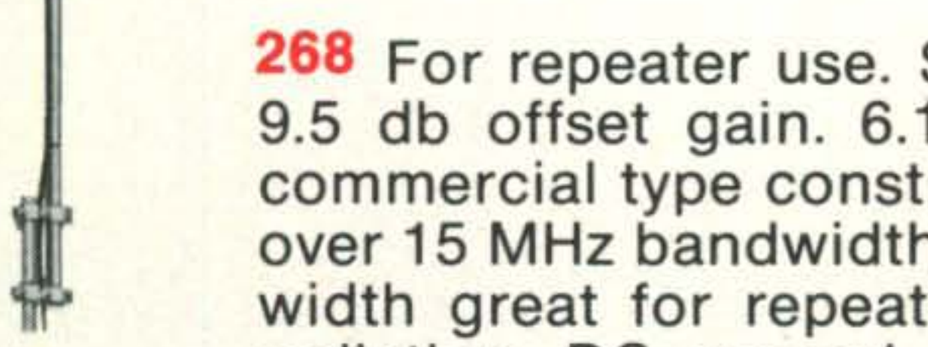


231

231 15 element high performance beam. 17.8 db gain. Coaxial balun. Beta Match. Unidirectional. Boom length 28'. VSWR 1.5:1 52 ohm feedpoint. Extra-strength heavy wall commercial aluminum tubing.

267

267 Standard 1/4 wave ground plane. May be precision tuned to any discrete frequency between 108 and 450 MHz. Takes maximum legal power. Accepts PL-259. Constructed of heavy gauge seamless aluminum tubing.



268

268 For repeater use. Special stacked 4 dipole configuration. 9.5 db offset gain. 6.1 db omnidirectional gain. Heavy wall commercial type construction. 144 thru 174 MHz. 1.5:1 VSWR over 15 MHz bandwidth eliminates field tuning. Extreme bandwidth great for repeater use. Center fed for best low angle radiation. DC ground. Complete with plated steel mounting clamps.

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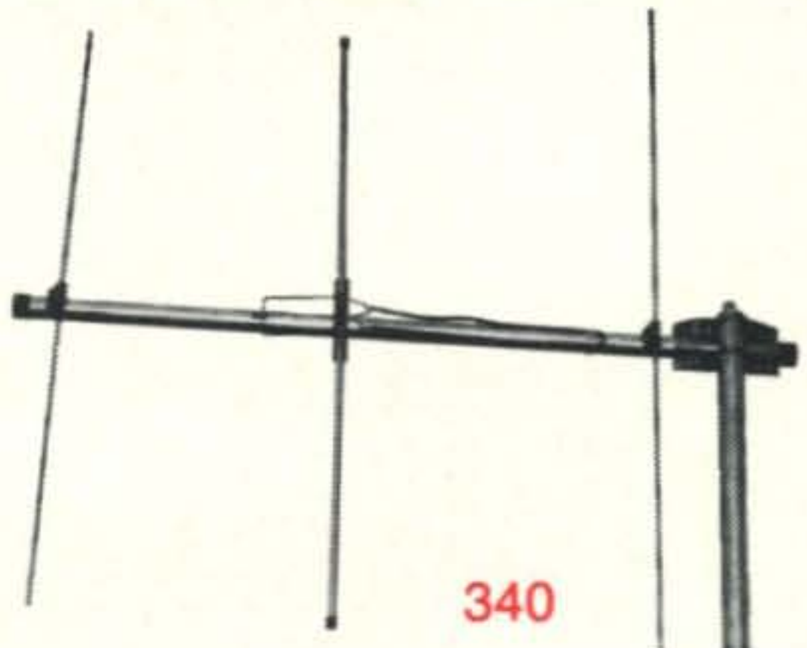
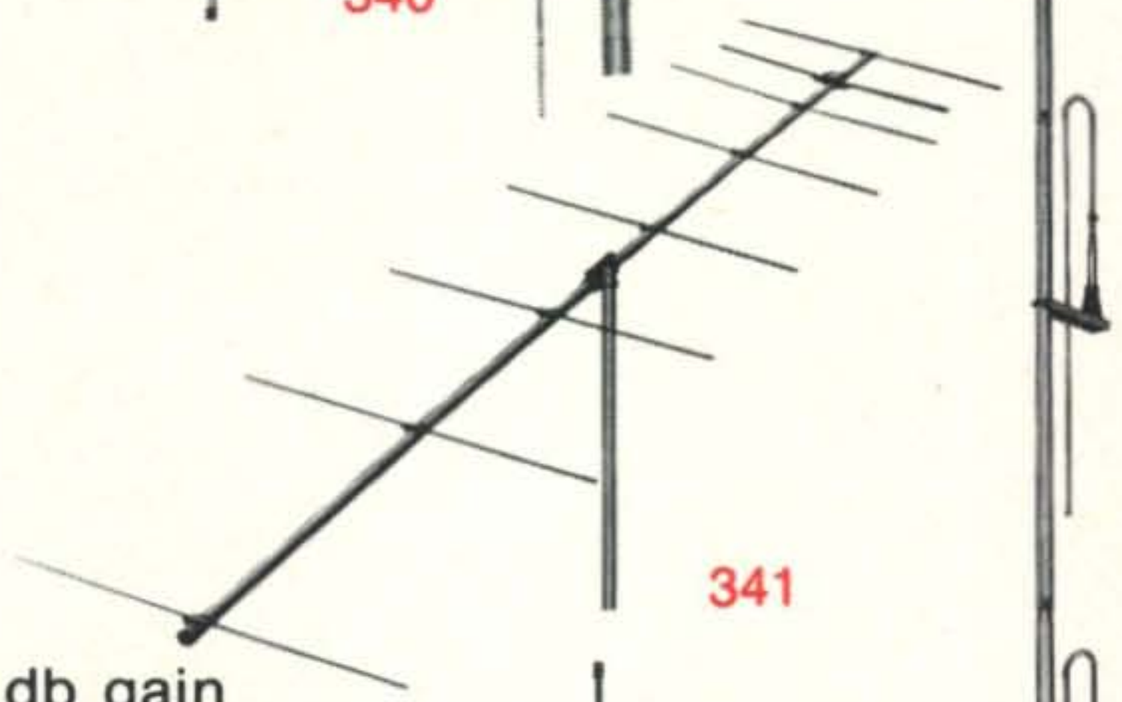
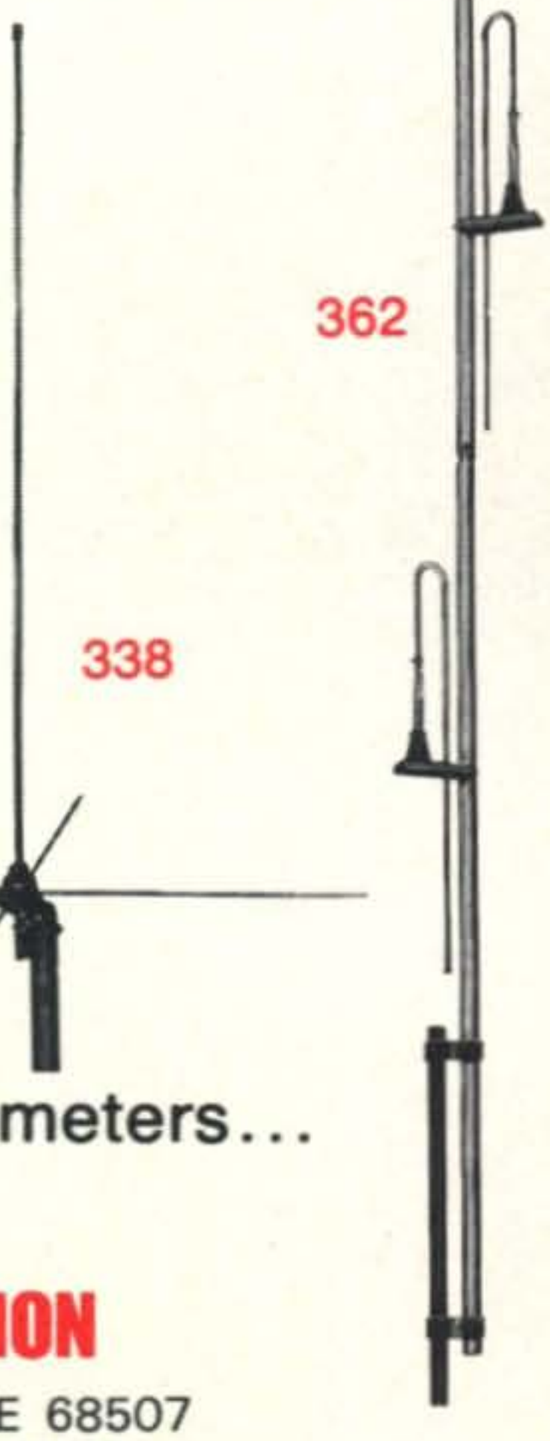
340 3 element high performance beam. 9 db gain. Coaxial balun. Special VHF Beta Match configuration. Unidirectional pattern. VSWR 1.5:1. 52 ohm impedance. Heavy gauge aluminum tubing and tough aluminum rod construction.



341 8 element high performance beam. 14.5 db gain. Coaxial balun. VHF Beta Match. Unidirectional. Boom length 14'. VSWR 1.5:1. 52 ohm feedpoint. Heavy gauge commercial type aluminum construction.



338 Colinear ground plane. 3.4 db gain omnidirectionally. Vertically polarized. 52 ohm match. Radiator of seamless aluminum tubing; radials of solid aluminum rod. VSWR less than 1.5:1. All steel parts iridite treated. Accepts PL-259.



362 SJ2S4 high performance all-driven stacked array. 4 vertically polarized dipoles. 6.2 omnidirectional gain. 52 ohm. May be mounted on mast or roof saddle. Unique phasing and matching harness for perfect parallel phase relationship. Center fed. Broad band response. DC ground.

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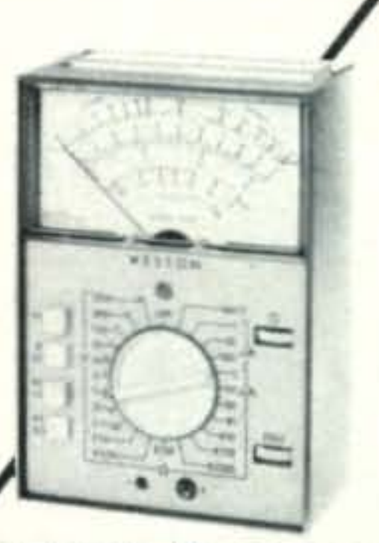

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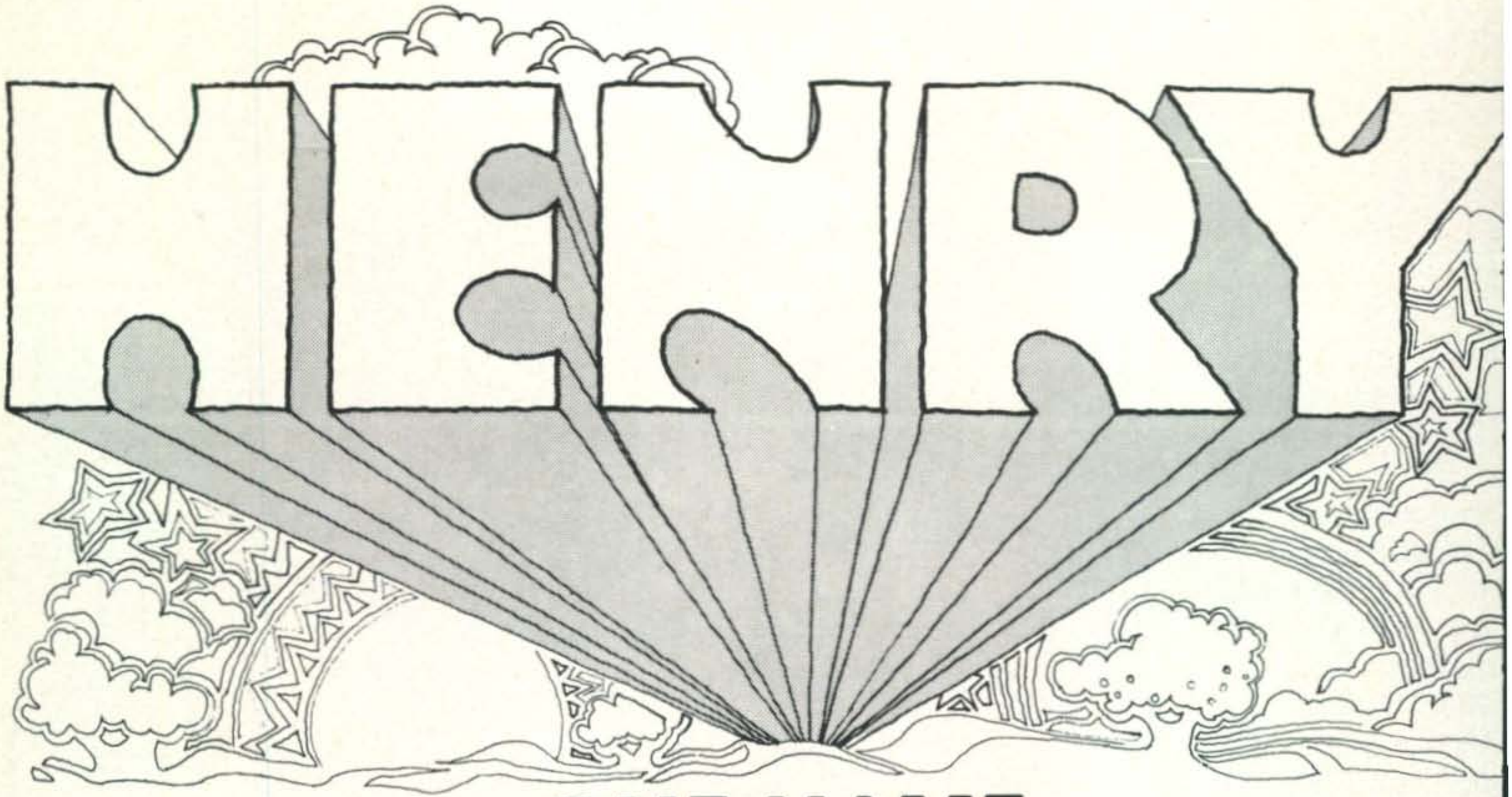

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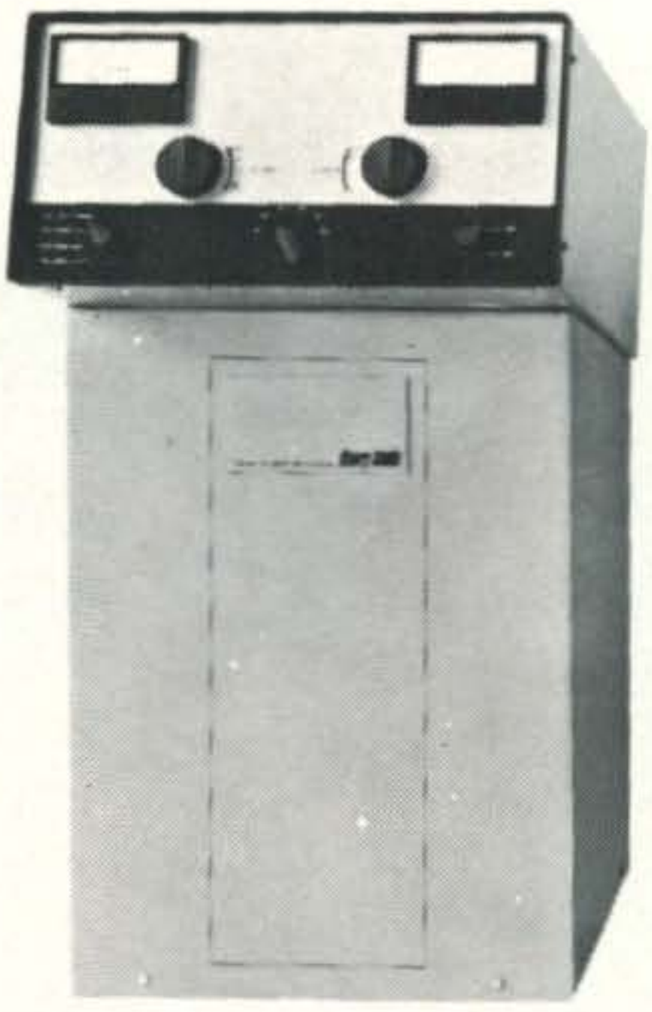

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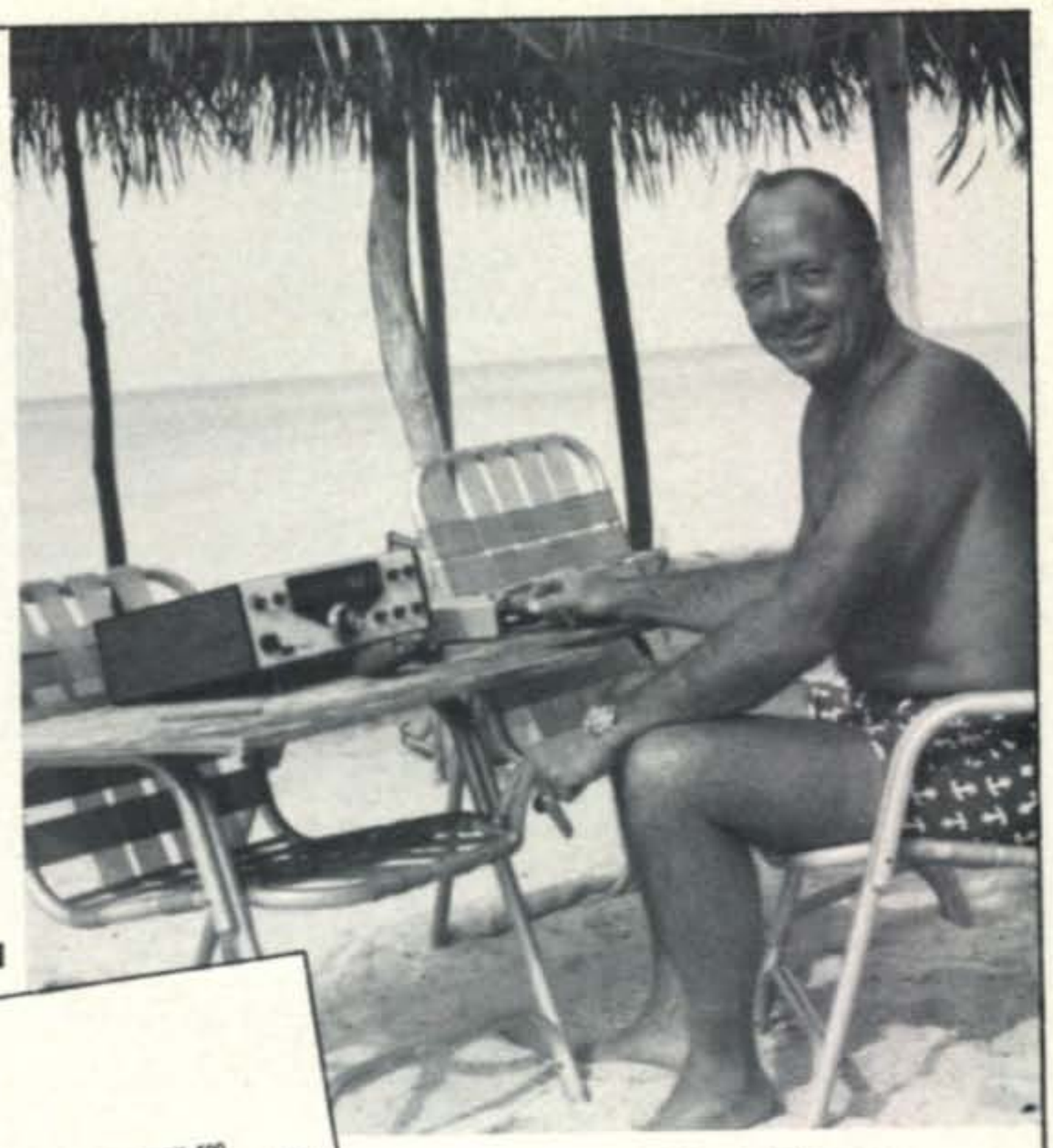

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J. DAWSON RANSOME
PRESIDENT

February 4, 1974

Mr. Albert Kahn
President
TEN-TEC, INC.
Highway 411 East
Sevierville, Tennessee 37862

Dear Al:

I have just returned from a three week trip to the Cayman Islands during which time I operated the Triton II using a vertical trapped antenna with a ground radial system in the ocean.

I felt I just had to write you and express to you and your people how extremely pleased I was with the operation of the Triton II. I found that the CW break-in feature, the CW filter, as well as the offset tuning made it extremely easy to separate stations in the pile-ups. Operating under my assisgned call ZF1RD, I talked to hundreds of stations all over the world on both CW and sideband, and was particularly impressed with the overall performance of the transceiver. It was not uncommon for me to work both on 40 and 80 meters a string of between 20 and 25 Japanese stations, and I received signal reports as high as 589.

Since returning from the Islands, I have operated the Triton II during the CW and phone ARRL DX Contest as part of our multi-station operation with great success.

My congratulations to you and your Engineering Department for developing what I consider one of the finest pieces of equipment I have ever operated.

You probably better remember me under my old call number of W2SAI rather than my current call number of K3MBF.

I look forward to seeing you in person soon.

Very truly yours,

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Dawson Ransome

J. Dawson Ransome (ZF1RD)
President

JDR/dip

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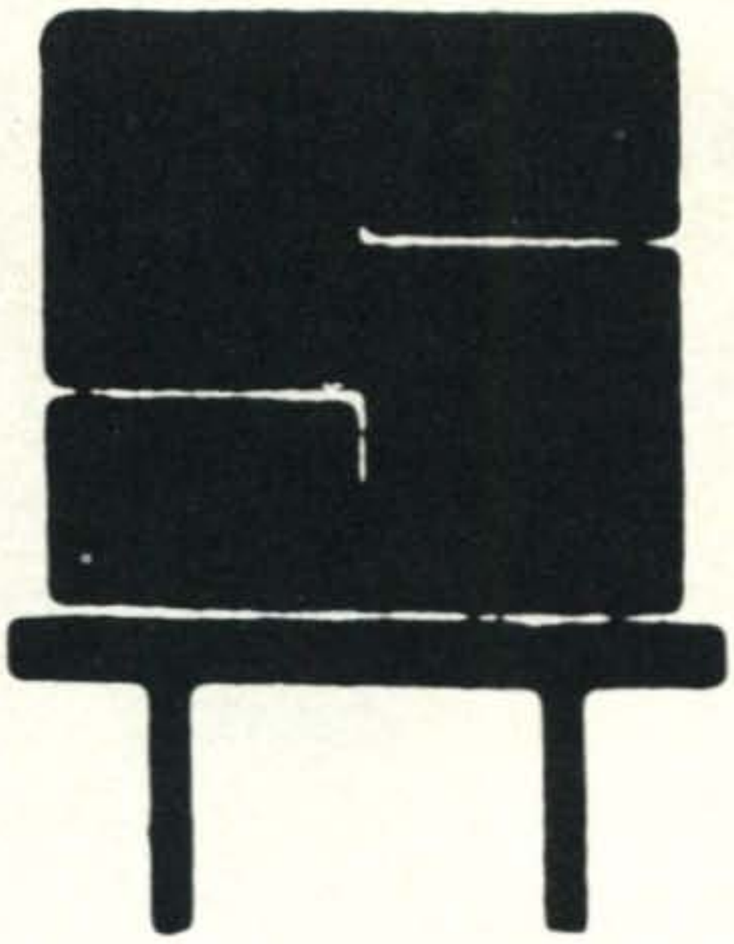

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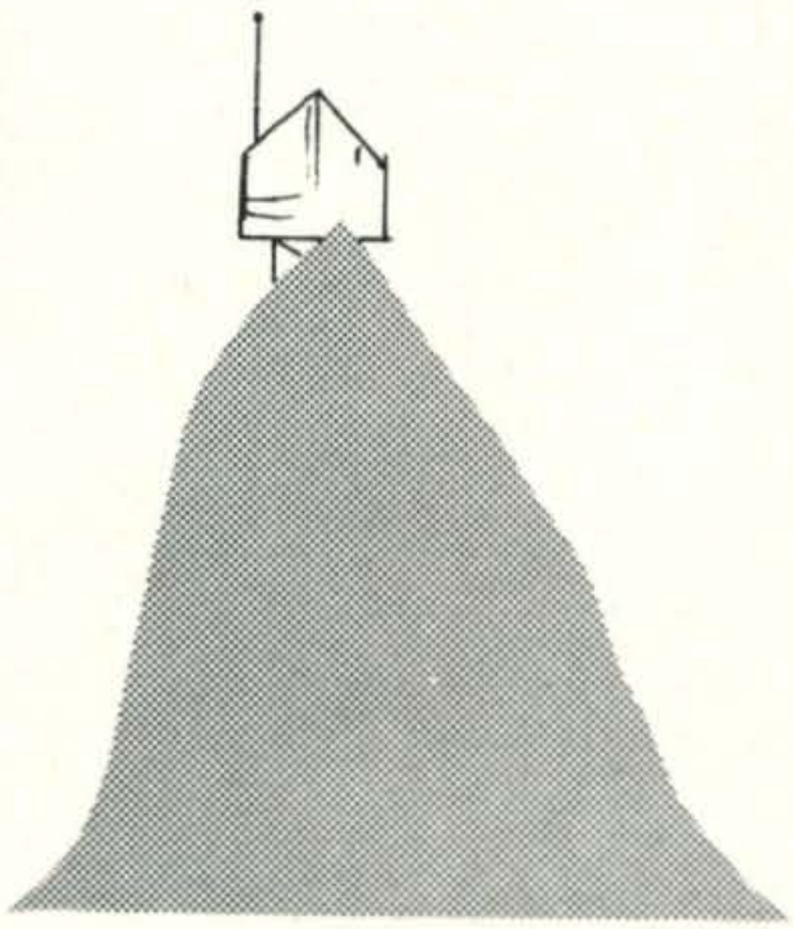

REPEATER USERS

If you want reliable access to the repeaters in your area, you want and need SENTRY CRYSTALS. SENTRY CRYSTALS are custom made for your rig. We don't stock a large quantity of crystals for a certain frequency and hope you can tweak them to frequency in your rig. We do offer FAST service on crystals made especially for you and your rig. If you want reliable, on-frequency operation, INSIST ON SENTRY.

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OUR DIGIPET 60 IS A GENERAL-PURPOSE FREQUENCY COUNTER WITH A RATING OF 1 kHz TO 60 MHz.

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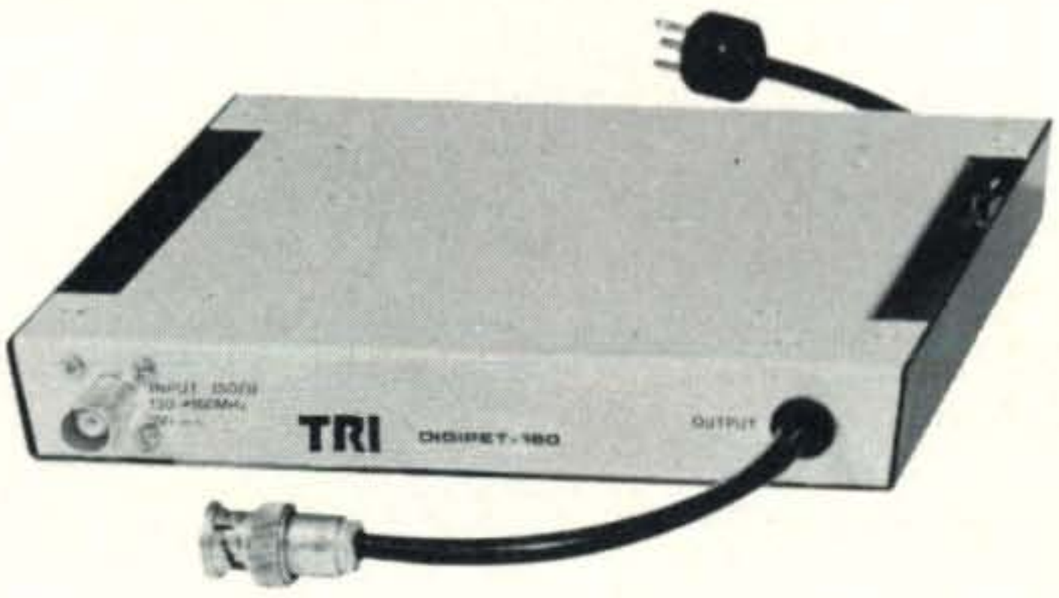

Perfectly designed for the radio amateur who wants quality, accuracy *and* economy.

If you operate around the 50 MHz band, we can offer you the Digipet 60—it measures a range of 1 kHz to 60 MHz—and it costs less than $300.

However, if you operate up around 140 MHz, you'll want the Digipet 160 converter. It costs an additional $50 and, mated-up with the Digipet 60, measures the critical range from 130 MHz to 160 MHz.

Its AC or DC operable with complete overload protection, plus being stable (aging rate: 1 part in 10^6/week), small (7" deep x 2½" high), sensitive (50 mVm's), flexible (five numerical-tube digits) and accurate (resolves to 1 kHz or 1 Hz, depending on gate time selected).

Write *immediately* for more information.

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The RVD-1002. The silent, reliable RTTY video display unit from HAL.

The revolutionary HAL RVD-1002 RTTY video display unit "prints" an RTTY signal from any TU at the four standard data rates (60, 66, 75 and 100 WPM), using a TV receiver with slight modification. Or it will directly feed a TV monitor. Power consumption is low, thanks to the RVD-1002's solid-state construction. So turn on to silent, trouble-free RTTY — with the RVD-1002.

Price: $575 ppd, USA. Air shipment $10.

The silent RTTY keyboard — that's the HAL RKB-1.

The RKB-1 TTY keyboard is loaded with features to make sending RTTY easy and fun. You get automatic letter/number shift at all four speeds, typewriter keyboard layout, and no clatter! The loop keying transistor is isolated from other keyboard circuits — wire it into any convenient point in your loop. Plus TTL logic, glass epoxy PC board, commercial grade keyswitches and more.

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RTTY — and CW on one keyboard! The HAL DKB-2010.

All solid-state. Transmit at data rates of 60, 66, 75 or 100 WPM at the flick of a switch. Complete alpha-numeric keys, 15 punctuation marks, 3 carriage control keys, 2 shift keys, break key, 2 character function keys, a "DE-call sign" key, even a "Quick brown fox . . ." test key.

The DKB-2010 is equally versatile in the CW mode, with complete alphanumeric and punctuation keys, speeds from 8-60 WPM, and a "DE-call sign" key. The DKB-2010 includes a three-character buffer operational in either the RTTY or CW mode. Optional 64 or 128 key buffer also available.

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Every amateur who knows his RTTY respects the ST-6 terminal as being the best. Autostart operation, an antispace feature and switch selection of 850 and 170 Hz shifts are standard. Circuitry is state-of-the-art, including DIP IC's on plug-in PC cards. Filters and discriminators are designed for standard RTTY tones. A 425 Hz shift discriminator is an option which allows superior reception when copying commercial press transmissions. Another option is the AK-1 audio frequency shift keyer for input to an SSB transmitter. The ST-6 and its options are available in assembled or kit form. Cabinet not included in kit.

Price: ST-6 $310 Assembled, $147.50 Kit, ppd USA.
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HAL Communications Corp.
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Telephone: (217) 359-7373

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The easy-to-use 1550 keyer is your answer if you're looking for an electronic keyer that lets you send accurate CW effortlessly. Send from 8 to 60 WPM with conventional, iambic, and dot memory operation. Operates with dual or single lever keys. The optional 1550/ID automatically sends "DE" followed by your station call. For fast, accurate CW, order the HAL 1550/ID or 1550 today.

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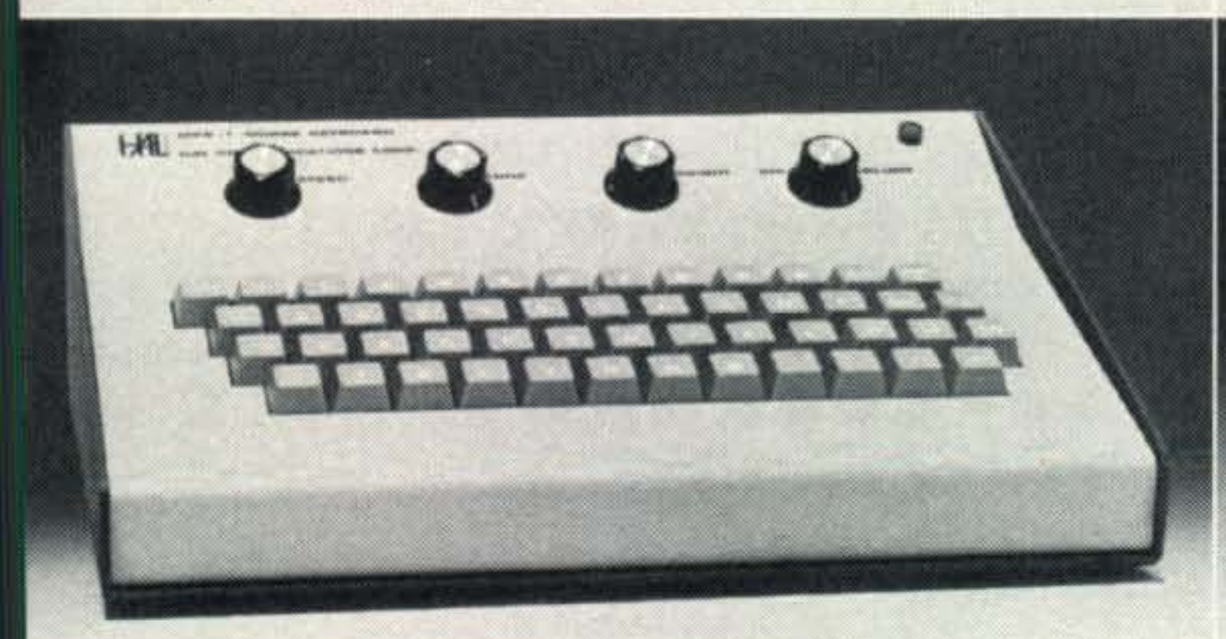
The HAL ID-1A brings the radio amateur a commercial-quality repeater identifier that complies with FCC ID requirements. It has a unique read-only-memory that you can easily reprogram yourself. Capacity of the ROM is 39 dots, dashes and spaces. TTL IC's assure immunity from noise and temperature. ID intervals available: 3, 6, 12 or 24 min. Specify call.

Price: $115, ppd USA. Air shipment, $3.



Send perfect CW every time with the MKB-1.

A complete Morse keyboard. Code speed variable from 10-60 WPM with variable dot-to-space ratio (weight). All solid-state, featuring computer-grade components. Complete alphanumeric and punctuation keys, plus an optional "DE-call sign" key factory programmed for you. Includes built-in speaker/oscillator monitor.

Price: $290 Assembled, $199 Kit, ppd USA. Without ID, $250 Assembled, $170 Kit. Air shipment, $5.

CW—and RTTY on one keyboard! The HAL DKB-2010.

All solid-state. Type out CW at 8-60 WPM. Adjustable dot-to-space ratio (weight). Complete alphanumeric keys, plus 11 punctuation marks. Five standard two-character keys, 2 shift keys, break-for-tuning key, 2 three-character function keys, and a "DE-call sign" key. We'll program your call right into the DKB-2010. Plus complete RTTY capabilities. Built-in three-character buffer. Optional 64 or 128 key buffer also available.

Price: $425 Assembled, $325 Kit, ppd USA. 64 key buffer $100, 128 key buffer $150. Air shipment, $10.

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Name _____ Address _____ Call Sign _____

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Illinois residents add 5% sales tax. C

An Accurate Solid State Component Curve Tracer

BY ALBERT J. KLAPPENBERGER,* K3KWX

HAVE you ever bought a surprise package of transistors or diodes and wondered what you had? Have you ever needed a set of matched transistors? Did you ever just want to know if a transistor was good or bad? Well, if you have, a curve tracer is an instrument that can help you out.

All of the curve tracers I have seen published lately have been simple and easy to build, but lack the accuracy I believe an instrument should have to be truly useful. In this design, accuracy was the main goal.

This unit was designed to be plugged into the horizontal plug-in compartment of an AN/USM-140C oscilloscope (military version of a Hewlett-Packard 170) from which it is powered, but by adding a power supply of its own, it could be used with any calibrated oscilloscope. A block diagram of the curve tracer is shown in fig. 1.

*Route 1, Box 227, Westover, MD 21871

Circuit Operation

Step Generator: IC_1 and IC_2 are a linear integrator and hysteresis trigger that form a free-running triangle wave oscillator.

The triangle wave is fed to a Schmitt trigger, Q_1-Q_2, which generates a square wave with transitions occurring at the zero voltage crossings of the input triangle. Q_3 clamps the square wave so that its voltage is exactly 6.3 v. peak to peak. The flip-flop consisting of Q_4 and Q_5 generate a square wave also clamped at 6.3 v. peak to peak but at half the frequency of the triangle wave.

The two square waves from Q_3 and Q_5 can be looked at as a binary count of zero to three (00, 01, 10, 11) and by adding these two square waves in such a way that the flip-flop output has twice the effect of the Schmitt trigger's output, a 3 step staircase voltage can be accurately generated with steps precisely in phase with the triangle wave zero signal crossings.

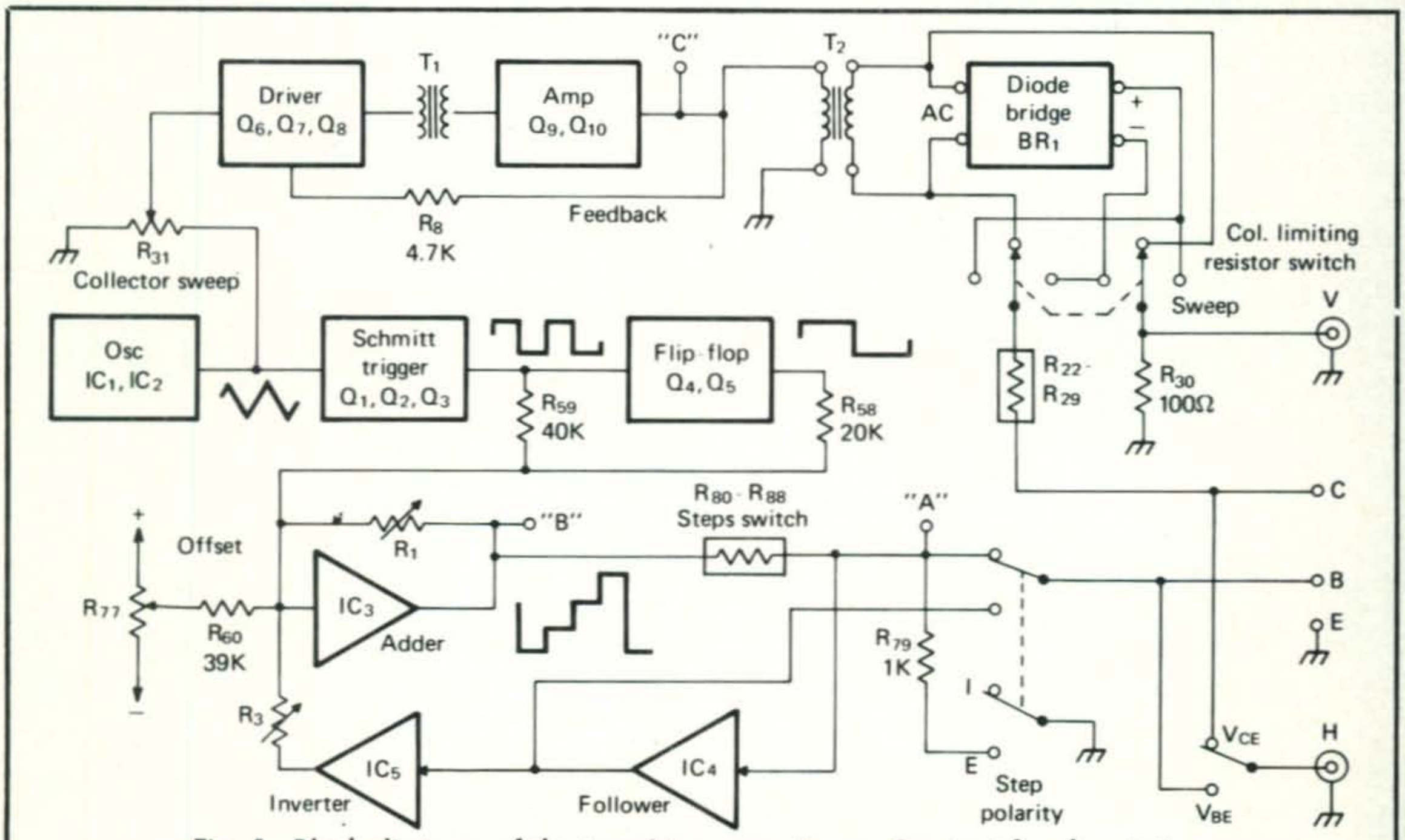


Fig. 1—Block diagram of the transistor curve tracer. See text for description.

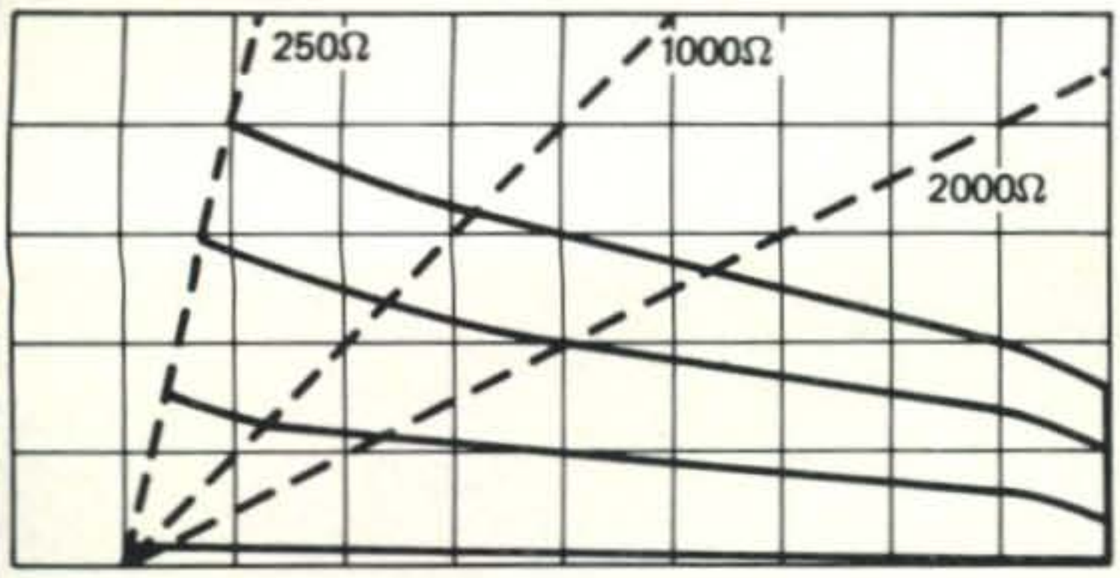
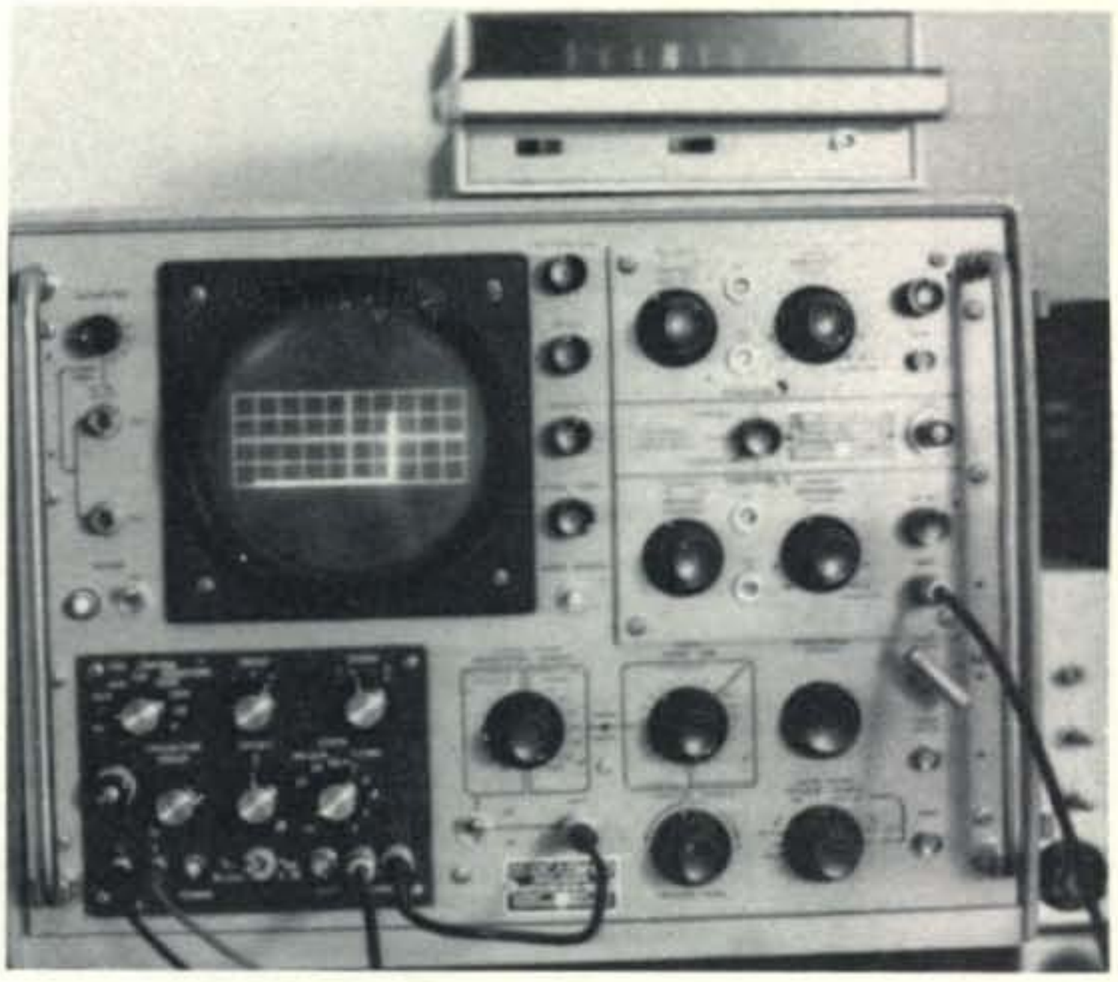


Fig. 2—Typical family of curves for a common PNP germanium transistor as displayed on the scope. These curves are for a 2N1305. Horizontal scale-2 v. per division; vertical-2 ma per division; 20 μa per step. The broken lines indicate the effects that different collector supply source impedances would have on the lengths of the displayed curves.



The curve tracer in operation in its associated scope.

The output of IC_3 is the sum of all its inputs as 'scaled' by its input resistors. By feeding the outputs of Q_3 and Q_5 through input resistors of exactly 40K and 20K respectively (R_{58} and R_{59}) with a feedback resistor of 1.3K (R_1 and R_6) a 2 v. per step staircase is provided.

A voltage staircase applied to the base of a transistor through a known resistance will provide known current steps so long as the base to ground voltage remains zero. In practice, base to emitter voltage will not be zero.

We would like to be able to terminate the step generator output in any resistance and still know that precise current steps are flowing. To do this, the voltage across the output of the step generator (B to E voltage of transistor under test) is added to the staircase voltage, this holds the voltage steps across the standard resistor equal, insuring accurate current steps. IC_4 and IC_5 perform this function.

IC_4 is a follower circuit that keeps the inverter (IC_5) from loading down the step generator output. R_3 is adjusted to allow the output of IC_5 to add the B to E voltage to the staircase in exact one to one proportion.

To generate voltage steps for FET analysis, the current steps are passed through a 1K 1% resistor (R_{79}).

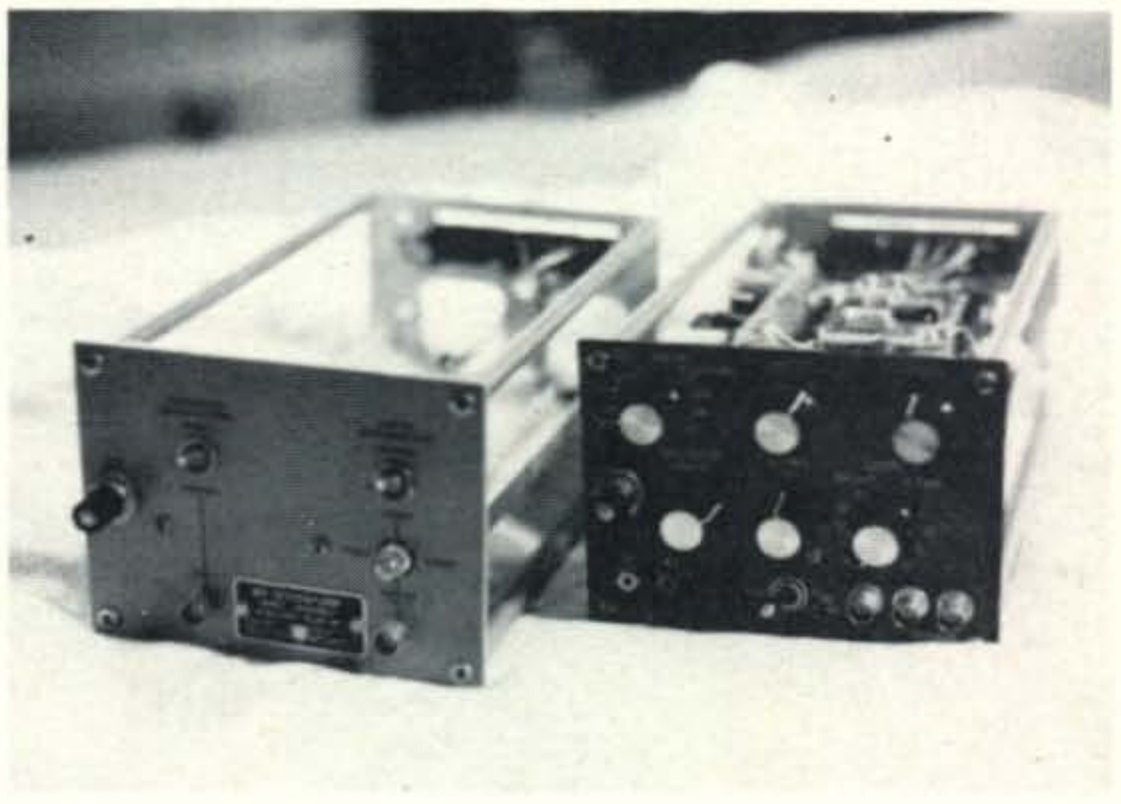
For negative steps the entire staircase is biased 6v. negative.

Collector Sweep Supply: To 'draw' a family of curves for the transistor under test the collector must be swept from zero to maximum voltage and back down to zero for each base step.

Most simple curve tracers use a transformer and bridge rectifier with a potentiometer to vary the sweep voltage. This method is fine for simplicity but seriously limits voltage regulation causing the trace of the higher base steps to be shorter than the lower ones when the potentiometer is turned down. Figure 2 illustrates this effect.

In order to have a large voltage sweep capability and still retain the ability to draw current at lower sweep voltages a power amplifier with low output impedance (about 250 ohms) was used for the collector sweep supply.

Q_6 compares the input triangle wave with the output of Q_9 and Q_{10} and amplifies the difference. Q_7 and Q_8 form a complement-



The transistor curve tracer is built into a spare plug-in oscilloscope module like the one at left. Power is drawn from the 'scope through the module's rear-mounted plug-in connector. The curve tracer need not be constructed in this way, however; conventional techniques may be used.

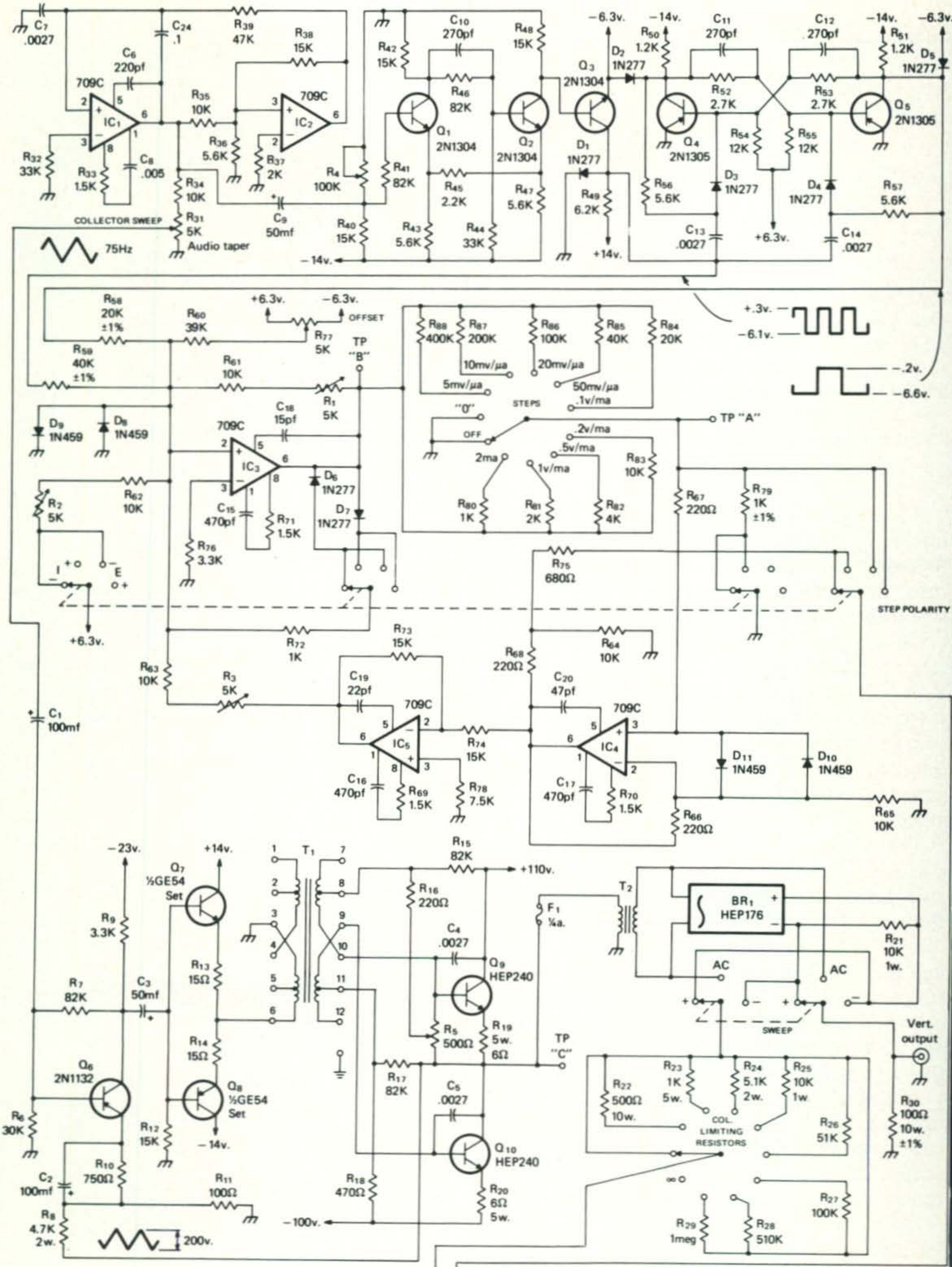


Fig. 3—Schematic of the transistor curve tracer. All resistors are ½ w. 10% unless noted otherwise. All decimal value capacitors are in mf; others as noted. IC_1-IC_5 are "709C" op-amps from Radio Shack. T_1 is a UTC A-20 multi-match audio transformer. T_2 is a 15 w. 1:1 isolation transformer, Stancor P-6411.

ary-symmetry driver for the low impedance primary of T_1. The high degree of feedback provided by R_8 assure low distortion and low output impedance (about 80 ohms at this point) while delivering more than 200 v. peak to peak to the primary of T_2.

T_2 isolates the supply from ground so a current sample can be taken across R_{30} for vertical deflection.

BR_1 and the SWEEP switch allow either positive or negative sweeps for transistors, or a.c. for diode analysis.

The collector limiting resistors provide a method of protecting delicate devices from excess current while measuring voltage breakdowns such as BV_{cbo}. The complete schematic is shown in fig. 3.

Power Supply

The 14 v. supplies are simply emitter followers that regulate the voltage dropped from the 100 v. supplies. See fig. 4. This is not the most efficient method of delivering power, but was necessary because 100 v. was all that was available from my particular oscilloscope. The supply voltages are not too critical, but the −6.3 v. supply must at least remain stable as the step generator is referenced from this supply.

The power relay (K_1) was operated from the 6.3 v. supplies because they were designed to run tube heaters and would deliver plenty of current. The silicon diode across K_1 absorbs inductive kick on drop out.

Front panel of the curve tracer showing control locations and designations. The knob at left center is a lock for the plug-in module. The "Z-Input" BNC connector near the lower right is not used for curve tracer functions.

Construction

My unit was built into the auxiliary plug-in frame that came with my 'scope. All parts associated with the triangle oscillator and base step generator were wired on a single 'Vector' board and mounted below the chas-

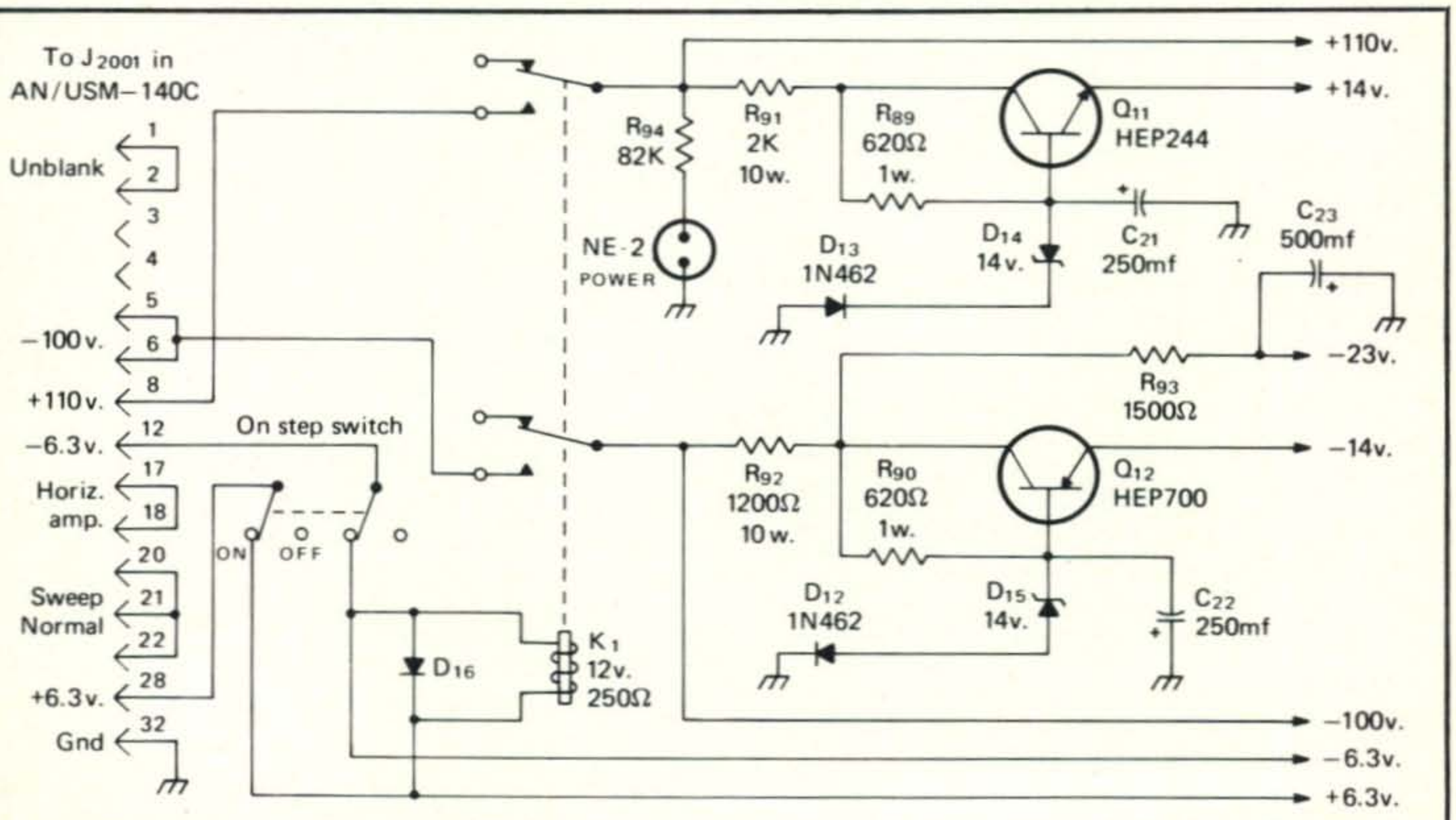
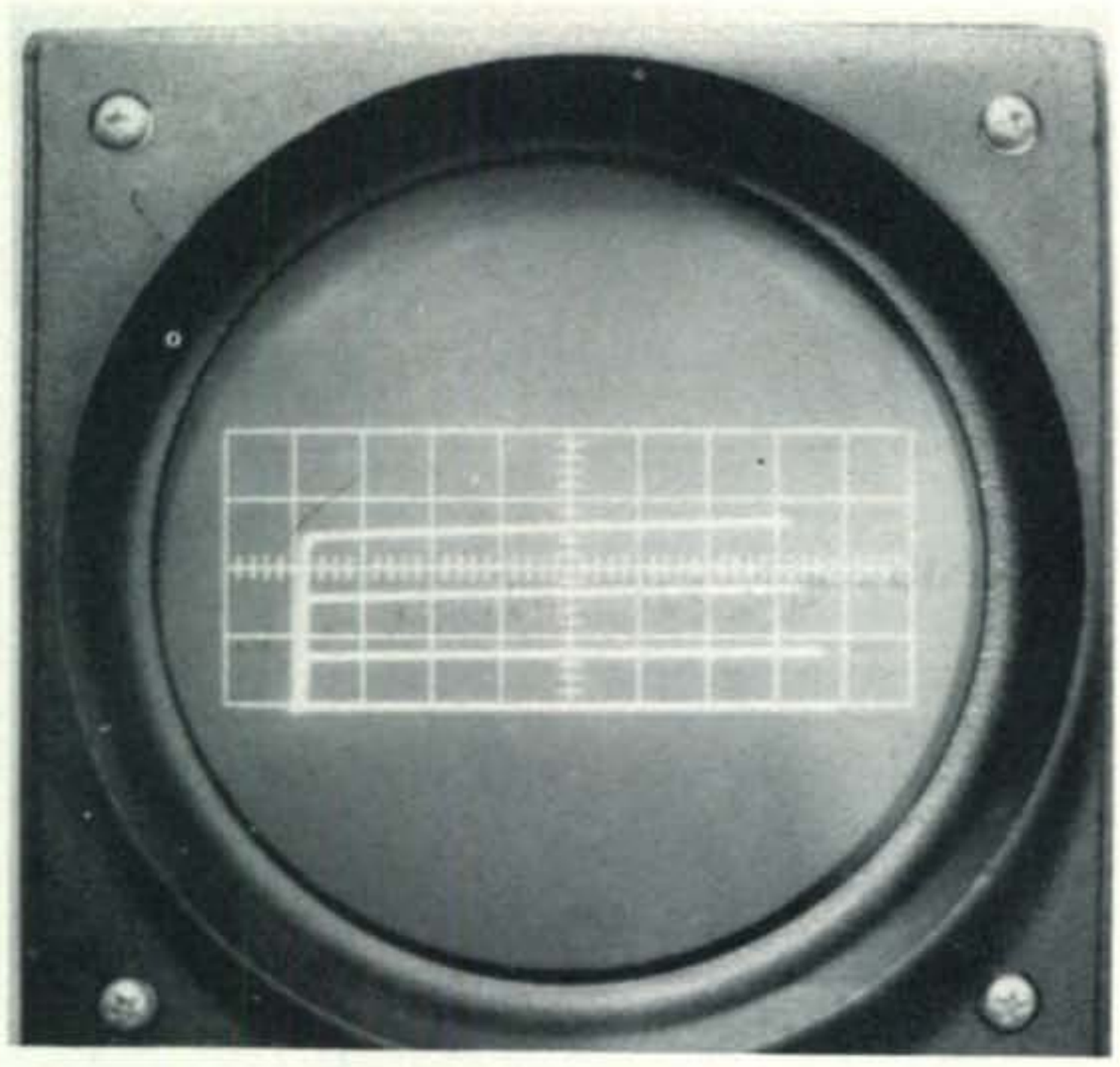


Fig. 4—Schematic of curve tracer power supply built by the author for use with his AN/USM-140C scope. Since unusual voltages were available from the scope, the power supply was designed to make use of them. In any other situation, conventional power supply techniques would apply, of course.



A typical family of curves as generated by the curve tracer and displayed on the scope. Note that the curves are relatively equal in length, a characteristic of a good low-Z collector supply.

sis. The collector sweep supply and power regulators are on separate boards above the chassis.

Most of the accuracy of the step generator depends on the precision resistors associated with IC_3, and the current sample resistor R_{30}. The cost of precision resistors is so high that I used 5% resistors in parallel, hand picked with a bridge for values I didn't have on hand.

The COLLECTOR SWEEP pot R_{31} is audio taper. This gives much nicer control at low sweep voltages than a linear pot.

Q_9 and Q_{10} were mounted on the chassis using Motorola HEP 452 transistor sockets. For Q_{11} and Q_{12}, heat sinks were made from small copper plates and attached directly to their cases.

The V_{be}/V_{ce} switch in my unit performs an additional function, it also is used to select intensity modulation or chopped mode blanking. This feature has nothing to do with the curve tracer and can be left off.

Alignment

Alignment of the collector sweep amplifier is simply a matter of setting R_5 for zero volts at point 'C' with no signal and fuse F_1 removed.

Adjustment of the step generator is a bit more involved and *must* be done in the given order or the adjustments will interact.

1. Adjust R_4 for equal time duration of each step at point 'B'. Adjust slowly.
2. Short circuit B to E output posts.
3. Set STEP POLARITY switch to 'I plus'.
4. Adjust OFFSET control R_{77} for zero volts baseline on positive going staircase at point 'B'. Approach final adjustment from positive side.
5. Slip OFFSET knob on shaft to align pointer with front panel center line.
6. Adjust R_1 for 2 v. per step at point 'B'.
7. Set STEP POLARITY switch to 'I neg.'.
8. Adjust R_2 for zero volts baseline on negative going staircase at point 'B'. Approach final adjustment from negative side.
9. Remove short B to E (step 2).
10. Select 'E plus' and 1 v. per step.
11. Adjust R_3 for 1 v. per step at point 'A'.

[*Contined on page 82*]

Specifications

COLLECTOR SWEEP SUPPLY: Triangle wave.

Pos. or Neg.: 150 Hz. 0-110 v. peak.
A.c.: 75 Hz. 0-220 v. peak to peak.
Current output: 300 ma or more peak.
Source impedance: 250 ohms.
Collector limiting resistance: 500 ohms to 1 meg. in 1-5-1 sequence plus zero and open circuit. All positions except "0" can absorb full output of collector sweep supply on a collector to emitter short.

BASE STEP GENERATOR: Pos. or Neg. steps from zero.

Number of steps: 3 steps from zero, phase locked to collector sweeps.
Offset: plus or minus 1 step. Offset control will not reverse step polarity.
Current range: 5 μa to 2 ma per step in 1-2-5 sequence, plus zero.
Voltage range: 5 mv to 1 v. per step in 1-2-5 sequence, plus zero.
Output impedance:
Voltage steps: about 1000 ohms.
Current steps: extremely high (current regulated).

HORIZONTAL OUTPUT:
Display: Voltage, Base to Emitter or Collector to Emitter.

VERTICAL OUTPUT:
Display: Collector current only.
Scale factor: 1 v. represents 10 ma collector current.

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

My mail has carried quite a few queries which can be answered in a general way via this column, so we'll do it now, because probably many of you are wondering about some of the same things.

Commercial QRPp C.W. Gear. At present, no all-band c.w.-only transmitter-only gear is being produced commercially, nor have I been notified that any is in the works. I've tried edging TenTec onto the idea, but market analysis suggests that only 25% of the QRPp market is interested in anything but the transceiver concept. However, there are some c.w. rigs on the way. MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762, has a 5 watt (input) 40 meter transmitter module packaged in a 4" × 3¼" × 2$^{3}/_{16}$" enclosure, completely assembled and ready to go. Sounds good. Includes a four-pole crystal (two mounted inside cabinet) switch, with provision for external crystal and v.f.o.; pi net output, short circuit and open circuit protection designed in. Price will be $19.95. Add a battery and crystal and you're on! A companion v.f.o. features FET's in the very stable Seiler circuit (100 Hz stability claimed for this v.f.o.) for $19.95. Judging from the extremely high quality and splendid performance of the MFJ audio filters, I'd take a chance on this rig combo sight unseen. Both will be available July, 1974.

In addition, M-Tech Engineering of Box C, Springfield, VA 22151, has a 40 meter rig on the boards. Plans include an FET Seiler v.f.o. and transmitter section running about 5 watts input. Price should be in the $25-30.00 range, but no recent details as to packaging. M-Tech has produced very high quality v.h.f. amplifiers for the past few years for almost unbelievable prices, so the c.w. rig ought to be a good one.

My only question is this: is there a commercial market for an all-band c.w.-only transmitter putting out 5 watts? I personally would take a chance on it. Any investors around? Hi!

The Argonaut. The TenTec Argonaut is the only commercial all-band, c.w.-s.s.b. transceiver on the market that is in the QRPp area. It is perfectly at home either in the shack, in the car (just plug it into the cigarette plug), or on the mountain-top. The receiver is very sensitive, with i.f. filter selectivity. Excellent. State of the art. Well-worth the $288.00 for the serious QRPp advocate, or if you have some extra cash laying around. Don't wait to find one second-hand—seems once a guy gets a hold of one, he just won't let go!

Ten Tec's PM series is being phased out, and that will leave Heath's HW-7 alone in the field for a QRPp transceiver using the direct conversion receiver. Because of design shortcuts in the HW-7, a great many owners have been plagued with a variety of receiver section problems. Transmitter section is fine—v.f.o. control, about 2 watts input on 40, 20, and 15 m. The HW-7 could be put on 80 meters without too much difficulty (you might query W8NDG).

Parts Sources

The greatest difficulty faced by the neophyte home-brewer is the source of parts to go with those projects found in magazines. For an exhaustive list of sources, see W1ICP, "Where Can I Buy Parts," *QST*, July, 1973. The following is a *very* selective list designed to allow you to acquire everything you will need for most projects from a few sources.

Big supply houses. Burstein-Applebee, 3199 Mercier St., Kansas City, MO 64111. Complete RCA line of semiconductors, Motorola HEP line semiconductors. Usual range of resistors, capacitors (including NPO zero-drift, but not N750 negative drifts necessary for temperature stabilizing an oscillator). Bargain section of catalogue is miniature flea-market with everything from p.c. board miniature electrolytics to meters, antenna wire—all bargains.

Allied Electronics—Industrial Catalogue, 2400 W. Washington Blvd., Chicago, ILL 60612. $1.00 catalogue. Large line of semiconductors—RCA, National, Signetics, Texas Instruments, ITT, Sprague. Usual range of resistors/capacitors, including NPO and N750, and Elmenco subminiature trimmers for p.c. board mounting.

Radio Shack. Brand new "Qwick-Fill" electronics parts catalogue listing over 2,000 hard-to-find electronic items most used by home-brewers—I haven't seen it yet. Apparently the catalogue is available at your local Radio Shack, which sends in the order for you and you pick it up there.

Circuit Specialists, P.O. Box 3047, Scottsdale, AZ 85257. Semiconductor Supermarket catalogue (1974) just off the press. The stock of this outfit was put together by a homebrew artist—fantastic. For starters: Motorola HEP line, RCA SK line, Fairchild-complete line of semiconductors. But: Ferranti ZN414 a.m. receiver IC, Lithic Systems LP1000, LS1496, and

[*Continued on page 84*]

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COP's COLUMN

BY COPTHORNE MACDONALD,* WØORX

Slow-Scan At Dayton '74

Don Miller, W9NTP, called it "the year of the scan-converter" and reports that people were often packed ten deep around the ATV exhibit where *four* different slow-to-fast scan-converters were on display. Each of these converters used digital storage techniques to convert an incoming SSTV signal into a constant brightness display on a standard TV set. Don sent a brief description of the performance and design of each of these converters, and Robert Suding, WØLMD, sent a more detailed description of the unit he designed. Let's look at each of these, starting with the brief descriptions.

Don's own scan-converter was on display. The digital part was very much like Bob Suding's. It used a 4-bit-per-picture-element encoding scheme that preserved 16 shades of grey. The digital memory used almost 68,000 bits of MOS shift register storage in which the stored picture was updated on a line-by-line basis with new slow-scan information. Don said that the main difference between his unit and Bob's was in the front-end circuitry: video processing, sync separation, etc.

The converter built and displayed by George Steber, WB9LVI, had "less jitter and a better picture than any of the rest," according to Don. Don attributed the reduced horizontal line-to-line displacement or "jitter" to George's use of better sync recovery circuits. (I plan to discuss the way of "jitter," and circuitry that helps to minimize it, in a future column.) George's unit also displayed 16 shades of grey, and updated the video information "on-the-fly."

Two Canadian hams, Bill Montgomery, VE3GZM, and J. C. VandenBerg, VE3DVV, displayed their jointly designed and built scan-converter. Their approach is the simplest in concept, but has the disadvantage of using twice as much memory. Basically it involves writing an entire slow-scan frame, sync and all, into shift register memory, and then speeding up the recirculation rate by a factor of 1000. The original 15 Hz rate becomes 15 kHz, and the 1/8 Hz vertical rate becomes 125 Hz! Since both amateur SSTV and regular TV use "blacker than black" sync, and since many TV set vertical oscillators have enough range to reach 125 Hz, this speeded-up signal can be used to drive a conventional TV monitor directly. The double-sized memory is necessary in order to keep an image on the display screen at all times. One frame of incoming slow-scan is written into storage while the preceding frame is being viewed on the TV set or monitor.

The block diagram of Robert Suding's scan-converter is shown in fig. 1. The incoming slow-scan f.m. subcarrier is passed through a limiter and then demodulated and converted to a 4 bit digital code in a Gray Code A to D converter. The digitized video from each odd-numbered video line is stored in an "odd-line memory buffer" as it arrives, and each even-numbered line goes to an "even-line" buffer store. The incoming sync signals are separated and used to control the timing of parts of the process.

The 67,584 bits of recirculating frame memory are provided by sixty-four type 2525 LSI MOS dynamic shift registers having 1024 bits of storage each, and four 512 bit registers. The 2525's at $9.00 each would have cost $576.00, but Bob managed to track down some on the surplus market for $0.25 each! About half of these surplus units tested OK. As he describes the availability situation, "Unfortunately, sources dry up quickly, and so the experimenter must keep an open eye and mind, and hang loose." (He places the cost of the additional "non-memory" logic at about $150.)

Because each picture element of the incoming video has been assigned a 4 bit digital code describing its grey shade, Bob uses a separate 16,896 bit recirculating memory for each bit of the code. These are clocked through in synchronism with each other. Among the tricky parts of the design are the "update" portions of the circuitry which replace old recirculating video with newly arrived video, one line at a time without stopping the recirculation process. As Bob puts it, "The complete operation revolves around the ability to update this recirculating memory. Because of the obvious lack of any direct speed relationship between the incoming SSTV and the output fast-scan TV, two separate clocks are utilized, a slow one to control video data movement into the buffer registers, and a fast clock to control video data movement out of the buffers into main memory, recirculate main memory, and output video to the fast-scan TV set. The buffers must thus be

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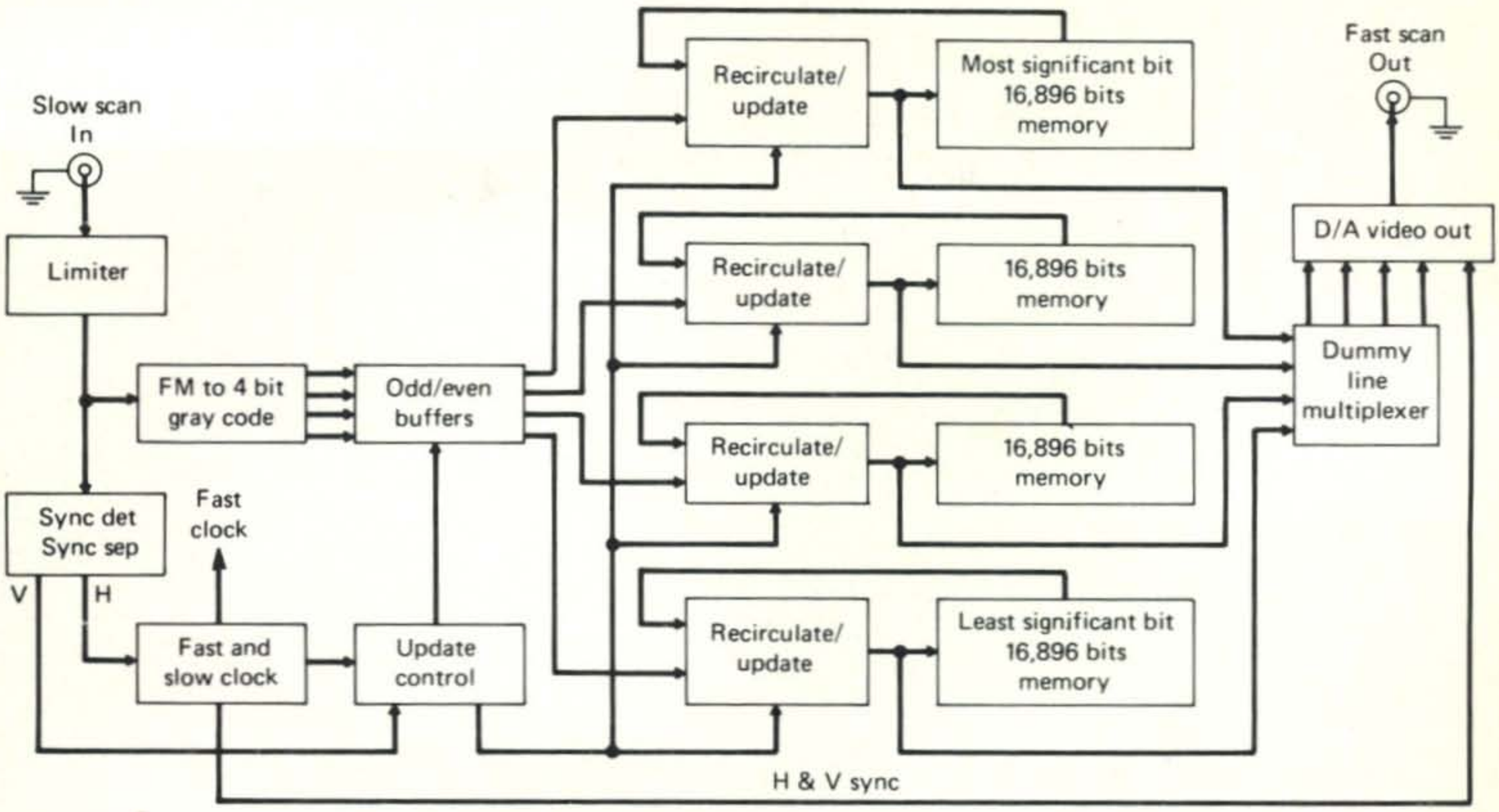

Fig. 1—Block diagram of the WØLMD "Receiving End" scan converter.

the speed linkage, having an ability to run slow, fast, or not at all; without ever accidentally losing any video data."

The "Dummy Line Multiplexer" block is a circuit which duplicates each fast-scan line so that the display on the TV set contains 240 or 256 horizontal lines, not just 120 or 128. While this does not improve the actual *resolution,* the "dummy lines" do make the display more pleasing to watch, especially on a large screen set.

What does the display look like? Again, in Bob's words, "This ability to update the continuously recirculating main memory from the incoming SSTV then means that a picture will be continuously displayed on the TV set. The only time any apparent video change occurs is during a completely new received video frame. In fact, after a good picture is received, the SSTV may be switched off, and the picture will remain until the scan-converter is turned off, or the converter receives some more SSTV which would overlay the recirculating video data. The memory can be completely updated in one SSTV frame, nominally 8 seconds in length. The operation appears identical to P7 reception except that the already written lines are just as bright as the line being written, and there is no remnant of the old picture due to phosphor video integration. Once a line is updated, the old video information is long gone."

Small screen TV sets would be best for ham shack viewing since the picture is still in the relatively coarse 128 × 128 picture element SSTV format, though the sharp edges at the boundary of each "picture element cell" give a "crispness" to the picture which should permit some increase in maximum acceptable screen size. Bob likes to use a 9 inch set which allows viewing at up to 15 feet. Large screen sets can be for talks in auditoriums, etc., and he says that the picture on a 19 inch set can be viewed at 50 feet.

Don Miller mentioned the "frame grabbing" capability of these solid-state converters. A frame can be held "frozen" on the receiving station's TV screen while the transmitting station talks about it, and even while the receiving station talks about it. Don feels that this is real competition to ISB as a way of combining audio and video. Bob Gervenack, W7FEN, feels, that there is a place for each technique. He points out that ISB permits rapid changing of frames while talking about them at the same time. With ISB it is also possible to point to various parts of a picture while talking about it, which can't be done if the frame is frozen at the receiving end. A third factor is the psychological atmosphere that exists when using ISB. There is a conversational aura that exists during a Q5 ISB QSO. There is a feeling af nearness and communication satisfaction that frame snatching might not be able to match. (For other pros and cons see the May Column.)

If you would like detailed information on Bob's converter, including "circuits, descriptions, and scope patterns" write to Dr. Robert Suding, 370 S. Queen Street, Lakewood, Colorado 80226 sending $2.50 to cover his reproduction costs. Phil Howlett, WA9UHV, is working on a set of P.C. boards for this scan converter which may be available by the time you read this.

Russ Sievert, W8OZA, was at Dayton selling

[*Continued on page 70*]

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

As a change of pace from the discussions of electronic theory of the last two NOVICE SHACK columns, we are going to discuss a number of simple antennas without worrying unduly about why they work. Antenna fact number one is that any conductor that is an appreciable part of a wavelength long at the operating frequency will radiate practically all the power fed into it, provided that the conductor is not concentrated into a too-small space and is mounted reasonably "in the clear." This fact formerly made the non-resonant, end-fed antenna with a length of 75 to 200 feet (everybody had his favorite length) a popular first antenna.

One end of the wire is connected to the output terminal of transmitter with a wide-range output coupling circuit, and the other end is guided out the radio-room window, up the side of the building, and out to the highest tree or other support. Use good r.f. insulators between the wire and the support points and space the wire at least a couple of inches from the wall of the building. Avoid parallelling the antenna wire to utility wires and rain gutters as much as possible.

Such an antenna often works surprisingly well on the 80 and 40 meter bands over the distances out to 1000 miles or so when it can be made to accept power from the transmitter. The antenna feed-point impedance can represent a resistance of between less than 25 ohms to more than 500 ohms in series or parallel with various quantities of capacitive or inductive reactance, depending upon the length of the antenna and its operating frequency. A length that is an odd multiple of an electrical quarter wave represents a low-impedance load, and lengths that are even multiples of quarter waves represent a high-impedance load. One reason for choosing non-resonant lengths for these "long-wire" antennas is, in fact, to try to find a length that the transmitter output circuit can cope with on several amateur bands. Older transmitters could compensate for wide ranges of load impedances. But modern transmitters and transceivers, that are designed to work into nominal 50-ohm loads, are not so versatile.

An antenna coupler or "transmatch," such as described in the amateur handbooks and available from several manufacturers is capable of transforming a wide range of antenna impedances to the 50-ohm value demanded by the transmitter or transceiver. But having to use an external antenna coupler with a long-wire antenna destroys its two main advantages—economy and simplicity.

Vertical Antennas

Although a vertical antenna can be a very-efficient DX antenna, it may share some of the disadvantages of the "long-wire" antenna in crowded locations. The conventional ¼-wavelength vertical antenna operates in conjunction with the actual earth or an electrical "ground plane" that acts like an electronic mirror that replaces the lower half of the antenna.

Unfortunately, the losses of the best earth ground are much higher than the losses in the half of the antenna it replaces, unless the ground losses are reduced. The standard method of improving the radio-frequency ground conductivity at the base of the antenna is to bury up to 100 (or more) wires approximately ¼-wavelength at the lowest operating frequency of the antenna extending like spokes of a wheel from the base of the antenna an inch or so below the surface of the earth. The shield of the coaxial transmission line is connected to the common point of the ground system, and its center conductor is connected to the base of the antenna.

Maximum radiation from an antenna occurs at its maximum-current points, which is at the ground point in a ¼-wave antenna. Thus, it is important to have a minimum of power-absorbing "junk" around it. The inability to meet

*385 Johnson St., Gary, Ind. 46402

Part of the 1973 Indianapolis Chapter of the American Red Cross Radio Club Novice course. Twenty of the students took the Novice test. The club has just completed its 50-student General and Advanced course and will start the next Novice course in September. Prospective enrollees may get details from the club president, Malcolm Mallette, WA9BVS, American National Red Cross, 441 East Tenth St., Indianapolis, Ind. 46202.

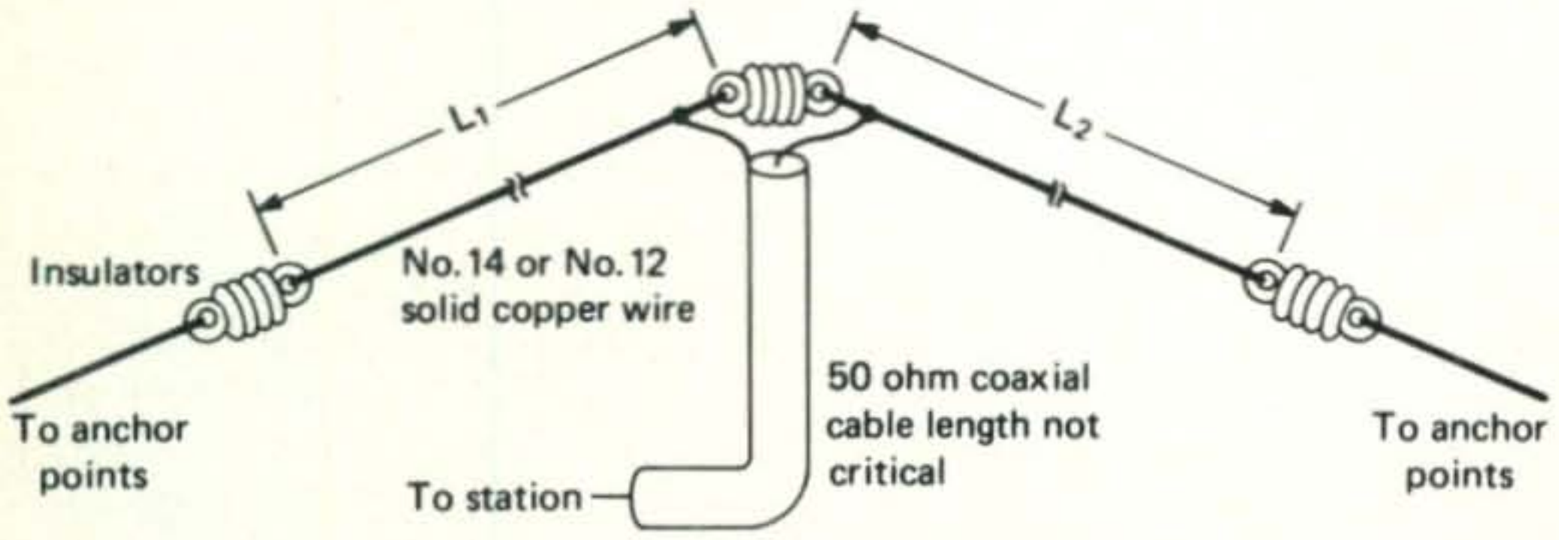

Fig. 1—Essential details of the centerfed, 1/2-wave dipole antenna. It may be installed horizontally or as an "inverted-V." Special center insulators for such antennas are available from several CQ advertisers.

Frequency, mHz	3.725	7.125	21.15	28.15
$L_1 + L_2$ (feet) = 468/mHz	125'7"	65'8"	22'1"	16'7"
$L_1 + L_2$ (meters) = 142.5/mHz	38.25	20	6.73	5.05

this requirement is one reason vertical antennas in crowded backyards often give such dismal results. The "ground-plane" vertical antenna can sometimes retrieve the situation by being mounted in the center of a roof and operated "against" two or (preferably) four electrical ¼-wavelength radials" extending from beneath the center of the antenna to the corners of the roof. These ground "radials" should be spaced a few inches from the roof and insulated at their ends. If the roof is too small to accommodate the radials, they may be dropped over the edge to preserve their full lengths. The radials may be slanted downwards 30 degrees or so from their centers to their ends, if necessary.

The Centerfed Dipole

Possibly, the ½-wave dipole centerfed via 50-ohm coaxial cable is the most-efficient simple antenna that many amateurs operating on the lower-frequency amateur bands can install. Its essential details are sketched in fig. 1. When it is carefully constructed, it is an almost sure-fire performer. If two tall end supports are available, the antenna may be installed horizontally; if a single high center support and two shorter end supports are available, it may be installed as an "inverted-V." Either configuration works well. If you have a choice, position the antenna so that its ends are in a line with the direction you are least interested in working. The "inverted V" is particularly attractive when the antenna must extend over a building. Often a mast can be mounted on the roof to support the apex of the antenna, and its ends can be anchored to fence posts or other existing structures. The apex angle is not critical, as long as it is at least 90 degrees. A small apex angle reduces the space required between the end supports, but it requires a higher center support. Many "inverted V's" employ an angle of approximately 135 degrees.

Practically speaking, the best (center) height is as high as possible. When propagation conditions favor the shorter distances, you can make plenty of contacts with a height of 10 to 15 feet; nevertheless, DX results definitely improve with height. If you are not a DX fanatic, however, 35 to 45 feet is a good compromise height.

The preceding remarks will not make it any easier to erect an antenna. But, by pointing out common mistakes in antenna construction, they should help you to erect a better one than you otherwise might have.

News And Views

Jim WB2EDW, 245 East 13 St., Apt. 11, New York, N.Y. 10003, spends at least an hour a day on the Novice bands—usually 80 meters. He concurs with our advice to listen before you call CQ. Also scrimp a little on the transmitter, if necessary, but get the best receiver you can afford. Many excellent second-hand amateur-band receivers that work rings around general-coverage shortwave receivers are available at reasonable prices from dealers that accepted them as trade-ins on new equipment. Jim took his own advice and invested in a 15-year-old National-303 receiver. Space does not permit repeating all his suggestions this month, but he advises that you automatically call every operator "OM." Jim's wife is **WN2TQH,** and her name is **Kathy** and hates to be called "OM." Jim and Kathy work 80 and 40 meters with an old Heathkit DX-100 transmitter feeding the antenna via a "matchbox." The antenna, by the way, is the fire escape: don't tell the landlord... **Larry Cotariu, WA9MZS,** 8041 N. Hamlin, Skokie, Ill. 60076, asks a familiar question: "Why do most Novices insist on sending their complete addresses on their first transmissions, without finding out how well they are being copied?"... **Jeff Lyn Popa, WN8QYT,** 1079 Cree Ave., Akron, Ohio 44305, was Senior Technician on the Goodyear Blimp *Europa* in Europe before he returned to the states to get his Novice license and quickly worked 34 states—22 confirmed—in a short time.

Send your "News and Views," pictures of yourself and your amateur station for publication in NOVICE SHACK to the address on the first page of the column. I'll do the rest.

73, Herb W9EGQ

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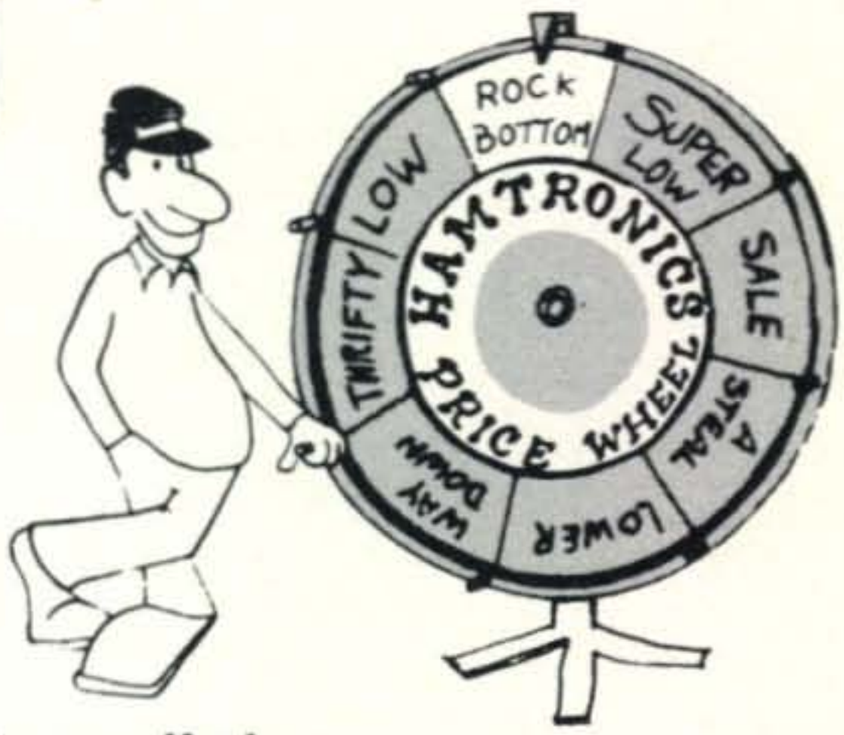

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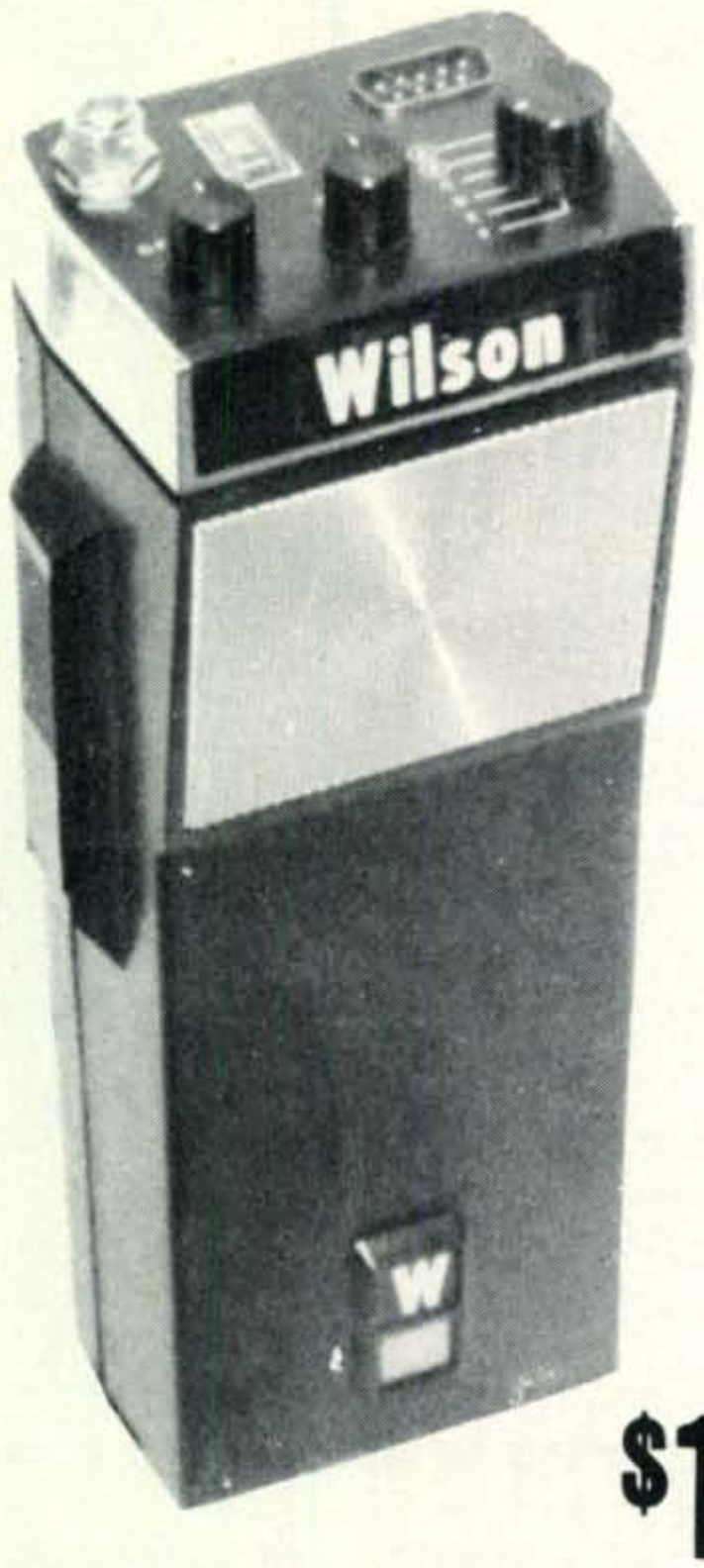

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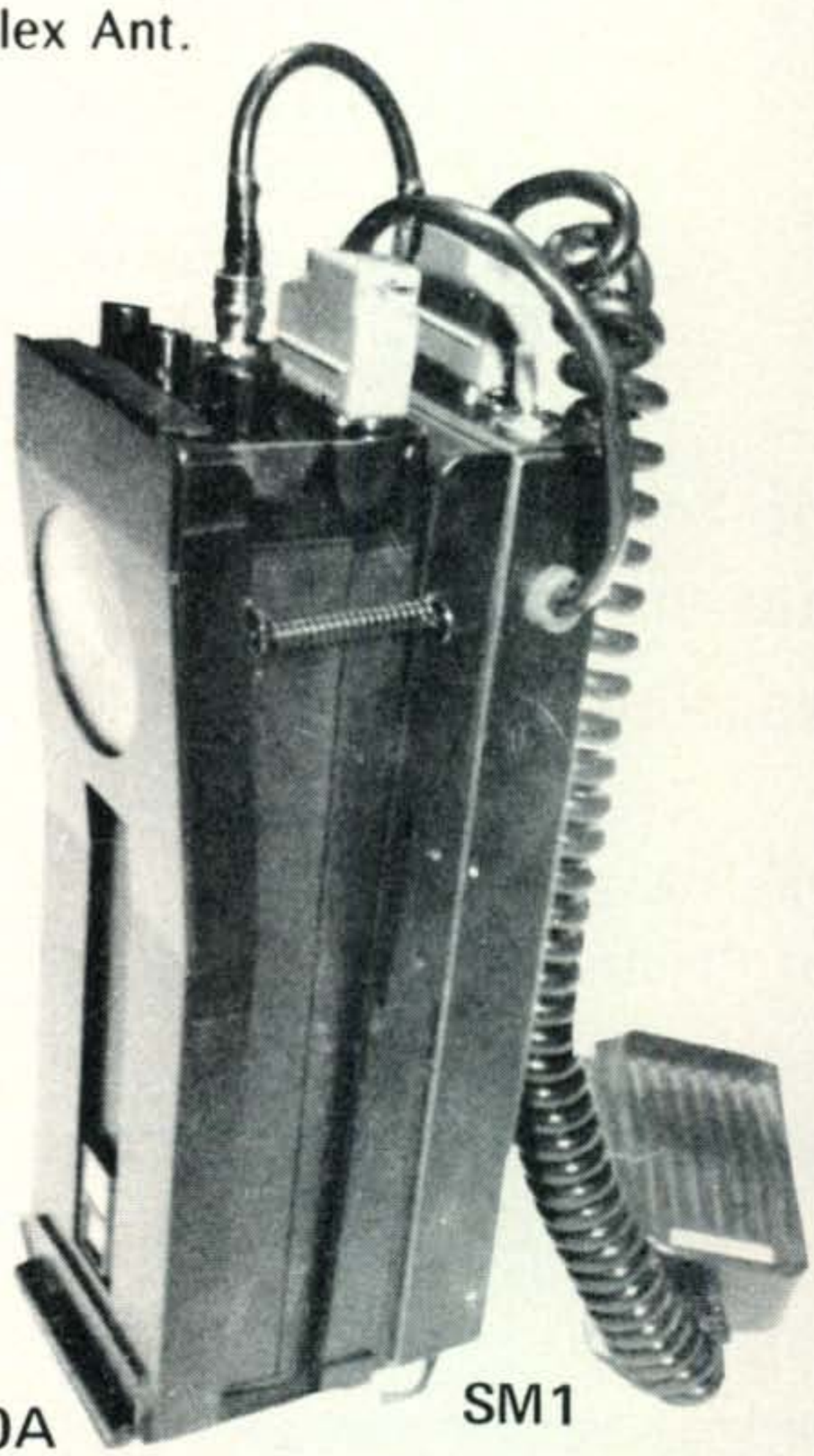

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'UP on FM

BY NORM STERNBERG,* W2JUP

SOMEWHERE back in a previous column, I made a snide reference to a kind of weekend sport, an exercise in futility which I call "frequency-countersmanship". This is my pet name for a popular pastime indulged in by many f.m. operators. Here is how the game is frequently played . . .

Step 1

Get some type of frequency counter. If you don't own one, arrange to beg, borrow or appropriate one. The greater the number of digits displayed on the device, the larger your final score will be. Point scoring is based on the following factors—

Digits displayed = 1 point per digit
Cost of counter = 1 point per $100 of market list price
Time base stability = 1 point per 10^{-1} in the spec sheet
Frequency range = 1 point per hundred megahertz

As an example of the scoring system, let's compare two different counters:

BRAND X

Digits displayed = 8 = 8 points
Cost of counter = 3.5 points
Time base stability = 1 part per million = 1 part in 10^{-6} = 6 points
Frequency range = 120 megahertz = 1.2 pts.

This gives a total of 18.7 points for this particular counter. Now let's look at another counter.

BRAND Y

Digits displayed = 8
Cost of counter = 28.8
Time basis stability = 1×10^{-8} = 8 points
Frequency range = 500 megahertz = 5 pts.

Now we are cooking with points, for a total of 49.8 for Brand Y. It should be obvious by now that the serious student of "frequency-countersmanship" must exert the maximum effort in his quest for the finest counter available.

Step 2

Make up some kind of a kluge to couple the counter input to the output of your f.m. transmitter. Try to avoid any direct hardwired kluges which might tend to incinerate the input stages of the counter. Burning out the input devices is grounds for automatic disqualification or at best, a serious award of penalty points. Start with a short chunk of wire as an antenna for the counter.

Step 3

Key your transmitter, wrapping a rubber band around the mike in order to hold the "push-to-talk" button firmly depressed. Don't forget to open up your rig, making sure that all those cute little screw-type thingies are exposed.

Note! Extra points are awarded by the committee for the following operating techniques—

a) Testing on the input of your local repeater = 3 points
b) Testing on that repeater during heavy rush hour when all the mobiles are on the road = 5 points
c) Testing during any type of emergency or priority conditions = 10 points
d) Timing out the repeater = 1 point per time-out

The committee reserves the right to award penalties as follows—

a) Use of dummy load = loss of 25 points
b) Excessive transmission of call letters = loss of 15 points

It is always good to bear in mind that the use of type F0 emmission is authorized on most of the f.m. band allocations. Your local repeater group will be pleased that you are prepared to demonstrate your noise-free, unmodulated carrier. (You might also consider combining your frequency adjusting exercise with duty-cycle testing to find out if your rig can really run for 40 minutes, key down, without blowing the output stage.)

Step 4

With the appropriate alignment tools, turn the little screws next to the crystal for the channel you are concerned with and observe the counter display to see which way your frequency is shifting. Try as hard as you can to get the transmitter exactly on the nominal input frequency of the repeater. If your local machine has a 146.34 input, keep diddling the screws until the counter reads "146.340000". Make sure that you are within 20 cycles of the exact number. Neatness counts! It also may help in scoring if you mumble into the microphone while adjusting the screws so that the counter sees a modulated signal and that last

---

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digit or two flashes a few numbers. This keeps the nixies or LEDs from becoming stale and prevents any possibility of burning them in. Kind of like jogging.

Step 5

When you are satisfied that you are dead on the proper frequency, get into a QSO with the local gang and tell them all about what you have just been doing, and how close you are on frequency. Don't be surprised if they start making cracks about how you sound like you might be off frequency. It's only "sour grapes" on their part.

Step 6

Put your rig back in its case, button up all the screws and disconnect the counter. You are finished for the time being.

Step 7

Contact the trustee or the chairperson of the repeater group and find out when someone will be at the repeater site to take a look at your frequency on the discriminator meter at their receiver. Make an appointment with them if necessary.

Step 8

When your frequency is read on the meter at the repeater site, you will be told that you are "so many microamps" high or low. That is your magic multiplier. For example . . . say you are told that you are two microamps low. Multiply that 2 figure by the total point score that you rang up on your particular counter, let's say Brand Y . . . 48.8 $\times$ 2 = 99.6—You have almost hit the Jackpot!! You have achieved mastery of the art of frequency-countersmanship! Of course, the fact that they told you that you were three kiloHertz low does not change things a bit! You used your counter in a workman-like manner and nobody can knock that! Brag about your achievement to all your friends at the next meeting of your repeater club. Seriously though . . .

Don't try to set up your equipment to an accuracy that exceeds the capability of the crystal that controls it! Many rocks in our rigs have stability tolerances on the order of 0.003%, (which at 12 megaHertz comes out to be about 360 Hertz) for temperature variations from —30 to +60 degrees C. When multiplied up to your repeater input frequency, that rock could be several kHz off, when the car is hot, or cold, as the case may be.

Don't try to set up your gear to a precision that exceeds the capabilities of the counter that you are using. If the counter time-base stability is rated at 1 $\times$ 10^{-6}, one part in a million, that means that at 147 megs, the counter *itself* could be 147 Hertz off!

Don't assume that the receiver at the repeater site is exactly on the nominal frequency. If it it, I would think it a rare bird, indeed! If it is normal, and a few kHz off, then you have wasted a pot full of time . . . yours and theirs too!

Don't assume that your rig will operate the same way *inside* its case as it did when you had it apart to tweek the little screws. There might be as much as 500 Hertz difference, in or out of the box!!

"The Feds"

Most of us manage to go through our careers in amateur radio without ever having contact with those friendly gentlemen employed by the organization euphemistically referred to at various times as the "Friendly Candy Company", "The Feds", "The Man", *et cetera*. Personally I have had many occasions to deal with these gentlemen in the course of earning my daily bread in the broadcasting business. As a matter of fact, some of my best friends work for the Federal Communications Commission.

Recently I had occasion to spend an afternoon at the regional office of the FCC, across the desk from a friend of mine, who is alleged to be one of the toughest RIs in the Commission. (RI, for the newcomer to our ranks, means "radio inspector"—sometimes considered to be on a par with Attila the Hun, Genghis Khan, The Marquis de Sade, and other figures known to be hard to deal with). My friend is an active amateur, works v.h.f., is an f.mer and is endowed with a call sign which predates mine by a bunch. Novice, he ain't! And as for being tough in the game, I can only say that the last time he inspected the station that I was running, he spent a solid seven hours in the house and did only the a.m. operations, never even looked at the f.m. side of the house. And even though we are friends, he still zapped me with no less than eight, count 'em, (8) violations of the rules and regs. Got me on stuff ranging from "tower needs painting" to "rack wiring not in accordance with standard switchboard practice." With friends like him, who needs enemies, you ask? He made me get rid of all the clip leads! Anyway, after negotiating the company business and seeing the clock roll around to quitting time, he asked me if I were driving back out to the Island and would I give him a ride home.

Ensconced in my wheels, friend RI glanced at the rice-box hung under my dashboard and asked what repeaters I had in the radio. So I handed him a list of twelve pairs of channels and he requested that I turn on to one of the Long Island repeaters serving the club that I belong to. And he listened as we drove. Of course, since it was Friday evening and the rush hour was even more catastrophic than usual, he had quite a long time to sit and ponder the noises emitting from the radio. About an hour and a half, to be factual. I drove without working

the radio. For some reason, I just didn't have the urge to yak on the machine.

After a while, when the traffic ground to a total stop on the expressway, I noticed that my friend had a small notebook in his hands and every few minutes, he would write something on the page, while nodding wisely and muttering strange incantations to himself. I couldn't really understand what he was mumbling and was afraid to ask. From time to time, it seemed as though I would hear words like "ninety seven point eight seven", or "ninety seven point nine one", and "ninety seven point one two three." Normally, I would have imagined these to be frequencies on the f.m. broadcast band, but some clammy intuitive sense told me otherwise. The ride continued to his home, and he invited me in for coffee. Never being known for refusing any kind of a freebie, I accepted. And in the course of the chit-chat, my buddy told me the following:

"While we were riding, I was keeping a log of the guys on your club repeater, and for your information, in the hour and ten minutes I was really listening, I recorded a total of thirty eight different stations. And of these thirty eight, I would be perfectly justified in issuing either warnings or citations to no less than thirty two of them!" I replied with silence and he went on.

"The most frequent thing is "failure to properly identify," followed by "one-way transmissions" and "unidentified transmissions." Also, I would say that based on what some of these guys are saying, we could consider violations of 97.67(b) on excessive power."

I listened intently for the next twenty minutes while my friend went on at length about the rules and regs, and how, as an active amateur himself, he was unable to understand why so many amateurs rant and rail about the misdeeds of the CB crowd, when many of the same amateurs show little regard for the regulations to which they themselves are obligated to adhere. There was very little I could say in rebuttal. I tried hard to take apart his logic, but all I really could conclude from the discussion is that many of us give lip service to the rules, and violate them frequently. And, much as it hurts to admit it, a large percentage of the abuse occurs on the repeaters. Let me give out a few well-chosen examples of what my friend was talking about . . . .

"W2JUP Mobile Two, clear 25-85 repeat."

This is one of the most frequent. The rules state in 97.87(b) like this...."Additionally, at the end of an exchange of...telephony transmissions between amateur stations, the call sign ...shall be given for the station, or for at least one of the group of stations, with which communication was established." No doubt about it, really. You are not communicating with a repeater...you are communicating with some

human being through the repeater, and clearing with the repeater while failing to clear with the station you were in fact talking to, does constitute failure to observe this rule.

"WB2ZWR, this is W2JUP, both mobile". This one is a beaut! And heard all too frequently. 97.87(b)(2) says..."When identifying by telephony, immediately after the call sign, transmit the word "portable" or "mobile" as appropriate, followed by the number of the call sign area in which the station is being operated". Oddly enough, one common misconception is that *you* are required to define the *other guys* operational status. Not true! You can't find one single thing in the regs that says that you have to say whether the guy you are working or calling is mobile, portable or fixed. But in our haste to be nice guys, we worry about the "both mobile" thing and ignore the requirement to give the call area! Fooey on this kind of operating!

The guy who brags that he is running his "linear amplifier at 150 watts" output, and then in the next breath states that he is only three miles north of the repeater site is really asking for it! And maybe, one of these days, will get it, on the basis of 97.67(b) which says..."Notwithstanding the provisions of paragraph (a) of this section" (discusses not exceeding the one kilowatt d.c. input thing),..."amateur stations shall use the *minimum* amount of transmitter power necessary to carry out the desired communications." Brother, I wanna see the guy who can justify the use of a high power amplifier when he is three miles from the repeater!!!

It is remarkable that many of these operating questions are not unique to the f.m. mode of communication. But, in today's amateur radio, f.m. seems to be attracting a very large share of newcomers, and an unwarranted number of people who sound like they belong somewhere else in the spectrum. There is only one reasonable conclusion to be drawn herein...as long as the rules are what they are, it is incumbent on each of us to observe them to the best of our ability to do so. If the rules are no longer consonant with the state of the art, let's get together and write the required petitions for change of rulemaking to get the rules updated to reflect our current operating needs. And while this sounds like so much motherhood, there are reasons to believe that it can and does work. And there are ample precedents that can be drawn from other areas of the communication arts, such as the Aeronautical and Public Safety Radio Services, whose operating procedures over the years, have been refined and modified to better serve the users in this changing world. Think about it, and let me know how you feel. (The petitions are easy...it's the fourteen copies that kill!)

73, Norm, W2JUP

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CQ Reviews:
The CEPCO Model T10-C Touch-Call Decoder

BY NORMAN STERNBERG,* W2JUP

SINCE the inception of f.m. as the dominant mode of commercial short-range communication, one problem has existed: having to hear unwanted information. Calls intended for another listener were a sore point for many circuit operators until the equipment manufacturers developed the idea of tone signaling.

In the earlier days, transmitters would be modulated by low-level sine-wave tones which would activate relay controls in receivers set up to accept those specific transmissions. Receivers not set to be activated by the transmitted tone would remain mute. Different tones would activate different receivers.

With the advent of multiple-tone selective calling, SELCAL, the situation became more complex. SELCAL continues to be used in h.f. aeronautical and marine radio. Today, hams may avail themselves of the security and selective benefits of the Bell System Touch-Tone system.

The CEPCO T10-C Touch-Call Decoder is a new product designed to selectively activate an f.m. receiver when the proper combination of Touch-Tone signals modulates the f.m. carrier. The decoder is designed to interface between the receiver audio output circuit and an external loudspeaker.

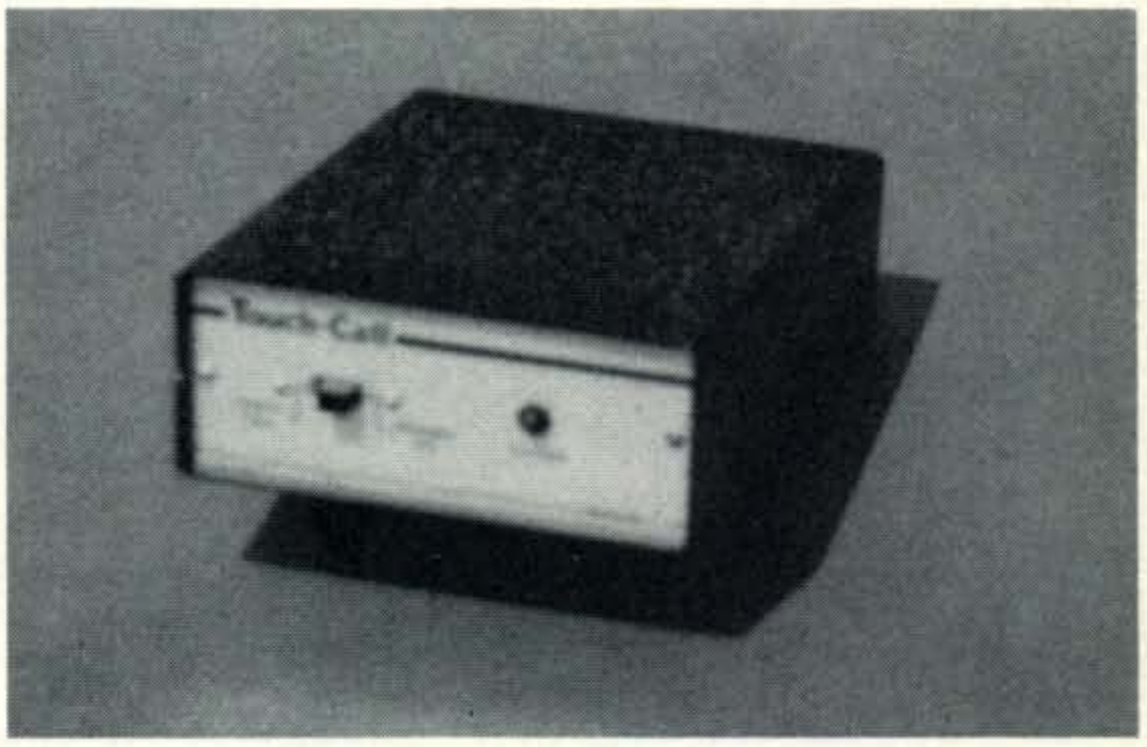
As shipped, the Touch-Call decoder provides for the detection of one 4-digit Touch-Tone sequence with the option available for the use of one 3-digit sequence. The self contained s.p.d.t. relay is wired to serve as a speaker-muting relay.

Upon receipt and detection of the final digit in the program sequence, the relay activates for a fixed time interval and a front panel mounted red LED latches on to indicate that a coded call has been received and that the unit is activated. The Touch-Call uses a dual phase-locked-loop decoder chip for tone detection, as well as seven other IC's.

A front-panel slide switch performs three functions: in the TOUCH-CALL position, the unit is set to receive a call with the relay de-energized and the externally-connected speaker muted. In the SPEAKER position, the front-panel LED is reset to Off and the relay is internally by-passed for direct speaker operation.

Although the unit was furnished factory wired and tested, the writer disassembled the decoder sufficiently to permit examination of the printed circuit board and other components. In kit form, the decoder is fairly simple to build and adjust. The PC board is good commercial quality, appearing to be G-10 glass-epoxy, with well-applied foils. Standard commercial-grade components are used throughout. The completed unit is fully enclosed, measuring about 5¼" wide, 2¼" high and 6¼" deep. An external 12 volt d.c. supply is required. This supply voltage is reduced to 5 v. by the built-in 7805 regulator chip, and permits the user to connect the decoder directly to any convenient 12 v.d.c. source.

The decoder furnished had an unmarked terminal barrier strip on the rear panel, with



Front view of the Touch-Call Decoder. The slide-switch and LED are described in the text.

*FM Editor, *CQ*.

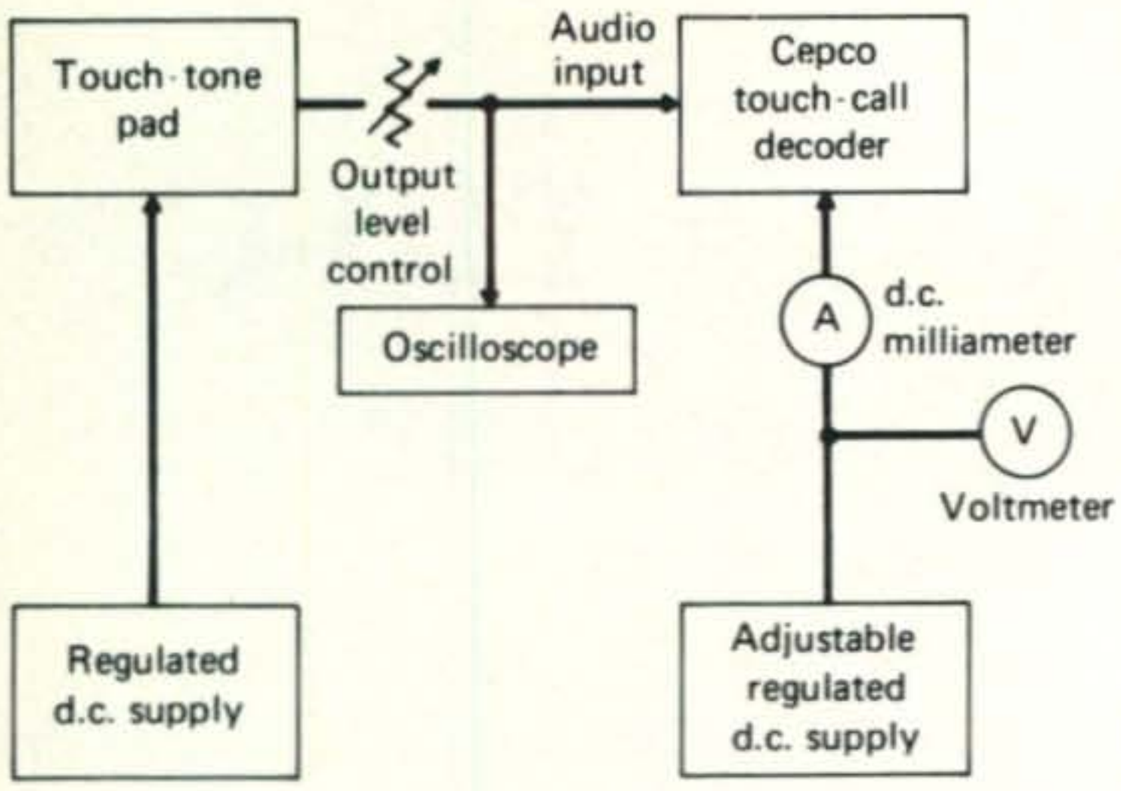


Fig. 1—Setup of test equipment for determining sensitivity of CEPCO T10-C Touch-Call Decoder.

one of the pins indicated in the manual as a spare. The writer strapped this spare terminal to the PC board marked "common", so as to bring the swinging arm of the relay out to the rear terminal strip in order to make the relay available for non-loudspeaker switching functions.

The two potentiometers which set the tone frequency settings were deliberately upset by the writer. Using a standard Western Electric 35Y3A Touch-Tone pad powered by a 12 volt supply, the manufacturer's setup procedure was followed and the two frequency-setting pots were adjusted with no difficulty.

Insulated jumper wires are used to program the 7401 chips for digit selection. The unit was received already programmed for a four-digit code, (the code numbers were silk-screened on the rear panel). Frankly speaking, the manual's instructions for code programming were not really very clear and the newcomer to IC logic may well have difficulty in following the outlined procedure. CEPCO could definitely improve this area as well as include a more satisfactory explanation of functional details and circuit description. The manual is, unfortunately, quite cursory and in this writer's opinion, inadequate.

Test Methods and Results

Although no specifications were received, the writer set out to perform some testing of the decoder. The equipment was configured as per fig. 1. The pad output being a two-tone signal, an oscilloscope was used to determine peak-to-peak signal levels for measurement of decoder sensitivity. With the decoder internal sensitivity control set for maximum, reliable operation was obtained with a minimum signal input of 640 millivolts peak-to-peak, or 225 millivolts r.m.s., when the decoder was supplied with d.c. voltages from 7.5 to 15.0 volts. Reliable triggering was obtained when the signal to noise ratio was as poor as 10 db, a rather noisy signal.

The release time of the relay was found to be about 12½ seconds and did not appear to vary with supply voltage. Power consumption was found to be 90 ma in the resting mode and 105 ma in the latched or energized condition. In regard to supply voltage, a wide range seems to be inherent in the unit, due apparently to the 7805 regulator chip. With a two-tone signal level input of 1.0 v p.-p. at 7.0 v. d.c. to the decoder, the LED would illuminate, but the relay would not operate. At 7.3 v., the relay began to operate sluggishly. At 7.6 v. reliable relay operation was obtained.

Conclusions

The CEPCO model T10-C Touch-Call decoder performs well under test conditions. Subsequent installation in a v.h.f. f.m. base station showed the unit to perform reliably under normal operating conditions. As a single-function decoder, the unit follows the intent of the designers and manufacturers.

—W2JUP

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

THIS month, we would like to describe a surplus item that can be easily converted into a welcome addition to any amateur radio station. Of course a little bit of work will be necessary to fully utilize the device but the results will be well worth it, so warm up the old soldering iron and read further.

Barry Electronics, 512 Broadway, New York, N.Y. 10012 (212-WA 5-7000) has been advertising an "SWR Bridge Coupler" in their *CQ* ads for several months now and since the price seemed right, only $10.95, we decided to purchase one. What we got was the bridge element (apparently brand new) from an obviously professional instrument, beautifully machined, with very impressive specifications; "1 KW c.w. power capability from d.c. to 800 mHz." Insertion s.w.r. of the unit we tested at 420 mHz, was only 1.01 and insertion loss at this same frequency was not measurable.

Being very well pleased we proceeded to build a complete reflectometer or s.w.r. bridge as they are sometimes called. The first problem was getting r.f. into and out of the unit since its connectors are both "TNC" types, threaded versions of the common BNC's. We got around this problem by purchasing two Amphenol type 79675 TNC to BNC adapters and we now had a BNC input and output capability. There would be nothing wrong however with simply using standard male TNC connectors on your transmission line to avoid the cost of the adapters. Either type of connector can be obtained from any large electronic parts distributor or well stocked surplus outfit.

The next consideration was getting the d.c. forward and reflected power signals out of the device. Two standard PL-259 UHF connectors with their center pins cut down to ⅛" long solved that problem rather neatly.

The rest of the circuitry was very easy to implement and is shown in fig. 1. Notice the third switch position, "F-R." This is normally not provided in a standard instrument, but if you think about it a bit, you will easily see that for minimum s.w.r. forward power should be maximum while reflected power should be minimum. Therefore F-R should be maximum

*5 Melville Lane, Great Neck, NY 10023.

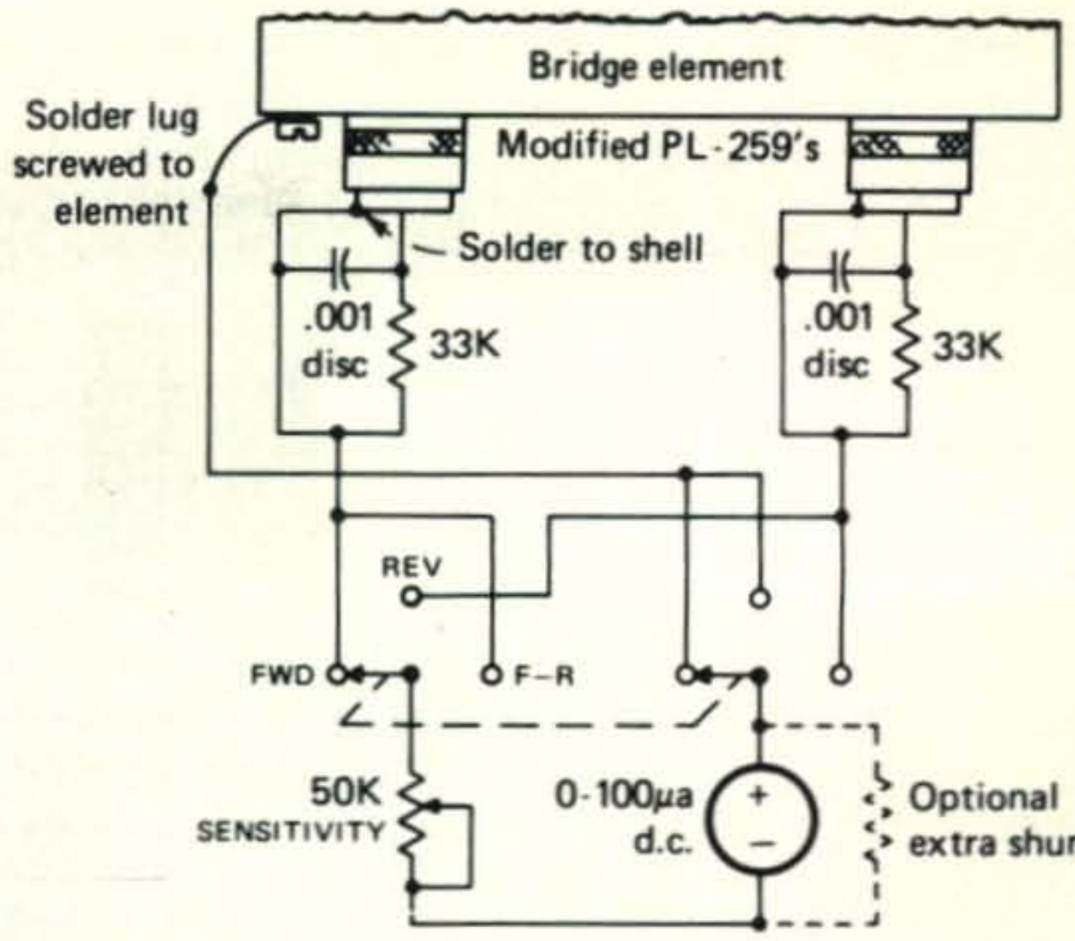


Fig. 1—Schematic of s.w.r. bridge described in text. If meter sensitivity is too great, try shunting it with a resistor as shown.

and, all you need do in this switch position is tune for maximum reading.

I built the entire unit in a readily available plastic instrument box measuring 6"×5"×2¼" with a matching front cover, although a Minibox will do fine. The meter was a standard 0-100 microampere d.c. unit I had in the junk box. Any meter from 50 microamperes to 1 milliampere full scale will work, however, you will be able to use the device at lower power levels with higher sensitivity meters. Figure 2 is a calibration chart for the meter which can be added below the existing scale with rub-on decals.

This unit should perform quite well on all amateur frequencies up to the 420 mHz band although sensitivity will drop off at lower frequencies. Full scale sensitivity with 75 watts is obtained down to the 40 meter band with a 100μA meter movement. A 50μa meter will allow full scale operation at 80 meters with 100

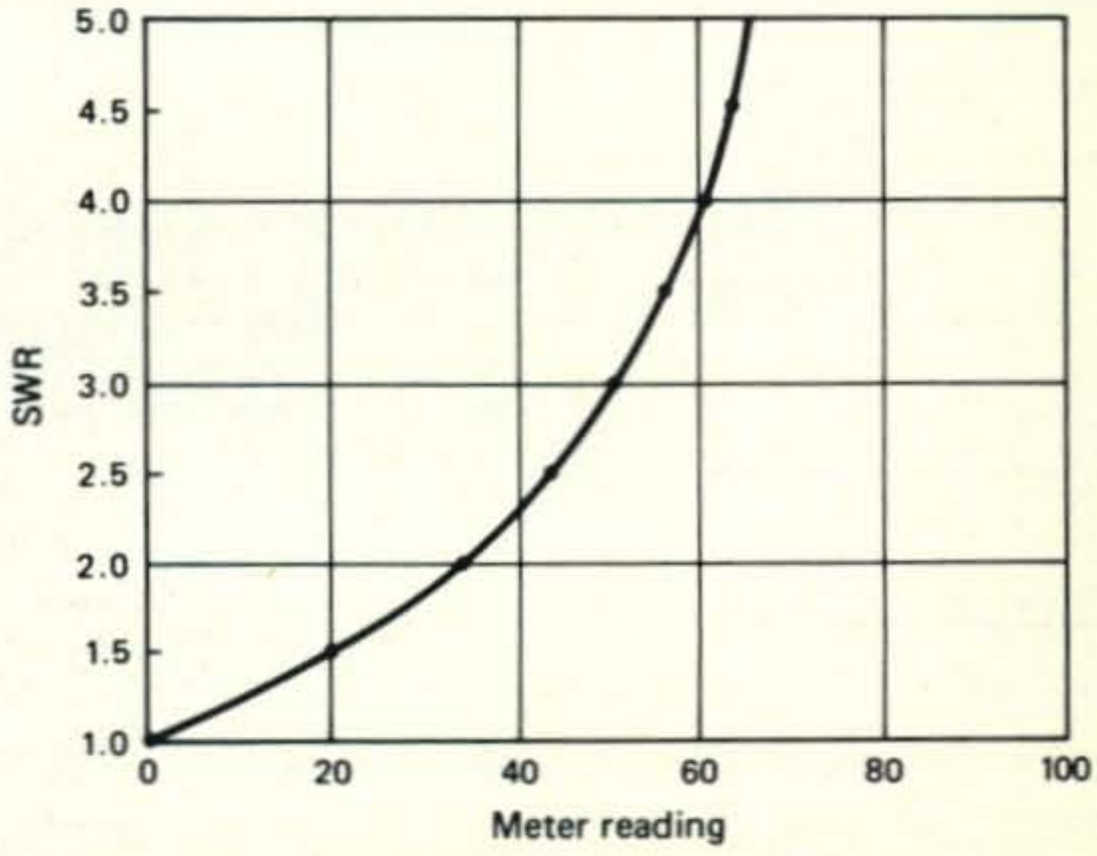


Fig. 2—Meter calibration. S.w.r. is accurately indicated when forward reading is set to 100 μa.

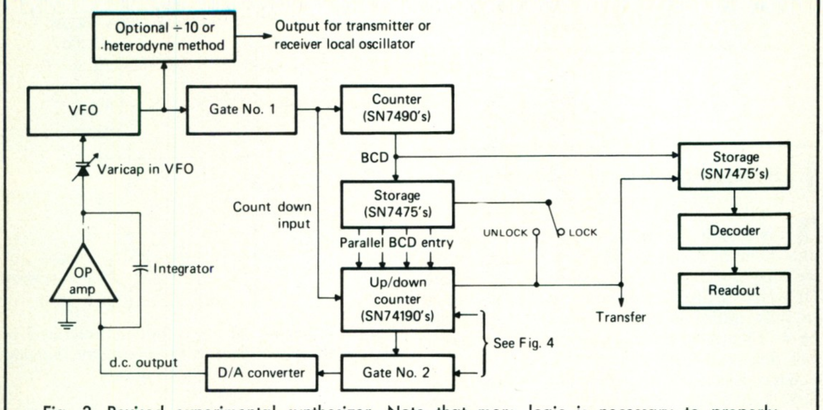


Fig. 3—Revised experimental synthesizer. Note that more logic is necessary to properly control the SN74190's. See fig. 4.

watts. Operation at lower frequencies will require an amplifier for the meter.

Frequency Synthesizing

In the March issue of *CQ* we described a method of frequency synthesizing that seemed quite usable for amateur applications, particularly rapid-tuning ones. Since that time we have received at least two dozen letters on the subject and would like to pass along some of the more interesting and applicable information.

John Souvestre, WA5NYY informs us that the 7480 subtractor chips are designed for straight binary computations and are not suitable for the BCD code that the rest of the system was intended to work in. A new Signetics 82S82 BCD arithmetic chip is what would be necessary but this is unfortunately expensive at this time—probably due to its newness.

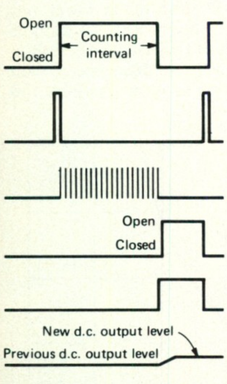


Fig. 4—Sequence diagram of steps necessary to operate the up/down counter and succeeding stages. Note that this is not a logic diagram as such. Refer to SN74190 data sheets for actual required signals.

He and many other readers feel that by including an integrator in the d.c. Varicap lead (which could simply be a suitable value capacitor) small jumps in frequency as the v.f.o. is periodically updated will tend to "smooth out" the corrections. At any rate, even a 0-5 Hz corrections "buzz" would probably not even be noticeable.

Another interesting thought, from Don Rasmussen, WA2STB, is to forget about the "lock/unlock" switch and simply limit the entire locking range (Varicap voltage swing) to some value such as 50 Hz. Therefore, one would acutally tune in 50 Hz steps which is probably fine enough for most amateur work while still being within the stability limits of most receiver v.f.o.'s during a 0.1 second or even 1 second updatnig interval. To properly use this technique, however, would require heterodyning for high frequency use rather than simply multiplying as the 50 Hz increment would also be multiplied.

E. Douglas Jensen has sent along copies of interesting articles on very similar schemes in actual use today. One of these schemes, apparently being used in a receiver manufactured by Racal Electronics, Ltd., a British firm, is almost a direct version of our method in that

[*Continued on page 82*]

antennas

BY WILLIAM I. ORR,* W6SAI

It's a lot of fun to read about five element Quad beams for 20 meter DX work, 3 element Yagis for 40 meters or foxy 80 meter monster Quads on 120 foot towers, but let's face it . . . "modern living" has its drawbacks as well as its blessings. Many amateurs have discovered, to their chagrin, that a large percentage of new homes, condominium apartments and townhouses in the larger cities have iron-clad restrictions against the erection of *any* antenna written into the lease or deed. To cap it off, the widespread use of cable TV in such dwellings, plus the installation of underground utility wires makes the amateur antenna an all-too-conspicuous standout and eyesore to many persons.

In some instances, the erection of a small antenna is tolerated, but the amateur immediately becomes the unwilling target for various complaints of television and stereo interference from suspicious neighbors, often before he even gets on the air!

Lack of available space, onerous restrictions and esthetic considerations can thus inhibit an otherwise enthusiastic amateur and reduce him to the ignomy of working through the local 2 meter repeater with a "rice box" and a 19-inch whip antenna in his living room. Antenna woes can be many, but with ingenuity and tact, many amateurs may erect an unobtrusive antenna without running afoul of the neighbors, the hard-hearted landlord or the steely-eyed Building Inspector.

The $64 Question

During the short life of this column, one of the most-asked questions dealt with the problems of erecting some kind of high frequency transmitting antenna under restrictive conditions: not enough room in the yard, landlord problems, deed restrictions, telephone and utility wires in the way and similar perplexing hazards. Unfortunately, no universal problem-solving antenna is at hand and each antenna installation must be solved on its own merits. Antenna information in the various handbooks is all well and good, but the pretty pictures of antennas atop sky-high poles, or stretched tastefully across a broad expanse of grass usually don't bear any relationship to the real-life situation in a large city where the amateur is surrounded by neighbors and buildings[1].

The problem, then, is how does the amateur —forced to operate under such restrictions— get on the air and put out a respectable signal on the DX bands? This column will be devoted to this difficult problem.

Provided there are no legal obstacles, which are outside the scope of the present discussion, it is possible to make the best of a delicate situation by following the principle of the "invisible antenna". This practical concept works on the theory that if the antenna is not easily seen, or recognized, it will not be an antagonistic object to the observer. In many hardship cases, it is possible for an amateur to get on the air with an "invisible" antenna and enjoy rag-chewing and DX on the high frequency bands without anyone being the wiser. Needless to say, this theory is valid only if the transmitting gear is fully TVI- and stereo-proof!

The "Invisible Antenna" Concept

The "invisible antenna" concept is based upon the fact that the antenna in question is either *hidden from view,* is *visible but disguised,* or it *disappears from view* when not in use ("when the sun goes down, the antenna goes up", as one wag put it). One of these styles of antenna can allow an amateur to get on the air under circumstances that would normally prohibit a more orthodox installation. The "invisible" antenna is not a touch of magic; it works according to accepted antenna theory and, when properly adjusted, can provide many happy on-the-air hours, regardless of the jaundiced eye of the next door neighbor.

The Indoor Antenna

The first type of "invisible" antenna to consider is the *indoor antenna.* A great majority of small dwellings and apartment houses in the United States and Canada are of wood frame construction with a roof of composition material or wood shingles. The only metal in the building (aside from nails) is the electric wiring, the water pipes and the drain lines. In recent construction, moreover, the drain lines—instead of being made of iron pipe—are made of large-diameter plastic (polyvinyl chloride) pipe. Experience has shown that a wood building causes little or no effect on an antenna placed within it, provided some care is taken not to let the antenna couple itself electrically with the wiring and metalic plumbing system of the building. Thus, standard dipoles and end-fed single

*48 Campbell Lane, Menlo Park, CA 94025.

[1]An outstanding exception to this comment is W6SAI's new Handbook, *Simple, Low-Cost Wire Antennas* (Radio Publications, Inc., Wilton, Conn. $3.95 plus 25c postage and handling). Highly recommended for beginner and old-timer alike. It has plenty of information on "invisible" antennas for "tough" locations.

—*Editor*

Rugged Giants

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MODEL	HEIGHT	
	EXTENDED	NESTED
TM-240	40′	22′
TM-358	58′	22½′
TM-370/370HD	70′	27′
TM-490	90′	28′
TM-5100R	100′	29′

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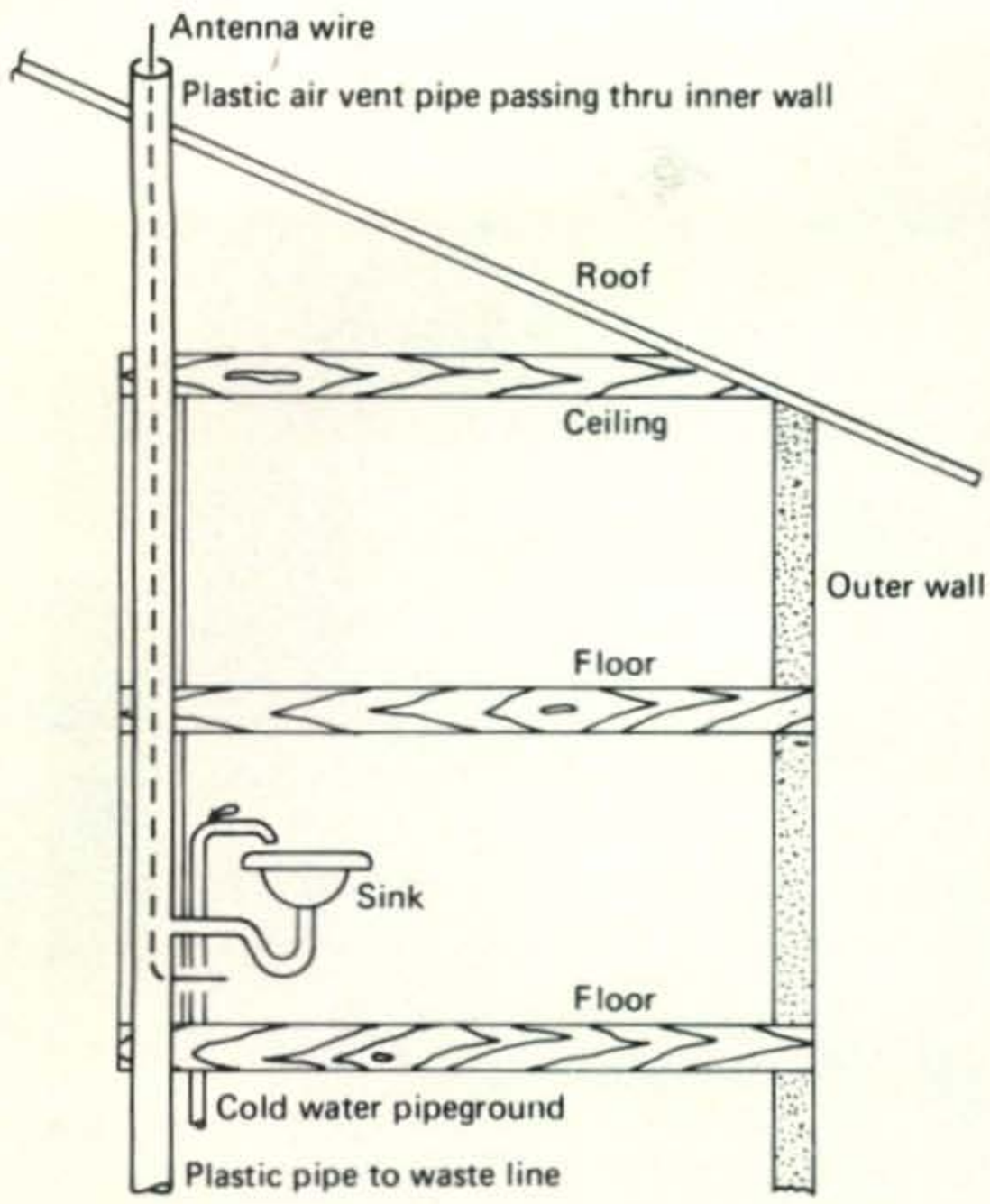

Fig. 1—"Invisible" vertical antenna is run from ground floor apartment to roof through plastic vent pipe of bathroom sink. Copper water pipe at sink serves as a convenient ground connection.

wire antennas can be erected within such buildings with an excellent chance that they will work as well as in open air.

The indor antenna is height-limited by the ceiling or roof line of your dwelling, so if you contemplate such an antenna, it is much better to place it on an upper ffoor of a building than on the ground floor. If you are lucky enough to have an attic space, or loft, the antenna should be strung up near the roof, provided it is not metal.

If you have access to the roof, an antenna may be laid directly on the surface of the roof, or perhaps strung a few inches above the roof, using existing vent pipes or chimneys for tie-points. If the antenna is placed indoors, it should be erected at right angles to most of the electric wires hidden in the walls of the building. By examining the plugs and wall switches, it is often possible to make a good guess as to the actual position of the wiring in the walls. The antenna can slope a bit, or be bent, if necessary, to fit into the available space. The whole operation, while not complicated, is cut-and-try and it is easy to move the antenna about to determine the best placement. Once the location has been chosen, the antenna is held in place using heavy twine (no insulators are needed) and hook-eyes placed in appropriate spots in the walls and ceilings.

If the amateur staiton is on the ground floor, the situation is more difficult, but still not impossible. It may be practical to run a coaxial line to an attic area, or loft; or possibly up a wiring duct to the roof. One enterprising amateur found that the air vent pipes in his plumbing system that ran up to the roof, past two apartment levels, were made of plastic pipe. He drilled a small hole in the vent pipe, well above the water level and fished a wire down the vent pipe from the roof, pulling the end out in his apartment! This gave him a 28-foot high vertical antenna that ran from the wash basin in the bathroom up to the top of the vent pipe on his roof! The adjacent cold water pipe was used for a ground connection. See fig. 1.

The All-Important Ground Connection

Many amateurs have run into difficulty with indoor antenna systems— particularly the end-fed antenna-plus-tuner combination — because they have a poor ground connection, which can cause improper transmitter loading, result in TVI and destroy the efficiency of the antenna.

Experience has shown that a rod driven into the soil or a wire connected to a radiator or heating vent is a poor radio ground. To make matters worse, the longer the wire connection between the transmitter and the ground, the poorer is the electrical efficiency of the ground. To put it bluntly, most typical ground connections are worthless, especially on the higher frequency amateur bands, where the length of the ground lead is an appreciable fraction of a radio wavelength. A sure sign of a poor ground is r.f. on the microphone that "bites" the operator whenever he touches it. Feedback and instability of the equipment are also signs of a poor ground connection.

These problems multiply when an indoor antenna is used, as the transmitting equipment is usually in the strong, nearby field of the antenna. Thus, regardless of the type of indoor antenna used, dipole, end-fed, or whatever, the *first secret of successful operation is a good ground connection!*

Broadcast stations have extensive ground systems that cover an area the size of a city block, but such an elaborate installation is impractical for radio amateurs in apartment houses and condominiums and they must settle for something less. Fortunately, this can be done by the use of a *tuned radial ground wire,* which is a modification of a more complicated grounding technique used in many commercial installations.

The Tuned Radial Ground Wire

The term "radio ground" does not necessarily imply a direct connection to earth, but rather an r.f. return path to the portion of the equipment normally accepted as being at ground potential. The equipment may, or may not, be connected to an actual earth ground. A few ready-made ground systems exist in some homes and, if available, should be used in conjunction with the tuned radial ground wire. For example, the cold water distribution system in

The New Hy-Gain 270 brings state-of-the-art design to 2 meter mobile.

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- 146-148 MHz.
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- 96" whip height.
- No pruning required, completely factory tuned!
- 50 ohm input.
- 3/8 x 24 standard mobile thread.
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Distributed in Canada by Lectron Radio Sales, Ltd.; 211 Hunter Street West; Peterborough, Ontario.

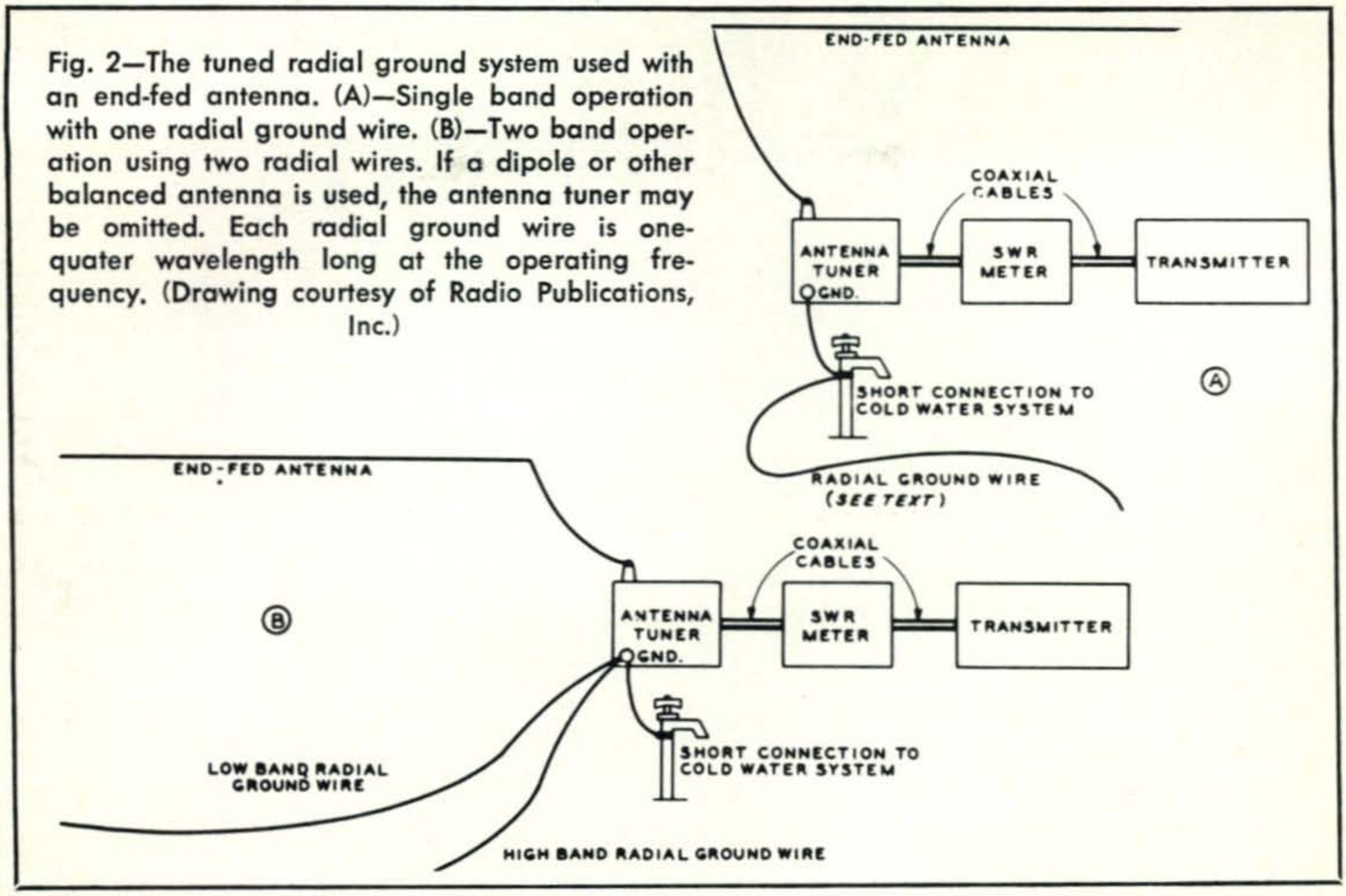


Fig. 2—The tuned radial ground system used with an end-fed antenna. (A)—Single band operation with one radial ground wire. (B)—Two band operation using two radial wires. If a dipole or other balanced antenna is used, the antenna tuner may be omitted. Each radial ground wire is one-quater wavelength long at the operating frequency. (Drawing courtesy of Radio Publications, Inc.)

many buildings is composed of copper pipe, soldered at the joints and grounded at irregular intervals. This can serve as an auxiliary ground in conjunction with the radial wire. Water systems of iron pipe have questionable joints (as far as electrical conductivity goes) and plastic water pipe systems are useless as a radio ground. An underground sprinkling system composed of copper pipe is an ideal auxiliary ground, provided the connecting lead from pipe to equipment is short and direct—not more than a few feet long.

The tuned radial ground wire (sometimes called a counterpoise by Old Timers) is an artificial electric ground that is very effective. It is simply an insulated wire, one-quarter wavelength long at the operating frequency, connected to the chassis of the transmitter at one end and run away from the equipment in a random direction, either indoors or outdoors. The far end of the wire is left free and is taped to prevent accidental contact. The wire is "hot" with r.f. energy at the open end and can cause a nasty r.f. burn to anyone unfortunate enough to touch it when the transmitter is operating.

As the tuned radial ground wire is resonant, it will only work properly on one amateur band. Two or more radial wires may be attached to the transmitter for multi-band operation, if a multi-band antenna is used (fig. 2). Radial placement is not critical, although it is usually run in a horizontal plane, along the floor of the radio room tacked against the wall, or perhaps out the window and along the side of the dwelling. For the lower frequency bands, where the radial is quite long, it can be run out of the window, down to ground level and passed through bushes or trees, a few inches above the ground. It should not actually touch the ground, nor any metallic objects that will detune it. It is not considered to be an antenna, so it does not have to be "in the clear", but it should run in as straight a line as possible.

If a reasonably good ground connection is at hand, it should be used along with the radial ground wire. The combination of the best possible radio ground, plus a radial wire, "tames" the most difficult antenna and reduces loading problems to a minimum. A chart of radial wire lengths for the h.f. amateur bands is given in fig. 3.

Bury Your Radial Wire?

Placing a tuned radial wire about your dwelling may be a real problem unless the wire

[*Continued on page 84*]

Band	Radial ground wire length
160 low	123' 0"
160 high	120' 0"
80	63' 0"
40	32' 6"
20	16' 6"
15	11' 0"
10	8' 3"

Fig. 3—Radial ground wire length.

1973 CQ WORLD WIDE DX CONTEST: PHONE RESULTS

BY FRANK ANZALONE,* W1WY

WE were somewhat apprehensive of how we would make out in our Phone Contest back in October. With a decreased sunspot cycle with an expected number of 36 which would make it almost 50% lower than last year and the lowest level since 1965, we didn't know what to expect.

George Jacobs had predicted at least Normal conditions for the contest week-end, but George upgraded them up to Good in his Dial-A-Prop last minute forcast and sure enough we experienced some very good band openings, even on 10 meters. Of course a lot depended on where you were located as all sections of the world were not so fortunate.

A total of 1746 logs gave us a modest 2% increase over last year. This in spite of a decline in state-side and European returns. However this slack was more than made up by a substantial increase from Japan and the USSR.

We are very happy to report that very close scrutiny of logs and analysis of tape recordings made by the Contest Committee showed that the vast majority of callsigns were being logged correctly this year. Particularly getting JA calls correct on 15 meters, which if you remember presented quite a problem last year.

Unfortunately however, in 1973 we faced a callsign problem of another kind. It seems a number of U.S. stations took advantage of the supply of VE stations on the low bands, and worked tons of them for 2 points each.

However, written requests to the Canadian stations for verification of these contacts, produced an unacceptably high percentage who were unable to confirm the claimed QSO.

For this reason the following multi-multi stations had their total score reduced accordingly: W2PV, W3AU, W4BVV and WA8ZDF. The message is clear fellas, before you log him make sure you've got his call right. We just cannot tolerate sloppy logging, and certainly in this case there is no excuse of a language barrier or a weak signal.

And we absolutely will not tolerate a log with an excessive number of duplicate contacts for which QSO credit has been taken. As we have indicated before, the word "excessive" is our guideline in determining whether a log should be disqualified, and not a set percentage.

TOP U.S.A. SCORES

Single Operator

All Band	**K6AHV**	**1,635,039**
28 mHz	WB4UYD	144,000
21 mMz	W4WSF	346,527
14 mHz	K2KUR	515,274
7 mHz	W4QCW	76,648
3.8 mHz	W5SZ	36,630
1.8 mHz	WB8APH	462

Multi-Operator

Single Xmtr	W7SFA	1,765,921
Multi Xmtr	W2PV	5,248,173

*Chairman, *CQ* Contest Committee.

ZF1GW/VP7—This was a fun trip for WB4TAF, WB4EYX, WB4GWL, W4ORT, and WA4SVH. Still that 1.6 million score was not bad considering they only had a 18AVT vertical. WB4TAF didn't explain why they used the double DX combination call.

PLAQUE & TROPHY WINNERS

Single Operator, Single Band

WORLD—North Jersey DX Association. Dr. Harold Megibow, K2HLB Memorial. Won by Mario Rebufello, CV4C (14 mHz)
CANADA—Gene Krehibiel, VE7DKS Trophy. Won by Alan R. Leith, VE1AL.
CARIB./C.A.—Gus Huether, HR2GK Trophy. Won by Pedro J. Piza, Jr., KP4AST
SO. AMERICA — Brazil DXers Trophy. Won by Talma Drumond, PY4OD (14 mHz)

Single Operator, All Band

WORLD—Bill Leonard, W2SKE Trophy. Won by Ville Hiilesmaa, ZD3Z
U.S.A.—Potomac Valley R.C. Trophy. Won by Robert Ferrero, K6AHV
CANADA—Jack Baldwin, VE3BS Trophy. Won by Jack Baldwin, VE3BS
CARIB./C.A.—Harold Fox, W3AA Plaque. Won by Rodrigo Madriz, TI2WD
EUROPE—W4BVV Operators' Trophy. Won by Ulrich Weiss, DJ2YA.
AFRICA—Gordon Marshall, W6RR Plaque. Won by John Dunnington, ZS6ZE.
ASIA—Japan CQ Magazine Trophy. Won by Zal Kabraji, VU2DK.
OCEANIA—Northern Calif. DX Club Trophy. Won by Station KH6RS, Philip Goetz, W6DQX operator.

Multi-Operator, Single Transmitter

WORLD — John Knight, W6YY Trophy. Won by Station VP2M. (Oprs. W5MYA, W5QBM, WA5JMK)

Multi-Operator, Multi Transmitter

WORLD—Radio Club Venezolano Trophy. Won by Station PJ9GIW. (Oprs. W4GIW, K4BAI, K4CEF, K4DJC, W4GKF, W4-MCM, W4SSU, W4YWX, WB4RUA)

Contest Expedition

WORLD—Stuart Meyer, W2GHK Trophy. Won by Station FG0ZZ/FS7. (Oprs. F5QQ, F5ZW, G3TXF)

Special CQ Award

To Ville Hiilesmaa, OH2MM, Operator World Champion Contest Expedition Station ZD3Z.

Be assured, however, that we are more than lenient in making a decision. Many factors are taken into consideration, mostly favorable to the contestant. Many scores have been proportionately reduced rather than disqualified, and some have even been upgraded when the situation warranted.

The calls of the disqualified stations will be found under a separate listing. One consolation is the fact that the list is less than half of what it was last year. The pity being that it would not have been necessary had the contestant taken a little time to check his log before submitting it.

That is, all except HG8KQX on 28 mHz, that one was a real "snow job."

A recent letter from one of the stations disqualified last year, complained bitterly that a part of tthe blame should be assumed by the dozens of W/K's who worked him two, three and four times on the same band. (And then sent him a QSL card for each QSO). He also feels that we do not allow sufficient time after the contest to check out the log. We can sympathize with his frustration, but feel there is more than enough time allowed to clean up the log and cross out these offenders. We cannot be expected to do it for you.

A change in your score may also have been due to several other factors. Some stateside stations took 3 point credit for working stations within the North American boundaries. Everything in Zones 1 thru 8, plus Greenland in Zone 40, are considered as part of North America and count 2 points per QSO. By the same token, those of you in N.A., who took only 1 point were given the extra credit.

Newfoundland and Labrador are not separate multipliers from Canada, and only VE2's north of the 50 degrees N. are in Zone 2. (VE2ACP was OK, but not VE2DLC).

Also Okinawa and Pantelleria do not count as extra country multipliers. JR6 is part of Japan and IH9 is considered as Sicily even though it is in Zone 33. We explained all that last year.

Most everyone is aware of the fact that we use the DARC WAE Country List for all European contacts. Therefore GM Shetlands, IT Sicily and UN1 Karelia are separate country multipliers. Of course its now official that East and West Germany have now been given separate country status.

In the multi-operator category we found a few of the Single Transmitter stations taking undue advantage of the rule permitting operation on more than one band within the same period, to pick up a new multiplier. The rule is specific that this is only permitted for the purpose of working a new multiplier. For this reason we found it necessary to put UK3AAO and UK9ANA in the Multi Transmitter division and not Single Transmitter as they claimed. A rule modification may be necessary for Single Transmitter stations.

Single Operator – All Band

Station	QSO's						Zones						Countries					
	1.8	3.8	7	14	21	28	1.8	3.8	7	14	21	28	1.8	3.8	7	14	21	28
ZD3Z		47	158	1035	1227	1630		13	19	27	27	27		23	37	82	78	85
KH6RS	21	237	478	746	1278	1292	7	16	21	34	28	23	5	20	30	71	53	45
4C9AA		322	657	703	1534	783		18	23	28	31	21		45	60	83	96	48
YV6AW			202	831	1069	1052			14	28	27	24			33	91	88	70
LU5HF1	3	14	53	931	892	965	3	4	15	32	30	26	3	7	21	88	72	73
DJ2YA		45	47	608	1064	329		7	13	30	26	24		34	31	86	75	65
G3LNS		134	63	823	736	261		10	13	32	32	22		39	32	97	87	43
KH6IJ	4	81	119	621	814	868	2	10	13	33	23	18	2	9	14	57	29	28
OZ5KF		378	285	750	428	52		15	26	33	32	18		44	59	75	52	26
VA7WJ	8	202	361	462	716	257	1	15	19	32	27	19	1	23	30	73	66	42
K6AHV	4	53	206	262	805	207	1	18	22	31	31	22	2	27	35	68	70	42

Multi-Operator – Single Transmitter

VP2M	50	359	460	1468	1198	1520	7	13	19	28	27	21	9	37	47	93	82	64
FG0ZZ/FS7	3	485	552	783	1287	1278	3	14	22	25	23	19	3	37	54	88	78	46
IH9AA		191	348	955	1120	615		8	19	31	27	17		36	50	84	78	57
DL0WU		149	436	924	884	482		12	23	33	32	22		52	61	87	79	71
UK9AAN		245	431	1423	277	187		11	31	37	31	22		44	73	100	75	46
PY2CAB			28	1258	920	615			10	38	35	21			15	114	95	45
W7SFA	9	57	283	493	775	65	5	15	21	33	26	21	4	23	32	84	54	41

Multi-Operator – Multi-Transmitter

PJ9GIW	35	479	653	1881	1960	1854	9	16	24	29	29	27	13	39	79	103	97	88
CR6AA		19	188	2197	1754	1707		7	21	36	33	29		13	50	145	109	90
DL0PG	124	639	610	1797	1065	350	2	17	25	37	34	27	11	57	73	138	106	74
UK9ABA		267	382	1162	1011	654		16	24	39	37	25		53	69	117	108	73
W2PV	46	*	298	1245	1176	496	5	*	28	39	31	27	7	*	73	135	129	107
DL0WW	83	399	746	978	1391	333	2	10	27	36	36	21	8	43	81	118	106	65

* 80 meter score deleted. See text.

Band-by-band breakdown of top scores.

Once again we were hard put to pick the winner of Stu Meyer's Expedition Trophy. Almost all the expedition stations were deserving candidates. Some for putting a country on the air from which there would not have been any contest activity, and others for making a rare country available to a maximum number of stations. It was a very difficult decision, but the Committee finally came up with two awards. The W2GHK Trophy to the FGØZZ/FS7 multi group of F5QQ, F5ZW and G3TXF for their excellent job from Saint Martin. And a special *CQ* Award to Ville, OH2MM for his championship performance as ZD3Z from Gambia.

A rather unusual and interesting operation was tried by Ken, K2FJ and John, K6SE/2 from the island of St. Martin in the Netherland Antilles. Since the Island is divided into a Dutch and French side it made two countries available. Ken set up his station PJ8DX/PJ7 in Sint Maarten on the Dutch side, while John operated FGØAFA/FS7 a few miles away on French St. Martin. Operating on the same frequency on 28 mHz it was possible for Ken to pass each station he worked over to John. Like getting two for the price of one. It slowed up their individual operation but it sure made a lot of guys very happy.

The PJ9GIW multi-multi contest expedition headed by Van, W4GIW was compared to that of a small military operation. With a compliment of 9 operators and 5 XYL's, Curacao must have thought they were really being invaded by an army. The equipment included 5 complete rigs, 3 linears, 5 beam/mast combinations and other odd accesories. This was the third contest expedition by this group from the South Eastern DX Club of Atlanta, Georgia. They finally hit the jackpot.

Same Committee, Fred Capossela W2IWC/6, Bob Cox K3EST, Dave Donnelly WB2SQN, Bob Entwistle W1MDO, Andy Malashuk W1GYE, Ralph Nichols W1CNU, Dick Norton W6DGH, Gene Walsh K2KUR, Bernie Welch W8IMZ and yours truly. Fred and Dick had a hard working crew that gave them a hand out on the West Coast. Here in the East we had Marguerite and Eileen out at the office who kept things moving.

It's back to the salt mines for the c.w. section. That one shouldn't be too difficult.

73 for now, Frank, W1WY

TOP SCORES

SINGLE OPERATOR

ALL BAND

ZD3Z	**5,085,806**	**DJ2YA**	**2,278,357**
KH6RS	**4,173,519**	G3LNS	2,145,287
4C9AA	4,125,934	KH6IJ	1,751,690
YV6AW	3,504,375	OZ5KF	1,721,020
LU5HFI	3,103,452	VA7WJ	1,702,416

SINGLE BAND

28 mHz

CR6CN	524,234
CR6OZ	379,197
PY1MB	312,600
LU8FEU	296,238
CR6FW	242,155
CR6II	167,320

21 mHz

G3HCT	669,987
CR6NO	658,668
YU2CDS	542,620
DL6EN	400,177
VE3BBH	354,432
W4WSF	346,527

14 mHz

CV4C	**1,233,128**
CR6LF	996,135
PY4OD	**985,473**
SM6CKU	608,381
EA4LM	586,333
F2QQ	518,034

7 mHz

KP4AST	**335,440**
CN8HD	213,465
HR1RF	176,517
VK6CT	135,810
OH5NW	111,078
YV4TI	96,609

3.8 mHz

KV4FZ	183,200
OH1XX	60,435
PAØHBO	46,200
VE7SV	42,096
W5SZ	36,630
W4CRW	32,155

1.8 mHz

ZF1GS/VP7	4,352
PAØHIP	2,310
GM3YCB	1,464
DK2QL	1,378
GW2UCB	1,122
WB8APH	462

MULTI-OPERATOR

SINGLE TRANSMITTER

VP2M	**5,167,355**	DLØWU	3,416,808
FGØZZ/FS7	**3,871,976**	UK9AAN	3,412,200
IH9AA	3,719,573	PY2CAB	2,991,460

MULTI-OPERATOR

MULTI TRANSMITTER

PJ9GIW	**11,132,443**	UK9ABA	5,327,817
CR6AA	9,181,991	W2PV	5,248,173
DLØPG	6,409,817	DLØWW	5,046,678

Number groups after call letters denotes following: Band, (A-all) Final Score, Number of QSOs, Zones and Countries. Certificate winners are listed Bold Face.

PHONE RESULTS

SINGLE OPERATOR

NORTH AMERICA

United States

K1ZND	**A**				
	1,191,015	**1060**	**111**	**288**	
K1CPF	**A**				
	1,095,032	**1049**	**106**	**260**	
WA1JUY	**A**				
	1,065,996	**1006**	**105**	**266**	
					(Opr. WA2LOZ)
K1CSJ	"	957,852	930	108	259
WA1KID	"	616,148	741	79	210
W1CMH	"	401,737	684	56	147
WA1NRV	"	357,030	496	78	175
K1OME	"	236,400	441	55	142
W1BIH	"	216,449	301	75	188
W1RED	"	185,861	310	74	147
WA1FOO	"	138,272	334	46	103
WA1FBX	"	126,310	262	51	119
W1WY	"	103,062	203	66	127
W1BPW	"	88,510	208	62	105
W1HWM	"	83,074	208	47	99
W1RML	"	80,556	196	50	97
K1JHX	"	70,400	191	40	88
K1DIR	"	55,566	152	49	77
WA1KOJ	"	47,248	144	31	66
WA9AUM/1		33,189	114	40	71
WA1PHF	"	32,110	126	30	65
					(Opr. WB2CHO)
W1ESN	"	30,216	149	50	103
K1DPB	"	21,840	99	26	52
W1LQQ	"	21,483	106	27	50
WA1NNC	"	19,716	118	23	39
W1PLJ	"	19,228	93	27	49
W1FLM	"	16,717	82	31	42
WA1KOC	"	11,890	54	33	49
K1GUD	"	7,520	80	12	30
W1DGL	"	1,860	23	14	16
WA1JBN	"	1,711	22	12	17
WA1KZE	"	1,547	34	13	23
WA1NLD	"	1,242	16	9	14
W1SK	"	638	12	11	11
K1THQ	**28**	**82,513**	**269**	**23**	**86**
K1LWI	"	61,000	218	20	80
W1MDO	**21**	**188,748**	**516**	**27**	**99**
WA1JMP	**21**	**186,732**	**518**	**31**	**95**
WA1MCY	"	70,252	259	26	65
W1PIV	"	64,034	222	25	76
K1INO	"	52,920	190	26	72
K1IIK	"	22,345	122	19	48
W1AWE	"	4,800	51	9	23
WA1SKV	**14**	**109,710**	**359**	**30**	**76**
CP3BY/1	"	4,368	57	16	23
K2LQQ/1					
	3.8	2,640	55	7	17
W1BB	**1.8**	**192**	**12**	**5**	**7**
W2GXD	**A**				
		1,048,874	**931**	**113**	**284**
WA2DHF	"	758,264	849	93	224
WA2FCA	"	533,052	618	84	222
W2FZJ	"	433,972	607	101	207
K2FL	"	311,866	402	78	205
WA2SFB	"	173,824	317	60	134
W2RHE	"	144,196	283	69	119
W2UI	"	138,159	282	65	124
K2QIL	"	110,532	248	56	127
WB2ZWJ	"	105,182	243	46	108
W2LEJ	"	102,663	238	51	102
WA2DLV	"	85,374	203	52	101
WB2EOO	"	43,800	113	47	78
W2PFQ	"	31,490	152	26	68
WB2JJN	"	24,534	104	39	55
WA2FHF	"	22,466	101	38	56
K2MFY	"	22,149	188	22	47
WA3UHJ/2		14,839	87	23	48
W2CKR	"	11,550	61	18	48
W2FGY	"	8,840	62	17	35
K2IEF	"	8,306	84	29	47
K2DW	"	4,253	71	24	45
WA2PAT	"	3,168	34	15	21
F3VN/W2	"	2,772	28	14	22
WA2RJZ	"	2,024	30	7	16
W2YT	**28**	**113,138**	**334**	**26**	**91**
K2QBW	"	51,512	199	20	74
WB2QYT	"	37,318	146	25	69
WB2MAN	"	35,334	163	19	59
K2OLG	"	14,013	76	19	62
W2FVS	"	11,984	79	15	41
WA2TUJ	"	1,311	23	6	13
K8WWU/2					
	21	**268,920**	**697**	**31**	**104**
W2NIN	**21**	**261,434**	**670**	**31**	**103**
WB2ZGI	"	71,508	244	27	74
WA2RQH	"	50,460	198	24	63
WA2AUB	"	24,570	111	21	57
WA2ZWH	"	6,630	58	15	27
WB2SXD	"	4,032	40	10	26
K2KUR	**14**	**515,274**	**1158**	**38**	**119**
K2BQO	"	235,524	732	29	85
W2AZO	"	36,936	181	21	51
K2ISP	**7**	**11,660**	**89**	**15**	**40**
WA2COS					
	1.8	98	30	3	4
K1LPL/3	**A**				
		1,195,990	**1075**	**106**	**292**
W3CRE	**A**				
		1,012,893	**1031**	**105**	**242**
WA3GUL	"	598,986	718	100	211
W3YP	"	559,616	625	99	230
					(Opr. W3DQG)
W3QOR	"	462,903	516	102	226
W3ZSR	"	380,484	498	88	271
W3VT	"	346,698	410	99	207
W3DHM	"	327,465	405	83	198
W3KT	"	323,750	438	75	184
W3KFQ	"	273,120	401	70	170
WA3AFQ	"	239,837	367	80	167
K3TGM	"	220,074	314	76	182
W3GHM	"	197,880	337	66	128
W3GRF	"	191,900	327	65	137
W3KV	"	166,650	296	69	133
W3GRS	"	163,300	258	71	159
W3GL	"	156,140	281	70	141
W3OV	"	154,560	252	76	148
WA3NNA	"	130,032	245	65	124
W3HYJ	"	114,576	229	64	122
W3EVW	"	87,760	177	56	104
W3HVM	"	72,854	180	51	95
K3MBF	"	51,090	216	32	65
W3CGS	"	48,552	162	41	78
W3YHR	"	41,730	132	48	82
WA3DMH	"	28,536	106	26	58
W3FA	"	21,528	117	25	44
W3SWF	"	18,000	73	36	54
W3ML	"	16,362	75	29	52
K3ZOL	"	10,988	57	25	42
W3BB	"	8,848	60	19	37
W3KDD	**28**	**66,000**	**231**	**24**	**86**
WA3FXW	"	63,994	233	24	74
W3SDV	"	13,260	85	18	42
W3BRB	**14**	**177,525**	**467**	**35**	**100**
WA3NGS	"	156,152	418	34	97
K5ZUV/3	"	3,597	41	12	21
K4VX	**A**	**964,366**	**915**	**109**	**268**
W4UPJ	**A**	**851,148**	**931**	**90**	**234**
W9MIJ/4	**A**	**774,675**	**878**	**95**	**218**
K4IRQ	"	552,000	614	94	226
WA4YBV	"	400,819	518	84	193
WB4HQE	"	375,984	530	79	173
WB4TPU	"	354,564	504	79	173
K4CL	"	288,164	432	75	169
KØCMF/4	"	250,624	355	82	174
K4PQL	"	248,868	399	67	156
WB4TBO	"	243,506	404	64	154
K4EZ	"	234,685	354	85	166
W4KFC	"	202,630	319	74	156
W4KNW	"	176,542	308	70	136
W4EZ	"	164,649	286	73	140
K4BEO	"	162,408	304	66	135
W4DM	"	156,005	279	65	140
K4TBN	"	155,372	275	72	145
WB4SIJ	"	136,526	271	54	124
K4ZA	"	133,110	194	66	109
WB4SGV	"	123,413	263	59	104
K4EBY	"	118,140	256	62	103
K4LRX	"	113,322	219	66	121
W4WRY	"	103,777	228	50	107
W4YHD	"	99,600	225	45	105
W4TMR	"	82,300	203	54	96
W4DSW	"	61,372	157	44	90
WB4TEL	"	51,875	153	46	79
K4RPK	"	51,408	147	40	79
WB4NRI	"	47,432	148	55	66
WB4YPT	"	45,360	156	43	69
WB4RDV	"	42,334	131	45	77
WB4NVH	"	39,536	132	41	71
W4IML	"	27,392	97	41	66

Disqualified Stations

The following stations have been disqualified for taking credit for an excessive number of duplicate contacts.
CN8BO (All Band), CV3TZ (21 mHz), CX8BE (28 mHz), HL9TB (14 mHz), JH3SFX (21 mHz), KH6IGA (14 mHz), VE3WT (21 mHz operated by VE3CDX), VK2APK (14 mHz), W1EBC (3.8 mHz). In addition HG8KQX (28 mHz operated by H-8-754) was disqualified for claiming an excessively high total of zone/country multipliers that could not be verified.

W4KMS	"	26,529	94	45	66
K4MG	"	20,298	79	35	59
K4KA	"	17,640	59	21	40
W4GTS	"	14,490	72	35	55
WB4EMF	"	9,150	64	35	40
K4JYM	"	7,470	58	16	29
W4GZD	"	6,426	43	19	35
W4DFU	"	4,628	36	20	32
W4GF	"	3,825	31	19	26
W4EEO	"	3,198	28	14	27
WB4UYD	**28**	**144,000**	**402**	**29**	**99**
K4KJN	"	94,920	306	26	87
WA4DRU	"	55,920	203	25	72
W4OZF	"	53,932	198	26	71
W4BJ	"	21,243	102	24	49
WB4SPG	"	19,224	98	19	53
K4KZP	"	12,474	80	20	43
W4HOS	"	4,212	40	13	26
W4WSF	**21**	**346,527**	**848**	**31**	**108**
W4ZTW	"	38,052	154	24	60
WB4FSB	"	7,421	66	13	28
WA4BWI	"	608	15	5	11
K4HAV	**14**	**48,070**	**179**	**31**	**64**
W4QCW	**7**	**76,648**	**293**	**28**	**76**
W4CRW	**3.8**	**32,155**	**262**	**18**	**41**
W4BBA	"	798	19	7	14
W5NMA	**A**	**403,448**	**500**	**99**	**197**
W5KKZ	"	184,800	298	84	147
WA5STI	"	154,125	274	82	143
VE6BU/W5		99,330	214	63	102
W5TWI	"	97,960	227	50	108
W5KZN	"	84,000	192	62	98
WB5FMA	"	58,995	176	55	80
K5LVZ	"	51,060	141	51	77
K5VTA	"	44,608	137	53	83
W5HCJ	"	36,176	115	39	73
WB5HAE	"	28,188	135	36	45
W5JFB	"	26,928	100	37	62
WB5HDA	"	26,288	94	46	60
WB5DBT	"	26,235	101	39	60
K5VVV	"	21,931	88	34	57
W5NVU	"	20,700	84	35	55
K5SOR	"	20,496	74	48	64
W5OB	"	12,870	66	31	47
K5RFJ	"	10,850	76	23	47
WA5YFQ	"	7,808	53	28	36
W5QHF	"	6,832	42	27	34
K5DEC	"	6,549	49	28	31
W5HIC	"	2,773	26	21	26
WB5GPA	"	420	11	10	10
K5OII	**28**	**58,032**	**203**	**26**	**78**
K5ODZ	"	30,861	135	24	57
WB5GYF	"	17,759	116	23	36
W5TMN	"	11,938	97	13	34
WB5HIH	"	11,918	75	23	36
WB5HJN	"	6.517	51	19	30
W5QNQ	"	3,103	40	12	17
W5ZWQ	"	1,200	20	11	14
WA5RXT	**21**	**176,000**	**491**	**31**	**94**
W5ZR	"	134,292	390	30	94
W5OSJ	"	56,430	224	29	66
WB5FKX/5		20,837	311	23	44
K5AM	"	12,740	95	19	30
WA5BKN	"	4,498	58	6	20
K5BLV	"	2,412	32	16	20
WA5UUK	**14**	**62,418**	**222**	**32**	**71**
WB5KPN	"	31,372	131	29	63
W5WMU	**7**	**30,784**	**166**	**22**	**42**
K5PFE	"	840	16	8	13
W5SZ	**3.8**	**36,630**	**208**	**24**	**50**
K5PFL	"	17,690	139	19	39
W5LUJ	"	5,187	60	14	25
K5DEG	"	405	14	6	9
K6AHV	**A**	**1,635,039**	**1537**	**125**	**244**
W6DGH	**A**	**983,016**	**1070**	**127**	**201**
K6UA	**A**	**895,409**	**940**	**119**	**218**
K6QW	"	606,227	793	104	167
W6PLH	"	442,680	670	85	153
WA6EPQ	"	425,194	604	95	156
K6DYQ	"	312,420	454	99	147
W6DKQ	"	279,225	453	84	135
K6SSJ	"	231,120	357	93	147
K6ITL	"	216,594	386	65	124
K6HIH	"	145,068	334	69	88
WA6JVD	"	144,750	413	51	74
WB6DSV	"	140,997	386	55	74
K6CQF/6	"	140,000	269	84	116
W6BJB	"	125,001	306	52	77
WB6UOM	"	122,240	285	69	91
W6YVK	"	107,570	252	64	91
W6OKK	"	75,240	212	55	77
WA6AHF	"	69,136	169	54	95
K6MP	"	68,286	211	45	69
W6LQC	"	67,570	170	57	88
W6PRP	"	52,745	145	58	79
W6EJ	"	50,622	133	54	89
K6DC	"	36,729	165	34	43
K6OC	"	36,420	133	38	54
K6QPH	"	21,780	98	39	51
W6JKR	"	16,638	75	36	58
W6NJU/6	"	16,160	90	38	42
K6DR	"	14,378	62	35	44
WA6MWG	"	13,554	97	50	54
W6DAB	"	13,244	63	26	51
W6ID	"	11,620	57	33	42
K6GKU	"	11,270	64	29	41
WB6JOD	"	10,000	100	42	58
			(Opr.	W6KHS)	
WA6WUI	"	8,360	58	26	29
W6RQZ	"	4,128	86	14	34
W6GBY	"	3,649	33	17	24
W6GXK	"	3,280	36	21	20
K6QM	"	2,856	30	21	21
W6YFS	"	2,040	24	14	20
WB6ZVC	"	1,978	37	12	11
W6BIL	"	1,744	27	20	20
W6NXP	"	1,680	23	14	16
W6EJA	"	1.425	27	9	10
W6HJP	"	432	10	8	10
WB6EXW	"	429	14	6	7
W6HX	**28**	**94,689**	**419**	**26**	**55**
WB6PZW	"	23,214	158	20	33
WA6FIT	"	20,832	135	19	37
W6AM	"	291	31	2	5
WB6PNB	**21**	**200,216**	**588**	**28**	**88**
WB6FDD	"	182,466	567	21	80
W6EYY	"	174,538	613	13	67
K6OZL	"	164,604	491	29	87
WA6RFX	"	114,172	529	24	49
K6ZM	"	93,052	376	28	58
W6WXO	"	4,662	26	7	9
WA6IQM	**14**	**163,920**	**491**	**33**	**87**
W6QJW	"	114,798	393	32	74
W6EUF	"	113,100	349	36	79
W6OK	"	36,865	184	27	46
W6BZE	"	2,088	33	10	14
W6DSQ/6	**7**	**53,970**	**289**	**24**	**46**
W6APW	"	9,315	78	20	25
K6ERT	**3.8**	**27,716**	**239**	**17**	**35**
K6VI	"	10,176	99	18	30
W6ITY	"	9,492	91	16	26
K7RSC	**A**	**533,281**	**734**	**101**	**158**
W7YBX	**A**	**490,776**	**722**	**93**	**149**
WA7KYZ	"	425,730	655	84	146
WA7PMI	"	359,268	542	77	155
W7OTO	"	346,788	774	66	90
WA7JCB	"	252,168	527	67	101
K7IRO	"	235,222	394	82	136
W7LZF	"	126,453	251	69	114
W7BRU	"	116,518	285	59	90
WA7TUS	"	98,494	289	46	75
W7AWH	"	85,680	263	46	74
W7NP	"	84,937	198	67	90
W7INH	"	74,566	192	65	93
WA7SSZ	"	74,128	257	46	67
W7OF	"	60,192	154	62	90
K7KTD	"	46,515	156	46	59
K7CVL	"	36,096	137	38	58
W7MCU	"	33,132	94	59	73
W7QN	"	32,160	117	38	58
WA7PAB	"	31,050	116	40	50
W7JUO	"	20,230	85	30	55
WA7TMD	"	13,056	99	25	26
W7HXG	"	12,880	64	29	41
W7SCQ	"	12,060	64	25	42
W7BQG	"	8,745	59	25	30
W7RIR	"	8,052	58	31	35
W7GSP	"	4,797	42	16	25
W7FCB	"	1,280	33	16	16
W7YU	**28**	**45,318**	**217**	**24**	**54**
W7AYY	"	24,021	163	18	33
W7UBA	"	11,210	72	21	38
WA7TTC	"	1,924	33	11	15
WA7TBF	**21**	**26,895**	**179**	**21**	**34**
WA7BPS	**14**	**74,690**	**271**	**31**	**66**
W7KSA	**14**	**73,557**	**258**	**32**	**67**
W7LAV	"	35,506	162	26	56
K7OAK	"	32,674	186	24	38
W7KH	"	10,360	66	22	34
W7ETZ	"	9,380	48	26	44
K7YDO	"	8,464	66	17	29
W7CMO	"	6,688	62	14	24
W7AQB	"	3,480	48	14	15
W7CX	"	1,512	18	13	15
W7BCV	"	1,444	27	7	12
WA7ILO	"	378	23	7	7
K7HTZ	**7**	**18,762**	**132**	**20**	**33**
W7YTN	**3.8**	**13,926**	**185**	**14**	**19**
W8TWA	**A**	**356,136**	**460**	**90**	**194**
WB8IAY	"	269,120	437	76	156
W8DQL	"	232,366	362	72	151
WB8EUN	"	209,855	333	81	154
WA8UUY	"	205,216	334	81	161
W8MBB	"	103,968	227	58	113
WB8IOT	"	60,480	157	49	91
W8FJS	"	53,361	165	43	78
K8PYD	"	3,034	31	17	20
WA8QIY	**28**	**70,834**	**242**	**25**	**82**
W8IMZ	"	61,800	239	23	80
WA8GUF	"	40,608	158	23	71
K8MFO	"	24,244	119	20	56
K8SWW	"	3,075	27	12	19
W8GLC	"	24	2	2	2
K8KAS	**21**	**240,000**	**668**	**29**	**96**
K8LEE	"	209,050	665	28	87
K8ULU	"	178,486	467	29	104
			(Opr.	WA8KLF)	
WA8GLY	"	104,075	316	28	86
W8KOD	"	91,478	299	28	78
WB8HLI	"	13,157	84	18	41
WA8VZO	"	6,996	71	9	24
W8JGU	**14**	**265,512**	**623**	**38**	**110**
WA8DXG	"	204,680	528	35	101
WA8QOY	"	131,375	371	35	90
K8SMC	"	122,545	345	36	91
K8NWD	"	59,784	230	28	66
W8KCJ	"	30,733	148	21	52
W8JSX	"	8,183	62	19	30
WA8CKT	"	5,265	52	15	24
WB8APH					
	1.8	**462**	**66**	**6**	**8**
WB9BPG	**A**	**929,124**	**871**	**119**	**259**
W9CTY	**A**	**642,690**	**702**	**98**	**235**
W9DUB	"	582,900	712	95	195
K9WEH	"	470,834	518	105	233
W9LF	"	403,472	500	92	210
WB9EBO	"	303,875	404	90	185
WA9HEU	"	291,072	408	89	167
WB9CEP	"	206,822	326	77	161
WA9IVL	"	178,665	309	77	138
WA9UEK	"	174,246	292	79	147
W9WYB	"	163,299	278	77	139
WA9LZA	"	123,125	243	72	125
WA9BHH	"	112,056	246	59	109
W9MYD	"	106,049	240	57	116
WA9NPM	"	95,608	225	54	98
W9PJT	"	73,788	200	51	92
WA9RJI	"	67,298	166	59	102
W9CL	"	63,801	169	48	91
W9SFR	"	63,450	158	57	93
W9LQ	"	55,485	147	38	97
WA9BWY	"	53,196	154	50	82
WB9CBY	"	50,386	159	35	83
K9LIH	"	46,659	137	61	90
W9QWM	"	45,144	124	48	84
W9MLG	"	40,764	125	46	83
WB9CPQ	"	29,568	116	37	59
WB9HZD	"	29,190	118	38	67
K9BQL	"	25,632	105	34	55
W9RR	"	25,317	99	38	59
WB9GUG	"	21,306	102	21	51
W9HZ	"	19,885	74	40	57
W9BZW	"	17,424	78	39	49
W9DY	"	16,632	71	34	54
WB9AJZ	"	10,950	60	31	42
WB9GJN	"	5,022	36	21	33
K9HDP	"	2,272	27	14	18
W9LW	"	1,421	17	14	15
W9DOB	**28**	**68,801**	**255**	**25**	**82**
W9OHH	"	55,762	214	22	76

[cont. on page 74]

CE5GO—We don't see any CQ certificates in that display of wallpaper, so we'll reward Ulrich with an award for making Zone 12 available in the contest.

DX

BY JOHN A. ATTAWAY,* K4IIF

DXERS the world over were shocked and dismayed this past April when the news media reported an attack on Fred Laun, W9SZR, a U.S. Consular Official in Cordoba, Argentina, by an Argentine revolutionary group. Fred is widely known and respected for his many years of skillful DX and contest operating from HI8-XAL, HS5ABD and LU5HFI. He is one of the world's most enthusiastic radio amateurs and a frequent contributor to this column.

The attack on W9SZR dramatically illustrates the great danger in operations from many DX locations by U.S. citizens. The attackers were attracted to Laun's home by the prominent antenna, and first reports mentioned that he "was known to have a powerful shortwave transmitter." That somewhat sinister sounding comment would apply to all of us, but at home we think nothing of it. However, when we travel to other countries, particularly those countries where political unrest and revolution is never far below the surface, that transceiver in your suitcase can have an entirely different connotation. People in the developing countries of Africa or Asia can hardly be blamed for a great deal of skepticism regarding a person who has spent $5,000. to travel 10,000 miles, erected a beam antenna, and proceeded to engage in a feverish outpouring of dots and dashes to give his friends back home a "new one."

The point is simple. If you are going on a DXpedition be aware of the risks, and those of you sitting at home making the contacts by all means show some appreciation. Follow instructions in making your contact, record the time in GMT on your card and put in a nice note of thanks along with your self-addressed, stamped envelope. That guy out there may be laying his life on the line to give you that contact, *literally!*

Single Band WAZ

Through mid-April, 1974 three single band awards have been made, all on 20 meters. Dr. H. E. Stricker, W8WZ, received the #1 plaque for 20 meter c.w., Mr. R. G. Parlin, WØSFU, received the #1 plaque for 20 meter phone (s.s.b.), and Mr. A. C. Emerald, K6GA, received #2 on 20 meter c.w. and the accompanying certificate. Plaques for 10, 15, 40 and 80 meter phone and c.w. are yet to be awarded.

At this point in the sunspot cycle the chances for a 10 meter winner are virtually nil, and 15 meters seems almost as unlikely unless someone worked the tougher zones along the east-west path last year when conditions were somewhat better. Without a mighty effort by some intrepid 80 meter DXer the next band to show a winner will be 40 meters.

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

The CQ DX Award Program

C.W. DX

148—ZL1ADD
149—OK2BMF
150—OK1MP
151—K9UQN
152—OK2BOL

S.S.B. DX

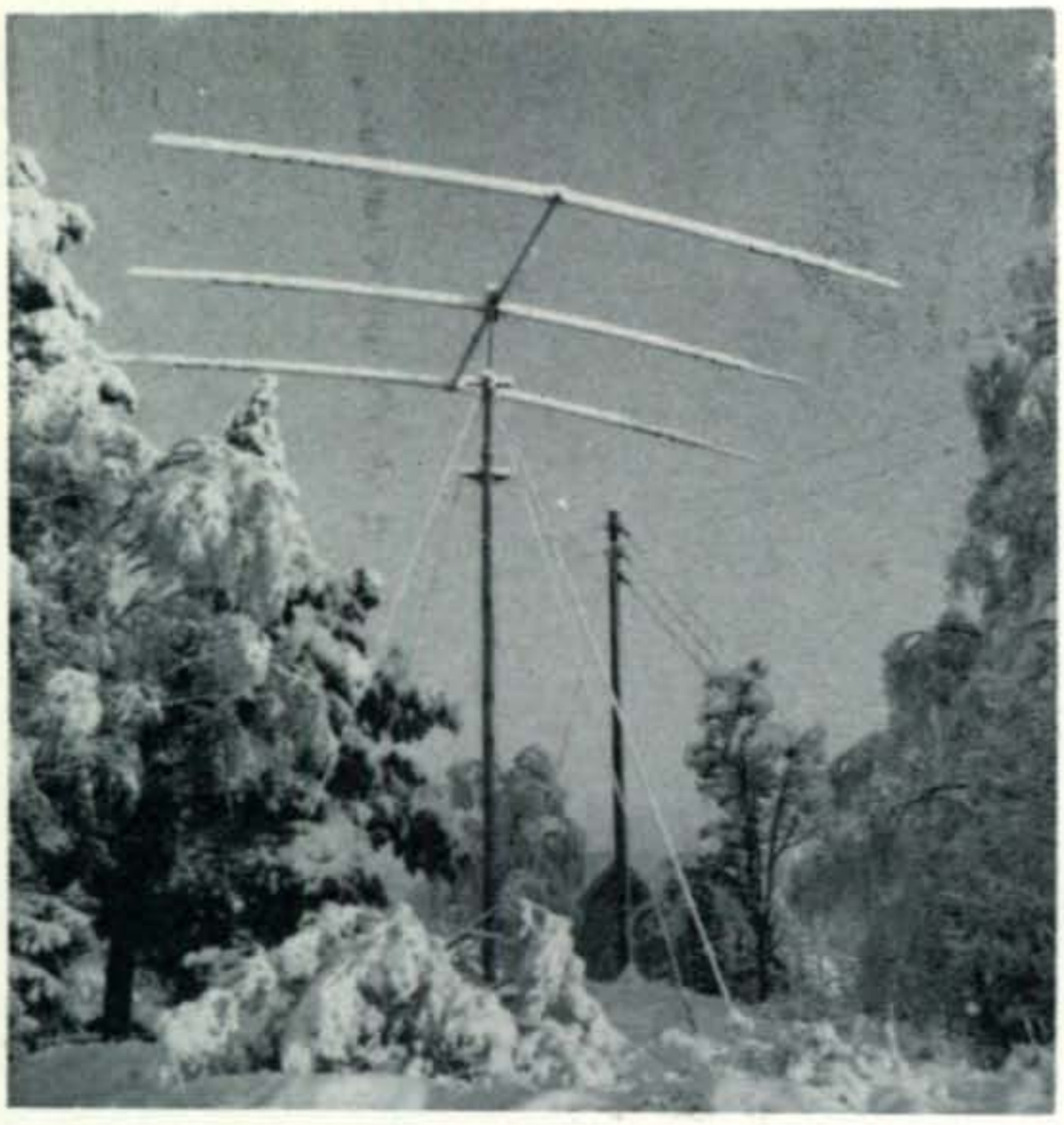
340—OK1OAT
341—VK5WV
342—G4AMJ
343—ZL1ADD
344—W6MFC

Endorsements

C.W.: OK1MP—200, OK2BMF—150.
S.S.B.: F2MO—310, WA6ESB—250, VK5-WV—200, W7CUJ, W6FMC—150, K6-SSN—3.5/7 mHz.

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January 1971 issue of *CQ*. Application forms and copies of the rules may be obtained by sending a business size, self-addressed stamped envelope to DX Editor, P.O. Box 1271, Covina, Ca 91722.

Here is Nick, SV1DA, processing some of the 5000 QSLs generated by thte spring, 1973 DXpedition to Mt. Athos, SV1DB/A. The Mt. Athos gang picked Nick to handle the cards because of his outstanding record as head of NARUG's Central SV QSL Bureau in Athens for the past 5 years. SV1DA also handles cards for the SXØDX operation and the special exhibition station SV1DB/70. *(Photo via SV1DB)*



How does this look through July heat? It's the TH3MK3 of LA5GC. Tor says that the snow is no problem for the antenna. The radiation pattern is FB, hot or cold.

News of Rare and Special Prefixes

In starting this section of the column, the staff is pleased to present news of a new, prefix-based award offered by the Amateur Radio Club of the Listowel District Secondary School in Canada. Called the Maple Leaf Award, it consists of an attractive flag pennant which will add a dash of international flavor to anyone's ham shack. All contacts must be made after Jan. 1, 1965, the year in which the Maple Leaf became the official flag of Canada.

The new Maple Leaf Award is available to radio amateurs of all countries who confirm a specified number of Canadian prefixes. The QSL's must be in your possession and a certi-fixed list signed by 2 amateurs must accimpany the application. Prefixes may come from the CF, CI, VA, VB, VE, VO, VX, 3B and 3C series and from later special callsign allocations. Endorsements for bands and modes are available, and three classes of the award are offered as follows:

Class I—30 or more prefixes
Class II—25 prefixes
Class III—15 prefixes

The application and certified list with $2.00 or 14 IRC's should be sent to the Award Custodian, Mr. Garry Hammond, VE3GCO, Geography Department, Listowel District Secondary School, 155 Maitland Ave. South, Listowel, Ontario, Canada. All awards will be sent via Air Mail.

A7—A7XA used the new prefix for Qatar for the first time. QSL to DJ9ZD.

BV2—BV2A is active sporadically around 14022 kHz c.w. A favorite time is 1230 GMT.

DU5—DU5DL was reported on 21266 kHz at 1400 GMT.

GD4—GD4AM was heard on 14020 kHz at 1805 GMT..

FCØ—FCØAMD, June 10-20, 1974, operated from Bastia, Corsica. QSL to DK8SQ.

II4—II4FGM was a special station commemorating the Marconi Centenary.

JY1—King Hussein has been reported on the air again around 14210 at 1500 GMT.

KD4—KD4ITU was issued to W2GHK for World Telecommunication Week, May 11-19, 1974.

KD9—From May 11-19, 1974, KD9ITU was operated by the Belleville Amateur Radio Foundation. QSL to W9MTT, Rt. 1, Box 1, Fults, IL 62244.

KE2—KE2TAE QSL's go to WB2FVO.

KK6—QSL KK6WSL to WB6WSL.

The WPX Program

Mixed

437—G3KDB
438—VE2BRW

C.W.

1308—SVØWTT
1309—OK2SKU
1310—JA2AHH
1311—ZL1ADD
1312—I8QO

S.S.B.

797—W6YVK
798—VK5WV
799—CE6EZ
800—OK1OAT
801—ZL1ADD

WPNX

70—WN9JTM/5

VPX

71—OK1-17963

Endorsements

Mixed: WB4KZG—850, YU2OB—750, WA-3GNW—600, WB2HNO, K3SXQ—550, W2FVS, G3KDB, VE1AI—500.

C.W.: WA9UET—550, W9MEJ—500, SM6-BZE, W2FVS—450, DJ4EJ—400, K9-DDA, ZL1ADD—350.

S.S.B.: W6YMV—750, PY3BXW, WB2NYM—700, DJ1XU—500, WA6ESB, W6YVK—450, W9EBO—400, JA2UYS, ZL1ADD—350.

VPX: OK1-17963—350, WDX2OBU—20 Meters, WDX5FEB—Oceania.

80 Meters: WA5VDH, OK1DVK.

20 Meters: VK5WV.

Asia: OK1AEH, DJ1XU, JA2UYS.

Europe: JA2UYS, JA2AHH.

Oceania: W7HKI.

Complete rules for WPX, WPNX, and VPX may be found on pg. 67 of the February 1972 issue of *CQ*. Application forms and reprints of the rules may be obtained by sending a business size, self-addressed stamped envelope to DX Editor, P.O. Box 1271, Covina CA 91722.

CQ DX Award Honor Roll

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. The total number of current countries on the DXCC list as of this listing is 322 with the addition of Mellish Reef.

CW

K6EC	317	W8LY	308	VK3AHQ	303	DL3RK	300	WA6EPQ	290
W6ID	317	W4IC	305	ON4QX	302	W4BQY	296	WA6MWG	290
W8KPL	313	W6ISQ	304	W9DWQ	301	W6NJU	295	WA8DXA	287
W4YWX	310	K6LEB	304	WØAUB	301	K1SHN	291	DJ7CX	278

2XSSB

W2TP	321	I8AA	314	K3GKU	308	W6FW	299	K8GQG	287
W2RGV	320	I8KDB	314	K6EC	308	K4HJE	298	W9OHH	285
IØAMU	319	W4IC	314	XE1AE	308	W9KRU	298	W3CRE	284
WA2RAU	319	W6REH	314	OZ3SK	307	G3RWQ	297	W8ZOK	284
DL9OH	318	W9DWQ	314	WA6MWG	307	WØSFU	282	K1KNQ	283
TI2HP	318	W9JT	314	W9QLD	307	YV1KZ	297	WØSU	282
K2FL	318	SM5SB	313	KH6BB	306	K1SHN	296	OE3WWB	281
W4SSU	317	SM6CKS	313	VE2WY	306	YS1O	296	HP1JC	281
W3NKM	316	WA2EOQ	313	W2CNQ	305	ZL3NS	296	WA2VEG	281
W6EUF	316	K4MQG	313	G3DO	304	WB6DXU	295	DJ7CX	280
W9ILW	316	W6NJU	312	WA6AHF	304	I8YRK	291	OK1MP	280
G3FKM	315	ZS6LW	312	ZL1AGO	304	G3KYF	290	W6FET	280
IT9JT	315	F2MO	311	VE3MJ	303	WB2RLK	290	W6TCQ	276
VE3MR	315	F9RM	311	VE3GMT	303	XE2YP	290	K6GUY	275
W3AZD	315	W3DJZ	311	W6KZS	303	YV1LA	290	I1WT	275
W6EL	315	W6YMV	311	SM6CWK	302	DL6KG	288	VE7HP	275
W6KTE	315	IØZV	309	WA2HSX	302	WAØKDI	288	WAØCPX	275
W6RKP	315	K4RTA	309	OE2EGL	301	DL1MD	287		
K6WR	315	F9MS	308	WA3IKK	300	OE1FF	287		

KS2—KS2RPI, April and May, 1974, commemorated the 150 anniversary of the founding of Rensselaer Polytechnic Institute. QSL to WA2-EAH.

LJ2—LJ2I was reported on 14194 kHz s.s.b.

S2—Bangladesh was activated by Erick, SM2-DWH/S2. QSL to his home QTH.

ST2—Sid, ST2SA, frequents 21300 between 1300 and 1700 GMT.

VA7—VA7BBL commemorated the Centenial of Langley, British Columbia, with operation planned through December, 1974. QSL to VE7-BBL.

WF8—WF8HOF (Hall of Fame) cards go to W8OYV.

WH4 — WH4DOC, April 4-18, 1974, was manned by the Atlanta Radio Club from Atlanta stadium in honor of Hank Aaron.

WM5—QSL WM5BIL to W5YIN.

WS4—Send cards to WS4SFF via WB4AID.

WS6—WS6MVM can be reached through W6-VID for QSLing purposes.

WX7—Cards for WX7AAA go to W7XD.

WY4—QSL WY4TBS to WA4WTG.

YC3—YC3AP was heard on 21248 kHz at 1300 GMT..

4JØ—4JØDI operated from the Soviet Kurile Islands during the *CQ* Worldwide WPX Contest in March.

Some of the good prefix stations heard during the *CQ* Worldwide WPX Contest in March included CF2UN, CF3DTG, CQ6WW, CR3WB, CR6OZ, CT7UA, CV2T, DA1WX, GC3ML, IZ1VVZ, KS6AM, PS2JD, PS4KL, PS7BDX, PS7NS, SV1GA/5B4, TU4AH, UK9AB, VP1-MPW, VP5BW, VX2AS, WF8HOF, XX6CC, YS1RV, 5Z4OY/A, 9Y4VU and 9Z4T. Other rare prefixes included PT1, TI1, VX1, XU1, WS7, 4M3, 4JØ and 9AØ. To help identify some of the countries represented by new prefixes, CQ6=CR6, XX6=CR6, CF=VE, CV=CX, PS=PY, and HG8=HA.

The WAZ Program

S.S.B. WAZ

1187.....KZ5JF	1192.....JA2JAB
1188.....JA5IU	1193.....WB6DXU
1189.....F6AXP	1194.....VK5WV
1190.....YO3AC	1195.....DK3PG
1191.....UK5MAF	

C.W.—Phone WAZ

3691.....SVØWTT	3699.....W3CTE
3692.....YO3AC	3700.....ZL1ADD
3693.....UV3CE	3701.....DK1LW
3694.....UP2AG	3702.....DL8FL
3695.....UC2OC	3703.....DK2UU
3696.....UK2WAF	3704.....DJØLC
3697.....JA2JAB	3705.....JA3IG
3698.....WA9HEW	3706.....W3CDG

Complete rules for the Single Band WAZ Program are shown on pgs. 57-58 of the December, 1972 issue. Complete rules for regular WAZ may be found on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of both sets of rules may be obtained by sending a self-addressed, stamped envelope to John A. Attaway, K4-IIF, P.O. Box 205, Winter Haven, FL 33880.

QSL Information

A51PN—Via W1JFL
A6XB—To K1DRN
AP2KS—c/o SM1CNS
CT2BM—Via WA5BDJ
FB8WB—To F8US
FGØAZM—c/c F9MD
FM7AQ—Via WB4SPG
FM7WN—To K2KGB
HI8LC—c/o W2KF
HKØAB—Via SM3CXS
HS3AIG—To WA4BKC
HS4AKF—c/o K7UXK
KB6CU—Via WB6IKU
KC4USX—To K7WPZ
KJ6DI—c/o W6JYT
KW6HF—Via WA6BBI
KX6LA—To K2BT
KX6MV—c/o WA6HRS
M1FOC—Via DL3RK
OJØAM—To OH0MA
OY3H—c/o W3HNK
P29FV and P29MC—Via K6ZDL
PJ1DA—To W3BYX
PJ8AK—c/o F6AEV
PJ8HR—Via W2JKN
TA1HY—To W5QPX
TA2QR—c/o DJ0J0
TI2WD—Via SM6CVX
TJ1EZ—To PA0EZ
TR8SS—c/o DJ5IO
TU2EN—Via F6EEE
TU4DD—To K2QHT
TY1UW—c/o ET3ZU
TZ1A—Via HB9TZ
VA7MRE—To VE7BCP
VE3AII/SU and VE6CBJ/SU—c/o VE1AL
VKØDM—Via VK3FF
VP1FOC—To W4MZQ
VP1MT—c/o G3UCT
VP2DAJ and VP2DE—Via VP[illegible]GCO
VP2GGC—To W5MYA
VP2G[illegible]—c/o W3YHB
VP2MAR—Via W0AR
VP2MAW—To W0AAW
VP2MHB—c/o W4WWG
VP2SAU—Via W3SF
VP2VBW—To WB8LSD
VP8MS—c/o K4MZU
VQ9HCS—Via WA1HAA
VR1AA—To K3RLY
VR4AA—c/o ZL4BL
VR4BS—Via ZL4NH
VS5MC—To DK5JA
VS9MB—c/o G3KDB
VS9UA—Via G3UAO
WB4BUQ/8R1—To WA6MWG
WA7IXE/KP6—c/o KS6DY
XT2AE—Via DJ9KR
XT2AG—To W1AM
XW8BP—c/o JH1ARJ
ZC4FI—Via DK1OP
ZD3M—To K3GJD
ZF1AL—c/o WA4SVH
ZF1AO—Via W2NJO
ZF1BR—To W4KA
ZF1JM—c/o WB8DZM
ZF1TV—WA2EXP
ZK1CD—To ZL2FA
ZS6YK—c/o WB2JYM
3A2CP—Via WA3HUP
3B6CF—To JA0CUV
4W1CW—c/o DJ9ZB
4W1GM—Via W3HNK
5R8CO—To F8US
5T5LO—c/o K9KXA
5U7AZ—Via CN8CG
6E1EEI—To XE1EEI
6F8J—c/o XE1J
7P8AD—Via VE2JH
7P8AY—To K3TUP
8P6BN—c/o VE3GMT
8R1CB—Via W2MIG
9M8SDA—To K6TWT
9X5NA—c/o W7LFA

Late QSL Information

HI8LPN—Via HI8LC, P.O. Box 88, Santo Domingi, Dominican Republic.
KG6JCZ—To W3HNK
TI2BEV—c/o K4VW, (ex-W4CKB) Box 1083, Lake Placid, FL 33852
VR4AA—Via ZL4BL
VS6AI and VS6DD—To W3HNK.
XU1AA—*Only* stations who contacted XU1AA through KA6WS as MC may QSL to Bill Spencer, KA6WS, P.O. Box 128 MCAS (H), FPO, Seattle, WA. Bill is *not* a regular QSL Manager for this station.
ZF1AH—c/o WA1QBH, 1 Fernwood Drive, Simsbury, CT 06070.
ZF1AL—Via WA4SVH, 718 Magnolia Drive, Lake Park, FL 33403.
ZF1CW—To K4SHB, P.O. Box 4906, Hialeah, FL 33014.
ZF1GW—c/o WB4TAF.
ZF1VD—Via K4SHB, P.O. Box 4906, Hialeah, FL 33014.
ZF1VW—To K4VW, P.O. Box 1083, Lake Placid, FL 33852.
ZL3KK/C—co Pat McRodden, ZL4NH, 18 Fraser St. Sawyers Bay, New Zealand.
4W1GM—Via W3HNK.
9L1JT—To W3HNK.

73, John, K4IIF

Propagation

BY GEORGE JACOBS,* W3ASK

WITH longer hours of daylight and the sun high in the northern sky, h.f. propagation conditions should be considerably more stable during July than they were during the spring months.

Twenty meters should be the optimum band for DX propagation during the month. The band should remain open to one area of the world or another from sunrise through midnight, and at times almost around-the-clock. Peak conditions should take place for several hours after local sunrise, and again during the late afternoon and early evening hours. During these peak periods, *twenty meters* may be open in almost all directions at the same time.

With declining solar activity and the doldrums of summertime propagation, not much DX propagation is expected on *15 meters*, and even less on *10 meters*. *Fifteen* should still open fairly frequently towards the south. Short-skip openings into the Caribbean area and Central America may be possible as early as 10 A.M. Longer-skip openings should take place later in the day, between 3 and 6 P.M., local daylight time. The band may occasionally open during the late afternoon from the eastern half of the country to Africa, and during the early evening to the Pacific area and Australasia. On *10 meters*, the only DX looks like short skip openings during the day towards the Caribbean and Central America and a very occasional longer-skip opening towards South America during the afternoon.

During the hours of darkness, *40 meters* should open to many areas of the world, but seasonally high static levels may often make DX reception difficult. High static levels are also expected to hinder DX conditions on *80 meters*, although some long distance openings are forecast during the hours of darkness. Not many DX openings are expected on *160 meters* during July, because of seasonally high levels of static and solar absorption.

DX Propagation Charts for July appeared in last month's column. For an assessment of day-to-day conditions expected during the month, see the "Last Minute Forecast", which appears at the beginning of this column.

*11307 Clara Street, Silver Spring, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For July, 1974

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date *July*				
Above Normal: 1, 7-8, 17, 19, 29	A	A	B	C
Normal: 2-6, 9-10, 16, 18, 22, 24-25, 27-28, 30	A	B	D	E
Below Normal: 11-12, 14-15, 20-21, 23, 26	B	C	E	E
Disturbed: 13	C	D	E	E

Where *expected signal quality* is:

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading and noise.

C—Fair opening, signals between moderately strong and weak, with some fading and noise.

D—Poor opening, signals weak 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 particular opening for any day of the month. For example, all openings shown in the Charts with a *propagation index* of (3) will be Excellent on July 1, Good on July 2-6, Excellent on the 7-8, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, or subscribe to weekly MAIL-A-PROP bulletins, P.O. Box 86, Northport, N.Y. 11768.

Peak Short-Skip Conditions

This month's column contains *Short-Skip Propagation Charts* for July and August, as well as Charts centered on Hawaii and Alaska. The Short-Skip Chart contains propagation forecasts for distances between 50 and 2300 miles from your transmitting location.

Short-skip propagation conditions are expected to be optimum during July as a result of a seasonal peak in sporadic-E propagation. During the daylight hours, considerable short-skip openings are forecast for *10* and *15 meters* over distances ranging between approximately 500 and 1300 miles, with some openings extending out to beyond 2000 miles. Around-the-clock short-skip openings are expected on *20 meters*, between distances of 300 and about 2300 miles. Conditions on *20* should peak during the late afternoon and early evening.

Good daytime short-skip openings on *40 meters* are forecast for distances between 100 and 750 miles, with good nighttime openings expected between 250 and 2300 miles. Conditions on *80 meters* are also expected to be good during the daylight hours, with openings up to approximately 300 miles. During the hours of darkness, good openings should be possible up to the one-hop limit of 2300 miles. While no short-skip openings are expected on *160 meters*

How To Use The Short-Skip Charts

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts, the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 Meters are likely to occur during those times when 80 Meter openings are shown with a *propagation index* of (2), or higher.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path mid-point*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between NY and Texas, the time would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones, *add* 3 hours in the PDT zone, 4 hours in MDT zone; 5 hours in CDT zone; and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart are given in GMT. To convert to *daylight* time in other areas of the USA, subtract 7 hours in PDT zone, 6 hours in MDT zone, 5 hours in CDT zone, 4 hours in EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in NYC.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts cw or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10db loss, it will lower by one level.

5. Propagation data 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.

during the daylight hours, some good openings should be possible during the hours of darkness up to at least 1300 miles, and as long as 2300 miles.

V.H.F. Ionospheric Openings

Intense sporadic-E ionization expected during July is very likely to result in numerous *6 meter* openings and an occasional *2 meter* opening. Fairly frequent *6 meter* openings should be possible, over distances ranging between approximately 600 and 1300 miles, with some openings extending out to as much as 2300 miles. While sporadic-E short-skip openings can take place at just about any time of the day or night, statistics indicate that conditions peak for a few hours before noon and again during the late afternoon and early evening.

During intense sporadic-E ionization, as the skip distance is observed to be *decreasing* on *6 meters*, the MUF will be *increasing*. When skip stations as near as 500 miles are heard on *6 meters*, check *2 meters* for possible openings in the same direction. As a good rule of thumb, when the *6 meter* skip distance falls below 500 miles, *2 meter* openings may be possible between distances of about 1000 and 1400 miles.

Check on *July 29* for meteor scatter openings on the v.h.f. bands. The very brief *Delta Aquarids* shower is expected, with a meteor count of 20 an hour when it peaks at about 9 A.M. EDT.

Check for auroral and other unusual types of ionospheric propagation on the v.h.f. bands during the following periods when the ionosphere is forecast to be below normal or disturbed: July 11-15, with the most likely date being the 13th, July 20-21, 23 and 26.

Sunspot Cycle

The sunspot cycle continues its steady decrease. The Swiss Federal Solar Observatory at Zurich reports a monthly mean number of 44 for April, 1974. This results in a smoothed sunspot number of 33, centered on October, 1973. A smoother sunspot number of 19 is forecast for July, 1974.

73, George, W3ASK

CQ Short-Skip Propagation Chart

July & August, 1974

Local Daylight Savings Time At

Path Mid-Point

Band (Meters)	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	08-10 (0-1) 10-14 (0-3) 14-18 (0-1) 18-22 (0-2) 22-08 (0-1)	08-10 (1) 10-14 (3) 14-18 (1-2) 18-22 (2-3) 22-08 (1)	08-10 (1-0) 10-14 (3-0) 14-18 (2-0) 18-22 (3-0) 22-08 (1-0)
15	*Nil*	08-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2) 10-14 (3) 14-18 (2) 18-20 (3) 20-22 (2) 22-00 (1-2) 00-08 (1)	08-10 (2-0) 10-14 (3-0) 14-16 (2-0) 16-18 (2-1) 18-20 (3-1) 20-21 (2-1) 21-00 (2-0) 00-08 (1-0)
20	10-00 (0-1)	07-10 (0-2) 10-16 (1-4) 16-21 (1-3) 21-00 (1-2) 00-07 (0-1)	07-10 (2) 10-16 (4) 16-19 (3) 19-21 (3-4) 21-00 (2-3) 00-07 (1-2)	07-10 (2) 10-16 (4-2) 16-19 (3) 19-21 (4) 21-23 (3-2) 23-00 (3-1) 00-05 (2-0) 05-07 (2-1)
40	08-12 (1-2) 12-16 (1-4) 16-20 (2-4) 20-00 (1-2) 00-08 (0-1)	08-10 (2-3) 10-12 (2) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-00 (2-4) 00-08 (1-3)	08-10 (3-1) 10-16 (2-0) 16-18 (3-1) 18-21 (4-3) 21-00 (4) 00-06 (3-4) 06-08 (3)	08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-21 (3-2) 21-06 (4) 06-08 (3-1)

80	07-12 (3-4) 12-17 (4-3) 17-22 (4) 22-05 (3-4) 05-07 (3)	08-10 (4-1) 10-12 (4-0) 12-17 (3-0) 17-19 (4-1) 19-21 (4-2) 21-23 (4-3) 23-05 (4) 05-07 (3) 07-08 (4-2)	08-10 (1-0) 10-17 (0) 17-19 (1-0) 19-21 (2-1) 21-23 (3-2) 23-05 (4) 05-07 (3) 07-08 (2-1)	08-19 (0) 19-21 (1-0) 21-23 (2-1) 23-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (3-0) 07-08 (1-0)
160	18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0)

ALASKA

July & August, 1974

Openings Given In GMT†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*Nil*	12-15 (1) 22-01 (1) 01-03 (2) 03-05 (1)	07-10 (1)	*Nil*
Central USA	00-03 (1)	13-16 (1) 23-01 (1) 01-04 (2) 04-05 (1)	08-12 (1)	*Nil*
Western USA	02-05 (1)	14-16 (1) 16-18 (2) 18-00 (1) 00-02 (2) 02-05 (3) 05-06 (2) 06-08 (1)	07-09 (1) 09-13 (2) 13-15 (1)	10-13 (1)

HAWAII

July & August, 1974

Openings Given In Hawaiian Standard Time†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	11-14 (1) 14-16 (2) 16-18 (1)	02-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	18-20 (1) 20-00 (2) 00-02 (1)	21-01 (1)
Central USA	08-13 (1) 13-17 (2) 17-19 (1)	04-05 (1) 05-07 (3) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	18-21 (1) 21-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	20-22 (1) 22-01 (2)* 01-02 (1)*
Western USA	08-11 (1) 11-14 (2) 14-16 (1) 16-18 (2) 18-19 (1)	04-06 (1) 06-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	19-20 (1) 20-22 (2) 22-02 (3)* 02-03 (2)* 03-04 (1)

†See "How To Use Short-Skip Charts" in box at the beginning of this column.

*Indicates best time to listen for 160 Meter opening.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

July	6-7	Venezuelan Contest
July	6-7	DL Activity QRP Contest
*July	20-21	Colombian Contest
*July	20-21	Space Net VHF Contest
*July	27-29	County Hunters C.W. Contest
†Aug.	3-4	Romanian Contest
Aug.	3-5	Kentucky QSO Party
Aug.	10-11	Argentina Phone Contest
Aug.	10-11	European C.W. Contest
Aug.	10-11	WE RTTY & VHF QSO Party
Aug.	17-18	SARTG RTTY Contest
Aug.	17-18	New Jersey QSO Party
Aug.	24-25	Oregon QSO Party
*Aug.	24-25	All Asian C.W. Contest
Aug.	31	Ohio QSO Party
Sept.	7-8	ARRL VHF QSO Party
Sept.	14-15	European Phone Contest
Sept.	14-16	Maryland/D.C. QSO Party
Sept.	14-16	Wash. State QSO Party
Sept.	14-15	Scandinavian C.W. Contest
Sept.	18-20	YLRL "Howdy Days"
Sept.	21-22	Scandinavian Phone Contest
Sept.	28-29	Delta QSO Party
Oct	5-7	WE Phone & C.W. QSO Party
Oct.	5-6	VK/ZL/Oceania Phone Contest
Oct.	12-13	VK/ZL/Oceania C.W. Contest
Oct.	12-13	RSGB 21/28 mHz Phone
Oct.	16-17	YLRL Anniv. C.W. Party
Oct.	19-20	RSGB 7 mHz C.W. Contest
Oct.	19-20	WADM C.W. Contest
Oct.	19-20	Boy Scouts Jamboree
Oct.	19-21	Manitoba QSO Party
Oct.	**26-27**	**CQ WW DX Phone Contest**
Nov.	**23-24**	**CQ WW DX C.W. Contest**

†Not officially announced
*Covered in last month's Calendar

Venezuelan Contest

Starts: 0000 GMT Saturday, July 6
Ends: 2400 GMT Sunday, July 7

This contest sponsored by the Radio Club Venezolano is in commemoration of the anniversary of Venezuela's Independence.

It's a world wide type contest on all bands, 10 thru 80, but phone only. There are three categories, single operator, single and all band, and multi-operator, single and multi transmitter.

Exchange: The RS report plus a 3 figure contact number starting with 001.

Scoring: One point per QSO, 2 points if its with a YV station. Same country not valid.

Multiplier: One for each country, YV call area and U.S. call area worked on each band.

Final Score: Total QSO points times the sum of the multiplier from each band.

Awards: There are Trophies for the leading station in each category and for the leaders in each of the following areas: No. America, So. America, Central America, Caribbean area, Bolivarian countries, Europe, Africa, Asia and Oceania.

In addition certificates will be awarded to stations with the following totals: *Americas*: Working 20 YVs and stations in 10 other countries. *Other Continents*: Working 5 YVs and stations in 5 other countries. S.w.l.s. must report at least 50 stations in the contest.

A remittance of $1.00 or its equivalent in IRC's is requested with each application.

Entries must be postmarked no later than Sept. 15th to: Radio Club Venezolano, P.O. Box 2285, Caracas, Venezuela 101.

DL QRP C.W. Contest

Starts: 1800 GMT Saturday, July 6
Ends: 1500 GMT Sunday, July 7

This is the summer section of the QRP contest run by the DL Activity Group.

Power input is limited to 10 watts or less, single operator and on c.w. only. Limit your operation to 15 hours, the 6 hour rest period may be taken in two parts.

Contacts may be made on all bands, 3.5 thru 28 mHz with any station, whether QRP or not.

Exchange: RST plus QSO no., and power input. Add "×" if crystal controlled. (ie: 579001/8X) Stations using more than 10 watts indicate QRO instead of power number.

Scoring: Contacts with stations in same country 1 point, other countries on same continent 2 points. DX on other continents 3 points. If QSO is with another QRP station add 3 more points. (4 to 6 points) If your power input is less than 3 watts or xtal controlled, double your QSO points. (8 to 12 points)

Multiplier: Each DXCC country, 1 if on own continent, 2 if DX on other continents. Following call areas will also count as a multiplier. JA, PY, VE, VK, W/K, ZS.

Final Score: Total QSO points times the multiplier from each band.

Use a separate log for each band and a sum-

*14 Sherwood Road, Stamford, Conn. 06905.

mary sheet showing the scoring, times of rest period and information on equipment used. Plus the usual signed declaration.

Mailing deadline for logs is July 31st to: Harmut Weber, DL7ST, D-3201 Holle, Kleine Ohe 5, Germany.

Romanian Contest

Starts: 1800 GMT Saturday, August 3

Ends: 1800 GMT Sunday, August 4

You may work other European countries as well as YO stations, on each band and mode, 3.5 thru 28 mHz.

Categories: Both single and multi-operator, single and all band in both divisions.

Exchange: RS(T) plus a progressive QSO number starting with 001. YO stations will include 2 letters denoting their county.

Points: European contacts count 2 points. 10 points if it's with a YO station.

Multiplier: Each European country and each YO county worked, each band and mode.

Final Score: Sum of QSO points times the sum of the multiplier from each band.

Awards: Certificates to the top scorer in each country in each classification. And a Crystal Cup to the over-all champion.

Mailing deadline is Sept. 1st to: Romanian Amateur Radio Federation, P.O. Box 1395, Bucuresti 5, Romania.

Kentucky QSO Party

Starts: 2100 GMT Saturday, August 3

Ends: 0100 GMT Monday, August 5

The Bluegrass ARC is once again sponsoring this party. A station may be contacted once per band, per mode and each county.

Exchange: QSO no., RS(T) and QTH. County for Kentucky; state, province or country for others.

Scoring: One point per QSO, Kentucky stations will use Ky. counties, states, provinces and countries for their multiplier. All others use Ky. counties worked. (max. of 120)

An operating time multiplier will also be given to encourage more operation. This bonus is computed by dividing 10 into the number of operating hours over a minimum of 10 hours. (ie: 18 hours divided by 10 = 1.8)

Final Score: QSOs × area multiplier × operating bonus multiplier.

Frequencies: Phone—3.9, 7.26, 14.28, 21.35, 28.6 mHz. C.W.—60 kHz up from each band edge. Try phone on even GMT hours.

Awards: Certificates will be awarded as warranted by the scores, separately for phone and c.w. The Top Kentucky score will receive a plaque.

Mailing deadline is Sept. 1st to: Terry L. Wells, WB4OSS, 540 Dover Rd. Lexington, KY 40505. Include s.a.s.e. for results.

Argentina Phone Contest

Starts: 0000 GMT Saturday, August 10

Ends: 2400 GMT Sunday, August 11

The object is to contact the greatest number of LU provinces possible and other countries as well. Use all bands, 3.5 thru 28 mHz. (LU's are not allowed to operate above 3750 mHz on 80 meters.) Single operator, all band only.

Exchange: RS plus a progressive contact number starting with 001.

Points: Each LU QSO is worth 3 points, all others 1 point. Stations in own country may be worked for multiplier credit only, no QSO.

Multiplier: Each LU province and country worked on each band. LU provinces are denoted by the letter immediately following the number in the call. Each letter denotes a province except for the following:

A, B, C, D, E, all Buenos Aires. GA-GOZ Chaco. GP-GZZ Formosa. XA-XOZ Santa Cruz. XP-XZZ Tierra del Fuego. Z are Antarctic stations.

Final Score: Total QSO points multiplied by sum total multiplier from each band.

Awards: Certificates to top scorer in each country and medals to continental leaders. There are plaques and medals to the 1st and 2nd place overall leaders.

Mailing deadline Sept. 28th to: Radio Cub Argentino, P.O. Box 97, Buenos Aires, Argentina.

European DX Contest

C.W.—Aug. 10-12 Phone—Sept. 14-15

Starts: 0000 GMT Saturday

Ends: 2400 GMT Sunday

This is the 20th annual European contest sponsored by the DARC.

Use all bands, 3.5 thru 28 mHz. There are two classes, Single operator, All Band and Multi-operator, Single Transmitter.

Only 36 hours out of the 48 hour contest period may be used by single operator stations. The 12 hour rest period may be taken in one but not more than 3 periods, anytime in the contest.

Exchange: A five or six figure number, RS (T) plus a QSO number starting with 001.

Scoring: One point per QSO and one point for each QTC reported.

Multiplier: For non-Europeans, number of EU countries worked on each band. Europeans will use The ARRL list and call areas as follows: JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9/UAØ. In addition the multiplier on 3.5 may be multiplied by 4, on 7 mHz by 3 and on 14/21/28 by 2.

Final Score: Total QSO points, plus QTC points, times the sum total multiplier from all bands.

QTC—Traffic: Additional QSO point credit may be realized by reporting a QTC. This is

a report of a QSO you have made earlier in the contest and later sent back to a EU station.

The general idea being that after a number of EU stations have been worked a list of these can be reported back during a QSO with another station. One point can be earned for each QSO reported. A QTC can only be sent from a non-European to a European station.

A QTC contains the time, call and QSO number of the station being reported. ie: 1300/DK2BI/134. This means that at 1300 GMT you worked DK2BI and received his number 134. It may be reported only once and not back to the originating station.

A maximum of 10 QTC's to the same station are permitted, and the same station worked several times to complete this quota. Only the original contact however has QSO point value.

Keep a uniform list of QTC's sent. QTC 3/7 indicates that this is the 3rd series and that 7 QSO's are now being sent.

Awards: Certificates to the highest scorers in each country and call area listed above. Continental leaders, stations having at least half the score of the continental leader and entries with a score of at least 250,000 points.

Disqualification: Violation of the rules of the contest, or unsportsmanship conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification. Decision of the Committee is final.

It is suggested that you use the official DARC log and summary forms. A s.a.s.e. with sufficient IRC's should be sent to address below. Figure 40 contacts to the page if you make your own. And use a separate sheet for each band. (W/K and VE stations can send their request to W1WY).

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone. To the WAEDC Contest Committee, D-895 Kaufbeuren, P.O. Box 262, West Germany.

European Country List

C31 — CT1 — CT2 — DL — DM — EA — EA6 — EI — F — FC — G — GC Guer — GC Jer — GD — GI — GM — GM Shetland — GW — HA — HB9 — HBØ — HV — I — IS — IT — JW Bear — JW — JX — LA — LX — LZ — M1 — OE — OH — OHØ — OJØ — OK — ON — OY — OZ — PA — SM — SP — SV — SV Crete — SV Rhodes — SV Athos — TA1 — TF — UA1346 — UA2 — UB5 — UC2 — UN1 — UO5 — UP2 — UQ2 — UR2 — UA Franz Josef Land — YO — YU — ZA — ZB2 — 3A — 4U1 — 9H1.

S.A.R.T.G. RTTY Contest

Three Periods (GMT)
0000-0800 and 1600-2400 Sat. Aug. 17
0800-1600 Sunday, August 18

This is the 4th contest sponsored by the Scandinavian A. R. Teleprinter Group.

Use all bands, 3.5 thru 28 mHz. The same station may be worked once on each band for QSO and multiplier credit.

Classifications: Single operator, (a) less 100 watts input, (b) over 100 watts. (c) Multi-operator, single transmitter. And s.w.l.'s.

Exchange: QSO no., and signal report.

Points: QSO's with own country, 5 points. With other countries on same continent, 10 points, other continents, 15 points. US and Canada call areas count as separate countries.

Multipliers: Each country and each W/K and VE/VO call area. (DXCC and WAE country list).

Final Score: Sum of QSO points from all bands times the multiplier from each band.

Awards: Certificates to Top stations in each class in each country and US and Canada call areas. Additional awards if warranted.

Mailing deadline is Sept. 18th to: SARTG Contest Manager, C. J. Jensen, OZ2CJ, Meisnersgade 5, Randers, 8300 Denmark.

Editor's Notes

I have not received official verification of the Romanian Contest August 3-4. The rules as listed are those from last year and should be OK if you hear any activity on that weekend.

The Italian YL "Jolly Flower" Contest ended on June 30th. There is still time to submit your log for the colorful lithograph award. See April Calendar for details.

The Western Electric/Bell Tel. annual QSO Party will be held on two separate weekends in August and October as listed. Those interested should contact the Holmdel A.R.C. host coordinator of this year's activity. The contest chairman is Joe Bauer, W2WQ, 113 Orchard Hill, Lincraft, N.J. 07738.

The week beginning July 15th has been proclaimed Amateur Radio Week by Governor Byrne of New Jersey. This is in conjunction with the Space Net VHF Contest held at the end of that week.

In addition the FCC has authorized the special call "WM2OON" to be used during this event. This is to commemorate the 5th anniversary of Apollo 11, man's first landing and walk on the moon. Special sterling silver trophies will be awarded to the highest scorers. See last month's CALENDAR for contest rules.

73 for now, Frank, W1WY

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA Honor Roll

3000		1000	
K2TPS	137	K2TPS	324
W6CLM	138	WAØTKJ	325
2500		W2SDU	326
K2TPS	173	WB6DXU	327
WAØYJL	174	K9DAF	328
2000		**500**	
WB4WBP	199	K2TPS	994
K2TPS	200	WAØTKJ	995
WAØTKJ	201	VK4AK	996
1500			
K2TPS	242		
WAØTKJ	243		

THE July "Story of The Month", as told by Jim is:

James C. Carmody, Jr., W8UOQ

(ALL COUNTIES #105, 5-16-73)

"Like many others, I started out as a Novice in 1953. About a year later I was on s.s.b. with a 20A and 4 - 6AG7s in GG and have been in s.s.b. ever since. I really never knew what a.m. was.

"The old story, 'If you can't lick them, join them', applies to me. I was introduced to the County Hunters by John, WA8SOF (now a silent key) who was just across town. I would try to get into some of the Michigan Nets that operate near the CH Net on 75, and John was running quite high power, and I couldn't copy very much with that big signal so close. John and I were good friends so I really didn't mind, too much. John would often say, 'Why don't you join the County Hunters?', and I would say, 'I can't spend my time chasing some nut across the country picking up Counties.'

"Well, the bug hit me like everyone else and I started to look into the County Hunters. I picked up my first County, Baxter in Arkansas from Steve, K5KDG on 75 in August 1970 and I was on my way. I spent a lot of time the first year as a N/C on the ICHN on 20 and then devoted N/C activities to the CH Net on 75. Twenty-eight and ½ months later I picked up my last County from the same station that gave me my first County, Steve, K5KDG. The last County was West Carroll, Louisiana, but what a let down it was to finish up, I have never felt right since.

"I really think my most pleasure was working as a Net Control. Not only was I helping the mobiles run as fast as possible, but it's one good way to pick up those Counties. I also felt it was a service to the whole group and I tried to run a very efficient Net and from the cards and letters received, I guess everyone was satisfied with the way I operated the Nets.

"I have so many to thank for their help in making *All Counties* possible for me. My only regret is that John, WA8SOF was not around to help me finish up *All Counties,* as he was the grand guy that got me started.

"Regarding my work, I spent 21 years in local law enforcement and gave up a Captain's job to go into Plant Security with the Chevrolet Motor Division at Flint, Michigan.

"I am a member of the Firebird Radio Club, and founded the Shiawassee Amateur Radio Association, and am Past President of the club here at Owosso, Michigan.

"What's next? Since I finished *All Counties* last March ('73), I have done very little fone work and have taken up c.w. My next project is to upgrade my license".

Our records show that Jim waited until he had them *all* and then did all his paper work all applied for USA-CA-500 through *All Counties* May 16, 1973. Hope that by the time

Jim, W8UOQ 1974 set-up, some change from 1953.

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

SMIRK—6-6 Award.

you get to read this, Jim will have had success on upgrading his license.

Awards Issued

George Johnson, K2TPS waited until he accumulated 3000 and then got USA-CA-500 through USA-CA-3000.

Bill Winnigar, W6CLM added USA-CA-3000 to his collection and says that new ones and QSLs are hard to get, at this point.

Tom Storm, (DDS), WAØYJL made USA-CA-2500.

John Criner, Jr., WB4WBP (His Dad is WB4SXM) got USA-CA-2000 and increased endorsement of his USA-CA-1000 to include all 75 S.S.B.

Dean Lewis, WAØTKJ applied for USA-CA-500 through USA-CA-2000.

Bob Margolin, W2SDU was issued USA-CA-1000 endorsed: All 14; All Mobiles; All S.S.B.

Nick Winter, WB6DXU qualified for USA-CA-1000 endorsed ALL SSB.

Bob Thorne, K9DAF was issued USA-CA-1000.

Gilbert Moody, VK4AK obtained USA-CA-500, this is #7 to Australia.

Awards

BARA Certificate: Sponsored by the Binghamton Amateur Radio Association, Inc., P. O. Box 853, Binghamton, N.Y. 13902. Work five B.A.R.A. members or work the club station W2OW and four members. Membership list available for s.a.s.e. For award, send GCR list and $1.50 check or money order to BARA at above address. Oh yes, request for membership list also goes to BARA, *not* to W2GT.

LIARS Award: The Long Island Amateur Radio Service Chapter of the Ten-Ten Net offers this award to any amateur who contacts any ten or more of their 50 odd members. (No, the members are not odd, just the number 50 plus-Hi!). Just send the list of stations contacted and their ten-X number (if any) to: Rich Levy, WB2MAN, 30-A Arleigh Road, Great Neck, N.Y. 11021 with 25c to cover handling.

Their Chapter takes in all of Long Island, Southern New York, and Northern New Jersey. The Nets meet twice weekly on Wednesday at 4:30, and Thursday at 8:00 P.M. local time on 28.620.

They are trying to keep ten alive as much as possible during this sun spot low, and anyone who would like to check in with them, is welcome. The Net is informal and is an easy way to catch new 10-X numbers. They are in the process of making an award for confirmation of twenty different countries with ten-X numbers. More details soon.

SMIRK Award: The Six Meter International Radio Klub was formed in October 1973. The idea is similar to the 10-X Net on 10 meters and one of the many purposes is to increase activity on 6 meters.

Like 10-X, there will be additional awards for 100, 250, 500 and 1000 contacts with Net members.

Six contacts are required for the basic

[*Continued on page 86*]

BARA Award.

Long Island ARS.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THIS is the second of a series of articles on the Teletype Model 28 stunt box, the assembly which fits behind the platen or paper roller in the typing unit and shifts from letters to figures, print to non-print, does line feeds, carriage returns, sequential switch operations, etc.

Most of the last column was theoretical, so we will get down to practical matters right away, to illustrate what you can do with the stunt box.

Assuming that you have a Model 28 Teletype page printer, open up the cover and look at the typing unit. Look at the right end, directly behind the black plastic sheaves which hold the miniature wire ropes which control the typebox movement. In back of the paper roller, just inside the right frame plate, looking down and in, you will see the stunt box, going across the entire width of the unit to the left frame plate.

Still looking at the right end, you should see the first of 42 rearward-facing slots in the stunt box assembly. Just in front of the first slot there should be a 3/16 inch hex-head screw, in a hex sleeve about one-half inch tall.

If you turn the screw all the way down into the hex sleeve, you will disable (on 99% of the units in service) the un-shift on space mechanism. By screwing it out you will permit the machine to unshift each time a "space" character is received. (By Un-shift I mean to go from "figures" to "letters." If it's already in "letters" when "space" is received, no change will occur.)

Wasn't that easy? Nothing to it. The rest may be a little more tricky, but nothing to be mystified about.

Now unshift on space was a commercial wire-network idea, and it is not used much on military or commercial RATT/RTTY stations, where many figures are sent. There unshift-on-space would require the operator to go back to figures after hitting the space bar. If you try to copy those stations using unshift-on-space you will get a lot of letters where you should have figures. Most amateur RTTY people seem to think it's a great convenience however.

I personally prefer unshift on "blank". In this mode you remove the "space" function bar from the #1 slot and insert a "blank" bar. Then, if you miss a letters character, you hit the "break" button. This opens the line, and the machine "sees" one or more "blank" characters. The "blank" shifts the typing unit to "letters", and you have a convenient but fully under control emergency "letters" override.

Let's see how this un-shift operation is made:

Turn the typing unit around so that the #1 slot is now on your left, and the rear of the slots are facing you. There should be stunt bars in the first three slots, and a slide mechanism bolted to the top of the stunt box above them. One slide is hooked to the stunt lever in the #2 slot; the companion slide in the assembly should have a hook on the rear that engages both the #1 and #3 stunt levers.

The #2 slot has the "figures" stunt bar, #3 is "letters" and #1 is coded to respond to "space." The slides operate a U-shaped fork which engages a post attached to the letters-figures code bar, moving it to the left (as seen from the rear) for letters, or to the right for figures.

Turn the machine around again, and looking at the front, examine the left end, where the bottom (#9) code bar extends through the frame. This is just under the left ribbon spool. You can move it with your fingernail, watching the linkage respond back up the line to the stunt box. Inside the front plate, you can see the movement of two slides which "condition" knee-action linkages which tell the typebox to go to its "letters" or "figures" position.

Back to the back. Now to the screwdriver. Without unhooking any of the wires which may be attached to the stunt box, you can loosen it enough to work on it.

At the lower rear of the stunt box is a "handle" 8½ inches long and ½ inch wide, attached with two screws at its ends. Leave it alone. At each end, ⅝ of an inch below and to the left and right respectively, are two more screws in the same brackets which hold the handle. Remove these.

Again, from the rear, you will see a reset arm coming up from the main shaft. This arm attaches to a rod at a point about 2⅝ inches in from the left frame plate. You have to remove a split ring and a small screw and slide the arm off the fitting which attaches it to the stunt box drive rod.

That removed, you can slide the entire stunt box to the rear, using the handle to pull with. You may have to rotate the main shaft to get the reset arm out of the way, but it is a case of wiggle and twist a bit and it will pop right out.

Turn the stunt box over and look at slot #1. You should see the "space" stunt bar there. You will note that it is held in the box by a spring, hooked into the edge of the frame.

*1502 Stonewall Rd., Alexandria, Va. 22302

Remove the spring from the stunt bar and you should be able to pull the "space" bar out. If it resists, look back at the top of the assembly and push up on the pawl which rides in the same slot, allowing the stunt bar to drop out. Once the space bar is out, slide in the "blank" bar, hook up the spring, and you're ready to replace the stunt box in the typing unit.

Before we do, however, lets look at the cavity in the typing unit into which the box fits. Starting from the left (rear view) you will notice a narrow bail, a quarter of an inch wide, shaped like a very wide "U" extending across the entire machine, with springs at each end to hold it to the rear. This is the space-suppression bail. About 3½ inches in from the left frame plate is the suppression assembly, which you will note operates if the bail is pushed in by hand. The bottom of the stunt levers engage the bail, if they have space-suppression extensions. These are used to prevent spacing on "line feed," "bell," "letters," "figures," etc. and other stunts which do not involve a printed character.

Look back at the hole the stunt box came from. Just beyond the space suppression bail is a heavier, fixed bar, running the entire width between the frame plates. One and a half inches from the left end an L-shaped bar should be found extending through a slot. If you push that by hand, you will see that it operates the carriage return mechanism, raising the spacing pawls in the front plate and allowing the carriage return spring to return the print hammer and typebox to the left margin.

At the right end, another L-shaped slide about ¾ of an inch from the frame operates the line feed mechanism, allowing the line feed clutch to drive pawls which relate the platen. A third L-shaped slide, 1⅞ inch from the frame, operates the keyboard lock mechanism, if your unit is so equipped.

The "bell' function is done electrically, by a stunt lever which momentarily operates a switch hooked into the 110 volt a.c. line to the bell solenoid in the base of the machine.

Now to get the stunt box back into the typing unit: Look at the front side of the stunt box—find the two guide studs, one with a round cross-section, the other rectangular, and find the sockets they match up with.

Note on the inside of each frame plate, a guide track into which ears on the stunt box frame go. With a gentle wiggle and twist, fit the stunt box back in place. It should go easily enough, being careful to get the reset arm back as it came out. The assembly should snap into place, and the two retaining screws push it in the last millimeter or so. Rotate the main shaft by hand to be sure nothing binds, before turning on the power.

See, wasn't it easy? Nothing to it. Now

you're ready to try coding in selective calling and other goodies, next month. If at all possible, it's good to get a spare stunt box from a junk typing unit so that you can keep your printer on the air during the process of rebuilding.

One word of caution: there are two styles of stunt box, MK I and MK II and MK III. The first two are the same. Instead of the MK III we described, the early boxes are re-set by a flat bail which extends through the frame plates. Short arms attached to the print drive mechanism, operate each end of the bail, instead of the clutch arm of the MK III. The two stunt boxes work the same way, but the different reset bail makes them non-interchangeable.

Next month we plan to have illustrations of the stunt box mechanism. ■

Cop's Column [*from page 29*]

sets of the bare P.C. boards needed to build one of WØLMD's *fast-to-slow* or "camera" converters. This unit, you may recall, converts the output of a standard scan rate vidicon camera to an amateur scan rate SSTV signal. A set of three P.C. boards, theory of operation, schematic with parts list, and test patterns are $31.00 postpaid. Write to W8OZA at 1411 Lonsdale Road, Columbus, Ohio 43227. (He estimates parts for a complete unit to run, at most, $94 in addition to the cost of the boards. The "camera" converter is much less expensive than the "monitor" converter because of its much smaller memory. It uses only one 1024 bit memory chip (a type 1402) instead of the 64 used in the slow-to-fast converter. Russ is an ardent SSTV enthusiast, and feels that by supplying boards of proven designs he can do his bit to keep hams abuilding in these days of sophisticated hardware. He has tested and debugged the board design himself, and appears to be taking a lot of pains to insure that the accompanying documentation is complete. Many thanks, Russ!

Speaking of thanks, we slow-scanners are mighty lucky to have such a large group of super-sharp, dedicated, hard working equipment designers, builders, helpers, innovators, and spreaders of the word. Three of those scan-converters at Dayton were designed and built by hams with Doctorates: WB9LVI, W9NTP, and WØLMD. This is not to say that a PhD is a prerequisite for SSTV creativity. It does indicate, however, that there were probably a lot of other projects bidding for the time and energy of these fellows! The list of doers is a long one, and there must be many folks feeling a good deal of inner satisfaction about their parts in moving this communication revolution along. Thanks!

73, Cop, WØORX

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(See Math's Notes this issue)

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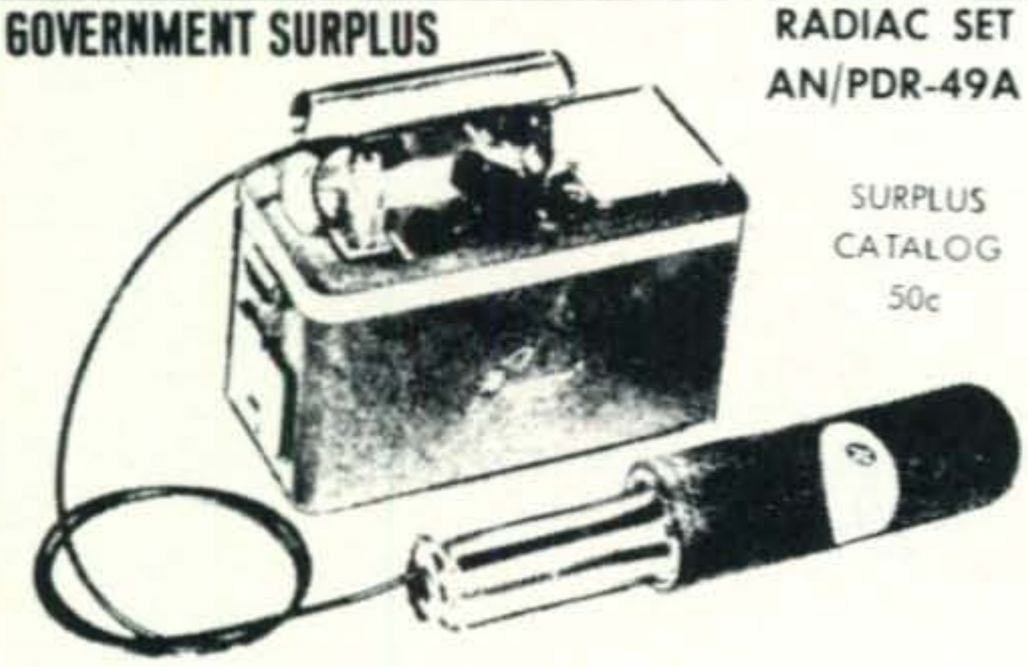

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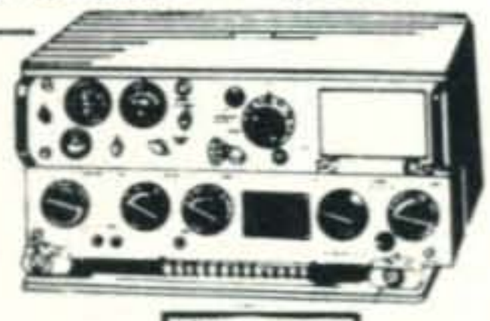

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Contest Results [from page 54]

K9ECE	"	41,454	158	24	24
K9HMB	"	28,884	127	22	61
W9IY	**21**	**68,728**	**291**	**24**	**64**
WA9JDT	"	13,300	81	21	49
WA9MZS	"	3,514	43	10	18
K9PPY	**14**	**210,795**	**519**	**36**	**105**
WB9GIT	"	191,970	493	36	99
W9YRA	"	130,052	375	32	90
WB9HAD	"	97,208	328	32	76
K9YXA	"	45,650	190	25	58
K9CLO	"	45,034	195	30	59
K9UQN	"	36,738	172	24	54
W9NZM	**7**	**17,595**	**101**	**22**	**47**
W9RX	"	15,232	86	25	43
WB9MOG	"	3,948	34	17	25
K9PQG	**3.8**	**5,439**	**87**	**12**	**25**
WØLBP	**A**	**298,350**	**432**	**91**	**164**
WØGYH	"	130,047	244	73	128
WØIUB	"	125,312	269	65	113
KØSGJ	"	110,911	217	76	121
WBØEZQ	"	101,700	226	66	114
WØTDR	"	98,450	202	59	120
WØLJF	"	61,080	184	49	71
WØUYL	"	55,552	174	42	82
WØLYI	"	44,288	130	51	77
WØFWW	"	32,240	104	40	64
WAØAGN	"	23,387	100	39	52
WØFZO	"	21,672	97	33	51
WØBWJ	"	11,218	59	29	42
WØJCT	"	10,024	65	16	40
WØUCK	"	8,968	51	22	37
WBØIEL	"	8,479	40	25	36
KØAGW	"	3,400	34	19	21
WBØFTK	"	966	15	12	11
WØGNX	**28**	**22,177**	**125**	**21**	**46**
WAØKDI	"	11,041	68	19	42
KØFPF/Ø	"	7,567	62	15	32
WBØCCF	"	5,203	46	15	28
WAØVJF	"	5,082	52	15	27
WAØEGZ	**21**	**43,882**	**207**	**26**	**48**
WBØAMJ	"	34,775	191	24	41
WAØGQI	**14**	**151,620**	**391**	**36**	**97**
WAØEMS	"	108,576	340	33	84
WØNUH	"	94,952	336	30	74
WA1NKK/Ø		33,532	173	29	54
W5EQT/Ø	**7**	**15,309**	**102**	**22**	**41**
KØPMZ	"	5,280	42	18	30
WAØQLH	"	4,028	44	17	21

Alaska

KL7HRP	**A**	**92,448**	**606**	**30**	**42**
KL7GI	**14**	**31,856**	**324**	**19**	**25**

Bahamas

K4VMA/VP7					
	A	3,390	52	12	18
WB4NXR/VP7					
	28	**101,188**	**532**	**24**	**58**
ZF1GS/VP7					
	1.8	**4,352**	**134**	**7**	**9**

Bermuda

W4EV/VP9					
	14	**109,224**	**557**	**23**	**59**

Canada

VO1AW	**A**	**39,445**	**125**	**45**	**70**
VE1AL	**14**				
		415,872	**1136**	**31**	**113**
VE1AIH	**3.8**	**22,908**	**228**	**11**	**35**
VE2AFC	**28**	**8,690**	**59**	**18**	**37**
VE2DU	**14**	**109,565**	**447**	**22**	**63**
VE3BS	**A**	**677,876**	**935**	**84**	**190**
VE3BZ	"	203,760	432	64	116
VE3BR	"	55,510	167	39	83
VE3BBH	**21**	**354,432**	**885**	**29**	**113**
VE3EDC	**14**	**308,935**	**889**	**33**	**104**
VE3FLE	"	176,410	571	31	84
VE3BSJ	"	94,350	340	27	75
VE3CBY	"	53,625	276	21	54
VE3FFA	"	38,860	230	21	46
VE3EOE	"	21,974	152	20	53
VE3BBN					
	3.8	**23,569**	**238**	**14**	**35**
VE4RP	**A**	**43,690**	**217**	**34**	**51**
VE4SD	**14**	**35,392**	**168**	**25**	**54**
VE5RA	**14**	**101,822**	**438**	**28**	**70**
VE5NW	**3.8**	**15,201**	**290**	**12**	**15**
VE5XU	1.8	384	25	4	4
VE6AYU	**A**	**282,492**	**737**	**66**	**111**
VE6AGV	"	235,262	630	58	100
VE6SB	"	217,875	537	68	107
VE6JD	"	157,472	471	65	83
VE6AP	"	118,712	328	55	87
VE6ZS	"	96,336	317	63	81
VE6MC	"	84,590	359	47	63
VE6AUH	"	31,488	149	37	45
VE6NW	"	18,054	135	22	37
VE6SL	"	8,804	53	33	38
VE6AB	"	6,384	50	27	30
VE6ABZ	"	1,829	23	11	20
VE6CAB	**28**	**7,136**	**120**	**8**	**8**
VE6AVU	21	56	5	2	2
VE6MP	**14**	**210,040**	**742**	**31**	**87**
VE6GQ	"	38,988	178	24	52
VE6AO	"	38,180	178	26	57
VE6ANX	"	2,660	36	13	15
VE6APJ	3.8	2,622	55	10	13
VA7WJ	**A**				
		1,702,416	**2006**	**113**	**235**
		(Opr. VE7BDJ)			
VE7IQ	"	8,432	111	31	31
VE7SV	**3.8**	**42,096**	**415**	**18**	**30**
VE7AZG	"	1,905	72	8	7
VE8OO	**14**				
		306,360	**1087**	**33**	**87**
VA8AS	"	111,972	572	28	56
VA8BL	"	100,232	507	28	60
VE8NS	"	44,226	286	21	42

Costa Rica

TI2WD	**A**				
		1,412,894	**1963**	**95**	**206**
TI2WX	**28**	**105,088**	**770**	**23**	**41**

Dominican Republic

HI8XAW	28	96	12	2	2
HI8LC	**3.8**	**3,762**	**81**	**7**	**15**

Grenada

VP2GBL	**28**	**129,549**	**588**	**22**	**71**

Guantanamo

KG4FX	**A**				
		274,378	**1040**	**42**	**80**

Honduras

HR1RF	**7**	**176,517**	**760**	**26**	**73**

Mexico

4C9AA	**A**				
		4,125,934	**3999**	**121**	**332**
XI1IX	**14**	**95,744**	**486**	**30**	**58**
XE1LLS	**7**	**15,520**	**223**	**13**	**19**

Puerto Rico

KP4AST	**7**				
		335,440	**1385**	**29**	**83**

St. Martin (French)

FGØAFA/FS7					
	28	**151,032**	**1283**	**18**	**38**

St. Pierre

FP8DH	**21**	**80,931**	**628**	**14**	**39**

Sint Maarten

PJ8DX/PJ7					
	A	**358,779**	**878**	**51**	**126**

Virgin Islands

KV4GP	**A**	**152,866**	**555**	**44**	**78**
KV4AM	**28**	**50,460**	**367**	**19**	**41**
KV4IC	**21**	**32,188**	**285**	**19**	**33**
KV4IG	**14**	**150,930**	**720**	**21**	**65**
KV4FZ	**3.8**	**183,200**	**836**	**20**	**80**

AFRICA

Angola

CR6QR	**A**				
		619,820	**1238**	**56**	**114**
CR6CN	**28**				
		524,234	**1546**	**30**	**92**
CR6OZ	"				
		379,197	1091	27	90
CR6FW	"	242,155	862	28	67
CR6II	"	167,320	635	25	64
CR6NO	**21**				
		658,668	**1706**	**34**	**97**
CR6LF	**14**				
		966,135	**1894**	**37**	**142**
CR6OY	"	231,989	709	31	82
CR6IS	**7**	**17,100**	**99**	**26**	**50**
CR6HU	"	7,020	62	19	35
CR6UE	"	5,355	56	19	26
CR6OT	3.5	108	6	6	6

Ethiopia

ET3USE	**A**				
		1,577,366	**1754**	**87**	**220**

Gabon

TRBDG	**A**	**161,348**	**315**	**72**	**121**

Gambia

ZD3Z	**A**				
		5,085,806	**4097**	**113**	**305**
		Opr. OH2MM)			

Ivory Coast

TU2EF	**A**	**396,440**	**796**	**50**	**120**
TU2DV	"	351,542	873	45	92
TU2DF	"	224,939	481	56	113
TU2DO	"	8,086	104	15	11

Morocco

CN8HD	**7**	**213,465**	**691**	**27**	**78**

Mozambique

CR7IZ	**7**	**198,727**	**514**	**40**	**91**
CR7WL	**28**	**92,325**	**419**	**23**	**52**
CR7RM	**21**	**88,038**	**409**	**22**	**51**
CR7IC	**14**	**266,602**	**673**	**38**	**99**

Portuguese Guinea

CR3WB	**14**	**135,191**	**527**	**22**	**67**

Rhodesia

ZE1CW	**14**	**204,750**	**613**	**32**	**85**

Sao Thome

CR5AJ	**A**	**157,568**	**443**	**42**	**86**

Sierra Leone

9L1JT	**28**	**36,250**	**217**	**16**	**42**

South Africa

ZS6ZE	**A**				
		1,291,031	**1381**	**101**	**222**
ZS6RM	"	276,232	548	62	110
ZS6BLK	**21**	**56,175**	**259**	**23**	**52**

Zambia

9J2EP	**28**	**150,771**	**585**	**23**	**64**
9J2BL	**21**	**92,722**	**490**	**21**	**53**

ASIA

Bahrain

MP4BJS	**A**	**354,756**	**627**	**63**	**140**

Hong Kong

VS6DD	**A**	**111,510**	**544**	**51**	**84**
VS6BL	"	10,557	93	33	36
VS6AW	**14**	**47,196**	**452**	**28**	**41**

India

VU2DK	**A**				
		1,605,408	**1682**	**88**	**252**

Andaman Is.

VU7GV	14	195	23	4	11

Iran

EP2NH	**A**	**209,066**	**510**	**58**	**129**
EP2MW	"	20,340	85	28	57
EP2ES	**21**	**65,284**	**296**	**22**	**54**
EP2EJ	**14**	**18,144**	**131**	**14**	**40**

Japan

JA2AAQ	**A**	**694,162**	**879**	**106**	**171**
JA4BBN	"	**126,725**	**258**	**73**	**112**
JH1OGT	"	96,525	253	55	80
JA8FBM	"	64,964	215	45	64
JA1CMD	"	55,404	180	51	63
JA7YOJ	"	48,290	164	50	60
		(Opr. JA7GQB)			
JA6EFT	"	18,072	98	31	41
JA7HLO	"	16,310	87	29	41
JA3ELU	"	14,950	87	24	41
JR1BVU	"	14,348	89	31	37
JH1ZIZ	"	11,880	71	29	31
JAØFMB	"	10,962	73	26	32
JA1CFJ	"	8,296	54	26	35
JH7AZW	"	7,701	58	24	27
JA4TR	"	7,579	48	25	28
JA2AIR	"	6,916	50	24	28
JA7PWG	"	5,304	54	20	19
JA1BUI	"	4,257	44	19	24
JAØIND/1		3,627	42	19	20
JA1ANA	"	3,354	03	20	23
JA1JSV	"	2,320	28	14	15
JR3CVO	"	1,102	20	8	11
JA7KM	"	247	9	6	7
JA9AG	**28**	**31,825**	**185**	**26**	**41**
JA2DYI	**28**	**26,145**	**156**	**24**	**39**
JA3HZT	"	23,725	140	26	39
JA7KTY	"	22,000	152	23	32
JA2BGH	"	20,540	115	2 4	41
JR1BRV	"	20,252	127	24	37
JA5EWQ	"	19,565	121	24	41
JA3LVP	"	16,758	124	24	34
JA2MTM	"	14,150	110	21	29
JA7MSQ	"	13,700	116	21	29
JR1IJV	"	13,250	102	21	29
JA2UYS	"	13,209	108	20	31
JH3GCN	"	12,720	106	20	28
JA1RUJ	"	9,588	84	19	28
JR1AXO	"	6,622	65	18	25
JH2NWF	"	6,615	77	16	19
JH2BUF	"	4,560	50	19	21
JA3XRC	"	4,012	47	15	19
JH3AKD	"	3,996	45	17	20
JA2NNQ	"	3,900	51	13	17
JA7CUK	"	3,885	42	15	20
JA8GO	"	1,120	22	10	10
JR3NDZ	"	432	11	9	9
JA6CDC	"	304	11	0	10
JA4EBU	"	108	6	3	3
JH1JGX	**14**	**360,537**	**880**	**37**	**104**
JA2IYJ	**14**	**263,000**	**722**	**38**	**87**
JA1PCY	"	137,004	447	36	73
JA2HGA	"	76,558	285	36	65
JA2CEC/1		57,583	234	30	59
JA1SKE	"	49,338	218	29	53
JA2INS	"	45,582	153	34	73
JA2HUN	"	39,920	182	30	50
JA1AAT	"	39,234	177	31	47
JAØSC	"	34,983	186	28	41
JA7JW	"	30,872	168	24	44
JA3IW	"	28,728	137	2 9	47
JA1AS	"	22,411	121	26	47
JA3IBU	"	21,980	131	26	34
JA6CM	"	19,966	114	25	42
JA5CEK/3		15,104	105	22	37
JA2OJ	"	10,466	69	22	32
JA1BNW	"	6,525	56	20	25
JA4CZM	"	4,074	38	19	23
JF1JDI	"	3,268	33	18	25
JA6YY	"	3,000	39	12	18
JA4KN	"	2,528	33	14	18
JR1XFS	"	1,925	37	12	13
JA1VP	"	1,612	24	13	13
JH1DQZ	"	1,485	20	15	18
JA9YE	"	1,100	18	12	13
JA8DL	"	704	17	12	10
JA1SGU	"	540	16	9	9
JH1DWM					
	21	**299,400**	**852**	**35**	**85**
JH1BBT	**21**	**167,375**	**558**	**31**	**72**
JA3PPR	**21**	**164,613**	**510**	**36**	**75**
JA9JX	"	153,425	556	31	64
JH1DEV	"	147,828	529	31	66
JA3ERG	"	105,900	373	34	66
JA8DFD	"	59,680	269	25	55
JR1FIH	"	50,925	236	27	48
JH2MYN	"	44,136	220	26	46
JH2EVL	"	38,493	211	23	40
JH6CAW	"	29,172	158	25	41
JH2BIM	"	26,846	151	23	39
JA3EY	"	23,764	164	20	32
JA3BUB	"	22,950	157	19	31
JA7EUK	"	22,656	128	23	41
JAØMHZ	"	20,473	130	23	36
JA7IJC	"	15,718	96	20	98
JH2AGC	"	15,708	109	21	30
JA9CWJ	"	14,739	100	21	30
JH2LUF	"	14,478	93	22	35
JA5IVC	"	14,053	104	17	30
JH2DBR	"	13,865	103	18	29
JE1TEO	"	11,385	90	18	27
JA7MYL	"	10,720	92	17	23
JA6HOI	"	10,395	104	15	20
JA8MKZ	"	10,368	75	18	30
JA9SV	"	9,900	79	15	29
JA6ABG	"	9,009	94	14	19
JA2KSO	"	8,295	83	15	20
JH1CMH	"	7,812	69	20	22
JH2FTH	"	7,720	66	18	22
JH6GYG	"	5,760	64	15	17
JH4BWS	"	5,440	50	16	24
JE1TVA	"	4,640	50	16	16
JR1VOP	"	4,108	55	13	13

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300B 80-10m 110vac Transceiver	$519.95
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Mark II 80-10m Linear	749.95
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14C 12v DC Module/cable ONLY	84.95
117X Basic AC Supply - w/117v cord	79.95
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VX-2 Plug-in VOX	44.95
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MTK Mobile Mounting Kit	9.95
GMTK "Gimbel type" mobile mtg. kit	5.20
SS-16B Custom Crystal Lattice Filter	89.95
600T 80-10m Transmitter, 600w	589.95
600RC CUSTOM Receiver	545.95
600RC CUSTOM Receiver/SS-16B	599.95
600S Speaker for 600R	24.95
600SP Deluxe Speaker (w/phone patch)	69.95
600 Hz CW Filter for 600R	34.50
AM Filter for 600R	44.50
SWAN 444 Desk Mike	35.95
SWAN 404 Hand Mike	24.95
WM-1500 Wattmeter	64.95
Solid-State 80-10m Transceivers (12 volt)	
SS-15 15 watt PEP input	$599.95
SS-15 with SS-16B installed	669.95
SS-200A 300 watt PEP input	799.95
SS-200A with SS-16B installed	869.95
Mobile Mounting Kits for SS-15, 200	
SSGMTK "Gimbel type" (under dash)	$ 11.95
SSMTK Hump-mount kit	16.95
PS-10 AC Supply for SS-15	99.95
PS-20 AC Supply for SS-200	159.95
PS-210 220 volt AC supply	109.95
PS-220 220 volt AC supply	169.95
SS-208 External VFO	189.95
610X Crystal-controlled oscillator	54.95
Solid-State Mono-Banders (12 volt)	
MB-40 40m Xcvr, 75w PEP input	$299.95
MB-80 80m Xcvr, 75w PEP input	299.95
MB-40A 40m Xcvr, 160w PEP input	329.95
MB-80A 80m Xcvr, 160w PEP input	329.95
P-1215 AC supply for above MB's	49.95
P-2015 220v AC Supply for MB's	59.95
MBCW CW Monitor for MB's	19.95
Model 45 80-10m Antenna	84.95
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FM-2XA 2m FM Transceiver	$259.95
AC Supply for above	40.00
FM-1210A 2m FM Transceiver	319.95
AC Supply for above	40.00
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JF1MAK	"	3,630	40	13	20
JH3FYW	"	3,360	41	13	15
JAØPZJ	"	3,250	47	12	13
JE1VTZ	"	3,216	46	11	13
JAØNCG	"	2,816	45	11	11
JH2FSE	"	2,413	43	10	9
JF1RLD	"	2,278	25	14	20
JA7NY	"	2,106	28	11	16
JAØLIZ	"	2,024	30	11	12
JA1NRG	"	1,992	27	9	15
JA3CMD	"	1,615	30	9	10
JR2BDF	"	1,140	19	9	11
JF1OSL	"	960	19	10	10
JF1HCE	"	944	21	8	8
JA3WKG	"	810	18	7	11
JR1XMZ	"	768	20	9	9
JF1FTU	"	768	13	11	13
JAØDRY	"	660	22	6	4
JF1SWC	"	570	14	7	8
JA1QEP	"	520	15	5	8
JF1RPZ/4		374	10	8	9
JA3YJQ	"	240	8	5	5
JAØAIE	"	96	8	2	2
JE1GFS	"	416	16	7	9
JA2EZA	"	345	13	8	7
JA9DOF	"	330	16	7	8
JA1EL	"	294	10	6	8
JA1PI	"	266	11	7	7
JA1HUS	"	264	8	5	6
JR1VMF	"	160	6	5	5
JA1ZSX	"	8	2	2	2
JA2BAY	**7**	**64,862**	**280**	**31**	**51**
JA1MCU	"	10,080	71	24	32
JA1BRK	"	9,087	82	18	21
JA9BBU	"	6,750	58	20	25
JA2GQT	"	3,441	44	15	16
JA7HYS	"	2,639	33	14	15
JH2EXR	"	30	3	3	3
JA1NEC	**3.8**	**3,080**	**49**	**9**	**13**
JF1XID	"	2,261	46	8	9
JA8DNV	"	1,836	37	9	9
KA6SS	14	35,533	157	30	59
KA7MS	"	12,322	76	24	37

Jordan

JY9GR	**A**				
		1,143,063	**1709**	**63**	**178**

Korea

HM1FM	**21**	**10,400**	**129**	**13**	**27**

Lebanon

OD5BA	**A**	**221,544**	**559**	**34**	**102**
OD5LX	"	55,360	195	36	77

Malaysia

9M2PV	A	1,120	17	16	16

Mongolia

JT1AT	**14**	**31,388**	**348**	**23**	**36**

Thailand

HS3AIG	**A**				
		382,356	**1059**	**78**	**150**

U.S.S.R.

Asiatic

UW9WB	**A**	**460,080**	**705**	**67**	**173**
UA9WS	"	349,217	716	46	127
UA9OO	"	337,025	565	69	152
UA9MR	"	226,914	525	55	122
UA9MP	"	87,837	300	40	83
UA9MQ	"	63,630	277	48	87
UA9VX	"	9,263	65	22	37
UW9TZ	"	4,448	52	11	21
UA9CBO	**28**	**80,227**	**431**	**20**	**53**
RA9CPF	"	36,816	303	15	37
RA9ODC	"	26,565	217	18	36
RA9CAS	"	13,376	152	13	25
UA9MDY	"	3,216	47	7	17
UA9EU	**21**	**28,623**	**245**	**10**	**37**
UW9CR	"	15,570	132	12	33
UA9IF	**14**	**98,397**	**439**	**25**	**62**
UV9OV	"	76,590	321	21	61
UA9TS	"	30,870	293	20	50
UA9MT	"	24,700	109	26	50
UA9UF	"	21,056	145	20	36
UA9DX	**7**	**19,084**	**154**	**13**	**39**
UA9MS	**3.8**	**23,136**	**172**	**9**	**39**
UAØFGM	**A**				
		864,864	**1292**	**104**	**106**
				(Opr.	UV3GM)
UAØNL	"	68,364	369	44	64
UAØCAH	"	58,468	470	40	54
UAØABP	**28**	**8,584**	**218**	**17**	**20**
RAØUBG	"	1,554	97	7	7
UAØFBZ	**14**	**289,296**	**969**	**34**	**89**
UAØMI	"	48,544	350	29	53
UKØOOO	"	31,752	250	19	37
UAØAAL	**3.8**	**7,076**	**95**	**8**	**21**

Armenia

UG6GAF	**14**	**142,011**	**543**	**28**	**65**
UG6JJ	"	88,815	355	28	65

Azerbaijan

UD6CC	**A**	**45,903**	**123**	**52**	**91**
RD6DFV	**28**	**40,425**	**321**	**15**	**34**
UD6DER	21	3,948	32	20	27
JD6DHW	**14**	**44,184**	**277**	**14**	**42**

Kazakh

UL7DAF	**A**	**248,124**	**566**	**53**	**121**
UL7GAZ	**28**	**21,164**	**211**	**13**	**31**
UL7YR	**21**	**38,624**	**276**	**20**	**48**
UL7IAF	**14**	**210,040**	**711**	**34**	**84**
UL7CT	"	8,714	85	12	27
UL7AAA	**3.8**	**12,708**	**138**	**8**	**28**

Kirghiz

UM8MAA	**A**	**111,274**	**387**	**34**	**84**

Tadjik

UJ8JGJ	**A**	**158,780**	**428**	**55**	**115**
UJ8JJJ	**28**	**10,900**	**296**	**16**	**34**

Turkoman

UH8BO	**A**	**39,655**	**162**	**39**	**64**

Uzbek

UI8LAG	**7**	**60,120**	**343**	**23**	**58**
UI8OM	"	294	13	6	8
UI8LAF	**3.8**	**6,612**	**90**	**8**	**21**

EUROPE

Aland Island

OHØNA	**A**	**18,802**	**200**	**24**	**55**

Austria

OE6MKG	**A**	**55,713**	**133**	**56**	**91**

Azores Islands

CT2BG	**A**				
		909,875	**1710**	**71**	**180**

Belgium

ON4XG	**A**	**56,056**	**169**	**55**	**88**
ON5AZ	**28**	**43,216**	**233**	**20**	**54**

Bulgaria

LZ2SA	**21**	**74,428**	**505**	**30**	**62**
LZ2KSQ	"	**51,300**	**349**	**24**	**51**
LZ1CW	"	37,908	313	23	58
LZ2JF	**14**	**126,036**	**755**	**26**	**82**
LZ1UO	"	124,146	688	34	87
LZ2ZK	"	78,900	573	30	70
LZ2JA	**7**	**13,850**	**229**	**12**	**38**

Channel Is. (Guernsey)

GC3YIZ	**A**	**25,112**	**183**	**28**	**45**

Czechoslovakia

OK3EA	**A**	**418,884**	**651**	**83**	**185**
OK1ADM	"	256,243	368	91	208
OK1TA	"	213,380	451	60	167
OK2BLI	"	181,700	515	69	161
OK3TMF	"	76,260	349	38	86
OK1FAK	"	66,062	323	42	92
OK3WM	"	56,274	202	38	75
OK1DA	"	48,096	176	47	97
OK1KZ	"	30,804	270	23	79
OK2PEQ	"	26,592	249	21	75
OK3CFS	"	25,198	261	21	65
OK3TZD	"	24,346	265	18	76
OK2SLJ	"	7,038	126	11	35
OK1EP	"	3,640	91	8	32
OK1MPP/P					
	21	**145,632**	**440**	**34**	**89**
OK2XA	"	1,450	30	9	16
OK1DVK	"	378	15	4	5
OK1AHV	**14**	**75,600**	**266**	**31**	**89**
OK1AVU	"	56,270	301	28	57
OK2LU	"	35,490	230	25	66
OK2BBI	"	31,789	226	24	59
OK1AEZ	"	24,794	132	25	52
OK3CM	"	19,343	120	26	56
OK1AKU	"	19,126	167	24	49
OK2SIR	"	6,432	96	23	44
OK1AJN	"	5,547	76	11	32

JH1DWM—Contest activity in Japan probaby reaches the highest level of any country in the world. Tsutomu's contribution on 21 mHz won him top honors for that country.

OK3YCA	"	2,788	36	10	31
OK2PBG	"	2,580	80	6	24
OK2BFX	"	624	20	7	17
OK1AGQ	**7**	**14,268**	**213**	**12**	**46**
OK1MP	"	7,936	103	14	48
OK1AHI	"	4,095	73	11	34
OK2KR	"	2,697	85	6	25
OK2SMO	"	2,080	80	4	22
OK3TJI	**3.5**	**16,650**	**366**	**9**	**36**
OK2BIQ	"	15,750	362	7	35
OK2QX	"	15,088	318	8	38
OK2SRA	"	6,052	177	5	29
OK1DBN	"	2,912	104	4	24
OK1IDD	"	2,002	92	3	19
OK2BEF	"	1,896	78	5	19

Denmark

OZ5KF	**A**	**1,721,020**	**1894**	**124**	**256**
OZ3KE	"	54,372	200	52	86
OZ6XR	"	36,848	209	35	77
OZ5ME	"	26,355	174	32	73
OZ5QU	"	25,520	116	39	77
OZ4HW	"	24,921	148	41	76
OZ1RH	"	17,784	90	29	43
OZ3PO	"	17,459	82	33	46
OZ6EI	"	5,852	57	18	26
OZ9ZS	"	738	19	7	11
OZ7HT	**21**	**103,292**	**398**	**32**	**66**
OZ1TD/A	"	33,217	224	20	39
OZ6RT	**14**	**171,796**	**671**	**32**	**84**
OZ6PI	"	120,009	666	30	79
OZ1LO	7	2,070	55	8	22
OZ8KU	"	608	38	4	12
OZ5EV	**3.5**	**4,495**	**154**	**5**	**26**

England

G3LNS	**A**	**2,145,297**	**2017**	**109**	**298**
G3SEM	"	357,435	701	77	158
G3JVJ	"	70,300	214	56	129
G4BMA	"	68,160	239	42	78
G3JKY	"	36,822	180	33	69
G2AJB	"	36,736	213	40	88
G3MWZ	"	23,940	145	31	59
G2BOZ	**28**	**80,025**	**334**	**24**	**73**
G5BAU	"	73,514	328	24	65
G3HCT	**21**	**669,987**	**1587**	**37**	**116**
G3XYP	**14**	**153,960**	**680**	**30**	**90**
G3ESF	**3.5**	**27,030**	**436**	**9**	**44**
G3KWK	"	17,340	266	9	42

Finland

OH2BM	**A**				
		1,252,728	**1487**	**112**	**299**
OH7RM	"	694,295	1513	68	171
OH5YF	"	302,760	573	78	154
OH1VA	"	106,552	445	46	106
OH5RZ	"	76,962	410	40	87
OH6XY	"	26,076	155	35	88
OH1KA	"	22,500	207	21	54
OH5RP	"	22,440	107	33	69
OH2LU	"	21,182	209	23	66
OH5AF	"	18,387	115	29	52
OH5YW	"	8,584	52	26	32
OH7ZE	"	5,460	54	19	41
OH2BFX	"	3,465	58	17	28
OH7NJ	"	2,580	48	16	27
OH9TD	"	1,440	30	10	26
OH1UR	"	1,296	23	15	21
OH1JW	"	588	16	9	12
OH4SO	"	396	12	8	10
OH5PA	**28**	**13,206**	**88**	**21**	**50**
OH1LW	"	11,088	80	19	47
OH4SF	"	513	15	8	11
OH5QQ	"	442	14	8	9
OH2XF	**21**	**68,607**	**280**	**32**	**67**
OH2BCD	"	5,066	67	13	21
OH2BW	**14**	**314,872**	**853**	**38**	**109**
OH6MM	"	17,898	208	14	43
OH2BLV	"	15,660	176	20	40
OH7PB	"	12,100	101	22	28
OH2BME	"	11,454	123	17	29
OH2EQ	"	8,415	76	15	40
OH7NW	"	7,350	95	14	36
OH7TO	"	4,961	121	11	30
OH9PH	"	1,144	36	6	20
OH2FS	"	388	10	6	7
OH5NW	**7**	**111,078**	**619**	**29**	**73**
OH1NK	"	83,636	584	27	76
OH1XX	**3.5**	**60,435**	**609**	**20**	**65**
OH2BCP	"	34,000	459	15	53
OH1VR	"	20,048	335	12	44
OH6ZH	"	17,520	336	9	39
OH1AA	"	12,985	221	9	44
				(Opr.	OH1ZK)
OH2BOZ	"	1,518	61	5	17
OH2BO	**1.8**	**390**	**41**	**2**	**8**

France

F2SI	**A**	**1,487,376**	**1838**	**85**	**228**
F9MD	"	374,595	604	83	172
F3IJ	"	106,370	386	43	67
F6BPL	"	16,800	129	28	47
F8TM	"	1,428	53	4	24
F6AWN	**21**	**9,120**	**102**	**18**	**39**
F6CVU	"	4,225	66	11	14
F2QQ	**14**	**518,034**	**1244**	**36**	**131**
F6BRK	"	17,880	183	18	42
F6CNB	"	12,760	139	17	38
FØTL	"	351	13	5	8
FØACS	**3.5**	**22,100**	**409**	**9**	**43**

Germany (East)

DT2AJH	**A**	**81,950**	**400**	**32**	**78**
DT2BTO	"	51,786	204	38	99
DT2CHM	"	32,754	228	30	73
DT2YLO	"	29,664	236	26	77
DT2BWD	"	14,896	170	17	59
DT2DEO	"	14,288	149	21	55
DT2COJ	"	10,561	174	12	47
DT3CF	"	4,408	66	12	26
DM400	"	2,340	55	11	28
DM2DUK	**21**	**29,300**	**200**	**20**	**30**
DT2CYO	"	3,393	29	16	23
DM2ATD	**14**	**353,871**	**1223**	**35**	**102**
DT2ARA	"	16,775	148	22	39
DM2CPE	"	7,791	91	15	34
DT2BPB	7	228	20	2	10
DM2CMF	"	132	12	3	8

Germany (West)

DJ2YA	**A**	**2,278,357**	**2093**	**100**	**291**
DL8UI	**A**	**1,354,498**	**1485**	**104**	**285**
DJ4PT	**A**	**1,305,414**	**1482**	**94**	**253**
DL8PC	**A**	**1,106,224**	**1200**	**110**	**282**

DJ4LK	**A**	**1,051,646**	**1232**	**105**	**277**
DK3GI	"	881,345	1147	101	258
DJ9MH	"	813,422	1118	94	223
DK2BI	"	668,568	697	96	260
DJ4ZR	"	345,612	561	77	172
DJ4UF	"	344,112	702	63	151
DJ3HJ	"	310,460	708	60	130
DJ4PI	"	291,890	445	88	201
DK2WY	"	135,603	324	50	121
DK5PR	"	103,104	252	66	113
DK4QG	"	101,039	250	67	124
DL1MD	"	99,588	266	54	118
DK3ME	"	90,684	232	65	133
DL9PO	"	89,712	287	49	95
DJ2UU	"	84,960	257	62	115
DJØBA	"	82,422	337	35	79
DK2BL	"	80,828	249	52	69
DL30H	"	72,280	208	53	86
DJ2XO	"	71,136	261	42	102
DJ9IA	"	68,363	259	43	94
DL1YA	"	59,328	242	43	101
DL9PU	"	51,792	241	35	69
DK8NI	"	50,304	225	43	85
DJ1ZUA	"	48,585	163	48	75
DL2JO	"	46,604	182	42	80
DL2HQ	"	42,920	135	55	93
DK6KA	"	35,490	124	44	86
DJ80T	"	35,244	155	33	66
DL6ZO	"	34,727	210	24	53
DL20R	"	29,370	124	40	70
DL3RA	"	24,384	131	30	66
DK5KJ	"	24,366	110	39	54
DK4PH	"	24,198	128	30	44
DK7NX	"	20,273	96	38	59
DK1KS	"	14,418	118	29	52
DJ1YHA	"	13,020	84	27	43
DK3HL	"	11,766	59	29	45
DK8NH	"	11,232	124	20	58
DL9XN	"	10,626	128	17	52
DL6RY	"	4,433	63	12	19
DK1YK		1,586	25	13	13
DL7AA	**28**	**74,568**	**273**	**27**	**77**
DL6EN	**21**	**400,177**	**1097**	**37**	**90**
DL9VS	"	122,540	407	31	79
DK3PZ	"	71,400	269	31	69
DJ9ZB	"	19,844	108	28	54
DL1RB	"	8,964	81	20	34
DL7AH	**14**	**311,538**	**848**	**34**	**103**
DL1AM	"	10,010	85	16	49
DJ5PN	**7**	**40,500**	**317**	**25**	**50**
DK3FB	"	4,186	62	11	35
DJ9NW	**3.5**	**25,905**	**436**	**12**	**43**
DK3SN	"	20,776	367	10	43
DL8FL	"	20,550	397	8	42
DK400	"	18,356	317	10	42
DJØUJ	"	15,552	344	9	39
DL1KS	"	10,353	179	10	41
DK2QL	**1.8**	**1,378**	**113**	**2**	**11**
DA1CT	**3.5**	**11,481**	**213**	**8**	**39**

Greece

SV1GA	**A**	**464,184**	**1214**	**75**	**177**
SVØWGG	"	320,925	920	45	120
SVØWJJ	**14**	**5,680**	**118**	**10**	**30**

Hungary

HAØDI/9	**A**	**152,064**	**491**	**57**	**141**
HA7PQ	"	146,680	400	58	132
HA6NP	"	101,851	432	49	130
HA9KOV	"	92,538	382	50	109
HA9OT	"	92,338	566	34	103
HA2RB	"	49,362	194	47	67
HA1ZU	"	25,048	213	35	66
HG9KPU	28	765	18	8	9
HA6NI	**21**	**107,973**	**471**	**29**	**64**
HA4XT	**3.5**	**12,505**	**315**	**7**	**34**

Iceland

WA3GHC/TF	**14**	**15,704**	**262**	**13**	**39**
TF3OJ	"	2,910	56	9	21

Isle of Man

GD3MBC	**A**	**378,834**	**753**	**62**	**144**

Italy

I4ZSQ	**A**	**857,025**	**1164**	**96**	**229**
I1MOL	"	704,026	1400	65	126
IC8DAG	"	413,236	858	69	167
I4GKM	"	307,632	834	62	112
I3GRX	"	119,945	296	62	99
I4CSP	"	62,487	207	50	81
I8YRK	**28**	**84,941**	**353**	**27**	**74**
I5ZCN	"	31,484	198	26	42
I8KBT	**21**	**147,840**	**622**	**29**	**67**
I2TTL	"	86,456	399	29	72
I3BYT	"	33,600	216	20	40
I6POY	"	30,294	257	16	38
I1GMU	"	29,904	162	23	46
I3FGX	"	3,536	57	13	21
I3MAU	**14**	**477,072**	**1352**	**37**	**107**
I3JR	"	435.040	1185	35	125
I5BPD	"	424,778	1138	36	127
I8LUU	"	64,860	486	25	69
I1WKW	"	50,776	393	26	62
I2DMK	"	16,986	169	17	49
I8RGA	"	12,960	144	17	37
I1DXD	"	522	30	4	14
I3BBZ	**7**	**39,785**	**458**	**19**	**54**
I4NU	"	33,818	322	18	56

Jan Mayen Island

JX4GN	**A**	**2,626**	**47**	**11**	**15**
JX2FL	14	126	10	4	5

Market Reef

OJØAM	**A**	**3,321**	**59**	**15**	**26**

Netherlands

PAØYN	**A**	**10,920**	**73**	**21**	**35**
PAØTO	"	9,300	72	27	48
PAØLVK	**14**	**10,672**	**96**	**19**	**39**
PI1ARS	"	8,492	105	14	30
			(Opr. PAØHTR)		
PAØFIN	"	4,352	110	8	26
PAØVB	"	1,972	53	9	20
PAØQP	"	1,876	57	7	21
PAØHBO	**3.5**	**46,200**	**664**	**14**	**46**
PAØHIP	**1.8**	**2,310**	**161**	**3**	**11**

North Ireland

GI6YM	21	5,143	84	9	28
			(Opr. GI3ZJR)		

Norway

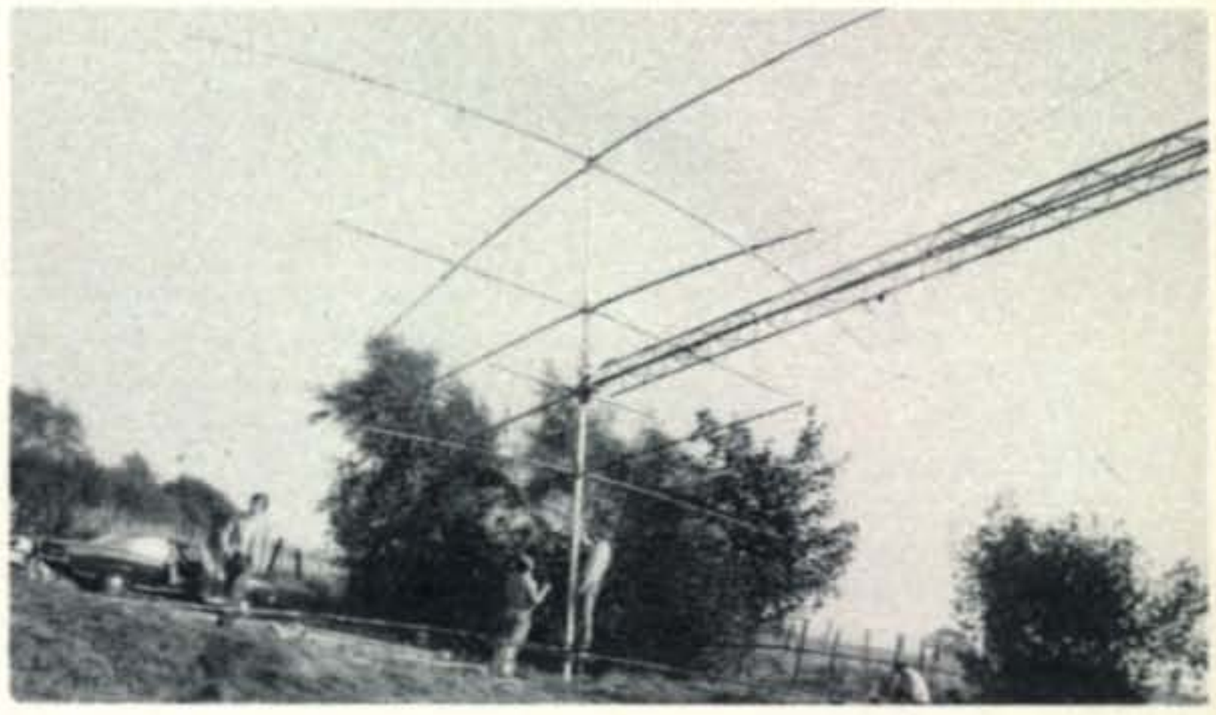
LA3XI	**A**	**1,016,856**	**1268**	**98**	**250**
			(Opr. LA5KG)		
LA6HL	"	803,216	1155	89	183
LA3JQ	"	140,049	494	47	124
LA5QK	"	57,780	260	45	90
LA5KO	"	41,250	230	40	85
LA3UQ	"	38,703	193	38	59
LA9LQ	"	33,216	215	29	35
LA4PQ	"	28,208	224	20	62
LA5NM	"	25,996	159	26	41
LA5JS	"	20,400	113	29	51
LA7FD	"	13,184	86	24	40
LA2IE	"	5,989	87	19	34
LA1RN	28	1,800	28	13	17
LA2ZN	**21**	**5,700**	**48**	**20**	**30**
LA2DR	"	330	11	4	6
LA8ZL	**14**	**7,320**	**83**	**12**	**28**
LA2CQ	"	945	29	7	14

Poland

SP5BB	**A**	**111,340**	**355**	**52**	**138**
SP8AWP	"	79,500	428	42	108
SP2BBD	"	68,608	414	33	95
SP6AOI	"	67,588	448	35	87
SP2GNB	"	8,494	133	14	48
SP6ECA	"	8,154	142	11	43
SP6AEG	"	1,540	20	13	15
SP6PIO	"	1,470	22	15	20
SP3DOI	**28**	**26,465**	**146**	**22**	**45**
SP3BQD	"	8,550	61	19	31
SP6DB	"	3,007	38	12	19
SP6FSH	**21**	**7,800**	**97**	**14**	**26**
SP1AGE	"	4,242	35	15	27
SP3HDB	"	714	13	9	12
SP4CLX	**14**	**86,869**	**547**	**32**	**71**
SP5XM	"	75,175	360	28	74
SP5CJL	"	62,881	341	29	62
SP9ABU	"	59,787	358	27	64
SP5QU	"	30,014	248	24	54
SP9AI	"	20,748	157	24	52
SP5DZI	"	16,478	109	20	57
SP7ASZ	"	6,345	101	14	31
SP9AGS	"	2,607	70	8	25
SP5BMU	"	2,340	58	9	21
SP6DMI	"	1,450	40	8	21
SP9EHW	"	380	17	6	13
SP9EVP	"	360	18	5	10
SP5ANQ	"	135	5	4	5
SP8GVM	"	117	13	3	6
SP6TQ	7	3,131	93	6	25
SP5ELA	**3.5**	**16,684**	**403**	**8**	**35**
SP6PAZ	"	120	13	2	8

Romania

YO3AC	**A**	**198,396**	**482**	**60**	**138**
YO8FZ	"	11,480	85	22	34
YO9KAG	"	10,792	143	17	54
			(Opr. YO9HT)		



DLØWU—Part of the crew, DJ4AX, DK4TP and DJ1MC putting the final touches on the monster used in the contest: a full sized 40 meter Quad and a 10/15/20 tribander. The spreaders were bamboo and the tilt-over tower was a home brew job.

YO3JW	**28**	**3,098**	**50**	**12**	**24**
YO2VA	**21**	**11,484**	**117**	**14**	**29**
YO8AHL	**14**	**3,567**	**64**	**15**	**26**

Sardinia

ISØBDO	**A**	**78,880**	**327**	**43**	**102**

Scotland

GM5BCV	**A**	**248,448**	**698**	**56**	**136**
GM3BCL	"	215,280	473	64	131
GM5AXY	**14**	**5,390**	**79**	**11**	**38**
GM3YCB	**1.8**	**1,464**	**124**	**2**	**10**

Sicily

IT9RKA	**A**	**329,056**	**835**	**60**	**122**
IT9SEZ	**14**	**247,498**	**750**	**36**	**98**
IT9LMK	"	68,940	600	26	64

Spain

EA1FX	**A**	**525,450**	**1153**	**70**	**156**
EA4ND	"	84,018	388	35	79
EA3OJ	"	77,254	325	27	80
EA3NA	**21**	**46,948**	**224**	**27**	**70**
EA4LH	**14**	**586,333**	**1822**	**34**	**117**

Sweden

SM3BIZ	**A**	**447,016**	**748**	**84**	**200**
SM5EP	"	272,568	567	73	173
SM5CAK	"	173,377	279	79	202
SM7ID	"	89,178	363	49	118
SM7TV	"	32,340	187	36	69
SM7EAN	"	29,766	132	40	81
SM1EUB	"	22,080	115	37	59
SMØBDS	"	22,078	134	31	52
SM6CRA	"	19,899	151	31	68
SK5EU	"	12,096	68	28	35
SM6CPO	"	8,618	51	27	35
SM4AZD	"	6,695	67	22	43
SM5RE	"	3,872	36	21	23
SM5ARR	"	3,690	46	16	29
SM7RS	"	3,588	30	25	27
SM5GA	"	864	25	8	10
SMØFY	"	748	13	10	12
SM5BHW	**28**	**32,994**	**156**	**23**	**71**
SM3CJA	"	280	8	7	7
SM6AEK	**21**	**231,684**	**638**	**35**	**94**
SMØFO/Ø	"	79,712	330	30	76
SL5BO	"	17,680	144	22	30
			(Opr. SM7DNL)		
SM7BUR	"	216	6	6	6
SM6CKU	**14**	**608,381**	**1486**	**37**	**130**
SM5AD	"	439,296	1223	36	120
SM5BNZ	"	298,320	1064	31	101
SM5CEU	"	275,034	874	33	105
SM4WQ	"	115,620	761	26	56
SM3DSP	"	77,913	370	32	67
SM7ACB	"	64,182	263	34	80
SM5EOO	"	27,370	256	23	47
SM6ADW	"	19,208	182	19	30
SM2DMU	"	10,472	84	17	39
SMØKV	"	10,296	150	15	37
SM6EHP	"	4,136	48	17	30
SM5CVC	"	3,115	55	11	24
SM6CDG	"	2,224	54	8	25
SM7BGA	"	589	19	7	12
SM6DHU	**7**	**96,099**	**579**	**28**	**75**
SM6DOK	"	273	21	4	9
SM5GZ	**3.5**	**12,663**	**170**	**16**	**47**

Switzerland

HB9UD	**A**	**9,928**	**67**	**31**	**42**
HB9DX	**21**	**17,775**	**93**	**25**	**50**

Wales

GW3ZQH	**21**	**196,842**	**747**	**27**	**79**
GW4BUC	"	12,328	129	14	32
			(Opr. G4BRK)		
GW3UCB	**1.8**	**1,122**	**104**	**2**	**9**
			(Opr. G3WXS)		

Yugoslavia

YU1NPG	**A**	**196,328**	**486**	**66**	**128**
YU1UM	"	162,070	416	58	132
YU1SF	"	6,405	59	24	37
YU3EJ	**28**	**66.559**	**255**	**26**	**75**
YU2RKC	"	47,783	243	20	51
YU2CBM	"	29,716	161	24	52
YU2CDS	**21**	**542,620**	**1511**	**35**	**95**
			(Opr. YU2RNE)		
YU2CAW	"	199,020	762	31	16
YU4VFC	**14**	**169,719**	**580**	**36**	**103**
YU5CYZ	"	169,120	796	31	81
			(Opr. YU5XDX)		
YU3TKT	"	13,481	172	11	50
YU3TWT	**7**	**5,490**	**107**	**9**	**36**

U.S.S.R.

European

UA3VAQ	**A**	**410,760**	**787**	**85**	**167**
UW3HV	"	189,400	549	52	148
UW3UH	"	129,314	399	49	117
UW3HY	"	124,605	422	45	90
UA4NAA	"	93,328	366	50	102
UW3DH	"	53,280	164	52	108
UW4NP	"	48,950	171	44	66
UA3XAN	"	46,158	193	46	101
UV3DN	"	39,984	238	30	72
UW1AE	"	37,760	172	45	83
UV3HD	"	26,432	148	38	80
UA6PAN	"	19,512	209	16	40
UA3IAT	"	19,019	158	27	64
UA3DAO	"	11,385	105	21	48
UA3HB	"	7,280	77	17	41
UW3IN	"	6,160	38	23	33
UA3GBB	"	621	21	7	16
RA3ACQ	**28**	**73,656**	**391**	**25**	**74**
UA6JAD	"	49,284	532	22	52
RA3MAH	"	28,776	239	23	43
RA3QFS	"	28,497	224	22	47
UK6LDZ	"	24,354	266	20	46
UA3QBU	"	10,088	131	17	35
UA6HBU	"	9,028	91	22	33
RA4WAN	"	6,204	169	8	25
UA3ADF	"	4,982	41	19	34
RA1AAF	"	2,370	49	12	18
UA6HYL	"	1,560	18	13	17
UA3QAQ	"	666	13	9	9
UA4QM	**21**	**231,085**	**912**	**31**	**84**
UW1BM	"	85,234	622	30	66
UW6CV	"	36,205	387	19	46
UA3DBG	"	15,350	175	16	34
UW3TP	"	3,745	55	13	22
UW6CW	"	1,365	41	5	16
UA1CS	**14**	**181,436**	**573**	**35**	**99**
UA3GM	"	112,700	513	31	84
UW3CX	"	98,230	483	31	79

KS6DY—Possibly the most active station in the Pacific. This is one of the operating positions, with John, KS6EZ and Bob, KS6EM in action. Steve, KS6ER, Jerry, KS6DH and Dave, KS6DY the rest of this multi-multi team were set-up in other rooms.

UW6LC	"	91,797	504	32	79
UA4QK	"	13,310	181	14	37
UA3HH	"	12,238	131	17	41
UA1MU	"	9,576	124	18	45
UK3QAA	"	1,738	66	6	16
UA3XM	**7**	**25,599**	**262**	**16**	**53**
UA4UAZ	**3.8**	**8,170**	**169**	**8**	**35**
UA3DGB	"	1,740	67	6	14
UA3QYL	"	1,560	51	6	20
UW3RR	"	1,320	54	5	17
UV3DL	"	1,254	45	4	18
UA3DFK	"	720	27	4	16
Estonia					
UR2QD	A	6,039	79	17	44
UR2ED	**28**	**10,850**	**82**	**18**	**44**
UR2RC	**3.8**	**4,619**	**144**	**4**	**27**
UR2PL	"	4,495	147	6	23
Kaliningrad					
UA2EC	**A**	**96,775**	**424**	**47**	**128**
Karelia					
UN1CC	**14**	**13,915**	**130**	**17**	**38**
Latvia					
UQ2MU	**A**	**124,792**	**500**	**40**	**112**
UQ2CR	"	43,030	404	28	67
UQ2IL	"	12,740	129	18	47
UQ2MS	"	2,277	60	14	19
RQ2GDT	**28**	**4,080**	**56**	**17**	**23**
UQ2GA	**14**	**269,860**	**900**	**30**	**101**
UQ2HO	7	2,294	62	7	24
UQ2AS	**3.8**	**5,184**	**168**	**6**	**26**
Lithuania					
UP2OU	**A**	**422,712**	**1040**	**70**	**185**
UP2SA	"	130,766	703	37	114
UP2BAS	"	74,025	415	37	104
UP2PBI	**28**	**4,633**	**50**	**16**	**25**
UP2NX	21	2,728	64	10	21
UP2NO	"	2,500	76	9	16
UK2PAR	**14**	**88,620**	**523**	**25**	**85**
UP2PT	"	26,781	219	26	53
Moldavia					
UO5SA	**A**	**325,510**	**960**	**62**	**153**
UO5DN	"	13,950	184	13	49
UO5OAK	**14**	**23,112**	**298**	**15**	**39**
UO5GR	"	11,573	91	19	52
Ukraine					
UB5CI	**A**	**223,008**	**510**	**76**	**200**
UB5QCW	"	18,488	136	38	84
RB5QAO	**28**	**36,852**	**270**	**22**	**61**
UY5RT	"	36,404	229	26	52
UB5VAZ	"	26,598	181	23	55
RB3VAC	"	9,126	95	18	36
RB5ABX	"	4,107	70	12	25
UB5AAF	"	1,000	21	9	11
UB5EC	**21**	**202,293**	**881**	**30**	**87**
UB5VY	"	31,232	235	21	43
UY5EM	"	18,095	182	13	34
UT5LE	**14**	**205,888**	**692**	**35**	**96**
UY5ZT	"	585	15	6	7
UB5WF	**7**	**58,820**	**581**	**20**	**65**
UB5EDU	**3.8**	**14,625**	**280**	**9**	**36**
White Russia					
UC2BF	**A**	**35,991**	**177**	**39**	**90**
UC2WP	"	31,520	264	20	70
UC2DO	28	1,323	24	12	15
UC2OAA	**21**	**38,430**	**327**	**23**	**47**
UC2DN	**14**	**6,160**	**113**	**12**	**28**
UC2AXX	**3.8**	**6,895**	**191**	**7**	**28**
UC2WAE	"	1,281	57	5	16

OCEANIA

Australia					
VK3ARY	**A**	**44,352**	**192**	**26**	**51**
AX3SM	**21**	**24,150**	**193**	**13**	**29**
AX3XB	**3.8**	**392**	**22**	**3**	**4**
VK4VU	**A**	**780,340**	**1226**	**77**	**143**
AX4FH	"	168,074	572	37	64
VK4UA	"	49,176	249	33	39
VK4DO	**14**	**42,280**	**197**	**30**	**59**
VK4AK	"	26,363	103	30	67
VK4PJ	"	176	6	5	6
AX5MF	**A**	**46,475**	**246**	**44**	**83**
VK6NE	A	8,262	54	25	29
VK6TU	"	3,063	33	15	19
VK6CT	**7**	**135,810**	**521**	**29**	**61**
Hawaii					
KH6RS	**A**	**4,173,519**	**4052**	**129**	**224** (Opr. W6DQX)
KH6IJ	**A**	**1,751,690**	**2507**	**99**	**139**
KH6IGJ	**A**	**1,601,145**	**2084**	**101**	**172**
KH6IGE	"	350,464	838	57	91
KH6ICR	**28**	**19,336**	**277**	**12**	**12**
KH6GHZ	"	10,464	218	8	8
KH6HNT	21	2,596	70	6	6
KH6CHC	**1.8**	**272**	**12**	**5**	**3**
Indonesia					
YBØABB	**A**	**521,220**	**869**	**72**	**132**
Guam					
KG6JAR	**A**	**438,400**	**976**	**68**	**92**
Marshall Islands					
KX6BB	**14**	**50,876**	**232**	**30**	**49**
New Zealand					
ZL1BKZ	**A**	**807,576**	**1237**	**70**	**158**
ZL2ACP	"	329,559	659	65	122
ZL1AMM	"	31,350	122	35	60
ZL1AGO	**14**	**145,883**	**442**	**35**	**78**
ZL1BKL	"	130,649	406	33	90
ZL2HE	"	15,720	101	22	39
ZL4BO	**7**	**81,972**	**420**	**24**	**45**
Ogasawara Island					
JD1AIE	21	3	1	1	1

SOUTH AMERICA

Argentina					
LU5HFI	**A**	**3,103,452**	**2858**	**110**	**264**
LU6HDV	"	247,752	681	48	76
LU6EF	"	20,790	143	28	35
LU4DMG	"	867	22	6	11
LU8FEU	**28**	**296,238**	**1028**	**26**	**71**
LU9UAC	"	2,350	81	6	4
Bolivia					
CP1EU	**A**	**192,602**	**421**	**61**	**97**
Brazil					
PY1ZAE	**A**	**1,048,844**	**1348**	**78**	**185**
PY1MO	"	166,470	381	52	102
PT2JB	"	138,380	544	30	55
PY1BAR	"	82,212	280	32	70
PY8JO	"	20,040	118	23	37
PY1BOL	"	12,467	114	31	50
PY7BSD	"	11,460	115	10	20
PY1VNY	"	1,920	22	18	12
PY2DPR	"	1,285	26	18	20
PY1MB	**28**	**312,600**	**1000**	**27**	**73**
PY4KL	**21**	**154,462**	**483**	**29**	**89**
PY4OD	**14**	**985,473**	**1933**	**38**	**133**
PY1DBE	"	16,092	104	18	36
PY1CHP	"	14,740	97	17	38
PY2LB	7	7,371	69	13	26
PY2ELZ	"	7,172	61	17	27
Chile					
CE5GO	**A**	**30,480**	**174**	**26**	**34**
Columbia					
HK1CMX	**14**	**45,479**	**219**	**21**	**52**
Ecuador					
HC1CW	**A**	**220,473**	**585**	**50**	**81**
Galapagos Is.					
HC8GI	**A**	**126,350**	**462**	**32**	**63**
Netherlands Antilles					
PJ9BB	**A**	**109,962**	**453**	**34**	**48**
Peru					
OA4AWI	**A**	**208,504**	**536**	**50**	**84**
OA4AKL	**14**	**82,584**	**322**	**27**	**66**
Uruguay					
CV4C	**14**	**1,233,128**	**2518**	**37**	**130**
CX9BT	3.5	1,566	26	12	17
CX3BH	1.8	18	4	2	4
Venezuela					
YV6AW	**A**	**3,504,375**	**3154**	**93**	**282**
YV1YC	"	464,640	916	50	126
YV1JA	21	15,680	137	14	26
YV4TI	**7**	**96,609**	**382**	**24**	**62**
YV9AF	**3.5**	**35,926**	**296**	**15**	**31**

MULTI OPERATOR
Single Transmitter

NORTH AMERICA

United States				
W1MX	**160,290**	**308**	**63**	**132**
W1QV	48,750	145	38	87
WA2BVU	**1,384,840**	**1262**	**109**	**279**
WA2HSU/2	1,154,820	1064	110	270
WA2OYR	209,960	339	73	158
W3EZT	**934,154**	**838**	**112**	**291**
WA3EPT	571,761	630	94	239
W3YXM	361,494	505	86	180
K3UZY	335,664	471	79	173
W3NX	255,936	360	86	172
WA3LJP	246,100	415	71	143
W3DOS	107,328	248	49	107
W4QBK	**1,590,908**	**1172**	**130**	**354**
W4FDA	367,207	473	79	192
K4EG	24,885	194	51	103
W5RTQ	**839,895**	**802**	**127**	**272**
W5NOP/5	672,576	667	108	264
W6PAA	**1,188,352**	**1191**	**120**	**232**
W6YRA	904,608	1085	104	184
K6SDR	855,772	1040	105	187
W6ONV	790,398	798	114	243
W6KG	477,283	703	92	147
W6BIP	176,540	335	69	113
W6VPZ	84,360	256	51	69
WA6GEY	56,500	207	43	57
WB6OOL	22,950	149	22	32
W7SFA	**1,765,921**	**1692**	**121**	**238**
WA7NIN	1,001,325	1073	116	209
W7JST	863,944	973	105	211
W7VRO	652,224	731	108	208
W7FR	540,487	874	86	141
WA7RUY	26,908	170	30	32
W8GIO	**369,852**	**587**	**79**	**180**
W8EDU	256,283	409	73	154
W8ZHO	229,658	345	83	159
WB8IJI	121,632	245	67	114
W9LT	**1,184,400**	**1019**	**117**	**306**
W9ZTD	860,682	776	119	283
WB9LHI	269,616	403	79	167
WAØCVS	**1,094,115**	**1092**	**109**	**240**
WBØFGV	349,733	559	77	156
WAØVPN	228,124	324	73	141
WØEEE	173,824	343	77	147
WB0FHH	160,925	293	74	131
WØQQQ	117,450	259	65	109
KØLIR	12,864	65	27	37
Bahamas				
ZF1GW/VP7	**1,609,344**	**2916**	**77**	**177**
Canada				
VE3HUM	**1,064,583**	**1192**	**96**	**241**
VE3LSS	650,238	906	67	190
VE4RCC	**292,228**	**563**	**65**	**107**
VE6GS	**296,426**	**814**	**67**	**102**
Canal Zone				
KZ5NG	**1,656,985**	**3198**	**80**	**155**
Monserrat				
VP2M	**5,167,355**	**5011**	**116**	**322**
VP2MDX	1,604,310	2497	78	187
St. Martin (French)				
FGØZZ/FS7	**3,871,976**	**4388**	**106**	**306**

AFRICA

Liberia				
EL7F	**1,573,600**	**1905**	**95**	**186**
Mozambique				
CR7GJ	**2,218,608**	**2041**	**110**	**262**
Sicily				
IH9AA	**3,719,573**	**3229**	**102**	**305**

ASIA

Cyprus				
5B4ES	**746,200**	**1408**	**49**	**133**
Japan				
Club Stations				
JA2YAB	**742,280**	**1079**	**92**	**149**
JA3YBF	555,822	882	69	150
JH1YDT	505,765	702	99	152
JA7YRR	250,428	555	63	101
JA3YKC	204,015	378	81	120
JA7YAA	114,210	267	66	96
JA1YAQ	65,424	213	48	68
JA6YAF	59,150	182	51	79
JA1YAC	24,525	135	31	44
JA1YHA	15,660	102	27	33
JA7YDM	7,248	55	19	29
JA7YEG	3,712	47	13	16
Malaysia				
9M2CJ	**666,471**	**1411**	**19**	**46**

U.S.S.R.
Club Stations

Asiatic				
UK9AAN	**3,412,200**	**2563**	**132**	**338**
UK9CBP	122,100	390	27	84
UK9UAO	92,379	445	28	55
UK9FAA	57,954	261	22	56
UKØAAB	**858,155**	**1362**	**96**	**199**
UKØFAA	**426,420**	**1108**	**70**	**110**
UKØAAC	105,120	443	32	64
UKØSAL	73,467	374	24	57
UKØCAX	28,567	501	24	31
Georgia				
UF6VAD	**414,908**	**740**	**51**	**147**
Kazakh				
UK7PAL	**70,110**	**340**	**29**	**66**

EUROPE

Belgium				
ON5GQ	**1,023,303**	**1205**	**98**	**249**
Czechoslovakia				
Club Stations				
OK3KAG	**454,360**	**819**	**84**	**223**
OK2KBR	208,902	503	63	154
OK3KGI	189,563	464	68	141
OK1KTL	128,860	324	64	106
OK1KNH	67,770	373	32	103
OK3KTR	46,936	351	25	79
OK1KRQ	22,422	190	25	76
OK1KVK	8,745	75	21	34
OK2KWL	4,672	144	5	27
England				
G4ANT	**2,782,483**	**2420**	**125**	**318**
G3FXB/P	2,350,788	2405	..99	264

G3WYX	2,231,455	2321	110	304
G3UBR	1,534,326	1904	84	229
G3RCV	1,083,576	1545	84	218
G3RRS	749,024	1147	79	184
G3KMI	496,620	993	83	196
G8JC	451,560	876	71	194
G4BUE	381,036	811	66	160
G3FVA	189,376	439	53	123
Finland				
OH3MG	**2,232,660**	**1936**	**131**	**377**
OH1IJ	408,702	817	78	185
OH2BAD	610,892	836	101	263
OH8TW	252,152	758	52	146
France				
F6KGB	9,384	204	19	27
East Germany				
DT3QO	**1,350,168**	**1616**	**107**	**297**
DT3ML	782,362	1248	71	216
West Germany				
DLØWU	**3,416,808**	**2875**	**122**	**350**
DF1SD/P	1,257,900	1699	94	206
DKØAA	1,064,983	1354	93	214
DLØDX	893,024	1145	105	247
DLØFD	670,068	1025	76	176
DL6UN	586,560	917	76	184
DLØJK	368,475	665	78	177
DK5EZ	333,980	584	88	192
DLØGV	13,774	179	30	50
Hungary				
Club Stations				
HG5A	**1,188,408**	**1766**	**99**	**239**
HG8U	662,376	1229	89	223
HA5AIR	337,428	800	64	118
HA5KFA	279,270	806	59	155
HA7KLG	246,844	712	55	133
HA5KFU	213,915	652	55	140
HA7KLF	184,338	595	62	147
HA5KKC	142,350	454	61	134
HA5KAS	133,806	523	53	121
HA25KRB	130,464	469	45	99
HA25KLC	109,809	343	59	130
HA5KKP	100,128	475	45	105
HA2KRL	98,820	409	57	105
HA9KOL	83,971	521	35	96
HA2KMR	78,402	357	40	106
HA100KKN	18,009	148	26	61
Ireland				
EI1AA	**387,074**	**977**	**61**	**145**
Italy				
I1BAF	**1,609,832**	**1928**	**98**	**258**
I1VVZ	1,249,672	2051	73	175
I2AT	717,620	1318	76	189
IØKBL	156,288	453	53	123
I2PEI	19,592	177	20	42
Norway				
LA7V	1,224	28	8	9
Netherlands				
PI1PT	**39,479**	**245**	**27**	**70**
Poland				
Club Stations				
SP5PWK	**1,191,458**	**1356**	**111**	**271**
SP6PZB	735,216	1214	80	209
SP9ZAF	99,144	433	42	111
SP9KRT/9	82,600	526	91	125
SP9KDD	47,744	278	41	87
SP5PTR	29,904	195	39	73
SP3ZEH	5,406	101	15	106
Roumania				
YO8KAN	6,890	96	15	38
Scotland				
GM4ALK/4	**535,600**	**985**	**69**	**191**
GM3ZRC	125,800	499	41	129
GM4CAN	108,337	648	43	87
Sweden				
SK5AL	**1,640,172**	**1929**	**111**	**301**
SM5AOE	1,452,422	1517	108	293
SK6AW	1,205,844	1276	103	288
SL2ZZU	654,976	1234	68	156
SMØMC	551,290	782	84	206
SL7AC	236,928	843	52	132
SJ9WL	122,220	470	54	140
SK4EN	26,712	129	40	66
Switzerland				
HB9CC	**694,844**	**1388**	**82**	**189**
Wales				
GW6GW	**1,673,140**	**2201**	**89**	**234**
Yugoslavia				
YU1BCD	**2,111,198**	**1944**	**128**	**321**
YU2CBV	137,509	536	56	143
YU2HDE	24,909	139	24	45

U.S.S.R.

Club Stations

European				
UK6LAZ	**1,942,980**	**1806**	**118**	**352**
UK3SAB	**1,400,672**	**2043**	**95**	**243**
UK4WAC	782,850	1337	81	226
UK3R	569,463	1328	72	177
UK3ABO	528,120	986	81	189
UK4FAD	382,536	886	67	185
UK3AAC	342,432	964	63	169
UK4WAK	159,642	539	52	129
UK4NAA	119,718	445	55	107
UK4PAS	110,252	463	49	123
UK3MAA	90,746	429	44	113
UK3SAA	85,284	342	45	93
UK6JAA	78,896	595	32	86
UK3WAC	59,944	356	33	94
UK4FAE	43,700	310	28	67
UK3MAX	35,770	321	19	51
Estonia				
UK2RAE	**305,694**	**898**	**67**	**176**
UK2RAT	61,697	539	20	83
Kaliningrad				
UK2FAA	**936,330**	**1218**	**103**	**257**
Latvia				
UK2GKW	**204,881**	**706**	**57**	**154**
UK2GCF	194,258	659	60	146
UK2GBJ	186,120	871	31	110
UK2GDZ	5,895	73	14	31
Lithuania				
UK2PCR	**1,412,928**	**1589**	**108**	**288**
UK2PAF	881,620	1329	96	244
UK2PAA	136,920	567	44	124
Ukraine				
UK5IBM	**871,782**	**1342**	**92**	**234**
UK5FAD	507,234	1164	81	192
UK5LAA	345,376	870	75	181
UK5VAA	275,116	846	58	160
UK5LAP	134,669	735	43	101
UK5ZAI	88,265	377	42	97
UK5MAF	66,759	455	35	84
UK5QAV	58,607	435	28	75
UK5LAS	51,948	334	34	77
UK5ICD	17,546	216	16	46
White Russia				
UK2WAF	**163,968**	**450**	**57**	**126**
UK2WWW	81,528	460	34	95
UK2AAB	28,665	205	23	68
UK2AAS	9,968	126	13	43

OCEANIA

Hawaii				
KH6SP	**1,357,668**	**2009**	**90**	**144**
Marianas Islands				
KG6SW	**2,662,968**	**2928**	**113**	**195**

SOUTH AMERICA

Brazil				
PY2CAB	**2,991,460**	**2821**	**104**	**269**
PY2DSC	1,554,970	1999	73	189
Trinidad				
9Z4LO	**2,647,235**	**2540**	**97**	**258**

MULTI OPERATOR

Multi Transmitter

North America				
W2PV	**5,248,173**	**3261**	**130**	**451**
W3AU	**4,749,690**	**3050**	**130**	**425**
W3WJD	**3,824,415**	**2395**	**133**	**434**
W7RH	**3,652,808**	**2708**	**140**	**332**
W1ZM	**3,326,176**	**2361**	**123**	**373**
WB5DTX	**2,866,700**	**2015**	**143**	**383**
W3GPE	**2,804,022**	**1898**	**130**	**391**
K6BCE	**2,769,672**	**2178**	**138**	**306**
W4BVV	**2,691,312**	**2051**	**113**	**341**
WA8ZDF	**2,616,718**	**1908**	**119**	**375**
K4CG	2,299,726	1871	109	364
XE2EIF	**2,281,734**	**3552**	**94**	**179**
VP1SYL	**2,190,375**	**3512**	**92**	**205**
W9YT	**1,955,562**	**1571**	**122**	**339**
W3FRY	1,947,825	1408	129	366
W3GM	1,371,708	1044	121	347
WA3ATX	1,328,460	1123	109	311
K3BW	1,040,664	946	109	284
WA3ATP	606,375	678	89	226
W3SS	490,752	617	79	205
W3BYX	486,210	603	80	205
W8NGO	358,545	473	87	178
K3KNH	282,348	353	88	188
ZF1DH	**220,836**	**681**	**54**	**100**

AFRICA

CR6AA	**9,181,991**	**5865**	**126**	**407**

ASIA

UK9ABA	**5,327,817**	**3476**	**141**	**420**
XV5AC	**3,552,983**	**4672**	**125**	**284**
VU2CBE	**821,436**	**1340**	**98**	**196**
JA6YTU	**476,758**	**635**	**98**	**156**
JA1YFL	**476,330**	**730**	**84**	**146**
JA3YCH	182,055	409	57	102
KA1BL	**173,550**	**527**	**50**	**80**

EUROPE

DLØPG	**6,409,665**	**4585**	**142**	**459**
DLØWW	**5,046,678**	**3930**	**132**	**421**
UK3AAO	**3,101,347**	**2556**	**121**	**346**
DL8HA	2,428,365	2514	113	332
DL5AY	2,220,064	2579	100	252
DA1RA	**1,364,30**	**1697**	**107**	**288**
HB9AGC	**737,002**	**1219**	**78**	**197**
HA25KDA	**225,993**	**825**	**55**	**158**
HA4KYH	**214,570**	**630**	**62**	**153**
DLØII	142,380	499	54	126

OCEANIA

KS6DY	**4,346,522**	**4467**	**118**	**229**
5W1AR	**1,303,380**	**1994**	**85**	**149**

SOUTH AMERICA

PJ9GIW	**11,132,443**	**6862**	**134**	**419**

Our thanks to the following stations who sent in check logs and logs solicited for checking purposes. Also a few unscored logs that were beyond salvaging.

CX1JM, CX8BBH, DK5OS, DM2-BWN, DM5PBN, DM5YVL, DT2BJD, DT4CF, FP8AP, HE9IDM, JH3BJN, K4LSD, KV4AA, LA7XQ, LA8BM, LA8O, LZ2RF, OH1LW, OH1VR, OH2AC, OH2BAC, OH3IM, OH5AB, OH5XO, OH5YE, OK2SKU, OY1M, OZ1LO, OZ5EV, PY1BQI, PY4LW, SM2COR, SM5BFJ, SM5BKI, SM7-BBV, SM7BXK, SM7TQ, SM0DJZ, SP2DVH, SP5GQG, SP6PWT, RC2-AIW, UA3RR, UA6NX, UL7JAC, UK-3REE, UK4NBM, UK4WAB, UK5-EAB, UK5MAG, UK9CCE, UT5HT, UW1AR, UW6FZ, VE1AHF, VE1AKU, VE1BT, VE1CK, VE1DF, VE1FS, VE1HC, VE1JU, VE1LU, VE2AED, VE2BGJ, VE2BQZ, VE2IQ, VE2OV, VE2SB, VE3APF, VE3ATW, VE3-BAK, VE3BBT, VE3BQC, VE3BVL, VE3CEA, VE3CGA, VE3CWO, VE3-DMP, VE3DPZ, VE3EB, VE3EFX, VE3EOX, VE3EQ, VE3ERY, VE3FBB, VE3FEK, VE3FFT, VE3FQJ, VE3-FVV, VE3GCE, VE3GN, VE3GOQ, VE3GT, VE3IM, VE3KT, VE3KU, VE3RJ, VE3SP, VE3UR, VE7AJ, VO1CE, VO1FG, VO1JR, VQ9D, W1AB, W1PCD, W1VF, WB2SHH, W3CTE, W3GID, W4NJF, W6CLM, W7CMO, W8CL, WB8CGC, YU1-ADO, YV5IZ, ZS2DC.

DLØPG—A month before the contest DJ6TK, DJ1FC, DJ4ZR, DJ91E and DJ9TQ held a meeting and planned their strategy for the contest. The master plan paid off putting them 3rd World High in the multi-multi category.

KA6SS—Some of our boys also join the action, but their activity has fallen off in recent years.

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☐ Antenna Roundup I	$3.00	☐ Surplus Conversion Handbook	$4.50
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Curve Tracer [*from page 24*]

Possible Variations

The collector sweeps need not be triangle waves, in fact, a sine wave is just as good. This means that the entire triangle wave oscillator could be replaced by the secondary of a 6.3 v. filament transformer. I could not take this simple approach as my oscilloscope had no usable a.c. available in its plug-in compartment.

In place of the collector sweep amplifier used, a complementary-symmetry Hi-Fi amplifier could be substituted allowing more reasonable power supply voltages to be used. In this case T_2 could be a filament transformer hooked backwards. If done properly, this could yield even lower output impedance than the circuit described.

This instrument was designed mainly for small signal transistors. If measurements of high current devices is your primary concern, T_2 could be replaced by a 24 v. filament transformer and R_{30} changed to 10 ohms 10 w. This would give you from zero to about 25 v. peak collector sweeps at 1 a. from a source impedance of about 30 ohms.

Operation

Use of the curve tracer for display of collector characteristic curves is straightforward, just connect the transistor to the three output posts and set up the correct sweep and step polarities.

The V_{ce}/V_{be} switch is normally left in the V_{ce} position. V_{be} is for transfer characteristic curves and is most useful for FETs.

Diodes are hooked from C to E output posts. The a.c. sweep feature is useful here, as well as for in-circuit checks of transistor junctions.

One point that should be mentioned is that although a 2 v. per step setting is provided on the step generator, it must not be counted on. The 2 v. per step position works, but because of the voltage swing at point 'B' (12 v. peak) calibration is poor and the OFFSET control is useless. ■

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Math's Notes [*from page 44*]

one storage elements is filled with the desired frequency and the other with the sampled v.f.o. frequency. The only apparent difference is the method of actually producing the difference frequency which is done without the subtractor mentioned by me in the March column or by the chip described by WA5NYY.

I will not reproduce the Racal method for lack of space, but will instead offer an alternate subtraction scheme spurred by the Racal method and the cost problems just mentioned. Fig. 3 is a block diagram of the revised synthesizer scheme. Note that the SN7480 has been replaced by a SN74190 which is a pre-settable up/down counter set to the count down mode. When the transfer signal comes, in addition to updating the counter reading (in the locked mode) it also transfers, or "loads" the up/down counter with the desired frequency from the locked storage chip.

As the next count cycle begins, direct v.f.o. pulses ($\div$ 2) are fed to the input of the up/down counter which now counts the incoming pulses. At the end of the counting period, the number left in the SN74190 counter is half of the difference frequency which is then converted to the Varicap biasing voltage. The divide-by-2 incidently assures that the up/down counter will always have an above zero value.

An integrator circuit is included in the Varicap bias line to handle the "pulses" of d.c. correction voltages to smooth out the control. We have also included fig. 4 which is a sequence diagram of the various steps necessary to control the SN74190 and succeeding circuits. It is interesting to note that the commercial version, according to Mr. Jensen's article, which samples the v.f.o. at 1 second intervals, exhibits no apparent increase in v.f.o. noise and an overall v.f.o. stability of better than 2 Hz. We have written to Racal for additional information and will present this when we receive it.

The overwhelming high level technical response from actual experimenters trying this technique as well as the fact that some commercial products apparently use a very similar method leads me to believe that it is certainly workable and of enough interest to quite possibly produce an amateur version. Thanks again to all of you who wrote and we will continue publishing up-to-date progress reports and information on the synthesizer as we receive it. Please remember though, that there is presently a 3 month lag from the time that I submit a column to the time that it is published.

73, Irv, WA2NDM

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QRP [*from page 25*]

LP2000 Monolithic IC transmitter, Plessey SL610 & SL611C low-noise r.f./i.f. IC's, SL620, SL621 a.g.c. IC's, SL640, SL641 Double-Balanced Modulator IC's, SL630 audio IC; plus Fairchild voltage regs., National LM370 a.g.c. IC, Motorola MC4044P phase detector IC—I've got to stop here—it goes on and on!

Building the Junk-Box

B&F Electronics, 119 Foster St., Peabody, MAS 01960. Good on many IC's, and a lot of way-out stuff. These guys got their start in hamfest fleamarkets and stock accordingly. Bargains. *TriTek, Inc.*, P.O. Box 14206, Phoenix, AZ 85031: another flea-market oriented outfit often with just the item you need most. Special in latest flyer—5% precision carbon-film resistors, regular values, ¼ and ½ watt sizes—10¢ each, or 10 of one value for 50¢. IC's, transistors, but sporadic supply. *S&R Enterprises,* 1344 E. Indian School Rd., Phoenix, AZ 85014, was the first to bring new balanced emitter power r.f. transistors to the general public, and continues to produce amazing bargains on MARKED (never accept unmarked!) r.f. power devices: 2N5589—$2.00, 2N5590—$6.50, 2N5591—$7.50! (5, 10 and 25 watts min. output respectively). Also bargains on good transistors like 2N3866 (10 for $4.50) and others.

Well, that's the list. One of the big houses, plus Circuit Specialists, plus S&R's power transistor line, and most projects will be handled completely. I've had good luck with each of the outfits listed above, so I can recommend them. Hope this helps out a bit. We'll dip into the mailbag next month. Remember, August 20 is deadline for submissions for *The Milliwatt Field Day Trophy*—a copy of your ARRL "check sheet" plus description of your equipment and operating location.

73, Ade, K8EEG

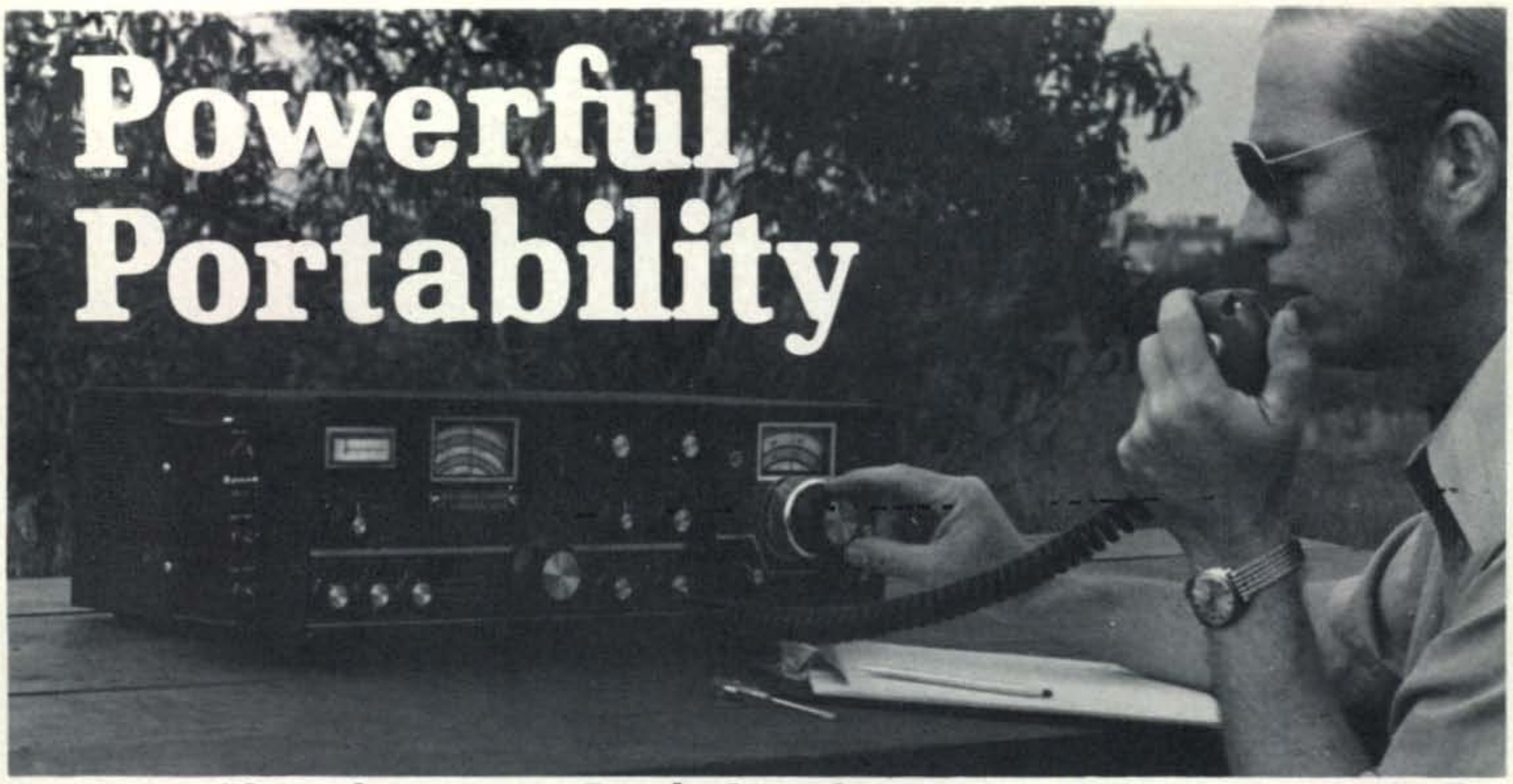
Antennas [*from page 49*]

can be tacked to a wall, or run through a flower bed. In the open, the wire is quite visible and creates a potential hazard to people walking about since it is possible to trip over the wire if it is low, or run into it if it is higher. The temptation exists to bury the wire, but this should not be done, as the wire is really part of the antenna system and is tuned to your operating band. Burying the radial would detune it, and it simply would not do the job. A ground system can be made of buried wires, but that's a different story.

Outdoor Antennas?

The next column will deal with "invisible" and "disappearing" antennas for outdoor use in difficult locations.

73, Bill, W6SAI



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Awards [*from page 66*]

Award/Membership and a $2.00 one-time fee is required, and a 6-6 Net number will be issued to you.

President of SMIRK is Tex Kennedy, W5QDB; Vice-President is Gene Barnes, WA5CBT; Secretary/Treasurer is Ray Clark, K5ZMS/5; and Net Co-ordinator is Bill Moore, K5OOJ.

The Net meets each Sunday night at 8:00 P.M. Central Time on 50.2 primary and 50.175 alternate.

For any additional information, by-laws, and award, write to: Ray Clack, K5ZMS/5, Six Meter International Radio Klub (SMIRK), 6-6 Net., 7154 Stone Fence Drive, San Antonio, Texas 78227.

Notes

As there are always new County Hunters requesting information, here is some data especially for them.

C.w. County Hunter Nets are: Mondays on 3582 kHz at 0030 GMT (Tuesday); Wednesdays 7055 kHz 2300 GMT; Saturdays 14070 kHz 1400 GMT and 2000 GMT; Sundays 7055 kHz 1430 GMT and check 21070 for any activity.

Infrequently, Net time (not day) is changed. Also band frequencies may be changed for one or two weeks to prevent conflict with major contests.

For up-to-date on such c.w. County Hunting, a monthly *CW County Hunter Bulletin* is published by James Hoffman, K1ZFQ, 42 Gresham Street, Milford, Conn. 06460. Cost is $1.75 per year.

S.S.B. County Hunting activity daily starts about 1300 GMT on 14336 and when that band folds look on 3930 or 3943, there is also some tries at activity on 7291 and 7280 starting at 0000 GMT. Mos s.s.b. operators will answer c.w. calls also.

A live s.s.b. organization is the MARAC, INC. (Mobile Amateur Radio Awards Club) who also put out a fine monthly News-Letter—for full details on s.s.b. Nets, Net Controlling, addresses, County Hunting in general, send a legal size s.a.s.e. with 30c postage on it to: Bertha Eggert, WA4BMC, P.O. Box 6811, Southboro Station, West Palm Beach, Florida 33405.

So Good Hunting, write and tell me, How was your month? 73, Ed., W2GT

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Custom Series 35 antennas, power rated at 2000 Watts, are of Heavy Duty design with interchangeable coils. Select components to suit your type of installation.

	35-6	6 foot stainless steel Whip Section. Includes Kwik-On connector.	$12.95	
	35-15	15 Meter Coil Section.	$22.95	
	35-20	20 Meter Coil Section.	$24.95	
	35-40	40 Meter Coil Section.	$26.95	
	35-75	75 Meter Coil Section.	$28.95	
	35-18	18 inch Base Section.	$ 9.95	
	35-36	36 inch Base Section.	$10.95	
	35-48	48 inch Base Section.	$11.95	
	Kwik-On	Stainless steel connector for quick removal of any mobile antenna coil or whip.	$ 7.95	
	MD-4	2-Meter Mobile Whip with distinctive molded transformer. 5/8 wave; 3 dB gain. Stainless steel whip.	$21.95	
	BMT	Deluxe Antenna Bumper Mount. Chrome finish.	$26.95	
	RMD	Mobile Antenna Roof Mount.	$ 5.95	
	TMD	Mobile Antenna Trunk-Lid Mount.	$ 9.95	

ALL PRICES F.O.B. OCEANSIDE, CALIFORNIA.
Antennas will be shipped best way, collect, unless otherwise specified in writing.

SUB–TOTAL	
CALIF. SALES TAX (Residents Only)	
TOTAL	
DOWN PAYMENT	
BALANCE DUE	

Method of payment (Check one):

- ☐ Full amount enclosed
- ☐ 20% deposit enclosed; Balance C.O.D.
- ☐ 20% down payment enclosed; Charge balance to BANKAMERICARD #_____ Exp. Date _____
- ☐ 20% down payment enclosed; Charge balance to MASTERCHARGE #_____ INTERBANK #_____ Exp. Date _____
- ☐ 10% down payment enclosed; Charge balance to SWAN CREDIT ACCOUNT #_____

SIGNATURE: _____ DATE: _____

HAM SHOP

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Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad. Free ads published on a "space-available" basis only.

Closing Date: The 15th day in the second month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publishers of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.**

AMATEUR VACATION: Livingstone Lodge, Mascoma Lake, New Hampshire, 03748. Cosy Cabin for two, $55.00, weekly. Swimming, Fishing, Boats, Sprots, Ham Radio, Showers, Fireplaces, Housekeeping, Children half, Tent Sites, Literature, C. Livingstone, W2LA, (603)-632-7784.

Free Crystals with the purchase of any 2 meter FM radio. Write for our deal on the rig of your choice. Factory authorized dealers for Regency, Drake, Icom, Kenwood, Tempo, Alpha, Genave, Swan, Clegg, Ten-Tec, Standard, Telex, Midland, Hallicrafters, Galaxy, Sony, Hy-Gain, CushCraft, Mosley, and Hustler. For the best deal around on HF or VHF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute, Indiana 47802. (812)-894-2397.

Rubber adress stamps. Free catalog. 45 type styles. Jackson's, Box 443F, Franklin Park, IL 60131.

FOR SALE: RIDERS MANUALS, Bolume 1 thru 21, Excellent Condition. Hate to break these up, would like to sell the entire 21 Manuals. Best offer takes them, also have old Tubes for sale.

FOUNDATION FOR AMATEUR RADIO annual Hamfest Sunday 20th October, 1974 at Gaithersburg Maryland Fairgrounds.

CRAMPED for antenna space? Slinky Dipole for 80/75, 40 & 20 meters operates efficiently at only 24 feet long on 80 meters! Money-back guarantee. Complete kit $30.95 ppd., C.O.D. $1 extra. Teletron Corp., Box 84-C, Kings Park, NY 11754.

BUY-SELL-TRADE: Write for monthly mailer. Give name address call letters. Complete stock of major brands, new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan, etc. SSB & FM Associated Radio, 8012 Conser, Overland Park, KS 66204.

QST, CQ, PE's over 100 - $50 or offer. Paul Scroggie, Sprague, WN 99032.

FOR SALE: Spectra Physics 2.0 mw 071-2 HeNe laser tube, brand new with power supply schematic, $110.00. WA2NDM, 5 Melville Rd., Great Neck, NY 11023.

Organize & enhance your QSL's with 20 pocket plastic holders. Two for $1.00, seven for $3.00. TEPABCO, Box 198Q, Gallatin, TN 37066.

SURPLUS. Giant bargain-packed catalog, $1. Etco Electronics, Dept. CQ, Box 741, Montreal A, H3C 2V2.

LABORATORY BRIDGE: Leeds & Northrup model 4760. Precision measurements for only $45. K2DA J. Boer, 449 Hill St., Boonton, NJ 07005.

FOR SALE: Galaxy GT550 with AC550 supply, speaker, crystal calibrator and fan; $350, plus shipping. W8IIT, 281 Jenny Lane Dayton, OH 45459.

WANTED: Sine and Square Wave Generator, Heath IG-18, EICO 379.377 or other. Stidfole, W5ZP, 820 Summit Dr., Rogers, AR 72756.

SELL: Heathkit SB-303, professionally wired, works perfectly, mint cond., used only 10 hours; $295 or $305 w/SB-600. Rick Scielzo, WB2ZHY, 19 Longview Dr., Waldwick, NJ 07463. (201)-445-8066.

TRADE: 13 1/2 ft. Travel Trailer, little used, for ham gear, Drake, Galaxy, Heath, Collins Trailer value; $900. WA5GFS, Box 462, Chickasha, OK 73018.

WANTED: Matching cabinet & speaker for Collins R-388/51-J3; also infor on mods to the R-388. - W2HLF, 16 Henry Circle, Rochester, NY 14624.

WANTED: Swan SW12DC power supply. State price. Merideth, K5ZUU, 5616 S. Yorktown Place, Tulsa, OK 74105.

SELL: Bud Low Pass filter LF-601 $10, Dow A.C. coil, Co-Ax relay, aux contacts $10, tube 4-400A, $25 plus postage. W6BLZ, 528 Colima St., La Jolla, CA 92037.

HEATH Counter-Scaler, Motorola 3 freq T43-GGV, Others, WA5CMC, 2309 Bullington, Wichita Falls, TX 76301.

WANTED: Used Heath HW7 and SB200. WIHZR, Tourville 22 Edward Ave., Milton, MA 02186.

SELL: Drake CC-1 conv. console & CPS-1 supply & SCC-1 VHF Calib-$70; Vanguard 6 mtr & 2 mtr convrs.; $30 each, 811, 815, 829, 4-400A tubes-Write: V. Iacopelli, 1720 77th St., Brooklyn, NY 11214.

WANTED: RTTY Page Printer, prefer model 15. WA7QLC, 2428 Chitwood Way, Boise ID 83704.

Drake TR-3, AC-3, spkr, $375. Swan 250, 117XC, $250. Galaxie FM 210, AC, 94/94, 28/88, $100. K3NXU, John LaMartina, 9118 Kilbride Rd., Baltimore, MD 21236. (301)256-2333.

WANT TO BUY: Collins KWM-2, 516F-2, and 312B-5 or 75S-3B, 32S-3, 516F-2, and 312B-4, also 30S-1 or 30L-1 linear. Or trade clean all original 1936 2D Pontiac Sedan, drive anywhere. Trade for KWM-2 outfit with 30L-1 or complete S-Line with 30L-1,/or $1800 cash for car,/or open to other offers. Richard Schark, K0ZBQ, 417 North Ferry, Ottumwa, Iowa, 52501.

MIX pleasure with pleasure at the Hamburg International Hamfest, Niagara Falls on September 21. For information contact Lin Brownell, WB2HCL, 210 Buffalo, Hamburg, NY 14075.

FCC test answers any class $2 Dixie Tec box-8352 Savannah, Georgia 31402.

FREE QSL SAMPLES - Samcards, Dept. Q, 48 Monte Carlo Dr., Pittsburgh, PA 15239.

Urgently need for school science project: Hammarlund HR-10 or SP600 VLF; any ARC-5 receiver especially BCB or 6-9; Rustrak tape and recorder. Call person-to-person collect, Bob Ammons, (406)-543-5359 or write 411 Keith, Missoula, Montana, 59801. Any reasonable price.

NAME BRAND digital test equipment. Discount prices. Free catalog and price list. Salen Electronics, P.O. Box 82, Skokie, IL 60076.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

LOOKING FOR old Lionel trains. Interested only in "O" 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. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

Did you know that supplements to the book, "CQYL," are available? They bring the book up to date with YLRL Officers through 1973 and the 6th YLRL Convention, held at Long Beach in May '72. If you have a copy of "CQYL" and would like to add the new supplements (the pages are "slotted" so they fit directly into the "CQ YL" spiral backbone), drop a note with your request to author/publisher, W5RZJ, Louisa Sando, 4417 - 11th St., NW, Albuquerque, NM 87107. Please enclose two 8 cent stamps to cover cost of mailing. The one and only book about YLs in ham radio, "CQ YL," contains 21 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.00 postpaid.

GREATEST of them all! That's the ARRL 1974 National Convention, sponsored by Hudson Amateur Radio Council. Remember the dates: July 19, 20, 21 at the Waldorf-Astoria, New York City. Three days of exciting events!! Wide array of demonstrations, exhibits and forums featuring latest in FM, SSTV, ATV, RTTY, FAX, Satellites, Antenna design, Transistors, Integrated Circuits, DX, MARS, ARPSC and much more. Something to do every exciting minute for YLs & XYLs -- Tours, New York sightseeing, visits to popular TV shows, Parties, Fashion Shows. Meet the ARRL president, Vice-Presidents, and all 16 Directors! Famous-name Speakers at Saturday Night Banquet! Everything for the Non-Ham, New Ham and Old Timer. For info, contact: ARRL Convention, 303 Tenafly Rd., Englewood, NJ 07631.

SELL: 3600-0-3600 xfmr at 1A, $30; 1.7A, $45, with 110/220 Pri. FOB, W0AIH, Paul Bittner, 304 W 17th St., Grand Island, Nebr. 68801.

FOR SALE: Swan 250-C with 117XC P.S., N.B. & V.O.X., Manual; $350. Like Factory New. Jim, WIVYB, (617)922-3850.

Clegg Zeus xmtr, $225; Hammarlund HQ-110AC VHF rcvr. mint, $165, Trade? WA1AEZ, 322 Cox St., Hudson, Mass. 01749.

ANTIQUE Flame Proof Key, Dated 1921, $12.95 PPD; W.E. Sounders, $25.00 PPD, or will trade for your duplicates. Walt Jacdson W5ZYA, 909 N.E. 11th, Grand Prairie, TX. 75050.

HIGH GLOSS QSL CARDS: From $8.95/1000. Full color catalogue, $1.00. Lijon Graphics, Box 48, East Longmeadow, Mass. 01028.

BOOKS WANTED: Radio Simplified What It Is, How to Build and Operate the Apparatus 1925 edition by Lewis Kendall and Robert Koehler. John Winston Co. Harpers' Electricity Book for Boys by Joseph Adams, Harpers and Bros.' 1907. Model Building by Raymond Yates, circa 1919. State condition and prices please. W9UKV, Maynard Faith, 1807 Tecumseh St., Fort Wayne, IN 46805.

FOR SALE: Swan SS100 complete, $500; FPM 300 mint at $300; Cent Elec 100V recond, $260, plus two towers, rotors, quad antennas, WA9WEN. 401 Briar Place Libertyville, IL 60048.

SWAP: Sourcebook of Electronic Circuits by John Markus/McGraw Hill for 19th edition of Radio Handbook. R.W. Skidmore, K8SVH, Box 436, Clendenin, WV 25045.

SELL: Sig. Gen. I-196A $4.00; Goldak model 87 pipe locator, $9 both as is; Need Crosley battery radio parts. Robert Ireland, Pleasant Valley, NY 12569.

TRADE: 50mm./f1.4 Takumar Lens, New for Heath HW-22A. Herb Bresnick, WB2IFV, 100 Hibiscus Dr., Rochester, NY 14618. 716-244-1132.

SWAP: Heath TV Alignment Generator, TS4 complete; for Heath HW 12 or ??. Write: WB0DHS, M. Marthaler, 103 G St., Marshall, MN 56258.

COMPLETE '72 QST, $3, plus postage. Oct-Nov-Dec '71 QSTs & CQ's all for $2.00 & postage. W2JBL 123 Davis Ave., Hackensack, NJ 07601.

SELL: 40 foot E-Z Way Tower, AR-22 rotor, TA32Jr. Ant. Pick-up deal, $150. WA2PPV, (212) RO4-9077.

WANTED: Swan 508 VFO. Donald Girard, RT, 5, Box 71, Chippewa Falls, WI 54729.

WANTED: CW Filter "MJF" etc., or DE101. NC McKamey, W0VFM, RR 1 Box 185, Bettendorf IA 52722.

WANTED: Dept. of Army Tech. Manual TM11-2229. Buy or trade. P.L. Lemon, 3154 Stony Pt. Rd., Santa Rosa, CA 95401.

WANT: In order, 75S3B/200, 75S3B, 75S3, Cash with or without 75A4/500. Must be guaranteed clean. Send details; 367 Northwest, Vacaville, CA 95688. All letters answered.

WANT: 2 mtr. FM xceiver. Swap never used Bolova oceonographer wrist watch; $125 value, and possible cash for exceptional rig. WB9HXZ, Bob Krueger 864 Hillside, Hickory Hills, IL 60457.

BRAILLE DIALS for the blind (at cost) on Drake Transceivers and Drake twins and VFO's. Remove knob, slip on Braille dial and replace knob, that's all. Please state model type. $2.00 ea. PPD Vernon Page, W8EXJ, 1969 Manz St., Muskegon, MI 49442.

FOR SALE: Fada model, 8-80 in good restorable condition, with 8 tubes, $50, plus shipping. James Fred, RR1 Box 28 Cutler, IN 46920.

FOR SALE: 4X5 Crown Graphic Camera with Kal Rangefinder, 162mm F4.5 Optar, 5 Holders etc., $195. Roger Mace, W6RW, 8600 Skyline Dr., H

FOR SALE: 4X5 Crown Graphic Camera w/Kalart Rangefinder, 162mm F4.5 Optar, 5 Holders etc.,- $195. Roger Mace, W6RW, 8600 Skyline Dr., Hollywood CA 90046.

WANT: Dial Drum for Heath TX-1, Apache. Also, Kcs dial for 51J3/4, filter conversion for R388/51J3. K6SDE, 20621 Canyon View Dr., Saratoga, CA 95070.

FOR SALE: 3-section triangular broadcast tower, 66 feet, 40-inch face, orange, with steps; $300. Palmer, K2FJ, (716)-652-7350.

WANTED: gpr-90 receiver. RCA WR-99A. E.H. Scott Philharmonic console cabinet. R.A. McNeill, Box 472, Yorkton, Sask., Canada, S3N 2W4.

WANTED: Northern Radio 115 VFO. Please state price and condition in first letter. WB4LPU, 406 Ellen Way, Brandon, FL 33511.

SELL: Galaxy 5MK3 xcvr, Dac 35 deluxe console with built in power supply, RV550 remote VFO. WA0MHJ, 14519 Lake St., Minnetonka, Minn. 55343.

WANTED: Call letter license plates for collection. I'll pay postage. Art Phillips, WA7NXL, 3401 N. Columbus Blvd., Apt. 5-0, Tucson, AZ 85712.

BUY OR TRADE: CQ's, QST's, Call Books for early radio receivers, transmitter & wireless parts & catalogs. Have 20 receivers to trade. ERV Rasmussen, 164 Lowell, Redwood City, CA 94062.

MAGAZINES FOR SALE: CQ/73/QST/Ham Radio Send SASE for list. E. Guimares, RFD 2, Box 480, Middleboro, MA 02346.

TRANSFORMERS REWOUND: Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806. (305)425-7251.

GOTHAM BEAMS: Never used, 4 el 20m-5el 15m, 7 el 10m; $25 ea. All 3 for $70. Heath Balun, $7.50 IP-17 Heath Reg. H.V. Power Supply, New, $70. Lotsa goodies for SASE. Art Messineo, W0NSA, Cloud 9, Smoky Rd., Tecumseh, MO 65760.

NEED: Receiver tuning cap. for Knight TR-108 C-8 Part No. 286-104 TRW No. 273-6707-293. WB2OZA, 716 Calhoun Ave., Bronx, NY 10465.

SELL OR TRADE: GSB-1 SSB adapter Excellent $85; New 4-250, $25 each; TV test equipment: RTTY 15, 19, 14; Some old tubes, 56-57-27-etc. L.G. Basham, W7TCT, 735 Caves HWY, Cave JCT, OR 97523.

FOR SALE: P&H Audio Compressor AF C-2, (new) $25; Johnson Audio Compressor, 250-33-$30; Eico 730 Modulator, $25; HQ 170C & spkr; $150; Vibro Keyer, $12; all FOB. A.B. Lawson Jr., K4IOP 1325 Highland Rd., Chattanooga TN 37415.

FOR SALE: Hammarlund, HQ 110, $80; Swan 1200W, $200; Sitronix 1011B, $350 and more. Big John, (213)939-6468, or P.O. Box 4158, N. Hollywood CA 91607.

WANTED: Chassis and cover for Swan FM 2X Power Supply. Will consider complete unit working or not. J. Arnone, K2MZE, 46 Copiague St., Valley Stream, NY 11580.

FOR SALE: Hard to find car radio vibrators and tubes. Write needs. James Fred, RR1, Box 28, Cutler, IN 46920.

WANTED: Radio news magazines prior to 1923. Millen 92200 Transmatch. RCA WR-99A Marker Generator, R. McNeill, Box 472, Yorkton, SASK, Canada, S3N 2W4.

WANTED: CV89/URA-8A manual, national 5880-AB power supply, SW-3 series 10 coils, B&W 51SB, and a telegraph sounder. George Marts, 4201 Colvin Drive, ST. Louis, MO 63123.

DRAKE SALE: R4B, $325; TR4 with noise blanker, $450; D.C. Power Supply, $79; A.C. Power Supply, $75. All equipment excellent condition/in original packages. Leonard White, WA2LFR, 14 Trescott Path, FT. Salonga, NY 11768. (516)269-3981.

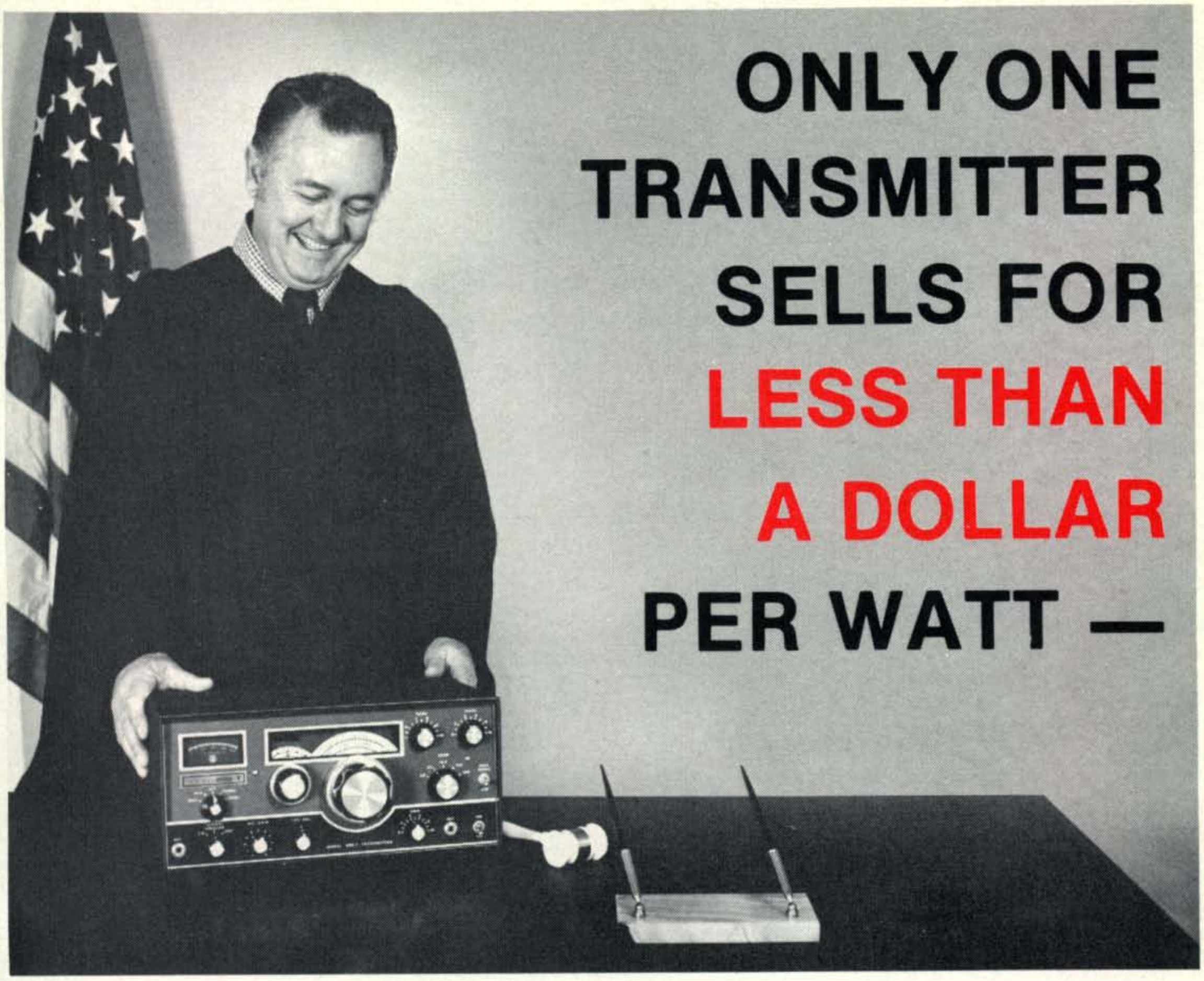
SELL: HQ170 ACVHF Rcvr., Mint, $250; HT-37 xmtr, SX-101A Rcvr., both excellent, $130 each. Dick Spahl, K1SYI, Lake Parkway, Webster, MA 01570. (617)943-2505.

XYL SEZ "El Junko" (WA0ZFC) must move 75,000 lb. Junkbox or else! SASE 131 Beaver Ave., Colorado Springs, CO 80906.

FOR SALE: SR-2000, P-2000, $750. Late 75A-4, 3.1 & .5, $350. Both Mint, no Mods. Don Burns, 4410 Reading Rd., Dayton, OH 45420. 513-256-0345.

NUMBERED HAM SENTENCES in 54 languages for you to copy! K3CHP's DX QSL GUIDE. $3.95, Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

WANTED: Robot Fast-Scan SSTV Monitor. Sell: Heath DX-100. Mike Ludkiewicz, WIDGJ, 143 Richmond Rd., Ludlow MA 01056.



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There are five transmitters available to amateur radio operators today providing 5-band coverage in SSB, CW and AM modes. Of these five, only SWAN's 600T supplies 600 watts P.E.P. input. Among the others, one has 240 watts P.E.P.; two have 200 watts P.E.P. (one of these requiring an accessory power supply); and one is a kit capable of a mere 180 watts P.E.P. input.

Compare the cost per watt, then judge for yourself as to which is the best value: The kit retails at $1.67 per watt; the 240 watt unit is $1.41 per watt; the 200 watt rig with the power supply built-in runs $2.30 per watt, while the other 200 watt transmitter costs $2.65 per watt by itself or $3.15 per watt if you buy the power supply recommended.

Now consider the economical SWAN 600T — it gives you a full 600 watts P.E.P. input, about three times the power of the others, for **JUST 98¢ PER WATT!**

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600T	Transmitter	**$589.95**
600R	Custom Receiver with SS-16B filter	**$615.95**
600S	Speaker	**$ 24.95**
600SP	Deluxe Speaker with FP-1 phone patch	**$ 69.96**
510X	Crystal Oscillator	**$ 54.95**
VX-2	Automatic Voice Control	**$ 44.95**
MARK II	Linear Amplifier (2000 watts P.E.P.)	**$749.95**

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FISHERMEN: Attract fish to your line with our transistorized electronic fish callers. Small, lightweight and battery operated; $4.00, ppd. Will swap one or more for any Ham Gear. James Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

SELL: BC-348 RCVR with AC; $40, Heath V7, A VTVM; $15, Heath GR-91 RCVR; $15. WANT: RD-92 FAX recorder, storage CRT. WA5NQE, 701 Carolyn Ave., Austin, TX 78705.

FOR SALE: HT-32 Transmitter; $175. Ranger Transmitter; $95. New Matchbox Johnson 275W for $70. NC-303 Receiver $225. SX101 Receiver; $125. Sig Tracer; $20. New Drake W4 Wattmeter; $50. New Eico 12V supply; $55. CQ, QST, Radio News, Electronic mag. Offer. Melvin Dupont, 15 Fitchdale Ave., Bedford, MA 01730.

FOR SALE: Swan 250-$195; NS-1-$22; Bird Thruline watt meter Mod. 43-$60; New Eimac 4CX-1000A Factory Sealed-$75. R.C. Richardson, 1109 Dakota S. E. Albuquerque, NM 87108.

WANTED: 1500-800-500 Cycle filters for Collins 75S-3B. WA9UCE/6-Rafferty, 555 W. Middlefield MT View CA 94943.

WANTED: Deforest Audion Triode, with two leads on top and candelabra screw type base. W9LGH, 610 Monroe Ave., River Forest, IL 60305.

WANTED: Brand New 572-B's. W8QX, P.O. Box 452, Birmingham, MI 48012.

SELL: G.E. FM Remote console 4EC28 $50. Lab Sig Gen TS 452 5-100 MC $35, WANT: Heath SB-610/SB620 Mon. K6KZT, 2255 Alexander Ave., Los Osos, CA 93401.

WANT: Ham-m or TR-44 Rotor-TRI Band Beam. SELL: HT-9 Xmtr $40. F1.9 8mm camera, $49. Walt W9AOL, 349 Eggleston, Elmhurst, IL 60126.

SALE: Clegg 22'er FM, Tunable receiver, power supply built-in like new. Full of xtals, & manual included. Best offer. K3YMN, 2185 Sampson St., Pittsburg, PA 15235.

WANTED: 30 Ft.-40 Ft. Tilt-Over or Crank-Up tower. Norris Preston, W01DD, 313 East Chicago Street, Marceline, MO 64658.

FOR SALE: OMEG-T Noise Bridge, model TE7-01. like new with instructions, less battery; $20.00 W3HUS, RD1, Box 103, Malvern PA 19355.

SELL: Round Emblem 516F2 Collins Power Supply, $125; 312B5, $375; Polaroid with beautiful black case, $65. no. 100 will buy KWM2 or 2A. (215)884-6010, WA3IFQ, Marty.

TRADE old radio programs on cassette tapes. For information, Cassette Swap, 1705 Kaywin Ave., Bethlehem, PA 18018.

FOR SALE: H-P 3302A Trigger/Phase Lock plug-in, $60; H-P 525 Frequency converter unit (100-220 Mc), $40; L. Hamilton, K6JVE/3, 9019 ST Andrews Place, College Park, MD 20740.

WANT: 4CX1000 socket and 2 mtr xverter, CX7 w/FSK & delux cw lilt, offer? Ken, WA2KAT, 214 Paradise Lane, Tonawands, NY 14150.

WANTED: Old parts, sets pre electric days. Also catwhisker crystal sets. Describe with price to: WA4NED, Box 468, Gainesville GA 30501.

WANTED: Series 12B2 Control for CDR TR-4A Rotor. WB4CQC, John A. Foster, Box 97 Petersburg, TN 37144.

SELL: Very good NCL-2000 Linear. First Cashiers check or money order for $325.00. $10.00 off if you pick up. Would consider a deal for a FM-27B or a SBE-144. Robert L. Sapp, WA0TSP, P.O. Box 239, Creston, IA 50801.

WANTED: Instructograph and tapes plus Heath Digital Clock. Tom Dornback, K9MKX, 2515 College Road, Downers Grove, IL 60515.

FORT WAYNE amateurs join the oldest club in your city. Just call WB9LJC, at 484-2783 for information.

RETURNING TO COLLEGE SALE: Heath PM-2 mobile tuning meter, $5; Heath IM-17 solid state voltmeter, $15; 1250 watt gasoling power plant, less than half new price. WA5ETK, 817 West 11th St., Littlefield, TX 79339. (806)385-4167.

HEATH HW 100/AC pwr; HW 12/DC pwr; HW 17 FM adapter; HW 16 with VFO priced to sell. Pick-up only. K5ROZ, 2025 Coronado, Orange TX 77630.

WANTED: Hi-gain 18 AVT/WB vertical antenna. WB5JXH, 7620 Springwood Dr., El Paso, TX, 79925.

SELL: New TR switch, $10; new 0.1 watt commercial 2m FM xmitter, $30. Used Heath twoer, $25. W5QNQ, 2025 O'Donnell, Las Cruces, NM 88001.

PAIR B&W Balun Coils, $12. Monarch Dual IMP DYN MIKE and Stand, $11. Weston 476 AC Boltmeter, 250 V, $12. G. Ruiffs, RFD 1, Sebago Lake, ME 04075.

RECEIVERS' FM SCA Multiplex for background music. McMartin & Browhing. $25 to $65. SASE for specifications. W4JGO, 643 Diamond Rd., Salem, VA 24153.

FOR SALE: Six meter Telrex 4 element beam, $10. WA2PCL, 101-23 Lefferts Blvd., Richmond Hill, NY 11419. (212)849-8458.

WANTED: Relay racks, enclosed types in good shape, standard width and depth. WB8NLM, 993 N.E. Catawaba Rd., Port Clinton, OH 43452.

WA2GLU/5 - NEW QTH. 6 Yale Circle, Richardson TX 75080.

WANTED: A T33 antenna with rotor and cables or it could be a T33 Jr. but preferably a tri-bander beam, 10-15-20. WE5DW, 939 Normandy Dr., Moose Jaw, SASK. Canada.

WANTED: Heath DX-60B, HR-10B, HG-10B, HRA-10-1, HM-102, HN-31 & SB-600. You pay for shipping. All must be in good to excellent condition, w/ manuals. Will pay between $150-$175. SL Ballinger, 11 Lown Court, Pough, NY 12603.

FOR SALE: Collins 516E-1, D.C. supply for KWM-2, 2A, $75; 351D-2 mobile mounting bracket, $65; MM-2 mobile headset with boom mike, $40. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York, 11050.

HELP! Last year I read an article on Solar Heating, article mentioned black plastic extrusions, available from California Firm. Can't find it now. Send name or article information to: K5VYY/5 3728 Wilkie Way, FT Worth TX 76133.

New Jersey QSO Party will be held on August 17, and 18. Englewood ARA, 303 Tenafly Road, Englewood, NJ 07631.

SWAP: NCX-3 w/Homebrew power supply, for all band receiver. Local pick-up only. RD Swift, W1CZM, Stockton Springs, ME 04981.

FOR SALE: 19" Jack Panels complete with 24 Jacks; $10. Goodman, 5826 S. Western Ave., Chicago IL 60636.

HEATH SB101 and HP-23 power supply. Best offer. WA2AUB, 220 Pinebrook Blvd, New Rochelle, NY (914)235-4940.

FOR SALE: Star 700 rcvr & Star xmtr, 300 wts, PEP 80-10 mtrs, excellent condition, cost $950 yours for $395. Silbert, White Sulpher Springs, NY 12787.

FOR SALE: Transtenna Mod. 102A T-R Switch, like new, $40. CEI Audio Compressor, $18. HW-30, $20. A. Emerald, 8956 Swallow Ave., Fountain Valley, CA 92708.

SWAP: RCA CMV-3 carfone, 52.525 simplex and .76-.64 repeat xtals complete with head, mobile antenna and cables for similar 2MFM rig or $75, cash. K3MGO, (215)374-9342.

SELL: Hallicrafters, No. HT44 xmtr, P/S 150-120 ES manual; $175. Roger Motta, III Kentucky Ave,; Warwick, RI 02888.

SELL: R.C. Heath GD-57, Freq. 53.4MHz, $80. SB-10, $35; RME pre sel. $10, and H.B. gear. no shipping. Bob Grill, W6NGA, 2464 N. Strathmore Ave., Rosemead, CA 91770. (213)280-0945.

WANTED: Old radio parts, magazines, service manuals, etc. B.C, wireless and short wave radios prior to 1932; any condition. Will pick up within 400 miles. Please give lowest price and description in first letter. W2GHF, 45 Allen Dr., Woodstock, NY 12498.

FOR SALE: Drake TR-4C, 34PNB, AC-4, MS-4, Factory Warranty; $625. Russell, 19680 Mountville Dr., Maple Hts; OH 44137. (216)662-2175.

WANTED: 24 hour clock conversion kit, PL-26380-G1 for HQ 180 Receiver; also, modulation transformer, p2429, for Johnson Ranger 1. Walt K7HGZ, 6410 W. Sells Dr., Phoenix AZ 85033.

SELL: Hammarlund FM50, 2m xcvr 6TXRX Mic, cables, base antenna, crystals for 3 ch., $150. WB9AMI, Box 128 Pittsboro, IN 46167.

FOR SALE: HQ129X Gen Coverage Rcvr, BC-30mc with prod. det., $60. WJ Kinne, 1163 Ingerson Rd., St. Paul, MN 55112.

SWAP: Motorola Rcvr FM, no. FMRU 16V and FM XMTTR no. FMTU 30DC with tuning head & Motorola Handbook and .94-.94 xtals; as is for equipment of equal value. I.E. $60.00, WA9YOZ, 4259 Harrison, Gary IND 46408.

SELL: Clean Heathkit Gear; SB-102 w/400Hz cw filter. SB-600 spkr. & HP23AC power supply. SB-650 frequency display, with manuals, $550; firm or Trade Yaesu FT-101. Bill Pritchard, 1 Jamros Terrace, Saddlebrook, NJ 07662.

WANTED: Power transformer for precision apparatus co. model ES-550 oscilloscope. K4TP, 618 Hillcrest Ave., Gastonia, NC 28052.

FOR SALE: Allied AX-190 Solid State Receiver Collins mechanical filter, HCD Detector, Extra crystal, with matching speaker, $180. Heathkit IM-22 Audio distortion analyzer, like new; $25. W. Bolin, Box 2784, Lancaster, CA 93534.

HAVE a NC81X Receiver & Speaker, will sell as antique. Working condition. Won't ship. TRADE: for 10-20-40-80-Transceiver 20-40w. HenryClayton 3248 Walnut St., Thorndale PA 19372.

SELL OR TRADE FOR HAM EQUIP: Lab and test gear; bird; H-P, GR, AIL, etc. SASE List. W4API, Box 4095, Arlington, VA 22204.

FOR SALE: SSB Transceiver: National NCX200 80 thru 10M with P.S. Mint condition with manual $225. WANT: Hustler 20M mobile resinator, Heath line voltage monitor, Heath soldering iron. T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

FOR SALE: Millen ant bridge new, $40, Daven step attenuator, $20, tape amplifier, 10, G.E. progline 12v P/S, $8. K6KZT, 2255 Alexander Ave., Los Osos, CA 93401.

FOR SALE: Collins 75A4, no. 2308; $225. Collins 75A3 no. 303; $175. Would consider trading for SSTV gear Venus, Robot Etc./or Drake R4B, R4A. WANT: BC458 or similar VFO for CE20A, no junk. Gary D. Elliott, K4IRQ, 29840 SW 172 Ave., Homestead, FL 33030.

WANT: Good Tri-Band SSB transceiver complete; Give cash or trade. Mint US Stamps. LB Fuqua Box 6, Eddyville, KY 42038.

CASH for incomplete Tx and Tcvr projects. Details first letter. John Conley, W7ZFB, 605 Cherry, Vandenberg, CA 93437.

SALE: HT-37; $150, SX111; $75, A-1 shape, Mic turner 911. Call W1FZY, (617)249-9890.

SELL: Alltronics-Howard Model "K" RTTY converter in excellent condition, $75. A.E. Johnson, K1IIK, Box 77, West Dover, VT 05356.

WANTED: Used Drake DC3 power pack and MC4 console; give condition and price FOB LA, W6CHU 5141 Lincoln Ave., Los Angeles, CA 90042.

WANTED: Ameco All Band converter model CMA 160mtr 175mc. Billy Mobray, K5YBQ, Box 1, Keyes, OK 73947.

WANTED: Singer Panalyzor SB-12 Complete; State price and condition. L.T. Evans, 1900 W. Beverly Blvd., Los Angeles, CA 90057.

FOR SALE: R390/A Receiver, $425; Local only. Sy Kramer, 120-8 Erskine Pl., Bronx, NY 10475. (212)320-2764.

SELL OR TRADE: Ham magazines; SASE for list W4NUL/6, 109 1rst St., Travis AFB, CA 94535.

WANTED: Manuals and Diagrams on Equipment made by Link Electronics; Fred Link or Link Corp. Write Price. Folger, 8215 Water St., Garrettsville, OH 44231.

WANTED: Any equipment, books, or manuals on cryptography. L. Kruh, WN2TSD, 17 Alfred Rd. W. Merrick, LI, NY 11566 or call collect, (516)-378-0263.

WANTED: Heath HD 10 or Vibroplex Key; John, 7602 Springwood, El Paso TX 79925.

FOR SALE: DX-100 xmtr., $80; Ameco Tx-62 xmtr, $80. Both good condition; no shipping. F. Kurz, P.O. Box 347, Zion IL 60099.

FOR SALE: Sixer, $29, Soundsign stereo system & turntable, $150. Bob Sherman, K2SJP, 350-65th St., Brooklyn, NY 11220.

MARYLAND AREA HAMS: Listen for W3MSN, Six & 2 SSB or CW-223.5 and 446.0 MHZ FM. Larry Briggs, 5108 Boulder Dr., Oxon Hill, MD 20021.

FOR SALE: Wheatstone Perforator Conversion Kit, 106943; $10.00. WPE3/WPE 17. K2MVR, (201)429-8880.

TRADE: HW-7 and HWA-71 P/S for Heath HX-20, WA7WKW, 3825 N. Nellis Blvd., SP 27, Las Vegas NV 89110.

STORE COUPON KLINIC! Info for SASE to:- Stock, K4CLA Rt 5 Box 111A Oak, Lexington, SC 29072.

FOR SALE: Model 28KSR, $300. Model 28ASR, $750. Model 28TD and typing reperf set, self contained units with gear shifts, $350. Model 15KSR, $70. Send SASE for complete listing RTTY equipment. L. Pfleger, 10615 W. Ridge Rd., Apt. 54, Hales Corners WI 53130.

SELL: 6P coax waters switch, $5.00. Turner 350C Mobile Mike, $6.00. Monarch SWR Bridge, $9.00. Heath SWR Bridge, $5.00. Johnson 50 OHM KW Lo Pass, $8.00. 45CFM 220V Blower, $6.00. Commercial 15KV/2A Bridge, $15.00. Sorenson 500W line regulator, $25.00. Mel, 7423 Oso Ave., Canoga Park, CA 91306.

SELL: Galaxy V MK3, AC400, RV-1 VFO, Heath twoer, Globe V-10 VFO, Hallicrafter HT-40, other items. SASE for list. FM Strickhausen, 2931 central Park Apt. 38, Topeka, KS 66611.

FOR SALE: Swan 500 & 117CX power supply, Mint, $420 5" GE Scope, $35; RTTY Station; TV test Equipment; Send SASE for info. LG Basham, 735 Caves Hwy, Cave JCT, OR 97523.

FOR SALE: Johnson Viking 6N2 and VFO with home brew MOD., $75. K6THQ, 1205 Clovergien Dr., Valinda, CA 91744.

SELLING: Surplus equipment and parts. Spectrum analyzers, oscilloscopes, new. List SASE. J. Lisaius 116 Orton Rd., W Caldwell, NJ 07006.

SELL OR TRADE FOR SSB XCVR: Motorola HT 220 6 frequency charger 4 batteries, 2 antennas & case, etc. Mike, WB8EQQ, 7519 Dorr Toledo, OH 43617.

FOR SALE: SST tunner, $15; Globe chief, $30; TBS50, $20; HQ100, $75; BC221, $30; T18T19T 20T22BC457, BC459 Arc5, $10, each. Box 8352 Savannah, GA 31402.

WANTED: For boys Club, Technical books, Magazines, & courses. E. Ezekiel, 43/2 Shaviv, Herzlia 46-221, Isreal.

FOR SALE: Kenwood TS900, PS900, 4 months old, new condition; $700. L Iannone MD, 404 Bloom St., Danville PA 17821.

WANTED: General coverage rcvr. SPR4, R530, etc. Mint condition, give price. John Mierzwa, 1430 Dartmouth Dr., Bethlehem, PA 18017. (215)865-4057.

WANTED: Heathkit Model AT-1 in good working condition. W5SYH, F. Salamon, 1905 So. 16th St., Rogers, AR 72756.

WANTED: Manual for receiver R417A/TRC and amplifier AM 913/TRC. W5SRO, Rt. 3, Box 18C, Norman, OK 73069.

FOR SALE: Motorola-1 freq. receiver, 2 xmit, $40; ARB receiver LW thru 9.01 MHz, $25; Heath Q-mult, $4.00. WA4BPE, Jim, Rt., 3 Lake Circle-Dr., Stuart, FL 33494.

WANTED: Grebe CR9 or CR13 & 2 Stage Audio Amp., Old AK breadboard receiver, Collin Kennedy 220 & amp., (for display only, I'm not a collector). Wells Chapin, W8GI, 507 Franklin, Kingsley, MI 49649.

SELL-SWAP-OR MAKE OFFER: SBE-144 and Hustler 5/8 wave antenna. Ken Hand, WB2EUF, Bridgehampton, LI, NY Box 246, 11932.

WANTED: Mint KWM-2, FOR SALE: Galaxy GT-550, RV550, F-3, AC400 PS., SBE 34, SB2LA, Mike. Hunter 2000B Amp., 2 meter Lunch Box. AF 67. Manuals, all mint. W0STH, (515)322-4464, Corning, Iowa 50481.

CLEAN GEAR WANTED: Will pay cash for KWM2 with noise blander and A.C. and D.C. supplies. Same for continous .5 to 30 MHz receiver 115V supply. No junk. W9UJ, 215 Lake Bluff, Oakwood IL 61858.

CALCULATOR: Latest model MITS no. 908M. Slide rule type w/square, roots, reciprocal, %, memory, float of fixed decimal, round-off, negative numbers. Xmas present, brand new. Cost $129.95, sell, $80 pp. H. Marhoff, P.O. 569 Largo, FL 33540.

WANT: Collins KWM2 or 2A. SELL: A Collins 312B5. Call Mon. to Fri. 9-5 (215)289-8050. Lee.

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Here is all the dynamic powerful performance needed to punch through QRM, *without an accessory amplifier.* SWAN's 700CX Champion transceiver lets you enjoy a more responsive value-packed ham station, for less cost-per-watt, than any other rig in its class . . . less than 86¢ per watt if you have your own power supply . . . less than $1.05 per watt with SWAN's 117-XC deluxe AC power supply with matching cabinet and built-in speaker . . . and, less than 98¢ per watt with the 117-X AC power supply.

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WANTED: Used amateur equipment AM, CW, SSB or what have you! In any condition. WA8ZCO, 16245 Beechwood, Birmingham, MI 48009.

BEST OFFER: Plate transformer, 2580 volts C.T. 600 V.A. W0VUU, 4108 Wooddale Ave. Minneapolis MN 55416.

SELL: Heathkit; SB-303, SB401, SB-220, SB610 SB-630, SB-600; Best offer over $850. RD 1 Box 195A, North East, MD 21901.

WANTED: HA26 VFO, 2 mtr FM mobile, Communicator III or IV, need not be working. Bob Krueger, 8864 Hillside Hickory Hills, IL 60457, WB9HXZ.

WILL PAY- $200 for good working CV-483/URA-17 group. This is converter only. George Tate, 306 Thornwood Drive, Taylors, SC 29687.

SELL OR SWAP: 30 watt 150MHz FM units. No accessories; Bendix 1 R-54 with TX/RX schematics. K8HWW, 33727 Brownlea, Sterling HTS., MI 48077.

FOR SALE: Collins 30L-1 Linear (1968), $375. 212B-4 control (1970), $160. Prefer Dallas/Ft. Worth sale. Len Hoops, 1704 Glenn, Ft. Worth, 76131.

SELL OR TRADE: Heath Kit 2-meter transceiver model HW-20. Transmitter works. Receiver does not. WA6AHF, 17494 Via Alamitos, San Lorenzo CA 94580.

FOR SALE: Viking Challenger transmitter, 80-6 with manual, $50.00. Excellent condition. 201 E. 59th St., Westmont, IL 60559. WA9AXA.

SALE: Lafayette HA-800 Ham bands plus six meters receiver. Same as brand new, used less than five hours, $70 postpaid. K8OUQ, 268 Annis CT, Chillicothe, OH 45601.

FOR SALE: Swan 14C DC module, $35; FP-1 patch, $35. Galaxy RF550 Wattmtr/ant sw/swr, $49. All Mint, WA3RCN, (215)885-4365.

FOR SALE: Transmatch, 2KW, Heavy duty components, Built in SWR and power bridge, $125. McCauley, WN6ELA, 10320 Calimesa Blvd. Calimesa, CA 92320.

NATIONAL SW-3 RX W/Coils 160-10M. Early books, handbooks, mikes, tubes, meters. SASE for list. W. Hambleton, RD 1 Box 373A Milford DE 19963.

FOR SALE: Collins KWM-2, 30L-1, power supply, speaker, cables and manuals, $995, or best offer. (216)896-1371, after 6 pm. Randy Haefka, 295 Skyview Drive, Akron, OH 44319. WB8MVX

FOR SALE: Collins 310B-1, $95. Peter Butler, W1BPW, 3 Elizabeth Dr., Merrimack, NH 03054 (603)424-7373.

FOR SALE: Triplett Modulation Meter 1696A. Carrier & % MOD-Meters 117V-60 cy power supply $15, plus shipping; Harold Mohr, K8ZHZ, 886 Taylor Rd., Gahanna, OH 43230.

WANTED: 6156 or 4-250A, also 811A's-12MF-700 volt electrolytic. J. Nelson 9614 N.E. 3rd St., Vancpiver. WASJ 98664.

WANTED: One new PL175A, Penta tube or two good, low hour used tubes, W4TM, LK Rush, 309 Walnut, Jackson TN 38301.

FCC 1rst and 2nd Class Questions for Memorization, $5.00. Autopatch Systems, Box 291, Western Springs, IL 60558.

LINEAR AMPLIFIER: Gonset GSB-201, 1500 watts pep SSB, 1000 watts CW, 400 watts AM, 4-811a's, used only 8-10 hours, mint condition, in original carton, like new, $285, firm. Pick-up or pay shipping. Ed, WB2TYR, 21 Hill Rd., St. James, LI, NY 11780.

FOR SALE: SX101A receiver, $130; D104 M.c. $15; Gonset 201, $160. WANTED: Drake MN 2000-L4B-C-4-DC4. WA2KXA, JL Stier, 75 Carwall Ave., Mount Vernon NY 10522.

FOR SALE: Voltage Cells, Lab. std., Weston model type 4, $7.50 each., Cell mounts for above, $2.50 each. Add PPD W4JGO, 643 Diamond Rd., Salem, VA 24153.

TRADE: 51S1 Collins all band receiver for Collins S Line-late model-even. J.P. Ashcraft, WB5BFZ 5641 Dyer St., Dallas, TX 75225.

SELL: Polaroid no. 100 Camera, photoflash plus beautiful black leather fitted case. $65. (215)-884-6010.

SELL: Special Power Supply and speaker for Drake T4XB. Gives higher output and better linearity, $40. David Schwartz, 1183 Southeast St., Amherst, MA 01002.

FOR SALE: AC adapters, 6VDC 150MA, Standard plug, brand new, $3.00. PPD. K2MFY, 2 Nutley Court, Plainview, NY 11803.

SELL: Heath HW16 Xcvr, HG10B VFO, $110, FOB. Eico 666 Tubetester/610 Adapter, $25, FOB List SASE. WB9BXX, Box N, Gridley IL 61744.

DRESS UP YOUR SHACK with large 24 hour wall clocks. Battery or electric. Top quality. Write for info. WB5BNM, 1524 N. Oklahoma Ave., Shawnee OK 74801.

SELL OR TRADE COMPLETE COLLECTION: 349 issues, "Radio News", Vol 1 no. 1 July, 1919 thru final issue July 1948, for good late model transceiver setup as TR-4 with accessories or?. Write, Bob Farmer, 3113 north Columbia St., Plainview, TX 79072.

NEED: EICO Keyer Model 717 instruction manual .....will copy and return via first class mail, help! R.E. Myers, K3HWL, RD1 Oakview Dr., Meadville PA 16335.

BACK TO GRADUATE SCHOOL: Must sell Hallicrafters SR160 Triband Xcvr, w/AC-DC, mike, $160. Micronta VOM 30Kr/V, $10. Raytrack electronic volume compressor, solid state, $30. Ameco 6M preamp, $8. WB5BAM, Rt 1, Box 225C, Breckenridge, TX 76024.

FOR SALE: German Crockery beer mugs, 1 quart capacity with brewery insignias; $3.50, each. Shipped. C. Smith, WN4UCC, Box 543, Conyers GA 30207.

FOR SALE: DX Speech processor for KWM-2, model LC-1-KWM; $50, Heath 0-10 Scope, $10. W4OZF, R.D. Patten, 2311 Nassau Dr., Mirmar, FL 33023.

WANTED: Six meter SSB or AM xcvr. Any power or model considered. Bill Hughes, RR 6 Box 174, Bloomington, IN 47401.

WANT: Clean MS-4 speaker, also good audio type cw filter. WB9JHS, 6092 Chase Ave., Downers Grove, IL 60514.

WANTED: Late model Motorola and GE radios, also good quality communications test equipment. Robert Bliss, 1440 Lakeview Ave., Minneapolis, MN 55416, (612)377-1171.

SELL: Radio shack, Archer Super Maxim C.B. ant. Brand New; $15. Feely, 15 Locust Hill, Yonkers NY 10701.

NEED: COSMOPHONE 35 manual/schematic, for copying. Return guaranteed. Amateur Radio Club K6LY, Naval Postgrad School Code 52, Monterey, CA 93940.

SELL: Drake R4-B, Exc. Cond., $300.; B&W 6100 $200. B&W LPA/LPS, $200. All equipment now on Air. W3GID, Box 396, RR no. 1, Furlong, PA 18925.

WANT: Drake W4 Wattmeter; Vertical mill, millrite, clausing, Bridgeport etc. Tappehorn, 2536 Kings Highway, Louisville, KY 40205.

WANT: Heath Dipper GD-1B. Will trade mid 20's Fada Neuter dyne radio, no spkr, for 80/40m ham gear. Rink, 1705 Windsor Way, Tampa, FL 33619.

TRADE: '59 Rambler wagon, one-owner, 6cyl, ('65 eng.), auto trans, owner & shop manuals. W1GSW, J. Pastor, R4, Phyllis Lane, Newtown, CT 06470.

FOR SALE: Signal one, $995. Drake L4B, $495; Heath HM-15, $15; SB610, $60. W1UH, 15 Selden St., Waban MA 02168.

TRADE: GTX-2 30 watt 2 meter solid state FM with 20 xtals, mike & manual, or Heath 10-103 scope. Unopened box, for SB-200 type linear. Rob Pohorence, 2334 Regal Court Lawrenceville, GA 30245.

WANTED: Cassette recorder, miniportable w/built in mike, auto-stop, Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30328.

FOR SALE: Mint SSB transceiver with AC supply National NCX-200, $250. WANT: Hustler 20m resinator, Heath MP-10 converter, Swan speaker phonepatch & VFO. T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

SELL: Mini-Quad HQ-1 with AR-22 rotor, $75; you pick up or pay shipping. WB5HBO, 4033 Dublin Corpus Christi, TX 78413.

TRADE: Battery Radio for 1926 Kolster table model, no speaker, no tubes. WANT: Ham gear or? WB2CFF, 124 East Ave., Hornell, NY 14843.

SELL: Swan Cygnet Model 270, SSB transceiver practically new; $250. W. Gorner, 11955 Viejo Camino, Atascadero, CA 93422.

WANTED: Communicator two meter receiver, W6OJF, 9337 Gotham St., Downey, CA 90241.

WANT: Old radio parts; telegraph & code keys. TG Soukup, WA1AWX, 161 Bob Hill Rd., Ridgefield CT 06877.

DX—PEDITION XYL approved? Montserrat W.I. House in tropical setting, pool, maidservice. Box 1077, Elmira, Ontario, VE3FHO, Dr. K.H. Hollatz.

MAKE OFFER: BC453-200/500 KHZ receiver. Set FT241 Xtals 27 to 38.9MC. 60 FT 243 6 to 8.5 MC. 1000 KC. 2K25 Klystron w/mount. K5RME, P.O. Box 74, Ingram, TX 78025.

FOR SALE: Counter-Heath IB-1101. Up to 112 MHz; $200. Motorola two meter crystals. Harry McCollum, K5FPI, 1010 W. First St., MT Pleasant TX 75455.

FOR SALE: Old instrograph in good condition top cover is missing, $10.00 plus UPS Shipping. James Fred, R 1, Cutler, IN 46920.

FOR SALE: Hallicrafters S-36A AM FM receiver, 27-143MHz; $30. Pick up only, WN2HHB, (516)-731-3868.

FOR SALE: Signal Corps Surplus Communication Equipment Catalog, 25cents. Colonel Wayne D. Russell, 9410 Walhampton, Louisville, KY 40222.

FOR SALE: Robot SSTV & Accessories, like new $200, off, list SASE. Also VHF/UHF gear, trade. W4API, Box 4095, Arlington, VA 22204.

MUST CLEAR OUT: Swan 350/pwr supply. Extra pair matched finals. Factory checked and mint operation; manuals. C.L. Meistroff, 7410 Chamberlayne Ave., Richmond, VA 2322.

FOR SALE: SBE-34, just factory aligned, mobile mount, mike, and Box, $225, also NCL-2000 Linear, $325. Both in excellent condition. Bank Draft or Money Order; $10 less if you pick up. Robert Lee Sapp, WA0TSP, 609 South Cherry Creston, IA 5081.

WANTED: Ham Radio magazine issues; Mar, July, Sept, Oct, Dec, 1968; Mar, April, Dec, 1969; Jan, Aug, Nov, 1970; Jan, Mar, Apr, 1971; Jan; Feb, Mar, 1972; Feb, 1973. Frederick Wasti, K1PUA, 470 Forest Ave., Brockton, MA 02401.

WANTED: Used TH-6 beam. W6MRK 29319 Golden Meadow Dr., Rancho Palos Verdes, CA 90276. (213)377-8657.

FOR SALE: Unique Wire Tunner, like new, $45, Box 8352 Savannah, Georgia, 31402. F. Sheehan.

FOR SALE: Heath RX-1 receiver w/spkr, $100; Heath HG-10B VFO, $35; Heath HD-10 keyer, $20 Walter Briggs, WA2MQF, 25 Jill Terrace, Succasunna, NJ 07876.

JOIN: World's biggest DX & Awards Hunters' Club, CHC, Over 1000 awards listed in CHC Awards Directory, $5. P.O. Box 385, Bonita, CA 92002.

WANTED: Archie Digest no. 1. VE6UP, C. Kropinak, 513-19 St. north, Lethbridge, Alta, Canada T1H 3K6.

SELL: Atlas crystal lapping machine complete w/ many lap carriers, like new condition; $130 FOB Temple. W5AMK, Box 96 Temple TX 76501.

WANTED: Collins 30S-1, 75S3-B or C, 312B-4, and C.W. Filters; WA9UCE/6, 555 W. Middlefield H-103, MT View CA 94043.

WANTED: Swinging Choke, 5-25H. (or more), 500 ma. (or more). K4MI, 2401 E. 4th St., Greenville NC 27834.

SALE: Lafayette HA460 6 meter Rig, $90. Perez, 430 Tacoma St., New Orleans, LA 70124.

FOR SALE: Hallicrafters HT-40 75w transmitter, realistic DX-150A receiver and misc. accessories; $75 for both or $40 each. Robert Dial, WNGSGU. RFD 1 Box 63, Biggs CA 95917.

NOVICES: Areas 7, 5, & 0, would like to start traffic Net. Interested? Write me: WN7WXQ, Doug DesEnfants, North Star Rt., Torrington, WY 82240.

COLLEGE HAM CLUB seeks donation of gear. Write to Campus Amateur Radio Club, 4304 University Drive, Wichita Falls, TX 76308.

FOR SALE: FB Heath TX-1 & SB-10 SSB adapter $145. Excellent HQ170C, $145. Want xcvr, Trade? FOB K6VSS/7 1401 Palo Verde, Carson City, Nev. 89701.

WANT: Regency ATC-1 converter, any condition. Will pay reasonable price depending on condition. W7JME, 733 Calle Del Norte, Sierra Vista, AZ 85635.

FOR SALE: Collins S Line, 75S-3C, 32S-3, 516F2 power supply, round emblem models. Ken Karr, P.O. Box 1669, Yakima, WA 98901.

WANTED: Rohn 25G tower sections and guy wire. SELL: Collins 75-A1, good condition, $75, or trade for 25G. WB0BQA, Paul Staupe, Britt, MN 55710.

MAGAZINES: "Radio", 1937 to 1947, "CQ", 1945 to 1965. Stamped envelope for list and prices K0JHW, 7061, Idlewild Ave., Jennings, MO 63136.

WORKED SOUTH AMERICA certificate. Work all 13 countries. Send list and $1. HC1-TH, 4805 Willowbend Blvd., Houston, TX 77035.

SELL: Drake TR-4, $375. L-4, $475. Both, $825. Mint condition. Extra finals 3-5002, $30.00, pair. WA8VFK, 314 So. Western Avenue, Springfield, OH 45506.

CONVERT any Regency HR to 4 channel scan with priority searchback. Write Ave, W8HVG, 4295 Kentridge S.E., Grand Rapids, MI 49508.

Yaesu FLdx 400 Xmtr working condition, for Jhn KW Match Box or make offer; WB4WKZ, 3654 Marlboro St., Martinez, GA 30907.

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WANT: National Receiver NC183 or HRO. Advise price and condition. L.E. Nichols, W2LXT, 254-17 Morgan St., Little Neck, NY 11363.

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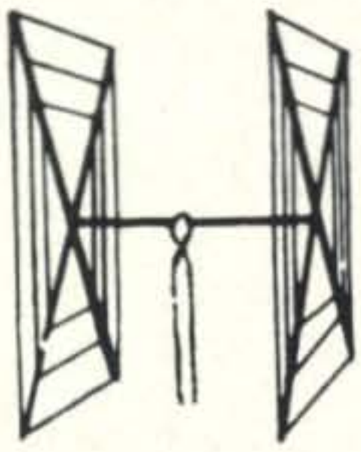

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10/15/20 CUBICAL QUAD SPECIFICATIONS
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Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

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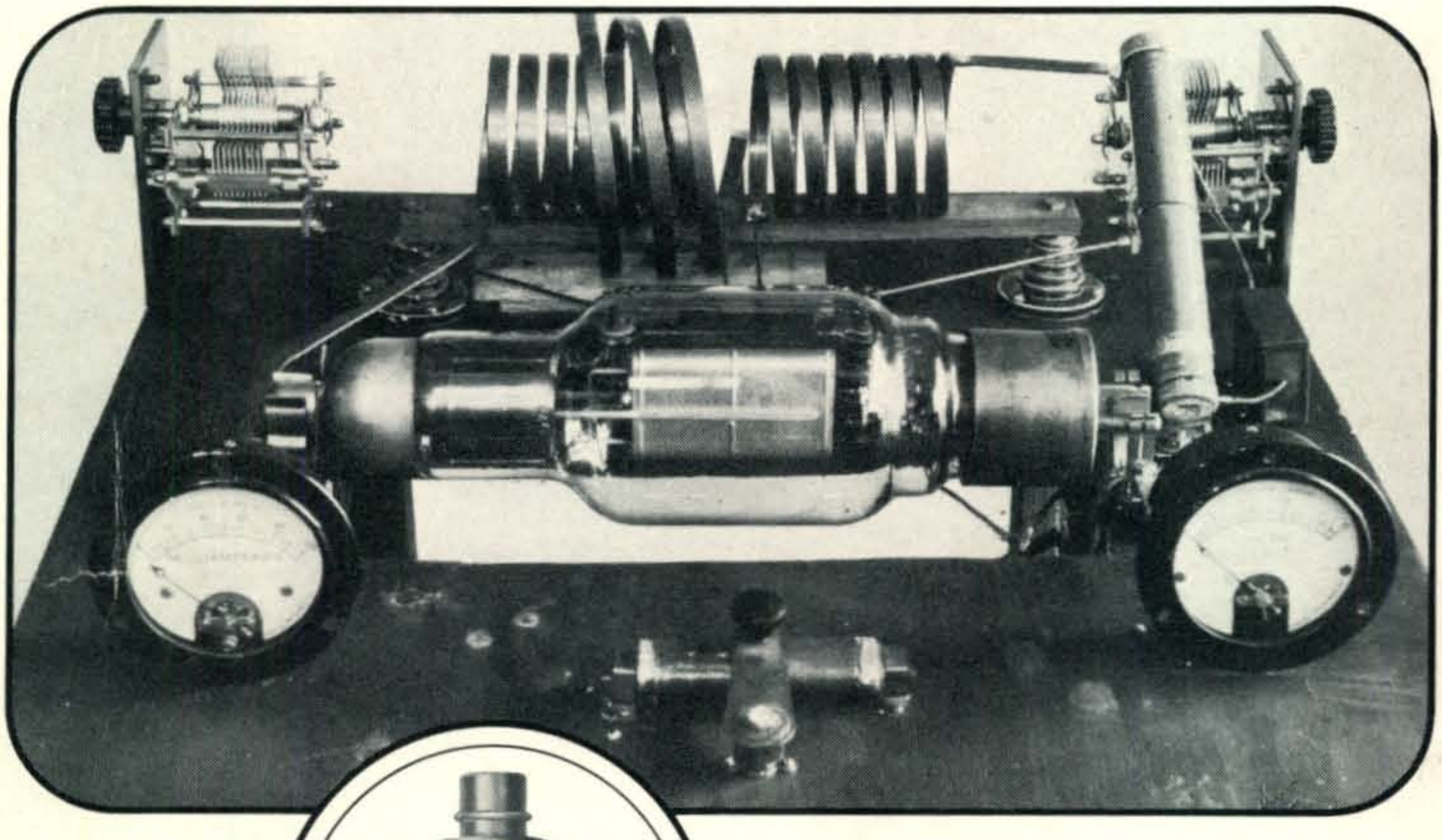
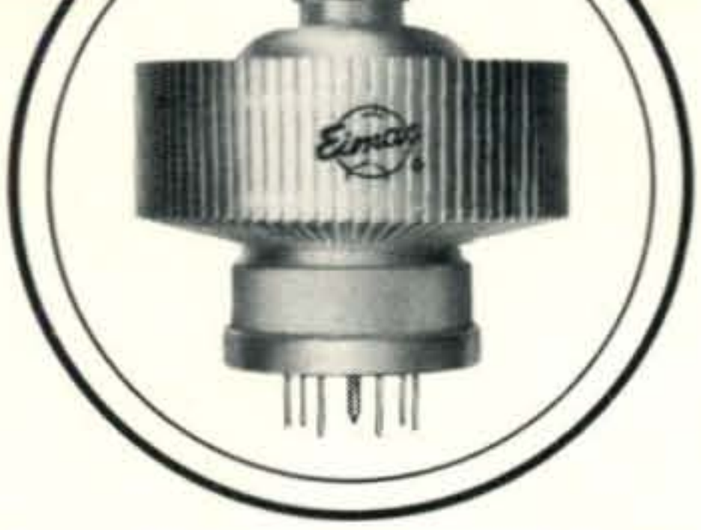
Ed Willis, 6TS, did it in 1925. He exchanged 20 meter signals across the continent—in daylight—with John Reinartz, 1XAM. Both Ed and John used 204 tubes for this record-breaking QSO.



The 6TS transmitter that made wireless history in 1925. This transcontinental QSO marked the beginning of the short-wave era.



EIMAC 8877 provides superior performance as a linear amplifier up to 250 MHz.

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