Amateur Radio

CQ

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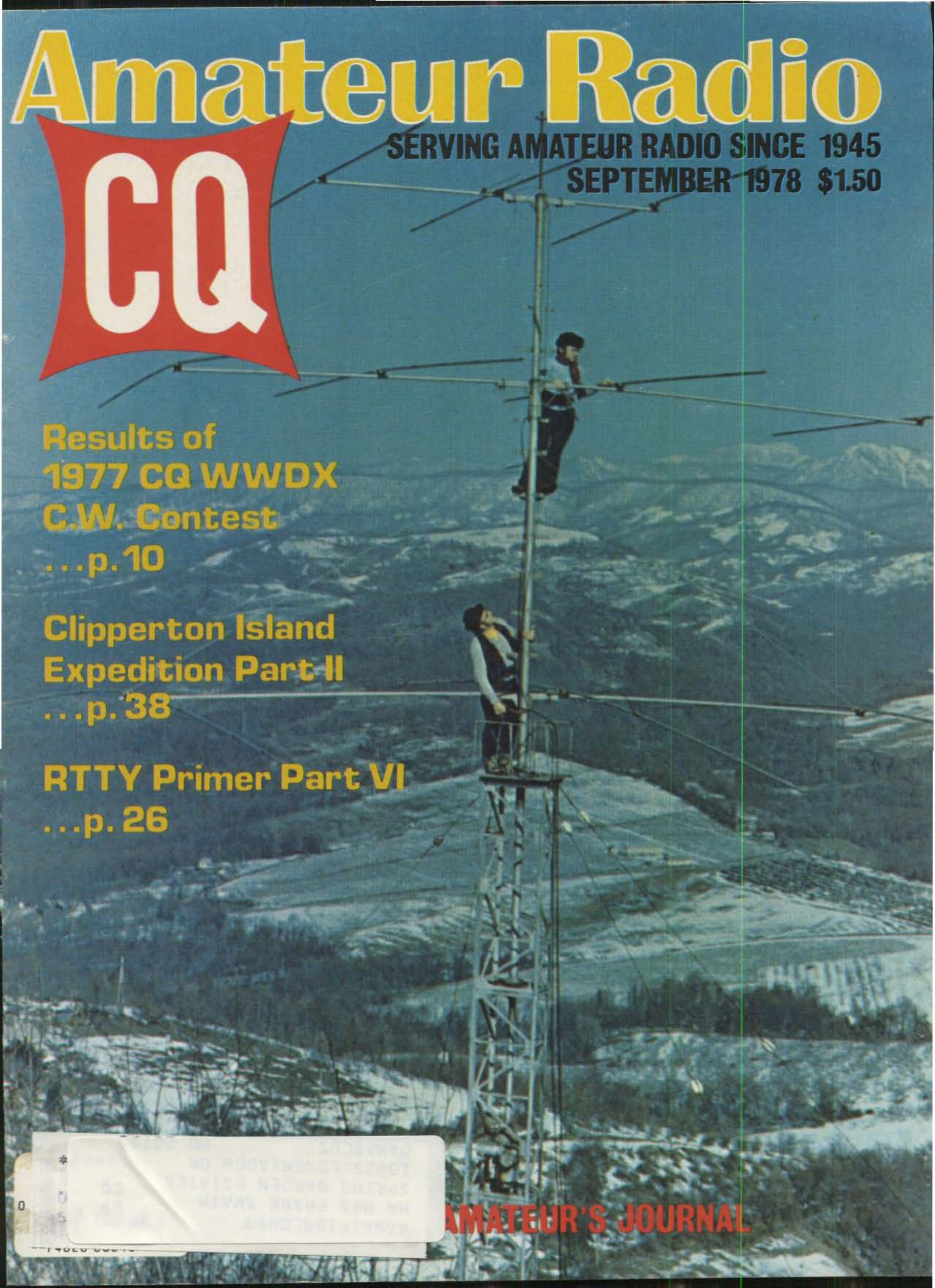
SEPTEMBER 1978 $1.50



AMATEUR'S JOURNAL

IF YOU'RE NOT DESIGNING WITH A CSC PROTO-BOARD®, LOOK AT ALL YOU'RE MISSING.

Utility—Models are available with or without built-in regulated power supplies (fixed or adjustable).

Economy—Eliminate heat and mechanical damage to expensive parts. Save money by re-using components.

Versatility—Use with virtually all types of parts, including resistors, capacitors, transistors, DIP's, TO-5's, LED's, transformers, relays, pots, etc. Most plug in directly, in seconds.

Durability—All Proto-Board models are carefully constructed of premium materials, designed and tested for long, trouble-free service.

Expandability—Proto-Board units can be instantly interconnected for greater capacity.

Visibility—All parts are instantly and easily visible, for quick circuit analysis and diagramming.

Speed—Assemble, test and modify circuits as fast as you can push in or pull out a lead. Save hours on every project.

Accessibility—All parts are instantly and easily accessible, for quick signal tracing, circuit modifications, etc.

Variety—A wide variety of models are available with capacities ranging from 630 to 3060 solderless tie-points (6 to 32 14-pin DIP's), to fit every technical and budget requirement.

Adaptability—Use in design, packaging, inspection, QC, etc. Works with most types of circuits, in many, many applications.

Flexibility—Use independently, or in conjunction with other accessories, such as scopes, counters, CSC Proto-Clip™ connectors, Design Mate™ test equipment, etc. One Proto-Board unit can serve a thousand applications.

Whatever type of electronic circuits you work with, you can do more in less time with CSC's solderless Proto-Board systems. As fast and easy as pushing in or pulling out a lead, you can design, test and modify circuits at will. Components plug into rugged 5-point terminals, and jumpers, where needed, are lengths of #22 AWG solid wire. In the same time you took to read this ad, you could be well on your way to assembling a new circuit.

CSC PROTO-BOARD SOLDERLESS BREADBOARDS

MODEL NUMBER	NO. OF SOLDERLESS TIE-POINTS	IC CAPACITY (14-PIN DIP'S)	MANUFAC. SUGG. LIST	OTHER FEATURES
PB-6	630	6	$15.95	Kit—10-minute assembly
PB-100	760	10	19.95	Kit—with larger capacity
PB-101	940	10	22.95	8 distribution buses, higher capacity
PB-102	1240	12	26.95	Large capacity, moderate price
PB-103	2250	24	44.95	Even larger capacity; only 2.7¢ per tie-point
PB-104	3060	32	54.95	Largest capacity; lowest price per tie-point
PB-203	2250	24	75.00	Built-in 1%-regulated 5V, 1A low-ripple power supply
PB-203A	2250	24	124.95	As above plus separate ½-amp +15V and −15V internally adjustable regulated power supplies

Order today. Call 203-624-3103 (East Coast) or 415-421-8872 (West Coast): 9 a.m.-5 p.m. local time. Major credit cards accepted. Or see your CSC dealer. Prices slightly higher outside USA.

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CIRCLE 10 ON READER SERVICE CARD

This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines.

BRAND NEW

$79.95

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941 Versa Tuner II with all these features at this price:

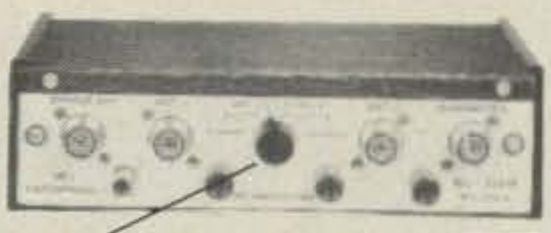
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balance lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balance line, or random wire.



ANTENNA SWITCH lets you select 2 coax fed antennas, random wire or balance line, and tuner bypass.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

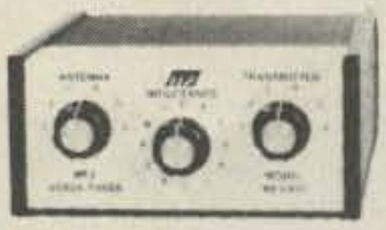
You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 8x2x6 inches fit easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balance line inputs (2), random wire input (1), and ground (1).



$59.95

BRAND NEW

MFJ-901 VERSA TUNER

New efficient air wound coil for more watts out.

Only MFJ uses an efficient air wound inductor (12 positions) in this class of tuners to give you more watts out and less losses than a tapped toroid. Matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF output. 1:4 balun for balance lines. Tune out the SWR of your mobile whip **from inside your car.** Works with all rigs. Ultra compact 5x2x6 inches. SO-239 connectors. 5 way binding posts. Ten Tec enclosure.

$49.95

BRAND NEW

MFJ-900 ECONO TUNER

Same as MFJ-901 Versa Tuner, but does not have built-in balun for balance lines. Tunes coax lines and random lines.

$39.95

MFJ-16010 RANDOM WIRE TUNER

Operate 160 thru 10 Meters. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz.

$39.95

BRAND NEW

MFJ-400 8043 ECONO KEYER

MFJ brings you a reliable, full feature economy keyer using the famous CURTIS-8043 keyer-on-a-chip.

Panel Controls: Speed (8 to 50 WPM), pull-to-tune; volume, on-off; 3 conductor, ¼ inch phone jack for keying output and key paddle input.

Internal weight control lets you adjust dot-dash-space ratio for a distinctive signal to penetrate QRM for solid DX contacts. Sidetone and speaker. Internal tone control.

Iambic operation with squeeze key. Dot memory. Instant start. Self completing. Jamproof spacing. Reliable solid state keying: grid block, cathode, solid state transmitters (−300V, 10 ma. max. and +300V, 100 ma. max.).

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CIRCLE 28 ON READER SERVICE CARD

Our portable 2-meter radio goes anywhere you do!!!

Wilson ... WE-800

800 channel - synthesized 1 and 12 Watt RF Output

Anywhere you go . . . camping, boating, sporting events, ham-fests . . . or just "talking around town" in your car, the small and lightweight WE-800 portable is with you. Designed as an all-purpose 12 watt mobile or 1 watt portable unit, it's loaded with features to satisfy even the most discriminating amateur.

"800" is for channels, from 144-148 MHz in 5 KHz steps, up or down 500 KHz for your local repeater. There are also provisions for 5 pre-programmed frequencies of your choice.

Additional features: • Operates on rechargeable internal Nicad batteries (not included) • Built-in S-meter/output indicator • Hi-Lo power switch • Connectors for external antenna, speaker and power • Mounting bracket/handle, flex rubber antenna and 12 VDC power cord furnished.

GENERAL SPECIFICATIONS:

• **Frequency Range:** 144,000 - 147.995 MHz • **No. of Channels:** 799 @ 5 KHz or 399 @ 10 KHz • **Operating Mode:** Direct frequency modulation • **Type of Communication:** Simplex or transmitter offset ±600 kHz • **Operating Voltage:** 13.6 VDC negative ground (10 to 15 VDC range) • **Current Drain:** Transmit: 290 mA @ 1 watt output. 2 amps @ 12 watts output. Receive: 45 mA squelched. 250 mA at full AF rated output • **Antenna impedance:** 50 ohms nominal • **Size:** 8-1/4 x 6-3/4 x 1-7/8 inches (209.6 x 171.5 x 47.6 mm) • **Weight:** 1 lb. 15 oz. (4.13 Kg): (3 lb. 11 oz. (8.16 Kg) with batteries • **Frequency Determination Method:** C-MOS phase locked loop • **Offset Option:** Two optional offset TX positions also available.

PERFORMANCE SPECIFICATIONS:

TRANSMITTER: • **RF Output:** Hi 12W, Lo 1W • **Frequency Stability:** .001% - 10° C~+ 60°C • **Local Oscillator:** Simplex, 21.4 MHz; Offset +600 kHz, 22 MHz; –600 kHz, 20.8 MHz (Options for two more offsets other than 600 kHz) • **Harmonics & Spurious:** More than 60 dB below carrier • **Deviation:** ±5 kHz • **Audio Response:** +1; –3 dB of 6 dB/Octave. Pre-emphasis characteristics from 300 to 3000 Hz.

RECEIVER: • **Receiving System:** Double conversion Superheterodyne • **First Local Oscillator:** PLL output of (F-21.4 MHz) • **First IF:** 21.4 MHz (with 2 pole monolithic filter) • **Second IF:** 455 kHz (with a ceramic filter) • **Stability:** .001% –10 ~+60°C • **Sensitivity:** .3 uV for 20 dB quieting • **Squelch Sensitivity:** .2 uV • **Spurious & Image Rejection:** Better than 80 dB • **Intermodulation:** 60 dB • **Selectivity:** ±6 kHz at 3 dB, ±15 kHz at 80 dB • **Channel Spacing:** 15 kHz • **Audio Output:** 2 W (10% distortion to 4 ohm)

For the "best" in amateur antennas, crank-up towers and 2 meter radio equipment, depend on WILSON . . . demand it from your nearest amateur dealer.

Wilson Electronics Corp.

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NEW AMATEUR DEALERS NEEDED IN CERTAIN AREAS . . . WRITE FOR DETAILS!!!

SEPTEMBER, 1978 VOL. 34, NO. 9

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200

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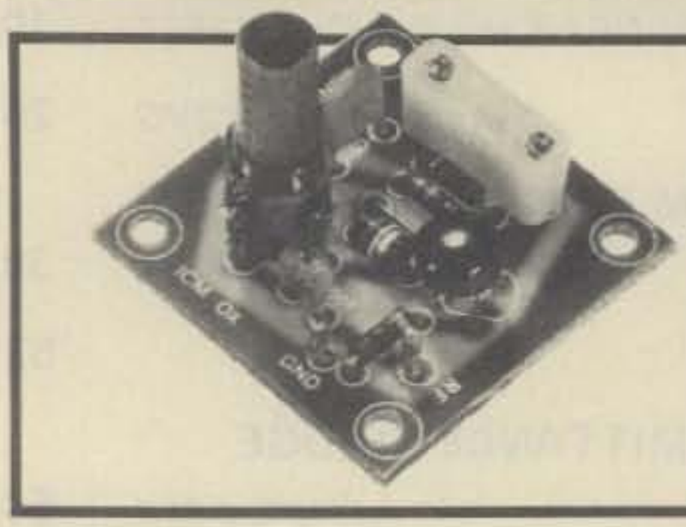
FOR THE EXPERIMENTER

INTERNATIONAL CRYSTALS & KITS

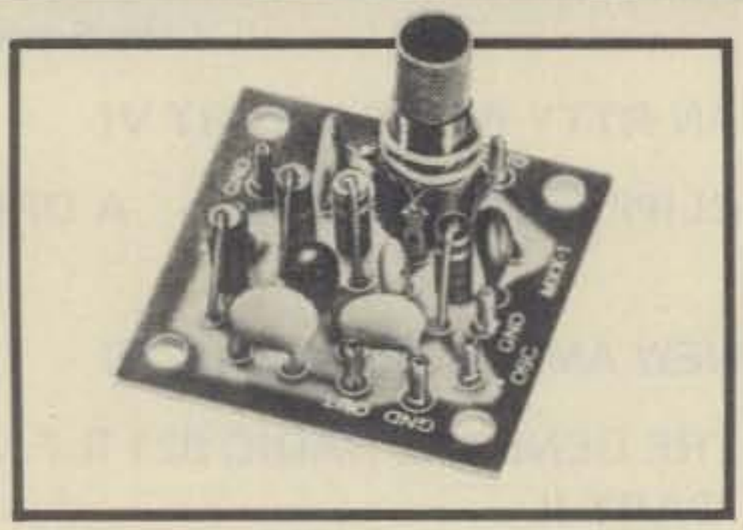
OSCILLATORS • RF MIXERS • RF AMPLIFIER • POWER AMPLIFIER



OX OSCILLATOR

Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.
Specify when ordering.

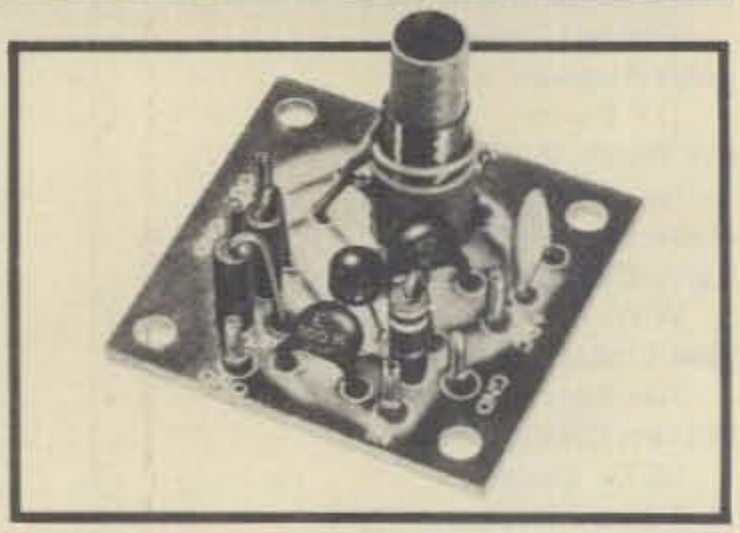
$4.95 ea.



MXX-1 TRANSISTOR RF MIXER

A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.
Specify when ordering.

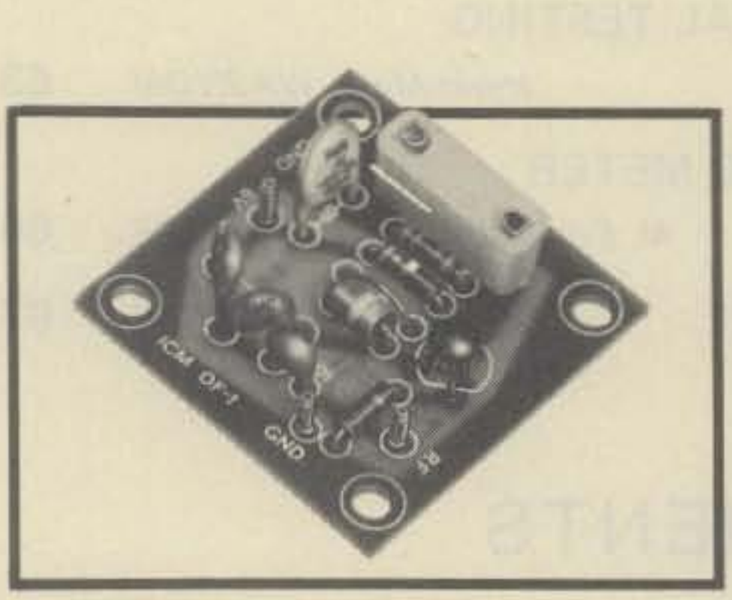
$5.50 ea.



PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104.
Specify when ordering.

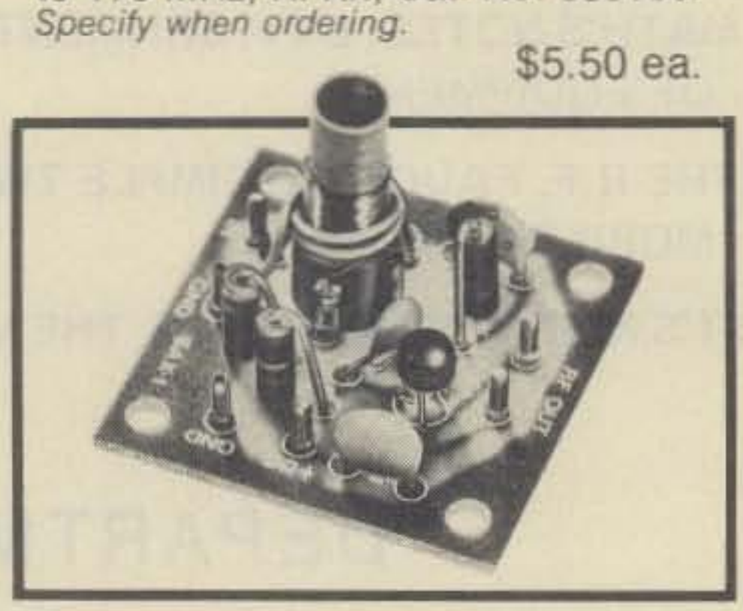
$5.75 ea.



OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 HI, Cat. No. 035109.
Specify when ordering.

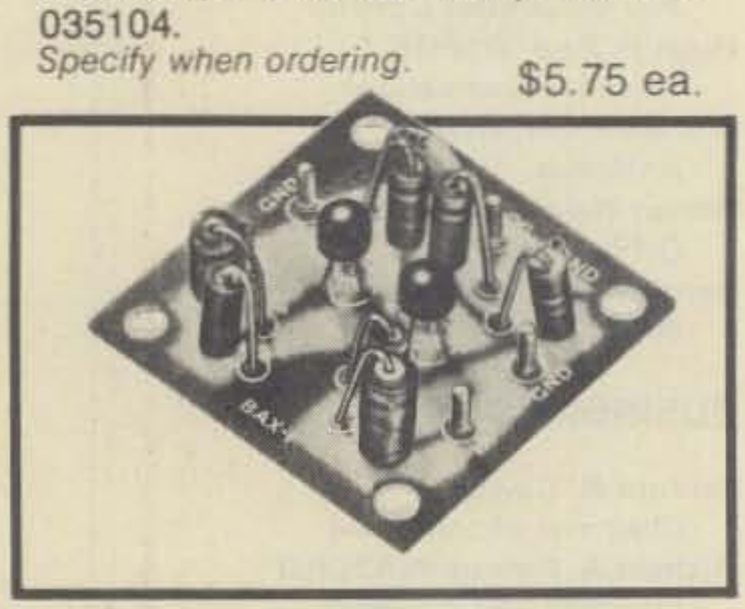
$4.25 ea.



SAX-1 TRANSISTOR RF AMP

A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 035102. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
Specify when ordering.

$5.50 ea.



BAX-1 BROADBAND AMP

General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat. No. 035107.
Specify when ordering.

$5.75 ea.

.02% Calibration Tolerance
EXPERIMENTER CRYSTALS
(HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo	
	Specify when ordering	$5.95 ea.
031081	20 to 60 MHz — For use in OX OSC Hi	
	Specify when ordering	$5.95 ea
031300	3 to 20 MHz — For use in OF-1L OSC	
	Specify when ordering	$4.75 ea.
031310	20 to 60 MHz — For use in OF-1H OSC	
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Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International. Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Address orders to:
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International Crystal Mfg. Co., Inc.
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Oklahoma City, Oklahoma 73102

Zero Bias

an editorial

FLASH! Goliath Lives!

Premature reports issued from Newington earlier this year on the death of Goliath (CB on 220 MHz.) have proven false. Young David (The ARRL) who took credit for the slaying, despite evidence to the contrary, will now have to think up another ploy for attention. For all intents and purposes, Goliath is alive and well.

The "threat" to 220 MHz. is just as real as it ever was. If it isn't CB, as we know it, then it will be some other form of Personal Radio Service that probably will occupy that part of the amateur spectrum. Whether 220 MHz. turns into another 11 meters is still up for speculation but there is no speculating on a change in its status.

Carlos Roberts who now heads up Safety and Special Services for the FCC, replacing Charley Higginbotham, WB3DLT, who retired recently, comes to Safety and Special Services from the Office of Plans and Policy. For the last two years, approximately, the Office of Plans and Policy (part of the FCC) has been actively involved in research which culminated in a two volume work, recently released, called *Alternatives For Future Personal Radio Services.* The gist of these two volumes is that the 220 MHz. and 900 MHz. bands are ideally suited technically and economically for an upward shift in the land mobile service, namely CB. Since there are some medical reservations concerning the use of 900 MHz, 220 becomes the ideal of the ideal spots to go. Mr. Roberts moves up in the FCC hierarchy at a most propitious moment. Previously, at recent FCC meetings, it was voiced by Commission advisors that putting a CB service on a band used by amateurs or adjacent to an amateur band would be tantamount to creating another 11 meter fiasco and that for that reason 220 MHz. should not be given over so lightly. The availability of equipment that can possibly be misused is enormous and would eventually lead to another "Linear" debacle. On the other hand, research was being conducted on the feasibility of using 900 MHz. for such a purpose. There were and still are medical restrictions to consider at that frequency but the consensus was that technology would be provided to limit the dangers.

If you think we as amateurs have friends at the FCC, forget it. If you felt confident that the ARRL would take care of the situation, you were wrong. If you read this and feel that somewhere along the line you were lied to, then you're partially right. You and I were lied to only to the extent that we didn't get involved to find out for ourselves. The truth isn't always pleasant but it

(Continued on page 83)

Announcing

• **Tyson's Corner, VA** — The DXPO 78 will be held on September 16 and 17, 1978, in the Washington, DC suburb of Tyson's Corner. DXers, contesters, and other active hams will find the program covering their favorite areas of interest. Sponsored by the National Capitol DX Association, DXPO 78 will be held at the Tyson's Corner Ramada Inn with easy access from Interstate 495. Plan to attend. Unless you have previously attended DXPO, write to Dick Vincent, K3AO, Rt. 1, Box 230, Bryantown, MD 20617 to have your name included on the mailing list. Advance registration is recommened. See you at DXPO 78.

• **Elimra, NY** — One of America's great Hamfests will be held on September 30, 1978, at the Chemung County Fairgrounds. Free flea market, grand prize, door prizes, tech talks, great food, and more will be featured. Talk-in on 146.52/52, 147.96/36, and 146.10/70. Contact WA2FJM, John Breese, 340 West Avenue, Horseheads, NY 14845 for tickets and further information.

• **Grand Rapids, MI** — The Grand Rapids Amateur Radio Association will hold its Annual Swap-N-Shop on Saturday, September 16, 1978, at the Hudsonville Fairgrounds, west of Grand Rapids on Highway 21. Talk-in on 146.16/76 and 146.52. There will be an indoor and outdoor swap shop, tables will be free. There will be door prizes with a main door prize. Admission will be $2.50 at the gate. Time: from 7:00 a.m. till 3:00 p.m. For more info contact: Grand Rapids Amateur Radio Association, Inc., P.O. Box 1333, Grand Rapids, MI 49501.

• **Montgomery, AL** — The Central Alabama Hamfest will be held on Sunday, September 10, 1978, in the new Civic Center in Montgomery. There will be food service, prizes, an air conditioned exhibit area, indoor and outdoor flea market space, and plenty of free parking. Free admission and free registration. For further info, contact: Al Erdman, W4CNQ, 3025 Pelzer Ave., Montgomery, AL 36109, or call (205) 272-9130, or any amateur in the Montgomery area.

• **Pecatonica, IL** — The Rockford Hamfest '78 Illinois State ARRL Convention will be held on September 10, 1978, at the Winnebago County Fairgrounds, 10 miles west of Rockford on U.S. Highway 20. There will be 40,000 square feet of inside area for dealers and flea markets plus acres of room outside. Talk-in on 01-61 and 52. Tickets are $1.50 in advance and $2.00 at the door. Send s.a.s.e. to: Rockford Amateur Radio Association, Post Office Box 1744, Rockford, IL 61110, for further information.

• **Pensacola, FL** — The Five Flags Amateur Radio Association will have its Annual Ham-A-Rama on September 3, 1978, at the University of West Florida field house in Pensacola. Anyone desiring additional info should write to: FFARA, P.O. Box 17343, Pensacola, FL 32522.

• **Cincinnati, OH** — The 42nd Annual Cincinnati Hamfest will be held on Sunday, September 17, 1978, at Stricker's Grove on State Route 128, 1 mile west of Ross (Venice) Ohio. Exhibits, prizes, good food, flea market, radio related products only, a hidden transmitter hunt and a sensational air show will be featured. There is no increase in cost, same as last year, $7.50 in advance. For further info, contact: Lillian Abbott, K8CKI, 1424 Main St., Cincinnati, OH 45210.

• **Erie, PA** — The Third Annual HamJam, sponsored by the Radio Association of Erie, will be held on Sunday, September 24, 1978, from 9 a.m. to 4 p.m., at Waldameer Park in Erie. Admission is $1.50 in advance and $2 at the gate. Refreshments, prizes, talk-in on 34/94, 22/82, and 52. Write: HamJam '78, Radio Association of Erie, Box 844, Erie, PA 16512.

• **Morgantown, W. VA** — The Second Annual Mon Ham Gala will be held on Sunday, September 3, 1978, from 10:00 a.m. to 5:00 p.m., at Westover Park, 300 yards off I-79 near Morgantown. This Mon Ham Gala is sponsored by the Monongalia Wireless Association. Talk-in on 16/76. For more info write: John Curtis, WB8AHH, 817 Willowdale Rd., Morgantown, W. VA 26505.

• **Valparaiso, IN** — The Valpo Tech Alumni Association will hold its Annual Hamfest on September 24, 1978, on the campus of Valparaiso Technical Institute. Admission to the event will be $2.00 for both visitors and exhibitors. For further info, write: Hamfest, Valpo Tech Alumni Association, Box 490, Valparaiso, IN 46383, or call (219) 462-2191.

• **Cherry Hill, NJ** — The South New Jersey Radio Association Hamfest will be held on September 10, 1978, rain or shine, at the Ellisburg Shopping Center in Cherry Hill, at the intersection of Routes 41 and 70. Family registration is $2.00. Tailgating is $3.00. Flea market, auction, many prizes, and many activities will be featured. Talk-in on 52. Contact: K2KA, Box 2736, Cherry Hill, NJ 08002 or phone (609) 429-6032 for more information.

• **Uniontown, PA** — Once again it is time for the Annual Gabfest, of the Uniontown Amateur Radio Club, which will be held on September 9, 1978, at the Club Grounds, on Old Pittsburgh Rd., in Uniontown. For more info, contact: The Uniontown Amateur Radio Club, Inc., W3PIE, c/o 438 Braddock Ave., Uniontown, PA 15401.

(Continued on page 84)

think of yourself as an antenna expert!

—you select your components!

1. Get optimum performance band for band. Choose from medium or high power resonators for your favorite bands.
2. Fold over, 360° swivel mast for quick band change or easy garaging. Select from two versions, fender/deck or bumper mount location.
3. Stainless steel ball mount, 180° adjustable, commercial duty for superior mechanical and electrical performance.
4. Get exceptional reports, broadest bandwidth, lowest SWR. Use with any convenient length 50 ohm coax. Matching devices not required.
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Get fixed station reports from your mobile—operate 6-10-15-20-40-75 or 80 meters with the experts and join the vast majority using Hustler for nearly two decades.

Model SSM-2 Ball Mount

Model QD-1
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Model RSS-2
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Model BM-1
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Model L-14-240
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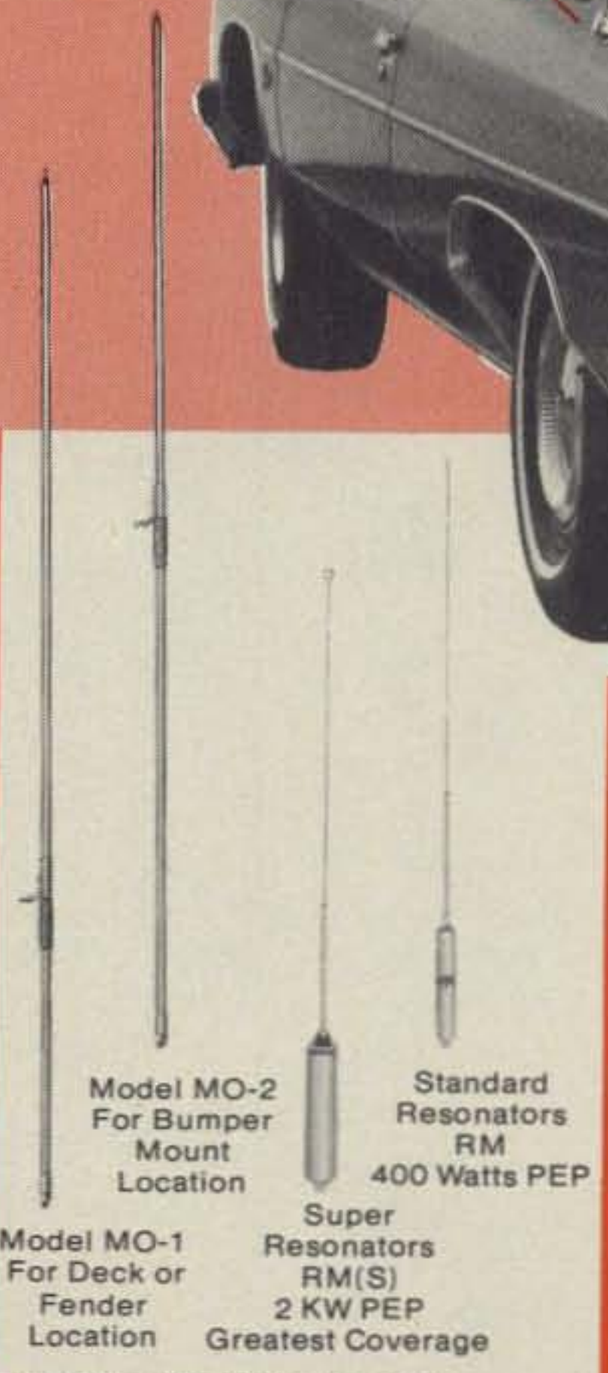
50 Ohm Feedline



Model MO-1
For Deck or
Fender
Location

Model MO-2
For Bumper
Mount
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Super
Resonators
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2 KW PEP
Greatest Coverage

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CIRCLE 31 ON READER SERVICE CARD

Look closely at the new MT-3000A. You've never seen anything like it.

Times have changed since DenTron introduced its first tuner. With rapid growth in condominiums and housing developments, we have new problems that require new solutions.

DenTron decided to rethink the tuner and what its total capabilities should be.

The MT-3000A is a capsulized solution to many problems. It incorporates 4 unique features to give you the most versatile antenna tuner ever built.

First, as a rugged antenna tuner the MT-3000A easily handles a full 3KW pep. It is continuous tuning 1.8-30mc. It matches everything between 160 and 10 meters.

Second, the MT-3000A has built-in dual watt meters.

Third, it has a built-in 50 ohm dummy load for proper exciter adjustment.

Fourth, the antenna selector switch; (a) enables you to by-pass the tuner direct; (b) select the dummy load or 5 other antenna systems, including random wire or balanced feed.

The compact size alone of the MT-3000A (5½" a 14" x 14") makes it revolutionary. Combine that with its four built-in accessories and we're sure you'll agree that the MT-3000A is one of the most innovative and exciting instruments offered for amateur use.

At **$349.50** the MT-3000A is not inexpensive. But it is less than you'd expect to pay for each of these accessories separately.

As unique as this tuner is, there are many things it shares with all DenTron products. It is built with the same meticulous attention to detail and American craftsmanship that is synonymous with DenTron.

After seeing the outstanding MT-3000A, wouldn't you rather have your problems solved by DenTron?

DenTron Radio Co., Inc.
2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216)425-3173

CIRCLE 11 ON READER SERVICE CARD

Our Readers Say

Yes Sir!

Editor, CQ:

To Richard A. Cowan, Publisher of **CQ**

Contrary to how I personally feel about your recently published "message From The Publisher" on ARRL related issues, I want to emphatically congratulate you on having the personal courage required to write such articles!

Seriously, I think it takes a person with "strong convictions" and enough "character" not to be afraid to stand-up for them when the going gets rough! Even people who disagree with you, should recognize this; but they probably will not.

Yes Sir, what I am saying is that as Publisher of **CQ Magazine**, you have earned my respect!

Charles R. Schlieper, N5TD
Temple, TX

How To Update Your Ham-M Rotors

Editor, CQ:

To Richard Klinman, W3RJ:

Thanks loads for your article "How To Update Your Ham-M Rotors" in the June 1978 issue. Now that's an article an author can be proud of. Beautiful. Just great. Gives the whole story on an important piece of gear. Because of the informative manner and the completeness, you've answered many questions for me on my CDR gear. And saved me bucks. The long cable run part was great. I've got a long run and was baffled until I added a Auto Transformer to keep up the line voltage. I'll be using your plans including remoting the Capacitor, etc. Again many thanks for a clear, objective report; it goes in my Ham 2 Owners Manual. Wish more subjects were covered so well.

Lee E. Warren, K7DX
Sun City, AZ

Stateside QSL Bureau

Editor, CQ:

I liked the article on a "Simple Phone Patch", by Richard Ferranti, WA6NCX/1, in the June 1978 issue. I believe many of the electronics circuits shown in other magazines are just too complicated for the available test gear, to the average ham, and to say nothing of the difficulty of securing the parts.

With the increase in postal rates, I believe that QSLing is soon going to be a thing of the past. This is unfortunate, as I believe this is the cornerstone of Amateur Radio. I would think if the ARRL wanted to do something for Amateur Radio, they would set up a stateside QSL bureau with paid help to handle QSL cards between all stations.

The main thing in this hobby, is to have a fat pocketbook and all your troubles are over!

Earl Stacy, K7BD
Selah, WA

AC2RN The Second

Editor, CQ:

I have read Paul Crum's tale about Pat Wyman's adventures in China in the late twenties and the chronicle of Ham Station AC2RN as published in the May 1978 issue of your magazine. I enjoyed it very much and feel it was a tale well written and quite accurate.

For me it was a nostalgic trip, since I arrived in China on the same boat that took Pat Wyman away. I never did actually meet Pat, having passed "like ships in the night", however I have corresponded with Pat through the years.

I inherited his ham station there at Chinwangtao and his home brewed equipment. I continued to use his old call AC2RN for several years after he left. I didn't change things much; his old 211 oscillator continued to send its growling AC signal across the Pacific and around the world.

From time to time, I sent Pat information which he incorporated in this article. So, I feel I had some hand in the make up of this story. I have always felt that, if I had Paul Crum's writing talent, I would have written about the old days there in China myself. However, it was for the best as I'm glad Paul did such an outstanding job on the subject.

Again, I wish to thank the publishers of **CQ** for accepting this article; it was very enjoyable reading and I appreciate it very much.

Glen Smith, N6CX ex AC2RN
Kenwood, CA

Can Anyone Help?

Editor, CQ:

I suppose that I am one of many amateur radio operators that have purchased a home in a residental area in which many ambiguous and vague restrictions exist. I therefore join the ranks of those operators who are frustrated with a personal decision of to, or not to, erect a tower and beam (or quad) so as to enjoy a hobby. I am very near a decision to erect a tower and beam. I have assumed a conservative attitude. If I erect an antenna system supported by a tower, I plan to have the erected antenna no higher than my two-story home (so that it cannot be seen from the street) and will not tolerate any TVI for the benefit of my neighbors. I would certainly appreciate views from your readers. Am I coming anywhere near the imposition of a barking dog that can be heard for many blocks in my neighborhood?

R.E. Morgan, WA5ULR
5518 Enchanted Timbers,
Humble, TX 77338

1977 CQ World-Wide DX Contest CW Results

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

People sure like to have a good time. The 1977 CQ CW Contest attests to this fact. In spite of less than normal conditions, interest and activity were never higher. We received a total of 2,324 c.w. logs. A whopping 12% increase over last year. From top band, where K1PBW and PAØHIP battled it out, to high band, where LU1DZ and C5AT ran high rates, the name of the game was *action*.

A new world record of 4.69M was turned in by Richard Norton, N6AA operating from 9Y4VT. Richard who finished third last year decided to go for the whole ball game this year. His 1400 Q on 14 MHz. is what did it for him and he walked away with the world title. One would think that beating the world record would produce a first place, but Pete, N6CJ operating from KP4RF had to settle for second (A fine job from a 2 point area).

The Sochi Radio Club decided that 3 points per QSO would be better than 2, so they took a trip down the Black Sea coast to UF6. It was well worth it, because their crew set a new world multi-single record with an incredible 4058 Q totaling out at 6M points. Two expeditions from England finished second and third. GU4DAA, the Channel Contest Group gave grateful participants a nice multiplier, while VP2M with G3VZT and G3XVY at the keys had fun "finally being in demand."

The battle of the big multi-multi stations was won by KP4EAJ (7.1M) with an expedition by the Yankee Clipper Contest Club and friends. They edged out the boys from Ural, UK9AAN. The crew from Pancevo, YU1BCD, edged out the U.S. entrants of W2PV, W3AU and K2GM.

The top USA all band score was Frank, W3LPL. Frank has quite a station, and winning the USA title for the third year in a row shows that it sure works when he pushes the paddle. W3LPL, N2LT and W1ZA all broke the USA record.

OH1TV went on an expedition to CT3 and came away with a new 3.5 world record. Pekka won the *new* 3.5 MHz. world trophy. In addition to the stations mentioned above, the following stations set new records: PAØHIP: Europe 1.8; DK3GI: Europe 3.5; UA6LD: Europe 7; OH8OS: Europe 14; KH6CHC: Oceania 1.8; YV10B: South America 1.8; N4JI/HC1: South America 3.5; K10X: USA 14.

The Kentucky antenna farm of N4AR edged out the Texas ranch of K5JA for the USA Multi-Single victory. N4AR's victory was the result of more multipliers on 40 and 80. With conditions on the rapid upswing, the 1978 Contest is really going to be a scramble for top honors.

Not to be outdone, the Frankford Radio Club repaired their antennas, turned their rigs, and walked off with the fierce Club competition title with a total of 62,7M points. That's a lot of work and cooperation. They were followed by their friends to the south, the Potomac Valley Radio Club with 56.6M. Another Group the Yankee Clipper Contest Club from New England (new this year) is breathing down everyones neck with 52.7M points. The foreign competition is getting hotter and hotter.

*5801 Huntland Dr., Temple Hills, MD 20031.
†7164 Rock Ridge Terrace, Canoga Park, CA 91307

WA4IAR/QRPp

SK2KW: L to R SMØDGU, SMØGMG, SM2DMU, SM2HTF, SM2EKM, SM2CEW, SM2EPR, DOG = "Yagi".

BAND-BY-BAND BREAKDOWN - TOP ALL BAND SCORES

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

WORLD TOP SINGLE OPERATOR-ALL BAND

Station	160	80	40	20	15	10
9Y4VT	73/7/9	336/19/44	553/21/55	1407/29/70	1045/25/60	578/21/37
KP4RF	49/8/16	295/19/50	639/22/62	968/27/62	1133/25/67	423/21/46
PJ9CG	34/6/8	360/15/41	550/18/43	605/24/57	867/24/58	839/21/33
ZL3GQ	16/8/5	120/20/30	389/23/44	485/27/65	860/28/69	457/22/43
PJ2VD	17/4/7	189/11/28	537/17/43	968/22/48	801/21/53	543/16/17
9Y4VU		197/10/19	378/13/38	654/24/48	835/24/57	607/18/30
ZS6WW		55/10/15	312/17/37	605/28/59	777/20/47	627/16/51
W3LPL	12/7/9	96/16/44	335/28/68	436/32/89	381/27/81	57/18/32
KH6IJ	25/6/5	276/14/13	380/18/18	590/30/49	840/17/25	287/17/21
YU3EY	47/3/12	248/14/48	289/20/58	621/30/75	414/27/62	87/18/38

USA TOP SINGLE OPERATOR-ALL BAND

Station	160	80	40	20	15	10
W3LPL	12/7/9	96/16/44	335/28/68	436/32/89	381/27/81	57/18/32
N2LT	6/6/12	147/14/45	326/23/59	633/29/75	308/26/65	31/15/20
W1ZA	4/3/3	180/17/52	137/21/54	754/31/84	303/24/62	31/13/21
N3RS	17/7/11	184/20/57	240/24/57	430/30/75	268/24/63	55/17/30
N6RO	11/5/4	124/15/22	536/28/51	380/29/61	351/23/46	96/17/23
K1NA	15/8/12	152/16/49	219/22/62	481/28/80	293/25/65	31/14/23
K9DX	7/5/5	84/20/38	165/26/55	614/26/71	363/21/60	43/14/24
N7XX	9/6/6	110/16/20	429/21/34	447/24/55	490/21/34	203/17/19
W7KW	11/7/6	101/19/27	418/27/46	328/31/69	335/26/50	126/18/26
W4DR	18/7/15	84/17/44	205/26/69	454/30/69	308/25/67	40/17/29

WORLD TOP MULTI-OPERATOR-SINGLE TRANSMITTER

4L6M		465/18/58	694/20/67	1512/31/85	1070/35/110	317/24/70
GU4DAA	113/6/22	532/15/54	422/19/65	1396/29/44	673/24/64	39/18/38
VP2M		378/14/46	749/20/54	1167/26/64	1004/23/57	294/14/19
EP2SV	13/5/9	352/19/49	598/14/53	682/28/64	537/20/56	372/15/41
YU3DBC		329/14/49	437/18/63	963/32/74	448/30/80	55/24/48
OK5CRC	17/3/17	515/16/55	340/19/70	947/24/71	484/28/83	38/20/37

USA TOP MULTI-OPERATOR-SINGLE TRANSMITTER

N4AR	18/11/16	83/22/52	409/29/75	677/32/83	355/29/76	31/16/30
K5JA	14/7/9	94/21/38	568/26/64	674/32/82	287/26/60	90/19/36
K2BU		190/18/57	434/26/66	643/30/81	294/24/58	20/12/14
K1PR	13/7/8	165/19/50	241/24/60	665/27/74	363/25/68	27/16/26
W6XR	15/8/8	90/13/20	665/27/56	578/29/72	366/20/36	56/14/19
K1XX	16/8/10	134/16/46	116/21/52	782/27/77	252/21/71	25/13/19

WORLD TOP MULTI-OPERATOR-MULTI TRANSMITTER

KP4EAJ	128/7/14	663/20/52	1621/26/66	2028/32/78	1654/24/64	923/20/38
UK9AAN		678/23/69	865/30/79	1462/37/114	1068/30/86	494/21/59
YU1BCD	125/5/19	658/18/60	1038/24/77	1536/36/98	646/27/77	140/25/57
W2PV	72/13/27	340/21/66	533/28/77	1286/35/95	548/27/74	104/21/41
W3AU	64/12/26	228/23/64	533/30/79	1069/33/96	691/29/80	116/21/45
K2GM	57/8/18	177/19/52	543/32/75	1238/35/104	531/29/87	159/23/48

USA TOP MULTI-OPERATOR-MULTI-TRANSMITTER

W2PV	72/13/27	340/21/66	533/28/77	1286/35/95	548/27/74	104/21/41
W3AU	64/12/26	228/23/64	533/30/79	1069/33/96	691/29/80	116/21/45
K2GM	57/ 8/18	177/19/52	543/32/75	1238/35/104	531/29/87	159/23/48
K3WW	54/10/23	269/25/69	544/31/81	970/36/103	613/29/84	92/20/41
K5RC	48/10/17	252/21/49	769/31/79	851/35/97	657/28/76	185/23/43
W3MM	32/ 8/19	265/18/59	336/29/74	1097/33/88	423/27/81	139/20/38

This year's winner is the Phein-Rubr DX Association (13.8M) followed closely by the Toronto DX Club and a fine effort by the Voroshilovgrad Radio Club.

Expeditions make it fun

Several expeditions were timed for the Contest. In addition to those mentioned above, CEØZM sure made everyone happy with a fine effort by K1MM and N4WW. Fine operating made them easy to work despite large pile-ups. Across South America PY7BXC/0 was putting another rare one on the map. In Africa, K4YT made lots of people happy by going all bands from EA8ID.

New category

The Committee has decided to institute a QRP category in which WPX rules apply. Output will be limited to 5W c.w. and 10W s.s.b. The top QRP entry on phone and c.w. will win a trophy. So remember that a weak station calling you may not be the Pacific long path but a QRPer in the next country.

Conditions and the Committee

The total logs received for the 1977 CQ SSB and CW tests were 4,500 an 11% increase over the 1976 Contest. With everyone everywhere aware of the improving conditions, the 1978 test entries should burden the mailman. We are ready.

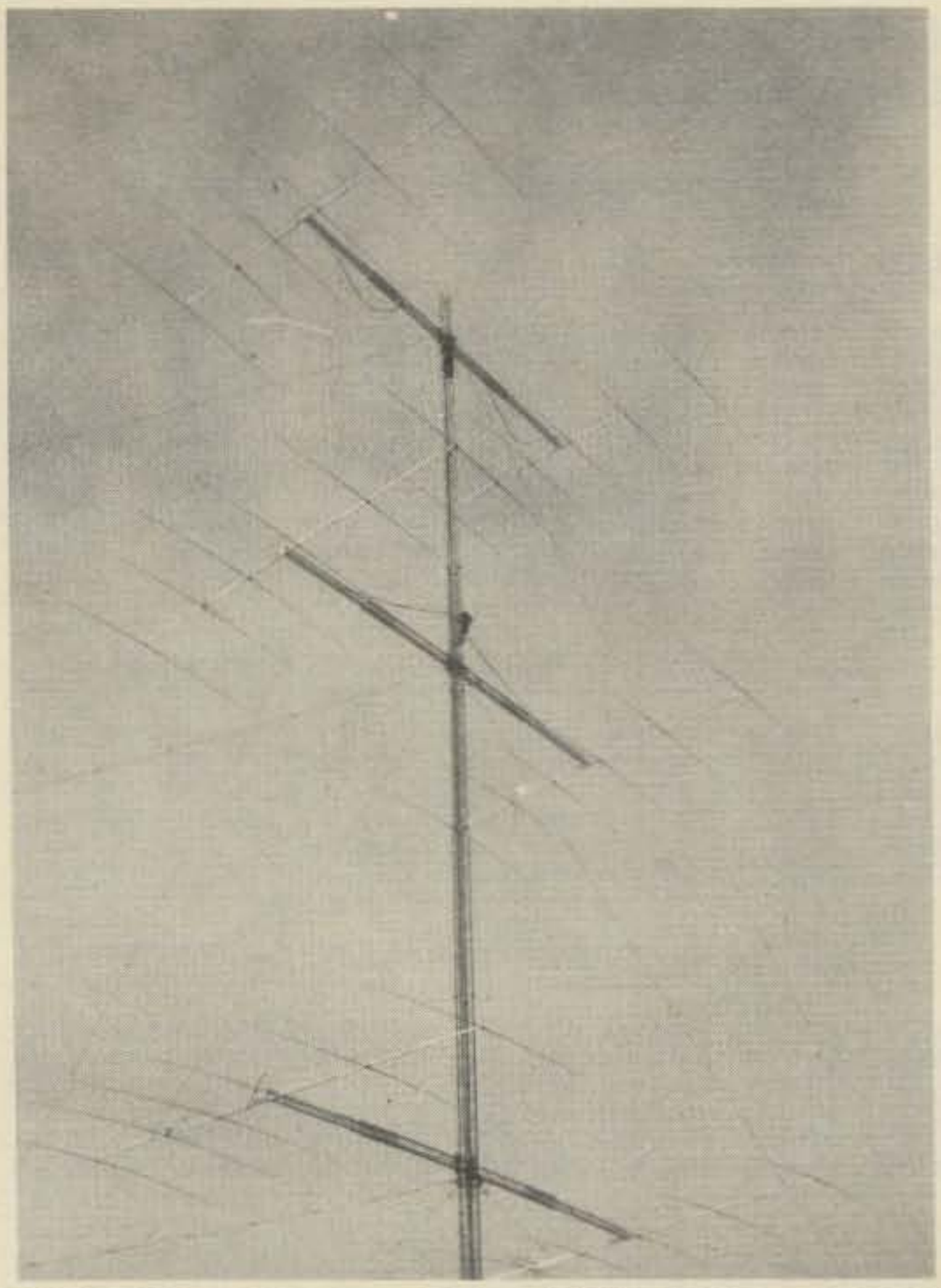
The following people provided the expertise necessary to check each entrant and summarize the logs for which they were responsible. Chairman; Frank Anzalone, W1WY; Glen Rattmann, K6NA; Gene Walsh, N2AA; John Kanode, N4MM; Terry Baxter, N6CW; Lenny Chertole, W3GRF; Gene Zimmerman W3ZZ; Jim Nieger, N6TJ; Dave Donnelly, K2SS; Low Jenkins, N6VV; Fred Morris, W6PVB; Tom Taormina, K5RC; Reg Toume, N6SV.

Coming up next month the 1978 CQ WW Phone Contest. Congratulations to all of the winners.

73, Bob, K3EST and Larry, N6AR.

Crew of GU4DAA; L to R G3FXB, G3MXJ, G4BUE, G4EHF.

4L6M:UA6APW and Oleg.



OH8OS; 200 ft. rotatable tower, 36 el. on 14 MHz; OH8OS and OH2BH on tower!

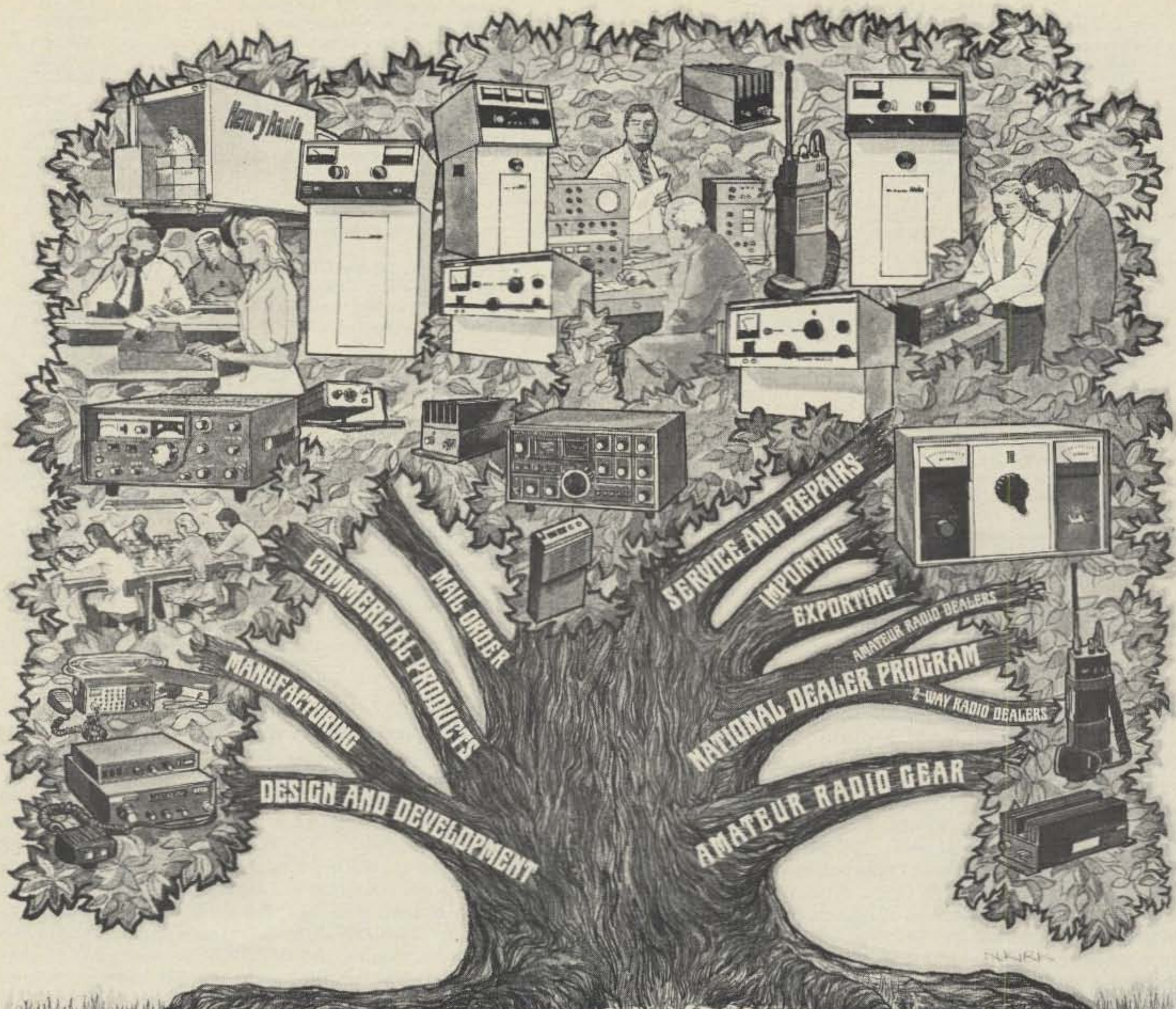
VO2EPA put zone 2 on the map. From Goose Bay, L to R VE1AI, VO2AM, VE1MX.

U.S. QRM

"Rotator on 20/15 beams broke Sunday morning. QSO and multiplier total suffered . . . *K1NA.* Lost rotator all day Sunday.— Still great fun . . . *N1GL.* The temptation of a party Saturday night was overwhelming . . . *K1DG.* Didn't use as many KW hrs as last year . . . *W1CNU.* With my antennas—next town is good DX . . . *W1PWK.* Enjoyed it very much . . . *W1LK.* Fine operators, lots of fun . . . *W1BB/1.* Was out in the rain soldering radials on the verticle Friday night . . . *K2BMI.* All my antennas came down in big wind Saturday night. That was that . . . *W2GGE.* 10m was a big disappointment . . . *K2FL.* Where is cycle 21? . . . *W2AX.* Sure was hard to find a clear frequency . . . *N2TW.* Antenna shorted; fell asleep during best opening; started going deaf . . . *N2RN.* My age overwhelmed my experience . . . *N3RS.* First CW contest—will be back again . . . *K3NZ.* Wouldn't you know, I had to move to North Carolina this weekend . . . *N3RB.* 80 sure gets slow when Europe drops out . . . *WB3AUN.* After 3 years, worked a JA on 28 for 5 band WAC . . . *W4YN.* I found it advantageous to tailgate *K3KA.* and *W3KA.* . . . *K4KA.* There is nothing funny about a 48 Hr DX contest from 5 land . . . *K5KU.* Climbed tower at midnight to unstick rotator . . . *N5TP.* First CW contest in 52 years . . . *W5DUI.* Had to climb the tower twice in the dark . . . *K1PR.* Had to work 36 hours on Friday and Saturday . . . *W4MYA.* JA8IEV/JD1 was country #91 for me on 160 . . . *K6SE.* Operated in the mountains with a motor generator that got 61 QSO's per gallon . . . *N6GG.* Next year, a memory keyer . . . *N6OZ.*

DX QRM

"For the first time, French amateurs have been able to make use of the 160m band. I recall then, thanks to the efforts of Gene, W4BRB, W4OO, and of Jean, F8EX, the first permission obtained by French amateurs for 160m band was on the occasion of the CQ 160m Contest in January 1977. My best QSO's during the November 1977 WW CQ Contest—eight US amateurs, one VE, and one YV on 160m band. Could have slept for a week after the Contest, very enjoyable . . . *GM3ZSP.* As you can see, I am with you every year. Including this Contest, came up to near 37,000 QSO's! So see you next year . . . *HB9KC.* Still the best of the lot . . . *G3KDB.* Not enough countries are active during the CW part . . . *F3AT.* Nice to see the newly erected double fed delta loop work so well, esp. on 80m where the size is small . . . *TF3KB.* Always a very nice contest. Hope next year again, age 78 years Hi. I hope. . . *PAØVB*. Here's the new European record. Will be difficult to bear Ernie, K1PBW for top world though. Think that will be a very close finish! Most annoying parts of contest: line voltage dropped below 160V at times (noticeable in log). Heard loads and loads of JA's. Could only work one. Most thrilling event: Working 5 (five) "sixes" it made me wake up again, Hi . . . *PA0HIP/A.* Heavy QRN (due to snow fall) made it impossible to copy stations during best DX hours on Sunday. Even beverages had S9 noise levels . . . *DJ8WLA.* Imagine the thrill of working XE1AN, good for 2 multipliers, as my last QSO in the Contest . . . *TF3CW.* I believe this Contest is the biggest pusher to improve antennas and equipment. You should have seen me on the roof the days before the Contest! . . . *EA5CQ.* Still the most enjoyable test. Gap in log first day O65.2-0803 while I tracked down an intermittent fault on the bias line! . . . *G3HCT.* (14mc) A struggle to get multipliers in Europe amongst S9 + W signals! . . . *GM4CXM.* Windiest weekend of the year and antenna 'Birling around like a yoyo.' . . . *GM3XNJ.* I got my first KL7 on 40 meters! . . . *DM3BF.* With a wire antenna and TVI keeping me off in the evenings, that's nearly my limit I'm afraid. pity, because I enjoyed the Contest very much . . . *GW3INW.* Though we would have a go on 28 MHz as a change from 21 MHz. Heard a few W's but could only raise one, band did not open . . . *G4CNY.* Better conditions than last year. But still not good, though 10 did open up from time to time. See you again next year, I hope. 73 . . . *G3DYY.* Much more pleasant looking out the window at the English countryside, than the cement shack walls back home . . . *G5CFV* (K9RA, ex WA9LZA opr. I am blind and my dog is dead . . . *K2SS.* "Thrilled to bag GU4DAA for a new country . . . *CE0AE.* USA operator courtesy better than usual . . . *HI8LC.* Spent fone contest in hospital after fall from tower. Want to thank boys from the Fairbanks NASA station for their help with the antennas . . . *KL7RA.* Prepared to work 160, but too much QRN so decided on 10 meters instead . . . *LU1DZ.* My last contest from KP4. See you next year from W6DCC . . .



Our tree has many branches

At Henry Radio, we are proud that amateurs not only in the United States but throughout the free world look to us as their pre-eminent supplier of fine communications equipment. For fifty years this has been our principal business and it still is.

Most amateurs don't fully understand, however, the manner in which we have grown and grown so that every year we are better equipped to provide a genuine service to the world amateur fraternity and at the same time extend our unique blend of responsible, expert service to many electronic services in addition to the amateurs.

Our tree has indeed grown many new and sturdy branches. Yes, as always we distribute all the available high quality amateur equipment. In addition, we manufacture a full line of linear amplifiers that have become world famous for quality and reliability. These have provided the standard of reference in amateur radio for many years and are widely employed by commercial and government users. More recently our tube amplifiers have been supplemented by a broad line of solid state amplifiers for the HF, VHF and UHF bands. Many of these amplifiers are type accepted by the FCC for business, Public service, RCC and marine two-way service.

Out of this program has grown an entire new operation providing high quality FM handhelds, mobiles and fixed station transceivers for all these services. Moreover, as an off-shoot of our vacuum tube amplifier program we now supply R.F. power generators to industry. These are used as plasma generators in thin film plating and other exotic scientific processes.

What does all this mean to our most important customers, the amateur radio operators of the world. Simply this. As Henry Radio grows these sturdy new branches on our tree of electronic expertise, we continually strengthen our ability to help the amateurs of the world satisfy their communications requirements. As always, we offer expert, responsible assistance, the kind amateurs need and want. Wherever you live in the world, we invite you to turn to Henry Radio, the pioneer in service to the amateur radio fraternity.

Henry Radio

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CIRCLE 20 ON READER SERVICE CARD

U.S.A. Club Scores

Frankford Radio Club	62,769,387
Potomac Valley Radio Club	56,645,474
Yankee Clipper Contest Club	52,724,912
Northern California DX & Contest Cooperative	27,149,189
Southern California DX Club	23,168,114
Murphy's Marauders	19,435,764
Western Washington DX Club	15,935,129
North Florida DX Association	12,417,614
Southeastern DX Club	10,303,142
Texas DX Society	8,924,524
San Diego DX Club	6,830,268
Indy DX'ers	5,728,991
North Texas Contest Club	5,152,422
Central Virginia Contest Club	5,058,062
Northern Illinois DX Association	4,319,918
Richardson Wireless Klub	4,145,868
Williamette Valley DX Club	3,757,453
Michigan DX Association	3,330,809
Mad River Radio Club	3,242,542
Wireless Institute of the Northeast	3,161,595
Northern California Contest Club	2,214,102
Order of Boiled Owls	2,081,599
Alamo DX Amigos	2,078,193
Virginia Century Club	2,021,208
Delta DX Association	1,680,974
Northern California DX Club	1,601,122
South Florida DX Association	1,469,194
Eastern Iowa DX Association	1,297,173
Central Arizona DX Association	1,252,921
Twin Cities DX Association	1,187,314
Kansas City DX Club	834,030
Mississippi Valley DX & Contest Club	616,367
Greater Milwaukee DX Association	427,076
Charlotte Amateur Radio Club	390,142
Gloucester County Amateur Radio Club	388,646
South Jersey Radio Association	370,795
Dade Radio Club	279,027
Joliet Amateur Radio Society	272,241
Bluegrass Amateur Radio Club	271,019
Waukegan VHF Society	222,705
Northern Ohio Amateur Radio Association	154,213
Dayton Amateur Radio Association	68,438

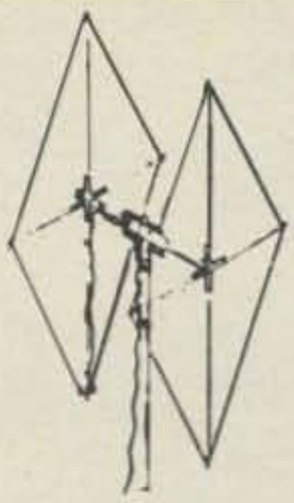
DX Club Scores

Rhein-Ruhr DX Association	13,819,801
Toronto DX Club	10,096,178
Voroshilovgrad Radio Club	10,070,861
South German DX Group	8,060,501
Kaunas Polytechnic Institute Radio Club	7,242,272
Chelyabinsk Region Radio Club	6,779,624
Saar/Pfalz DX Club	4,501,593
Channel Contest Group	4,183,802
Tetrahedral Contest Circle	3,647,862
Fraser Valley DX Club	2,003,431
Halifax Amateur Radio Club	1,727,552
Tallinn Radio Club	1,399,651
Honolulu DX Club	1,396,383
Minsk Radio Club	1,385,439
UBR (Brasil)	1,299,857
Winnipeg DX Club	1,267,189
Danish DX Group	1,074,636
DX Club of Puerto Rico	815,526
Radio Club Venezolano	512,264
CW YV Club	283,475
Swiss DX Club	101,156

KP4DKX. Big thrill to work CE0ZM for country number 170 with 5 watts . . . *OA8V*. Started at 10 w.p.m. and finished at 30 w.p.m. with a standard brass key. Will have a bug for the next contest . . . *VE8CC*. JA2UEO - I have moved to Yokohama this April, so went back to home country for the contest by bullet train. An always pleasant contest. Biggest thrill - was called by KP4BC via long path (7 MHz.) His signal was 10 dB over S-9 on my S meter . . . *JA5BJC*. I had to waste 1 hour because I got the traffic accident 1 hour before the test - missed many mults. . . . JE1CKA (JA0CUV Opr.). One of the most interesting competitions of the year - worked 12 new countries for 5B-DXCC. . . . *OK1DVE*. Operated by OH2BH - 36 el. beam, artic circle . . . propagation and good conditions resulted in my best score ever from Finland . . . *OH8OS*. It was fine Biz. test - worked 3 new countries. Very good opening on Sunday evening to Japan on 1.8 MHz . . . *OH2BO*. 65 years young, so don't try that all band rat race anymore. Fun with a different band each year . . . *SV0WTT*. Was 1st in 1968 from Italy, hope I can repeat it ten years later on 28 MHz . . . *IK2FGP*. Conditions were much better a week before the contest . . . *SP9ADU*. Poor conditions on 40 meters this year, had great fun as always in this contest . . . *YO3BEJ*. Fine conditions but much local QRM . . . *YU2OB*. Had fun in contest even with poor conditions . . . *YO6AW*. Nice to work so many stateside stations with new vertical antennas. Did miss 16 hours due to snow storm . . . *OH1IJ*. Rotator burned out before contest and repaired just in time to start test, then high winds damaged my quad so was limited to 21 MHz . . . *OK3EA*. How about CW in the WPX contest? . . . *CY3HFS*. Rainstorms washed out roads and cut off power . . . *W4ORT* (Op. of HH2DX). A lightning strike didn't help the 140 per hour rate . . . *G3XVY* (op. of VP2M). Suitcase DX-pedition stations just 'aint' the most secure in a Caribbean thunderstorm . . . *W4UY/PJ8JM*. Had to pass up some 1 point JA's for some slower 3 pointers . . . *K6KM/EP2SV*. We celebrated 50 years of our club by putting a team into the CQ WW CW, but some hard going when no one is beaming this way . . . *ZL2AKW* (op. at ZL2WB). Linear blew in the last hour of the contest . . . *N4VV/CE3* (That's a switch—ed.). Lots of troubles including interference, but hope to progress in the future, Nice Contest . . . *UK9AAN* (UA9AN). Contest was very good, we were happy to visit Georgia for DX-pedition over 10 years after 4L3A operation in 1967 . . . *4L6M* (UA6APW)

OK5CRC: OK2RZ, OK2SSS (standing) OK2RN, OK2HZ. We wonder which bottle has the most output.

N4AR, N4KG (standing), W8KIC.



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COMPLETE KITS INCLUDE HARDWARE, WIRE, ALL MOUNTS, BOOM.

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STRONGER AND LIGHTER THAN ALUMINUM.

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MAXIMUM GAIN.

AVAILABLE IN A COMPLETE RANGE OF KITS

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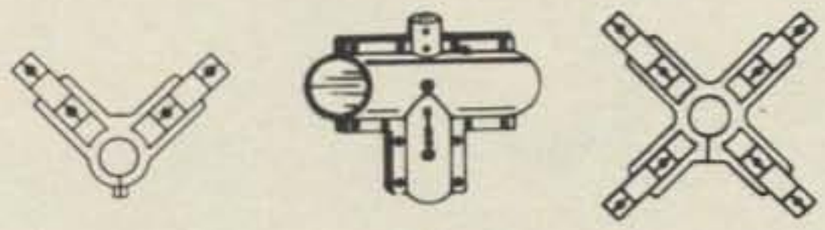
ANTENNA MOUNT KITS



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HEAVY DUTY CAST ALUMINUM

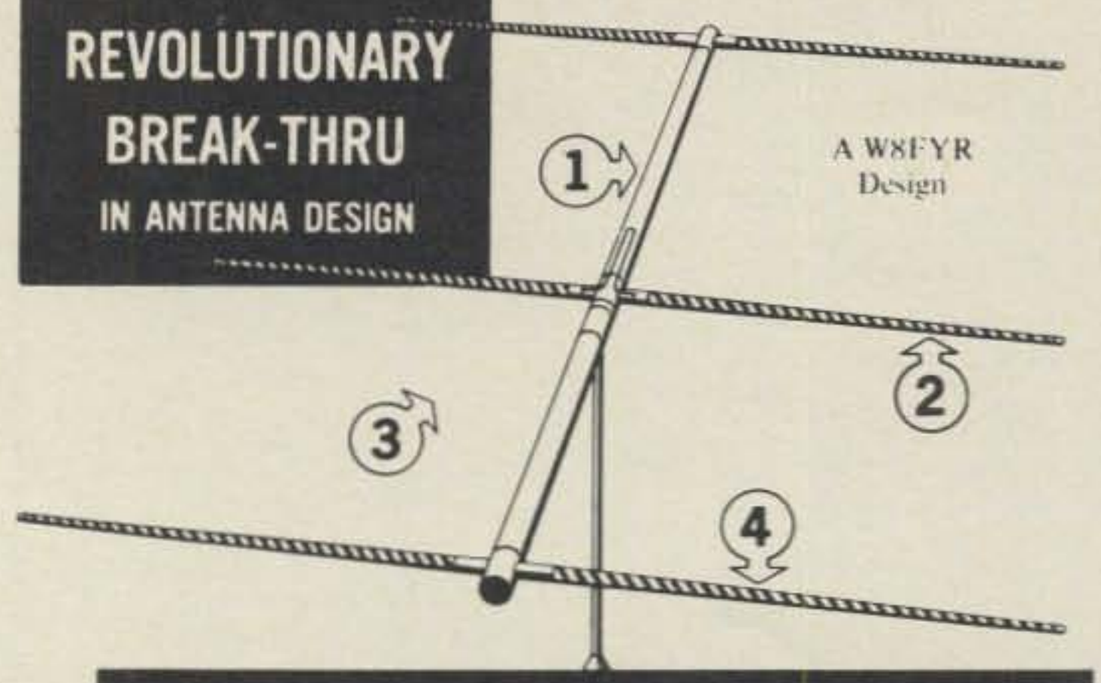
DELTA LOOP MOUNT KIT

DL-1	(2)	1½" Hub V-Supports	
	(1)	1½" Boom to 1½" Mast T-Mount	**$16.10**
DL-2	(2)	2" Hub V-Supports	
	(1)	2" Boom to 1½" Mast T-Mount	**$24.69**
DL-3	(2)	3" Hub V-Supports	
	(1)	3" Boom to 2" Mast T-Mount	**$40.64**

QUAD MOUNT KIT

QM-1	(2)	1¼" Hub Spiders (Small Spider for VHF)	
	(1)	1¼" Boom to 1¼" Mast T-Mount	**$11.95**
QM-2	(2)	1¼" Hub Spiders (Heavy Spider for 6M & 10M)	
	(1)	1¼" Boom to 1¼" Mast T-Mount	**$15.12**
QM-3	(2)	1½" Hub Spiders	
	(1)	1½" Boom to 1½" Mast T-Mount	**$16.10**
QM-4	(2)	2" Hub Spiders	
	(1)	2" Boom to 1½" Mast T-Mount	**$24.69**
QM-5	(2)	3" Hub Spiders	
	(1)	3" Boom to 2" Mast T-Mount	**$40.64**

REVOLUTIONARY BREAK-THRU IN ANTENNA DESIGN



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AVAILABLE IN: 2 & 3 ELEMENT - 40 METER
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Example:

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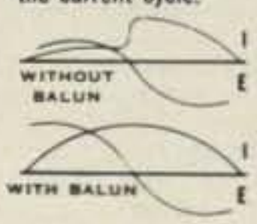
Kirk Broad Band Baluns are designed for matching an unbalanced line, such as coaxial cable, to a balanced antenna to produce a symmetrical wave form of equal intensity from the current cycle.



Kirk Baluns provide the greatest breakdown insurance by use of mylar insulation between the tough poly thermaleze winding and the Ferrite Core and a final dip coating of low dielectric impregnation. Handle peak power of 2000 watts provided ratio error is low.

Unique in design, Kirk Baluns are produced in two distinctive models: One for Dipoles and one for Beam Antennas.

NET PRICE **$14.25**

Application Frequency Coverage & Power Ratings For The Various Models Shown Below

MODEL	APPLICATION	F/MC.	POWER
5075-D	Dipole	3.4-52 mcs	2K PEP
5075-B	Beam	3.4-52 mcs	2K PEP
5075-LF	Dipole	1.7-10 mcs	2K PEP

MODELS 5075-D & 5075-LF For Dipole Antennas Net Wt. 7 Oz.

MODEL 5075-B For Beam Antennas Net Wt. 7 Oz.

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KIRK ELECTRONICS DIVISION

VIKING INSTRUMENTS, INC.

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CIRCLE 27 ON READER SERVICE CARD

DK5WL

YV1OB: 66' with 400m² ground on 160.

VP1AH (WA4DRU Opr.)

STATION OPERATORS

Multi-Operator Single Transmitter

DA2AY & DA2LJ, DA1MM, DA1HL, DA1LD, DA1PQ, DL1ZX, DF7FH, DK5FJ, DCØHO. **DKØBN:** DL6WT, DK9PY, DK9PD. **DKØTU:** DK5GB, DK5HH, DK6QI, DJ9NX. **DL8CM** & DL8AN, DL8CH, DL8FR, DL8HA. **DLØAA:** DJ4XG, DJ5PA, DK2ZO, DL3BK, DL6BK, DL8NU. **DL90KF:** DJ7SW, DJ8FR, DJ4FZ, DJ2BV, DJ5AV, DJ5UZ, DL2ZJ, DL7OY, DK8LD, DK8LE, DK9XT, DK6LG, DC5OH, DF3LP. **DLØWU:** DJ4AX, DJ8SW, DK4TP, DK5EZ, DK4EM, DL9DY, DA1UM. **DM3CK:** Rusher, Roleder, Lüdecke. **DM3SO:** DM3XSO, DM3YSO. **DM4CM** & DM4WCM. DM4EB & DM2CCB. **DM4FM:** DM4ZFM, DM2FDM, DM2FBM. **DM4ZA** & DM4YZA, DM4XZA. **DM5IG** & DM5YIG, DM5XIG. DM7BE: **DM2DBE,** DM2AGL, DM3NBE. **EI1AA**: EI2BB, EI2CN, EI3CP, EI6CW, EI7H. **EP2SV** & G3SXW, K5MM. **F6CZU** & F6COU, F6DZS, F6DBX, F6CIL. **G3GJL** & G3RLF, G3TQD, G3TQZ, G3UMV, G4AAL, G4DXD. **G4FDC/A:** G3HZL, G3KTZ, G3LIK. **GU4DAA:** G3FXB, G3MXJ, G4BUE, G4EHF. **HA1KTD:** Pozsgai, Markus. **HA1KZU:** HA1XY, HA1ZU, HA1XV, HA1XR, Borsai. **HA2KMB:** Bolla, Magyar, Gesztesi. **HA4KYH:** HA4YO, HA4YQ, Csanálasi, Barnoczky. **HA5KDQ:** HA5JI, HA5MK, HA5FM, HA5HD, HA5HP, HA7RY. **HA5KFZ/2:** HA5GN, HA5KF, Puskas, motnar. **HA5KJC:** HA5GP, HA5LN, Kovacs, Motnar, Hotman, **HA5KKC/2:** HA5MA, HA5MD, HA5MO, HA5LY. **HA5KKK:** Zoltan, Pali, Antal. **HA6KNV:** Uram, Lokos. **HA6KVB:** Kulcsar, Simon, Suszter, Pap, Toth. **HA7KLB:** Balogh, Czonka. **HA7KPK:** Schulez, Algan. **HA7KSV:** HA7SF, HA7SH, HA7UF, HA7UK, Adamecz. **HA8KAX:** Deveny, Toth. **HA9KOB:** Pokber, Orban, Nagy, Laki. **HA9KPU:** Jenei, Lakatos, Laub, Szabo, Mihaly. **HAØKHW:** HAØHF, HAØIG, **HAØKLL:** HAØ503, Racz. **HAØKLU:** HAØMM, HAØMU, Szabolczay. **HB9AYZ** & Schuetz. **HB9LP** & Fisher, Kumli. **HG8U:** HA8UD, HA8VL, HA8UB, HA8UI, Szentesi. **HH2DX:** W4ORT, WA8RWU, N2BA. **JA2YKA:** JH2EUV, JH2QXG, JA4UDP, **JA3YEE:** JA6HFV, JE3PZC, **JA5YAS:** Akihito, Shigeyuki. **JA7YFB:** JA7IBJ, JA7LPX, JA7UMD, JA7WBW. **JA8YAU:** JA4RAJ, JA8FPX, JA8UXL. **JAØYAN:** Saito, Okubo, Arai, Kawse. **JE1ZWT:** Hideo, Takao, Shoji, Takashi. **JH6YAY:** JA6FB, JA6VQA, JH6KBG. **JR1ZTI:** JA1CAJ, JA1QEU, JA1QXY, JA6KBK, **JF1WED, K1PR** & K1XM, WA1MAO, WA1QNF. K1XX & W1KM. **K1ZZ** & YU1PCF. K2BU & WA3LRO, **K3KA** & Repeater. **K3RS** & K3TA, N3TR. **K5JA** & K5MR, K5RX, K5SR, N5AU, NSTR, WD5GNJ. **K6DC** & W6BJH. **K6CYX** & WA6JAH. **K6SE** & WB6CEI. **K6SMH** & WR6ACZ. **K6YK** & WR6ACZ. **K7RI** & K7SV. **KL7MF** & KL7IUN, KL7PJ. **LA1H:** LA4KQ, LA8UL, LA9DI. **LX/DL7ON** & DL7QU, DL7SI. **LZ1KDP:** LZ1MS, Boris, Rumen, LZ1GZ, Rumi, Vasco. **LZ1KDW:** Ivanov, Kirilov, Temelbov. **LZ1KOZ:** Dimov, Kolev, Zlatanov. **LZ1KRD: Nenev,** Zografov, Latinov. **LZ2KEF:** Georgiew, Marinov, Totov. **LZ2KIM:** Enchev, Penchev, Kalchek. **LZ2KKK:** CLUB. **LZ2KSQ:** Lazarov, Blazev, Angelov. **LZ2KSU:** Petkov, Ivanov, Dicnev. **KM6BI:** KM6FC, WD8KLN. **N1AC** & W1IHN, **N3AW** & G3HLW, K2HR. **N3RD** & W3XU. **N4AR** & K4KSC, N4KG, W8KIC. **N4BP** & N3BL, N4ZU. **N4HU** & Repeater. **N4IB:** N4KE. **N4OL** & Repeater. **N4RA** & K4AW. **N6GG** & WR6ACZ. **N6IQ** & WR6ACZ. **N6OZ** & WR6ACZ. **N8ET** & WA8YEE. **OF3EW** & OH2BSS, OH2BOR, OH2DS, OH2OH, OH3NY. **OF2AA:** OH2BDP, OH2CG, OH2HI, OH2BNP. **OH6UC** & OH6RE. **OK1ALW** & OK1DWA. **OK1KOK/P:** OK1MPP, OK1-11661. **OK1KPU:** OK1AXA, OK1JDX, OK1MUF. **OK1KQJ:** CLUB. **OK1KRS:** OK2PEG, OK1DKR. **OK1KRY:** CLUB. **OK1KSL:** OK1AQ, OK1AHG, OK1FAF. **OK1KSO:** CLUB. **OK1KUA:** CLUB. **OK1KUR:** OK1AET, OK1DLA. OK1AYE, OK1DDT. **OK1KWV:** CLUB. **OK1KYS:** CLUB. **OK1KZJ:** CLUB. **OK1ONF:** OK1AXY, OK1DWE, OK1FAV. **OK1OXP:** CLUB. **OK2KPS:** CLUB. **OK2KWI:** CLUB. **OK2KZR:** CLUB. **OK3KAP:** OK3CGI, OK3TPV, OL8CGI, OK3-27060. **OK3KFO:** CLUB. **OK3KKQ:** CLUB. **OK3KTD.** CLUB. **OK3KTR:** CLUB. **OK3RJB:** OK3TCL, OK3TCN, OK3CKW, OK3TDO, OK3-26312, OK3-26832, OK3-26693, OK3-26694, OL8CGB, OL8CGX. **OK3RKA:** OK3TAM, OK3TDP, OK3TDJ, OK3-26015, OK3-26513, OK3-26515. **OK3VSZ:** CLUB. **OK5CRC:** OK2HZ, OK2RN, OK2RZ, OK2SSS, OK2YAX, OK2BYW. **OK5TLG/P:** OK1MMW, OK1FCW, OK1AMY, OL1AVB, OK2PFM. **ON6VN** & ON6LW, ON5JM, ON5OV, ON4NM. **OY6FRA:** OY2H, OY2J, OY5NS, OY7K. **OZ3LF** & OZ8AE. **OZ7BW** & OZ1HX, OZ1SC. **PA3AAT** & PA3AAM. **PA3ACE** & PA3AAZ. **PI1PT:** Koken, Van Kessel. **PJ8JM:** W4UY, W5AT. **SK1AQ:** CLUB. **SK2KW:** SM2ALH, SM2CEW, SM2DMU, SM2EKM, SM2EPR, SM2HTF, SM2HAK, SM2HZQ, SMØDGU, SMØGMG. **SK3HK:** SM3AFR, SM3CER, SM3DXC. **SK5DB:** SM5BKK, SM5CUI, SM5DCQ, SM5DGA, SM5DSE, SM5GTE, SM5GYE, SM5HRP, SM5FCJ, SM7MS, SM7FZA, SM1KQ, SMØDJZ. **SK5EU:** SM5FUG, SM5HEV, SM5EKQ. **SK6CM:** SM6CJK, SM6AWZ, SM6EPA, SM6EDI, SM6COZ, SM6ESW. **SK7CE:** SM7RN, SM7BGK, SM7EBC, SM7ECM, SM7EQL, SM7FUE. **SK7GC:** SM7GNT, SM7IDF. **SP2KAE:** SP2FAX, SP2FLE. **SP2KDT:** SP2FAP, SP2ADW, SP8ZAP/2. **SP3PGX:** CLUB. **SP9KAD:** SP9BOR, SP9DTI, SP9DWT, SP8HRA/9, SP8JTA. **SP9KRT:** SP9ZW, SP9FKQ. SP9PBN: SP9AMH, SP9HZV, SP9DLF, SP9JCW. **UK1ZAA:** UA1ZX, UA1ZBQ, UA1-145-113, UW1YY. **UK2AAA:** Khezev, Gorski, Chernov. **UK2AAG:** UC2AAK, UC2LAR, UC-009-105. **UK2AAP:** Bilchenko, Shudakov, Trocevsky. **UK2AAR:** CLUB. **UK2ABC:** UA2FCZ, UC-009-479, UC-009-401. **UK2BAG:** UP2BZ, UP2BCE, UP2DT, UP2BAD, UP2BAA. **UK2BAS:** UP2PAJ, UP-038-609. **UK2BBB:** UP2BAS, UP2MB, UP-038-517, UP-038-727. **UK2BBF:** UP2BDV, UP2BDX, UP2BFL. 2e$UK2BCB: UP2PBM, UP-038-369, UP2BEN. **UK2FAS:** Kuznetsov, Kozlov. **UK2IAJ:** Klenko, Bekish, Sinkewich. **UK2GCB:** UQ2-037-91, UQ-037-145, UQ-037-135. **UK2PAO:** UP2BEJ, UP2BFU, UP2PAQ, UP-038-440, UP-038-574. **UK2PCR:** UP2BCR, UP2BCT, UP2BCU, UP2BDF, UP2BEE, UP2-038-728, UP2-038-1541. **UK2RAX:** UR2REE, Fu, Neil, Toomas. **UK2RIL:** UR2ED, UR-083-75, UR-083-378. **UK2TAD:** CLUB. **UK3AAC:** UA3AGX, UA3-142-1232, UA3-170-1163. **UK3AAH:** Kustovsky, Kazasnovskey, Kuleshov, Zhukov, Solmcev, Afrefjeva. **UK3ABB:** UA3XAC, UA3ABZ, UA3AEM, UW3FI, UV3CC, UA3-170-888, UA3-170-834. **UK3DAU:** UA3DKF, UA3DKU, UA3-142-1153. **UK3SAB:** Shebolkin, Efremenko, Pozdnikow, Terchow, Shevstow, Sonushin. **UK3TAF:** Alexseev, Kuznin, Maslenn, Kov. **UK3TAG:** Chivow, Gorjachev, Tezhein, Timofrechv. **UK3UAA:** UA3UAR, UA3UBN, UA3VB, UW3UO. **UK3WAA:** UA3WZ, UA3WU, UA3XJ, UA3WBC, UA3WBZ, UV3WT, UA4CCG, UL7-026-199. **UK3XAM:** UA3-127-364, UA3-127-363. **UK4HBB:** UA4HBW, UA3HCW, UA3HAU, UA4HAL, UA4HGG, UA4HBR, UA4HFR, UA4HBX, UA4HFP. **UK4LAA:** UA4LM, UA4LN, UA4LAJ, UA4LAR. **UK4PAE:** UA4PAU, UA4PWT.

JA5BJC uses a 2 el. Delta loop on 40 meters.

OH6JW

YU2CDS (YU2CT Opr.)

I2FGP

UK4WAB: Baranov, Kanusov, Krylov, Sakerin, Sisin, Scobkarev. **UK4WAR:** Fomin, A., Fomin, T., Kuznetsov, Markovi, Onotnicov, Yamilov, Zapolskin, Volkov, Shevtsov. **UK4YYY:** Leontyev, Danilov, Filippov. **UK5EAG:** Owod, Dron, Pasyuk. **UK5IAK:** UB5-060-805, UB5-060-238, UB5-60-203. **UK5HAB:** UB5-071-73, UB5-071-330. **UK5IAN:** UY5EC, UB5IEP, UT5SI, UB5-073-1732. **UK5IAZ:** UT5AA, UB5-073-202, UB5-073-218, UB5-073-313, UB5-073-342, UB5-073-474, UB5-073-209, UB5-073-1249. **UK5IBB:** UB5IHO, UB5-073-394, UB5-073-734, UB5-073-2077. **UK5JAD:** Yavorsky, Shalya. **UK5JAO:** Grene, Vlasov, Dolotovski. **UK5LAA:** UB5LCV, UB5LCX, U Grene, Vlasov, Dolotovski. **UK5LAA:** UB5LCV, UB5LCX, UY5OQ. **UK5MAB:** UB5MDD, UB5MDA, UB5MHQ. **UK5MAF:** UY5LK. UB5MDC, UB5MAK, UB5-059-22. **UK5MAG:** UB5MDP, UB5MBP, UB5MDL, UT5HP. **UK5MBF:** UB5MDG, UB5MCH, UB5MHM. **UK5MBV:** UB5MFR, UB5MIA. **UK5MBW:** UB5MFT, UB5MGM, UB5-059-12. **UB5MCP:** UB5MIU, UB5-059-704. **UK5QBE:** CLUB. **UK5UBB:** UB5-065-271, UB5-065-73. **UK5VAA:** Dobrovolski, Lisovski. **UK5WAA:** UB5WCJ, UB5-068-420, UB5-068-389. **UK5WAG:** UY5XB, UB5-068-309, UB5-068-339. **UK5WAZ:** UB5WCT, UB5-068-395, UB5-068-392. **UK5XBA:** UB5-062-240, UB5-062-239, UT5QG, Vodotiets. **UK5ZAK:** UB5ZBK, UB5-069-337, UB5-069-396. **UK6AJA:** UA6AKK, UA6AJO, UA6AJG, UA6ALC, UA6AKT, UA6-101-1446, UA6-101-472. **UK6DAU:** Gorogets. **UK6LEZ:** UA6-150-1781, UA6-150-7371, UA6LBX, Rybak. **UK6QAA:** Wezhowski. **UK6YAB:** Deynecin, Kuznetsov, Velitchko, Grechnikov, Caplya. **UK7CAC:** UL7-028-1, UL7CAZ, Ex. UA9AFU. **UK7NAA:** UL7-031-003, UL7NAT, UL7NAU. **UK8AAI:** UI8ACI, UI8BI. **UK8BAA:** Soloddvinikov, Chichelenko, Novkov. **UK9ADY** UA9AFZ, UA9ADH, UA9ADI, UA9AAX, UW9AT, UA9AAF. **UK9CBD:** UA9CBM, UW9DW, UA9CT, UA9CAM, UA9DU, UA9CDJ, UA9-154-1162, UV9DO, UA9-154-1333. **UK9HAC:** UA9-158-307, UA9HBQ, UA9HBH, UA9-158-377. **UK9OAD:** UA9OFU, UA9OEH, UA9OFB. **UK9QAG:** Vidish, Selivanov, Lukhinyh. **UK9XAA:** Beznosikov, Shvec, Chegesov, Ikohnikov, Nikitin, Shishelov. **UK9XAC:** UA9XN, UA9XV. **UK0AAC:** UA0ACQ, UA0BW, UA0ABB, UA0AAK, UA0AAF. **UK0AAS:** Popov, Nepovinnyh, Dovgopoly. **UK9BAA:** Sataev, Holodov, Pakulsky. **UK0FAA:** UA0-153-1, UA0-153-79, UA0FAM, UW0FM, UA0FBX, UW0FX. **UK0LAB:** UA0LS, UA0LBW, UA0-107-387. **VE1MOT** & VE6BKF. **VE6ASI** & VE6JA. **VE7AUB** & VE7AVU. **VO2EPA:** VO2AB, VE1AI, VE1MX. **VP2M:** G3VZT, G3XVY, VP2MF. **W2UR** & N3KR. **W3EVW** & K4PJ. **W3HB** & W3NX, WA3WPY. **W3UO:** K3KU, W3IKA. **W4MYA** & W4LDF. W4NVU: K4KQ, W4OBA, WA4LJZ, WD4KRZ. **W5YZ** & W5SVN. **W6BH** & N6QR, WA6IQM. **W6BIP** & WA6DJI. **W6KG** & W6QL. **W6XR** & W1ARR, N6TV, K6UD. **W9LT** & K9UWA, W9FC, WD9DSU. **W0HP** & K0WWX, W0BE, K0KX, W0UO, W0YCR, W0ZZ, WA0LYN. **W0SD** & K0RA, K0SD, K0ZZ, K0GKE, K0QPH, W0UD, W0SMV, WA0NRE, WB0PJB. **W0YR** & N0AR, W0AR. **WA2HDD** & WB2MAE. **WA3NAN:** WB3ANV, WB3AON. **WA4LZR:** N4RU, W4ROA, WA0ACF. **WB9VLV** & WD9ADE. **WD8JZQ** & WD8IEX. **WD0BPG** & WD0DLV. **YO4SI** & YO4HW, YO4XF, YO4AIP, YO4ATW, YO4ARR, YO8BAH. **YO5KAU:** YO5DH, YO5RE. **YO8KAN/P:** YO8GV, YO8CP, YO8MI. **YO8KGV:** YO8AJG, YO8AMT. **YU1ELM:** YU1DFT, YU1OND, Petkovic, Krkic, Krkicz, Stolics. **YU2CDS:** YU2CT, YU2RNC, YU2RTM, YU2RUX, YU2RQX. **YU3BUV:** Majer, Alojs. **YU3DBC:** YU3ZV, YU3TYX, YU3TPZ, YU3EZ. **YU4CBC:** Karanovic, Zagovcic, Kosovic. **ZL2WB:** ZL2AKW, ZL2AYP, ZL2CD, ZL2OM. **4L6M:** UAGAPW, UA6APP, UA6DL, UA6AAQ, UW6CA, UW6CG, UA6AYR, UV6AF, UA6APH, UA6APR, UA6APL, Kravchenko.

STATION OPERATORS

Multi-Operator Multi-Transmitter

CE0ZM: K1MM, N4WW. **JA1YHA:** JH1LGZ, JG1BQP, JR2SMB, JA7UES, JA9GAE, JA0GBO, JA0KSX. **JA1YXP:** CLUB. **JA1ZLO;** JE1JJI, JR1FIG, JH2CKX, JH4EBN, JH6HDL. **JA2YEF:** CLUB. **JA3YBF:** CLUB. **JA3YKC:** CLUB. **JA3YQA:** JA3NHK, JA3STP, JH3QNH. **JA4YQO:** CLUB. **JA6YAP:** JH6GFF, JH6INJ, JH6INQ, JH6KPZ, JH6QKX, JH6RIM, JR6DTB, JR6KGU, Uchi, Masa, Nori. **JA6YDH:** JA3VXN, JA6KGB, JH6DRF, JH6EFI, JH6MWG, JR6DUL. **JA7YAA:** JA7LMK, JA7NRQ, JA7HKB, JA7JQG, JA7LMU, JA7LKH, JA7TNO, JA9DTO, JA8FTW, JH2DVX, JA7KPK, JG1IGW. JA9YBA: JH2FKX, JH2SGU, JR2NKG, JA9DZS, JA9GU, JA9GOE, JA9LWB, **JH1YDT:** JA1MRM, JH1AGH, JH1BBT. JH1BNC, JH1BTV, JH1GNU, JH1KLA, JR1AOQ, JR1IJV. **JH1ZLA:** JA1CUW, JA1KSO, JE1FFW, JE1GWP, JE1OMO, JH1DTC, JI1HXR, JR1JFO, K7JA. **K2GM** & N1XX, W1PM, K2BQ, K2GL, K2SS, K2TT, K2UU, N2AA, WB2VYA, WB6KIL, B. WALSH. **K3WW** & K3DZB, K3UEI, K3WJV, W3HXK, WA3LNM. **K4CG:** K3WUW, K4YEP, N4MO, WB4BQX. **K4LRJ** & N4HI. **K5RC** & K5GA, K5GN, K5KG, K5MA, K5TM, K5WA, K5ZD, N5AM, W5VAH, W5VQ, WB5QWX. **K6RR** & K6OZL, N6CW, N6FU, N6IN, N6MU, N6PD, N6RJ, N6XX, N6ZZ, WA6OTU, WA6PNG, AA6RX. **K8LX** & K8GM, N8EA, W8KPL, W8SYR, W8WA. **K0RF** & K0GU, N0RR, W7ZQ, W0UA, W0UN, W0ZV, WD0DSU. **KP4EAJ** & K1OME, K1VR, K1ZM, K2DM, K5PM, N4ZC, WB8NTK, WB8TON. **N2MM** & N2ME, WA2HGM, WB2SST. **N4KE** N4IB. **N6AW** & N6AV. **N6MG** & WA6PGB, REPEATER. **OH1AA:** CLUB. **OH2AW:** OH2BAD, OH2BGD, OH2BPN, OH2BQT, OH2BR, OH2CX, OH2EO, OH2KA, OH3MK, OH3YI, OH3XZ, OH5UX. **SK5AJ:** CX1AAC, SM5AD, SM5AXP, SM4BNZ, SM5CAK, SM5CBN, SM5CNQ, SM5DPS, SM2DQS, SM7EXE, SM5HPB, SM5GPP. **UK9AAN:** UA9AN, UA9AEN, UA9ACZ, UA9ABA, UA9AID, UV9AX, UW9BY, UA9165-965, UL7LEZ, UA9AHH, UA9AIA, RA9AIL, UA9-165516, UA9-165686, W2PV & K1AR, K1IR, K1PT, K2TR, K2XA, N2FB, N6DE, WA2SPL. **W3AU** & K3EST, N4IN, K3TW, CX1EK/W4, WA3TAI, K3LR. **W3FA** & N8II, W3ABC, W3XY, WA3KCY, WA3ZAS. **W3GM** & K3GM, K0VCK, W3GL, WA3JYB, WA3WIM, W83DKM. **W3MM** & K2TD, K3YL, N2HI, N2ME, N3AD, N3DA, WB2OYU, WA3VYD. **W3TV** & W3AOH, W3VW. **W3ZZ** & W3IUU. **W4WS** & N4IO, N4OO, N4UN, N4WC, W4QM, W4YA, W4ZCB, WA4YWE, W7NG, **W7FU** & K7XX, W5XZ, VE7ZZ. **WA3NNA** & W3GRS. **YU1BCD:** YU1NQW, YU1NZV, YU1OCV, YU1ODO, YU1OQI, YU1QBC, YU1QFK, YU3TCA, YY1RS-625, YU1RS-627, YU1RS-628. **YY5A:** YV5AAQ, YV5AAS, YV5AAZ, YV5ANT, YV5BNR. **ZF2AW:** K8MFO, N8AA, W8DNC, W8VW, VE1CD.

TOP SCORES

WORLD Single-Op All Band		USA Single Op All Band	
9Y4VT	4,697,304	W3LPL	1,693,956
KP4RF	3,732,350	N2LT	1,594,104
PJ9CG	3,334,884	W1ZA	1,543,850
ZL3GQ	2,648,064	N3RS	1,411,830
PJ2VD	2,591,440	N6RO	1,387,368
9Y4VU	2,221,024	K1NA	1,344,512
ZS6WW	2,131,200	K9DX	1,330,060
W3LPL	1,693,956	N7XX	1,327,872
KH6IJ	1,661,756	W7KW	1,318,592
YU3EY	1,636,605	W4DR	1,310,985

Single-Op Single Band 28 MHz		Single-Op Single Band 28 MHz	
LU1DZ	231,504	W5MYA	40,133
C5AT	156,060	N6KA	26,235
4Z4KX	92,232	K5UR	25,996
CR9AJ	70,766	W6MUR	22,960
UA9SCH	64,854	K4JD	20,700
EA8URE	47,700	W1BR	19,400
21 MHz		**21 MHz**	
KX6LA	543,345	N4RJ	221,598
CX8DT	387,844	W4RX	198,024
KH6DD	320,320	W1RM/2	194,129
YU2OB	254,767	K4FJ/3	161,690
OE3AKA	229,381	K9FN	158,256
N4RJ	221,598	WA8PKB	157,728
14 MHz		**14 MHz**	
ZW4OD	648,825	K1OX	450,596
OH8OS	625,812	N9MM	394,482
K1OX	450,596	K8IA	331,303
CY3EDC	399,663	K4JPD	313,575
N9MM	394,482	W5FO	285,496
OZ1LO	385,330	K3UA	277,300
7 MHz		**7 MHz**	
KV4FZ	371,628	W5UN	246,584
UA6LO	269,654	K7UR	97,440
W5UN	246,584	K4VX	97,008
I2XXG	212,443	W4FDA	76,911
ZL1AMO	187,026	N0DX	57,570
CY3IXE	180,978	W4VQ	33,341
3.5 MHz		**3.5 MHz**	
CT3/OH1TV	223,364	WB3AVN	34,580
DK3GI	165,216	K8MD	33,670
DL7AV	130,916	K9OTB	25,950
UA1DZ	129,692	N4QQ	24,752
I3GNQ	105,252	K5NU	22,388
CY3BMV	102,828	K9AJ	18,612
1.8 MHz		**1.8 MHz**	
K1PBW	19,872	K1PBW	19,872
PA0HIP	17,346	W1BB/1	6,012
YV1OB	14,220	W4HBK	3,465
KH6CHC	8,400	N4EA	3,168
DJ8WLA	7,018	W5USM	2,759
OK1ATP	6,014	K5AAO	1,175
Multi-Op Single Transmitter		**Multi-Op Single Transmitter**	
4L6M	6,095,824	N4AR	2,131,746
GU4DAA	2,842,776	K5JA	2,087,400
VP2M	2,766,433	K2BU	1,755,914
EP2SV	2,505,068	K1PR	1,714,172
YU3DBC	2,247,696	W6XR	1,630,608
OK5CRC	2,164,941	K1XX	1,447,419
Multi-Op Multi-Transmitter		**Multi-Op Multi-Transmitter**	
KP4EAJ	7,177,275	W2PV	4,318,650
UK9AAN	6,540,380	W3AU	4,216,306
YU1BCD	4,707,000	K2GM	4,034,360
W2PV	4,318,650	K3WW	4,016,352
W3AU	4,216,306	K5RC	3,896,904
K2GM	4,034,360	W3MM	3,158,142

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

PHONE RESULTS SINGLE OPERATOR NORTH AMERICA

UNITED STATES

W1ZA	**A**	**1,543,850**	**1397**	**109**	**276**	
						(Opr. K1EA)
K1NA	"	**1,344,512**	**1191**	**113**	**291**	
N1GL	"	791,605	826	102	233	
W1YG	"	590,226	754	77	196	
K1WB	"	469,635	696	77	162	
K1IU	"	442,736	588	90	178	
W1BIH	"	438,292	506	95	221	
K1SB	"	416,520	568	78	182	
K1YXK	"	392,380	621	75	155	
W1NG	"	374,596	488	87	197	
W1XS	"	315,616	514	78	146	
K1DG	"	315,016	485	71	162	
K1OT	"	276,621	473	67	144	
W1ZT	"	224,640	365	81	153	
W1FJ	"	212,877	364	69	148	
W1GG	"	192,058	333	76	142	
W1OO	"	174,796	349	60	118	
WA1TAI	"	97,654	241	50	107	
W1VV	"	85,965	194	59	106	
W1SD	"	75,150	173	70	97	
W1WY	"	69,280	169	55	105	
W1CNU	"	67,815	182	41	96	
W1IUU	"	53,504	158	43	85	
WA1POJ	"	51,088	162	42	82	
W1GD	"	41,769	132	35	84	
W1RQ	"	39,710	136	37	73	
K1MBQ	"	38,150	133	36	73	
K1SA	"	29,484	112	29	62	
W1PWK	"	27,200	104	33	67	
WA1UZH	"	23,375	100	30	55	
W1XK	"	21,879	90	35	64	
W1YNE	"	19,683	87	27	54	
W1XX	"	15,030	115	13	32	
K1GQ	"	14,381	72	26	47	
WA2ERT/1	"	8,723	171	26	35	
N1AU	"	7,072	48	20	32	
K1IK	"	3,024	29	19	23	
W1PLJ	"	2,784	31	11	21	
W1OPJ	"	2,310	27	11	24	
K1SF	"	1,568	21	11	17	
K1KNQ	"	936	16	10	24	
W1BR	**28**	**19,140**	**114**	**21**	**45**	
K1LWI	"	10,764	84	16	36	
W1YN	**21**	**126,351**	**439**	**26**	**75**	
W1PH	"	117,832	393	27	77	
K1WX	"	68,034	290	20	67	
WA1FCN	"	9,270	80	11	34	
K1OX	**14**	**450,596**	**1217**	**33**	**94**	
						(Opr. K1UA)
K1DKX	"	159,782	544	29	72	
W1LK	"	112,423	391	26	71	
K1ZSY	"	73,429	266	27	70	
W1HOF	"	42,851	201	23	50	
K1WJL	"	42,420	181	25	59	
W1ZM	"	7,105	51	16	33	
K1CO	7	3,724	41	12	26	
K1PBW	**1.8**	**19,872**	**145**	**14**	**34**	
W1BB/1	"	6,012	56	10	26	
N2LT	**A**	**1,594,104**	**1451**	**111**	**270**	
W2IB	"	**1,137,312**	**1121**	**106**	**253**	
K2BMI	"	877,051	901	102	241	
N2WT	"	694,407	833	93	208	
W2GD	"	687,974	790	103	211	
W2GW	"	643,530	794	86	199	
N2RM	"	597,135	895	72	159	
WA2ZKY	"	584,199	714	83	214	
W2YV	"	564,706	697	82	207	
W2GGE	"	432,752	531	94	202	
N2MR	"	350,760	530	80	157	
K2UA	"	344,080	654	54	133	
K2FL	"	335,160	428	91	203	
W2AX	"	319,559	537	62	161	
W2FVS	"	260,370	373	83	180	
W2REH	"	197,303	361	65	126	
W2JJ	"	192,660	319	76	152	
K2SD	"	160,680	292	60	135	
N2OO	"	150,012	327	53	109	
WA2ZWH	"	141,792	313	56	112	
K2VV	"	119,377	403	30	73	
N2TW	"	110,630	318	43	87	
W2EUD	"	108,125	242	49	124	
W2CP	"	99,302	211	62	111	
W2NS	"	97,097	243	47	96	
WB2RTF	"	88,740	222	49	103	
WB2EOO	"	82,492	218	60	104	
W2SGK	"	80,556	211	47	90	
WA2VYA	"	71,722	241	41	68	
WA2LJM	"	64,201	233	33	76	
K2MFY	"	56,048	168	37	87	
W2PQZ	"	47,625	142	50	77	
K2PH	"	40,341	136	40	73	
K2SB	"	38,110	136	38	65	
K2PF	"	37,516	130	40	73	
W2FTY	"	36,712	131	35	69	
K2FS	"	31,734	100	51	72	
W2HUG	"	30,747	116	42	69	
WB2LJK	"	29,988	117	36	62	
K2MN	"	25,761	104	30	63	
W2KI	"	16,380	92	20	45	
W2QY	"	14,910	80	19	51	
WA2VCZ	"	9,861	65	24	33	
W2IY	"	5,900	38	26	33	
WA2AUB	"	5,280	43	23	32	
K2PE	"	1,770	21	13	17	
W2RS	28	7,500	60	17	33	
W2HG	"	3,465	46	14	21	
W1RM/2	**21**	**194,129**	**632**	**30**	**79**	
WB2FIT	"	127,504	426	26	78	
K2LE	"	92,268	326	25	74	
K2UR	"	90,768	336	24	69	
W2AZO	"	18,176	104	20	44	
K2LWR	**14**	**209,760**	**624**	**32**	**83**	
W2SUA	"	180,290	582	31	79	
						(Opr. N2CQ)
K2IGW	"	129,865	500	27	67	
W2AO	"	53,185	328	17	38	
WA2CSQ	"	4,092	47	11	20	
W2XN	"	3,872	43	12	20	
K2ZM	"	2,856	44	11	17	
K2TD	"	588	14	9	12	
N2IN	"	495	14	6	9	
N2GC	7	14,280	92	19	41	
N2RN	"	10,731	97	15	34	
N2SS	"	6,660	57	16	29	
W2ER	3.5	17,050	103	14	48	
W3LPL	**A**	**1,693,956**	**1317**	**128**	**323**	
N3RS	"	**1,411,830**	**1194**	**122**	**293**	
W3BGN	"	1,230,293	1185	106	253	
K3ZO	"	1,164,800	1130	108	256	
K3RA	"	989,095	1024	101	236	
W3AP	"	954,603	920	115	254	
K3CY	"	861,300	929	89	230	
N3BB	"	843,200	880	106	234	
W3GRF	"	790,824	857	99	233	
N3ED	"	657,926	705	95	218	
W3RJ	"	651,147	756	94	209	
K3NA	"	600,849	748	94	209	
W3OV	"	529,644	683	81	195	
W3GG	"	521,040	756	79	161	
						(Opr. WB3FGR)
K3OO	"	440,707	579	90	187	
K3II	"	420,863	551	74	197	
K3NZ	"	413,910	556	87	183	
W3FV	"	402,582	503	90	203	
N3NA	"	383,894	602	73	165	
DK5AD/W3	"	376,540	507	85	183	
W3AZ	"	367,104	551	73	166	
W3NZ	"	354,273	476	83	186	
W3JO	"	305,976	588	50	133	
W3GK	"	256,872	394	73	158	
W3KV	"	228,712	384	71	155	
N3UN	"	223,416	413	73	141	
WA3WRD	"	201,201	375	70	131	
W3GU	"	191,239	339	65	134	
W3RL	"	187,660	313	74	146	
W3KT	"	170,476	294	69	149	
WA3FUV	"	164,780	328	63	127	
K3HWL	"	141,225	285	55	120	
W3ARK	"	138,574	280	60	133	
N3LR	"	130,524	309	52	94	
W3MA	"	110,408	271	46	102	
W3GNQ	"	103,695	261	57	98	
K3NL	"	101,250	227	54	108	
W3BB	"	96,590	261	40	90	
W3UJ	"	96,489	238	50	101	
N3AM	"	81,204	251	43	91	
N3II	"	76,230	187	54	100	
K3PA	"	46,148	118	40	95	
W3HVM	"	42,716	141	43	75	
W3YFV	"	38,608	130	38	66	
W3PC	"	36,952	114	42	82	
WA3SZV	"	32,300	149	23	52	
N3RB	"	29,029	115	32	59	
WA3ZKL	"	20,461	98	26	53	
W3BI	"	5,346	57	23	31	
W3GRW	"	5,217	56	18	19	
WA3WPY	"	4,264	39	15	26	
K2SCU/3	"	2,400	28	19	21	
WB3FHO	"	1,782	27	10	17	
K3WOK	"	1,380	24	14	16	
WB3FSB	"	741	17	8	11	
W3EB	28	10,335	75	19	34	
K2PLF/3	"	6,519	74	17	24	
K4FJ/3	**21**	**161,690**	**493**	**27**	**88**	
N3CW	"	157,040	521	26	78	
WB3ERS	"	1,188	20	8	14	
K3UA	**14**	**277,300**	**815**	**31**	**87**	
K3JLT	"	204,288	626	30	82	
K3FN	"	203,868	564	34	90	
W4NL/3	"	202,630	605	33	82	
K3ND	"	120,890	381	31	79	
W3HW	"	69,608	253	32	82	
K3AO	7	29,568	146	23	54	
WB3AVN	**3.5**	**34,580**	**165**	**20**	**56**	
W3HVQ	"	4,130	45	9	26	
W4DR	**A**	**1,310,985**	**1109**	**122**	**293**	
						(Opr. WA8ZDT)
N4RR	"	**1,141,764**	**1172**	**104**	**234**	
N4RV	"	859,548	898	103	229	
K4PQL	"	729,344	845	91	205	
K4BAI	"	729,330	774	104	241	
W4HR	"	709,290	727	112	243	
W4KFC	"	587,972	638	99	233	
K7ZZ/4	"	467,266	509	109	225	
W4YE	"	428,280	591	77	181	
W4XR	"	355,514	481	90	208	
K4II	"	320,922	436	96	187	
N4ND	"	314,870	484	73	157	
W4HJ	"	303,502	411	90	173	
N4XM	"	286,365	406	84	171	
N4AA	"	261,765	485	56	133	
W4EI	"	246,960	385	79	161	
WB4BVY	"	243,380	407	65	150	
W4DM	"	230,748	406	62	139	
N4UF	"	167,475	349	60	115	
W4LVM	"	164,010	284	78	132	
K4KQ	"	146,718	266	67	131	
W4YN	"	129,042	242	71	130	
W4OUN	"	126,608	256	68	125	
W4RW	"	124,659	263	58	113	
K4ZVS	"	108,398	256	57	109	
W4ZM	"	96,800	206	57	103	
N4NX	"	94,764	237	51	98	
K4JM	"	85,470	205	61	93	
K0CMF/4	"	67,200	162	54	96	
WA4IAR	"	65,486	196	54	83	
W4GF	"	58,225	155	46	91	
N4ZR	"	58,164	170	44	87	
W4GTS	"	54,924	152	54	84	
K4GFH	"	48,070	160	38	72	
W4JBQ	"	47,424	159	32	64	
K4OD	"	44,958	138	45	82	
N4IA	"	43,384	142	44	72	
WA4LWO	"	40,341	138	43	76	
K4KA	"	31,152	106	44	74	
W4KMS	"	23,814	90	42	56	
N4YJ	"	18,942	103	25	52	
K4UEE	"	18,914	77	39	59	
N9RC/4	"	16,892	76	30	52	
K4JTH	"	13,662	82	25	41	
K4PI	"	10,790	55	27	56	
WB4BZR	"	10,602	72	19	38	
WB4VCQ	"	9,152	76	17	35	
WB4GKN	"	8,576	62	26	38	
W3YY/4	"	8,382	52	30	36	
K4BKX	"	6,156	46	21	33	
W4PAK	"	4,508	39	21	25	
WB4WHE	"	4,108	42	24	28	
WD4CTA	"	780	21	9	30	
K4JD	**28**	**20,700**	**118**	**22**	**47**	
W4QQN	"	15,900	104	23	37	
N4PN	"	14,396	104	20	41	
N4MM	"	13,750	101	17	38	
WA4GQJ	"	6,020	54	18	25	
W4EEO	"	561	11	7	10	
N4RJ	**21**	**221,598**	**658**	**29**	**88**	
W4RX	"	198,024	617	27	84	
WB4OSN	"	127,070	471	26	71	
K4RV	"	73,167	296	22	87	
WA4JTI	"	62,328	266	27	57	
WA4DAE	"	27,229	133	21	52	
K4JRF	"	11,280	96	17	31	
WA2BCK/4	"	608	13	7	12	
K4JPD	**14**	**313,575**	**970**	**31**	**82**	
W4AAV	"	150,696	445	33	84	
W0DAD/4	"	23,488	153	31	65	
N4HB	"	10,172	86	16	32	
W4OBA	"	2,070	26	10	20	
WB4WRM	"	1,125	23	8	17	
K4VX	**7**	**97,008**	**396**	**25**	**61**	
W4FDA	"	76,911	303	27	66	
						(Opr. WB4IAE)
W4VQ	"	33,341	156	23	54	
N4QQ	**3.5**	**24,752**	**130**	**19**	**49**	
WB4RUA	"	9,976	69	21	37	
W4HBK	**1.8**	**3,465**	**40**	**10**	**23**	
N4EA	"	3,168	40	11	22	
K5KU	**A**	**631,180**	**740**	**102**	**200**	
N5IP	"	594,528	604	119	233	
K5DB	"	219,099	407	71	128	
W5VGX	"	189,602	355	73	130	
W5OB	"	182,070	322	78	132	
K5LP	"	170,452	357	67	105	
K5UA	"	164,781	385	56	97	
W5BE	"	150,984	347	66	96	
W5FL	"	146,791	320	74	107	
W5LW	"	130,572	277	58	104	
W5OSJ	"	119,195	286	64	91	
K5EWJ	"	106,049	244	68	105	
W5LUU	"	104,463	248	61	98	
K5MA	"	95,424	214	67	101	
W5JC	"	87,505	186	69	116	
K5NA	"	79,060	211	51	83	
W5DUI	"	69,542	233	39	70	
W5EJT	"	22,050	87	36	54	
K5BDX	"	13,534	74	30	37	
K5RF	"	4,708	46	21	23	
WA5IYX	"	2,204	33	11	12	
W4MYA	**28**	**40,133**	**228**	**22**	**45**	
K5UR	"	25,996	160	21	46	
W5WW	21	851	51	6	5	
W5FO	**14**	**285,496**	**804**	**34**	**93**	
W5NA	"	94,080	346	27	69	
K5DI	"	31,892	170	21	46	
W5UN	**7**	**246,584**	**816**	**31**	**73**	
K5NU	**3.5**	**22,388**	**144**	**21**	**37**	
K5OA	"	5,984	55	15	29	
W5USM	**1.8**	**2,759**	**39**	**11**	**20**	
K5AAO	"	1,175	31	9	16	
W5JVF	"	714	15	8	13	
N6RO	**A**	**1,387,368**	**1498**	**117**	**207**	
W6PU	"	**990,102**	**1216**	**110**	**172**	
N6AR	"	**937,860**	**1076**	**116**	**192**	
W6AM	"	872,645	1171	99	166	
						(Opr. N6TJ)
N6RA	"	870,974	1099	111	167	
W6RR	"	784,084	973	98	189	
N6JV	"	430,528	687	90	134	
N6ND	"	374,070	605	91	131	
W6OKK	"	273,408	543	71	107	
N6AN	"	261,300	605	61	95	
W6NKR	"	151,810	318	65	105	
N6QQ	"	149,040	435	49	71	
WA6TLA	"	148,851	360	55	94	
K6DR	"	147,675	323	72	93	
K6RU	"	129,059	434	42	61	
WA6TKT	"	120,510	411	41	62	
W6CNA	"	120,380	330	56	74	
WB6RSE	"	104,451	331	48	63	
W6OAT	"	102,935	221	64	109	
WB6ZHD	"	92,322	272	54	84	
W6BVM	"	74,704	216	51	72	
W6BZE	"	72,316	258	39	62	
N6IC	"	71,925	206	58	79	
N6MW	"	71,258	181	69	89	
K6WD	"	63,020	224	35	57	
W6TPH	"	60,341	252	33	50	
W7CB/6	"	60,000	210	47	53	
W6KPJ	"	52,894	182	45	61	

N6UW	"	46,980	191	36	54
K6OC	"	44,440	142	44	66
N6JM	"	32,274	119	44	55
WA6AWF	"	31,293	180	27	34
N6HE	"	26,166	160	41	48
W6SUJ	"	20,655	91	36	49
W6JD	"	19,039	88	27	52
WB6JMS	"	12,540	88	30	30
N6GL	"	7,020	54	24	28
N6OU	"	5,550	47	25	25
W6QDE	"	5,292	51	14	22
AA6EE	"	4,459	49	25	24
W6BYH	A	4,365	35	19	26
W6TDO	"	2,625	40	12	13
N6OB	"	725	13	12	13
WA6QCZ	"	330	11	6	5
N6KA	**28**	**26,235**	**191**	**20**	**33**
W6MUR	"	22,960	153	22	34
N6PE	"	7,140	76	16	18
W6YX	**21**	**116,856**	**571**	**23**	**49**
			(Opr. N7MH)		
N6VI	"	113,516	550	24	50
WB6JGY	"	31,735	211	22	33
N6UC	"	10,440	108	18	22
N6TO	14	51,768	251	23	49
K6XX	3.5	2,448	27	17	19
N7XX	**A**	**1,327,872**	**1688**	**105**	**168**
			(Opr. WA1KKM)		
W7KW	"	**1,318,592**	**1319**	**128**	**224**
			(Opr. K6NA)		
W7N1	"	824,310	1,082	98	172
W7WA	"	553,245	855	88	143
K7NF	"	258,957	648	62	77
W7JYW	"	241,025	590	62	93
W7NP	"	183,183	442	53	90
N7AM	"	174,334	469	61	73
W7ZMD	"	142,880	319	81	109
K7UU	"	78,864	277	47	59
K7WA	"	65,856	231	53	59
W7HXG	"	45,780	168	43	66
N7MW	"	37,736	146	48	58
W7IIT	"	33,417	151	36	43
W7GUR	"	22,698	107	34	44
W7BCS	"	21,655	142	31	40
W7QK	"	20,979	111	31	32
K7CPC	"	6,336	51	20	24
W7BYK	"	6,321	53	21	22
W7FR	21	49,032	320	21	33
			(Opr. W7PHO)		
W7AYY	"	25,760	165	20	36
W7ATF	**14**	**236,440**	**738**	**35**	**80**
			(Opr. N7RP)		
K7OEW	"	110,736	549	22	50
W7IJ	14	62,900	313	23	45
W7ZI	"	4,500	62	12	13
K7UR	**7**	**97,440**	**429**	**27**	**53**
W7ISX	"	2,790	35	16	15
N7RK	**3.5**	**16,550**	**128**	**19**	**31**
W7XZ	**1.8**	**660**	**37**	**7**	**5**
N8JW	**A**	**652,210**	**805**	**93**	**197**
K8GL	"	**356,680**	**536**	**83**	**158**
W8RSW	"	130,152	235	65	139
K8MR	"	115,938	254	60	111
WA8KME	"	101,232	229	65	106
K8RD	"	100,492	197	70	124
W8DSO	"	69,987	201	38	85
W8GOC	"	69,840	189	58	86
WA4RIJ/8	"	54,016	180	50	78
K8LJG	"	44,289	143	38	73
W8VSK	"	38,584	137	32	72
W8ICC	"	18,249	88	30	49
K8US	"	13,020	77	26	44
WD8LRV	"	7,316	49	24	35
K8KR	"	3,440	35	17	26
K8MVZ	"	2,380	26	12	22
W8WPC	**28**	**15,180**	**134**	**20**	**40**
			(Opr. N9AG)		
W8LU	"	9,750	78	18	32
K8MN	"	3,465	44	15	20
W8WVU	"	2,848	44	13	19
WA8PKB	**21**	**157,728**	**532**	**27**	**79**
			(Opr. K8WW)		
K8CX	"	135,616	455	29	75
W8TA	"	133,421	462	28	73
K8DYZ	"	107,800	381	28	70
K8IA	**14**	**331,303**	**864**	**33**	**100**
W8TWA	"	113,553	430	26	67
W8ILC	"	15,872	100	22	42
WA8TNJ	"	6,232	60	12	26
K8PYD	"	1,728	32	7	11
N8BB	**7**	**38,097**	**169**	**27**	**56**
			(Opr. W8UVZ)		
K8CW	"	32,025	156	20	55
K8MD	**3.8**	**33,670**	**174**	**21**	**53**
K9DX	**A**	**1,330,060**	**1276**	**112**	**253**
W9RE	"	**862,576**	**968**	**102**	**217**
W9ZR	"	670,880	846	93	187
N9NS	"	257,625	424	82	143
W9NA	"	250,575	446	70	125
W9OP	"	188,968	385	63	121
K9IL	"	181,634	343	71	126
W9RX	"	140,600	276	66	119
WA9MAG	"	119,358	280	63	108
W9TKV	"	77,028	189	49	98
WB9TZM	"	73,914	238	47	80
W9OA	"	38,907	147	39	60
W9QWM	"	34,946	145	44	57
W9RY	"	28,665	126	36	55
K9BK	"	17,850	92	30	55
WA9PBK	"	15,768	99	29	44
W9TNZ	"	7,112	48	20	36
W9ZA	**28**	**17,050**	**118**	**21**	**41**
N9DP	"	15,780	114	23	37
W9OBF	"	12,426	86	20	37
W9YYG	"	9,450	81	19	35
W9JUV	"	6,795	61	18	27
K9FN	**21**	**158,256**	**492**	**30**	**82**
K9ES	"	129,584	430	30	82
K9DAF	"	70,890	297	26	59
W9JZK	"	68,150	258	27	67
K9AB	"	35,136	171	21	51
W9MVL	"	11,935	80	18	37
W9WI	"	4,672	54	11	21
WD9BCG	"	364	9	5	9
N9MM	**14**	**394,482**	**1057**	**35**	**94**
K9CLO	"	155,471	510	30	77
W9DWQ	"	81,630	323	24	66
N9B8	"	67,452	307	21	56
W9GIL	"	66,780	268	26	64
W9JI	"	59,254	261	24	62
K9BN	"	33,040	152	23	57
W9JOO	"	23,694	139	21	45
WB9SMU	"	817	21	9	10
W9SFR	**7**	**49,959**	**209**	**26**	**65**
WA9JCO	"	48,025	223	27	58
K9MFI	"	25,350	140	24	51
W9CH	"	11,660	89	17	36
W9CL	"	7,268	63	18	28
W9NB	"	4,859	53	17	26
K9OTB	**3.5**	**25,950**	**128**	**23**	**52**
K9AJ	"	18,612	108	22	44
K9KM	"	10,437	85	15	34
W9BZW	"	7,014	68	12	30
K9JF	"	2,376	29	12	21
KØFX	**A**	**564,838**	**905**	**84**	**134**
KØMM	"	**405,090**	**691**	**65**	**145**
NØGA	"	335,040	531	90	150
KØLUZ	"	275,712	526	68	124
WØIUB	"	267,154	449	83	140
WØSR	"	164,016	312	75	126
WØVU	"	142,450	294	61	114
WØVX	"	107,027	311	45	86
KØIR	"	96,875	283	46	79
WAØKDI	"	85,860	235	53	82
WØJU	"	76,734	242	50	97
WAØAGN	"	67,770	189	50	85
WAØFBQ	"	60,243	179	51	78
WBØEZQ	"	54,740	172	46	73
WØYK	"	50,270	174	47	63
WØUZ	"	45,847	140	48	79
WØQWS	"	41,496	142	47	67
WAØVBW	"	34,374	135	43	59
KØFPC	"	7,296	51	26	31
WØMJN	"	5,187	53	18	21
WBØLFY	"	2,278	30	16	18
NØDX	**7**	**57,760**	**225**	**28**	**67**
NØRF	"	21,280	103	24	52
WAØLYO	"	143	7	6	5

ALASKA

KL7RA	**A**	**811,944**	**1681**	**75**	**114**
KL7RW	"	625,314	1338	83	95
KL7AF	"	259,700	1023	53	53
KL7GN	**21**	**32,829**	**446**	**15**	**16**
KL7EWP	**14**	**30,272**	**274**	**17**	**27**
KL7HR	**7**	**40,664**	**321**	**19**	**33**

BELIZE

VP1AH	**21**	**181,440**	**992**	**22**	**59**
			(Opr. WA4DRU)		

BERMUDA

WA1RFM/VP9					
	A	**124,868**	**542**	**39**	**67**

CANADA

VO1KO	**A**	**49,062**	**470**	**24**	**27**
VE1AIH	**A**	**333,465**	**667**	**69**	**146**
VE1EP	"	2964	33	15	23
CY1BDT	28	731	20	4	13
VE2AYU	**A**	**365,800**	**797**	**72**	**128**
VE2DNU	14	369	20	5	4
VE3DUS	**A**	**251,729**	**761**	**45**	**94**
VE3GCE	"	142,560	331	57	105
VE3IR	"	100,833	237	68	115
VE3JCV	"	41,587	208	36	55
VE3IRN	"	280	17	5	3
CY3BBH	21	43,700	212	22	54
CY3EDC	**14**	**399,663**	**1276**	**34**	**87**
VE3ODX	"	248,490	882	32	78
			(Opr. VE1AL/3)		
VE3ENM	14	168,696	675	28	71
CY3IXE	**7**	**180,978**	**895**	**26**	**67**
VE3IPR	"	4878	140	8	10
CY3BMV	**3.5**	**102,828**	**575**	**22**	**60**
VE3ABG	1.8	504	35	4	4
CY4VV	**A**	**136,876**	**909**	**36**	**40**
VE4RF	"	122,917	564	40	61
CY4UO	"	65,270	542	32	29
VE4XJ	**14**	**88,021**	**372**	**26**	**64**
VE5RG	**A**	**1,033,854**	**2101**	**91**	**131**
CYSRA	**28**	**15,972**	**165**	**17**	**27**
VE6LU	**A**	**214,848**	**434**	**72**	**120**
VE6MP	"	138,006	613	42	57
VE6AYI	**14**	**188,856**	**922**	**24**	**62**
VE6KW	"	164,592	804	24	57
CY6APN	"	17,982	210	16	21
CY7CC	**A**	**1,049,965**	**1936**	**96**	**133**
VE7AV	"	103,132	477	40	52
VE7IQ	"	19,446	188	24	18
VE7CRW	21	784	65	4	3
VE8CC	**14**	**74,932**	**588**	**19**	**33**

CANAL ZONE

KZ5FR	**14**	**251,909**	**1100**	**31**	**66**

CAYMAN IS

ZF2AH	**A**	**103,323**	**546**	**48**	**45**
			(Opr. WA6VNR)		
ZF2AD	"	22,392	306	19	17
			(Opr. K3MBF)		

CUBA

CM2HB	**7**	**22,534**	**283**	**14**	**24**

DOMINICAN REPUBLIC

HI8MOG	**A**	**261,443**	**1061**	**48**	**71**
HI8LC	**14**	**39,092**	**299**	**20**	**38**

GREENLAND

OX3OA	**A**	**368,760**	**1176**	**49**	**91**
OX3RA	"	103,562	445	37	69

GUANTANAMO BAY

KG4OO	**A**	**220,860**	**1216**	**38**	**52**

HONDURAS

HR1AT	**14**	**25,709**	**260**	**17**	**30**

MEXICO

XE1AN	**A**	**1,456,442**	**2267**	**103**	**175**
			(Opr. N5JJ)		
XE1VV	"	585,984	1632	71	97
XE2MX	"	156,860	755	40	52

PANAMA

HP1AC	A	30,875	206	28	37

PUERTO RICO

KP4RF	**A**	**3,732,350**	**3507**	**122**	**303**
			(Opr. N6CJ)		
KP4DKX	**21**	**71,691**	**434**	**20**	**49**

U.S. VIRGIN IS

KV4FZ	**7**	**371,628**	**1436**	**26**	**85**

AFRICA

Canary Islands

EA8ID	**A**	**194,090**	**509**	**41**	**39**
			(Opr. K4YT)		
EA8URE	**28**	**47,700**	**268**	**16**	**44**

EGYPT

OH6NO/SU					
	A	**394,356**	**751**	**45**	**132**

KENYA

5Z4CW	14	29,526	174	20	37

MADEIRA ISLANDS

CT3/OH1TV					
	3.5	223,364	1066	19	57

REPUBLIC OF SOUTH AFRICA

ZS6WW	**A**	**2,131,200**	**2376**	**91**	**209**
ZS2CW	"	68,310	255	33	57
ZS5CP	"	54,000	240	28	47

RHODESIA

ZE3JO	**A**	**103,059**	**315**	**31**	**68**
ZE5JJ	7	13,804	138	13	21
ZE2KV	3.5	7,596	74	14	22
ZE7JX	1.8	275	9	4	7

SOUTHWEST AFRICA

ZS3LK	**28**	**41,064**	**264**	**17**	**41**

THE GAMBIA

C5AT	**28**	**156,060**	**632**	**24**	**61**

ASIA

INDIA

VU2GO	**A**	**220,252**	**492**	**55**	**109**
VU2BK	"	181,653	477	42	109
VU2JN	A	122,400	350	63	97

IRAN

EP2DT	**A**	**318,786**	**596**	**57**	**144**
EP2IA	**14**	**70,218**	**345**	**25**	**58**

ISRAEL

4Z4KX	**28**	**92,232**	**519**	**16**	**45**
4Z4NUO	**21**	**8,010**	**100**	**7**	**23**

JAPAN

JA6MPJ	**A**	**982,506**	**1123**	**109**	**205**
JA2MGE	"	**574,560**	**927**	**84**	**132**
JA7DAH	"	**547,274**	**894**	**84**	**131**
JA2EKR	"	396,738	596	92	145
JA8SW	"	338,082	616	85	116
JR1RCQ	"	323,790	536	83	131
JA7AKQ/1	"	283,200	515	75	117
JA7ARW	"	257,922	538	69	109
JH7BRG	"	240,875	437	79	124
JG1CDM	"	233,742	518	63	100
JA1ITS	"	228,416	496	70	96
JA6CNL	"	225,134	456	72	110
JA2VGP	"	193,738	421	70	87
JA1NLX	"	176,368	443	63	83
JH1ESR/2	"	160,300	341	72	103
JF1NCT	"	148,836	352	67	90
JA5CEK/6	"	147,742	436	51	71
JF3CCN	"	131,760	386	49	73
JJ1MZH	"	126,732	405	45	73
JA7MLG	"	126,126	322	60	87
JA2BNN	"	122,175	340	55	79
JH3UBF	"	121,176	318	58	78
JR3COZ	"	120,704	349	60	68
JH1ENA	"	119,335	293	66	79
JE1WIH	"	119,210	230	52	78
JR1SLU	"	116,224	319	56	72
JA4DZ	"	107,124	335	45	69
JA4GXS	"	105,884	358	43	60
JR2IEG	"	102,272	284	53	83
JE1GCI	"	98,900	309	52	63
JA2AE	"	95,400	279	47	73
JA3EQC	"	89,815	276	46	69
JAØDCQ/1	"	88,275	296	47	60
JR3XEX	"	84,424	252	54	68
JH3LCU/Ø	"	76,820	242	54	61
JA1ZIK	"	73,882	258	44	62
JA7FFN/1	"	64,818	192	50	67
JH1OEL	"	64,350	253	43	47
JR1IOS	"	61,350	149	67	83
JA3XIS	"	57,681	237	38	49
JA9JBK	"	55,783	221	41	50
JH1EIG	"	53,544	134	58	80
JA7BIJ	"	51,246	236	30	48
JAØOZ	"	50,050	197	38	53
JA1BFR	"	46,280	190	45	44
JA1AYC	"	43,953	303	21	28
JA7OJW	"	43,296	179	33	50
JH8KAN	"	42,245	183	39	46
JA1WL	"	41,440	204	34	40
JA7KCD	"	39,644	135	51	55
JE1BQE	"	39,072	157	38	50
JA5PFI	"	31,152	126	39	49
JA1KQX	"	30,514	148	27	46
JA3JF	"	29,337	134	38	39
JA6LYV	"	26,925	131	33	42
JA1DSI	"	22,753	127	32	29
JAØEJZ	"	19,750	138	26	24
JK1KRR	"	19,482	136	25	26
JA1BSU	"	18,924	116	25	32

C.W. TROPHY WINNERS AND DONORS

Single-Operator All Band

World

9Y4VT, (Opr. Richard Norton, N6AA)
Donor: Larry Le Kashman, W2AB

U.S.A.

Lewis A. Tompkins, N2LT
Donor:Frankford Radio Club

Canada

Lee Sawkins, CY7CC
Donor: Canadian DX Association

Europe

Tine Brajnik, YU3EY
Donor: W3AU Operators

Carib./C.A.

KP4RF, (Opr. Peter H. Grillo, N6CJ)
Donor: Don Wallace, W6AM

Africa

Oliver Sweningsen, ZS6WW
Donor: Gordon Marshall, W6RR

Asia

N. S. Kotsyuba, UV9AH
Donor: Japan CQ Magazine

Oceania

Norman R. Duxbury, YBØACT
Donor: Maui Amateur Radio Club

Single-Operator Single Band

World (14MHz)

Talma Dangelo Drummond, ZW40D
Donor: W2JT Memorial, (No. Jersey DX Association)

World 3.5 MHz

Pekka Ketonen, CT3/OH1TV
Donor:Fred Capossela, K6XX

U.S.A.

K1OX (Opr. Stuart Santelmann, WA1LKX) (14MHz)
Donor: No. Illinois DX Association

Europe 14 MHz

OH8OS (opr. Martin Laine, OH2BH)
Donor: G2LB Memorial from His Friends

Multi-Operator Single Transmitter

World

4L6M (Oprs. UA6APW, UA6APP, UA6DL, UA6AAQ, UW6CA, UW6CG, UA6AYR, UV6AF, UA6APH, UA6APR, UA6APL)
Donor: Anthony Susen, W3AOH

Multi-Operator Multi-Transmitter

World

KP4EAJ (Oprs. KP4EAJ, K1OME, K1VR, K1ZM, K2DM, K5PM, N4ZC, WB8NTK, WB8TON)
Donor: Hazard Reeves, K2GL

U.S.A.

W2PV (Oprs. W2PV, K1AR, K1IR, K1PT, N2FB, WA2SPL, K2TR, K2XA, N6DE)
Donor: Rush Drake, W7RM

Contest Expedition Trophy

World Single Operator

9Y4VT (Opr. Richard Norton, N6AA)
Donor: K2HLB Memorial (Don Miller, W9WNV)

World Multi-Operator

4L6M (Oprs. UA6APW, UA6APP, UA6DL, UA6AAQ, UW6CA, UW6CG, UA6AYR, UV6AF, UA6APH, UA6APR, UA6APL)
Donor: Bill Scheider, K2TT

Top World Single Operator—Combined Phone/CW

Clarke Green, PJ9CG

Donor: Associazioni Radiotecnica Italiana Guglielmo Marconi Memorial; A.R.I. 50th Anniversary

Club Trophy

Frankford Radio Club, 62,769,387
Donor: Southeastern DX Club

JA7JNF/1	"	18,336	134	25	23
JA9BKU	"	16,380	98	23	37
JA2GBO	"	15,402	105	24	27
JA1AS	"	14,824	80	33	35
JA2HUN/1	"	14,049	88	27	36
JA2HAY	"	13,728	104	20	28
JA3HUL	"	11,200	80	21	29
JA3DBD	"	11,029	92	18	23
JA4AQR	"	10,224	100	18	18
JA3PYC/1	"	9,366	78	22	20
JA2QVQ	"	9,270	70	20	25
JAØVFM	"	8,869	67	24	25
JE3NWQ	"	8,729	78	22	21
JH3WKE	"	6,765	62	17	24
JA6GGD	"	6,279	56	17	22
JE2SBU	"	4,824	47	16	20
JR6CF	"	3,354	40	19	20
JA7JT	"	2,736	28	19	17
JAØBOP	"	2,622	22	13	10
JA1BZM	"	2,160	47	8	8
JH4HVI	"	2,002	32	11	11
JA1KXT	"	1,995	37	11	8
JA1BNW	"	1,584	24	12	10
JA1BBZ	"	946	16	12	10
JH1IFS	28	37,920	233	27	33
JE1HJJ	"	31,850	221	23	30
JA9BEX/3	"	24,957	185	20	27
JR6RRD	"	23,997	159	21	37
JA1DQT	"	20,539	164	21	26
JA6AKW	"	13,416	127	19	20
JH3FQF	"	12,320	127	18	17
JA6WW	"	3,612	46	14	14
JJ1SYM	"	3,302	48	13	13
JA2ETQ	"	1,848	33	9	12
JA2GFE/1	"	798	22	7	7
JE1CKA	21	183,951	778	27	54
			(Opr. JAØCUV)		
JF1COE	"	171,948	650	29	63
JA2HO	"	136,728	579	27	54
JE2BNZ	"	99,216	484	24	48
JK1AII	"	88,403	441	26	47
JE1AYU	"	66,357	316	25	48
JF3PNQ	"	63,190	258	28	61
JAØVBJ	"	58,893	314	22	45
JG1UGS	"	55,784	263	24	52
JA8GQ	"	49,996	330	22	36
JE3FCM	"	41,742	282	19	35
JJ1XDL	"	41,202	267	18	36
JA5HLM	"	38,478	251	22	31
JA1EM	"	36,822	223	20	37
JI1KUV	"	34,892	204	21	40
JJ1EXH	"	34,831	200	22	39
JA2JHR	"	33,832	203	21	36
JR3GDY	"	32,801	204	21	36
JA1CFJ	"	32,184	205	19	35
JE3JDJ	"	31,405	210	20	35
JH3JTD	"	26,700	158	19	41
JR2XHT	"	26,411	188	18	31
JA7HMZ	"	22,344	139	25	32
JA1CSB	"	22,095	171	17	28
JG1RJB	"	21,010	134	23	32
JA1OP	"	20,988	174	21	23
JF1SEK	"	19,700	137	23	27
JA5XFS	"	18,450	130	19	31
JE3FSD	"	15,640	126	20	26
JA5XH	"	13,340	103	20	26
JA7AZJ	"	11,840	104	17	23
JH7WEE	"	10,800	105	17	19
JA5BLF	"	10,208	120	12	17
JE2KPM	"	9,440	90	15	25
JF1FTU	"	9,108	92	15	21
JH7AKT	"	8,050	86	15	20
JH7CUU	"	7,182	62	16	26
JA6YMI	"	6,900	82	16	20
JA3WHJ	"	4,293	64	13	14
JF1HEF	"	3,633	61	11	10
JG1FPE	"	1,862	34	9	10
JAØNCE	"	1,760	40	10	6
JA9SOT	"	1,134	16	12	15
JE3OWX	"	1,050	36	5	5
JA4BKL	"	820	21	10	10
JA1AAT	"	462	29	3	9
JA6AKV	"	60	10	1	1
JA7MGH	"	48	4	2	2
JA1RDW	14	200,832	729	30	67
JA1IDY	"	196,713	697	31	68
JA2BY	"	184,052	679	28	66
JG1EEE	"	166,076	639	30	61
JA8FXO	"	159,027	772	25	54
JA1JKG	"	129,444	531	28	56
JA4CTL	"	87,640	435	23	47
JAØSC	"	81,440	403	25	50
JA2DMO	"	80,256	326	26	62
JR1XFS	"	72,216	332	19	53
JA5SIX	"	65,564	317	27	47
JF1DSN	"	56,550	266	27	48
JA2IU	"	55,680	318	23	41
JH7IOS	"	55,096	278	24	45
JA2UA	"	51,709	209	30	59
JF1RWZ	"	50,025	254	24	45
JA5TX	"	48,620	300	17	38
JF1UKJ	"	41,013	244	21	42
JA1GLT	"	34,595	220	21	34
JH1MTR	"	34,720	177	19	37
JA9SV	"	33,480	164	24	48
JA6UYF	"	32,922	203	23	36
JA6OKK	"	27,716	120	30	52
JA9FT	"	25,926	156	23	35
JA4PHT/1	"	24,225	150	23	34
JA1CVP	"	22,904	143	23	33
JA3MFE	"	22,860	135	23	27
JA7AOU	"	19,708	142	22	30
JA9HW	"	19,690	124	20	35
JH3BRC	"	18,615	143	22	29
JA2RER	"	16,470	118	20	34
JR6CWC	"	14,632	83	27	35
JA1QKI	"	14,335	112	17	30
JR1LEV	"	12,920	128	16	22
JA6GFJ	"	12,600	97	21	24
JA1BDI	"	12,096	72	25	39
JA3KAR	"	9,867	85	18	21
JAØGZ	"	8,052	73	19	25
JK1AXM	"	7,590	81	14	19
JH3CXL	"	7,350	53	18	32
JH6ASZ	"	6,660	67	17	19
JA1AVI	"	6,534	84	12	15
JA2OJ	"	5,168	47	15	23
JA1DFQ	"	4,920	89	9	11
JA1KKA	"	4,795	49	14	21
JA2MIM	"	4,428	45	17	19
JA3BIP	"	4,416	52	14	18
JA5FDG	"	4,260	51	14	16
JA5AF	"	3,536	41	13	21
JH6UJP	"	2,905	31	16	19
JA9IAX/2	"	2,740	53	9	11
JA6FYM	"	2,272	52	9	7
JH6WRM	"	2,160	37	12	12
JA2DN	"	2,032	45	9	7
JA5BJC	7	173,734	596	31	75
JA2INO	"	128,310	574	27	51
JA1CWZ	"	104,975	436	27	58
JA1JIO	"	22,356	159	21	33
JA2LA	"	7,722	86	14	19
JR1DTN	"	7,910	86	14	21
JA1HOM	"	6,641	82	13	16
JA7ECI	"	2,970	60	11	11
JH3BJN/4	"	108	12	2	1
JA2JW	3.5	33,728	194	22	42
JH1APZ	"	20,355	140	20	39
JA3IW	"	19,152	137	20	37
JA8DNV	"	17,043	112	22	35
JR1BRV	"	13,100	101	20	30
JA1ITX	"	9,964	80	20	27
JA2RGH	"	4,640	65	13	19
JA1GUC	"	2,520	49	14	16
JH1WLA	"	56	4	4	4
JA3ONB	1.8	1,944	37	8	10
JA2UEO	"	819	22	6	7
JA3BDB	"	741	20	7	6
JH1LKH	"	612	18	6	6
JA3AHQ	"	96	5	4	4
		KOREA			
HM2JN	A	15,624	99	26	36
HL9KL	21	35,711	190	22	45
HM1II	3.5	476	68	4	3
		LEBANON			
OD5LX	A	112,056	340	33	83
		MACAO			
CR9AJ	28	70,716	584	24	47
		MONGOLIA			
JT1AN	A	113,187	767	29	58
JT1BF	21	7,820	185	15	19
JT1KAA	14	16,422	259	17	29
		SAUDI ARABIA			
HZ1HZ	A	471,878	731	78	163
		TURKEY			
TA2HIA	14	6,058	80	5	21

ASIATIC U.S.S.R.

		ARMENIA			
UG6GAF	14	235,980	971	25	70
		ASIATIC RUSSIA			
UV9AH	A	1,254,744	1446	92	241
UA9ND	"	674,836	1127	62	164
UA9YAR	"	335,983	814	48	131
UA9OO	"	248,884	595	50	122
UA9QE	"	230,482	545	43	120
UA9LBM	"	114,608	321	44	108
UW9SG	"	30,099	143	19	60
UA9WDP	"	25,826	131	23	51
UA9WDV	"	19,552	152	14	38
UA9AED	"	17,700	121	23	52
UA9WEE	"	1,700	38	4	13
UA9SCH	28	64,854	435	17	37
UA9CAL	"	35,037	237	16	35
UA9UOZ	"	13,680	155	17	31
UA9MQ	21	41,580	407	12	33
UA9ADQ	14	221,544	808	29	73
UA9MR	"	73,760	387	23	57
UV9QC	"	65,110	327	26	59
UA9HBK	"	24,786	216	17	37
UA9OS	"	7,182	63	15	27
UA9WS	7	66,552	405	14	45
UW9WL	3.5	99,825	475	20	55
UA9TS	"	67,437	429	14	45
UA9CM	"	67,260	417	14	46
UA9AAP	"	52,224	300	17	47
UWØAF	A	690,820	1041	77	183
UWØLT	"	380,103	548	92	165
UAØAG	"	210,984	497	51	126
UAØPJ	"	29,512	240	18	38
UAØFDB	"	6,930	170	15	15
UAØYAD	"	6,156	63	21	22
UAØJAY	"	4,347	120	10	11
UAØLFK	28	9,982	92	18	28
UAØAAC	21	45,074	379	17	45
UAØUBA	"	8,790	155	8	22
UWØIX	14	225,582	1111	30	52
UAØSAU	"	143,088	662	29	59
UAØBAC	"	122,990	671	20	50
UAØACJ	"	110,204	640	20	52
UAØABC	"	103,050	475	27	63
UAØQWB	"	87,462	516	26	60
UAØADN	"	57,620	374	22	45
UAØVF	"	50,952	339	18	48
UAØCCR	"	24,180	207	18	34
UAØSY	"	12,738	166	9	24
UAØKBI	"	5,634	118	8	10
UAØJAD	"	4,608	70	12	20
UWØAR	"	4,004	101	9	19
UAØQCA	"	1,000	30	5	5
UAØSB	"	392	10	7	7
UAØZBP	7	10,044	261	16	11
UWØFB	3.5	4,416	142	11	12
		AZERBAIJAN			
UD6CN	A	126,900	352	33	108
UD6DKW	14	4,075	61	9	16
UD6DFK	"	3,456	48	11	21
		GEORGIA			
UF6OAA	A	231,150	645	29	105
UF6FAL	"	109,800	419	23	77
UF6CX	28	12,765	185	2	21
UF6FCR	14	40,716	292	12	42
		KAZAKH			
UL7CT	A	1,205,380	1380	85	239
UL7GAA	"	394,352	747	53	143
UL7LAW	"	355,544	681	59	137
UL7PBW	"	10,396	106	11	35
UL7AAQ	28	33,318	228	18	36
UL7TA	"	26,555	228	13	34
UL7GBP	"	10,414	132	13	28
UL7JG	21	77,528	584	20	53
UL7PA	14	130,479	588	28	65
UL7PBK	"	79,378	406	19	52
UL7CBD	"	35,340	248	16	41
UL7QH	"	26,898	149	24	50
UL7CBM	7	75,772	407	22	54
UL7JAW	"	49,678	395	15	44
UL7IBC	"	7,540	90	7	22
UL7GBZ	"	7,491	104	10	23
UL7CAD	3.5	67,767	357	12	49
UL7GAV	"	18,681	215	11	28
		KIRGHIZ			
UM8MBA	A	120,744	491	30	74
UM8NNN	28	1,527	138	11	29
UM8MAO	14	243,064	961	29	63
UM8NAJ	"	69,930	469	19	44
UM8MBN	"	28,050	190	17	38
UM8MCO	3.5	16,965	205	11	28
		TADZHIK			
UJ8JAS	A	784,080	1275	72	168
UJ8AW	21	2,862	74	8	10
		TURKOMAN			
UH8HBR	A	39,042	265	14	40
UH8BAU	14	49,392	315	18	45
UH8BAX	7	22,698	216	10	29
		UZBEK			
UI8GAJ	A	130,624	495	25	79
UI8ADR	7	7,656	98	8	25

EUROPE

		AUSTRIA			
OE5CWL	A	299,922	856	54	139
OE3AKA	21	229,381	1016	27	76
		BELGIUM			
ON4FD	A	237,128	669	59	125
ON6WK	"	167,958	662	23	106
ON4XG	"	156,980	539	49	118
ON8HF	"	128,590	373	49	118
		BULGARIA			
LZ2KB	A	507,552	1222	60	144
LZ2ZB	"	157,626	581	44	118
LZ1AG	"	115,415	286	61	144
LZ2BR	"	82,350	460	38	97
LZ2GS	"	10,875	102	25	50
LZ1IF	"	5,456	104	16	30
LZ2DR	"	3,916	31	16	28
LZ1AU	21	16,390	168	17	38
LZ2VP	"	11,572	193	12	32
LZ1EP	14	10,032	167	11	37
LZ2KRZ	"	2,790	75	8	23
LZ2UU	"	870	25	5	10
LZ2EV	7	120,704	703	22	70
LZ1DZ	"	102,850	808	21	64
LZ2JF	"	76,712	608	19	67
LZ2PP	"	51,072	554	14	50
LZ2XW	3.5	14,899	276	11	36
LZ1XT	"	6,810	114	5	13
LZ1FJ	"	3,136	99	5	23
		CZECHOSLOVAKIA			
OK1IQ	A	416,760	776	75	201
OK2BLG	"	352,618	593	79	204
OK2SEO	"	191,664	694	46	130
OK1MDK	"	167,233	309	76	177
OK3IF	"	157,320	546	52	138
OK1DKW	"	128,140	469	50	122
OK2PBG	"	98,592	392	35	121
OK1BLC	"	97,155	349	40	87
OK1KZ	"	96,924	407	45	119
OK1VE	"	83,912	355	37	99
OK1DVK	"	79,061	256	47	126
OK1AWF	"	51,816	296	33	94
OK3YCA	"	49,268	262	26	87
OK1FCA	"	41,924	198	31	63
OK1MWN	"	40,224	252	28	68
OK2BEC	"	35,880	202	34	86
OK3BT	"	35,840	234	28	84
OK2LN	"	33,666	362	21	72
OK3CPY	"	31,964	262	34	88
OK1DAV	"	30,856	126	36	80
OK1DKR	"	30,576	140	34	44
OK1FJS	"	25,576	204	23	69
OK2BEF	"	22,770	160	24	75
OK3YCV	"	22,422	144	29	72
OK1EP	"	21,567	105	35	56
OK2PDC	"	19,650	117	29	46
OK1AOR	"	19,610	154	23	51
OK3BTG	"	18,480	196	17	53
OK1MAA	"	17,700	192	17	58
OK2SGW	"	17,141	122	20	41
OK2BCI	"	15,089	98	33	46
OK1AHQ	"	13,395	132	14	43
OK1AEH	"	12,675	123	18	57
OK1FAM	"	12,033	101	22	41
OK1AHN	"	7,714	123	16	42
OK2PEX	"	6,612	99	15	43
OK1AIA	"	2,414	39	15	19
OK1OFK	"	2,106	37	10	16
OK1TW	"	1,920	44	10	20
OK1FBH	"	1,856	24	13	16
OK1DA	"	189	7	4	5
OK1DOC	"	121	11	4	7
OK1ATT	28	15,330	99	20	50
OK3EA	"	6,700	53	19	31
OK1TW	"	4,680	58	12	28
OK1MP	"	2,304	31	13	19
OK2BBJ	"	624	16	7	9
OK2CGP	"	504	12	7	11
OK2SPS	"	36	3	2	2
OK2BEW	21	56,764	259	26	66
OK2AOP	"	44,874	242	22	59
OK1VB	"	37,362	285	24	54
OK2BPK	"	18,900	163	16	38
OK3CO	"	12,992	92	20	44
OK1DDS	"	11,232	109	15	24
OK2ABU	"	1,404	33	6	7
OK1PCL	"	918	19	8	10
OK2BSA	"	705	25	7	8
OK1ANS	"	507	17	6	7
OK3UQ	14	179,583	818	25	68
OK1FV	"	130,152	558	29	73
OK2TBC	"	56,724	289	26	61
OK1AGI	"	44,200	342	17	48
OK3CDP	"	34,320	172	25	63
OK1FDB	"	26,019	195	19	40
OK1IDD	"	24,222	200	16	50
OK3BA	"	22,330	226	14	44
OK3CAU	"	19,176	134	14	54
OK2BGR	"	16,131	136	16	41
OK3FZB	"	13,800	141	12	34
OK1MAC	"	8,694	95	13	29
OK3CKY	"	8,505	112	10	35
OK1ATB	"	8,056	96	14	24
OK1ASG	"	3,864	61	9	19
OK3TRI	"	3,393	56	10	29
OK3RRC	"	1,386	63	7	14
OK1MSO	"	693	24	7	15
OK3KFF	7	151,410	743	22	81
OK3OM	"	117,594	725	22	72
OK1TA	"	75,524	667	17	62
OK2BFN	"	47,508	413	18	56
OK3TAY	"	8,096	143	8	36
OK1MKU	"	4,318	94	8	26
OK2YN	"	3,640	66	9	26
OK2PFQ	"	2,480	44	9	22
OK3BDE	3.5	45,375	440	17	58
OK1DOK	"	41,665	543	14	51
OK1WC	"	39,660	493	14	46
OK3CJK	"	27,405	332	13	50
OK2HI	"	22,774	277	14	45
OK3TAO	"	11,340	262	8	27
OK1DMJ	"	10,794	249	7	35
OK3TDO	"	8,112	127	9	39
OK2PDL	"	8,096	165	9	35
OK2SFO	"	6,335	151	5	30
OK1AZR	"	6,138	204	5	26
OK1MZO	"	3,960	130	5	25
OK1DDQ	"	3,680	111	6	26
OK2BTI	"	3,379	112	5	26
OK3CMK	"	2,592	100	4	23
OK1MLA	"	2,015	61	6	25
OK1TJ	"	1,932	65	6	17
OK1KSH	"	1,077	56	6	15
OK3ZWX	"	1,050	50	4	17
OK2BTK	"	720	45	4	12
OK1DFB	"	459	25	4	13
OK1AYQ	"	406	29	3	11
OK1MSP	"	308	16	3	4
OK3KIC	"	4	2	1	1
OK1ATP	1.8	6,014	165	7	24
OL4ATY	"	4,482	166	4	23
OK3LL	"	2,684	108	3	19
OL8CGD/P	"	2,369	108	3	20
OL8CGS	"	2,116	97	4	19
OK3WM	"	1,920	72	4	20
OK1DDL	"	1,740	85	3	20
OK3CEI	"	1,501	85	2	17
OK1KWP/P	"	1,155	54	3	18
OK2PGU	"	1,152	57	5	19
OL8CGI	"	1,062	61	3	15
OK1AIJ	"	992	64	2	14
OK1DFI	"	992	63	2	14
OL8CGB	"	990	56	2	16
OK1FSM	"	714	41	3	14
OK1AYY	"	686	32	2	12
OK3CWQ	"	663	41	3	14
OLØCFI	"	574	41	2	12
OK1DCF	"	525	37	3	12
OL9CGE	"	276	24	2	10
OK1DDU	"	253	24	2	9
OL8CGN	"	228	20	3	9
OK1MNW	"	228	20	2	10
OK1DDW	"	207	25	2	7
OK1JEN	"	200	23	2	8
OK3CAA	"	168	22	2	6
OL6AVY	"	140	20	2	8
OL7AVX	"	108	17	2	7
OK3TQQ	"	99	12	2	7
OL8CJM	"	54	11	2	4
OL5AWC	"	36	6	2	4
OL8CII	"	9	4	1	2
OL8CJO	"	3	3	1	2
		DENMARK			
OZ6XR	A	107,250	566	33	91
OZ2NU	"	73,461	333	33	108
OZ6XT	"	63,750	247	40	85
OZ1EE	"	57,669	257	46	95
OZ4HW	"	33,488	227	30	74
OZ1AIK	"	25,066	145	35	48
OZ8ND	"	20,240	120	27	65
OZ1W	"	15,675	83	30	45
OZ5DP	"	10,488	115	21	48
OZ1DYU	"	10,074	70	27	46
OZ1BII	"	9,570	137	18	48
OZ7XG	"	918	22	8	19
OZ6KS	"	408	18	7	10
OZ1LD	14	385,330	1445	31	82
OZ7YL	"	50,388	320	21	47
OZ8XW	"	11,100	105	15	35
OZ5TB	"	4,884	81	9	24
OZ1AJL	"	780	30	6	14
OZ5QU	3.5	6,384	116	11	37
OZ1DQX	"	342	18	5	14
		ENGLAND			
G3DYY	A	306,000	581	72	178
G3ESF	"	302,584	745	58	160
G2AJB	"	90,407	341	45	114
G3JKY	"	67,032	336	32	82
G3SGQ	"	56,320	290	32	78
G6NK	"	9,592	138	11	33
G4CNY	28	20,424	209	20	49
G3HCT	21	168,740	665	32	78
G3RZ1	"	147,056	598	27	77
G3MZV	"	82,650	427	27	67
G3SSO	"	67,488	387	24	52
			(Opr. G4BEZ)		
G3KDB	14	301,040	1162	29	77
G3PVA	"	87,295	616	19	46
G5CFV	"	28,665	313	13	32
G4DSE	7	44,178	391	18	56
G3WPF	3.5	96,538	749	19	60
G3ZFC	1.8	4,002	137	5	18
G3YMC/A	"	3,243	129	3	20
		FAEROES IS.			
OY4M	14	8,556	124	5	18
		FINLAND			
OH1XX	A	939,390	1269	95	251
OH6JW	"	839,094	1235	90	231
OH1PS/2	"	539,398	948	81	202
OH7UE	"	189,180	580	55	125
OF1LF	"	183,676	535	53	135
OH8PF	"	152,235	468	52	147
OH1MA	"	85,722	301	52	105
OF7SQ	"	46,216	248	34	75
OH2KP	"	43,264	205	36	72
OH6ZAB	"	37,516	160	38	75
OH5LU	"	30,067	210	28	79
OH5PT	"	28,314	118	34	87
OF7SX	"	25,466	163	33	74
OH2VZ	"	21,200	107	34	46
OH2BOI/3	"	17,646	111	30	72
OH1SA	"	13,987	133	17	54
OF3FT	"	11,152	149	28	40
OH5PA	"	9,581	67	26	41
OH9TD	"	8,532	63	25	54
OH5RW	"	6,784	79	18	35
OH1FM	"	4,704	81	11	37
OH6PT	"	4,140	41	14	22
OH6ID	"	3,956	41	17	26
OH9PH	"	3,300	71	15	29
OH5LY	"	1,548	30	11	25
OH1UR	"	380	18	8	12
OH5XL	28	6,909	79	13	36
OF3TA	"	630	22	6	12
OF4SL	21	83,130	378	27	75
OH2PQ	"	55,675	379	24	61
OH1IG	"	20,355	186	20	49
OF5LP	"	12,455	153	14	39
OF3MF	"	12,213	126	15	44
OH7QU	"	1,085	23	9	22
OH8OS	14	625,812	1961	34	87
			(Opr. OH2BH)		
OH3AG	"	85,775	543	22	51
OF6MM	"	40,848	251	20	49
OH2EL	"	35,464	241	18	44
OH2BCD	"	28,314	184	18	48
OH2JQ	"	22,660	209	14	41
OH3XX	"	17,287	146	17	42
OF3NM	"	15,879	103	17	50
OH1HX	"	12,243	143	12	21
OF5AD	"	11,684	113	14	32
			(Opr. OH5LK)		
OH1QP	"	7,348	74	13	31
OH1LU	"	7,300	68	17	33
OH5SS	"	7,030	94	9	28
OH4TS	"	6,006	78	14	28
OF1MQ	"	4,085	52	11	32
OH6VV	"	2,871	41	10	23
OH5TS	7	87,204	585	21	57
OH1IJ	"	75,225	582	21	54
OH3PE	"	42,600	369	20	55
OH7AA	"	22,366	357	12	41
OH4TP	"	8,029	180	7	30
OH3FN	"	4,662	89	9	33
OH7WJ	"	15	3	2	3
OH1VQ	3.5	47,061	388	21	62
OH2BCI	"	46,722	426	18	60
OH1TN	"	29,862	368	15	48
OH6TI	"	23,628	232	18	48
OH6RC	"	11,956	143	13	48
OH3XT	"	8,918	137	10	39
OH2BO	1.8	5,394	143	7	22
OH1VA	"	2,780	140	3	17
		FRANCE			
F6KAW	A	906,059	1628	82	205
			(Opr. F6AUO)		
F6EID	"	545,832	925	77	175
F5IN	"	399,000	1131	50	125
F8VJ	"	291,816	644	62	131
F3AT	"	126,488	315	65	129
F9BB	"	101,525	323	44	111
F8TM	"	37,620	208	33	81
F6EUJ	"	18,056	157	21	53
F6DNR	"	15,180	167	17	43

HAMTRONICS USED GEAR • TEST EQUIPMENT • SPECIALS

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Bendix BC221 Freq Meter	39
Polarad Spectrum Analyzers A84T	1695
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Precision E-400 Signal Generator	125
Electro Impulse Spectrum Analyzer	395
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Hewlett Packard 4905A Ultra Sonic Detector	550
Hewlett Packard 120A Scope	250
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Hewlett Packard 4910B Open Fault Locator	650
Bird Mod 43	80
General Radio 650A	150
Measurements Mod 80	195
Nems Clark 1400	495
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PACO Scope Mod-S-50	75
Singer FM-10C	3495
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Allied

AX-190 Receiver	$159

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PV-50	$ 9
CN-50	29
CN-144	39
TX-62	79
621 VFO	45

B&W Waters

Nuvertor 2+6 Conv.	$ 75
6100 SSB Xmitter	395
670 SSB Adaptor	39
Co-Dax Keyer.	95

Central Electronics

100V Transmitter	325
MM-2 Scope	69
20-A SSB Adaptor	79

Clegg

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66'er 6M Xcvr	115
99'er 6M Xcvr	59
Interceptor BRCUR	275
Ant Pre Amp	22
All Bander	69
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FM-27-B Xcvr	325

Collins

75 A4 Receiver	$395
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7551 Receiver	349
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3251 Xmitter	349
PM-2 AC Supply	95
516 F2 AC Supply	139
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361D2 Mount	29

Drake

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2AQ SPKR QMULT	29
R4 Receiver	289
R4-B Receiver	349
R4-C Receiver	399
MS-4 Speaker	19
2NT Transmitter	125
2NT Transitter	99
TR-6	695
TR-22 2 Meter	140
T-4X Transmitter	339
TR-72 2 Meter FM	225
AC-4 AC Supply	95
TR-4-C Transceiver	449
CC-1 Console	
CPS-1 Supply	
SC-2 Conv	
SC-6 Conv	
SC-1 Calibrator	
The above all assembled complete pkg.	Only $200

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470-25 450 MC	120
P-1416 16 Amp Supply	95

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720 Transmitter	$ 49
722 VFO	39
730 Modulator	39

Elmac

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Genave

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VHF 6+2 Transm	$ 39
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Galaxy III Xcvr	159
Galaxy V Xcvr	189
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GT-550 Xcvr	279
GT-500A Xcvr	329
AC-400 Supply	79
FM-210 2M FM	95

Gonset

Com II 2M	$ 75
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GC-105 2M	115
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SX-101 Receiver	159
HT-32 Transmitter	179
HT-32B Transmitter	269
SX-99 Receiver	79
SX-115 Receiver	349
HT-37 Transmitter	159
HT-40 Transmitter	49
SX-99 Receiver	99
SX-117 Receiver	189
SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
HT-44 Transmitter	159
SX-111 Receiver	149
SX-122 Receiver	249
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Hammarlund

HQ-110 A VHF Receiver	$189
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HQ-110AC Receiver	149
HQ-145X Receiver	169
HQ-170C Receiver	159
HQ-180 Receiver	379
HQ-215 Receiver	259
SP-600 Receiver	179
HX-50 Transmitter	169

Heathkit

SB-300 Receiver	$199
SB-301 Receiver	229
HR-10-B Receiver	69
SB-303 Receiver	269
SB-220 Linear Amp	449
SB-102 Trivcvr	379
DX-60B Transmitter	69
HW-32 Transmitter	85
HW-100 Transceiver	249
SB-100 Transceiver	299
SB-401 Transmitter	249
SB-101 Transceiver	349
SB-650 Digital Freq. Display	149
HW-30 Twoer	29
Also Sixer	29
H-10 Monitor	69
VHF-1 Seneca	79
HW-12 Transmitter	75
HP-23 AC Supply	49
HP-23B AC Supply	59
HW-202 2M FM Xcvr	159
SB-620 Spectrum Analyz	120
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SB-610 Scope	95
HA-20 6m Linear	125
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ICOM

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Johnson

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Ranger II Transmitter	139
Valiant I Transmitter	129
Invader 2000 Xmitt	495

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R-599 Receiver	289
TS-520 Tranc	429
QR-666	259
QR-666 Receiver	239
TV 502 Transvertor	179

Knight

T-60 Transmitter	$ 39
r-100 Receiver	59
TR-108 Trancur 2M	79

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509 H.T.	$149

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AC-500 AC Supply	69
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NC-190 Receiver	149
NC-105 Receiver	69

Regency

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HR-25 2M FM	225
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SBZ-LP Linear	179

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SRC-146 HT	$149
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260 Cygnet	289
279 Cygnet	329
500 Xcvr	299
500 CX Xcvr	389
117-XC AC Supply	95
14X DC Module	39
MK II Linear	475
KK VI 6 Meter	550
250 C 6M Xcvr	349
FM 2X2M Xcvr	169
FM-1210A 2M	249
350 Transceiver	269
350C Xcvr	299
600R Receiver	339
600T Transmitter	399
410 VFO	79

Tempo

Tempo one Xcvr	$299
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FMH 2M H.T.	149
CL-220 Trncur 220 MC	179
FMH 2M w/Talkie	149

Ten Tec

PM-3 Trnsur	$ 49
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KR-40 Keyer	79
RX-10 Receiver	49
S-30 Signalizer	29
Triton II	479

Yaesu

FT-401 Xcvr	$499
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FT 2 Auto 2M FM	249
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FL-2100B Linear	295
FV-101 VFO	79
101E Xcvr Demo	695

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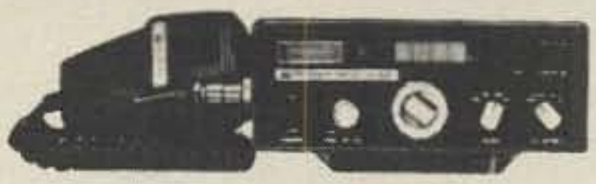

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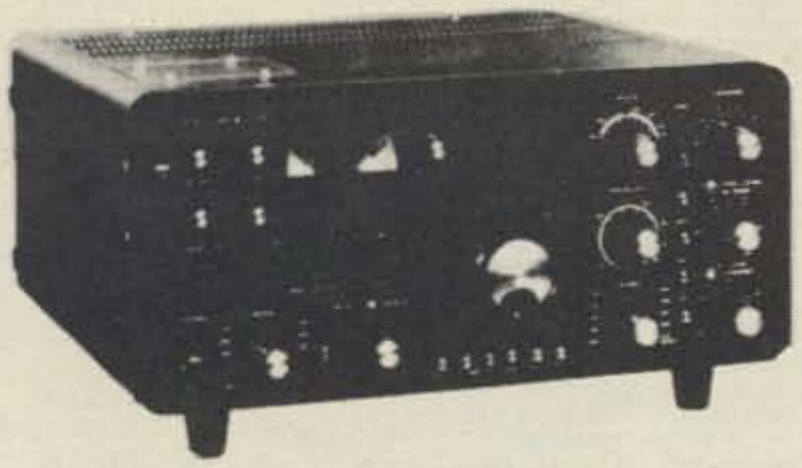
F6DBO	"	8,118	100	13	28
F2BU	"	7,137	83	13	26
F6ERZ	"	6,321	74	15	34
F6BFH	"	6,174	68	18	24
F6AUS	21	26,730	206	20	46
F8TQ	3.5	8,480	168	9	31
F8EX	1.8	752	45	3	13
GERMANY (FRG)					
DK5WL	A	1,266,258	1586	98	256
DJØUJ	"	893,412	1374	84	215
DJ2HH	"	611,289	843	86	193
DK4PH	"	493,060	849	81	196
DKØFR/P	"	474,320	920	73	172
			(Opr. DF7GR)		
DK1QC	"	456,354	916	69	174
DJ9MH	"	393,525	800	73	192
DJØXT	"	294,000	564	78	167
DL3LU	"	290,745	526	83	190
DL7BQ	"	287,280	738	60	150
DK3KD	"	282,700	689	65	155
DL1JF	"	271,855	630	57	151
DJ4UF	"	270,710	596	62	168
DK3SN	"	241,280	691	45	82
DJ9GW	"	240,847	442	64	163
DL8YR	"	232,932	502	69	167
DK1FW	"	184,160	638	45	115
DJ2AA	"	173,250	761	27	63
DJ2TI	"	171,666	409	63	124
DL1YA	"	129,789	357	51	120
DL1MD	"	115,940	346	52	103
DJØUP	"	96,695	244	64	169
DK5MP	"	95,885	339	47	104
DJ4AN	"	94,714	325	40	102
DI7FH	"	85,500	291	54	126
DK9ZQ	"	83,265	361	35	70
DL8BU	"	65,403	290	36	93
DJ1LD	"	64,403	199	50	106
DK5GD	"	58,045	314	35	60
DL1CR	"	50,000	253	27	53
DK8KC	"	42,240	222	35	75
DK3YD	"	41,310	204	31	71
DK8AN	"	38,097	249	25	58
DJ2UU	"	28,025	148	31	64
DF3QN	"	21,384	145	21	60
DL1QT	"	19,320	117	34	58
DJ1YH	"	16,110	126	25	65
DJ5GW	"	12,567	94	27	32
DF4BO	"	9,500	106	18	32
DK8NG	28	6,517	53	18	31
DL1KS	"	5,040	55	14	28
DJ7PT	21	90,700	417	27	73
DJ7RJ	"	55,728	270	23	58
DL1RB	"	31,620	215	20	48
DF4QW	"	11,220	116	16	28
DL1AM	"	924	16	11	11
DK5JI	14	241,696	880	31	81
DK5PR	"	200,384	806	26	75
DJØVO	"	29,468	233	17	36
DK6PY	7	110,840	794	22	63
DJ6EN	"	9,680	133	12	32
DK8AX	"	714	30	6	15
DF1DX	"	520	25	5	15
DK3GI	3.5	165,216	967	23	73
DL7AV	"	130,916	822	23	69
DJ2YA	"	58,048	617	15	49
DL1BU	"	38,280	356	15	45
DA2LJ	"	27,931	378	12	41
DA1QO	"	4,750	75	10	28
DK8BI	"	3,857	125	6	23
DJ8WLA	1.8	7,018	201	6	23
DJ6TK	"	3,680	171	3	20
DL1ED	"	294	23	2	12
GERMANY (GDR)					
DM2CUJ	A	299,296	757	52	136
DM3GM	"	173,888	674	38	105
DM4TEK	"	167,508	655	32	109
DM3NKF	"	165,240	649	39	131
DM2BPF	"	122,796	333	45	117
DM5PUL	"	114,240	322	58	134
DM5YVL	"	66,861	330	41	112
DM4ZBK	"	47,824	198	39	83
DM4NEE	"	45,732	186	42	106
DM2CMM	"	45,108	205	37	89
DM3VAA	"	32,368	207	33	79
DM3EA	"	31,592	110	50	58
DM2CWB	"	31,416	304	15	69
DM2DED	"	26,965	95	44	63
DM2BWK/p	"	21,225	194	20	55
DM2COJ	"	15,120	116	24	46
DM2YLD	"	12,095	81	25	34
DM2GIL	"	12,006	118	21	48
DM4YEL	"	10,098	60	30	36
DM5ZDL	"	10,064	98	21	53
DM4LG	"	7,488	72	22	42
DM2BBK	"	6,600	70	15	29
DM4WFF/p	"	5,889	93	16	23
DM2CBE	"	5,734	58	23	38
DM2CLM	"	5,652	59	18	18
DM2BTO	"	3,612	34	18	25
DM2BOH	"	2,109	40	15	22
DM4JC	"	1,560	43	12	18
DM3ZUE	"	897	17	9	14
DM2CMA	"	750	31	5	20
DM3SBM	28	609	14	8	13
DM4YUL	"	238	8	6	8
DM2FFL	"	49	4	3	4
DM4SDA	21	47,025	298	21	54
DM3PQO	"	2,772	27	13	23
DM3UE	"	2,546	28	16	22
DM3EL	14	21,360	165	17	43
DM2BUB	"	11,577	121	15	36
DM2FWL	"	10,881	131	11	28
DM2GHL	"	10,070	119	13	32
DM3XUE/A	"	9,120	71	18	42
DM3LE	"	8,733	114	12	29
DM3IM	"	7,998	90	12	31
DM2EHL	"	5,180	103	10	27
DM2FBM	"	1,664	31	9	17
DM3BF	7	42,851	420	17	56
DM2DLE	"	12,555	250	9	36
DM2AOM/A	"	6,468	124	8	34
DM2BPB	"	2,871	96	5	24
DM3WMJ	3.5	21,576	300	11	47
DM3ZC	"	10,956	220	9	35
DM3ZEN	"	6,516	135	7	29
DM2CIM	"	5,754	116	9	33
DM2FKL	"	5,382	135	7	32
DM2PML	"	2,842	101	4	25
DM2CRB	"	2,366	86	6	26
DM2CVB	"	1,675	75	3	22
DM2CHJ	"	1,073	34	6	23
DM3VTL	"	726	33	4	18
DM3YPE	"	720	18	6	9
DM2AUG	"	551	18	6	13
DM2AFA	"	100	10	3	7
DM4QL	"	99	9	3	8
GREECE					
SVØWTT	7	14,784	202	12	36
HUNGARY					
HAØDU	A	407,120	730	81	199
HA7MC	"	129,115	509	35	84
HAØHN	"	102,521	494	45	112
HA7SU	"	45,066	305	27	84
HA7PQ	"	39,528	208	32	90
HA8UH	"	35,047	245	24	77
HA5JK	"	14,820	137	17	40
HA7UJ	"	7,000	146	9	26
HAØKLF	"	4,233	66	16	35
HA8VV	28	5,368	53	15	29
HA8UY	21	179,523	695	28	81
HA3HE	"	29,220	220	19	41
HA5KKO	"	20,532	169	17	41
HA8CH	"	13,805	103	18	37
HA5NP	14	91,000	718	18	47
HA7MW	"	64,206	402	24	63
HA5BA	"	54,416	390	20	56
HA7TM	"	27,202	264	14	44
HA3GB	"	6,802	138	8	30
HAØMJ	"	861	33	6	15
HA1ZZ	7	39,536	507	13	43
HA5LZ	"	30,804	330	13	55
HA6NE	"	28,582	351	14	48
HA5NS	"	21,216	312	11	40
HA3PT	"	16,779	265	10	41
HA7LM	"	11,925	242	8	37
HAØDD	"	2,387	71	8	23
HA1YA	3.5	91,650	839	17	58
HA7KLG	"	69,632	656	16	52
HAØKLE	"	46,332	499	16	50
			(Opr. HAØMJ)		
HA6NL	"	7,913	187	8	33
HA6OA	"	7,293	171	9	30
ICELAND					
TF3IRA	A	129,794	454	42	104
			(Opr. TF3KB)		
TF3CW	"	80,848	731	16	46
TF3AW	"	31,232	230	18	46
ITALY					
IK2FGP	A	575,421	1175	63	168
IX1LDX	"	146,400	661	44	116
IØHCJ	28	33,930	210	29	58
I6POY	"	15,879	114	23	44
I1GXR	"	7,686	55	20	41
I1SLI	21	188,802	1023	26	76
IØDYB	"	141,372	607	26	76
IØEMV	14	47,040	477	18	42
IK1QJC	"	22,629	212	15	42
I2XXG	7	212,443	1179	22	67
I3GNQ	3.5	105,252	848	21	63
I.T.U.					
4U1ITU	A	434,184	1105	61	168
			(Opr. HB9AW)		
MALTA					
9H1CH	21	74,784	450	22	60
NETHERLANDS					
PAØTAU	A	323,904	550	70	171
PAØINA	"	209,720	455	64	132
PAØPSK	"	138,767	416	54	139
PAØTA	"	71,323	253	50	111
PAØVB	"	57,590	261	41	89
PAØUV	"	51,370	228	40	70
PAØCYW	"	39,270	215	29	76
PA3ABA	"	16,154	149	22	60
PAØWRS	"	1,242	22	7	12
PAØMRN	"	170	15	3	7
PAØGT	14	26,000	196	19	46
PAØEFI	"	20,844	183	15	39
PAØBWM	"	1,768	41	8	9
PAØLVB	7	7,584	98	14	34
PAØATY	3.5	19,822	267	11	42
PAØDIN	"	3,090	103	5	25
PAØHIP	1.8	17,346	297	12	30
NORWAY					
LB1G	A	122,120	666	38	104
LA5H	"	53,460	209	37	98
LA6EV	"	30,943	197	30	67
LA1SV	"	29,616	262	23	45
LA7ED	"	15,800	126	23	56
LA7SI	"	10,001	100	21	52
LA2Q	"	6,916	91	14	38
LA1VL	"	4,059	57	16	25
LA9VF	"	3,115	31	15	20
LA6XQ	"	728	22	5	9
LA5SH	21	11,271	115	14	37
LA8CJ	14	48,704	329	17	47
LA6XU	"	31,507	303	16	33
LA2IE	"	15,104	172	13	19
LA8WG	7	11,088	203	9	35
LA4MV	"	1,475	60	4	21
POLAND					
SP9KBY	A	436,232	937	67	181
			(Opr. SP5GRM)		
SP7CTY	A	391,755	775	62	183
SP5AFL	"	134,067	453	59	142
SP1ADM	"	73,139	314	34	75
SP9EIJ	"	41,623	184	39	68
SP9ZD	"	30,870	169	34	71
SP9BDQ	"	29,155	159	35	84
SP2FAP	"	24,675	154	32	73
SP2PAH	"	16,353	177	15	54
			(Opr. SP2BRZ)		
SP9CTW	"	14,679	100	26	37
SP7BFC	"	13,520	56	34	56
SP2JGW	"	8,910	126	12	42
SP9AGS	"	7,260	109	13	42
SP6DB	"	7,168	52	26	38
SP9PT	28	7,410	54	19	38
SP9ADU	"	5,640	54	17	23
SP9CAV/9	"	5,724	50	19	34
SP5EXA	21	58,604	289	24	67
SP2JKC	"	7,938	73	17	32
SP2AVE	14	98,673	562	25	68
SP6DMJ	"	48,888	284	20	64
SP5AGU	"	45,012	382	17	49
SP2JJC	"	26,235	288	13	42
SP4DM	"	15,876	131	16	33
SP2BMI	"	9,384	113	15	31
SP2HMT	"	4,600	65	12	34
SP5ARN	7	50,396	386	18	68
SP5BAK	"	38,160	361	16	56
SP3FYX	"	1,058	47	4	19
SP5PWK	3.5	30,426	339	14	52
SP3DAH	"	10,516	224	8	36
SP2HPD	"	2,156	93	5	17
ROMANIA					
YO3CR	A	158,476	442	61	165
VO7DL	"	132,172	483	46	127
YO3JJ	"	105,391	475	45	98
YO8DD	"	88,644	330	47	131
YO3RF	"	83,201	219	28	70
YO6HQ	"	52,822	321	28	70
YO2BEO	"	45,012	305	27	66
YO9YE	"	43,672	239	34	69
YO8FZ	"	21,150	106	32	43
YO3AQJ	"	17,877	172	24	35
YO6AW	"	9,943	103	26	35
YO2BON	"	8,424	110	16	36
YO5BBO	"	6,867	96	12	49
YO3AC	"	4,650	49	17	33
YO6KNI	"	2,280	44	12	28
YO8GF	"	2,204	40	14	24
YO5BEU/6	"	567	29	6	15
YO3JW	28	3,705	43	15	24
YO5BAT	"	693	19	7	14
YO5BQ	21	44,115	257	24	61
YO2BLO	"	34,920	280	18	42
YO6AWR	"	7,215	86	12	27
YO3BEJ	7	74,740	701	16	58
YO2BKK	"	2,628	74	13	21
YO3ABR	"	240	13	4	12
YO8BDQ	3.5	3,456	124	5	22
SARDINIA					
ISØHFF	14	50,952	449	16	46
ISØFPH	"	32,832	410	14	43
SCOTLAND					
GM3KGT	21	50,616	397	21	53
GM4CXM	14	63,480	471	18	45
GM3XNJ	"	30,888	281	14	38
GM3ZSP	7	75,300	711	18	57
SICILY					
IK9LMK	21	54,740	510	18	52
SPAIN					
EA7TL	A	501,498	1039	66	185
EA7AAW	"	76,432	349	39	97
EA2HW	"	36,499	233	31	82
EA5CQ	"	36,300	185	35	65
EA5QR	"	8,742	141	17	45
EA3IH	28	3,885	95	9	26
EA2OP	21	50,690	391	20	54
EA4BV	"	8,560	136	9	31
SWEDEN					
SM5CSS	A	247,748	611	65	176
SMØBDS	"	132,240	436	48	126
SM6DJI	"	76,572	484	29	79
SM5AKT	"	74,360	208	48	121
SM5AHK	"	67,184	302	37	115
SM6AYM	"	62,468	197	55	106
SMØCMM	"	55,120	272	36	70
SM5CLE	"	52,965	166	51	114
SM7BYV	"	47,730	302	26	85
SK2IV	"	36,708	235	26	88
SMØCGO	"	13,884	100	27	62
SM6HFF	"	13,776	109	27	57
SM6CPO	"	12,384	89	24	48
SM5FXF	"	12,180	99	27	60
SM5BNX	"	10,089	92	23	34
SM7AAQ	"	6,408	76	14	22
SM4AZD	"	6,032	71	18	40
SM5BAX	"	4,640	64	14	15
SM1CUZ/Ø	"	552	26	10	14
SM7VY	"	420	10	7	8
SMØFY	28	4,370	49	14	32
SM6EUZ	"	2,244	31	12	21
SM6BXV	"	1,404	32	7	20
SM2HZQ	"	162	9	4	5
SM3VE	21	68,080	400	25	66
SM3DNI	"	36,630	276	21	53
SM5DRW	"	32,116	254	22	52
SM3DXV	"	24,004	175	20	48
SM5RE	"	4,935	50	13	22
SM7GGK	"	3,150	54	10	20
SM7FWZ	"	2,850	38	5	5
SM5CMP	14	99,176	514	25	67
SM5BRS	"	44,224	377	18	46
SM5BKI	"	30,217	182	19	48
SM6JY	"	18,630	231	13	33
SM5UQ	"	8,970	141	10	29
SM7CZC	"	5,016	59	10	34
SMØAJU	7	64,408	357	22	61
SM5VB	"	50,048	481	16	52
SM2COR	"	39,220	359	17	57
SM5CCT	"	15,565	192	13	42
SWITZERLAND					
HB9EP	A	214,493	536	40	151
			(Opr. HB9ZE)		
HB9QA	"	62,964	258	47	112
HB9KC	"	24,885	145	24	55
HB9AGH	28	7,398	64	21	33
HB9DX	21	14,006	72	25	69
HB9BLQ	14	26,040	254	19	41
WALES					
GW3INW	A	93,720	453	39	103
GW3MPB	"	62,790	211	54	107
YUGOSLAVIA					
YU3EY	A	1,636,605	1,706	112	293
YU4VBR	"	215,380	722	51	127
YU1NGO	"	168,675	436	57	138
YU1BM/1	"	83,424	424	34	124
YU1OCZ	"	70,784	553	40	88
YU2BTU	"	9,701	73	22	67
YU1EFG	28	27,208	176	25	51
YU2CBK	"	7,250	54	21	29
YU2CQ	"	6,477	60	19	32
YU1NZR	"	2,244	41	10	24
YU2OB	21	254,767	948	30	77
YU4FRS	"	212,058	835	28	74
YU3RM	"	192,888	741	28	80
YU2CBV	"	117,612	499	27	72
YU4HA	"	74,152	409	25	67
YU1GMN	14	93,879	527	24	71
YU1SF	"	4,956	82	11	31
YU1AJF	7	179,011	880	27	80
YU1ONV	3.5	12,420	270	9	37
YU1ONO	1.8	1,316	99	2	12
EUROPEAN S.S.R.					
BYELO-RUSSIA					
UC2ACA	A	301,977	601	71	190
UC2SE	"	47,424	456	11	42
UC2OBA	"	38,727	199	31	86
UC2OCB	"	15,318	127	22	52
UC2AAM	14	205,535	944	26	75
UC2AAX	"	44,091	384	19	52
UC2WAZ	"	14,210	131	14	44
UC2RG	"	6,510	101	8	27
UC2OBI	7	37,196	467	15	53
UC2WBJ	"	15,444	316	8	36
UC2ABT	3.5	80,278	712	21	63
UC2LBE	"	2	1	1	1
ESTONIA					
UR2RJ	A	885,060	1,475	86	244
UR2QD	"	98,174	304	57	134
UR2IP	"	3,220	59	12	34
UR2RCU	28	10,416	125	15	41
UR2JL	"	7,802	114	13	34
UR2AR	21	105,084	436	28	80
UR2NP	"	12,915	158	13	32
UR2TAB	14	164,772	784	25	67
UR2RGH	"	79,902	422	18	51
UR2RBI	"	5,776	58	15	23
UR2REC	7	28,728	428	12	45
UR2RHF	"	18,768	315	11	40
UR2QA	"	18,354	250	15	42
UR2RWA	"	4,880	101	9	31
UR2QI	3.5	62,561	713	16	57
UR2RER	"	39,900	468	14	56
UR2JW	"	35,282	512	13	46
UR2REY	"	27,702	379	10	47
UR2CW	"	888	39	4	20
EUROPEAN RUSSIA					
UA6LWI	A	330,848	854	58	166
UA3RO	"	241,800	711	49	146
UA3VDS	"	158,992	715	33	119
UA4IV	"	134,638	826	48	115
UA3DDF	"	69,937	406	27	76
UA3ST	"	53,940	335	20	67
UA1ZV	"	32,016	217	18	40
UA4HCV	"	23,613	201	21	30
UA1DF	"	23,520	138	24	60
UA3IAK	"	15,092	139	21	56
UA3MT	"	10,716	87	24	52
UA3AAU	"	7,840	80	19	37
UA3PDA	"	3,003	89	10	23
UA3GO	"	2,160	42	11	25
UA3AFL	28	2,625	45	10	25
UA4PNW	21	190,026	861	26	76
UW6DR	"	172,805	1,079	25	60
UA6LBH	"	98,532	574	25	59
UA3QAQ	"	93,930	567	24	69
UV3GZ	"	49,842	413	19	52
UA3EZ	"	45,804	423	18	48
UA6PBA	"	37,882	303	21	41
UW3EH	"	24,766	222	18	43
UA3BK	"	3,175	70	10	25
UW3HV	14	224,296	1,008	31	75
UA4FBL	"	169,928	910	25	63
UA1ZEX	"	166,050	860	23	59
UA3WBO	"	87,665	527	25	64
UW6CV	"	76,692	550	21	56
UA1CJD	"	70,518	528	20	49
UA3EAT	"	35,260	544	19	46
UA3DEA	"	29,880	214	19	41
UA6LLI	"	22,968	224	16	42
UA1ZBL	"	22,873	89	18	30
UA3TA	"	20,296	151	18	38
UA3IAR	"	15,228	145	15	39
UA6YBK	"	10,835	153	16	39
UA4HDV	"	10,560	125	15	33
UA3LAR	"	7,380	82	14	27
UA3QBX	14	6,144	90	10	22
UA4FCM	"	4,611	84	10	19
UA4ACP	"	525	16	7	14
UA6LO	7	269,654	1,167	32	87
UA1ALZ	"	231,304	994	30	86
UA1DZ	3.5	129,692	832	26	71
UA4PAO	"	98,007	604	24	67
UA6CQ	"	34,872	440	12	49
UA6LLT	"	26,712	317	14	49
UA3ECF	"	22,330	314	12	43
UA4ACD	"	16,377	189	12	41
UA1AGL	"	15,179	316	9	34
UA6WF	"	9,900	202	7	29
UA4ACD	"	6,464	106	11	32
UA3DLN	"	3,780	108	6	29
UA3AGX	"	3,190	104	6	23
KALININGRAD					
UA2DM	A	281,088	668	65	161
UA2FCB	"	60,032	305	27	107
UA2EC	21	65,835	302	25	74
UA2FCW	3.5	18,576	327	9	39
LATVIA					
UQ2GDQ	A	729,540	1,174	83	232
UQ2PP	"	165,945	525	42	143
UQ2GCN	21	46,268	270	24	62
UQ2GCO	14	95,710	534	24	61
UQ2GEY	"	70,644	405	25	59
UQ2GBJ	"	17,712	190	15	39
UQ2GGB	7	13,571	319	10	31
UQ2GCP	"	3,264	72	7	25
UQ2PG	"	1,960	65	5	23
UQ2GDW	3.5	91,314	745	21	68
UQ2GFN	"	19,635	326	11	40
UQ2GGS	"	3,389	133	5	20
UQ2OE	"	270	30	3	6
LITHUANIA					
UP2NK	A	1,390,460	1842	102	268
UP2SA	"	838,400	1230	85	235
UP2BAO	"	530,037	1091	77	216
UP2OM	"	459,420	985	68	228
UP2BAT	"	247,544	643	62	170
UP2OO	"	230,178	565	57	170
UP2BAR	"	137,240	340	51	137
UP2BEA	"	81,075	360	36	105
UP2BCX	"	32,263	398	16	61
UP2BB	"	25,300	170	24	76
UP2BBF	"	23,576	182	22	61
UP2BDO	"	1,482	32	10	29
UP2BAE	21	15,548	132	14	38
UP2OX	14	282,051	1218	28	71
UP2BV	"	69,312	485	19	57
UP2BF	"	43,824	664	12	54
UP2PCW	7	47,642	419	20	63
UP2ND	"	14,798	254	10	39
UP2PCB	"	7,105	170	7	28
UP2BCG	"	3680	87	10	39
UP2BFE	3.5	42,504	524	14	52
UP2OU	"	39,816	512	14	49
UP2BBI	"	12,390	275	8	34
UP2BDH	"	7,953	210	8	25
MOLDAVIA					
UO5OGX	A	7,350	108	14	35
UO5OBD	14	98,910	646	25	65
UO5OWB	"	3400	72	8	26
UO5ODA	7	22,828	363	11	41
UO5GR	3.5	6,996	105	11	33
UKRAINE					
UB5EC	A	1,210,440	1849	84	246
UB5WF	"	982,215	1297	98	267
UY5OO	"	735,504	1014	91	245
UB5ML	"	255,106	644	56	173
UB5MFY	"	249,700	683	61	166
UB5MCU	"	231,889	685	56	155
UT5VZ	"	153,582	471	53	126
UT5MB	"	156,864	497	43	129
UB5KAK	"	146,960	318	62	158
UB5MFI	"	135,720	470	46	134
UB5MHB	"	125,976	496	45	129
UY5TE	"	124,500	532	39	127
UB5MAQ	"	116,250	495	42	108
UB5TAM	"	110,670	428	38	117
UB5ZBF	"	100,646	382	39	119
UB5UAH	"	100,415	392	33	100
UB5MAB	"	100,302	454	37	109
UB5ICS	"	86,005	244	51	116
UB5MGS	"	80,830	497	30	88
UB5MEI	"	77,400	534	21	69
UB5MEF	"	60,844	314	30	76
UB5MCR	"	53,781	407	22	69
UB5MCM	"	49,855	321	24	73
UB5EAX	"	39,100	294	25	75
UB5MET	"	38,259	219	32	77
UB5MGQ	"	37,823	211	34	75
UY5DV	"	31,008	212	23	73
UB5MIF	"	26,344	181	24	65
UB5UAM	"	23,793	145	26	51
UB5MCV	"	22,848	242	15	49
UB5MHV	"	19,637	191	20	53
UB5MBM	"	16,200	144	21	54
UB5ZAT	"	15,265	89	27	44
UB5MEV	"	8,372	135	12	40
UB5MAV	"	5,704	72	16	46
UB5ZBM	"	308	15	8	14
UB5AAF	"	120	10	4	8
RB5ION	28	4,506	71	14	32
UB5ZAL	21	98,552	515	25	72
UB5VY	"	54,600	313	22	56
UY5EX	"	42,354	321	22	56
UB5ZEL	"	24,420	222	17	43
UB5FAQ	"	21,442	129	22	49
UB5IIA	14	200,575	952	30	83
UB5IDL	"	188,786	883	28	78
UB5CE	"	112,840	563	27	64
UT5HZ	"	54,201	365	23	64
UB5LDP	"	26,536	215	14	48
UB5MAJ	"	16,520	162	15	44
UB5PAD	"	14,362	201	12	31
UB5LYL	"	8,446	136	13	28
UB5HN	"	5,508	73	11	25
UB5EEW	"	4,774	68	10	21
UB5JIM	7	124,215	627	26	79
UB5UCJ	"	65,200	474	18	62
UB5ZDF	"	38,367	393	15	48
UB5QEO	"	20,552	260	14	42



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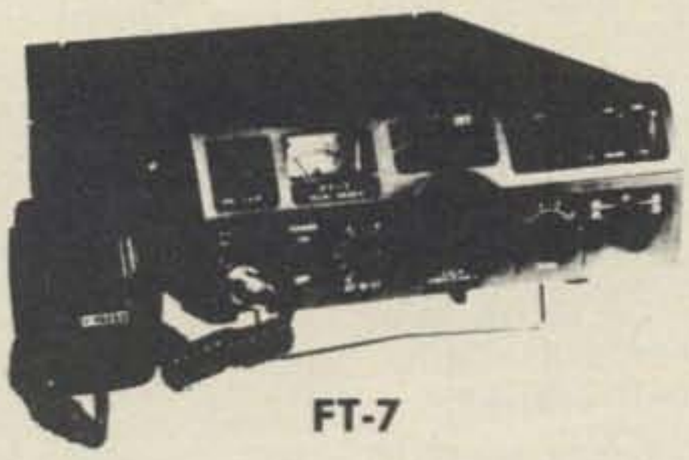

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UB5JFP	"	4,206	93	9	22
UB5WAG	"	3,465	91	8	25
UB5EEP	"	2,444	75	7	19
UB5LAW	**3.5**	**44,484**	**512**	**14**	**42**
UB5RS	"	12,985	201	11	38
UB5UBY	"	1,829	47	6	25

OCEANIA

AUSTRALIA

VK5SW	**A**	**244,902**	**888**	**41**	**61**
VK3QK	"	199,728	487	60	84
VK2GW	"	174,981	408	63	78
VK2BJL	"	102,358	296	48	74
VK3ANI	"	73,008	345	37	35
VK4QK	"	39,486	257	41	65
VK7CM	"	15,428	90	25	33
VK3MR	**28**	**79,430**	**452**	**21**	**44**
VK3MJ	"	33,602	218	19	34
VK4XA	"	29,225	290	17	18
VK3RJ	21	26,622	184	19	32
VK4DO	"	8,282	72	15	26
VK5NLC	"	18	9	1	1
VK4LX	14	39,044	169	30	56
VK6AJ	"	22,712	125	24	44
VK3OP	**7**	**29,356**	**244**	**18**	**23**
VK2BQQ	3.5	3,888	66	13	11

GUAM

KG6JAR	**A**	**99,456**	**400**	**42**	**42**
KG6JHW	"	17,014	126	22	25
KG6DX	1.8	456	26	3	3

HAWAII

KH6IJ	**A**	**1,661,756**	**2398**	**102**	**131**
KH6NO	"	**587,375**	**1550**	**59**	**68**
KH6DD	**21**	**320,320**	**1533**	**27**	**43**
KH6HGL	"	63,181	526	19	22
KH6JB	14	22,302	295	13	14
KH6IRO	"	10,881	150	14	13
KH6DX	**7**	**104,762**	**723**	**20**	**29**
KH6CHC	**1.8**	**8,400**	**139**	**10**	**10**

INDONESIA

YB0ACT	**A**	**1,295,805**	**1538**	**91**	**196**
YB3AP	"	69,030	204	45	73

MARSHALL IS

KX6LA	**21**	**543,345**	**2068**	**29**	**60**

MINAMI-TORISHIMA

JA8IEV/JD1					
	A	**320,628**	**717**	**76**	**78**

NEW ZEALAND

ZL3GQ	**A**	**2,648,064**	**2327**	**128**	**756**
ZL2MM	21	15,207	145	14	23
ZL3CC	14	8,823	61	21	30
ZL1AMO	**7**	**187,026**	**885**	**23**	**73**

PHILLIPPINES

KØAX/DU2					
	A	**635,880**	**1295**	**70**	**98**
N4SN/DU2					
	"	50,370	252	32	37

SOUTH AMERICA

ARGENTINA

LU1DZ	**28**	**231,504**	**1005**	**27**	**51**
LU8ADK	"	14,268	121	18	23
LU9FAZ	**14**	**73,360**	**327**	**27**	**53**

BOLIVIA

CP5NK	14	13,780	87	21	31

BRAZIL

PY1ZDK	**A**	**845,668**	**1347**	**68**	**144**
PY7AZQ	"	**626,974**	**950**	**69**	**158**
PY1BOA	"	519,400	931	72	128
PY1DG	"	357,752	626	71	126
PY7AAI	"	183,607	698	30	59
PY3APH	"	126,350	334	56	77
W1OR/PY2	"	47,730	199	34	52
PY7CC	"	15,550	106	20	30
PY7DA	"	14,630	93	26	29
PY5CFK	"	3,162	35	15	16
PY1WC	**21**	**14,514**	**130**	**15**	**26**
PY2WUZ	"	7,360	85	14	18
PY1VT	"	6,798	86	13	20
PY1DHN	"	3,332	42	10	18
ZW4OD	**14**	**648,825**	**1963**	**35**	**88**
PY7HQ	"	20,104	240	2	8
PY7BOS	"	16,456	171	14	20
PY2FRW	"	5,852	179	6	5
PY7CCZ	"	1,500	51	6	4

EASTER IS

CEØAE	**A**	**148,458**	**472**	**48**	**61**

ECUADOR

WA4UAZ/HC1					
	A	**509,190**	**1045**	**68**	**97**
HC1BU	**14**	**51,322**	**267**	**26**	**41**
N4JI/HC1					
	3.5	**77,748**	**463**	**21**	**36**

FERNANDO DE NORONHA

PY7BXC/Ø					
	A	**435,666**	**919**	**55**	**106**

NETHERLANDS ANTILLES

PJ9CG	**A**	**3,334,884**	**3255**	**108**	**240**
					(Opr. K1JX)
PJ2VD	"	**2,591,446**	**3171**	**91**	**195**

PERU

OA8V	**A**	**125,788**	**370**	**53**	**65**

SURINAM

JA1PIG/PZ					
	A	**859,560**	**1199**	**82**	**165**

TRINIDAD AND TOBAGO

9Y4VT	**A**	**4,697,304**	**3992**	**122**	**275**
					(Opr. N6AA)
9Y4VU	"	**2,221,024**	**2671**	**89**	**192**
9Y4LA	"	146,624	418	43	73

URUGUAY

CX5RV	A	96,922	302	44	54
CX8DT	**21**	**387,844**	**1405**	**27**	**67**

VENEZUELA

YV5SJ	**21**	**68,200**	**460**	**12**	**38**
YV6AZC	"	50,895	440	11	28
4M4ID	**14**	**171,640**	**825**	**20**	**50**
4M7PF	**7**	**60,940**	**377**	**16**	**39**
YV1OB	**1.8**	**14,220**	**192**	**9**	**21**

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

K1PR	**1,714,172**	**1474**	**118**	**286**
K1XX	**1,447,419**	**1325**	**106**	**275**
K1ZZ	1,342,160	1241	113	267
N1AC	852,204	1029	77	205
K2BU	**1,755,914**	**1581**	**110**	**276**
W2UI	235,222	393	74	144
WA2HDD	13,593	83	27	42
N3RD	**1,239,315**	**1125**	**113**	**272**
N3AW	718,994	833	93	214
K3RS	645,532	804	93	191
W3HB	414,426	573	91	198
W3UO	314,340	448	83	177
W3EVW	229,827	392	63	150
WA3NAN	154,700	284	66	135
K3KA	2,520	27	13	23
N4AR	**2,131,746**	**1573**	**139**	**332**
N4RA	465,388	559	98	210
N4BP	411,858	571	89	172
N4HU	325,496	508	82	150
WA4LZR	190,422	327	67	146
W4MYA	155,736	284	72	134
N4OL	154,686	321	54	120
N4IB	60,258	178	44	77
W4NVU	1,197	20	7	14
K5JA	**2,087,400**	**1727**	**131**	**289**
W5YZ	124,752	272	66	118
W6XR	**1,630,608**	**1770**	**111**	**211**
W6BH	**1,441,044**	**1680**	**106**	**191**
K6SE	1,333,180	1345	125	224
K6DC	868,400	1158	102	158
WA6JUD	644,436	936	93	150
N6GG	610,848	858	98	154
W6KG	538,356	922	77	127
W6BIP	457,236	710	90	144
K6CYX	279,174	613	63	98
K6YK	245,340	492	69	111
N6OZ	124,614	338	50	79
N6IQ	65,703	194	45	76
K6SMH	11,163	79	26	35
K7RI	**771,096**	**1169**	**96**	**132**
W7KKR	18,340	75	36	59
N8ET	**744,800**	**883**	**103**	**201**
K8OT	64,530	182	51	84
WD8JZQ	260	66	7	6
W9LT	**1,003,884**	**1019**	**111**	**246**
WB9VLV	**10,362**	**115**	**27**	**39**
WØHP	**1,074,048**	**1010**	**124**	**260**
WØSD	**979,616**	**1003**	**121**	**231**
WØYR	94,120	247	49	81
WDØBPG	875	26	13	12

ALASKA

KL7MF	**376,420**	**1294**	**46**	**72**

CANADA

VE1MOT	111,592	627	22	52
VO2EPA	**816,651**	**1749**	**75**	**144**
CY3AKG	**1,537,557**	**1876**	**113**	**234**
CY3HFS	497,367	1351	61	108
VE6ASI	**98,850**	**1318**	**32**	**43**
VE7AUB	7,614	137	17	10

HAITI

HH2DX	**858,850**	**2240**	**65**	**113**

MONTSERRAT

VP2M	**2,766,433**	**3592**	**97**	**240**

SAINT MARTIN

PJ8JM	**862,645**	**1597**	**77**	**168**

ASIA

IRAN

EP2SV	**2,505,068**	**2554**	**101**	**272**

JAPAN

JE1ZWT	**1,139,004**	**1520**	**96**	**165**
JA2YKA	625,940	929	88	150
JA8YAU	610,638	1016	86	131
JA7YFB	326,155	589	81	124
JAØYAN	315,819	613	77	112
JR1ZTI	291,600	666	62	88
JH6YAY	128,234	473	32	65
JA3YEE	86,240	283	42	68
JA5YAS	10,224	100	19	17

ASIATIC U.S.S.R.

ASIATIC S.S.R.

UK9ADY	**960,534**	**1250**	**71**	**187**
UK9HAC	**723,261**	**1257**	**64**	**167**
UK9CBD	715,274	1006	71	195
UK9OAD	192,786	636	40	98
UK9QAG	8,176	141	22	50
UK9XAC	5,940	57	9	27
UKØAAC	**1,101,961**	**1511**	**91**	**210**
UKØFAA	637,334	1505	90	133
UKØLAB	211,296	683	55	87
UKØBAA	94,830	460	28	59

GEORGIA

4L6M	**6,095,824**	**4058**	**128**	**390**
UK6QAA	42,808	266	15	41

KAZAKH

UK7CAI	**275,906**	**764**	**38**	**104**
UK7CAC	43,890	154	29	81

UZBEK

UK8AAI	**297,124**	**509**	**64**	**172**

EUROPE

BELGIUM

ON6VN	**75,136**	**807**	**17**	**47**

BULGARIA

LZ2KIM	**844,272**	**1524**	**89**	**223**
LZ2KSU	325,124	1198	60	178
LZ1KDP	228,005	1095	37	118
LZ2KKK	158,522	638	41	128
LZ1KRD	130,092	574	44	104
LZ1KOZ	49,350	351	23	82
LZ2KSQ	41,019	250	32	81
LZ1KDW	13,184	381	9	23
LZ2KEF	1,460	17	10	16

CZECHOSLOVAKIA

OK5CRC	**2,164,941**	**2341**	**110**	**333**
OK1KSO	**1,353,216**	**1640**	**103**	**281**
OK1ALW	**1,235,124**	**1409**	**108**	**288**
OK3VSZ	655,995	1179	82	221
OK1KSL	468,234	919	80	219
OK5TLG/P				
	381,752	862	58	180
OK3RKA	371,280	842	65	190
OK1KUR	329,807	616	77	194
OK1KOK/P				
	318,816	679	69	177
OK3KAP	298,109	679	63	196
OK3KTD	153,608	543	55	127
OK1ONF	127,890	568	41	106
OK1KRS	127,710	358	56	109
OK3RJB	91,045	444	38	93
OK1KPU	82,592	398	32	84
OK3KTR	82,350	349	42	108
OK1KRY	70,700	412	29	71
OK1OXP	70,110	465	31	59
OK2KPS	54,990	294	28	102
OK1KZJ	39,960	346	33	78
OK2KZR	34,884	145	42	60
OK1KUA	30,848	197	20	44
OK3KFO	30,179	181	31	72
OK2KWI	28,911	178	24	45
OK1KYS	23,192	86	41	63
OK3KKQ	4,230	83	9	38
OK1KQJ	1,881	73	4	5
OK1KWV	1,584	42	6	12

DENMARK

OZ3LF	**314,646**	**724**	**66**	**163**
OZ7BW	219,372	612	63	118

ENGLAND

G3GJL	**400,235**	**1055**	**56**	**153**
G4FOC/A				
	43,296	281	39	84

FAEROES IS

OY6FRA	**673,569**	**1937**	**61**	**186**

FINLAND

OF3EW	**625,656**	**1337**	**72**	**190**
OF2AA	**544,710**	**1177**	**78**	**193**
OH6UC	80,203	377	34	105

FRANCE

F6CZU	**385,857**	**632**	**78**	**201**

GERMANY (FRG)

DLØWU	**2,002,995**	**2147**	**104**	**297**
DA2AY	**1,951,471**	**2170**	**88**	**291**
DLØAA	1,857,987	2043	108	279
DKØTU	1,844,421	2143	103	278
DL8CM	1,263,024	1512	93	265
DLØKF	996,788	1321	94	283
DKØBN	895,158	1576	76	198

GERMANY (GDR)

DM3SO	**688,905**	**1359**	**68**	**175**
DM4FM	335,610	854	64	162
DM5IG	251,672	809	48	145
DM7BE	178,500	495	64	146
DM3CK	125,364	627	36	98
DM4CM	50,976	300	27	81
DM4ZA	39,501	305	21	78
DM4EB	20,769	156	23	46

GUERNSEY

GU4DAA	**2,842,776**	**3175**	**111**	**317**

HUNGARY

HA5KDQ	**1,452,474**	**1781**	**93**	**249**
HA9KOB	**906,604**	**1491**	**91**	**225**
HA6KVB	749,708	1383	80	201
HA9KPU	528,320	1022	69	191
HA5KJC	490,000	952	81	199
HG8U	477,508	1173	72	172
HAØKLU	469,568	1131	67	186
HA4KYH	426,398	962	64	165
HA5KKC/2	381,052	1001	59	158
HA5KFZ/7	217,160	757	49	129
HA2KMB	151,264	603	44	119
HA7KSV	145,314	472	47	115
HA1KTD	98,010	519	35	100
HA1KZU	88,476	324	45	101
HAØKHW	67,056	320	34	98
HAØKLL	48,160	258	34	78
HA5KKK	37,230	302	25	77
HA7KLB	27,573	175	25	66
HA8KAX	18,207	258	15	48
HA6KNV	13,653	327	8	33
HA7KPK	10,206	145	12	30

IRELAND

EI1AA	**1,275,846**	**2185**	**81**	**205**

LUXEMBOURG

DL7ON/LX/P	**1,311,050**	**2126**	**88**	**237**

NETHERLANDS

PI1PT	**117,810**	**450**	**43**	**111**
PA3AAT	105,741	655	24	69
PA3ACE	88,218	514	34	83

NORWAY

LA1H	**999,680**	**1602**	**68**	**188**

POLAND

SP2KAE	**580,146**	**1149**	**75**	**191**
SP9KRT	317,898	763	56	133
SP9KAD	203,188	809	40	118
SP9PBN	118,500	452	48	110
SP2KDT	73,416	323	36	102
SP3PGX	16,720	149	26	62

ROMANIA

YO4SI	**1,410,705**	**2121**	**92**	**253**
YO5KAU	236,964	796	50	146
YO8KAN/P	168,350	593	42	130
YO8KGV	32,269	461	12	52

SWEDEN

SK2KW	**1,855,590**	**2494**	**92**	**238**
SK7CE	667,562	1064	77	210
SK5DB	405,844	954	64	177
SK3HK	382,914	1221	56	133
SK5EU	265,359	770	57	140
SK6CW	189,214	599	49	129
SK7GC	66,930	305	43	90
SK1AQ	16,448	103	23	41

SWITZERLAND

HB9AYZ	**143,440**	**538**	**45**	**118**
HB9LP	198,512	611	46	106

YUGOSLAVIA

YU3DBC	**2,247,696**	**2432**	**118**	**314**
YU2CDS	**2,052,760**	**2,371**	**98**	**282**
YU1ELM	1,088,682	1554	90	253
YU3BUV	42,501	239	33	60
YU4CBC	24,300	149	28	62

U.S.S.R.

BYELO-RUSSIA

UK2AAG	**407,650**	**1015**	**67**	**196**
UK2ABC	340,844	1182	47	141
UK2AAP	116,100	639	40	89
UK2AAR	80,412	322	41	90
UK2IAJ	83,711	560	25	72
UK2AAA	27,872	199	24	43

ESTONIA

UK2RAX	**341,824**	**1002**	**56**	**162**
Uk2TAD	170,345	671	41	114
UK2RIL	43,460	325	27	79

EUROPEAN RUSSIA

UK4HBB	**1,439,100**	**1748**	**113**	**297**
UK4WAR	**1,189,945**	**1630**	**87**	**244**
UK6LEZ	894,948	1340	104	227
UK4WAB	874,500	1505	83	247
UK3ABB	795,375	1029	81	222
UK6AJA	749,274	1377	56	216
UK3WAA	722,904	1379	82	230
UK1ZAA	462,024	1167	53	154
UK3SAB	412,296	956	65	181
UK3AAH	405,900	1178	58	162
UK4LAA	368,631	970	61	182
UK3UAA	349,011	1113	48	123
UK3AAC	254,320	829	61	125
UK6YAB	215,824	805	45	119
UK4PAE	161,084	594	43	111
UK3TAG	159,840	609	41	107
UK3DAU	65,740	488	21	55
UK3TAF	61,268	504	18	55
UK3XAM	43,248	424	30	72
UK4YYY	10,290	215	13	29

KALININGRAD

UK2FAS	**164,715**	**850**	**31**	**108**

LATVIA

UK2GCB	**262,191**	**885**	**41**	**118**

LITHUANIA

UK2BBB	**1,406,048**	**1782**	**107**	**302**
UK2PCR	**1,108,450**	**1695**	**95**	**255**
UK2PAO	534,303	1169	67	190
UK2BAS	479 302	639	99	268
UK2BAG	441,760	1013	70	181
UK2BCB	80,080	510	28	76
UK2BBF	30,485	319	19	72

UKRAINE

UK5MAF	**1,446,326**	**1731**	**112**	**301**
UK5IAZ	**1,044,174**	**1389**	**96**	**257**
UK5MAG	825,258	1286	91	252
UK5QBE	762,930	1348	79	215
UK5IBB	702,614	1295	80	213
UK5LAA	529,737	1010	79	210
UK5XBA	394,944	1192	55	149
UK5VAA	327,128	1017	54	152
UK5MAB	296,142	668	55	176
UK5JAD	257,784	723	45	139
UK5UBB	232,704	693	52	150
UK5WAA	226,047	562	40	111
UK5WAZ	197,372	721	56	150
UK5EAG	189,150	615	48	147
UK5IAN	177,550	598	48	127
UK5EAK	176,064	496	51	141
UK5MBF	139,505	641	32	91
UK5JAO	125,056	606	40	88
UK5WAG	109,500	432	34	116
UK5HAB	69,412	259	41	93
UK5MBW	57,951	269	36	105
UK5MCP	39,200	241	28	84
UK5ZAK	34,960	186	32	83
UK5MBV	8,323	127	11	30

OCEANIA

MIDWAY ISLAND

KM6BI	85,491	463	34	29

NEW ZEALAND

ZL2WB	**650,937**	**1009**	**83**	**140**

SOUTH AMERICA

CHILE

N4VV/CE3	**1,680,896**	**2299**	**88**	**168**

MULTI-OP. MULTI-XMTR. NORTH AMERICA

U.S.A.

W2PV	**4,318,650**	**2883**	**145**	**380**
W3AU	**4,216,306**	**2701**	**148**	**390**
K2GM	4,034,360	2705	146	384
K3WW	4,016,352	2542	151	401
K5RC	**3,896,904**	**2762**	**148**	**361**
W3MM	3,158,142	2292	135	359
K6RR	**3,092,400**	**2877**	**138**	**262**
W4WS	**2,909,170**	**2081**	**145**	**354**
KØRF	**2,798,901**	**2409**	**134**	**279**
W3FA	2,286,585	1920	127	300
W3GM	2,029,566	1558	130	332
W7FU	**1,789,774**	**1838**	**124**	**219**
K8LX	**1,563,480**	**1364**	**121**	**283**
K4CG	1,403,360	1391	104	254
W3ZZ	1,369,528	1249	108	278
N6MG	984,540	1136	113	192
N2MM	685,875	864	88	207
WA3NNA	650,084	703	105	226
W3TV	616,832	707	85	231
N6AW	346,970	557	79	142
K4LRJ	181,068	350	66	125
N4KE	124,656	236	75	121

CAYMAN IS.

ZF2AW	**3,159,648**	**4504**	**95**	**229**

PUERTO RICO

KP4EAJ	**7,177,275**	**7017**	**129**	**312**

ASIA

JAPAN

JH1ZLA	**3,540,656**	**3118**	**141**	**263**
JA3YKC	**2,832,285**	**2604**	**132**	**251**
JA3YBF	**2,405,312**	**2339**	**127**	**237**
JH1YDT	2,237,760	2137	129	241
JA9YBA	1,794,880	2010	124	192
JA1YXP	1,488,950	1705	112	195
JA7YAA	901,530	1321	91	152
JA6YDH	655,291	961	92	155
JA2YEF	635,544	986	91	143
JA1ZLO	564,886	1135	96	161
JA1YHA	532,026	956	83	115
JA4YQO	227,088	508	67	99
JA6YAP	182,376	428	67	86
JA3YQA	2,520	32	10	20

R.S.F.S.R.

UK9AAN	**6,540,380**	**4567**	**141**	**407**

EUROPE

FINLAND

OH2AW	**3,494,328**	**36005**	**124**	**350**
OH1AA	**3,182,880**	**3187**	**124**	**356**

SWEDEN

SK5AJ	**2,672,626**	**3029**	**116**	**335**

YUGOSLAVIA

YU1BCD	**4,707,000**	**4143**	**135**	**388**

SOUTH AMERICA

JUAN FERNANDEZ

CEØZM	**2,472,546**	**3401**	**87**	**159**

VENEZUELA

YY5A	**1,759,757**	**2482**	**79**	**160**

CHECK LOGS

Our deep thanks to the following stations who sent in check logs.

C5AAD, DK3OI, DK5OS, DL9HP, DM2ADC, DM2AFA, DM2AHE, DM2BGC, DM2BML, DM2BSD, DM2BYJ, DM2CGH, DM2CKD, DM2CMF, DM2CPE, DM2CRJ, DM2DZH, DM2EDL, DM2EKH, DM2FBN, DM2FIL, DM2FMH, DM2FQN, DM3HF, DM3SQU, DM3UE, DM3XM, DM3ZXG, DM4YSL, DM4ZEL, G3FAS, G4FDC, K3DR, K6DSK, K7EFB, LA1K, LA2IE, LA7X, LZ1UA, N8WA, OH2MM, OK1ANM/P, OK1-IAR, OK1JDJ, OK1JST, OK2BPL, OK2BJU, OK2QX, OK2TBC, OK3EQ, OK3TOA, OK3CGI, OY1H, OZ8XO, OZ9PP, PP5CO, PY1DHG, PY2KN, PY6AUC, SM5RE, SM6BGA, SM6BZE, SM6FKF, SM7AIL, SM7ASN, SM7FSV, SM7TV, SP5GBT, SP5GRU, SP5IXI, SP5PSL, SP6SD, SP7HT, SP8BAB, SP9PDF, UA1AWO, UA1TAL, UA3ABP, UA3DAM, UA3DFK, UA3DFV, UA3DL, UA3EAL, UA3ESN, UA3IBH, UA3LBE, UA3MCI, UA3PAE, UA3YBO, UA4AY, UA4FAR, UA4HEJ, UA4HFG, UA4LAJ, UA4QK, UA6ACP, UA6AJG, UA6LXZ, UA6YBH, UA9CAL, UA9CES, UA9CLQ, UA9HM, UA9JAA, UA9KAI, UA9MAX, UA9MK, UA9MY, UA9NN, UA9OBG, UA9OCI, UA9SEQ, UA9UDR, UA9UMO, UA9YAQ, UAØCAW, UAØCBW, UAØFBF, UA9JCA, UB5AAF, UB5AAQ, UB5ECY, UB5FAP, UB5GBD, UB5HK, UB5IAN, UB5ICK, UB5JCA, UB5JCC, UB5JCF, UB5JDI, UB5JEA, UB5JFX, UB5LAL, UB5LAY, UB5LBJ, UB5QAE, UB5QBJ, UB5QCR, UB5UBU, UB5UDG, UB5VAI, UB5XBU, UB5XU, UB5ZBB, UB5ZBX, UB5ZCT, UC2SLG, UD6DFD, UH8DL, UH8HCA, UJ8JCR, UK1CUA, UK1ZAS, UK3DBE, UK3EAK, UK3IBB, UK3TAA, UK4LAZ, UK4PAA, UK4YAN, UK5WBG, UK6DAU, UK7NAA, UK8BAA, UK8NAA, UK9LAA, UK9WBD, UK9XAA, UKØAAS, UL7EAH, UL7EAR, UL7JAA, UL7PBY, UL7QF, UM8MBL, UM8MCA, UO5AP, UP2BCD, UP2BDW, UP2BFB, UP2BFH, UP-2PAP, UQ2GEO, UR2REE, UT5BW, UT5SI, UV3DN, UV3TV, UV9DU, UW3FW, UW3UG, UW3WZ, UW9VH, YU5SY, UY5UG, VE7DTA, W1SK, W1YS, W4ZRJ, W5EIJ, W5ICH, W5NR, W7EKM, W7JKA, YO5BQ, YO8BDQ, YO9HP, YO9HT, YO9KAG, ZL2GZ

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This installment covers the exciting world of silent, video RTTY. Techniques and commercially manufactured equipment are discussed.

AN RTTY PRIMER PART VI

BY IRWIN SCHWARTZ*, K2VG

It can probably be safely stated that ninety percent of today's electronics technology has accumulated within the past fifteen years of its seventy-five-or-so year history.

The sharp growth which marked the explosion found its roots in the period immediately following the second world war.

Research during the early 'forties planted the seeds for the renaissance of solid-state techniques. Older readers will no doubt remember semiconductor origins in the crystal sets they admired as youngsters.

Following a long period of inactivity researchers, most prominent among them William Shockley, astounded the electronics community by demonstrating the feasability of junction transistors.

With that noble contribution an ever-increasing spiral of revolutionary technology began.

Radio amateurs have historically been privy to the latest technology, from inception to final product. It is common knowledge that every aspect of our service has been touched by the revolution.

The concern of this article will be to describe the influence of solid-state techniques on radio teleprinting communications.

In addition to discussing methods used for processing transmitted and received signals, commercially manufactured equipment will be described.

It is my hope that, after having studied these pages, the reader will be in a position to understand the processes involved and will be prepared to make an intelligent choice of gear.

Background

Solid-state techniques have already eclipsed the primitive, albeit functional, methods of amateur radioteletype. Modern approaches, for example, eliminate the toroidal inductor such as the one used in the demodulator project of this series. Operational amplifier (op-amp) technology, through what may be considered as a process of osmosis, has supplanted the cumbersome filter circuits which were originally used. It is now common, for instance, to build a discriminator whose frequency tolerances are much tighter than and whose tuning is significantly simpler than previously possible.

Similarly, the generation of RTTY tones has also been taken under the wing of solid-state. This is true for both a.f.s.k. and f.s.k.

*Technical Editor, *CQ*

But, perhaps most exciting of all, is that final printed messages appearing on a television-like screen has become a technical and financial reality for many amateurs. The mechanical process of transmitting and receiving RTTY will soon be consigned to the museums of wireless communications.

Memories

The heart of a video RTTY system is multi-chambered. Each of the chambers serves a function which is related to or dependent on each of the others. Perhaps the most outstanding chamber is that which serves as a memory.

There are basically two types of memories in use. These are the **ROM** (**R**ead-**O**nly **M**emory) and the **RAM** (**R**andom-**A**ccess **M**emory). Regardless of which is used, information is fed to, stored in and taken from the memory in **binary form.**[1] That is, pieces of information are encoded using 0's and 1's.

A ROM is distinguished in that it contains data which can be read only. No modification or erasure is possible once the memory has been programmed. Such memories are used for duties which never change, such as a "look-up" function. An example of a ROM application may be using a pocket calculator to find the square root of 688.5376 (no need to get yours—it's 26.24). This information is literally burned into the memory so that each time the square root of a particular number is called for, one, and only one, answer appears on the calculator's display.

[1]**The word "binary" means "of two parts." Binary nomenclature can be used to express data in a form which requires two digits (usually "0" and "1"). Under circuit or component conditions the "0" and the "1" may represent "off" and "on," "low" and "high," "0 volts" and "+5 volts," "-3 volts" and "+3 volts," etc.**

This use must be distinguished from the mathematical application of "binary" as a number base. Here, rather than being written in powers of ten, as *decimal* numbers are written (. . . , 10^3, 10^2, 10^1, 10^0, 10^{-1}, 10^{-2}, 10^{-3}, . . .), binary numbers are based on powers of two (. . . , 2^3, 2^2, 2^1, 2^0, 2^{-1}, 2^{-2}, 2^{-3}, . . .).

The decimal number 526 can be represented as

10^2	10^1	10^0
5	2	6

In the base two, using binary notation, 526 becomes

Particularizing the use of ROM's to this discussion, their services are called upon for the transmutation of Murray code into **ASCII.**[2] For example, if the letter "F" is pressed on a keyboard it is encoded as M/S/M/M/S (or, in binary form, as 10110) into the ROM and then changed to the ASCII equivalent (0110100). Note that the ROM changes a five-bit[3] encodement into a seven-bit encodement. A ROM designed for Murray-to-ASCII (sometimes called "Baudot-to-ASCII") conversion can do only that and nothing else. ROM's are very specialized devices. See the inset for a discussion of how a ROM works.

A RAM can be used for retrieving data from any one of its locations ("addresses"), at any time and in any order. Its stored information is not immutable as in the case of the ROM. In addition, whereas a ROM's memory lasts only as long as power is applied to it (this condition is called *volatility*), a RAM can store information with no power applied to it (*nonvolatility*).

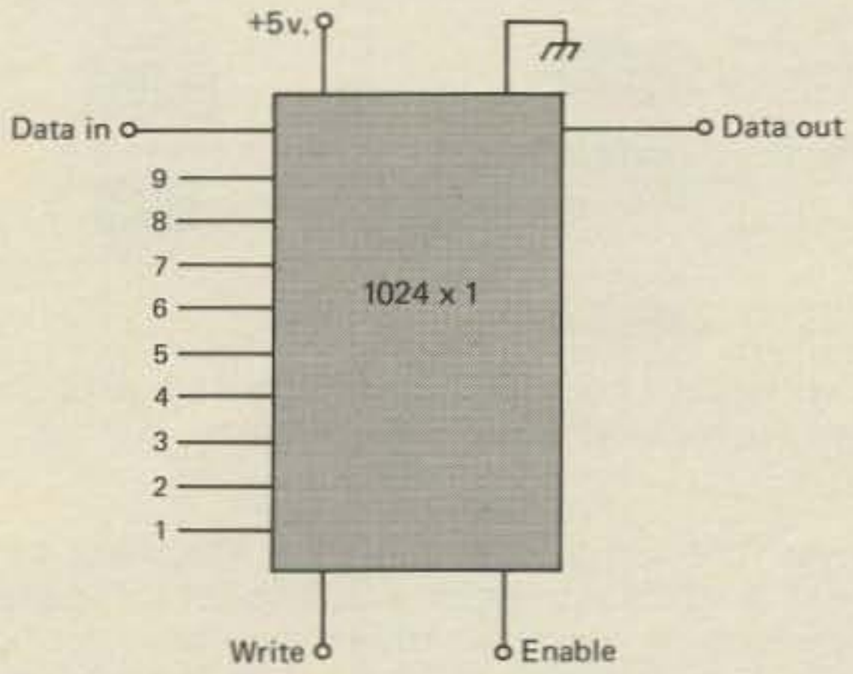


Fig. 1 – Illustration of a 1024 x 1 RAM (also called a 1k RAM). This RAM can store 1024 one-bit pieces of information.

Fig. 1 shows a picture of a typical RAM. The one in the illustration might be, for example, a 1024 x 1 RAM (also called a 1k RAM), meaning that it can store 1024 one-bit pieces of information. There are other combinations and limits of storage available.

Unlike the ROM, the RAM presents great flexibility of use. A ROM is proscribed for look-up functions only. A given piece of input data uniquely determines the resulting piece of output data. This is not so with a RAM. Information from a RAM can be constantly updated, changed or molded to suit its particular design needs.

By using a ROM for specific duties and the RAM for flexible duties a very powerful electronics tool is realized.

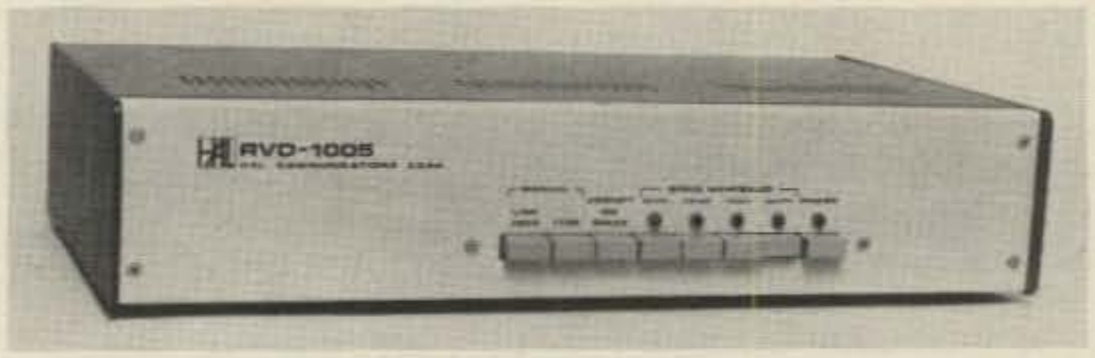
2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	0	0	0	0	0	1	1	1	0

or 1000001110.

Although the binary representation (1000001110) seems more unwieldy than the deciman notation (512), the former allows for easier use in electronics applications. Simply let a "0" represent a switch that is open and a "1" represent a switch that is closed. Using this approach, it is possible to encode, process and read data through a computer, for example. See any text which discusses *Boolean Algebra* for a much deeper look at binary mathematics and its applications to electronics.

[2]ASCII is an acronym for "American Standard Code for Information Interchange."

[3]A "bit" is the smallest unit of information in a code. In Morse, a "dit" is a bit. In Murray or ASCII, a "mark" or a "space" is a bit. A combination of bits is called a "byte."



HAL RVD-1005 visual display unit.

The Video Converter

A **video converter** is used to take binary-encoded Murray code, convert it into ASCII and then drive a cathode-ray tube circuit for printed output of the message being sent.

The device is quite complicated. A complete discussion of its intricacies and subtlties is beyond the scope of this article.

The example to be used in this installment is the HAL Communications Corp.[4] Model RVD-1005 Visual Display Unit. This unit has complexities not necessary for minimal station performance. It is a very sophisticated and versatile piece of equipment. Following is an outline of its operation. Refer to fig. 2.

A **shift register**[5] accepts and stores the first six pulses of a seven-bit incoming character (The seven bits are the "start" pulse, the five character-encodement pulses and the "stop" pulse. The stop pulse, however, is not stored in the shift register). The pulses are received in **serial form** (one after the other) and are made available at the output of the shift register in **parallel form** (all at the same time). See fig. 3.

The Murray-encoded characters then move to a read-only memory (ROM) which converts the encodement to ASCII.

The ASCII-encoded characters are now prepared for transfer to the page memory.

It should be noted at this time that memory circuits operate independent of the display section circuits. The two sections interact only when a character has been parallel-assembled and ready for transfer.

The video converter's operating speed is switch-selected through a choice of one of four oscillators. Each oscillator runs at a speed of 2^{17} times the **baud rate**[6] of the input signal.

The oscillator output passes through a divide-by-2^{13} circuit (thus effecting a final operating frequency of 2^4 or 16 times the input baud rate), whereupon it drives the **input clock bus.**[7]

The RVD-1005 has a unique **input conditioning circuit.** There are two possible ways to connect the visual display unit into the station loop circuit, *viz.*,

(1) Direct coupling from the RTTY demodulator (on reception), in which case the input appears as changing voltages;

---

[4]Box 365, Urbana IL 61801.

[5]A register having the capability of serially shifting the data from each stage of the register (memory) to an adjacent one.

[6]A "baud" is the reciprocal of the duration of a bit, where time is measured in seconds. For example, if the length of a mark (or space) is 22 ms (.022 s), then the baud rate is

$$\frac{1}{.022} = 45.45.$$

This is, in fact, the baud rate for 60 word per minute RTTY operation.

[7]A "clock signal" is used to synchronize the operation of several stages of a circuit. A "clock bus" is a link or group of links joining the clock (oscillator) with the rest of the circuitry.

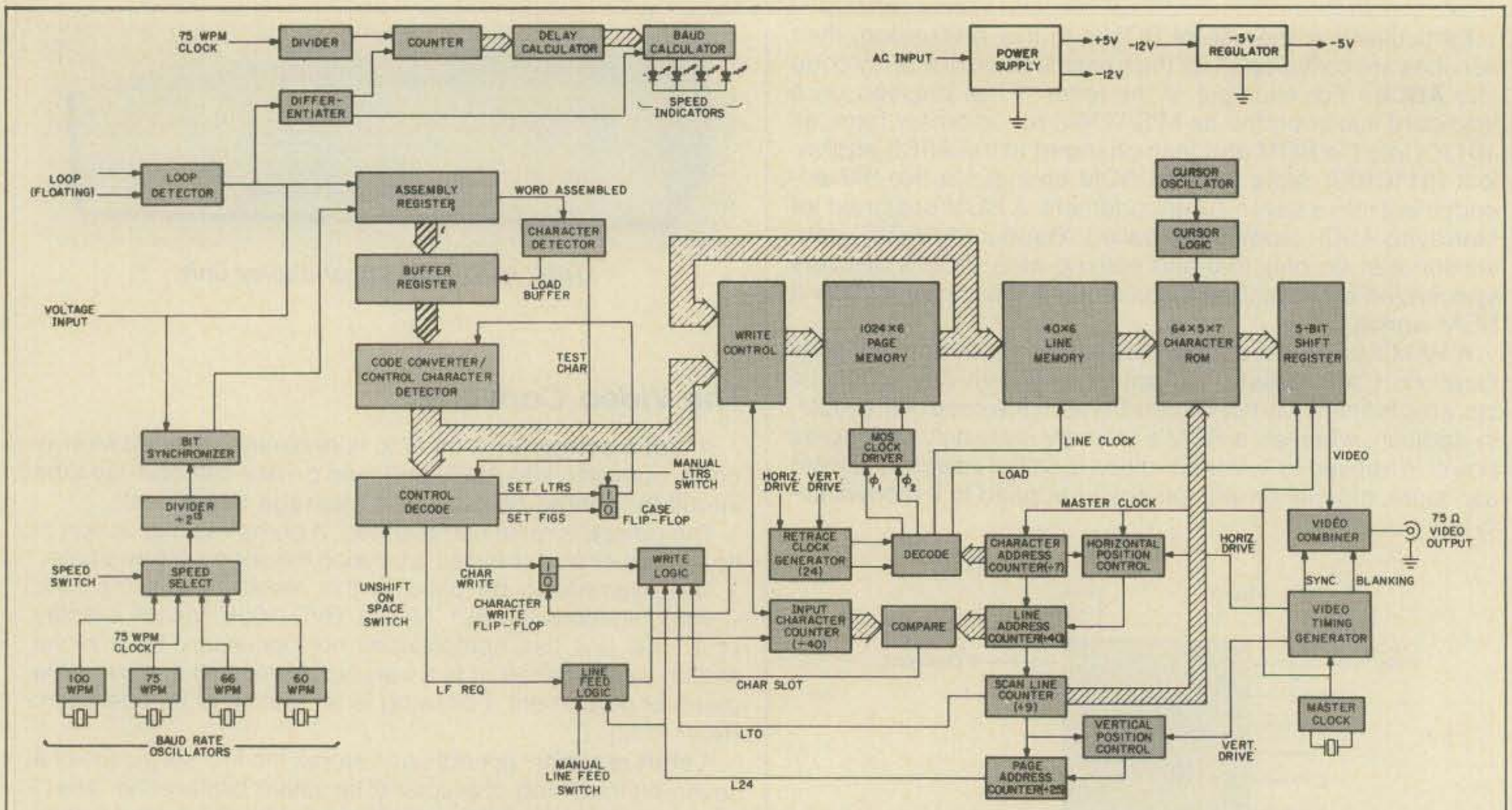


Fig. 2 – Block diagram of the HAL Communications Corp. RVD-1005 Visual Display Unit. The lighter shaded stages comprise the input section and the darker shaded stages comprise the memory and display section.

or

(2) From the station loop (on transmission), in which case it is necessary to convert the current (usually 60 mA) to a voltage signal of appropriate level.

In either case, the final requirement is feeding the **input data line** with the required voltage. See fig. 4 for HAL's solution of the voltage/current input problem.

The **bit synchronizer** phases the input pulses with the **clock input** pulses. This prepares the signal for entry to the **assembly register.** When no characters are being received (the *mark-hold* condition), the divide-by-16 counter runs free; when a space is received, indicating the end of a character bit sequence, the counter is reset to "0" and is ready for the next clock pulse.

A logic change from "0" to "1" shifts the assembly register one stage. The change occurs in the middle of a select pulse.

At some point the assembly register will fill up. A character detector determines when the last start pulse can enter. When this occurs, the start bit and five character bits occupy the assembly register's six positions, whereupon a command is generated by the character detector, which allows the six bits to enter the buffer register. The bits are stored while one character is moved to the page memory. The assembly register is then reset and prepared to receive another character.

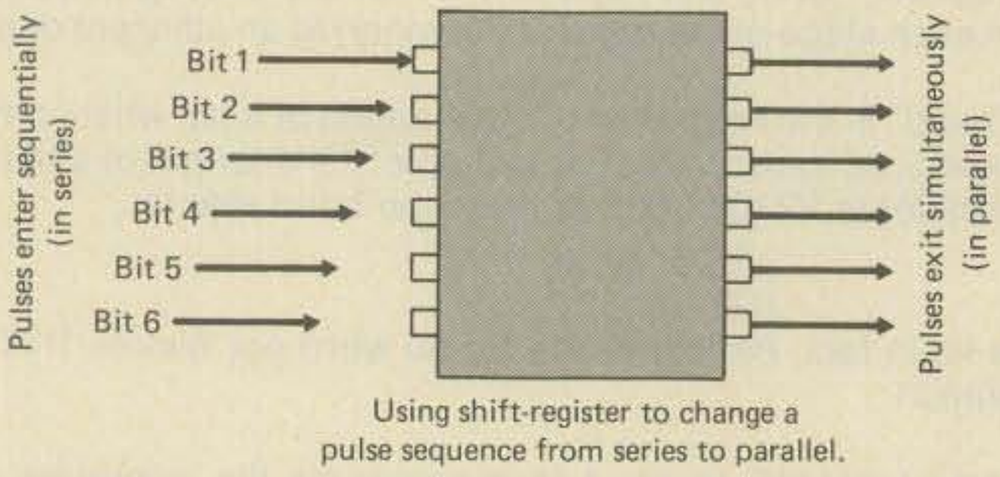


Fig. 3 – Using a shift register to change a pulse sequence from serial form to parallel form.

The RVD-1005 contains two ROM's which act as code converters. One ROM stores the ASCII codes for letters-case Murray characters; the other stores the codes for figures-case characters. Only one ROM is active at one time.

Once an incoming character has been assembled, stored in the buffer register and converted to ASCII, it is ready for transfer to the **memory and display section.**

Memory and Display Section

The memory and display section stores the character codes supplied by the input section, converts each one to a pattern of dots to form the display, and generates a composite video signal to drive the monitor.

The system incorporates three different memories. The first is the **page memory,** into which the incoming characters are written. Each time a row of characters is to be displayed, forty characters are transferred from the page memory to the **line memory,** where they are stored temporarily and supplied, one at a time, to the **character generator** circuitry. A ROM in the character generator converts the ASCII codes to the pattern of dots needed for the display.

Demodulated Reception of RTTY Signals

Part III of this series (*CQ*, February, 1978) described the basic theory behind the operation of an RTTY demodulator. The block diagram of the TU appeared in fig. 4 (p. 31). The string consisted of a bandpass filter, a limiter/amplifier, a discriminator, a detector and a keyer. The construction project associated with the article was a simplification of the fundamental converter. HAL Communication Corp.'s ST-5 demodulator follows the block diagram closely and, in that regard, it will be used to present the operation in greater detail. Refer to fig. 5.

The receiver audio output enters the demodulator at J_1. Resistor R_1 provides a 560 ohm termination output for the receiver. As a result receivers with output impedances between 500 and 600 ohms will perform best with the unit,

although, for receivers in the 4, 8, or 16 ohm range, an impedance matching transformer will maximize the demodulator's performance.

Diodes D_1 and D_2 provide protection against any transient static bursts that might enter the TU. Resistors R_5, R_8 and (adjustable) R_7 allow varying of the limiter switching level for minimum distortion. C_2 and R_9 provide power supply decoupling, as do C_3 and R_{10}.

OA1 (a 709 op-amp) acts as the limiter/amplifier. You will recall that a limiter/amplifier processes the RTTY signal so

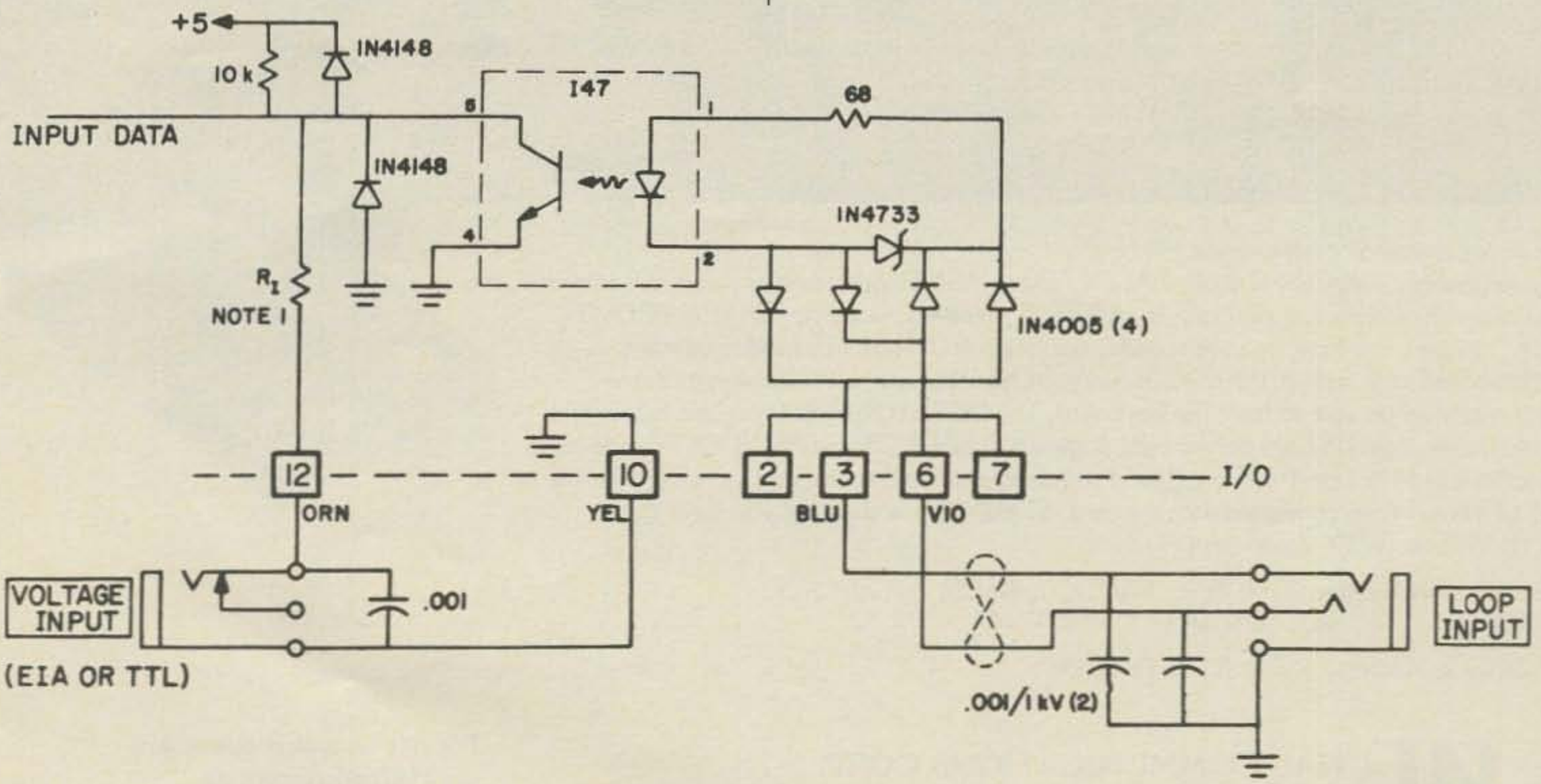
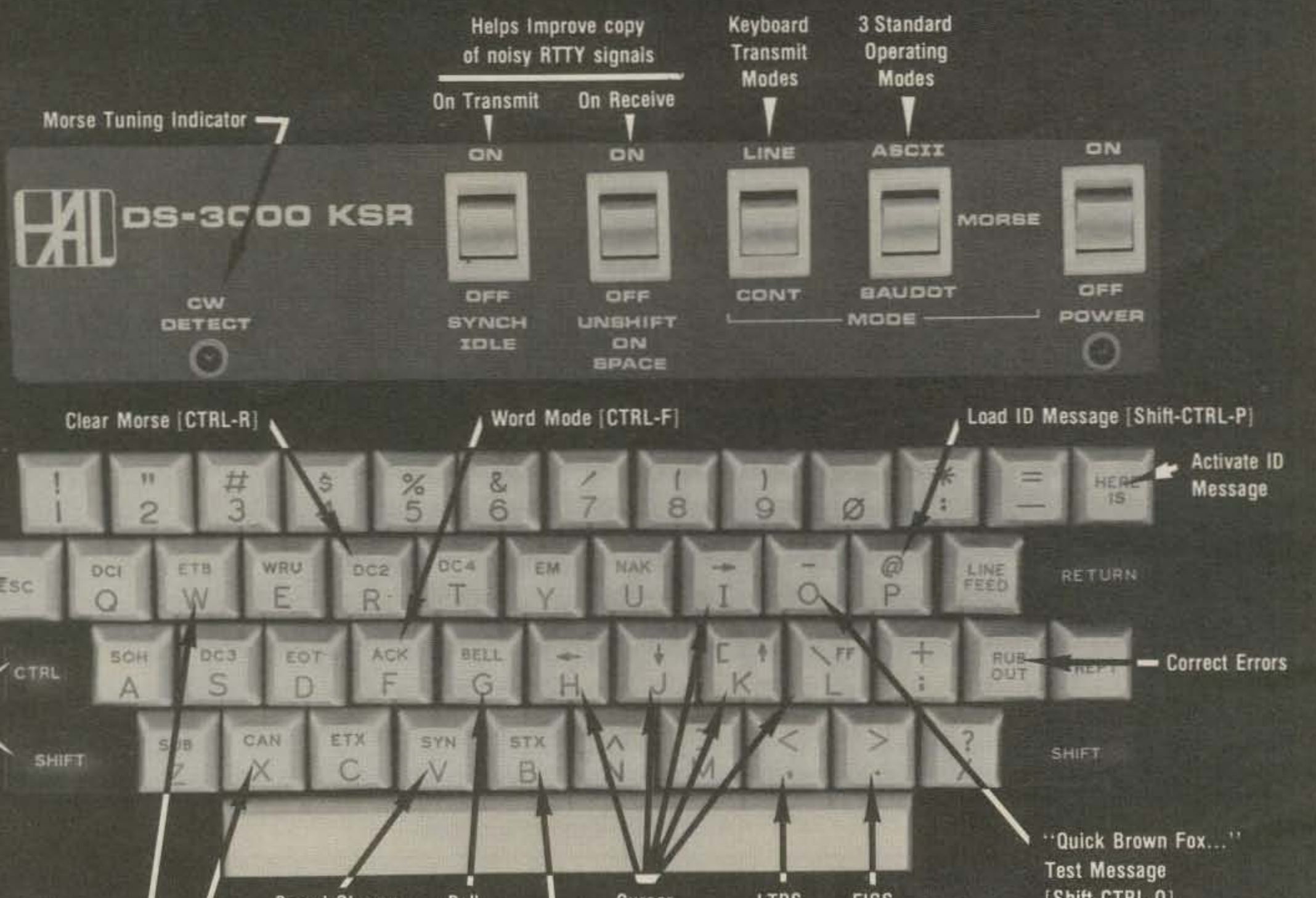


Fig. 4 – The input conditioning circuit in the HAL RVD-1005.

Super Terminals with
Hidden Features



For super operator convenience,
Our keyboard works in MORSE, BAUDOT, and ASCII codes *and* controls the terminal, too. You can edit a message, program the HERE IS message, send the "QUICK BROWN FOX . . . " test message, change speeds, and change the terminal modes, all from the keyboard itself. In fact, the KOS (Keyboard Operated Switch) feature even turns the transmitter on and off from the keyboard, The DS-3000 KSR also features full-length 72 character lines (16 lines per screen), 5 speeds of BAUDOT and ASCII RTTY and Morse code from 1 to 175 wpm (Version 3), and word wrap-around to prevent splitting of words at the end of a line. When combined with the HAL ST-6000 Demodulator, you have the ULTIMATE in RTTY equipment.

DS-3000 KSR Version 3 (MORSE, BAUDOT, ASCII) $1575.00
DS-3000 KSR Version 2 (BAUDOT & ASCII only) $1195.00

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Full Features and Superior Performance ST-6000 RTTY DEMODULATOR

Select Rx & Tx Shifts
Accurately Tuned Rx Filters
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True Transceive Operation

Invert Both Rx Demod, and Tx Tones

Data Status Indicators

Loop 1

Post-Autostart

Pre-Autostart

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The HAL ST-6000 Demodulator offers outstanding performance, versatility, and ease of operation. The Receive Demodulator features multiple-pole active filters available for "high" or "low" tones. These filters are frequency-matched to the transmit tone crystals for true transceive operation. Input bandpass filters, discriminator filters, and post-detection filters are carefully designed and tested for optimum weak-signal recovery. The ST-6000 has an internal loop power supply, 2 loop keyers, RS-232, MIL-188C, and CMOS data I/O, and rear panel connections to data and control circuits for connection to UART and computer devices. Use it with the HAL DS-3000 KSR for the best in RTTY performance.

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that the mark and space amplitudes are always the same, regardless of the input conditions.

L_1-C_7 (and C_7A, if necessary) act as the mark filter, being tuned to a frequency of 2125 Hz. L_2-C_8 (and C_8A, if necessary) act as the space filter, being tuned to 2295 Hz for 170 Hz

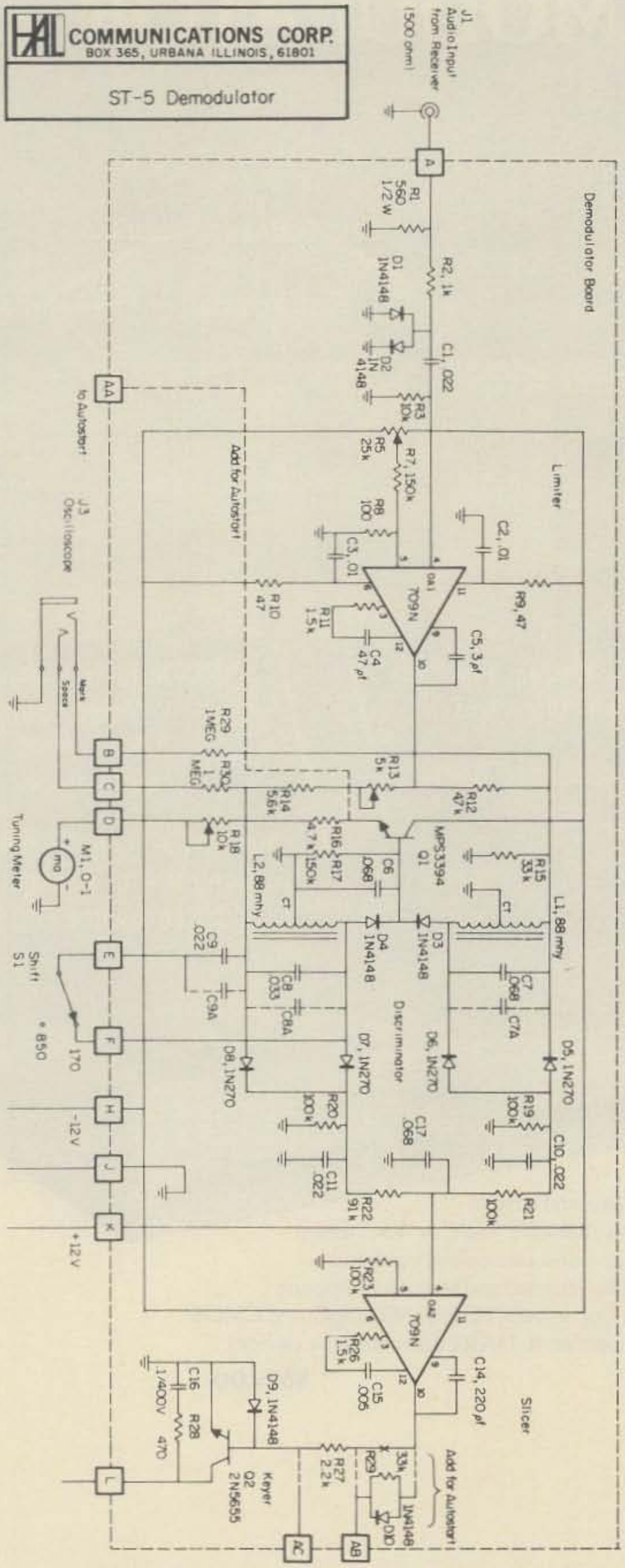
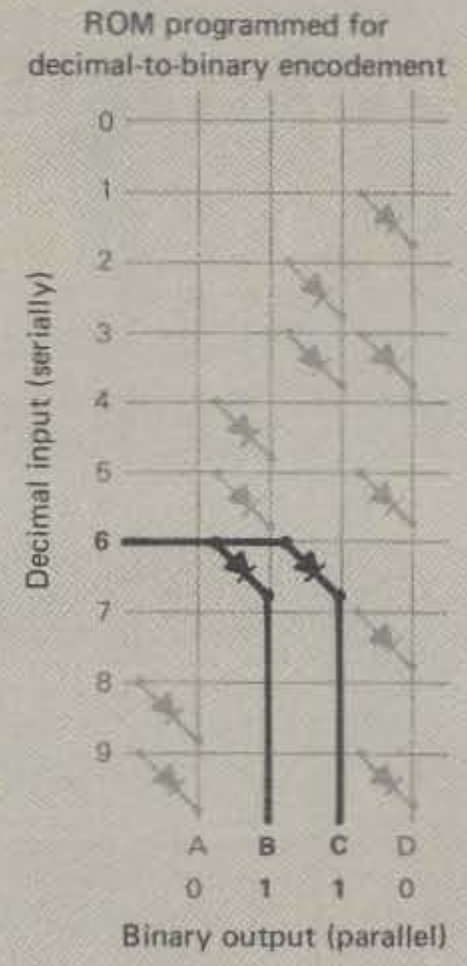


Fig. 5 – Schematic diagram of HAL's ST-5 demodulator. Only the indigenous circuitry is shown. The power supply and control sections have been omitted.



Inset

This inset illustrates the operation of a read-only memory (ROM) for use as a decimal-to-binary encoder.

The input is fed to the ROM *serially*, that is, one impulse after another. In the case of the decimal input, however long it takes to feed the ROM one pulse (bit), it takes ten times as long to feed the whole byte, i.e., ten bits. Note that every decimal number is encoded by a series of ten bits. For example, the digit "6" is encoded as 0000001000. For each digit, 0 through 9, there is one, and only one, binary representation.

Follow the current path through the ROM for the digit "6." A pulse enters the ROM (arrow at left) and passes through diodes D_1 and D_2, eventually emerging at points B and C at the bottom of the picture. The pulses at B and C are 1's. There are no pulses at A and D; they are therefore 0's. Hence, the binary output is 0110, which is indeed the binary encodement for "6."

The binary output is in *parallel* form, i.e., all the bits emerge simultaneously.

Decimal Input

0	1	2	3	4	5	6	7	8	9
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
1	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0	0
0	0	0	0	1	0	0	0	0	0
0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	1

Binary Output

	2^3	2^2	2^1	2^0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

shift or to 2975 Hz for 850 Hz shift. Variable resistor R_{13} is used to balance the amplitudes and band-widths of the mark and space filters.

The D_5, D_6 combination provides full-wave rectification of the mark signal, as D_7, D_8 does for the space signal. The outputs of these detectors are combined through R_{21} and R_{22} and appear at the input of 0A2. The R_{21}-R_{22}-C_{17} network is a low-pass filter. The exact value of C_{17} is a function of the speed of the RTTY signal being processed.

OA2 (another 709 op-amp) shapes the output waveform into a square wave whose positive voltage corresponds to a mark and whose negative voltage corresponds to a space. The output of OA2 enters the keying transistor, Q2, which keys the loop circuit of the teleprinter. C_{16} and R_{28} combine to suppress voltage transients induced by the selector magnets.

An Equipment Potpourri

The number of manufacturers and, thus, the amount of video RTTY equipment, is on the increase. Whereas as recently as five years ago there was less than a handful of sources of commercially manufactured video gear, today there is quite a large number. The greater the number of choices, the greater the confusion, apprehension and opinions about which to buy.

I will try, as objectively as possible, to present what is available, what the equipment can do and what the expected price would be. The final decision, of course, rests with the person who pays for the gear—you.

The manufacturers will be presented in alphabetical order.

DOVETRON

627 Fremont Ave.
(P. O. Box 267)
South Pasadena, Ca. 91030

Dovetron manufactures three major pieces of RTTY equipment. Each is top-of-the-line and state-of-the-art.

MPC-1000C. Standard features of this unit include continuously tuneable mark and space channels (1000 Hz to 3200 Hz), dual-mode autostart, and an internal high level neutral loop keyer (20 to 60 mA). Both MIL f.s.k. and EIA outputs are provided for direct interface to a microprocessor and video terminal unit. $545.

MPC-1000CR. On this unit, a front panel switch permits an internal signal regenerator/speed converter assembly to electronically "gear shift" between 60, 67, 75, and 100 w.p.m. operation. All incoming and outgoing signals are regenerated to less than 0.5% bias distortion. The unit is also available with digital autostart. $695.

MPC-1000R/TSR-500. This piece of gear provides preloading and recirculation of a 200 character FIFO memory, a keyboard-controlled word correction circuit, variable character rate, TD inhibit, a triple tone pair a.f.s.k. keyer and a character recognition/speed determination digital autostart mode. $895.

Electrocom INDUSTRIES
1105 N. IRONWOOD DRIVE, SOUTH BEND, INDIANA 46615

Electrocom manufactures two major pieces of RTTY equipment. Both come under the umbrella of the **Series 400 Converters.**

Electrocom Model 400 converter.

The **Model 400** front panel digital knob selects shifts up to 1000 Hz, while two knobs on the **Model 402** independently select the mark and space frequencies. Both models can be preset with any tone pair between 1000 and 3200 Hz.

The units feature matched filters, precision linear detectors, baud-rate selectors, bias compensation and semi-diversity circuitry. Also included are a CRT monitor, autostart with solid-state motor swtiching, antispace, markhold, EIA/MIL spec output voltages and a constant current loop supply.

Both units are very sophisticated and are designed with the most discriminating amateur in mind.

The 400 and the 402 are each available either as a table model or for rack mounting.

The Model 400 costs $690 and the Model 402 costs $735.

Flesher offers a series of kits for the RTTY enthusiast.

Electrocom Model 402 converter.

FLESHER CORP
P.O. Box 976, Topeka, Kansas 66601 (913) 234-0198

TU-170. This unit is small (7-¼" × 3-¼" × 7-½"). However, its size belies its performance.

Flesher TU-170 converter.

Features include a 115 v.a.c., 15 watt power supply, three-stage active mark and space filters, a mark-hold circuit, autostart, a built-in 60 mA loop supply and loop switching circuitry. The unit is housed is a metal and plastic cabinet.

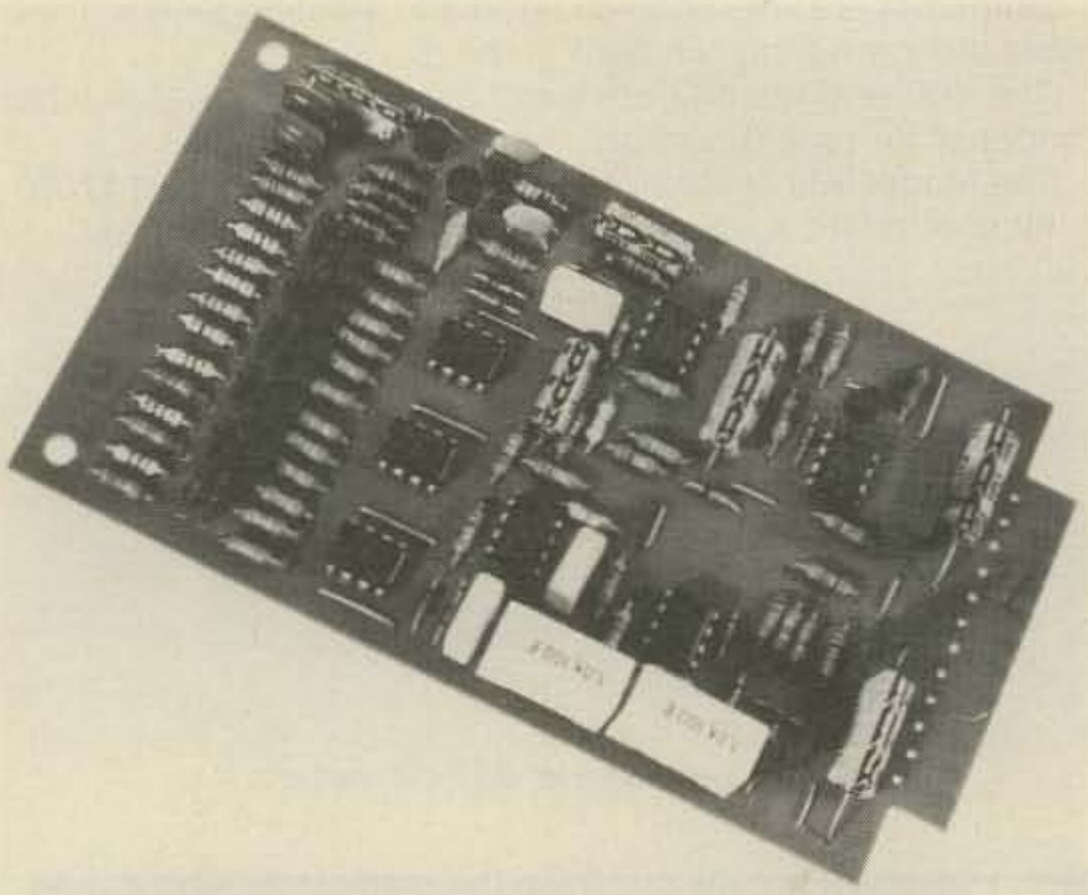
In addition, the TU-170 has, for a.f.s.k. operation, a 200 mV sine wave output, uses phase coherent frequency shift, and contains a standard mark frequency for 2125 Hz. All inputs and outputs are TTL compatible.

The unit has a large tuning meter or can be connected to a scope for a "+" display as an aid to tuning. The kit sells for $149.95, or it can be bought wired and tested for $219.95.

DM-170. This demodulator is designed for 170 Hz shift use and includes an anti-space circuit and autostart output with adjustable threshold and programmable start and stop displays.

It is available in kit form or ready-assembled. All components are mounted on 2.95 × 5.25 inch photo-etched, plated, glass-epoxy circuit board, notched for a 12-pin edge connector.

The kit sells for $39.95 and the wired version sells for $59.95. A board connector is available for $2.



Flesher DM-170 demodulator.

PS-170. This unit is a bandpass preselector designed with an optimum characteristic for 170 Hz shift. It features selectable filter output or limiter output.

The PS-170 uses four stagger-tuned, cascaded stages to achieve a flat-topped, steep-skirted response with a roll-off of 80 dB/decade. The bandpass preselector has unity gain with the passband, with 3 dB cutoff frequencies of 2040 Hz and 2385 Hz and 20 dB cutouff frequencies of 1925 Hz and 2560 Hz.

It sells for $11.95 in kit form and $21.95 wired.

FS-1. The FS-1 is an audio frequency shift oscillator. The unit is completely solid-state, eliminating the use of toroid inductors and is thus quite small (2.5 × 2.75 inches). As a kit it sells for $23.95 and as a factory-wired unit it sells for $34.95.

ID-1. This unit was designed as a plug-in identifier for the HAL ST-6 terminal unit. It features adjustable speed and is compatible with other keyers. The program is easily changed. It has a 127-bit capacity in its diode matrix.

The unit comes with 50 programming diodes. It sells for $26.50. A board connector is available for $2.

TMT. TMT is a ten-minute station timer for identification. One LED readout indicates the number of minutes since the last ID and it can be used to automatically start an identifier. It sells for $21.95 as a kit.

HAL COMMUNICATIONS CORP.

Box 365
Urbana, Illinois 61801
217-367-7373

HAL offers a complete line of video RTTY equipment. Gear can be purchased either individually or as "sets" of units. The equipment is up-to-date state-of-the-art. Some units can be bought as a kit.

Demodulators

For the experienced builder, HAL offers the popular **ST-5** and **ST-6** demodulators in kit form. The units are offered in two packages. The **ST-6K** package includes the demodulator, cabinet, crystal tone keyer (formerly the XTK-100) and discriminators for 170, 425 and 850 Hz shifts. The ST-6 features input bandpass filters, wide dynamic range limiting, a balanced discriminator, an active low-pass filter, automatic tone control (ATC), autostart and antispace. The tone keyer of the ST-6K is crystal controlled assuring accurate tone frequencies at all times. The ST-5 package includes the demodulator, autostart (formerly the ST-5AS), audio tone keyer (formerly the AK-1) and a Bud 2110 minibox for use as a cabinet. The **ST-5K** package features wide dynamic range limiting, a balanced discriminator, a solid-state loop switch, autostart, a tuning meter and the AK-1 a.f.s.k. oscillator. An unscreened and undrilled Bud 2110 minibox is provided for tailoring for requirements. The ST-5K sells for $125 and the ST-6K sells for $275.

The **ST-5000** demodulator provides RTTY performance on both the h.f. and v.h.f. bands. Features such as a hard limiting front end, active discriminator and an active detector are contained in this unit. Wide and narrow shift (850 Hz and 170 Hz), normal or reverse sense, autostart, self-contained high voltage loop supply and an audio tone keyer are standard. The unit sells for $275.

The **ST-6000** is HAL's top-of-the-line demodulator. The ST-6000 provides an outstanding ability to recover h.f. RTTY signals, despite noise, interference, or weakness. Features include a multi-pole active filter front end, wide dynamic range limiter, either f.m. or a.m. reception, active filter discriminator and low-pass filters, and an internal crystal-controlled a.f.s.k. tone keyer.

HAL DS-3000 KSR and ST-6000 converter.

The automatic threshold control and the decision threshold hysteresis features minimize the effects of selective fading and multi-path distortion of a RTTY signal. The ST-6000 is available with either "high tone" pairs or "low tone" pairs and receives and transmits 170, 425 and 850 shifts. Other features include an internal loop supply, KOS (keyboard operated switch), autostart, antispace, optional oscilloscope tuning indicator and a rear panel with input/output connections for interfacing with other data handling equipment.

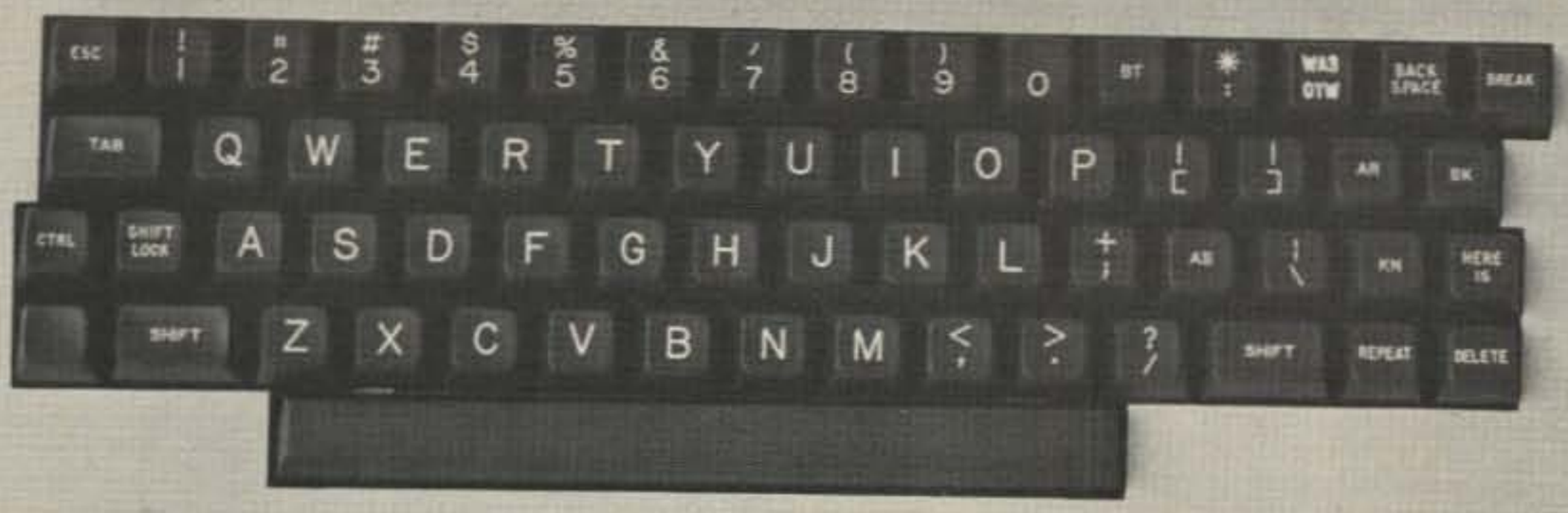
The ST-6000 sells for $495 with a tuning meter and $595 with a tuning scope.

Let your fingers do the talking . . .

MICROLOG CORPORATION / AKB-1

CW SPEED

*$299.00



Use the feature packed AKB-1 programmable memory keyboard to send perfect MORSE and RTTY.

Microprocessor controlled; 128 Character text memory; 64 Character message memory; LED buffer status indicator; Repeat function; Adjustable CW speed; 63 Key keyboard; Built-in sidetone and speaker; Solid-state keying; Anti-bounce keying; Special command inputs; MORSE, BAUDOT, AND ASCII.

Newly incorporated features include: digital selection of MORSE speed [1 to 99 wpm] via the keyboard, a MORSE weight control, a tune control, and for RTTY, an automatic CW identification.

Use the companion AVR-1 Decoder to convert MORSE, BAUDOT, and ASCII codes into plain text for display on a standard video monitor. Connects directly to your receiver's speaker terminals.

***AKB-1 $299.00 (RTTY add $50.00)**
AVR-1 $349.00 (RTTY add $50.00)
Video Monitors from $149.00

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MICROLOG CORPORATION

4 Professional Drive – Suite 119
Gaithersburg, Maryland 20760
Telephone (301) 948-5307

CIRCLE 23 ON READER SERVICE CARD

Keyboard

The **DKB-2010** can be used for transmitting either Baudot or Morse code. In the Morse position, the keyboard can send in a range from 8 to 60 w.p.m. In addition, the DKB-2010 features a build-in "here is" identification message, four speeds for RTTY, four weights for c.w., an internal sidetone oscillator, a RTTY bell, and a 128-character buffer memory. The 2010 is compatible with either grid-block or cathode c.w. keying circuits and can be used in either current loop or RS-232 RTTY circuits. The DKB-2010 costs $395 and the EMO-128 buffer costs $85.

HAL DKB-2010 dual mode keyboard.

Visual Display Unit

The **RVD-1005** features four switch-selectable speeds, automatic carriage return/line feed and unshift-on-space. The 1005 can be used with either a TV monitor or a standard TV set (a description of TV set conversion to a monitor is covered in the operating manual).

It sells for $395.

INFO-TECH INCORPORATED

Specializing in Digital Electronic Systems
2349 Weldon Parkway St. Louis, Missouri 63141 (314)576-5489

Info-Tech offers a long line of solid-state video RTTY equipment. The **Model 75** is a receive-only (RO) converter that will change audio from a receiver into a composite video signal to drive a monitor.

The 75's specifications inlcude an 8-600 ohm audio input responding from 1200 to 3000 Hz, switch-selection of 170, 425 or 850 Hz shift, switch selection of 60, 66, 75 or 100 w.p.m. signals, a two-LED tuning indicator, switch-selectable audio limiting and a normal/reverse switch.

The Model 75 sells for $324.95 for a 32-character line and $344.95 for a 72-character line.

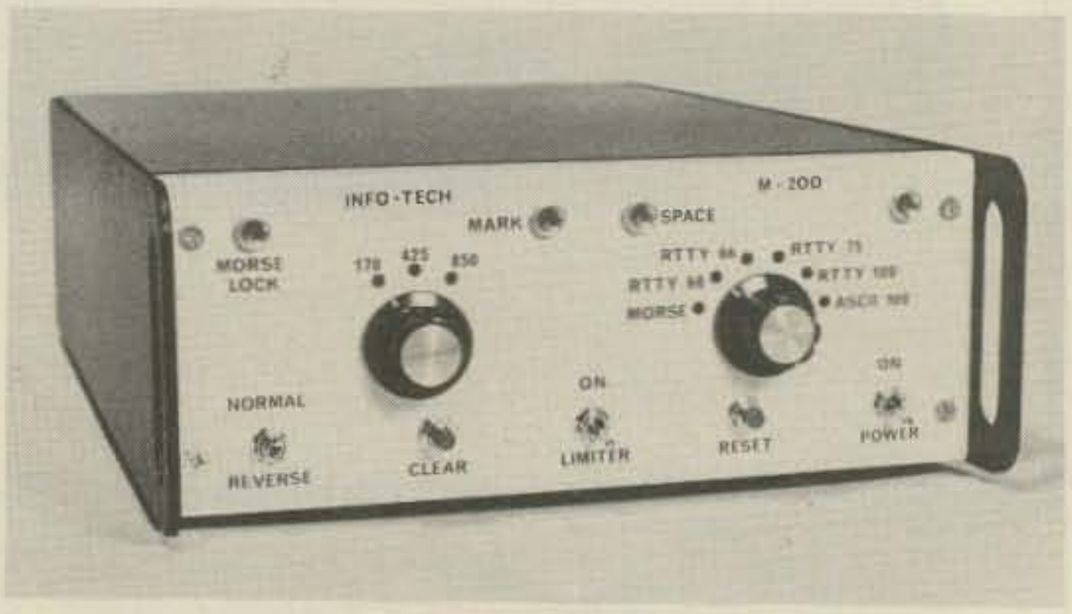
The **Model 93** is a combination demodulator, video generator and shift keyer. It operates on any of the three standard shifts. In addition to the features it shares with the Model 75, the 93 regenerates an incoming signal using a UART (Universal Asynchronous Receiver/Transmitter), contains autostart circuitry, has a front-panel transmit switch,

Info-Tech Model 93 terminal unit.

regenerates a keyboard output by use of a UART and has built-in c.w. ID which can be programmed at the factory for your particular call sign. $239.50

The **Model 200** is a tri-mode (Morse, RTTY and ASCII) converter.

In its RTTY mode, the 200 is speed selectable at 60, 66, 75 and 100 w.p.m. and features automatic video indication of incoming speed and has a digital input on its rear panel.



Info-Tech Model 200 tri-mode converter.

The TU part is shift selectable for the three standard shifts, has a switch-selectable limiter, a normal/reverse switch, mark-space LED's for tuning, active filters, digital output and loop keying.

The **Model 200A** (32-character video) sells for $500 and the **Model 200B** (72-character video) sells for $525.

Info-Tech Model 150 RTTY keyboard.

The **Model 150** RTTY keyboard features the four standard speeds and the three standard shifts. It has built-in a.f.s.k. and a provision for building in a c.w. ID. It also contains a 64 character buffer, automatic carriage return/line feed (selectable for 64 or 72 character lines) and a standard typewriter keyboard format.

The unit sells for $289.50.

The **Model 300** is a tri-mode keyboard. In its RTTY mode the 300 features the four standard speeds and two shifts (170 and 850 Hz). It has built-in keyboard programmable c.w. ID, a built-in "RY" generator, automatic carriage return/line feed and "loop" and "a.f.s.k." outputs.

In addition, the 300 features a built-in "quick brown fox" generator (for all three modes), a 700 character buffer, ten recallable, user programmable message memories of 120 characters each, "CQ" and "DE" keys and much, much more.

The Model 300 keyboard sells for $425.

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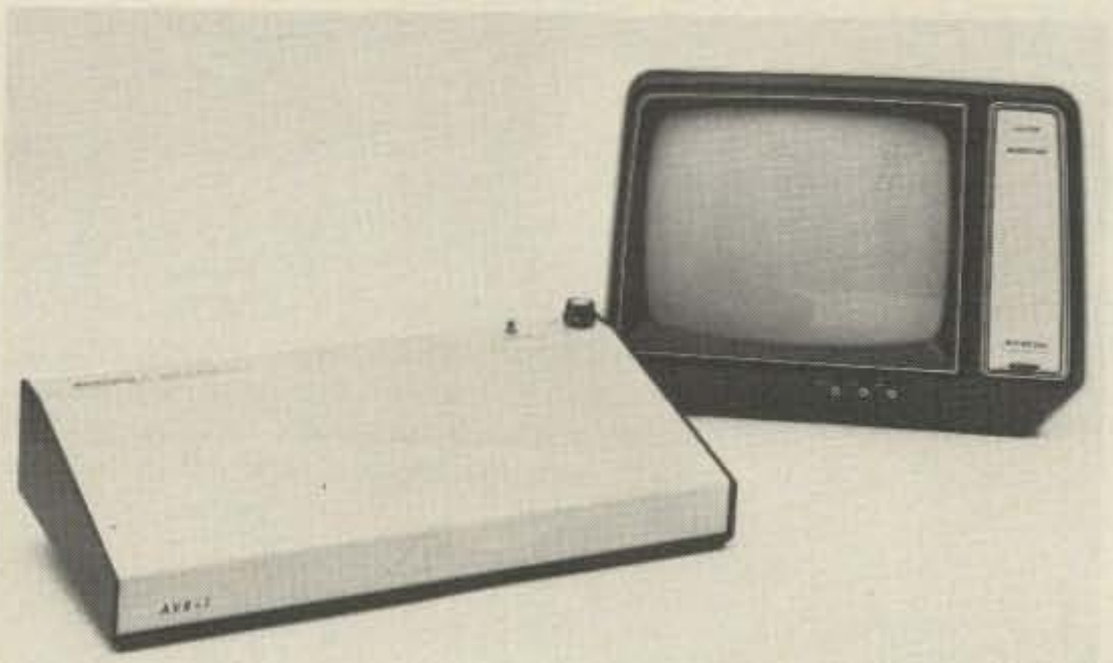


Microlog AVR-1 video converter and monitor.

The Microlog **AVR-1** decoder converts Morse and RTTY from the audio line of a receiver into an alpha-numeric visual display. The decoded characters are presented on any standard video monitor in plain text, featuring an easy-to-read format of up to 62 characters per line. The system will automatically start a new line and scroll up previous text without breaking up most words.

The unit measures 17.8" × 3.7" × 9.5" and costs $349. A matching 12-inch video monitor is available for $149.

XITEX CORP. P.O. Box #20887
Dallas, Texas, 75220 ● Phone (214) 620-2993
Overseas orders and dealer inquiries welcome

The Xitex Corp.'s **SCT-100** allows the user to assemble a complete RTTY station with a few additional parts.

The unit features 16 line, 64 character per line display capability using a 5 × 8 dot matrix for the characters.

Full upper case and lower case alpha, numeric, Greek, common symbols and some special graphics characters are provided on the on-board character generator ROM. Four

Xitex SCT-100 video terminal unit.

user-programmable baud rates are provided. ASCII 110 and 300; and Baudot 45.45 and 74.2.

In RTTY operation, the 60 mA Baudot interface connects directly to most f.s.k. terminal units and, when not in use, can be switched to ASCII mode for home computer use. "Letters" and "figures" commands are automatically generated as required. Keys on the ASCII keyboard which generate characters having no Baudot equivalent are ignored.

There are three variations on the unit that can be purchased: **SCT-100A** is an assembled and tested board with a complete documentation package ($185); **SCT-100K** is an unassembled kit including all components, p.c. board and a complete documentation package ($155); **SCT-100P** is a partial kit including a Mostek 3870 microprocessor chip, character generator ROM, crystal, p.c. board and complete documentation package. The parts required to assemble the kit are specified in detail ($95).

The documentation package alone costs $3.

Conclusion

It should be pointed out that video equipment resources are not limited to the commercial manufacturers. There has been a wealth of literature published in amateur journals and in topical books that will represent a virtual cornucopia of information to the interested operator. However, throwing caution to the wind is not a practical procedure for one who is interested in home-brewing video RTTY gear.

As can be seen from the description of the techniques and the commercial gear, undertaking such a project is reserved for none but the most knowledgeable among us. A solid-state video converter is not a weekend project by any means. However, if you are interested in giving either the most noble or the most rudimentary project a try it would be advised to research the situation thoroughly before buying even so much as a resistor.

I would like to thank all the readers of this series for adding to my enthusiasm for writing it. In addition, I would like to express my grateful appreciation to Harlan Kramer, WA2HPS, for the photography.

In the future I will write about various aspects related to the adventure of radioteletype. If you have any ideas about a topic, please drop me a line. CQ

"Never before...had such a large group of amateurs come from so many different places and backgrounds to a place so far away with such widespread support to accomplish a single goal." -WA9INK

Clipperton — A Dream Come True Part II

BY CHARLES SINGER*, WA9INK

Clipperton, March 20, 1978. The deserted atoll which our advance landing party had just set foot on could have been mistaken by an untrained eye for Gilligan's Island, but to us it was as though the main vault of the Bank of France had just been opened for the first time in twenty years and we had been given seven days to carry out one by one as many gold coins as we could. We had awakened from a DXpeditioner's daydream of landing on the rarest country in the world to absorb the reality of a great adventure.

With the precedent of setting foot on what seemed to us to be the moon, our assignment became one of putting ashore enough amateur radio and camping equipment to provide for at least three separate stations and seventeen individuals during the coming seven days. For several hours our Avon rubber raft went in and out countless times to set on the shore beach what seemed to be enough material to satisfy the needs of a signal corps brigade. That first day everything from keyers to generators had to be carried from the landing point over 1000 rocky meters to Bougainville.

Memorial plaque mounted on Clipperton Rock.

By about 3 p.m. local time that day, March 20, those of us still on the *Phillippa* were able to hear FOØXB blasting through on 15 meter s.s.b. starting with an inaugural exchange of signal reports with N6ND in San Diego. Since all of the Atlas 350-XL transceivers had gone ashore by then, we were using an Atlas 210-X listening to the transmit frequency only. As we had heard about after several other Pacific expeditions, there were comments from unidentified American stations on the FOØXB transmit frequency, but this did not phase Olivier, the first to operate from the island, because he was listening to the receive frequency some kilohertz up and because Olivier's iron operating discipline would otherwise not permit giving these "policemen" a second thought.

Herb, Doug and I did not stay on the island the first night, and as we tuned across the bands with the little Atlas we suddenly failed to hear any signals emanating from the island. We saw a flashlight aimed in our direction from the beach signalling the letters F-O-O-D. In their haste to get on the air, the men on the island had not thought of the most basic element of survival. Later, they were on the air to explain a generator failure. The hunger for contacts kept them going through the small hours of the morning into the dawn.

The following morning Jeff, Kim and I went ashore with breakfast and some of the smaller items that had been forgotten the afternoon before. We lugged various packages over the rocks and onto the blanched sand from which they would be carried the distance of the flat area that led toward Bougainville. As Jeff and I approached the shade of the coconut grove I saw my first crab, an orange creature about two inches across with six legs, two claws and a pair of beady eyes. By the time we had gotten through the foliage to the hut in which the French had placed their sleeping bags, I had seen my 1000th crab. I was convinced that if they ever extend the recent series of horror films such as "Jaws," camera teams could

Don, N6IC, at the OSCAR operating position. Note the skivvies in the background.

*2118 28th Street B, Sacramento CA 95818

come to Clipperton to shoot a feature called "Crabs" without the need for a special effects man. The crabs are everywhere and eat everything that is not moving, including crab meat. Actually, the crabs are quite timid, and I figured that if I looked like them I would be shy too.

Jeff and I made our way through the branches and broken coconut shells to the rusted, filthy, 75-foot long abandoned French Navy quonset building and peer down the long corridor in the direction from which we could hear a loud s.s.b. pileup. In the building were many rooms, the first of which was lined with shelves marked with the names of popular French wines, the obligatory "wine cellar" of a long since departed French squadron, which was now to be our kitchen. Passing by about 20 rooms, empty except for a few rusted storage lockers, we came to the 20 meter FOØXC/FOØXH station, which was being used by Jacques and Oliver as they were finishing up a European pileup. Stepping outside, I could see on the left our 20 meter monobander on a 50-foot mast, secured by the remains of a French military radio mast which had been bent to the ground by a typhoon. On the right was our 2.4 kW generator on a slab of cement that must have been the floor of a tent long since blown away. Not far straight ahead was the 10/80/160 meter FOØXF/FOØXA tent, where I found Hoppy in the process of trying to satisfy the seemingly unquenchable thirst of a ten-meter c.w. pileup.

In the distance, beyond the 15/40 meter FOØXD/FOØXB/FOØXE tent, I could see Jean-Charles carrying a piece of cloth in his hand heading down the flat plain with François in the direction of a pole. It occured to me that the two were about to perform the ultimate ceremony, that of planting the French tricolor on a distant French overseas territory. The flag that must have been left there by a military mission of the past had long since disintegrated, and this flag that had only two weeks before vanished from the Ministry of Justice building in Paris, was now to reappear on the other side of the globe. François climed up the 15-foot steel rod to a small pulley, stuck a rope through it and hoisted the flag as if to proclaim this forsaken atoll as French soil.

Following that almost unseen moment of glory we returned to the coolness of the 15/40 meter tent where Doug Murray and Bernard Chereau were busy logging Europeans on 15 meter c.w. during one of the best days of propagation that I had ever seen or so it seemed at the time. Gus Browning was quoted once as saying that a rare call sign tends to improve signal strengths by 20 dB. I now knew what he meant because I had never heard so many Europeans since I had been in Europe. This occasion was also the first in which I had ever seen Doug Murray in a pileup situation, and I was pleased to see the expertise with which he could log stations at a rate approaching 180 contacts per hour and the dedication which would keep him going not only that first day but later on when the novelty of operating from a rare location would wear off.

A little anxious to partake of the action myself, I returned to the 10/80/160 tent, where I found hoppy still plugging away at a stateside c.w. pileup. I managed to get Hoppy to relinquish the key for a while and took over the pileup. After a few pages of log sheets it occured to me that most of the callsigns on the pages I had completed were of the 1 × 2 variety, those serious DXers who had been waiting for us after seeing our frequencies mentioned in the major DX bulletins.

This was the first time I had been on the working end of a pileup in over two years, since my last operation as C31IL, and despite the fact that the stations I was working could express themselves only in dots and dashes I was especially sensitive to their special excitement which comes only when contacting a new country. At the same time I recalled my theory that the thrill of conquest in DX involves the act of making an operator at a distant station write the callsign—the radio name—of the operator calling in a list of contacts as if by remote control, as if the operator calling were able to reach out with his hand over a distance of thousands of miles to record his name on the pages of the history of a far-off land. No other activity offers that sense of power and accomplishment, and it is a unique experience to act as the instrument of so many people in so many different parts of the world in a short space of time.

I would be able to operate all bands, 80 through 10, during my week at Clipperton, but the real pleasure I would have during the course of the operation would be to study the surplus of skills and talent that each of the other operators displayed. The success of the Clipperton amateur effort was not just that we had 16 operators of differing backgrounds and strengths which complemented each other, it was a fortunate circumstance of 16 highly competent amateurs whose individual lifetimes of experience were compressed into one all-out campaign. If we installed each of these operators on different islands and at different times, each would have returned with noteworthy results. On Clipperton, the extraordinary was commonplace. All we can offer to those who were not there is each person's trademark.

You will remember Jacques as the fellow who would somehow pull out your call even if you didn't pronounce it correctly that time and then return with "five-nine, OK?" Hugh was the

Clipperton Rock, as seen from the island.

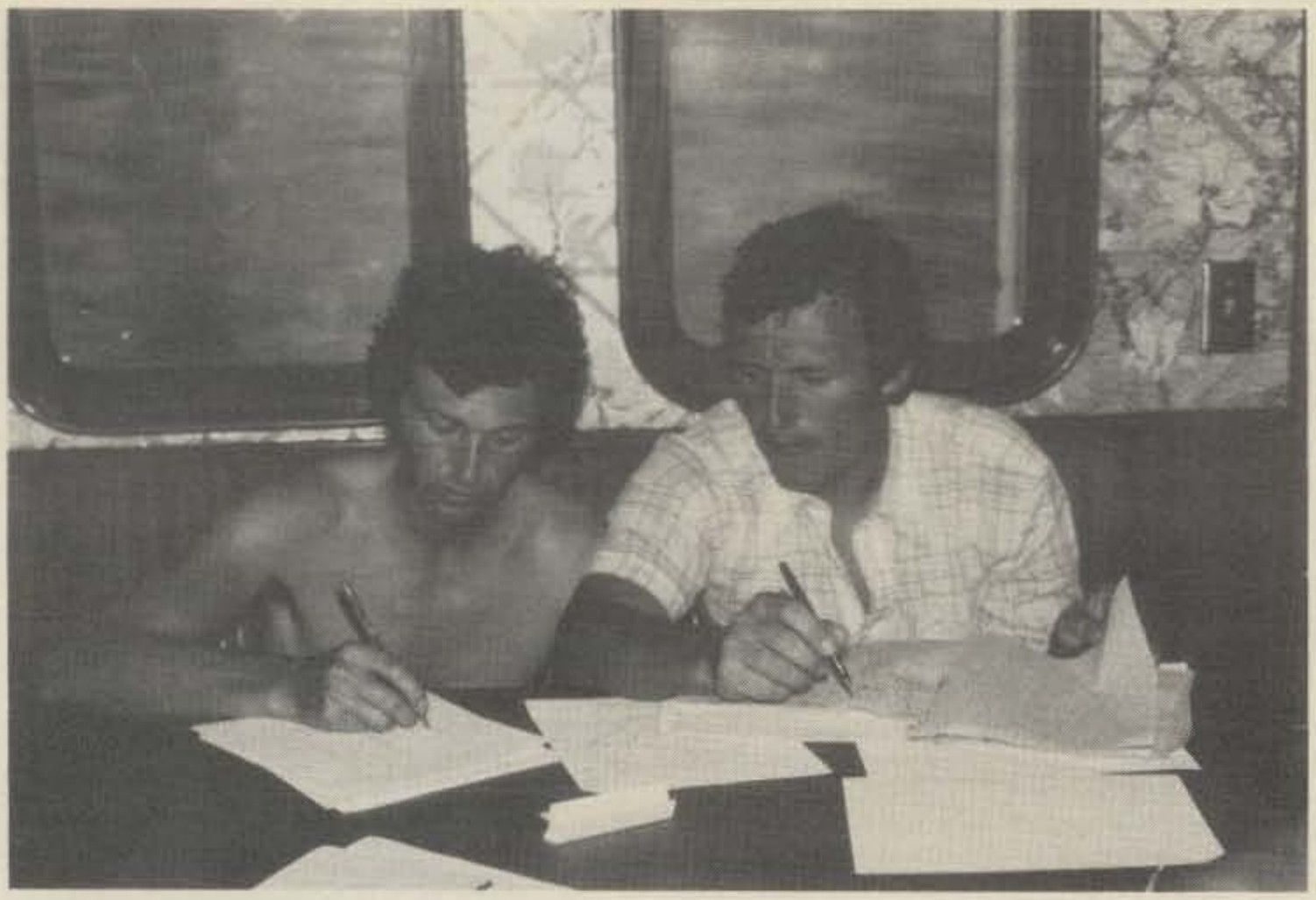
Home on Clipperton Island.

fellow who would tell the American stations that below 14.200 they were out of band, then "Allright now, fellas, fourteen ten fourteen thirty". Jacky was the fellow you could always recognize because you knew his voice from Moyotte.

Doug was the fellow with real fast, crisp c.w. who would hesitate for a moment while he would tell his logger that the call wasn't WB6VDF but WB6VDH. Bernard was the fellow who had copied the call correctly the first time.

Alain was always identifiable because he had brought a sideswiper from France for

The French tri-color graces the island. Next to the flag stands a coconut tree which provided refreshment for the DXpeditioners.



Alain, F6BFH and Andre, F6AOI working on the logs on the Phillippa.

c.w. André, the one you thought sounded as though he had an Italian accent, didn't speak English and knew only the English phonetic alphabet, but by that token could pick out your phonetics better than anyone else.

You knew that Don belonged to a Clipperton team because he would tell you that his home call was "November six I'm Clipperton". Don would then turn the rig over to c.w. so Hoppy could work you on 160.

Jean-Charles was one person you heard but could not recognize. He told us that he wasn't a real contest operator, but when he got on the air he fooled us and you too. Herb also surprised us all, but his voice was well known from the maritime mobile operation on the yacht.

François was one that you might have thought was two completely different individuals, one whom you patiently waited for to complete a seemingly endless number of Europeans, the other speaking such good English that you thought he was an American trying to put on a French accent. Willy you could always recognize because he also spoke perfect English but with a slight German accent. Fred was one that you mistook for Willy but later could identify from his relaxed yet efficient way of calling the stations.

If you worked Clipperton more than a couple of times, odds are that you ran into Olivier. Olivier was so fast that it was three QSO's after he worked you that your mind realized that you were in the Clipperton log. Many didn't believe that anyone could be so efficient, so they called again a second time to make sure, a waste of time since Olivier had invariably copied their calls correctly the first time.

The only member of the Clipperton team that didn't show on the air was Henry Schaub, the Swiss diver. To me, Henry exemplified the quiet strength that I have always associated with my Swiss ancestors. I had the impression that if Henry didn't have such a pleasant personality he could have bent any one of us into a pretzel.

During the days of the Clipperton amateur activity, operation went on at all three stations around the clock, and it was rare to see any of the Atlas transceivers sitting unused. Never were we at a loss for a large number of stations calling us. Not only had we come to the island at a time of good propagation, but at any hour at least three bands would offer good conditions to the largest concentration of stations in the world, in the United States. Clipperton is in something of a unique position geographically for contacting the United States because it is just about the right distance to reach all parts of that country at the same time. Contrary to a popular misconception, the W6's really have little advantage over the other call areas, since Clipperton is rather centrally located due south of the state of New Mexico. Although we did not keep score, it is almost certain that we worked all states on both modes of all bands 80 through 10. Under such conditions our only real concern was to work as many of the two other largest concentrations of the world's amateur stations in Europe and Japan. We especially wanted to maximize our efforts to those two areas because almost all of the growth in the Japanese amateur population had taken place in the last ten years and because only one European had reportedly been able to work FO8AT in 1958.

Typically, we would have about ten hours of total operating time per day to Japan and Europe each. I was a bit surprised after hearing stories of other Pacific DXpeditions that propagation to Japan did not last longer, but I discovered that both areas are roughly equidistant from Clipperton, and in the end our contact totals, about 3000 to each area, proved this in practice. It was a combination of the patience of many stateside operators and the strict operating discipline of the Clipperton team that led to this relative success.

Of the lessons that I learned operating at Clipperton, perhaps the most important was the realization of the need for the use of split-frequency techniques in planning a rare DXpedition such as Clipperton. When I was told a month before of the French decision to operate all split, I was a bit disturbed that many operators who owned transceivers without outboard v.f.o.'s might have difficulty in working the island. I believed that it would be unfair to penalize those amateurs for not owning equipment that does not offer the versatility of the Atlas 350-XL. When we got to the island, we found pileups on the announced receive frequency segments that seemed as though they were five separate pileups per 10 kHz. Because we were able to tune around freely with the main v.f.o. to extract calls from the number calling us, we were able to copy many more stations than we ever could have under straight-transceive conditions. In straight-transceive it would have been the stations without linears and big antennas that would have been penalized. This was, perhaps, a refreshing return to the days when everybody had separate transmitters and receivers. Many of those whom we contacted obviously were tuning back and forth with one-v.f.o. transceivers, so the handicap of those operators was not as great as I

Inside the Clipperton shack. Left to right: F5II, F6ARC, F9JS, Henri (SWL), and F5IE.

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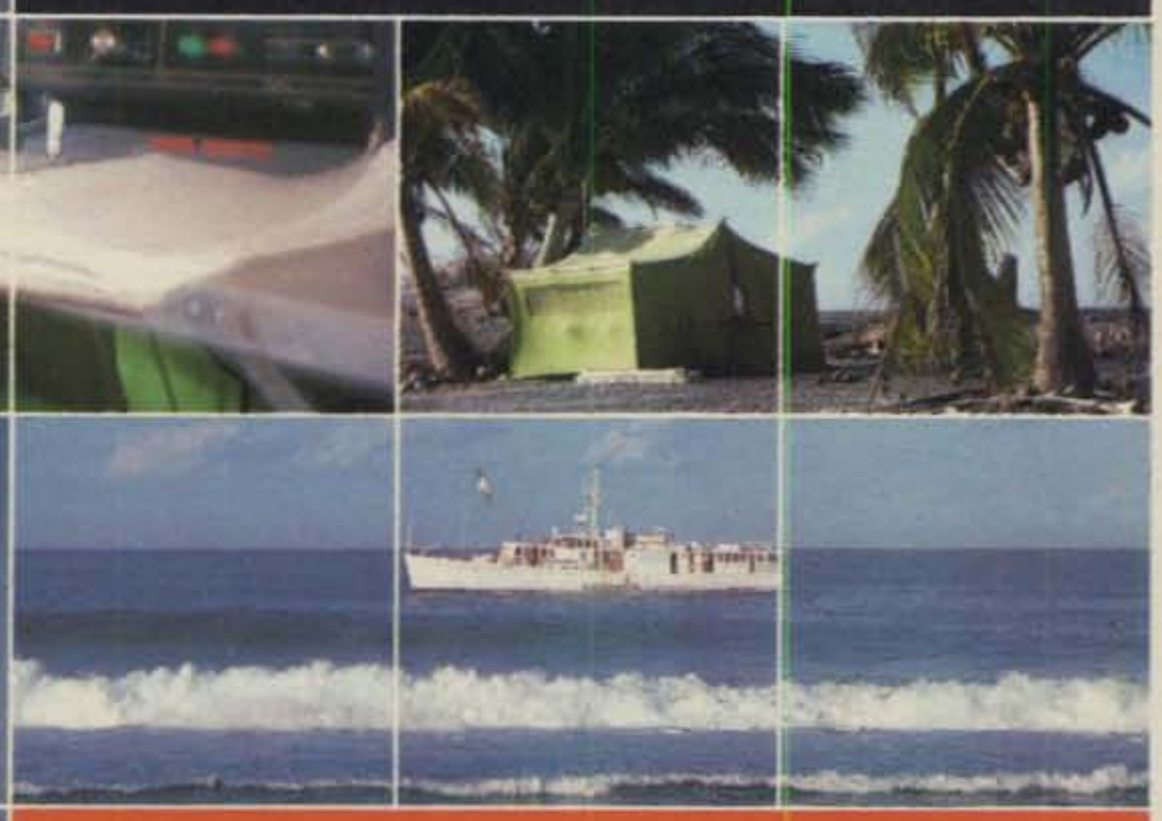

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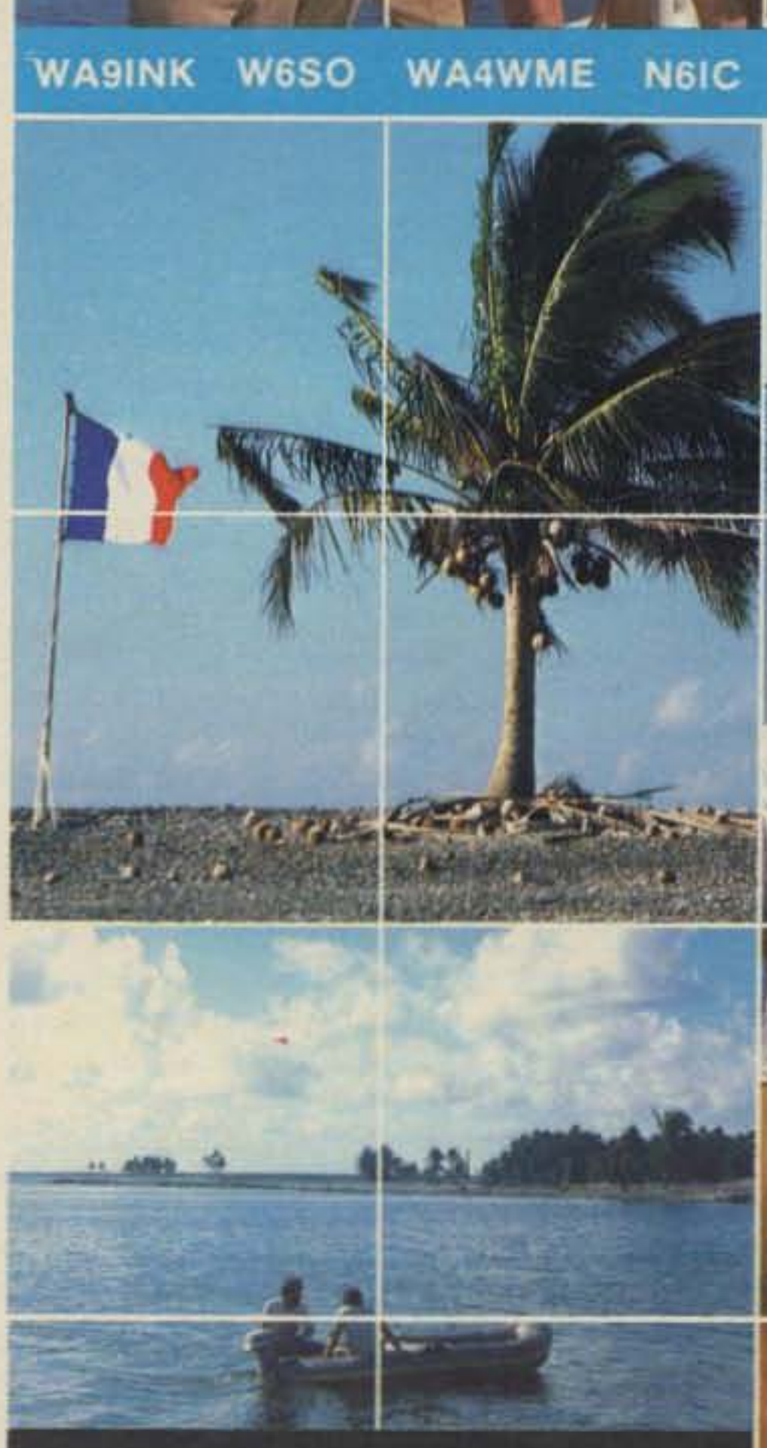

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had feared. I am now convinced that major DXpeditions of the future should plan split-frequency capability to maximize the total of different stations worked, which is the purpose of all DXpeditions.

The overall h.f. operation went quite smoothly at all three operating positions. We had good results with our antennas, especially the Wilson monobanders which went up quite easily and were helpful to us on the "bread and butter" bands of 20 through 10. On 80 meters Olivier put together a delta loop in the hopes of improving results toward the East Coast/Europe path, with some success.

We were especially pleased with the performance of the Atlas transceivers which we used mainly barefoot. The receiver in the Atlas made attacking pileups a pleasure, even on 40 meters where signals are so tightly packed. At one point we started receiving reports of chirp from our signal, and after checking our line voltage we found that one of our generators was putting out only 75 v.a.c. on transmit, far below the rated input voltage range of the Atlas, and we were surprised that the Atlas worked at all under that condition. We were also a bit amazed that a solid state transceiver could take such a beating under the equivalent of several years of home operation.

The Dentron linears and tuners also performed well with no problem at all. I was sure that we would wear out at least a pair of finals in the 100 degree plus heat in the 20 meter operating room. As a c.w. man, I was pleased with the flexibility of the Curtis keyers, and even though I had never used the Bencher paddles that Doug Murray had recommended I found that it took me only about one minute to get a feel for that paddle. The Curtis-Bencher combination was so easy to get used to that I even learned iambic keying during the course of the operation without realizing it. We also had a couple of Redi-Kilowatt programmable keyers on the island, and I was surprised how easy it was to get them to record various short messages even without reading the directions. If we had been in a contest they would have been a must.

The generators, a Honda 2.4 kW that Herb had brought, a Sears 2 kW and a small Briggs and Stratton, also worked relatively well, and we consumed much less gasoline than we anticipated. After we filled them up with gasoline we would let them run out as a way of reminding ourselves to check the oil. At times we switched to batteries to let the generators cool off and to make sure that the batteries were charged in case we needed them.

I was pleased that the special Clipperton logsheets that I had printed were well received by the team. These were of the "Don Miller" format which included spaces to record only the time, station worked plus two rows to indicate the report given with only an X needed for 59 or 599. Another large area was set aside for other information and notes. All that was required at the head of the logsheets was the last letter of the FOØX callsign being used and a number 20 through 27 to record the date. I had these printed on NCR paper so that we could have a copy right away for the QSL manager without wasting a lot of time and money getting the sheets copied by machine. One of the problems that I had not anticipated with the logsheets was that I didn't think the operators would bother to record signal reports received, and they didn't know where to put them. Another inconvenience was that the yellow NCR copy was spoiled if it touched salt water. Overall, the log experiment worked well, and a lot of lost time and confusion was avoided.

Although much of the operating at Clipperton had been accomplished by the FO8AJ and FO8AT DXpeditions, the 1978 FOØXA-H operation offered us the opportunity not only to set a record contact total for the island but also to use amateur equipment for the first time on the island on various bands and by satellite. Since France had authorized 160 meter operation only about a year before our arrival, it was the special desire of our "160 men" Don and Hoppy to work the Top Band giving each station worked a new country on that band. Using the Atlas to a vertical donated by KLM; with many radials, about 200 contacts, mostly c.w., were accomplished under conditions that did not give us the time to properly tune a 160 antenna, a process that can take years.

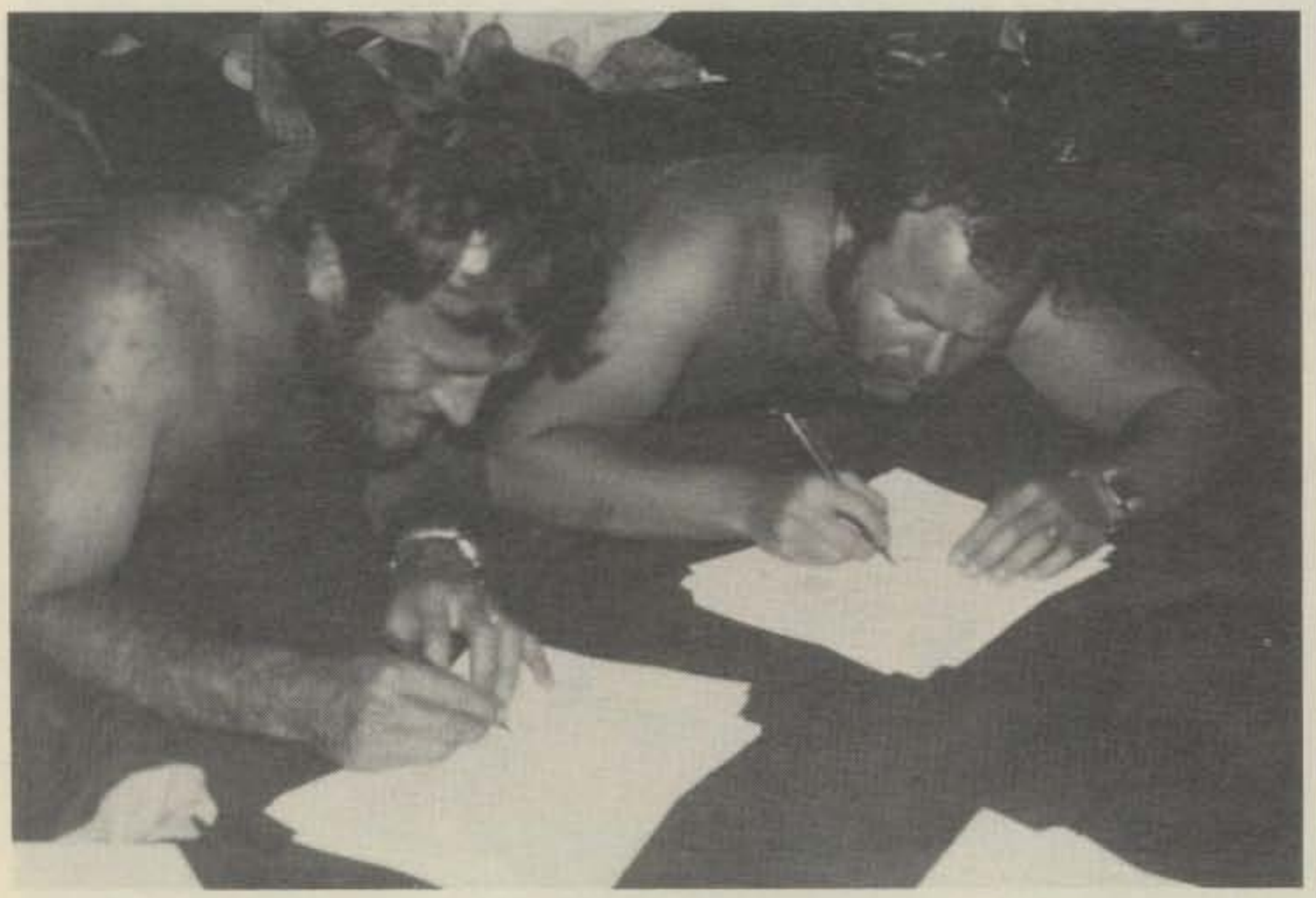
Thanks to the help of Dennis Dinga, N6DD, who loaned us equipment for two and ¾ meters, Don and Hoppy also had some measure of success on OSCAR. With my Kenwood TS-700A and a set of antennas manually aimed, the two OSCAR operators were able first to hear their own FOØXA signals through OSCAR and later work a total of 20 contacts starting with W6VPH and none other than N6DD. W2BXA managed to add to his DXCC total on OSCAR by being the only East Coast station to work Clipperton by satellite. Quite apart from h.f. operation, satellite work from Clipperton was difficult because of the few minutes per orbit when both FOØXA and those listening in the United States would be in range at the same time. In absolute numbers the total OSCAR contacts was not great, but future DXpeditions to the island operating under similar conditions will be hard pressed to shatter the present OSCAR record.

Six meter enthusiasts will be relieved to know that their opportunity to be the first to work Clipperton on six meters is still open. We were not able to hear any activity on six even with a six element beam and the Redi-Kilowatt keyer constantly calling "CQ."

Although we had three stations operating constantly around the clock, the large number of operators gave us all the chance to explore the island itself. From the first day on the island, we all had a craving to get closer to Clipperton Rock, which from a distance looked like a pebble sticking out of a sand dune, and to see the opposite side of the island from which the other two authorized DXpeditions had operated. Since Clipperton is only a couple of miles across, the task of making a tour of the atoll seemed simple enough, so after a couple of days I accompanied Willy around the island as Willy took samples of vegetation to send back to Switzerland for study.

Venturing down the flat, rocky plain towards the rock, Willy took a few plants and placed them into cardboard presses as I took pictures of his activity and of the birds nesting on the ground. Although trees have been on the island since they were first planted by a Mexican expedition in 1897, the birds still have not learned to nest in the coconut groves, and they insist on sitting out on the baren, rock soil that under the unrelenting sun feels like just-solidified lava. After walking about a kilometer it was becoming apparent that the maps which indicated large patches of foilage were no longer accurate. Willy had only limited use for the large number of plant presses that he had hoped to fill. Although the strip of land about 100 meters wide that we were following was surrounded by water, the desolation before us could only remind us of pictures of lunar landscape.

Approaching the rock, we came to a patch of bleached white sand contrasting quite sharply with a patch of black rocky soil, a combination which evidenced the origin of the atoll. When Clipperton was first discovered it was little more than Clipperton Rock alone with small growths of coral attached to it. Later, when the island was first seriously surveyed in the 1840's, the map of Clipperton showed two small islands that surrounded a lagoon of calm sea water. Sometime between 1840 and 1897 the coral growths joined the two small islands together into a ring, one of the three closed atolls in the world. Eventually the sea water evaporated and was replaced



Fredy and Willy were always prone to do the log work.

by rain water to form a fresh-water lake in the middle of the Pacific Ocean. The fresh water of this island lagoon is adulterated sometimes during the storm season when sea water is pushed over the narrow parts of the reef.

Our walk to the rock was a bit more tiring than we had thought, and we were relieved not just to have reached this famous landmark but to have some shade as well. At the bottom of the rock we found several plaques that had been left by various French military missions dating back to the 1950's. Clipperton Rock is one of those remote parts of the world where travelers celebrate their very presence there as something of an accomplishment by leaving a momento of themselves that hopefully will last forever. I tried to carve my callsign into the rock with a hammer and chisle that I had found on the ground nearby, but I found that the volcanic edifice was harder than steel. Later the commemorative plaque that Willy had brought to immortalize our expedition for future visitors would be attached to the rock with epoxy cement.

Just before the expedition we were a bit chagrined to learn that following the 1958 expedition the wild pigs that once inhabited the rock had been reduced to such a small number that they finally disappeared from the island. Actually their demise was not a loss to the ecology of Clipperton because the pigs had been introduced onto the island only in 1897 as domestic stock and had reverted to a wild state after living abandoned for several generations. We hoped to find at least some of their remains, but it was apparent that the crabs had removed all trace of them long before. We climbed into their former trails in the rock to find nothing but the remains of a lighthouse which had fallen from the top of the rock decades before and was now a nondescript lump of metal.

Moving counterclockwise around the island Willy and I found nothing over a long distance except clear, wild beaches bordered by sparse clumps of coconut trees infested with crabs. We were getting very hot and thirsty, and Willy managed to break open a couple of coconuts for a few drops of precious milk. Moving northward, we eventually found the clutter of the large dumps of live ammunition that had been left by the U.S. Navy over 30 years before. Not far away we found a mass of rust that had once been a tractor, while on the beach we found a 15-foot section of steel which we could hardly believe was what remained of the infamous LST that marked the site of the 1954 and 1958 landings by DXpedition teams onto the island.

In the heat of this part of the island, and in sight of all the war garbage, we had little difficulty understanding the unpleasant impression that the previous DXpedition teams had of the island. Picturing that side of Clipperton during a storm season, we could see how they were able to describe the island as one of the most unpleasant areas of the world. Even the birds in that area tended to hover in the air as if to stay away from grounds that they seemed to consider rather reluctantly as their home. It was at that time that I realized that the stories we had heard of the island as being either a tropical paradise or a hardship outpost were all true at the same time and that the impressions left by the island depended on what side of the island previous visitors had landed on and what kind of weather they had had at the time.

Willy and I continued around the island in the noontime heat taking frequent rest stops and counting the steps as we came agonizingly closer to the haven of Bougainville. Even though we were surrounded by water, no place that I had ever visited had ever seemed any drier or more lifeless. At long last we came onto the flat western side of the island, the "home stretch" which once had been slated for transformation into a landing strip for trans-Pacific aircraft.

It was great to be able to collapse into Hugh's hammock for a well-earned rest in the coolness of the Bougainville grove. I envied Hugh being able to sleep there every night especially since this was one of the few places I have ever found where one could use a hammock without being bothered by insects.

After a short nap I arose to discover that Henry Schaub, the Swiss diver, had returned from the beach with several small fish which would be dinner for the Clipperton team that evening. The fishing in the waters of Clipperton is reason enough to visit the island. Clipperton marks the only shallow-water feeding grounds for sea creatures for many hundreds of miles, and schools of all types of fish are attracted to the area. Among the more peaceful species are numerous sharks. Normally the sharks would be a serious problem for experienced divers, but here they have a menu of sea food much more delicious than human swimmers from which to choose. During the course of our stay on the island, those who dived into the ocean would bring back a large number of lobsters for a late afternoon picnic on the beach.

The Clipperton divers also had the opportunity to dive into the lagoon, in which they discovered that there is hardly any vegetation or fish life. Doug Murray walked into the water of the lagoon only to discover that he had become covered with small green leaches. Those who swam in the middle of the lagoon found only the darkness of semi-transparent water. The Bottomless Hole, which is said to be more than two miles deep, was located by the divers but much closer to Clipperton Rock than maps had indicated.

As the generators droned on day and night past the half-way point of our scheduled stay on the island, a decision on whether we should enter the phone portion of the *CQ* WPX contest that weekend was facing us. We had a very serious discussion among a group of us who wanted to enter the contest to set an all-time record and another group that would prefer to stay completely out of the contest to avoid wasting time working again for contest credit many of the stations that we had already worked during the first days of the operation. Those who argued to stay out of the contest knew that if we stayed out of the contest we would benefit from a slight lessening of QRM if we stayed on c.w. during this phone weekend. Eventually it was decided that we would stay completely out of the contest because this DXpedition might be the last chance for many stations to work Clipperton for many years, and we felt that it would be better to log the greatest possible number of different stations even if that would mean that we would have to cut the actual number of contacts to do it.

Although a few of the phone men were disappointed at the decision, it gave them the opportunity to visit the other parts of the island. On Saturday morning I set out with Jacques, André, Olivier and Alain on Herb's 10-foot Avon raft for a 20 minute cruise on the lagoon to Clipperton Rock, as Jacky and Jean-Charles made the trip on foot. I had to return to the rock to shoot 8 mm sound film and some 16 mm film for Dave Bell, W6AQ.

Jacky and Alain were not content just to take pictures of the rock at a distance, they wanted to climb all the way up to the top of the 70-foot slippery, tricky volcanic formation. Jacky and Alain must have been fairly competent at climbing mountains, since before I knew it they had talked me halfway up the rock's narrow steep cliffs to a point where we had a good view of the curvature of the island. I was satisfied to take pictures of the shoreline from between the boulders, but the Frenchmen did not stop climbing before they had inched their way up to the unsure guano-polished steps to the summit. As I took films, Alain reached what was quite literally the height of any Clipperton experience,

Olivier, F6ARC, during a QSO.

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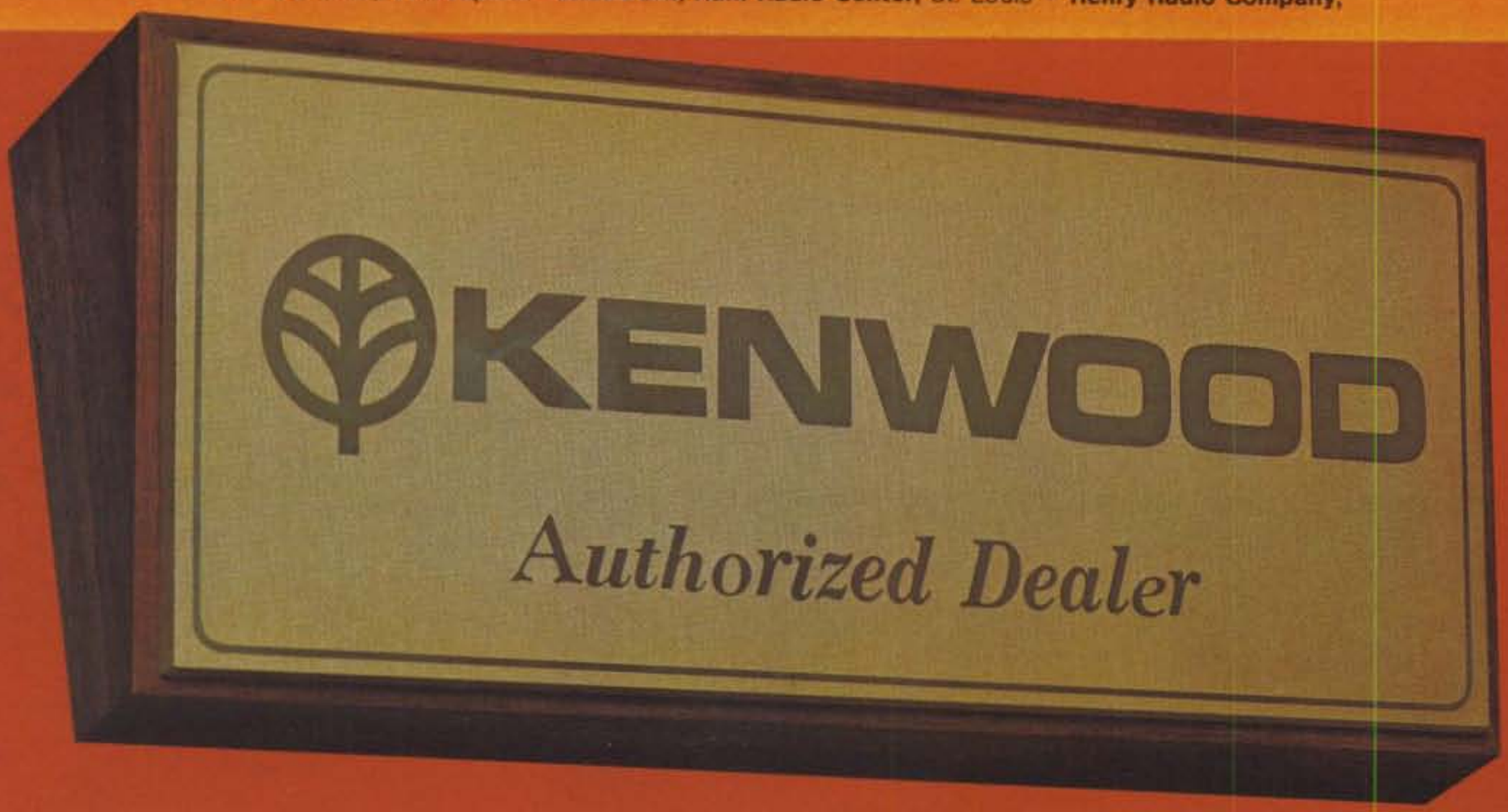

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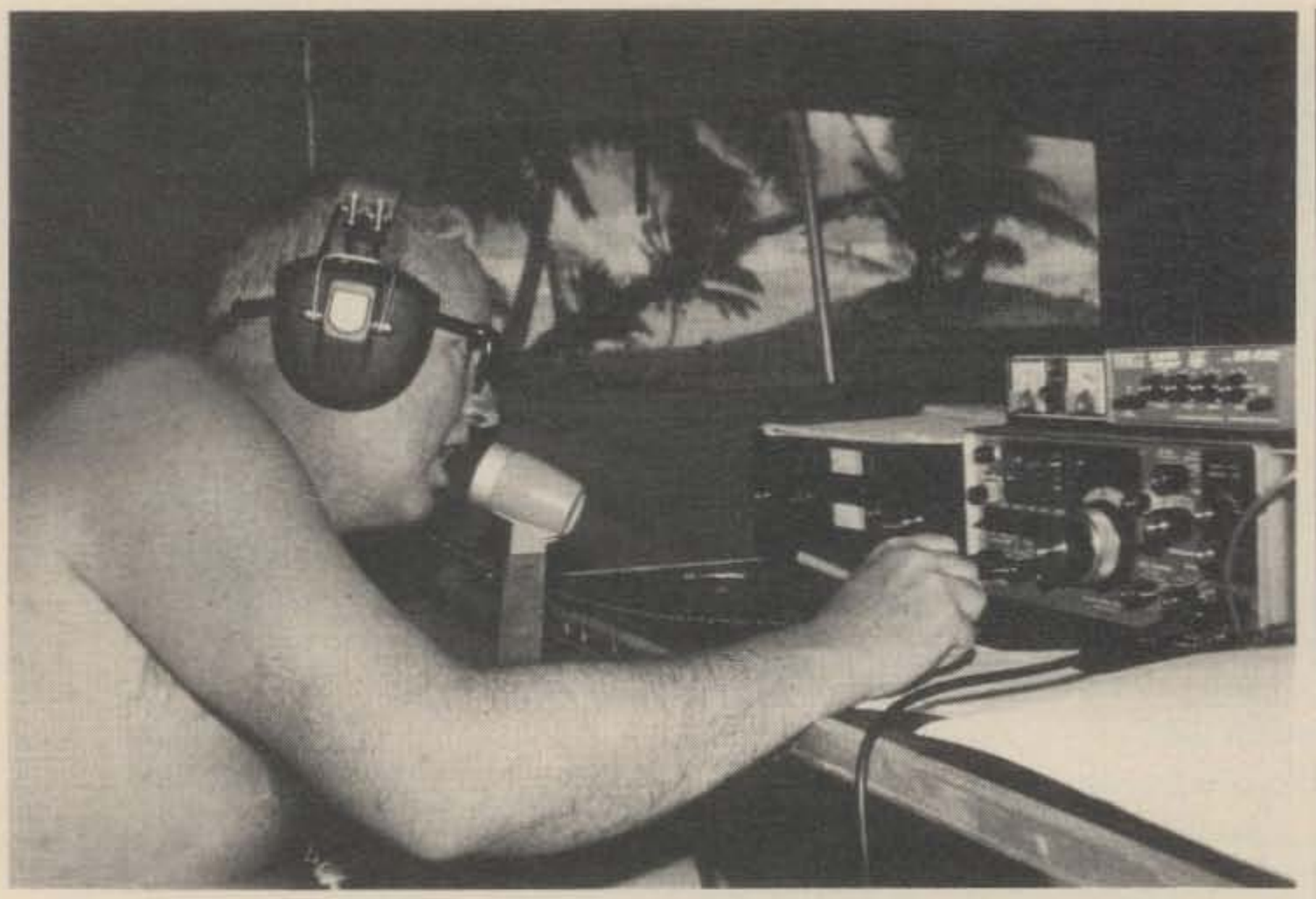
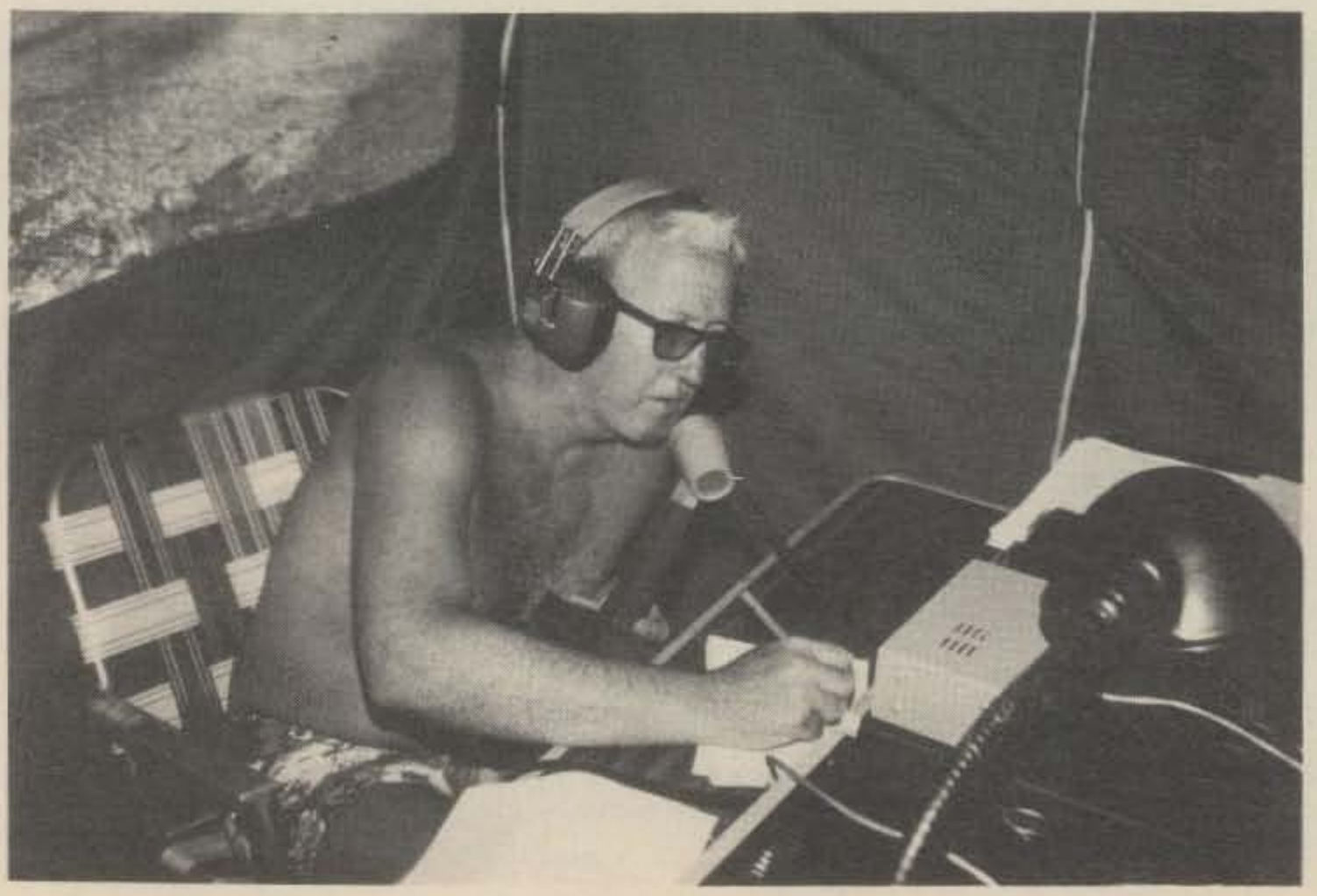


Hugh, WA4WME, operating the Atlas/Dentron station.

standing on the cement platform which some foolhardy French legionnaires had dared to build on the pinnacle of the rock to hold a flagpole. As I expected the worst, Alain reached up and untied what looked like a blue, white and red streamer representing the French colors. Unravelling it, Alain saw that it was indeed a flag, and in this case perhaps one of the greatest souvenirs ever brought back from a DXpedition.

Returning to the DXpedition village late in the afternoon, I could see from the piles of completed logsheets and the slightly more relaxed pace of the pileups now working some of the weaker stations that we were reaching our goal of 25,000 contacts. Now was the time to begin packing up some of the nonessentials in advance of our final departure from the island. As operation continued, personal effects, some pieces of equipment no longer being used and finally the tents were removed to the beach.

Very early on the morning of our departure, Monday, March 27th, I arose to take over the last operating position in use, the 20 meter station. The other two stations were silent because almost all of the operators still on the island were exhausted from the final pileup blitz the day before and needed rest for the hauling of the great amount of equipment to the yacht after sunrise. Shortly before 6 a.m., after I had worked a few pages of JA stations straight transceive, Herb called on the frequency from the yacht to say that he had a cassette recorder going to tape the final QSO from the island. I called one more station, VK6LK, and as I was trying to think of something suitable to say to mark the termination of a great mission, for some unknown reason the Atlas went out. The clock just had turned 6:00, and it seemed as though destiny had pulled the big switch on Clipperton '78. In a few minutes the rig came on again as mysteriously as it had gone out, but by then the time and mood had passed, and the new assignment of disengagement was upon us.



Hugh, WA4WME, in QSO.

Equipment was placed at a landing point on the lagoon where it would be transported across the fresh water in Herb's Avon raft to a point on the atoll only about 100 meters away from where we would meet the yacht's landing craft. Much of the lugging of generators and many other smaller articles that had been done the first day was thus avoided this time, and by about 10 a.m. most of the gear was on the beach.

The seas that we found that morning were much more agitated than they had been since our arrival at the island, and with a high tide at the time, we had great difficulty negotiating the surf. The rubber raft turned over several times dumping its passengers and much valuable equipment into the salt water. It was evident that if we wanted to leave the island that day we would have to face abandonning the transceivers and linears on the beach, saving only the persons on the beach and the logbooks. Alain wrapped the logs in as many plastic bags as he could find in the hopes of somehow keeping them dry on their way to the yacht.

It was evident that we would have to employ a method of getting off the island that both Doug and Hugh had proposed during the course of our planning. A buoy was tied about 150 meters off the beach to which long ropes were stretched and by which we could pull ourselves through the waves to the relative calm of the open water. As Roy helped us, Olivier and I waded out and pulled ourselves and the raft to a point where we would meet Kim and Henry Torrez in the whaler for the return to the yacht.

For several hours the slow, difficult process was repeated many times as we hoped that the tide and surf would permit the passage of the operators and the most valuable items from the beach. Although Roy saw sharks lurking nearby he said nothing since our fear of them would do nothing to facilitate the evacuation operation. As the whaler brought in loads of equipment from the buoy, almost everything was thoroughly drenched in salt water despite careful wrapping in plastic bags, and the only things that came back dry were the logbooks and things that had been placed in the airtight water coolers that I had bought with the landing in mind.

By the middle of the afternoon it was becoming apparent that through the efforts of Doug, Hugh and and Don still on the beach and the professional crewmen in the whaler our hopes of getting everything off the island would be realized even if most of what came aboard the yacht would be soaked. By about 4 p.m. Doug and Hugh, the last to leave the island, were on deck, and we were preparing for sea. Hugh was showing signs of sunburn that he had suffered on the beach after standing out in the intense sunlight reflected by the white sands. After a couple of hours on board Hugh's pain bacame quite acute, and it was evident that he had second-degree burns on his back. For the next three days Hugh would be in a virtual state of shock from the pain, and all he could do was to lie on the floor waiting for his present state to pass. François, with infected cuts from diving in the coral, was not much better off.

The anchor was raised in the early afternoon after a brief visit by two Mexicans who had come from a 50-foot sailboat not far down the coast. The sailboat had arrived off the island three days before, and looking at it from time to time from the island I wondered

why the people on board were not fishing, diving or doing anything that one does with a pleasure craft. From those who were aboard the *Phillippa* during the last three days at the island I learned that this innocent-looking sailboat was in fact a pirate ship which had been attracted to Clipperton after reports were heard from Central American radio amateurs that a DXpedition was coming to the remote French island.

I had realized the growing danger of piracy in the seas off the Mexican and Central American coast from our research on the area, and because of that problem we had to pay $1400 for special insurance through Lloyd's of London for the Clipperton charter, an amount that might have been only one-fifth that much only a few years before. The *Phillippa* had been approached by a few men from the sailboat before our departure, and they asked questions about our operation including how many people were aboard the yacht at night and how many firearms we had. Our captain, Jeff Clough, recognized an American in their number in connection with the disappearance of various small yachts, and it was learned that members of the sailboat crew were unwelcome in several Central American countries after they had tried to sell stolen vessels. Jeff made it known that a sufficient number of firearms were being carried by the *Phillippa* crew and that firearms were on the island. In the end we had no trouble with these pirates, but if our expedition had not as big as it was our experience at the island might have been much different.

In the early evening we cruised around the bottom of the island and then set course for Cabo San Lucas as we watched the island quickly recede into the horizon. I brought out a bottle of Dom Pérignon 1943 to mark the occasion and later Don produced a case of California champagne which quickly disappeared.

The first full day back at sea had the French team counting each contact in the logs by band and area worked, and we were pleasantly surprised at the total of 29,069 contacts from the 160-hour operation, 17,000 of which had been on phone and over 12,000 on c.w. More than 20,000 contacts had been with the United States, and guessing at the number of duplicate contacts, I probably would not be far off if I said that we had worked about 10,000 different Americans, a figure that represents an estimated number of the most serious DXers in the United States. When we returned home, checks with various DX clubs indicated that almost all of their members who had given it a fair try had worked Clipperton. Even though the lion's share of contacts had been with stateside stations, our country totals showed that contacts had been spread rather evenly around the world's amateur population. Although we were not keeping a checklist during the operation we managed DXCC on 20 meter phone.

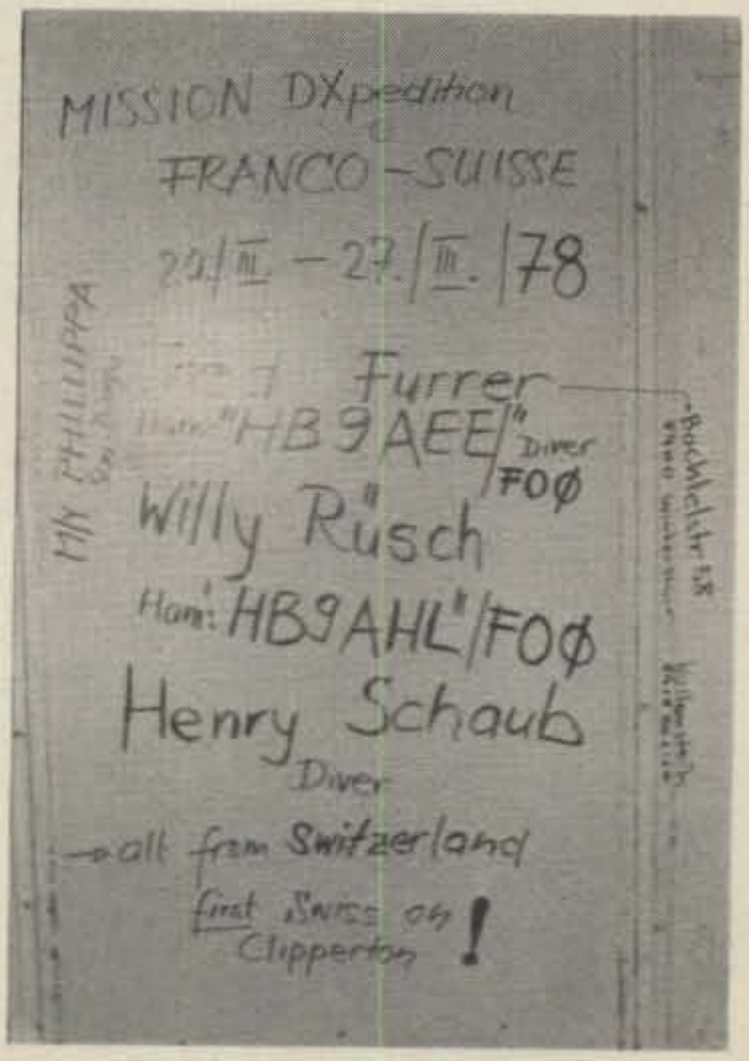
The first day away from the island also gave us the chance to get on the air maritime mobile, and after allowing the transceivers to dry in the sun we chose one of the Atlases at random and put it on the air immediately with no repair. We had a hard time believeing that the Atlas would ever operate again since salt water is normally considered a death sentence for solid-state gear. I have concluded that the 350-XL's ability to pass this ultimate test of reliability is due to the fact that it is rather conservatively designed and not overly cramped with integrated circuitry.

The following days were mainly a time of rest marked at times by mirror-smooth seas. We sorted out the various souvenirs that we had taken from the island and tried to dry out and clean our personal effects. I brought out about 400 maps of Clipperton that I had printed to be used later as certificates of appreciation to those who had contributed to the yacht fund up to the last day of the operation. Although I had expected difficulty in getting everybody assembled, all the members of the Clipperton team went to work signing each one of the 400 certificates individually.

After the seas became rougher moving northward, we were glad to pull into Cabo San Lucas for refueling and for our first taste of civilization in over two weeks. It was also to be something of a sad occasion because the Swiss team would be leaving the yacht there for a short trip to Costa Rica and then their return home, and this would perhaps be the last time that the entire Clipperton team would be together in the same place. We really hated to see the Swiss fellows go because they had been such a pleasure to share an adventure with.

At the same time Don, Herb and Hoppy left the yacht to return to San Diego in time to

(Continued on page 84)



Graffiti left by the Swiss team.

IC-701, the HF (160-10M) Maximizer

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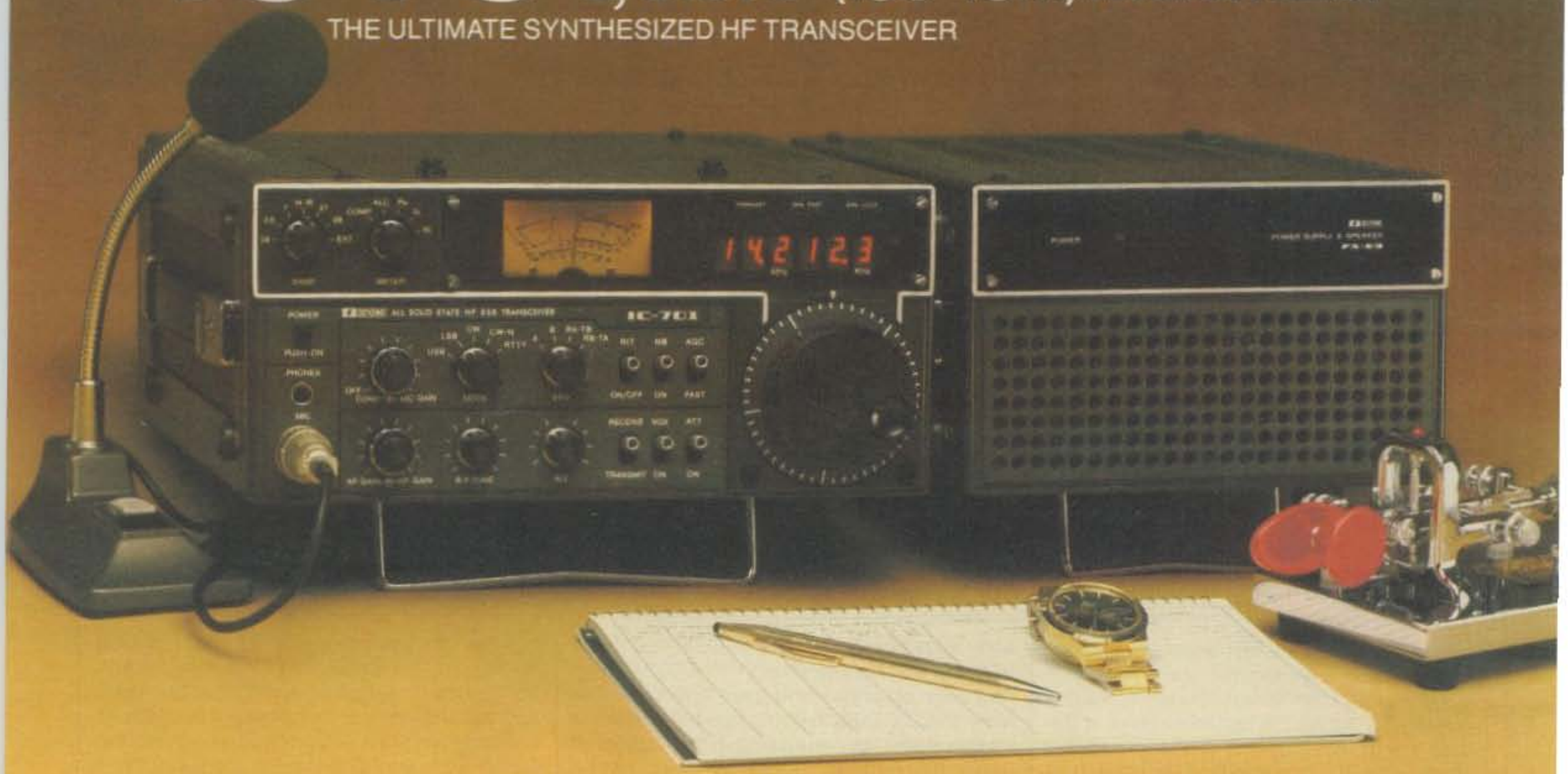

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CIRCLE 22 ON READER SERVICE CARD

CQ looks at some of the latest equipment and accessories of interest to amateurs.

New Amateur Products

Alliance Manufacturing Co. HD-73 Antenna Rotator

Alliance has just marketed a new antenna rotator and control box. The HD-73 rotator is constructed of heavy-duty aluminum castings. It will support an antenna of up to 10.7 square feet in area under severe and adverse weather conditions, which include temperature ranges of 128°F to -20°F.

The HD-73 control unit features dual-speed rotation with one five-position switch. It presents a one revolution per minute speed.

The rotator is externally fused and has an internally mounted automatic reset thermal protector for the motor and transformer.

For more information on the HD-73 contact Alliance Manufacturing Co., Inc. in Alliance OH 44601.

Radio Shack's Realistic PRO-2001 Programmable Scanner

The new Realistic PRO-2001 scanning monitor receiver features digital entry programming for up to 16,560 frequencies, with no crystals to buy.

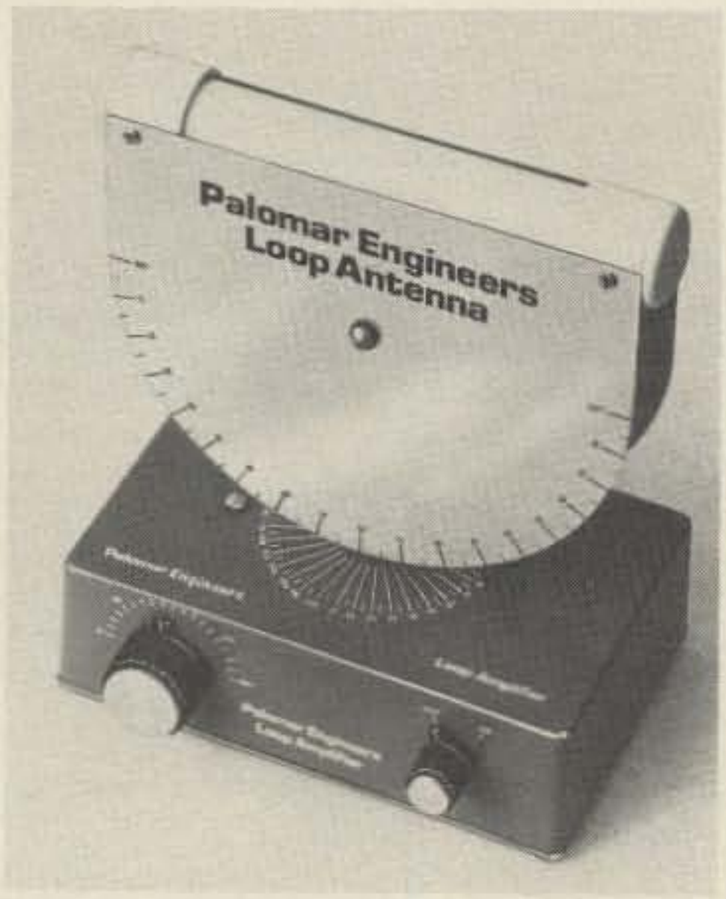
Bands covered by the scanner include: 30-50 MHz, 144-148 MHz, 148-174 MHz, 430-450 MHz, 450-470 MHz and 470-512 MHz.

An LED display shows which frequencies are being scanned, monitored or programmed.

The PRO-2001 has a built-in speaker and jacks are provided for headphone, tape recorder and external speaker. There are separate antenna inputs for v.h.f. and u.h.f.

The unit measures 3⅜" by 10-3/16" by 10⅞" and is priced at $399.95.

The PRO-2001 is available at all Radio Shack stores throughout the 50 states and Canada.



Palomar Engineers Receiving Loop Antenna

Palomar Engineers announces a new receiving antenna for 80 meters, 160 meters, the broadcast band and the v.l.f. bands.

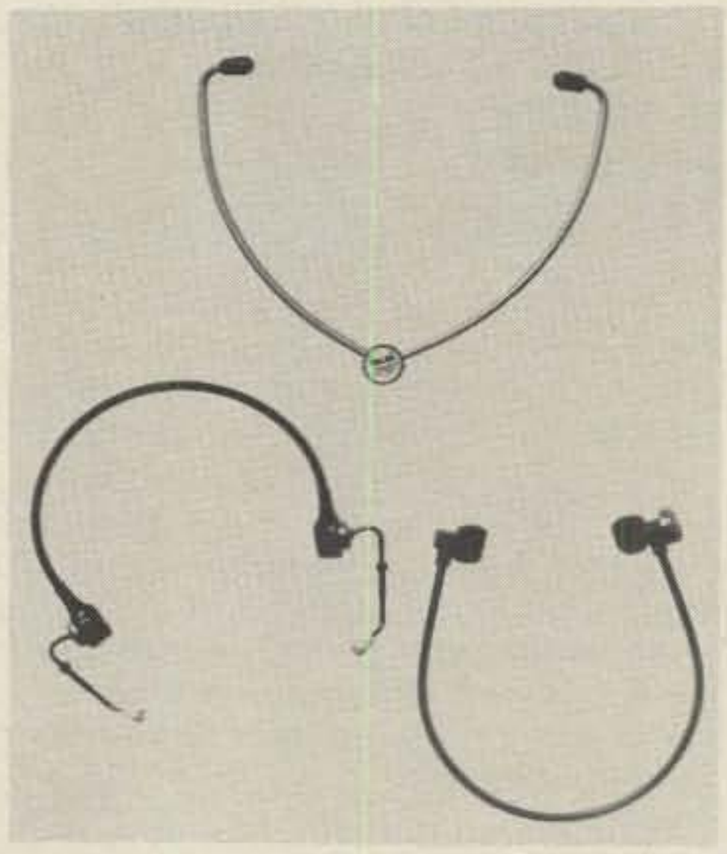
The loop rotates 360° in azimuth and ±90° in elevation with calibrated scales for both.

A loop amplifier serves as the mounting base for the antenna. It contains a tuning capacitor to resonate the loop and an amplifier to boost the signal and preserve the high *Q* of the loop.

Plug-in loops are available for each band of operation.

The loop antenna sells for $67.50 and each plug-in loop costs $47.50.

A free descriptive brochure is available from Palomar Engineers, P.O. Box 455, Escondido CA 92025.



Telex Communications Lightweight Amateur Headphones

Telex Communications offers the radio amateur three lightweight headphone models, usable in 3.2 to 20 ohm applications.

All three models have magnetic transducers with rising frequency response, making them suitable for s.s.b. and c.w. service.

The lightest of the three (1.6 oz) is the model HTC-2.

Contact Telex Communications at 9600 Aldrich Ave. S., Minneapolis MN 55420 for further information.

No 51-52

In Part II of K4KJ's paper, he derives some of the equations that will be useful in using the 821-A, lists programs for an H-P programmable calculator and discusses some other interesting addenda to Part I.

The General Radio 821 R.F. Admittance Bridge

(A Poor Man's Q-Meter) Part II

BY JOHN J. NAGLE*, K4KJ

APPENDIX 1
Transformation of Series to Parallel Equivalent Circuits

The derivation of the equation for transforming admittance into impedance and *vice versa* is straight forward. The problem is shown in fig. A-1.

Assuming that it is desired to transform an admittance $Y = G \pm jB$ into the equivalent impedance $Z = R + jX$. Write

$$\frac{1}{Y} = Z = R + jX = \frac{1}{G + jB} \qquad \text{(A-1)}$$

Rationalize by multiplying both numerator and denominator by the conjugate of the denominator, $G - jB$. (Note: The conjugate of a complex number is the same as the complex number, but with the sign of the imaginary term reversed.)

$$Z = R + jX = \frac{1}{G + jB} \cdot \frac{G - jB}{G - jB} \qquad \text{(A-2)}$$

We now carry out the multiplication indicated by eq. A-2 and separate into real and imaginary parts:

$$Z = R + jX = \frac{G}{G^2 + B^2} - \frac{jB}{G^2 + B^2} \qquad \text{(A-3)}$$

It is a fundamental rule of complex numbers that if two complex numbers are equal, both the real parts of the two complex numbers must also be equal. Therefore, equating the real and imaginary parts of eq. (A-3) gives

$$R = \frac{G}{G^2 + B^2} \text{ ohms and } X = \frac{-B}{G^2 + B^2} \text{ ohms} \qquad \text{(A-4)}$$

Notice that the sign of the imaginary part is reversed. If the admittance has a capacitive component so that the susceptance is positive, the reactance will be negative.

As an example, assume the 821-A reads, after corrections,

$$Y = 4000 - j3000\ \mu\text{mhos}$$

and it is desired to convert to series impedance. Note: A μmho is 10- mho so that

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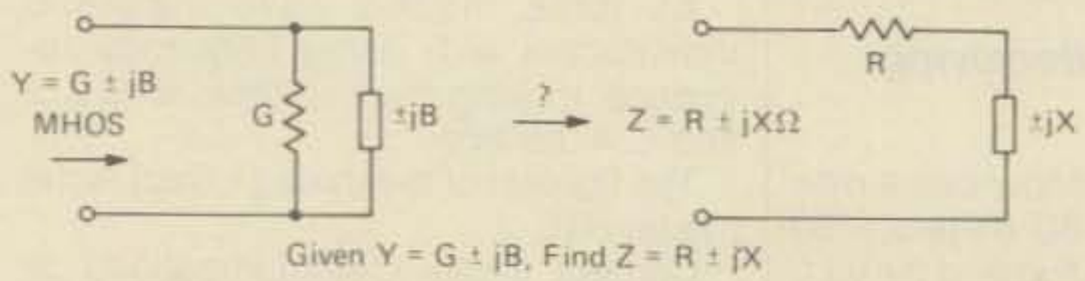

Fig. A1 – A pictorial statement of the admittance-to-impedance problem.

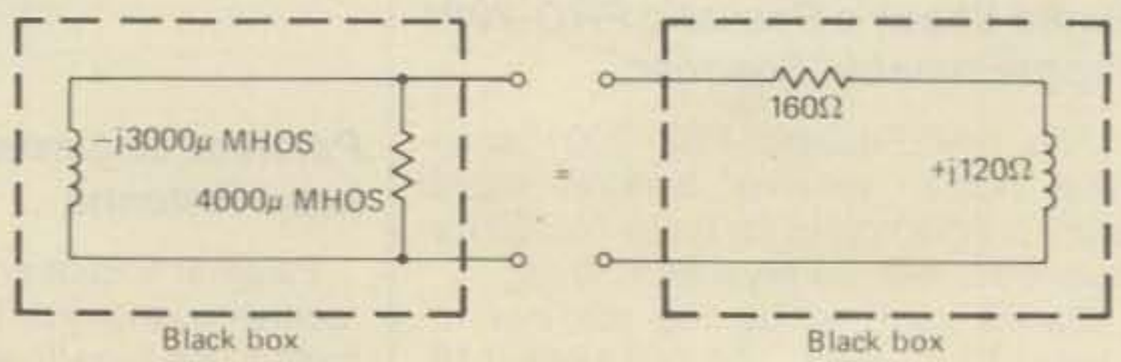

Fig. A2 – The two black boxes are equivalent. Both will draw the same current at the same phase angle for a given voltage.

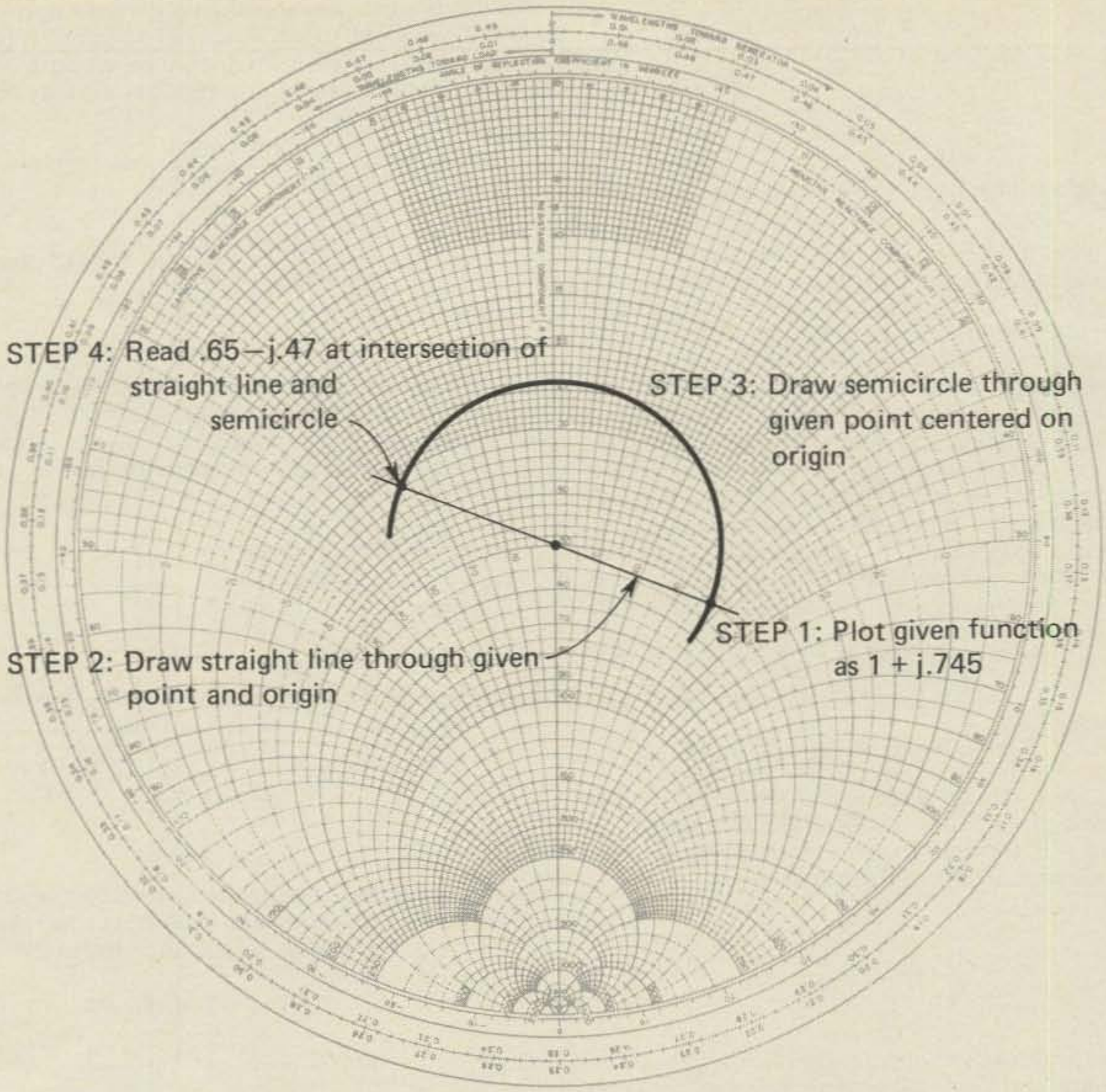

Fig. A3 – A Smith chart implementation of the admittance/ impedance transformation.

$$R = \frac{.004}{(.004)^2 + (-.003)^2} \text{ ohms}$$

and

$$X = -\frac{-.003}{(.004)^2 + (-.003)^2} \text{ ohms}$$

$$R = \frac{4 \times 10^{-3}}{25 \times 10^{-6}} = 160 \text{ ohms and } X = \frac{3 \times 10^{-3}}{25 \times 10^{-6}} = 120 \text{ ohms}$$

Hence $Z = 160 + j120$ ohms

What this means is if one were to put a parallel admittance combination of $Y = 4000 - j3000$ μmhos in one black box and a series impedance of $Z = 160 + j120$ ohms in a second black box so that only two terminals of each combination were available to the outside world, as shown in fig. A-2, it would be impossible to tell which box was which.

The same procedure is used to convert an impedance into an equivalent conductance. Write

$$Y = \frac{1}{Z} = G + jB = \frac{1}{R + jX}$$

Rationalize and then equate real and imaginary components to obtain

$$Y = \frac{R}{R^2 + X^2} + \frac{-jX}{R^2 + X^2} \quad \text{(A-5)}$$

$$G = \frac{R}{R^2 + X^2} \text{ and } B = \frac{-X}{R^2 + X^2} \quad \text{(A-6)}$$

Note that the transformations of eqs. A-4 and A-5 have the same form. These are known mathematically as *bilateral transformations*. Since they both have the same form, the same computational procedure can be used in going from impedance to admittance or *vice versa*.

These transformations can be easily programmed on a scientific calculator or solved graphically on a Smith chart.

A program that can be run on the Hewlett-Packard 25 series of scientific pocket calculators for either of the transformations of eqs. A-4 or A-6 is given in the table.

If the values of the known impedance are such that they can be plotted on the Smith chart directly with reasonable accuracy, it is not necessary to perform the initial rationalization.

It must be emphasized that the impedance/admittance transformations described above *only* transforms a series impedance to a parallel admittance or *vice versa*, and are not

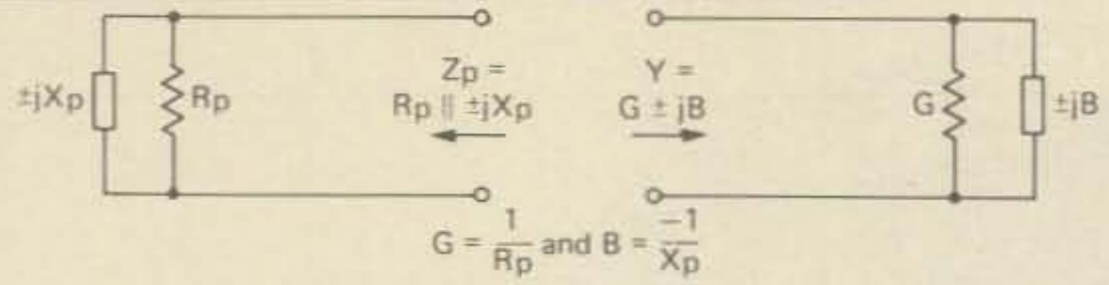

Fig. A4 – Transformation of $Z_p = R_p \parallel \pm jX_p$ te $Y = G \pm jB$.

valid for any other purpose. Two possible pitfalls for the unwary are going from a parallel resistance/reactance combination to a parallel conductance form or from a parallel resistance/reactance form to a series resistance form. Both of these are straight forward and I will touch on them briefly.

First, in discussing the transformation from a parallel combination of resistance and reactance to parallel admittance, I will write parallel resistance and reactance as $Z_p = R_p \parallel jX_p$ where the vertical bars, $\parallel$, stand for "in parallel with." This is necessary because it is not correct to write $Z_p = R_p \parallel jK_p$ as $Z_p = R_p + jX_p$ since this latter form defines a series connection.

In figure A-4 we see that $Z_p = R_p \pm jX_p$ is to be transformed to $Y = G \pm jB$. This transformation is very straight forward; since everything is in the parallel form to begin with or

$$R_p = \frac{1}{G} \text{ and } X_p = \frac{-1}{B} \qquad \text{(A-8)}$$

$$G = \frac{1}{R_p} \text{ and } B = \frac{-1}{X_p}$$

The equations (A-8) can be used to determine the *Q* of an inductor in terms of its conductance and susceptance. As shown in figure A-5, the *Q* is known to be $Q = R_p/X_p$.

Taking the reciprocal of both R_p and X_p gives

$$Q = \frac{R_p}{X_p} = \frac{\frac{1}{G}}{\frac{1}{B}} = \frac{B}{G} \qquad \text{(A-9)}$$

The minus sign in the reactance/susceptance transformation has no meaning in the *Q* calculation. By using eq. (A-9), the *Q* of an inductor may be determined directly from 821 readings.

The parallel impedance to series equivalent impedance form can also be confusing if one is not careful. This transformation is shown in figure A-7.

The easiest way to derive this transformation is to use the equation for the equivalent of two impedances in parallel; the familiar product divided by the sum form. Hence

$$Z_p = \frac{jX_pR_p}{R_p + jX_p}$$

As before, rationalize the denominator and separate into real and imaginary parts. Remember $j^2 = -1$.

$$Z_p = \frac{jX_pR_p}{R_p + jX_p} \cdot \frac{R_p - jX_p}{R_p - jX_p} = \frac{X_p^2R_p}{R_p^2 + X_p^2} + \frac{jX_pR_p}{R_p^2 + X_p^2} \qquad \text{(A-10)}$$

$$R_s = \frac{X_p^2R_p}{R_p^2 + X_p^2} \text{ and } X_s = \frac{X_pR_p^2}{R_p^2 + X_p^2}$$

Notice that there is no sign reversal on the reactance term and that this is a one-way transformation only: parallel to series.

As a numerical example we will transform a parallel impedance of 3000 ohms resistance in parallel with 4000 ohms of inductive reactance into its equivalent series impedance.

From eq. (A-10)

$$R_s = \frac{(4000)^2 \cdot 3000}{(3000)^2 + (4000)^2} = 1920 \text{ ohms} \qquad \text{A-8}$$

$$X_s = \frac{(4000) \cdot (3000)^2}{(3000)^2 + (4000)^2} = 1440 \text{ ohms}$$

Hence

$$Z_s = 1920 + j1440 \text{ ohms.}$$

Again, if the two circuits of fig. A-6 were put into black boxes with only the terminals available, it would not be possible to tell which network was which. This assumes that one does not change frequency, for this would change the reactances.

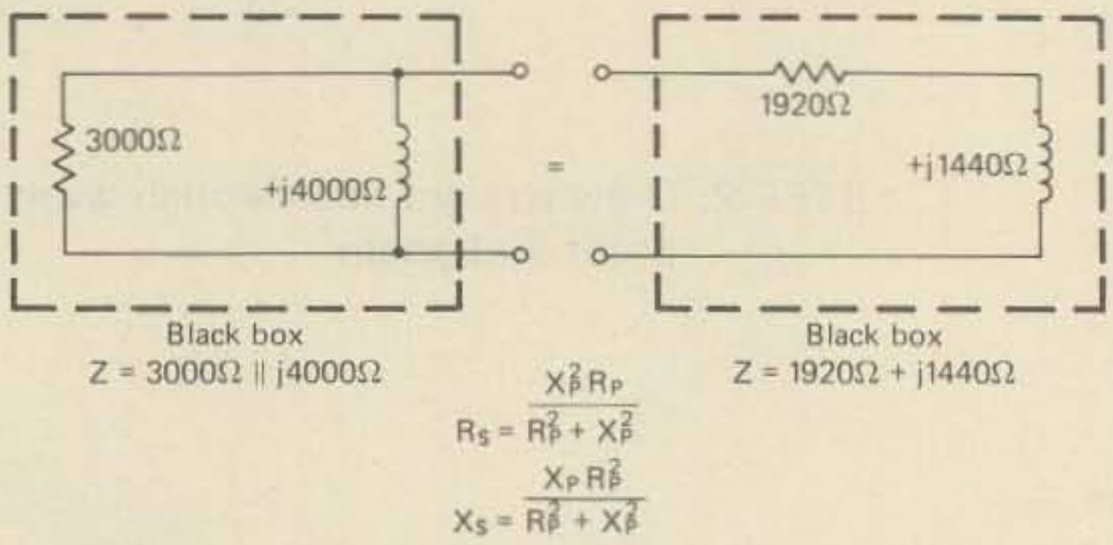

Fig. A6 – Parallel-impedance to series-impedance transformation. For a given voltage both boxes will draw the same current at the same phase angle.

This program solves

$$G = \frac{R}{R^2 + X^2} \text{ and } B = \frac{-X}{R^2 + X^2} \text{ or } R = \frac{G}{G^2 + B^2} \text{ and } X = \frac{-B}{G^2 + B^2}$$

PROGRAM

IN PROGRAM MODE				REMARKS
01	23	00	STO 0	Store reactance
02	15	02	x^2	Square reactance
03		21	x y	Put resistance in x register
04	15	02	x^2	Square resistance
05		51	+	Add resistance and reactance squared (denominator)
06	23	01	STO 1	Store
07		71	÷	Divide resistance by denominator
08		74	R/S	
			READ G (OR R)	Stop to read conductance
			KEY R/S TO RESUME RUNNING PROGRAM	
09	24	00	RCL 0	Recall reactance
10	24	01	RCL 1	Recall denominator
11		71	÷	Divide to obtain susceptance
12		32	CHS	Change Sign
			READ B (OR X)	Read susceptance

IN RUN MODE KEY IN

VALUE OF R (OR G)

ENTER

ENTER

VALUE OF X (OR B)

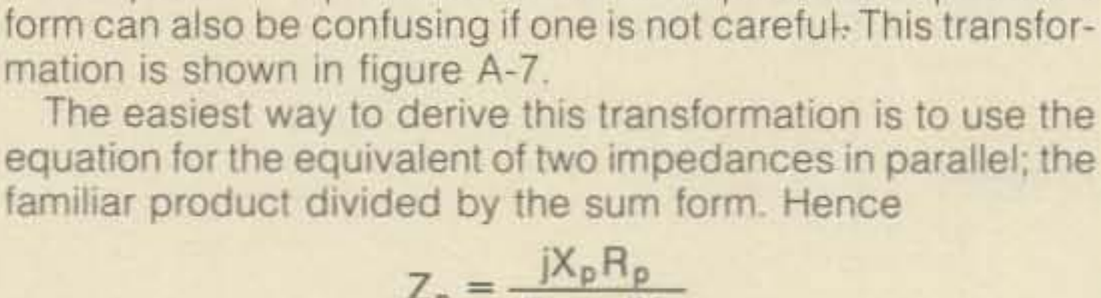

Fig. A5 – Determination of circuit Q in admittance form.

R/S TO START PROGRAM

As a test run, solve the example above where Z = 160 + j120 ohms.

APPENDIX 2
HP-25 Program to Reduce GR-821 Data to Y = G ± jB

PRELIMINARY (in *run* mode)

1. Place reference frequency, f_{ref}, in MHz in STO 0.
2. Place the product 2π in STO 1.

IN PROGRAM MODE		REMARKS
01 23 02	STO 2	Store test frequency
02 24 00	RCL 0	Recall reference frequency
03 71	÷	Divide
04 15 02	x^2	Square
05 61	X	Multiply by dial reading
06 74	s	Stop to read actual conductance in μmhos
		Key R/S to continue program
07 34	CL x	Clear x register
08 24 02	RCL 2	Recall test frequency
09 61	X	Multiply by ΔC
10 24 01	RCL 1	Recall 2π
11 61	X	Multiply by 2π
12 32	CH S	Change sign
		Read actual susceptance in μmhos.

TO RUN PROGRAM

Key in ΔC (with sign)
ENTER

μmhos conductance dial reading — multiplied by 10, if necessary
ENTER

Test frequency (in MHz)
R/S to start program

APPENDIX 3
Derivation of Transmission Line Attenuation from GR-821-A Measurements

The input impedance of a lossless transmission is given by the well known equation

$$Z_{in} = Z_o \left[\frac{Z_l \cos\beta s + jZ_o \sin\beta s}{Z_o \cos\beta s + jZ_l \sin\beta s}\right] \qquad \text{(A3-1)}$$

where Z_o = characteristic impedance of the transmission line
Z_l = Load impedance
β = phase constant of line
s = length of lines

The product βs is the electrical length of the line in radians. When the line has losses, eq. (A3-1) becomes

$$Z_{in} = Z_o \left[\frac{Z_l \cosh\gamma s + Z_o \sinh\gamma s}{Z_o \cosh\gamma s + Z_l \sinh\gamma s}\right] \qquad \text{(A3-2)}$$

where Cosh is the hyperbolic cosine
Sinh is the hyperbolic sine
γ is the propagation constant $\gamma = \alpha + j\beta$
α = attenuation in nepers per unit length
β = phase constant per unit length

In the loss-free case, it is assumed $\alpha = 0$ and it can be shown that eq. (A3-2) becomes eq. (A3-1).

In the present problem, the load-end of the line will be open circuited so $Z_l = \infty$. Taking the limit of eq. (A3-2) as $Z_l \to \infty$ gives

(Continued on page 91)

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Amateur Radio Station Grounding–Part I of III

One of the least understood but most important parts of a good amateur radio station is the ground. This 3 part article provides a simple explanation of the importance of grounds and how a satisfactory station ground can be established. I hope readers who have poor station ground, (or no external ground) will learn the true importance of the station ground and will install a good one.

I check several new amateur radio station installations each year for students in our licensing courses and I usually find the station ground to be either inadequate or nonexistent. This situation bothers me because I always stress the importance of good grounding in each course. However, I have come to realize that grounding remains poorly understood by most amateurs because the disadvantages of a poor station ground are not always as apparent as the lack of an adequate antenna or receiver. Consequently, the antenna system and station equipment normally get upgraded rather quickly but grounding problems continue to exist for years.

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What is Ground?

A dictionary of electronic terms defines ground as:

(1) A metallic connection with the earth to establish ground potential.

(2) The zero voltage reference point of an electrical or electronic circuit, which may or may not actually be connected to earth ground potential.

(3) The zero voltage circuit reference point that can be connected to earth ground without disturbing circuit operation in any way.

The preceding definitions are good but newer amateurs need more information to really understand grounds.

Ground is an electrical reference point which may or may not actually be at true zero voltage ground potential. As an example, the chassis of the receiver, transmitter, or transceiver serves as an equipment ground. However, each chassis could be at a different voltage level and the station could be operated with no station chassis connected to earth (zero voltage) ground. However, an equipment chassis cannot function as an effective ground unless it is attached to a true zero voltage external ground point.

It might be difficult at first to understand that an equipment chassis could be at any electrical potential other than ground, but a little thought makes one realize that it would be far from zero voltage if it were not connected to a good external ground. If you have tubes in your gear, it is very likely that one side of the low a.c. voltage heater (tube filament) supply is connected to the chassis (equipment ground) to eliminate the need to run two wires to the heater of each tube. One heater power supply output lead is simply attached to the equipment chassis and one of the two heater leads is connected to ground at each valve. The chassis serves as one of the heater leads in this arrangement. There are other applications in which one side of a.c. and d.c. voltages are attached to the equipment chassis, which functions as a common reference point, whether or not it is connected to an external ground to put it at zero voltage. It is also a common practice to use the equipment chassis as a common reference point to which negative outputs of d.c. supplies are attached. As before, the chassis serves as the conductor to connect the power supply to portions of circuits, as required. In this configuration, just the positive power supply outputs need to actually be wired to the associated circuits. The negative output of d.c. power supplies is called the low, minus, or negative point and a

This is Australian Novice Peter Jeffery (VK2NJQ) of Bullaburra. The main item in his station is the Kenwood TS-520 and his antenna system includes a quad for 10 and 15 meters. VK2NJQ uses the 10 meter Australian Novice band (28.1-28.6 MHz.) to work American and other DX. He works many European amateurs on the 15 meter Australian Novice band (21,125–21,200 kHz.) and he uses his 80 meter band (3525–3775 kHz.) to work Australian, New Zealand, and other closer contacts.

term such as B-minus simply means the negative side of the B (high voltage) power supply. It is important to understand that a power supply's positive (rather than negative) output can be connected to the equipment chassis when the output voltage is required to be below ground (negative) instead of being above ground (positive). It is common to have both negative and positive outputs of different d.c. power supplies attached to the chassis of the same piece of equipment.

In addition to the equipment chassis serving as a common connecting point for various d.c. and a.c. voltages, it also serves as a common reference point against which all signals are processed and transferred throughout the station equipment. The low (return) path for such signals (audio, intermediate, and radio frequencies) are usually attached to the equipment chassis by leads called signal grounds. By-pass capacitors add an assortment of voltages to the equipment chassis. When one considers the variety of voltages attached to an equipment chassis it is easy to understand that the chassis is far from zero voltage unless it is attached to a true ground (zero voltage) point. It is also easy to understand that each equipment chassis in one's station would be at a different voltage potential if they were not connected together. With so many different voltages connected to the equipment chassis, it is important to put the chassis at zero voltage potential by attaching it to an effective external ground. The equipment functions best when the chassis is at zero volts and is not allowed to fluctuate from zero.

The preceding explanations should make it clear that maximum communication capability cannot be achieved without a good ground system. Subsequent material should help make this point even more evident. There should be essentially no difference of potential between the chassis of one's equipment and the external ground at the zero voltage point. It is true that one can communicate all over the world without a good ground system but it is also true that communication capability is significantly improved by establishing an effective station ground. In addition to improved communications, proper station grounding provides protection from electrical shock. It is extremely important to take all steps needed to make it impossible for adults, children, or pets to come in contact with any potential source of electric shock and grounds are required to have a safe station.

Grounding the Station

The station should be connected to the external ground from a single point and that point should be a heavy duty ground stud on the chassis of one's transmitter (or transceiver). All other station equipment and accessories (receiver, remote frequency control, antenna tuner, phone patch, etc.) should be individually attached to the transmitter ground stud without depending on coaxial cable shields to provide required ground interconnections. The best leads to use to provide these ground interconnections are wide strips of silver plated material or ground braids. Since ground braids are less expensive and more available, we will just discuss them in this article, although both are used in the same basic way. Do not use wire for ground leads, since quarter-wave lengths can act like an insulator between the station and the external ground.

It is expensive to purchase new heavy duty ground braid. A relatively inexpensive source of ground braid is to strip the shield off old coaxial cable. It is a simple matter to use a razor blade or sharp knife to slice a groove the length of an old coax. This groove will weaken the outer protective jacket and allow you to easily pull it off, exposing the braided shield underneath. If you push the exposed shield from one end of the cable towards the other end, it will bunch up, which increases its diameter and allows it to be

stripped off very easily. It is not difficult to strip more than 100 feet of coax at a time this way.

Whether you buy ground braid or obtain it from some other source, you want to have a station ground lead (between your equipment and the external ground point) that is at least three-eighths of an inch wide. The ground braids used to interconnect other station units to the transmitter ground stud should be at least one quarter of an inch wide.

The best electrical connector to use on ground braid leads is none at all. Simply flatten the end of the ground braid, tin (solder) it until it is completely covered on both sides for a distance of about one inch from the end, and drill a hole to let the ground braid lead easily slip over the machine screw ground connection.

The transmitter ground stud should be no smaller than a 8-32 machine screw. The electrical contact to the equipment chassis should be optimized by cleaning the area around the machine screw hole down to bare metal on both inner and outer chassis surfaces. Contact area should be increased by adding a half inch to one inch flat washer at both inner and outer contact points. The heavy-duty stud should be securely held in place with a lock washer and nut. It is advisable to lock the securing nut in place with another nut. The ground stud should be about one inch long to allow ample room for attaching all ground braid leads. As is true with all grounding connections, the d.c. resistance should be reduced as much as possible to obtain optimum grounding effectiveness. An apparent d.c. resistance of just a few ohms can be indicative that the r.f. ground is hundreds of ohms above real ground. Be sure to add a large diameter flat washer to the bottom and top of the stack of ground braid leads connected to your transmitter ground stud and lock the stack in place with a lockwasher and nut.

It is important to weatherproof each point where different types of metal come in contact with each other, such as where your copper ground braid attaches to a brass or steel machine screw ground stud connected to the aluminum transmitter chassis. Failure to weatherproof these contact points will allow electrolysis (Galvanic Corrosion) to eat away at surrounding metal surfaces. Electrolysis is a process in which the chemical composition of the material (the electrolyte) is changed when electron flow (current) passes through it. The undesirable result of electrolysis is that electric current decays the surrounding material. Some amateurs simply cover exposed dissimilar metal connections with tape or spray it with paint. I believe that the silicone based sprays provide the best and longest lasting protection for these connection points and ESP is typical of these spray products. ESP (Extra Slippery Product) is manufactured by Sanico Chemicals, 13143 Saticoy Street, North Hollywood, California 91605 (telephone 213-875-2211) and it conforms to Military Specification MIL-I-8660. There are several similar products on the market and one should be able to easily obtain a suitable spray.

Most amateurs just protect connections that are exposed to weather. These outside connections are the ones that must be protected. However, it is a good practice to cover all ground connections to prevent electrolysis and oxidation.

The station ground lead must be securely attached to the external ground. As an example, if you are connecting a copper ground braid to the copper outer surface of a ground rod, it is best to clean the connecting surfaces of the braid and rod and then solder them together. The braid should be wrapped almost a full turn around the rod and you will probably have to use a hand-held torch to make a good solder connection.

(Continued on page 82)

Here are plans for a home-made dual-band vertical antenna. Author Russ Rennaker shows how to build your own.

An Effective 40-75 Meter Vertical Antenna

BY RUSS RENNAKER*, W9CRC

There has been so much written about antennas recently that I hesitate to add my two cents worth. Yet I have had so many requests from stations I have worked asking for information that it may be of general interest to those amateurs like me, who find pleasure in experimenting with antennas and still like to make their own.

There is nothing radically different about this antenna except, perhaps, the method of making and resonating the coils. Two problems in making traps or loading coils for verticals (or dipoles for that matter) become apparent. One is how to make them waterproof and the other, and more difficult, is how to easily resonate the coils to frequency. This method presented here makes both problems easy.

I used 1½" (inside diameter) plastic water pipe, the rigid kind, for the coil forms. This is easily available from any plumbing source and consists of ¼" walls making the o.d. 2". 1½" aluminum tubing just slips easily inside the plastic pipe and, when sealed with epoxy, becomes absolutely waterproof. The coil forms (A in fig. 1a) are ten inches long. The aluminum tubing inserts (B in fig. 1a) I made ten inches long also but they may be any length long enough to provide rigidity to the antenna. They are inserted into the plastic pipe four inches, leaving two inches of space between ends in the center of the plastic pipe. This spacing is not critical however. The capacitor tubing (C in fig. 1a) is ¾" aluminum tubing ten inches long. The end supports (D in fig. 1a) in my case were turned out of some walnut stock I just happened to have but could be any insulating material that could be turned down. The idea is to be able to keep the inside tubing centered in the outside tubing. These insulating ends should be turned down so that they fit snugly but not so tightly so they may not be moved in or out when resonating the coil. The stub, however, that goes inside the inner tubing should fit tightly, preferbly held in place with epoxy to keep it from slipping out when the antenna is erect.

I wound my coils with #12 bare copper wire with nylon cord separating the turns. I then brushed clear epoxy over the whole thing making a very rigid coil, impervious to moisture. I wrapped the entire assembly with plastic tape but I doubt if that was necessary. The 40 meter coil consists of 30 turns of #12 bare copper wire wound around the plastic pipe and fastened to metal self tapping screws (a and b in fig. 1b). These screws pass through the plastic pipe and fasten firmly into the aluminum tubing. Care must be taken here that these screws do not go through the aluminum tubing far enough into the air space between the two tubes that might cause r.f. flashovers. One screw however, (E in fig. 1a) must be left long enough to go through the outer tubing and penetrate the inner ¾" capacitor tubing, to form the connection between the inner and outer tubes. Obviously the opposite end of the inner tubing must *not* be connected to the outer tubing, thus forming a capacitance across the coil.

The coil may be easily resonated using a grid dip meter. The method is simple. Loosen metal screw E enough to be able to move the resonator in or out by inserting a wood dowel

*1011 Linda Drive, Kokomo IN 46901

Fig. 1 – In (a), dimensions for the coil forms and the aluminum inserts. In (b), a picture of the 40 meter coil.

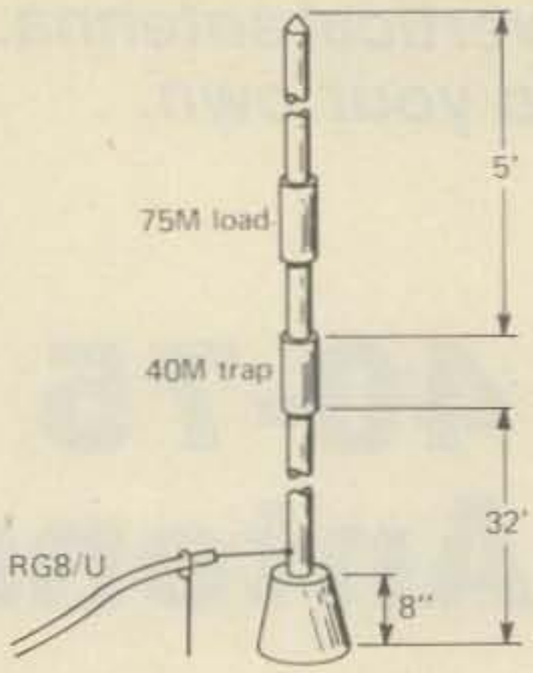


Fig. 2 – The overall dimensions of the antenna and the method used to feed it.

(do not use metal for this) into one end or the other pushing it farther in or out of the coil form until you have it resonated as required. Each time you make a measurement with the grid dip meter be sure you have tightened screw E down against the inner tube. Note also that the hole for screw E in the outer tubing should *not* be a clearance hole, in other words screw E must fit tightly into both the outer and the inner tubes to form a good connection.

When you have adjusted the coil to the resonance frequency (in the case of 40 meters it should resonate at about 7.1 MHz for the phone band) take screw E out and drill a hole into the inner tube so that the screw will now permanently connect with the inner tube. Of course at this point care must be taken not to move the inner tubing while drilling the hole or you may find your coil off resonance when you tighten the screw down again. In my case I used another screw on the opposite side (a) to hold the tubing in place while I drilled the hole for E. This screw can be left in contact with the inner tube or you may want to repeat what you just did with E and screw "a" into the inner tube just as you did screw "E." As a matter of fact I used four screws at each end of the plastic pipe to hold the aluminum tubing more firmly into the plastic pipe—of course at only one end did the screws penetrate into the inner tube.

The 40-75 meter vertical antenna. Note the 40 meter trap and the 80 meter loading coil near the top.

The length of the antenna proper, of course, will decide the resonance frequency of the antenna. I used a 12 foot section of 2" tubing for the lower section and a second 12 foot section of 1½" which telescoped into the 2" nicely. This is the place to adjust the length of the 40 meter antenna. The 40 meter section should be adjusted correctly to the frequency in the band at which you wish to operate *before* the top section is adjusted for 75 meters, since any adjustment of the lower section will also affect the 75 meter section—but not so in reverse. The 75 meter loading coil was constructed like the 40 meter trap except it consisted of 20 turns of #12 bare copper wire and was resonated at 4.1 MHz (because it is a loading coil and not a trap it must be resonated above the 75 meter band). The top section above the loading coil was then cut to the proper length to bring the 75 meter antenna into resonance wherever you wish in the band. The top section could consist of telescoping pieces to make this adjustment easier, but I cut mine to formula and it was just right the first time.

The antenna is fed at the base with RG8/U, the shielding grounded and the inner conductor connected to the aluminum tubing near the base insulator. The bottom of the antenna should be about eight inches from the ground but this dimension is not critical. In my case I buried 120 radials out from the base of the antenna and connected the whole thing with a #6 copper wire to the plumbing in the basement. The better your ground system the more effective your antenna will be. I have 1.1:1 s.w.r. across the 40 meter band and about 1.5:1 at the center of the 75 meter phone band. I supported the antenna with an insulator at the apex of my house roof at about the 12' point and attached nylon guys just above the 75 meter load coil. Also be sure you seal the top of the antenna tubing so water will not run down inside your antenna. I simply turned a piece of wood to just fit into the end of the tubing and used epoxy to hold it in place and to make it waterproof.

While this particular antenna is designed for only 40 and 75 meters I have made all-band verticals the same way. In that case, however, the 10, 15 and 20 sections all operate at ¾ wave while the 40 and 75 operate at ¼ wave as they do in this one. One advantage of this antenna is that no matching arrangement need be used and random length non-resonant coax may be used. With a good ground system the impedence of the antenna at the base approximates the impedence of the RG8/U closely enough. CQ

A typical trap coil and the "capacitor" tube that fits inside the coil section.

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

For a different twist this month, we thought that we would offer a neat solution to a problem that occurred at the author's office. Being in a relatively new field (fiber optics) and in a new company, the budget for test equipment was soon used up and the need arose for an environmental test chamber to do temperature testing on various circuits.

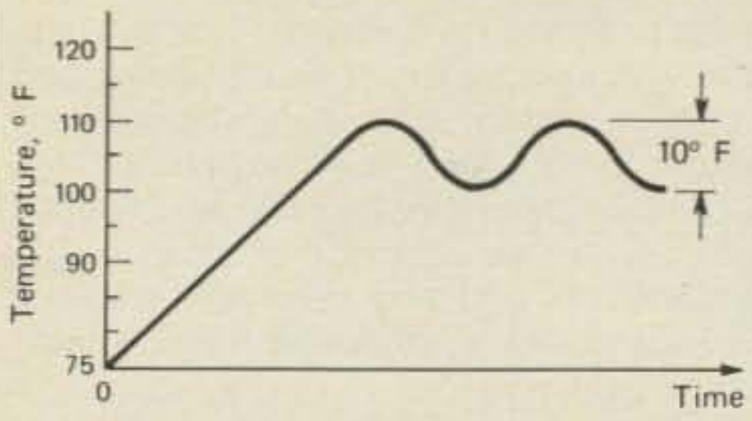


Fig. 1 – Initial temperature plot.

An immediate thought was to purchase a surplus, second-hand commercial temperature chamber. One quick look at the quoted prices of $200 and up soon changed our minds however. The next idea was to purchase a simple oven of the toaster/broiler type and use it. Its size was perfect for the circuitry used, and even better, the local discount house had reduced the $24.95 model to $18.00!

We immediately purchased one and hooked it up. The low end of the thermostat did indeed work however, at any given temperature, 100°F for example, the excursion of the thermostat was at least 10°. This meant that the inside would vary from 100° to 110°F. Such a range unfortunately did not let one know at what temperature the circuit was actually operating. Fig. 1 shows a temperature plot of the unit that was taken as we turned it on.

Our final solution was to remove the internal thermostat and replace it with a very simple proportional control circuit. This did the trick as can be seen by the second temperature plot, (fig. 2). Now, the total excursion was only ¼°— perfect.

The schematic diagram for the proportional controller is shown in fig. 3. It is very inexpensive and if all the purchased parts are new it will cost less than $10. This, coupled with the $18 cost for the rest of the oven, results in a unit that performs as well as commercial test chambers at a tiny fraction of their new or used cost.

In operation, a thermistor RV, and resistor-potentiometer combination

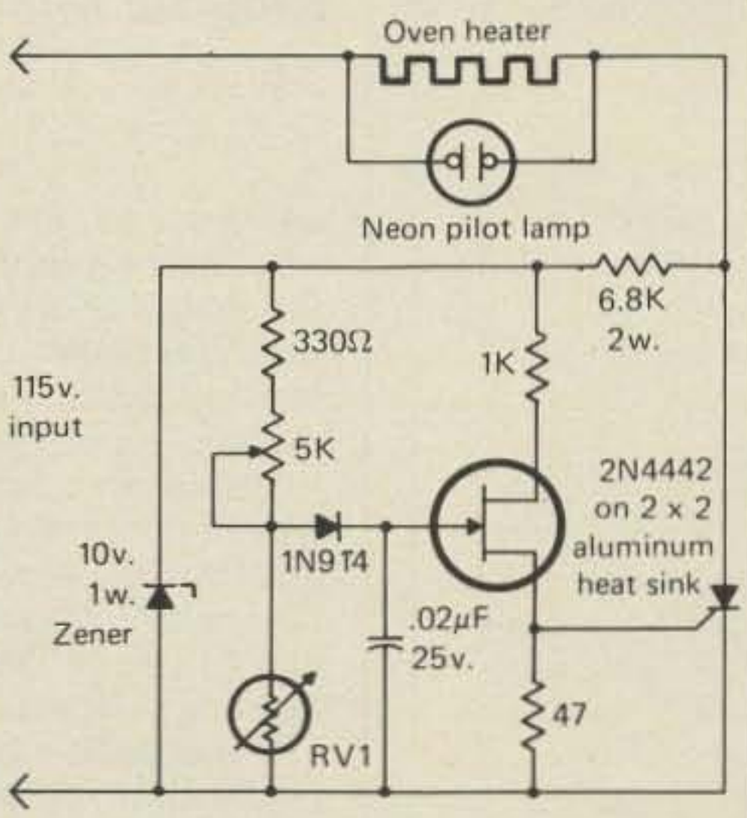


Fig. 3 – Schematic of proportional control circuit for oven. The pilot lamp tells when the heater is energized.

form a voltage divider across a 10 volt zener diode. The output voltage of this divider is applied to the base of a unijunction transistor and a .02 microfarad capacitor. Since the 10 volt zener is connected directly to the a.c. line, the voltage across the capacitor will be a ramp, (as shown in fig. 4) during positive half cycles. The slope of this ramp is a function of the ratio of the thermistor's resistance (temperature) and the setting of the potentiometer. When the voltage across the capacitor reaches the firing voltage of the unijunction transistor, it fires and turns on the SCR which applies power to the load. As also shown in fig. 4, the negative half cycle of the a.c. input turns off the SCR and the cycle repeats.

In operation, when power is first applied the oven winding heats, since the resistance of the potentiometer is lower than that of the thermistor, and the SCR fires early in the cycle. As things

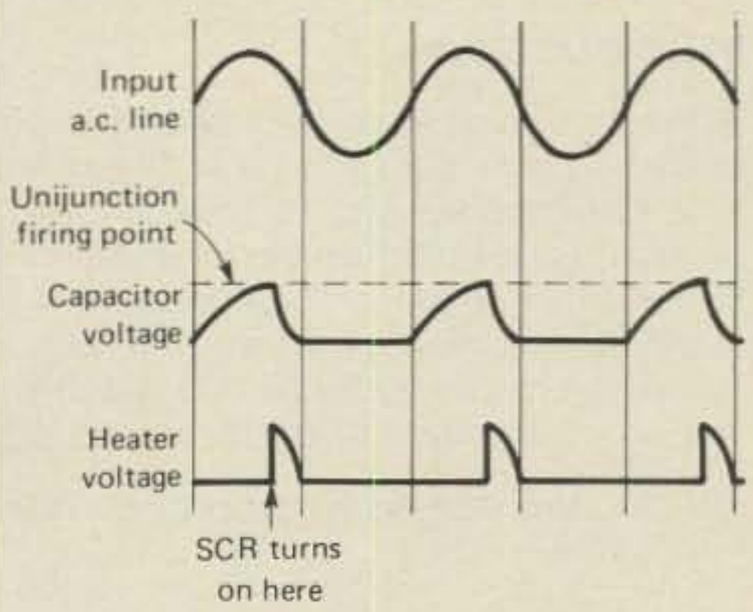


Fig. 4 – Waveshapes of circuit in fig. 3.

heat up however, the thermistor's resistance drops and the SCR fires later in the cycle supplying less power to the oven. Finally a point is reached where the SCR fires so late in the cycle that the amount of power supplied is just enough to compensate for the heat being lost through conduction or convection.

In building the circuit, we utilized the space available in the original oven/broiler housing, as the entire circuit with pot fits on a board 2 x 2 inches. A simple heat sink cut of a 2 x 2 inch piece of tin-can stock aluminum was bolted to the SCR to help with heat dissipation. The thermistor was clamped to the wall of the oven just under the heating ele-

(Continued on page 82)

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

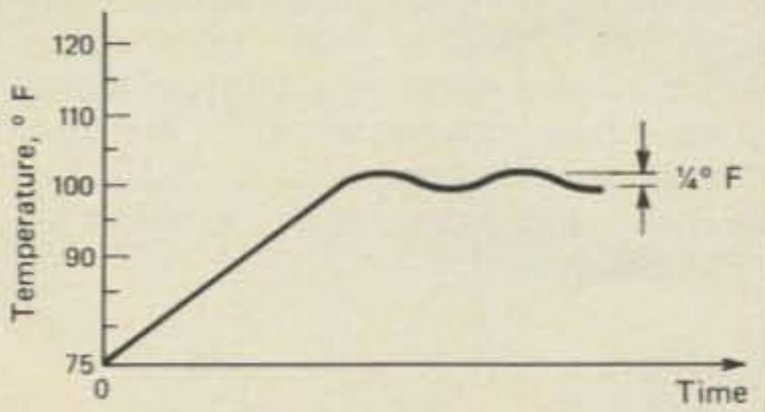


Fig. 2 – Temperature plot after modification.

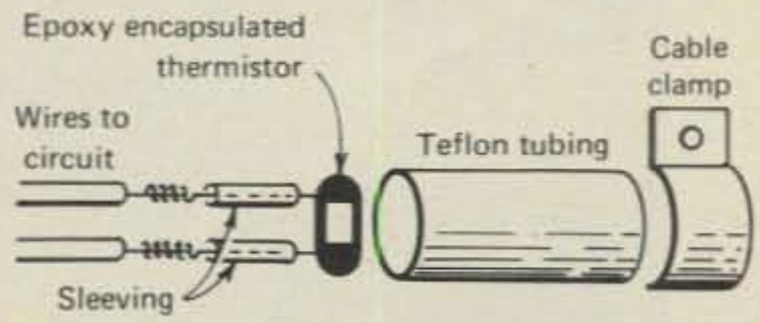


Fig. 5 – Exploded view of thermistor mounting.

If you're looking for a simple, inexpensive and elegant solution to your two-meter mobile antenna needs, read WA4TPE's construction details.

THE R.F. FAUCET

A Simple Two Meter Mobile Antenna

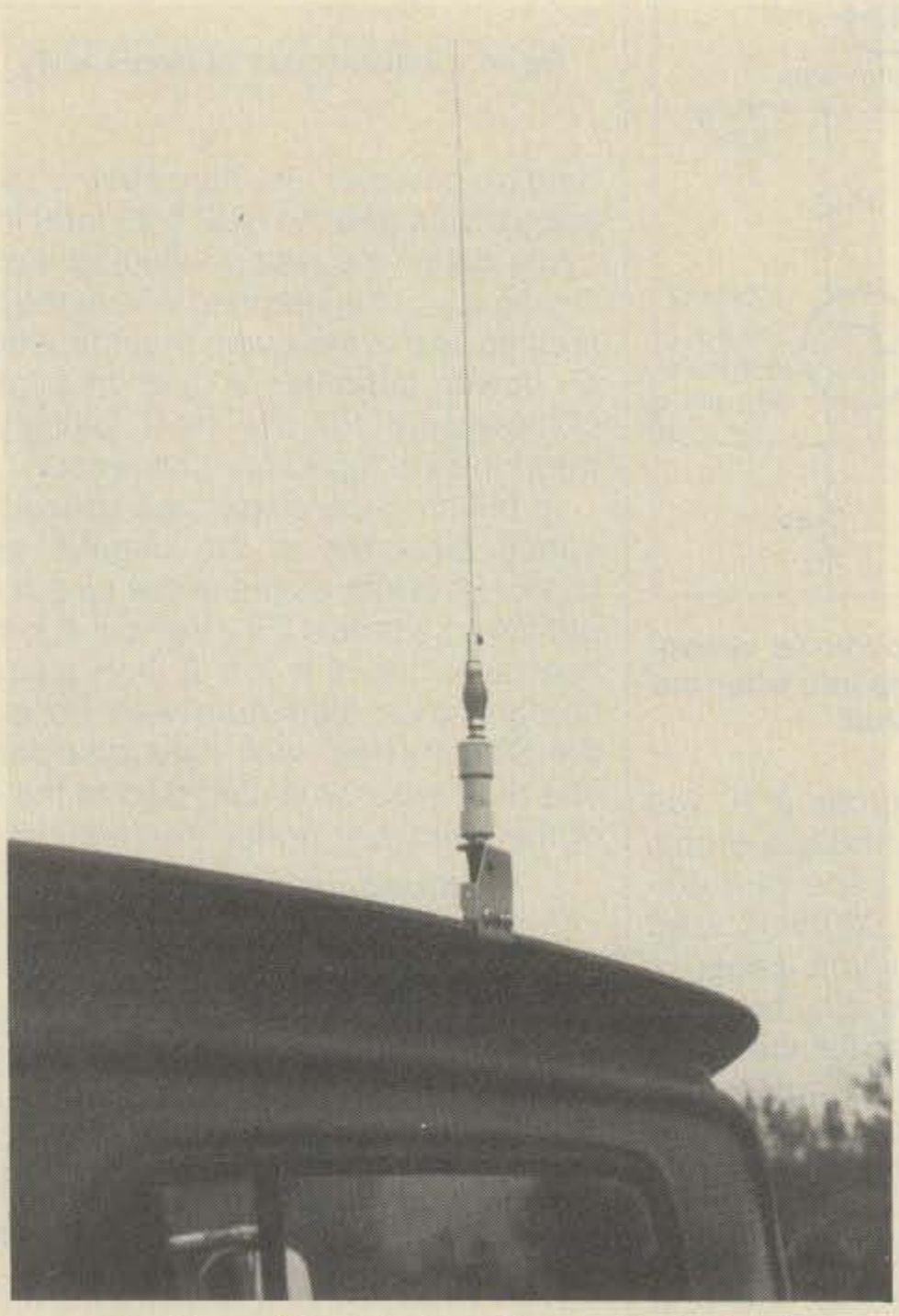
BY M. EDWARD TUTWILER*, WA4TPE

Introduction

In recent years there has been a proliferation of commercially built amateur radio gear. Where the hobbyist once had to convert or construct, he now can buy. The only obstacle to obtaining a desired article now seems to be the amount of money one has on hand. Certainly, this equipment availablity is wonderful; however, that only obstacle sometimes becomes an insurmountable one. Such was the case recently with Neil Buckingham, WA4KKL, and myself. As is the case in many situations, a need produced a method.

The problem at hand was how to obtain an efficient, good quality, 2-meter, mobile antenna without spending next week's grocery money to buy it. After much experimenting, the solution to the problem became the antenna described in this article. Since a highly visible part of the antenna is a section of plastic water pipe and two pipe end-caps, it seemed natural to call the finished project an *R.F. Faucet*.

*RFD 1, Box 432, Waynesboro VA 22980



RF Faucet *installed on the author's truck.*

General Information

Basically, this is a junk box project. Four units have been built, none identical; however, all perform equally well. A quick glance at the materials list shows that no exotic parts are required. Everything could be purchased at local hardware and electronics parts stores at a total cost of $10-$12. But substitution with materials at hand was, and is, the watchword. For instance, judicious horsetrading at a local hamfest produced spring base assemblies for 50¢. Also, two models have been constructed using replacement automobile antennas with attached spring assemblies. This type of spring is not electrically shorted with a bonding strap, and this may allow the s.w.r. of the completed antenna to vary somewhat; although, the units constructed in this way do not seem to be seriously affected. As a net result, the cost of the last unit built was around $5.

The chassis mount RCA-type connector may prove to be a bit difficult to obtain locally. The ones used in the project were purchased as scrap from an electronics manufacturer; however, any similar type connector could be used as long as the outside mounting diameter does not exceed ⅜ inch (.953 cm). Even this limiation can be bypassed if some forethought and planning are employed. For example, one of the antennas Neil and I built has a length of cable soldered permanently in place without any connector, and another has a mounting stud insulated from ground and used as a connection for a ring terminal. The use of a small r.f. connector soldered in place does provide ease of mounting, portability and attractiveness. If you chose to wire the cable directly to the loading coil without using a connector, a means of grounding the cable shield and mounting the antenna assembly can be easily improvised.

Theory of Operation

Technical reference for this project may be found in Section

27-3 of the 20th edition of the *Radio Handbook* (William I. Orr, Editor and Engineers, division of Howard W. Sams & Co. Inc. Indianapolis, Indiana).

Technically speaking, The *RF Faucet* is a ⅝-wavelength vertical antenna. The field strength reaches a maximum figure when an antenna is ⅝-wavelength high. This fact allows the ⅝-wavelength antenna to provide a 3 dB power gain over the more common ¼-wavelength vertical antennas. Since the feedpoint of a ⅝-wavelength antenna is reactive, a series inductor is required to establish a non-reactive termination. Quarter wave radials are normally required with a vertical antenna; however, the vehicle body serves this purpose in a mobile installation.

The final desired length of a ⅝-wavelength vertical antenna is determined by the following formula:

$$\text{Length in meters} = \frac{300}{(\text{operating frequency in MHz})\ (.625)}$$

Any mounting base (spring, etc.) is included in the overall measured length, but the matching inductor is not. In the case of the *RF Faucet*, it worked well when the spring and vertical element together measured 50.32 in. (1.278 m). This length was based on an operating frequency to 146.7 MHz.

Construction and Testing

Construction

Begin the construction of the *RF Faucet* by fabricating the connecting termination. The procedure detailed below describes the method when the RCA-type chassis mount connector is employed. As noted previously, another type of connector could be substituted if the diameter is the same or smaller than the ⅛ IPS, ⅜ o.d. pipe nipple. If the feedline is to be wired permanently in place, fabricate the termination less the connector.

(1) Thread a hex nut onto one end of the nipple, and solder it in place. Be sure to not close the opening through the nipple with solder.
(2) Solder a 3 inch (7.62 cm) length of #22 stranded hookup wire onto the connector terminal.
(3) Cover this connection with a short length of slip-on or heat shrinkable insulation.
(4) Thread the hookup wire through the nipple, and slip the mounting portion of the connector into the nipple.
(5) Solder the connector in place. Be sure to use a very thin bead of solder to prevent fouling the threads of the nipple.

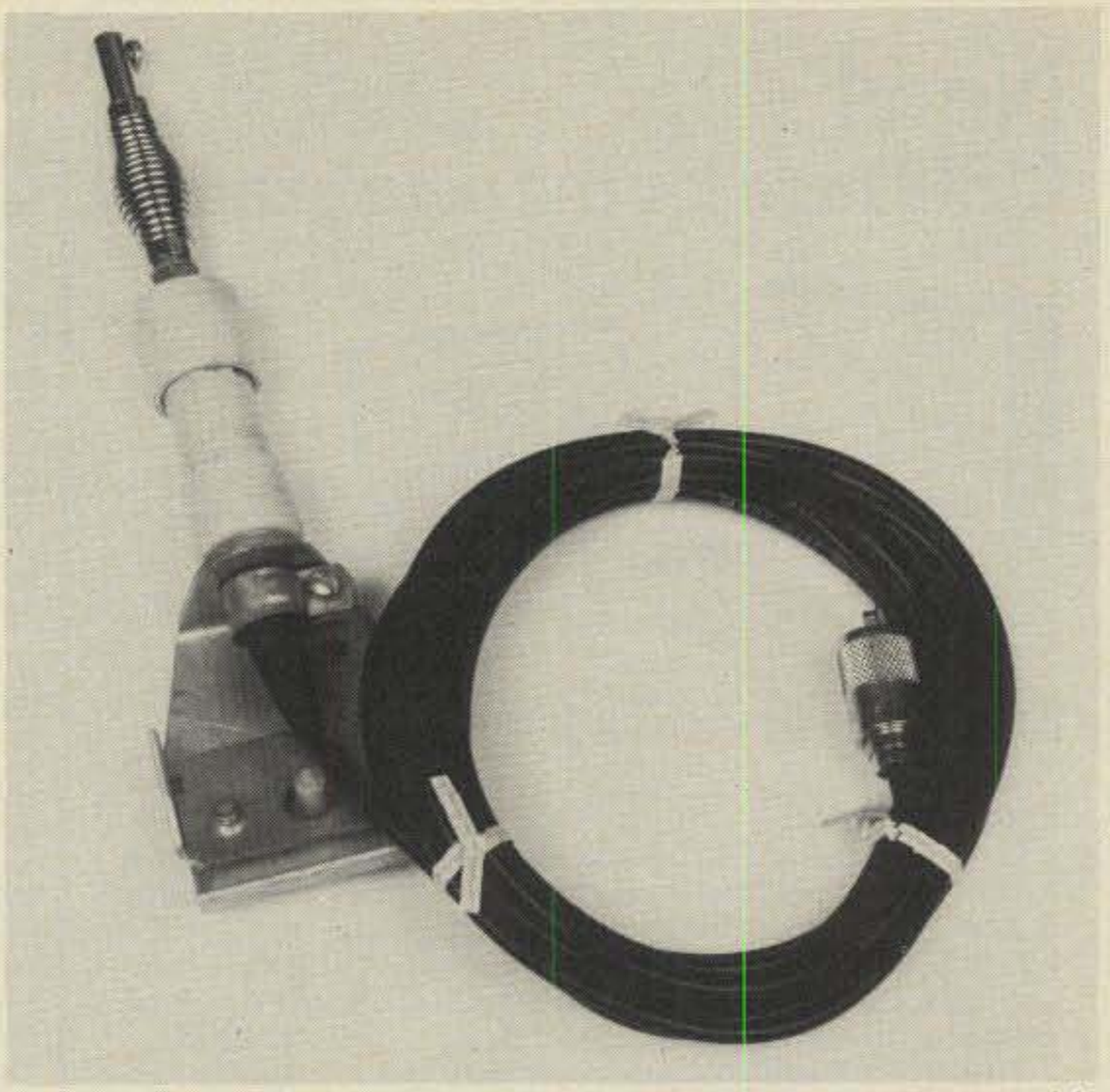
The next step is to wind the series inductor per the materials list. Five turns are generally too many; nevertheless, the matching does differ slightly from unit to unit, and it is best to have ample inductance to play with. Once the coil is wound, solder a ring terminal at one end and bend the ring terminal to a 90° angle.

The spring base assembly should now be assembled per the following procedure:

(1) Drill a ¼ inch (.635 cm) hole in the center of one plastic end cap.
(2) Place the ¼-20 × 2 inch screw through the inductor ring terminal, a lockwasher, and the plastic end-cap. Thread a waterproofing washer (rubber, plastic, etc.) and a hex nut onto the screw, and tighten the nut.
(3) Screw the spring base onto the protruding screw end.
(4) Once the end cap assembly is put together, the base length can be determined, and the steel whip cut to achieve the desired overall length of the radiating element. Be sure to measure the length to include the whip and the spring base, *but not* the inductor.

Assemble the remainder of the *RF Faucet* as follows:

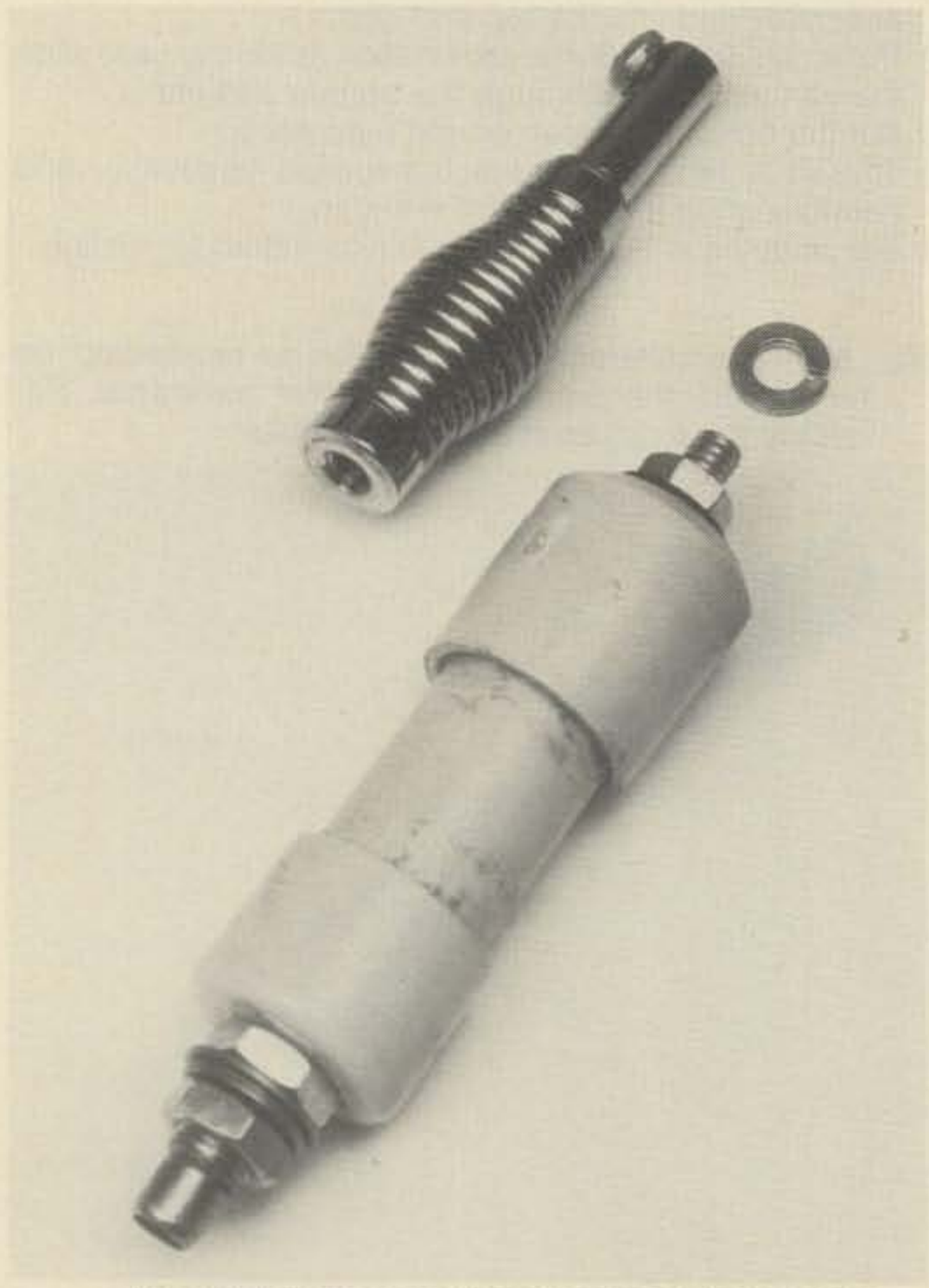
(1) Drill a ⅜ inch (.953 cm) hole in the other plastic end cap.
(2) Cut the section of the plastic (PVC) water pipe to a length which will be a bit longer than the inductor when the section is in place in the upper end cap. Exercise care when sliding the pipe section over the inductor for sizing since the fit is rather snug.
(3) Route the connector wire through the inside of the coil, and tack solder it in place three (3) turns from the top of the coil.
(4) Slide the pipe section over the connector termination assembly and into the top end cap.
(5) Put a star washer on the termination assembly, and slide the connector end through the bottom and cap.
(6) Put the bottom end cap on the pipe section.
(7) Thread a hex nut on the termination assembly, and carefully snug it against the end cap.
(8) The antenna is now temporarily assembled for testing.



Completed RF Faucet *spring base and loading coil assembly mounted on a gutter clamp ready for installation. Other means of installation mounting are certainly permissible.*

Note: Should a different connector (or no connector) be employed, the procedure will differ somewhat. Basically the final result should be similar.

Completed loading coil ready for final assembly.



Assembled RF Faucet *components (less whip).*

Testing

The *RF Faucet* must be mounted in some manner to a large section of metal to simulate the ground plane provided by a vehicle body. I used a Radio Shack Model 21-911 gutter clamp mounted to the bottom of an overturned wheelbarrow. Once mounted, connect the antenna through an s.w.r. meter to a suitable r.f. power source.

The measured s.w.r. should be below 2:1 without further experimenting. Optimum results can be achieved by varying the tap placement on the inductor. Standing wave ratios in the neighborhood of 1.5:1 can easily be achieved. Obviously, the testing action requires mounting and unmounting, and assembling and disassembling the unit several times. It seems like a big job, but the entire procedure consumed less than an hour.

Final Assembly

The loading coil portion can now be permanently assembled as follows:

(1) Examine the solder joint at the inductor tap, and examine all other internal electrical and mechanical connections for good permanent junctions.
(2) Use plastic pipe cement to glue the pipe section to the end caps.
(3) Tighten the hex nut securing the termination assembly.
(4) Make a final electrical test to see that everything remained in place.
(5) A liberal dose of silicon rubber at all seams and crevices is acceptable, but certainly not required. It is a good idea, however, to seal the connector/feedline connection against the elements. The model illustrated is sealed with a rubber boot and a small hose clamp.

Summary

The *RF Faucet* antenna is a simple and inexpensive project to build. It is uncomplicated enough to be carried through to completion without major snags, yet challenging enough to hold the builder's interest due to the various improvisions allowed.

The unit is sturdy and reliable. Having survived 20,000 miles of travel and the coldest winter on record, the s.w.r. on mine still measures 1.4:1.

Bill of Materials

Spring Base Assembly	Similar to Russell Industries Inc. part number HAS-1H
48 inch (1.219 m) steel whip	Similar to Russell Industries part number CAR-1H
RCA-type chassis mount female connector	Similar to Lafayette Radio Electronics part number 99R62341
6 inch (15.24 cm) length of ¾ inch (1.905 cm) i.d. PVC water pipe and 2 PVD pipe end-caps	Plumbing supply store, hardware store, etc.
2 inch (5.08 cm) length of ⅛ IPS, ⅜ inch (.953 cm) o.d. threaded pipe or pipe nipple	Available in hardware stores which stock lamp parts.
Inductor	5 turns #12 bare wire. Wound on ½ inch from with turns spaced ⅛ inch apart.
Misc. hardware	Ring terminal(s) ⅜ inch ⅛ IPS hex nuts and star washers ¼–20 × 2 inch screw, lockwasher, rubber washer, and hex nut

The old saw says, "You don't get something for nothing." Canadian amateur Pete Walton explains the price he and his fellows pay for the "oversized" phone band they have.

It's Not all Roses for the VE

BY PETE WALTON*, VE3FEZ

While listening to and talking with amateurs south of the border I often hear the comment "Why don't you Canadian fellows give up your extra phone band segments and buy linear amplifiers?" The general feeling seems to be that we Canadians have unfair advantages over the American amateur and if we were to give up our extra phone band segments and use higher power the competition would be a little more equal. I must admit that these extra phone band segments are very nice to have and possibly they do give us a slight edge in DX. We do however have some disadvantages that some of the U.S. fellows are not aware of. Our biggest disadvantage is the availability and price of parts and equipment.

As you probably already know almost all of our equipment and components have to come across the border from the U.S. suppliers. There is almost no Canadian equipment on the market and what is manufactured here is usually very difficult to obtain. As soon as commercial gear or parts come across the border they are subject to about 30 percent charges in duty and special taxes. If we can get the equipment at all we must immediately pay 30 percent more than the American amateur. Some time ago I ordered a popular Japanese transceiver from our local dealer. I had to wait seven months for it to arrive. At that time it was selling in the U.S. for $499.00. When I finally received it I had to pay $670.00 for the same unit.

Another excellent example of what we VE's have to pay for parts relates to the frequency counter that I am presently working on. Nixie tubes for my counter are available for my counter from our local supplier for $5.40 each but he has only three in stock and would have to order the rest. I can order these same tubes from the U.S. for $2.50 each including the shipping. We do however have one way to get around these high duty charges on small orders. If you order anything for $5.00 or less from the U.S. it is not subject to duty charges and is usually sent directly to us from the Canadian Customs Dept. So how did I get my tubes! You guessed it. I sent three separate orders to a U.S. supplier, each one under $5.00, and this resulted in a saving of $17.40 on the readout tubes. The sending of three separate orders is a very time consuming and troublesome procedure both for the supplier and the poor fellow who is doing the ordering.

There are three IC's used with these Nixie tubes to make up a decade counter. My local dealer has all three of these IC's in stock for a total cost of $4.22. I can order all three of them from the U.S. for a total of $2.59. Since I require a total of 18 of these IC's you can guess again how I am going about ordering them.

Another problem that Canadian amateurs are faced with is the variety of components that is available to us. Sometimes we feel like crying when we get a hold of a U.S. catalogue and see all the goodies that are available to the American amateur. A lot of the components that are everyday items to you fellows south of the border simply just are not available to us in Canada without a considerable waiting period. I have had a transformer on order from my local supplier for four weeks now. The transformer is manufactured right here in Canada but the manufacturer will not sell directly to the amateur. You must go through one of his authorized dealers. The authorized dealer will not send an order to the manufacturer until he has 8 or 10 transformers to order as he does not like small orders. This results in a very long ordering delay for the poor amateur who needs a part that is manufactured only twenty five miles from his home.

The old timers are always saying, "Why don't amateurs today do more building and experimenting?" Possibly this parts situation is one of the chief causes for a lack of interest in building your own equipment. I personally would like to build many more projects if I could only obtain the parts that are required at a reasonable price and without such a delay and fuss in ordering. This parts situation is very frustrating to the new amateur who is probably still in school and not very well off financially. These new fellows want to get on the air for a reasonable price and this seems to be pretty hard to do in this day and age. There is also very little surplus equipment available here that could be put on the air without too much trouble. After visiting all three of our surplus outlets last weekend I found only one piece of gear that could be put on the air without any major and expensive transformation. This was an old command 75 meter transmitter that was priced at $27.00. No wonder many of the CBer's I talk to say they would like to be amateurs but could never afford it. I am almost beginning to believe it.

So as I said at the beginning, its not all roses for the VE but I must say that conditions are improving. We are starting to get some reasonably priced IC's available here now and the general availability of semiconductors seems to be improving tremendously. Possibly we deserve a little extra band space when you consider the prices we pay to use it. CQ

*421 Lodor St., Ancaster, Ontario, Canada

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

Some new things are cooking! *CQ's* subcommittee on WAZ and the DX Hall of Fame is evaluating the feasibility of a 5-Band WAZ Award. Enough comments have been received to say with certainty that the recommendation will be favorable.

In 1972, the CQ DX Award's Advisory Committee voted to establish the Single Band WAZ Awards rather than a 5-Band Award, as they felt that WAZ on 10 meters was next to impossible during the sunspot minimum. This judgment proved correct as the first Single Band certificate was not awarded until EA8BK made it this year on 28 MHz c.w., see the June issue, pg. 69. For the next few years it should be possible to work all zones on the 5 bands. Note that we said *possible*, certainly not easy. Five Band WAZ will be the most difficult and prestigious of the major operating awards.

The Subcommittee hasn't yet resolved the effective date for the award, but it will be offered for all c.w. or all phone, including s.s.b. More next month.

The Subcommittee is also considering several nominees for the DX Hall of Fame, and the next super DXer to be honored should be announced next month.

The CQ DX Awards Program

S.S.B.

563 . . . W7NJ
564 . . . PA2TMS
565 . . . HAØHW
566 . . . SM4ACH
567 . . . N7SW
568 . . . I8KNT
569 . . . W1PCD
570 . . . K3MWV
571 . . . I8IGS
572 . . . I8YZP
573 . . . WBØRTZ
574 . . . WB2RBG
575 . . . W8IMZ
576 . . . WB4AKY

C.W.

313 . . . W7KVV
314 . . . K4CEB

S.S.B. Endorsements

300 . . . YV1KZ/304
300 . . . I5WT/301
275 . . . W9SS/296
275 . . . W8ILC/286
150 . . . W1PCD/194
150 . . . WBØRTZ/189
150 . . . I8YZP/180
150 . . . I8KNT/177
150 . . . W8IMZ/170
150 . . . K3MWV/155
QRPp1W . . .
W8ILC/226 . . .

C.W. Endorsements

310 . . . ON4QX/315
250 . . . K4CEB/270
150 . . . K6DSK/199
150 . . . EA2OP/150

Complete rules and application forms for the CQ DX Awards Program can be obtained by sending a business size, No. 10, envelope, self-addressed and stamped to: "CQ DX Awards", 5632 47th Avenue S.W., Seattle, Washington 98136 U.S.A.

Another Guest Writer

After several nice comments on PAØTO's feature in the June issue of *DXing in Europe*, we asked Chip Margelli, K7JA, to write some impressions on DXing from Japan. Chip has lived in Tokyo for several months. We hope you will enjoy his observations.

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

THE JAPANESE DX COMMUNITY

by
Chip Margelli, K7JA
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Tokyo 146

The phenomenal growth of amateur radio in Japan is well known to most amateurs. In a few short years, the Japanese amateur population has surged past that of the United States by a large margin. This comes as no surprise to the American big gun who encounters a swarming pile-up every time he calls "CQ ASIA" on 15 meters. Familiar, too, is the inevitable pile-up of QSL's several months later.

A number of articles have been written about the JA population explosion, mostly dealing with statistics, awards, and the like. Little subjective, people-oriented information has been shared with U.S. DXers, mostly because few foreigners are in Tokyo long enough to form an opinion of Japan other than "it's a dynamic country" and "it's expensive!" Japanese DXers face a host of truly unique adversities, and I hope to share some reflections on these problems in a few short paragraphs. The goal is to foster better understanding between the American and Japanese DX fraternities.

JA DXers are a diversified lot, as are DXers everywhere. One finds, though, relatively few really "Old Timers" in DX circles. Rare, indeed, are tales of doing battle between 14.200 and 14.300 with 100% modulated full-carrier AM. Just count the number of JA two-letter calls in your log in the past year. In Japan, the overwhelming majority of amateurs have been licensed in the past 15 years. A reasonable generalization of the JA amateur community as a whole would say that they are young, and, for a time, highly motivated. What happens to this motivation?

Fukuoka, Japan is represented on the DX charts by Thoru Ono, JA6BVU, of Buzen City. Thoru is active in the CQ DX Award programs.

Few stations in metropolitan Tokyo sport antenna systems this large. Those "long wires" are not part of the station. (K7JA photo)

Shigeru Sugiyama, JA0AXV, is an avid DXer from his home QTH in Nagaoka, Niiagata, Japan. (Photo via Leo, K8PYD)

The number one problem facing JA DXers is that of overcrowding. Japan is an incredibly rugged country. Only a small percentage of the land will support human habitation. The result is that population densities of 1000 people per square mile are not uncommon in urban areas. Put another way, consider that an amateur population of some 400,000 is crammed into a land area the size of Pennsylvania. One can see that the JA's can work up only a limited amount of sympathy over QRM complaints by someone caught in the middle of a DX contest battle between the Potomac Valley DX Club and the Frankford Radio Club!

The Tokyo area (JA1) has, perhaps, 100,000 amateurs within ground wave earshot. An additional 50,000 or more are in daily single hop range in JA4, 6, and 8. Though the JA's are dedicated listeners, the appearance of a semi-rare DX station is cause for utter chaos on the listening frequency, unless the DX station takes extraordinary means to control the situation.

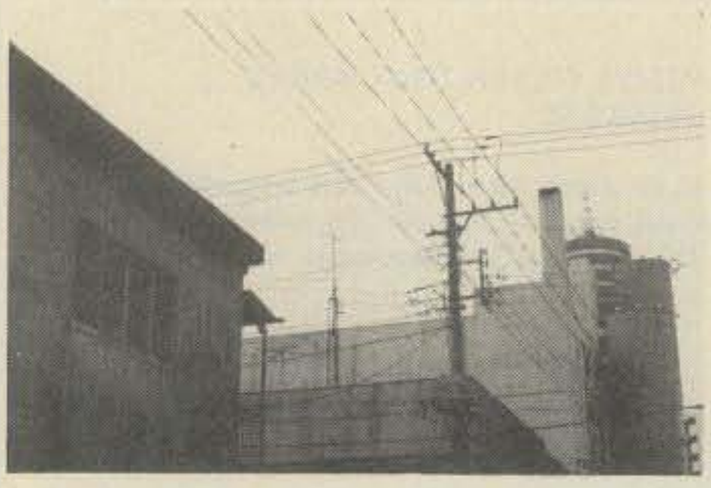
Tight regulations also contribute to the plight of JA DXers. On 160 meters, for example, Japanese amateurs are allowed a whopping 5 kHz., from 1907.5 to 1912.5 kHz. In a recent All JA Contest, it was estimated that some 2000 stations were active in this segment! One multi-operator station apparently picked out over 500 QSO's, but the other chaps must have developed acute headaches. On 75 meters, the situation is much better: the JA's get 10 kHz there!

The crowding situation confronts the Japanese DXer even before he can turn on his rig. Tower and antenna construction can be, for the urban dweller, a terrifying experience. American amateurs are accustomed to seeing pic-

Yasushi Koide, JA1FKJ, of the J.A.R.L. Technical Department demonstrates one of the League's modern headquarter's stations to CQ DX Editor K4IIF. It was a big change to hear a JT1 with a signal strength of 40 over S9. (Photo courtesy J.A.R.L.)

At J.A.R.L. Headquarters in Tokyo are left to right, Takenobu Kaieda, JH1HNH, Manager of the League's Publicity Dpeartment, CQ DX Editor K4IIF, and Tadao Kiga, JA1AR, Head of the League's Technical Laboratory. (Photo courtesy J.A.R.L.)

The J.A.R.L. QSL Bureau in Tokyo processes over 1,000,000 cards per month. Observing a Bureau worker sorting cards are left to right, QSL Bureau Manager Shinichiro "Yama" Yamazaki, JA1SGU; CQ DX Editor K4IIF and Nao Akiyama, JH1VRQ, Overseas Laison for J.A.R.L. (Photo Courtesy J.A.R.L.)



A typical urban dweller in Japan must resort to "apartment building backscatter." (K7JA photo)

tures of the W7RM, K5RC, W6AM or N6DX plantations, where Murphy is dressed as tree limbs or rattlesnakes. In Japan, "Murphy-san" comes dressed as electric train power lines, fist-shaking taxi drivers with 2 KW horns, and countless rows of wet laundry. Guy cables are practically unknown, as an extremely lucky (and wealthy) family may be so fortunate as to own a lot 20 by 50 feet in size. It should go without saying that a 40 meter beam is a rarity in downtown Tokyo!

One would expect that, in the face of severe limitations on the size of antennas, the difference would be made up through high power levels. There is no denying that some stations are capable of generating large amounts of r.f., but an astounding number of JA stations are, in fact, using the 10 to 20 watts stipulated for the Telephone Class of license (which is held by the vast majority of JA amateurs). The reason for this restraint should be clear: every houshold in these super-compact neighborhoods has a TV, stereo, and/or other RFI-susceptible device, almost none of which have any protection from high energy levels. In Japan, moreover, the average citizen has a more direct way of getting his TVI complaint addressed: instead of calling the JA version of the FCC, they call the police! One can imagine the damper placed on the DX ambition of an 18 year old when he is confronted by several uniformed officers backed by an irate neighbor.

One finds, to be sure, that many DXers give up in frustration, retiring to the relative calm of two meters. Mobile operation is another haven for former DXers, though the driving habits of some Japanese citizens do produce occasional conversations with the police while mobile!

Those who give up in despair, though, are quickly replaced by new and enthusiastic troops eager to do battle on

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of current countries on the DXCC list as of this listing is 318*. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted anytime. Updates indicating "no change" will be accepted.

C.W.

W6PT 318	W6ID 313	W2GT 306	K6JG 302	N6FX 296
K6EC 315	DL7AA 312	N6AV 303	W4BQY 301	K9MM 291
ON4QX 315	W8KPL 309	W9DWQ 303	W6ISQ 300	WA8DXA 291

S.S.B.

W2TP 317	W9JT 312	K6EC 307	W0SD 298	N6AW 282
I0AMU 316	F9RM 311	K9MM 307	W9SS 296	OK1MP 282
WA2RAU 316	SM6CKS 311	OE2EGL 307	HP1JC 295	W7JYX 282
DL9OH 315	W2QK 311	W4DPS 307	DL6KG 294	WA4WTG 281
G3FKM 315	K6WR 310	ZS6LW 307	JH1EIG 294	WB2RLK 281
W4EEE 314	WA2EOQ 310	I4ZSQ 305	DJ9ZB 293	VE7HP 280
XE1AE 314	I8YRK 309	YV1KZ 304	K8PYD 292	W7OM 280
K6YRA 313	I0ZV 309	VE2WY 303	K9RF 292	W9QQ 280
W3NKM 313	K4RTA 309	EA4LH 302	VE7CE 291	9H4G 280
W4SSU 313	K6JG 309	I5WT 301	W6FET 291	N2SS 279
W9DWQ 313	W9QLD 309	K9LKA 300	G3WW 289	K4SB 278
I8KDB 312	ZL3NS 309	W3GG 300	OE1FF 289	DJ2AA 277
K4MQG 312	K8DYZ 308	WB6DXU 300	SP5BSV 288	K9PPY 277
VE3MJ 312	OZ3SK 308	XE1KS 300	W8ILC 286	I6PLN 275
VE3MR 312	SM5SB 308	VE3GCO 299	OE3WWB 285	JH1VRQ 275
W3AZD 312	SM5CWK 308	N4MM 298	N6FX 284	K4LSP 275
W6EL 312	W6YMV 308	W9OHH 298	K3EH 283	K8LJG 275
W6EUF 312	F2MO 307	.....	.....	.....

SSTV

W8YEK 108	G3IAD 100	.....	.....	.....

*Geyser Reef was deleted effective this listing.

WA Z Program

Single Band WAZ

15 Meter C.W.

3 . . . DL7AA
4 . . . JE1JKL

20 Meter C.W.

48 . . . KH6HC
49 . . . N7UT
50 . . . JF1DSN

15 Meter Phone

4 . . . JH2MYN

20 Meter Phone

123 . . . W9NSM
124 . . . VE6HT
125 . . . W6ORD
126 . . . VE7DSR
127 . . . EA4JF
128 . . . SM4ACH
129 . . . I8YZP
130 . . . I2OMF
131 . . . JA3GM
132 . . . W6ZUM
133 . . . N7OK
. . .

80 Meter Phone

3 . . . OH7XX

All Band WAZ

S.S.B.

1470 . . . W4HYY
1471 . . . W2BAI
1472 . . . K9FN
1473 . . . N9BA
1474 . . . K4XP
1475 . . . N4CC
1476 . . . WD8BJK
1477 . . . W7LIR
1478 . . . W6ZUM
1479 . . . W8TN

C. W.-Phone

4247 . . . K4XP
4277 . . . G3JZG
4278 . . . K9DID
4279 . . . W3HER
4280 . . . K1WJ
4281 . . . W6ABT
4282 . . . JH4OGD
4283 . . . WA4LOF
4284 . . . WB4TDH
4285 . . . F5RU
4286 . . . UV0EX
4287 . . . W4WX
4288 . . . OK1DKR
4289 . . . JA1TNV
4290 . . . K8RD
4291 . . . VE3EUP
4292 . . . N4TX
4293 . . . JA2ETQ
4294 . . . W2KLN
4295 . . . WB8ZRV

The complete rules for WAZ are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the WAZ Manager, Mr. Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904.

The WPX Program

Mixed

658 . . . JA3VXH
659 . . . K4KKJ
660 . . . SP9CTW
661 . . . DM2GFL

S.S.B.

1053 . . . G3TSZ/m
1054 . . . WB5UKI
1055 . . . F3CY
1056 . . . JA3VXH
1057 . . . I8KNT
1058 . . . EP2TY
1059 . . . K6ASI
1060 . . . G4EJA
1061 . . . KL7HKE
1062 . . . DM2CON
1063 . . . OE1SKC
. . .

C.W.

1705 . . . F3CY
1706 . . . AA4FF
1707 . . . VE7CNE
1708 . . . SP7KTE
1709 . . . SP2ZHB
1710 . . . JH3KAI
1711 . . . DM2CKD
1712 . . . SM6AYM

WPNX

116 . . . WD4MHY
117 . . . WD0BZY
118 . . . WD9GBB
. . .

VPX

145 . . . DM-2968/L
146 . . . DM-2604/F

Endorsements:

Mixed: 400 JA3VXH, K4KKJ, DM2GFL, 800 WA2AUB, 1000 SP9CTW, I0JX, 1100 YU2OB
SSB: 300 G3TSZ/m, WB5UKI, F3CY, JA3VXH, 18KNT, EP2TY, K6ASI, G4EJA, KL7HKE, DM2CON, 400 OE1SKC, 550 WA4QMQ, 1200 K2POA.
CW: 300 F3CY, JH3KAI, SM6AYM, 400 VE7CNE, SP2ZHB, DK7XX, 500 SP1ADM, 650 K9WA, W9OYZ, W1OPJ, 750 W6BZ, 1100 G2GM, K8MFO.
20 meters: PA2TMS
40 meters: WA2AUB
80 meters: DM2GFL
160 meters: YU2OB
Europe: I2OMF, SP2ZHB, G3TSZ/m, DM2GFL
No. Amer.: AA4FF
Oceania: YU2OB
So. Amer.: YU2OB.

Complete rules for WPX can be found in the May, 1976 issue of CQ Magazine. Application forms may be obtained by sending a business-size, self-addressed, stamped envelope to "CQ WPX AWARDS", 5014 Mindora Dr., Torrance, Calif. 90505. U.S.A.

the DX front. That they are active can be verified by looking at one's logs; JJ1's and JK1's will be in the majority on 15 meters now, while a few years back the JR1's and JE1's were prevalent. The author recently ran a whole page of JE3's without interruption, to illustrate this phenomenon.

These newcomers have specialized needs, not the least of which is QSL's. When you were a beginner, you were, as we all were, eager for a QSL, any QSL. For many years, the Japan Amateur Radio League has addressed this need with an efficient QSL bureau, which it sponsors as a membership service. This bureau, which handles *domestic and foreign* QSL's, both outgoing and incoming, has allowed JA DXers to QSL in a very cost-effective way. Until the ARRL outgoing QSL bureau was inaugurated, American DXers had no such service. That some U.S. stations, swamped by up to 10,000 QSL requests per year, do not QSL promptly (or at all) is a situation which many JA's, new and old alike, cannot comprehend. The problem is exacerbated by the fact that the few stations a JA "little gun" can work are the ones most inundated by QSL requests.

Despite all these obstacles, DXing in Japan is an extremely popular sport. Radio shops in the Akihabara, a discount area of Tokyo, are packed with amateurs seeking the latest box which will help them sort through QRM. Applications by the hundreds for CQ DX Awards, DXCC, and other certificates stream from JA amateurs every month. And the living situation has its bright side: zoning restrictions are unknown in Tokyo! This is quite peculiar, as the destruction of the latter days of WWII gave the opportunity for the laying of some solid foundations in urban planning. Any visitor to Tokyo will testify that a seemingly deliberate effort to the contrary was made by the city fathers, and tribanders can be found next to luxury apartments, atop fashion boutiques, and within corona discharge distance from the bullet train high voltage lines!

A few concluding operational tips are in order. Any DX-pedition far removed from Japan would be well-advised to operate split-frequency when the band is open to JA; otherwise, their own signal will be quickly obliterated by QRM. Working by call areas is very effective: rates approaching 300 QSO's per hour have been attained by calling for JA3's, then JE3's, then JF3's, etc., on my several trips to Saipan and KG6SW. It is essential that control be kept of the calling sequence, and limiting the number of stations calling at any one time is an effective tool for accomplishing this. For casual operation, the ability to utter even a few phrases of simple Japanese will win you many friends, and may assist when trying to cool off a heated pile-up!

And, finally, remember . . . what may be, to you, "just another JA QSO" may be, for the JJ1 sneaking away from her homework, a first-ever exchange of words across the ocean. Whether the memory of that first DX QSO is a fond one, or a heartbreaker is up to you.

Masa Saito, JA8IEV, returned to Japan from Marcus Island in February. He operated JD1 and passed out a new one to many DXers. Masa specializes in 40 meters, and has worked all zones and over 200 countries on 7 MHz. using a groundpiece antenna with 20 radials.

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

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

Charles E. Gagon, Jr., W1LQQ. All Counties #163, 1-18-77

"My entry into this world was on July 2, 1917 in a place called Marblehead, Massachusetts, the claimed 'Birthplace of the U.S. Navy.'

"My introduction to ham radio was in 1936 when a friend showed me his 5 meter gear and had a contact with a station in New Hampshire. That did it, and in 1938 I passed the General Examination, and in those days the license arrived at my home in 9 days.

"I tried 5 meters with loop modulation, a bit dangerous but successful. I did finally settle on 40 meters with an oscillator and a 210 final with about 20 watts and a National SW-3 receiver.

"In May 1941 I entered the Navy and spent most of the time with anti-submarine warfare, although I was rated as a Radioman. I carried this rating until my final discharge in 1952.

"Back in 1942, I was married to wife Edith and we have been going strong for 35 years. We have two children but neither is interested in ham radio but both have tried CB and our daughter still has one on the air.

"When discharged from the service, I went to work as a technician with CBS Electronics (now defunct), and was promoted to Supervisor of Quality Control. I did some labratory work in the early days of color TV, and also with stereo amplifiers and cartridges. After the closing of CBS Electronics, I went to EGG in nuclear instrumentation and from there to my present employment in New Hampshire, again in Quality Control.

W1LQQ showing some of his equipment and certificates.

"My introduction to County Hunting came as a result of trying to clear the frequency for the YLISSB system. I got hooked with the lively activity and stuck around to find out what was happening. I had finished my WAZ after 35 years of hamming, so I needed a new challenge and this was it. Two years and 7 months later, I was issued #163. The last County came from Ron, K7LTV in Garfield, Montana at 2355 December 24, 1976—What a Christmas present—thanks again, Ron.

"The present equipment are a Yaesu FT101E, SB200 linear, 4 band vertical antennas, dipole for 80 and TA33Jr up on a 36 foot tower. (He failed to say what happened to the nice 3 band Quad that he put up in August 1973)

"I like to mobile and do so as often as permitted, mostly weekends. I'll be happy to help any County Hunter with Northern New England Counties.

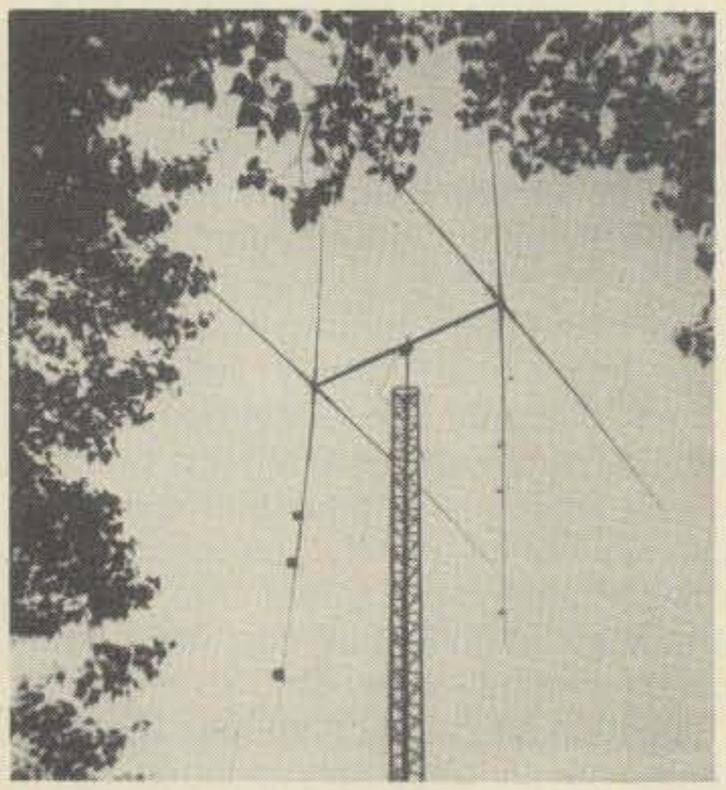
"I am not so active with County Hunting at this time, but the receiver monitors 14336 when I am home and working around the acre.

I do like contests and enter many of them, not for a big score, to have some fun. I love the competition of pile-ups, when DXing. I have 258 counties confirmed and 260 worked in the DXCC race. I also have WAS, WAC, WAZ, QCWA, member #8853 of YLISSB and MARAC #581.

To *all* County Hunters, many thanks for the ones you gave me. It is about the most demanding challenge there is in amateur radio."

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

Charlie, W1LQQ with that happy smile.



That missing Quad, put up in August '73

Special Honor Roll (All Counties)

#184 Phil D. Wilson, WB5DPR 5-9-78.
#185 William M. Smith, W7GHT 5-25-78.
#186 Bertha Swenson, KØITP 5-30-78.

USA-CA Honor Roll

3000		1500		500	
WB5DPR	201	WB5DPR	360	WB5DPR	1240
W2CUE	202	W2CUE	361	W2CUE	1241
WA7RKN	203	WA5ZDZ	362	JA1GTF	1242
W7GHT	204	W6OUL	363	JA3AAW	1243
KØITP	205	**1000**		DJ7CX	1244
2500		WB5DPR	476	W5TZN	1245
WB5DPR	258	W2CUE	477	SM5CAK	1246
W2CUE	259	WD9AXF	478	KL7AF	1247
W6OUL	260	SM5CAK	479	WB9QNX	1248
2000		WB9QNX	480	VE3FEA	1249
WB5DPR	305	WB2PMO	481	SV1GO	1250
W2CUE	306	WA5ZDZ	482	W6OUL	1251
K9GTQ	307	W6OUL	483	K8MKA	1252
W6OUL	308				
WB9OOE	309				

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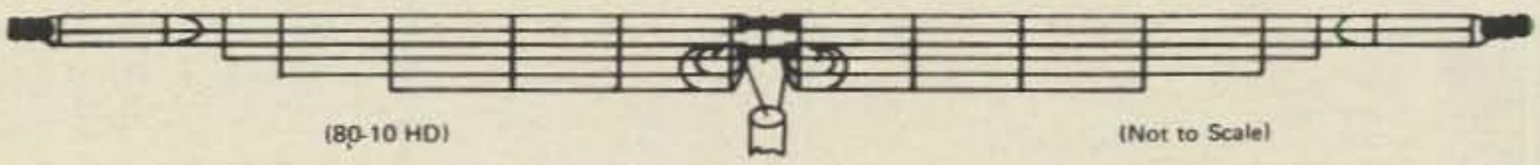

(80-10 HD) (Not to Scale)

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We're Pleased to Introduce Two New Models Specifically Designed for the Novice or Technician

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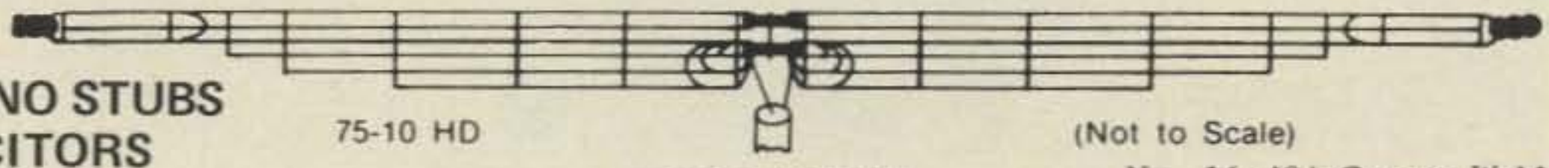
No antenna tuner required. Completely factory assembled and tuned specifically for the novice/technician bands. Both models can be easily re-tuned for higher license class allocations in just a few minutes.

*● There is no better antenna at any price . . . **W9QIO** ● I had a Mor-Gain antenna and liked it extremely well . . . **K4JMR** ● The antenna has worked out well with very good reports . . . **W2TVK** ● I can only give glowing reports about it . . . **WA2IRN** ● I have used these fine antennas before and see no reason to change now . . . **W6BF** ● It has given me excellent service and results . . . **W6CZS** ● I believe I have "sold" your antenna to almost every ham I have talked to . . . **W4AHN** ● Its performance here far surpasses any other antenna that I have had . . . **WA5GGS** ● For several years I have used the Mor-Gain and have been very satisfied . . . **K2TSD** ● Am letting everybody know that it has been doing a good job for me . . . **VE2VW** ● The antenna is performing just beautifully . . . **W8WDZ/6** ● My 75-40 has performed beautifully and I'm very happy with it . . . **WB8DMB** ● Another chap said he had also used it and that it was the greatest . . . **W4NSP** ● I do not hesitate to recommend the antennas to others . . . **K0SPR** ● I heard a ham extolling the virtues of your antenna . . . **WB0PTM** ● I worked a station last night and the Mor-Gain was doing quite a job for him . . . **WA3TCV***

NO TRAPS, NO COILS, NO STUBS NO CAPACITORS



75-10 HD (Not to Scale)

MOR-GAIN HD DIPOLES . . . ● One half the length of conventional half-wave dipoles. ● Multi-band, Multi-frequency ● Maximum efficiency - no traps, loading coils, or stubs. Fully assembled and pre-tuned - no measuring. no cutting. ● All weather rated - 1 KW AM, 2.5 KW CW or PEP SSB. ● Proven performance - more than 15,000 have been delivered. ● Permit use of the full capabilities of today's 5-band xcvrs. ● One feedline for operation on all bands. ● Lowest cost/benefit antenna on the market today. ● Fast QSY - no feedline switching. ● Highest performance for the Novice as well as the extra-class op.

EXCLUSIVE 66 FOOT, 75-10 METER DIPOLES

● All models above are furnished with crimp/solder lugs. ● All models can be furnished with a SO-239 female coaxial connector at additional cost. The SO-239 male coaxial cable connector. To order this factory installed option, add the letter 'A' after the model number. Example: 40-20 HD/A. ● 75 meter models are factory tuned to resonate at 3950 kHz. (SP) models are factory tuned to resonate at 3650 kHz. See VSWR curves for other resonance data.

No. 16 40† Copper Weld wire annealed so it handles like soft Copper wire - Rated for better than full legal power AM/CW or SSB-Coaxial or Balanced 50 to 75 ohm feed line - VSWR under 1.5 to 1 at most heights - Stainless Steel hardware - Drop Proof Insulators - Terrific Performance - No coils or traps to break down or change under weather conditions - Completely Assembled ready to put up - Guaranteed 1 year ONE DESIGN DOES IT ALL; 75-10HD - Only $12.00 a band!

Model	Bands (Meters)	Price	Weight (Oz/Kg)	Length (Ft/Mtrs.)
40-20 HD	40/20	$49.50	26/.73	36/10.9
80-40 HD	80/40 ½ 15	57.50	41/1.15	69/21.0
75-40 HD	75/40	55.00	40/1.12	66/20.1
75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
80-10 HD	80/40/20/15/10	76.50	50/1.40	69/21.0

NOVICE LICENSE OPERATION. The MOR-GAIN HD Dipole is the ideal antenna for the new or Novice operator. As the Novice progresses to higher license classes, he can easily re-tune the HD Dipole to the new frequencies of his higher frequency privileges. The HD Dipole is thus a one-time investment. HD Dipoles are available for all Novice frequencies.

LEAST COST. Dollar for dollar, the HD dipoles are the highest performance, least cost multi-band antennas on the market today. For example: the 5-band 75-10 HD dipole costs less than $15.00 per band - an unbeatable low cost.

LIMITED REAL ESTATE. Where real estate for antenna installation is limited, the HD dipole is the ideal solution. Operation on 80/75/40 meters is now possible since the HD dipole is only half the length of a conventional half-wave dipole. For all around operation, the HD dipole will outperform any trap loaded horizontal or vertical dipole.

Above Models furnished with lug terminations. Cap-female SO-239 connector assembly – $3.75 additional. Include $2.50 for Shipping & Insurance with your order.

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Award Issued

Phil Wilson, WB5DPR who made them all endorsed all SSB, also made USA-CA-500 endorsed, all SSB, all YLs; all 14 and all Mobiles. Also USA-CA-1000 through 2500 endorsed, all SSB, all 14, all Mobile and USA-CA-3000 endorsed all SSB, all Mobiles.

Bill Smith, W7GHT made them all as well as USA-CA-3000 endorsed all SSB, all Mobiles with the added all A-1 endorsement to his USA-CA-1500.

Bertha Swenson, KØITP made them all endorsed all Phone as well as USA-CA-3000 endorsed all Phone.

Alex Marion, W2CUE was issued USA-CA-500 through USA-CA-3000 endorsed all SSB, all 14 and his 500 through 1500 also endorsed all Mobiles.

Keith Harlow, WA7RKN was posthumously issued USA-CA-3000-Plus, endorsed all SSB.

Jim Robb, W6OUL qualified for USA-CA-500 through 2000 endorsed all 2XSSB, all 20 and USA-CA-2500 Mixed.

Jim Latimer, WB9OOE had me send him USA-CA-2000 endorsed all A-3.

Marge Moore, WA5ZDZ acquired USA-CA-1000 and 1500 endorsed, all SSB.

Tom Ross, K9GTQ added to his collection USA-CA-2000 endorsed, all SSB, all Mobiles.

Canadian Islands Award

Mixed USA-CA-1000 certificates went to:

Jack Johnson, WD9AXF

Lars Erik Bohm, SM5CAK (#2 to Sweden) in addition to USA-CA-500.

David Bishop, WB9QNX, who also received USA-CA-500

DIG-WARC-Action-40-Award

Larry Taylor, WB2PMO

Mixed USA-CA-500 certificates were received by:

Koichi Ishida, JA1GTF, (#11 to Japan)

Takeshi Yoshida, JA3AAW, (#12 to JA and #1 to JA3)

Leonhardt (Leo) Poelt, DJ7CX

Wyndell Walker, W5TZN (ex K4NTC)

Tony Smaker, Jr., KL7AF, (#2 Award to Alaska)

Wilfried Antheunis, VE3FEA

Adrian A. (Stag) Stackpoole, K8MKA

Constantine (Costay) Granitsiotis, SV1GO sent for USA-CA-500 endorsed all SSB, all 20 (#1 Award to Greece)

Awards

Action 40 - DIG WARC Award: This award is available to all licensed amateurs who can prove contacts with at least 100 different amateur radio stations within one calendar-month (Gregorian calendar) after November 1, 1977, on the 40 meter amateur band. All modes are accepted. Contest QSOs and crossband QSOs do not count. Split-frequency QSOs (all on 40) count. Fee for the diploma is 5,00DM or 10 IRCs. Sticker for SASE or SAE and 1 IRC. Application must be made using special log sheet obtainable for SASE or SAE and 1 IRC. Awards manager: Klaus Kleine, DJ1XP, Fasanenweg 22, D-4714 SELM-BORK, Fed. Republic of Germany.

Canadian Islands Award: This attractive parchment diploma is issued in four steps. The basic award is for working and confirming five (5) islands. Class II is for 10, Class I is for 15 and an Award of Excellance is given for 20 or more islands or island groups. This award is in co-operation and support of the *DX Newsheet* (Geoff Watts) of England which sponsors the IOTA (Islands of the Air) award program. Send log data and $2.00 or 10 IRCs to VE3GCO, Garry Hammond, VE3GCO, 5 McLaren Avenue, Lestowel, Ontario N4W 3K1, Canada. Check list from VE3GCO for SASE or SAE & 1 IRC, this lists 29 Islands/Island Groups. As mentioned in last month's column, this award and many other Canadian awards are listed in the first, exclusive, inclusive *Canadian Amateur Radio Awards Directory* of over 60 pages of rules, maps, check lists and application forms. Send $3.00, any currency, to co-authors, VE3HLL, Eric Walden, Gowanstown, Ontario, Canada or to VE3GCO, Garry Hammond, 5 McLaren Avenue, Listowel, Ontario N4W 3K1 Canada. Oh yes, instead of the $3.00, they will accept 15 IRCs.

Noviomagum Certificate: This award is issued by the radio-amateurs of the Nijmegen branch of VERON, the Netherlands section of I.A.R.U. To obtain this certificate, one must prove that he made 10 QSOs on the h.f. bands or 30 QSQs on v.h.f. or higher. QSOs made on u.h.f. and s.h.f. count double. All QSOs must be confirmed by QSL cards. There will be no limitations except QSOs via repeaters are not valid. A copy of log data including date, call and fequency, certified by two other licensed radio amateurs should be sent, with Hfl. 5, or 10 IRCs to: Award Manager, Postbox 1538, Nijmegen, Netherlands. QSOs

Noviomagum Certificate

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

Solar activity continues to climb rapidly. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 79 for May. This results in a smoothed sunspot number of 50.5 centered on November, 1977.

A smoothed sunspot number in the low 90's is now expected for September, 1978.

The following is a list of the smoothed sunspot numbers reported since the present cylce (Cycle 21) began.

Smoothed Sunspot Numbers Reported For Cycle 21 March 1976–November 1977

	1976	*1977*
January		16.7
February		18.1
March	12.2	20.0
April	12.6	22.2
May	12.5	24.2
June	12.2	26.3
July	12.9	28.9*
August	14.0	33.0*
September	14.3	38.5*
October	13.5	44.6*+
November	13.5	50.5*
December	14.8	

*Provisional

+Incorrectly given as 48.5 in last month's column.

Propagation conditions on the h.f. bands are generally quite variable during September and early October. On some days conditions will continue much as they were earlier in the summer, but on other days the first signs of wintertime conditions will be noticeable. For this reason, this month's column contains *DX Propagation Charts* for the one month period September 15–October 15, rather than the usual two month span. This month's column also contains *Short-Skip Propagation Charts* for September and October.

September Propagation

During September and early October expect a noticeable increase in *10* meter DX openings, during the daylight hours. Expect some fairly good openings to the Caribbean and South America, and to the South Pacific area and the southern and central portions of Africa, particularly during the afternoon hours. When conditions are HIGH NORMAL, or better, openings should be possible to most other areas of the world as well.

A considerable improvement is expected for DX propagation on *15* meters. With steadily increasing solar activity, a greater number of DX openings are expected this year as compared to the past several years. The band should open for DX shortly after sunrise, and remain open until after sundown. Openings should be possible to all areas of the world, with conditions best towards Europe and the northeast before noon, and to the rest of the world during the afternoon hours. Openings towards the South Pacific, Australia, New Zealand and the Far East should be possible well into the early evening, particularly when conditions are HIGH NORMAL, or better.

It may be a toss-up between *15* and *20* meters for the best DX band during the hours of daylight in September and early October, but the edge will probably go to *20* meters. Look for the band to open for DX at sunrise and remain open in all directions for a few hours. It should be possible to work into many areas of the world throughout the daylight hours, but look for a peak in DX propagation conditions during the afternoon hours. *Twenty* meters should remain open for DX during much of the hours of darkness as well. Nighttime conditions will favor openings towards the south and to tropical areas, but some openings will also be possible to other areas of the world, particularly when conditions are HIGH NORMAL, or better.

Expect an improvement in nighttime DX conditions on *40, 80* and *160* meters during September and early October. This results from the increasing hours of darkness and a seasonal decline in the static level. *Forty* meters should be best for worldwide DX from sunset through the sunrise period. Check *80* and *160* meters during the hours of darkness, particularly for an hour or so before local sunrise.

For short-skip propagation during September and early October, use *80* meters during the day for openings shorter than *250* miles, and either *80* or *160* meters at night. For distances between *250* and *750* miles try *40* meters during the day and *80* meters at night. For openings between *750* and *1300* miles best bet should be *20* meters during the day, *40* meters from sundown to Midnight, and *80* meters from Midnight to sunrise. For openings beyond *1300* miles, try either *15* or *20* meters during the day, and *40* meters during the hours of darkness. Check *10* meters for some fairly good openings beyond 1300 miles during the afternoon hours, particularly when conditions are HIGH NORMAL, or better.

Equinoctial Propagation

The fall, or *autumnal* equinox will occur on September 22. This is the day

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Sept. 1978

Propagation Index	*Expected Signal Quality* (4)	(3)	(2)	(1)
Above Normal: 3, 12	A	A	B	C
High Normal: 2, 4, 11, 13, 25 29-30	A	B	C	C-D
Low Normal: 1, 5-6, 9-10, 14, 19-20, 22, 24, 28	B	C	D	D-E
Below Normal: 7-8, 15, 17-18, 21, 23, 26-27	C	D	D-E	E
Distrubed: 16	C-E	D-E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB., with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, some with fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of (3) will be fair (C) on Sept. 1st, good (B) on the 2nd, excellent (A) on the 3rd, good (B) on the 4th, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP P.O. Box 1714, Silver Spring, MD. 20902.

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

on which the sun will cross the plane of the earth's equator as it appears to travel from northern to southern skies. On this day the hours of daylight and darkness are equal in length throughout the world. Sunrise should take place at approximately 6 a.m. local time and sunset at about 6 p.m. local time, no matter where you are in the world.

The effects of the equinox are felt on h.f. propagation from about mid-September through early October. During this period, the characteristics of the ionosphere are similar over large areas of the world, and this is usually the best time of the year for DX openings between the temperate regions of the northern and southern hemispheres. A similar period occurs during the spring equinox, which is centered on March 21.

Expect considerably more frequent openings from mid-September through early October between the USA and South America, to the South Pacific area and Australasia, to southern Asia, and to southern Africa and Antarctica. Openings to these areas should improve on all bands, but will probably be most noticeable on *20* and *15* meters during the day and on *40* meters at night. These equinoctial-type openings may follow either the *long* or the *short* great circle path. The best times for these openings should be the twilight periods around sunrise and sunset, but they will occur at other times as well.

V.h.f. Ionospheric Openings

Conditions for trans-equatorial, or TE-scatter propagation are expected to peak during the equinoctial period. *Six* meter openings, and some *2* meter openings as well, should be possible by this propagation mode between the southern tier states and deep South America. The optimum time for TE openings is between 8 and 11 p.m., local time. Openings can last from a few minutes to a few hours, signals can vary between very weak and moderate, with flutter fading almost always present. While TE propagation favors the southern third of the country, during September some *6* meter openings should be possible from most other areas as well.

Although summertime sporadic-E ionization should fall off considerably during September, an occasional *6* meter short-skip opening may still be possible over distances ranging between approximately 1000 and 1300 miles. Best time to check is before noon and again during the early evening.

There is usually an *increase* in auroral activity during the equinoctial period, so expect some fairly frequent *6* and *2* meter auroral-type openings during September and early October. The best times for such openings should coincide with periods of radio storminess on the h.f. bands. Check "Last Minute Forecast" at the beginning of this column for those days during September expected to be BELOW NORMAL or DISTURBED.

No major meteor showers are expected during September, but some minor ones may permit meteor-scatter type openings on the v.h.f. bands from September 19 through the end of the month.

CQ DX Contest Special–1978

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 28-29	Phone Section
November 25-26	C.w. Section

As for the past 27 years, next month's *Propagation* column will be devoted to a special, comprehensive forecast which will focus on both sections of the Contest.

For those who desire a more in-depth analysis, a special two-month subscription to MAIL-A-PROP (five issues), covering both sections of the Contest, will be available for $6, postpaid in the USA, Canada and Mexico. Elsewhere in the world, this special subscription is available for $8, airmail postpaid. All payment should be made by US dollar check or postal money order, and remitted to: MAIL-A-PROP, 11307 Clara Street, Silver Spring, Md. 20902.

MAIL-A-PROP is a bi-weekly newsletter containing detailed day-to-day propagation forecasts for the h.f. bands for a two week period in advance. These forecasts have achieved a relatively high level of accuracy during the past four years. The format changes a bit with each issue, so that over a period of time, band-by-band, continent-by-continent and major time periods throughout the day are covered with detailed forecasts and analysis. Short-skip forecasts are given monthly. Newsworthy items concerning radio propagation, solar activity, progress of the sunspot cycle, v.h.f. ionospheric band openings, schedules of meteor showers, etc., are also included. MAIL-A-PROP is written in simple language and is intended for the radio amateur, the shortwave listener and the professional user of the h.f. spectrum.

An annual subscription to MAIL-A-PROP, 26 bi-weekly issues, is $25 postpaid in North America. Outside North America, the postpaid airmail subscription rate is $35. All payments should be made in US dollars.

A free sample copy of MAIL-A-PROP is available for a stamped, self-addressed envelope.

.73, George, W3ASK

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 40 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

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

(4) Opening should 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 midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in 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 is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave 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.

CQ Short-Skip Propagation Chart
September & October 1978
Local Daylight Savings Time
At Path Mid-Point (24-Hour Time)

Band (Meters)	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	10-21 (0-1)	08-10 (1) 10-13 (1-2) 13-15 (1-3) 15-16 (1-2) 16-21 (0-1)	08-10 (1) 10-13 (2) 13-15 (3) 15-16 (2-3) 16-17 (1-2) 17-19 (1) 19-21 (1-0)
15	*Nil*	08-10 (0-1) 10-15 (0-2) 15-21 (0-1)	08-09 (1) 09-10 (1-2) 10-15 (2-4) 15-17 (1-4) 17-18 (1-3) 18-20 (1-2) 20-21 (1) 21-08 (0-1)	08-09(1) 09-10 (2-3) 10-11 (4-3) 11-17 (4) 17-18 (3) 18-19 (2-3) 19-20 (2) 20-21 (1) 21-08 (1-0)
20	12-14 (0-1) 14-16 (0-2) 16-22 (0-1)	08-09 (0-1) 09-10 (0-2) 10-11 (0-3) 11-12 (0-4) 12-14 (1-4) 14-16 (2-4) 16-18 (1-4) 18-19 (1-3) 19-22 (1-2) 22-08 (0-1)	06-08 (1-2) 08-09 (1-3) 09-10 (2-4) 10-11 (3-4) 11-18 (4) 18-19 (3-4) 19-22 (2-3) 22-00 (1-2) 00-06 (1)	06-08 (2) 08-09 (3) 09-14 (4-2) 14-16 (4-3) 16-19 (4) 19-21 (3-4) 21-22 (3) 22-23 (2-3) 23-00 (2) 00-06 (1)
40	08-10 (1-3) 10-12 (2-4) 12-18 (3-4) 18-19 (2-3) 19-21 (1-2) 21-06 (0-1) 06-08 (0-2)	08-10 (3-4) 10-12 (4-3) 12-16 (4-2) 16-18 (4-3) 18-19 (3-4) 19-21 (2-4) 21-23 (1-4) 23-03 (1-3) 03-06 (1-2) 06-08 (2-3)	08-10 (4-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-19 (4-2) 19-20 (4-3) 20-23 (4) 23-03 (3-4) 03-06 (2-3) 06-08 (3-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-19 (2) 19-20 (3) 20-21 (4-3) 21-03 (4) 03-05 (3-4) 05-06 (3) 06-08 (4-3)

80	07-09 (3-4) 09-12 (4) 12-19 (4-3) 19-23 (4) 23-05 (3-4) 05-07 (2-3)	07-09 (4-2) 09-12 (4-1) 12-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-05 (4) 05-06 (3-4) 06-07 (3)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-04 (4) 04-06 (4-3) 06-07 (3-2)	07-09 (1) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (3-2) 06-07 (2-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

ALASKA
September & October, 1978
Openings Given GMT

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern States	19-22 (1)	17-19 (1) 19-23 (2) 23-00 (1)	12-15 (1) 18-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-04 (1)	08-12 (1)
Central States	20-00 (1)	17-19 (1) 19-21 (2) 21-23 (3) 23-01 (2) 01-02 (1)	13-22 (1) 22-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	08-11 (1) 11-13 (2) 13-14 (1) 11-13 (1)*
Western States	20-22 (1) 22-01 (2) 01-02 (1)	18-21 (1) 21-22 (2) 22-00 (4) 00-01 (3) 01-02 (2) 02-03 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-03 (4) 03-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

HAWAII
September & October 1978
Openings Given in Hawaiian Standard Time

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern States	08-10 (1) 10-13 (2) 13-14 (1)	07-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	11-13 (1) 13-14 (2) 14-18 (3) 18-20 (2) 20-04 (1) 04-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-03 (1) 10-21 (1)* 21-00 (2)* 00-01 (1)*
Central States	08-10 (1) 10-14 (2) 14-16 (1)	07-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	09-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-21 (2) 21-04 (1) 04-09 (2)	18-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Western States	08-09 (1) 09-10 (2) 10-15 (3) 15-16 (2) 16-17 (1)	07-09 (1) 09-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	10-12 (2) 12-14 (3) 14-18 (4) 18-20 (3) 20-00 (2) 00-05 (1) 05-06 (2) 06-10 (3)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-05 (1)*

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

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

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

September 15-October 15, 1978
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

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

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

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

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

4. Time 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. Appropriate *daylight* time is used *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-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 10 db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-17 (3) 17-20 (2) 20-23 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & European USSR	09-11 (1)	08-10 (1) 10-12 (2) 12-14 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (3) 15-16 (2) 16-18 (1) 22-01 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	10-12 (1)	08-10 (1) 10-13 (2) 13-14 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-18 (2) 18-21 (1) 21-23 (2) 23-00 (1)	20-23 (1) 21-23 (1)*
Western Africa	11-13 (1) 13-15 (2) 15-17 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (2) 18-19 (1)	05-06 (1) 06-08 (2) 08-15 (3) 15-17 (2) 17-18 (3) 18-19 (4) 19-22 (3) 22-00 (2) 00-01 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	12-15 (1)	09-11 (1) 11-15 (2) 15-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-22 (1)	21-00 (1)
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	07-09 (1) 09-12 (2) 12-13 (3) 13-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-21 (2) 21-23 (1) 23-01 (2) 01-02 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*

Time Zone: PDT (24-Hour Time)
WESTERN USA TO:

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

Western & Central Africa	11-12 (1) 12-14 (2) 14-15 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	21-00 (1)
Eastern Africa	11-14 (1)	10-13 (1) 13-16 (2) 16-17 (1)	07-09 (1) 12-15 (1) 15-19 (2) 19-21 (1)	20-22 (1)
Southern Africa	10-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-16 (1)	05-07 (1) 07-09 (2) 09-10 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-22 (1) 22-00 (2) 00-01 (1)	19-22 (1)
Central & South Asia	17-19 (1)	08-11 (1) 16-17 (1) 17-19 (2) 19-21 (1)	07-08 (1) 08-11 (2) 11-13 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1) 19-21 (1)
Southeast Asia	16-19 (1)	10-11 (1) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-12 (1) 21-23 (1) 23-01 (2) 01-02 (1)	01-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
Far East	16-17 (1) 17-18 (2) 18-19 (1)	14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-10 (4) 10-13 (3) 13-15 (2) 15-20 (1) 20-22 (2) 22-00 (3) 00-01 (2) 01-03 (1)	01-03 (1) 03-07 (2) 07-08 (3) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	09-11 (1) 11-13 (3) 13-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-01 (1)	13-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-03 (3) 03-05 (2) 05-06 (1) 06-07 (2) 07-09 (3) 09-13 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Austral asia	14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-10 (1) 13-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	19-21 (1) 21-23 (2) 23-01 (4) 01-03 (3) 03-04 (2) 04-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-13 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries Of South America	09-10 (1) 10-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-23 (4) 23-01 (3) 01-03 (2) 03-05 (1) 05-06 (2)	19-21 (1) 21-02 (3) 02-04 (2) 04-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	09-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2)	07-08 (1) 08-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-19 (4) 19-20 (2) 20-21 (1)	06-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-01 (3) 01-06 (2)	21-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
McMurdo Sound, Antarctica	14-18 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-10 (1) 17-19 (1) 19-20 (2) 20-23 (3) 23-01 (2) 01-03 (1)	01-03 (1) 03-05 (2) 05-07 (1) 03-06 (1)*

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

There will be no changes in the rules of this year's World Wide DX Contest. They are the same as in previous years with one addition. By popular demand we have added a QRPp section similar to the one used in the WPX SSB Contest last March.

Output power must not exceed 5 watts, and competition will be only with other QRPp stations. Besides the usual certificates we hope to have a Trophy for the overall winner.

We found it impossible to run the rules in this month's issue. The c.w. results of the '77 Contest, another record breaker, has crowded us right out of this issue. We will run the usual detailed copy of the rules next month. Advance copies will be sent to overseas clubs and publications.

Yes, Bernie! As mentioned in last month's Column, we are finally going to have a WPX C.W. Contest, May 26th and 27th in the coming year, the last week-end of the month. Bernie Welch, W8IMZ and his committee will also handle this one.

Rules will be the same as those now being used in the WPX SSB Contest. The 36 hour out of the 48 hour operating time will be retained as will the double QSO point value for 40, 80 and 160 meter contacts. The multiplier will be determined of course by the number of different prefixes worked and counted *only once* (not per band).

And there will be trophies, some having already been donated. However, we are open for more donors. Anyone wishing to donate a trophy for a particular area or category should contact me for availability and details.

So you can start spreading the word, especially to overseas areas, of the coming big event the last week-end of May. It's going to be a good one.

73 for now, Frank, W1WY

Ohio QSO Party

Saturday, Aug. 26 & Sunday, Aug. 27
Noon to 10 PM EDT each day.

The Farout A.R.C. will be handling this year's party. The same station may be worked on eachband and mode, and Ohio stations may also contact other in-state stations.

Exchange: QSO no., and QTH. County for Ohio, state or province for others.

Scoring: Ohio stations multiply total QSOs by number of states, provinces and Ohio counties worked. Out-of-state stations multiply their QSOs by Ohio counties worked. (max. of 88)

Frequencies: C.W. — 50kHz. up from low edge of each band. SSB — 5 kHz. in from low edge of General portion of each phone band.

Awards: Certificates to each state, province and Ohio county winner. Special awards to top Ohio, out-of-state and mobile scores.

Multi-multi operation not eligible for awards.

A summary sheet showing the scoring, a check sheet for each band and mode, and the usual signed declaration is requested. Include a s.a.s.e. for a copy of the results.

All entries must be postmarked no later than September 15th and go to: Farcout A.R.C., Att: Frank Stillwell, WB80FR, 5326 Brainard Drive, Kettering, Ohio 45440

Four Land QSO Party

Starts: 1800 GMT Sat. September 2
Ends: 0200 GMT Mon, September 4

This is the 9th annual party sponsored by the 4th Call District A.R.A. of the I.A.R.S.

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

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

Scoring: *4th call area* – One point for W/VE contacts, 3 points if it's DX. (Including KH6 & KL7) Final score, total QSO points times the states and VE provinces worked. (counted once only)

All other - Two points for each 4th district QSO times the total 4th area states and 4th area counties worked. (Also counted once only)

Frequencies: C.W. - 3575, 7060, 14070, 21090, 28090. Phone - 3940, 7260, 14340, 21360, 28,600. Novice - 3710, 7110, 21110, 28110.

Awards: Certificates to the top scor-

Calendar of Events

Aug.	26-27	Ohio QSO Party
Sept.	2-4	FOUR Land QSO Pary
Sept.	9-10	ARRL VHF QSO Party
Sept.	9-10	Pennsylvania QSO Party
*Sept.	9-10	European Phone Contest
**Sept.	10	North American CW Sprint
Sept.	13-15	YLRL "Howdy Days"
Sept.	16-17	Scandinavian CW Contest
Sept.	16-18	Maryland/DC QSO Party
Sept.	16-18	Wash. State QSO Party
Sept.	23-24	Delta QSO Party
Sept.	23-24	Scandinavian Phone
Sept.	24-25	Classic Radio Exchange
Oct.	7-9	ARCI QRP QSO Party
Oct.	7-8	VK/ZL/Oceania RTTY
Oct.	7-8	VK/ZL/Oceania Phone
Oct.	14-15	VK/ZL/Oceania C.W.
Oct.	14-15	RSGB 21/28 MHz Phone
Oct.	14-16	Manitoba QSOHParty
Oct.	15-16	Boy Scouts Jamboree
Oct.	21-22	RSGB 7 MHz SSB Contest
Oct.	**28-29**	**CQ WW DX Phone Contest**
Nov.	4-5	RSGB 7 MHz CW Contest
Nov.	4-5	ARRL CW Sweepstakes
Nov.	18-19	ARRL Phone Sweepstakes
Nov.	**25-26**	**CQ WW DX C.W. Contest**

* Covered last month
** See July Calendar

Inaki Alcorta, EA2IA one of the top European contesters. He operates both modes but c.w. is his forte. To prove the point Inaki won the W3AU European All Band C.W. Trophy in the 1975 CQ World Wide DX Contest. That should make a nice addition to his already attractive display of Trophies.

* 14 Sherwood Road, Stamford, CT 06905

1977 VK/ZL/Oceania Results

Phone		C.W.	
LU1BAR/W3	1722	WA1QNF	72
N3RL	1349	W2LW	4050
N4MM	3726	W2FCR	2166
W5OB	444	W3TV	168
W6HX	7252	W4MM	1701
W8YA	1026	W5SOD	352
K8VIR	400	W5OB	94
W9SS	1408	N6JM	225
K9AB	672	W7IR	12599
K9IL	144	W7JKA	135
WB2FVF/Ø	20	K9AB	2277
KH6IJ	3720	KØFX	1658

ers in each state, VE province and DX country, 2nd and 3rd place when warranted. Also county awards to 4th call area states. Special awards to Novices, s.w.l. and B/H (Blind and handicapped). There are also High Honor Awards to the leaders in four land, outside the 4th district and VEs and DX.

Mail logs within 30 days to: Fourth Call District A.R.A., ATT: Bob Knapp. W4OMW, 105 Dupont Circle, Greenville, N.C. 27834. Include large s.a.s.e. for a copy of results.

Pennsylvania QSO Party

Starts: 1700 GMT Sat. September 9
Ends: 2359 GMT Sun. September 10

This is the 21st annual party sponsored by the Nittany A.R.C. The same station may be worked on each band and mode for QSO points. Pennsylvania stations may also make in-state contacts for QSO and multiplier credit.

Exchange: QSO no., RS(T) and QTH. County for Pennsylvania, ARRL section for others.

Scoring: *For Pennsylvania* - 3 points for out-of-state contacts, 1 point for in-state. Multiply total by ARRL sections worked. (inc. EPa. & WPa.) Also a multiplier of 1 may be taken for DX, but 1 only regardless of DX worked.

For Others - 1 point for each Pennsylvania contact, multiply total by Pennsylvania counties worked. (max. of 67)

Frequencies: C.W. - 1810, 3550, 7050, 14050, 21050, 28050. Phone - 1815, 3980, 7280, 14315, 21380, 28560, Novice - 3715, 7160, 21115, 28115.

Awards: Certificates to section winners, and to outstanding Pennsylvania entries. (minimum of 10 QSOs)

Look for "super-activity" on Saturday evening at 8PM local time and again at 1 PM on Sunday.

Include a summary sheet with your entry showing the scoring, equipment description and other interesting information. A check list of counties worked is also required. Include a s.a.s.e. if copy of results is desired.

Mailing deadline is October 15th to: Douglas R. Maddox, W3HDH, 1187 S. Garner St., State College, PA 16801.

Scandinavian Activity Contest

C.W. - Sept. 16 - 17 Phone - Sept. 23 - 24
Starts: 1500 GMT Saturday
Ends: 1800 GMT Sunday

It's the world working the Scandinavians in this the 20th S.A.C. The same station may be worked once on each band, 3.5 thru 28 MHz., for QSO and multiplier credit. Phone and c.w. are separate contests.

The prefixes used in Scandinavia are: LA/LB/LG/LJ Norway, JW Svalbard & Bear Is., JX Jan Mayen, OF/OG/OH/OI Finland, OHØ Aaland Is., OJØ Market Reef, OX Greenland, OY Faroe Is., OZ Denmark, SJ/SK/SL/SM Sweden.

Classes: Single operator and multi-operator, both single and multi transmitter. Multi operator stations must use a separate series of serial numbers for each band. Club stations are considered multi-operator.

Exchange: RS(T) plus a QSO number starting with 001.

Points: European contacts count 1 point for each QSO on any band.

DX contacts are 1 point for QSOs on 14, 21 and 28 MHz., 3 points if on 7 or 3.5 MHz.

Multiplier: Each *call area* in the above list of Scandinavian countries worked on each band. (LA1, LB1, LJ1 are in same call area, as are SM3, SK3, SL3) Portable stations in Denmark or Norway count as the 10th area. OHØ is the 10th area for Finland, and OJØ is also separate.

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

Awards: Certificates to the highest scoring stations in each class, both phone and c.w., in each country and each U.S. call area.

Use a separate log sheet for each band. Include a summary sheet showing the scoring, your name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed.

The usual disqualification criteria will be observed and strictly enforced.

Mailing deadline for entries is October 15th. This year your logs go to: EDR Contest Manager, Lief Ottosen, OZ1LO, Bankevejen 12, Kong, DK 4750 Lundby, Denmark.

Maryland/D.C. QSO Party

Starts: 2300 GMT Sat., September 16
Ends: 0100 GMT Mon., September 18

This is the 13th annual party sponsored by the Maydale A.R.S. The same station may be worked on each band and mode for QSO points as well as a band multiplier.

Exchange: QSO no., RS(T) and QTH. Country for Md./D.C., (Baltimore and Washington are independent cities) and ARRL section or country for others.

Scoring: Two points for each QSO. Md./D.C. use ARRL sections and countries worked on each band for their multiplier. Others use Maryland counties and Independent cities worked on each band. (max. of 26 per band.)

Frequencies: Use all bands including Oscar. On c.w. 75 kHz. up from low end of each band on even hours. On phone 25 kHz. in from low end of each phone section on odd hours. Try 10 and 15 on the half hour.

Awards: Certificates to the top scorers in each ARRL section, Maryland county and independent city, and in each country, both on phone and c.w. (min. of 1000 points for Md./D.C. and 250 points for all others.)

Plaques for top combined phone/c.w. scores in Md./D.C., stations outside the Md./D.C. area, and Mobiles with a minimum of 10 contacts from each county and independent city.

Use a separate log for each band and mode, and a summary sheet showing the scoring, name and address in block letters, and a signed declaration that all rules and regulations have been observed.

Mailing deadline is October 15th to: Maydale A.R.S., c/o C. E. Andersen, W3XE, 14601 Claude Lane, Silver Spring, Md. 20904

Washington State QSO Party

Three Periods GMT
0100 to 0700 Saturday, September 16
1300 to 0700 Sunday, September 17
1300 to 0100 Sun./Mon. Sept. 17/18

This is the 13th annual party sponsored by the Boeing Employees ARS (BEARS). The same station may be worked on each band and mode, and again if it's a new multiplier. Washington stations may work other in-state stations for QSO points.

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

Scoring: *For Wash.* - Two points per QSO, multiply total by number of states,

VE provinces and DX countries worked.

For Others - Two points for each Wash. QSO, multiply total by number of Wash. counties worked. (max. of 39) There is a multiplier of 1 for each group of 8 contacts with the same Washington county.

Frequencies: C.W. - 1805, 3560, 7060, 14060, 21060, 28160. Phone - 1815, 3925, 7260, 14305, 21380, 28580. Novice - 3725, 7125, 21150, 28160.

Awards: Certificates to the top scorers, both single and multi-operator, in each state, VE province, DX country and Wash. county. Additional awards where, warranted. The Worked Five Bears Award is available to anyone working five club members, before, during or after the party. The Worked Three Cubs Award is available for working three Novice members.

Include a check sheet with your entry if you have 100 or more contacts. Results will be mailed to all entries, no s.a.s.e. required.

Mailing deadline is October 18th to: Boeing Employees A.R.S. Contest Committee. Att: Willis D. Propst, K7RS, 18415 39th Ave. South, Seattle, WA 98188

Delta QSO Party

Starts: 1800 GMT Sat. September 23
Ends: 2400 GMT Sun. September 24

This is the 9th annual QSO Party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) may work stations both in and outside their boundries, others only Delta stations. The same stations may be worked on each band and mode, and portable and mobiles in each county change.

Exchange: QSO no., RS(T) and QTH. County and state for Delta stations, ARRL section for all others.

Scoring: *For Delta* - Total number of QSOs multiplied by the ARRL sections worked. (max. of 75)

Outside Delta - Total QSOs multiplied by the Delta counties worked. (max. of 316) DX stations may be worked but for QSO points only. They have no multiplier value.

Frequenies: C.W. - 3550, 7050, 14050, 21050, 28050. SSB - 3990, 7290, 14290, 21390, 28590. Novice - 3775, 7175, 21125, 28125.

Certificate Awards:

A. Achievement: All stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 Delta states, 4th and 5th place awards if warranted.

C. Others: To the highest scoring station in each ARRL section and in each country, 2nd and 3rd place awards if warrented.

D. Plaques: To the Top scorers in and outside the Delta division. Top portable and mobile Delta station. Highest scoring Delta Club station.

Mailing deadline for logs is October 21st. To: Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180.

Classic Radio Exchange

Starts: 1800 GMT Sunday, Sept. 24
Ends: 0100 GMT Monday, Sept. 25

This is the Fall edition of this unusual activity sponsored by the Southeast A. R. C.

The object is to restore, operate and enjoy older equipment with like-minded amateurs. A Classic Radio is any piece of equipment built since 1945 but at least 10 years old. (An advantage but not required to enter).

The same station may be worked on each band and mode and with different equipment combinations, but no a.m. phone below 21 MHz. (Non-contestants may also be worked).

Exchange: Name, RS(T), state, province or DX country, receiver and transmitter type. (i.e.: home brew, 807 final and etc.) Also any other interesting information.

Scoring: Add the number of different

transmitters and receivers, states, provinces and DX countries worked on each band. Multiply by number of QSO's made. Multiply that total by the Classic multiplier. (Total years old of all transmitters and receivers used. Minimum of 3 QSO's per unit.) Multiply years old by 2 if it's a transceiver.

Frequencies: C.W.—60 kHz. from low edge of each band. Phone — 3910, 7280, 14280, 21380, 28580. Novice/Technicians—3720, 7120, 21120, 28120.

Awards: Certificates to the highest scorers, longest DX, most equipment combinations, oldest equipment, and "unusual achievement."

Send logs with comments, pictures, anecdotes and etc. to: Stu Stephens, K8SJ, 2386 Queenston Road, Cleveland Heights, OH 44118. Include s.a.s.e. for Newsletter.

YLRL Howdy Days

Starts: 1800 GMT Wed. September 13
Ends: 1800 GMT Fri. September 15

This activity is for YLs and scores will be based on contacts between YLs only. All bands and modes may be used. However crossband and Net contacts do not count, and only one contact with the same station is permitted regardless of the band.

Score 2 points for each YLRL member worked, and 1 point if it's with a non-member. There is no multiplier, just add the QSO points.

The top scoring YLRL member will receive her choice of a YLRL pin, a charm, or stationery. The highest scoring non-member receives a one year membership in the YLRL.

Logs must be received by October 16th and go to: Phyllis Shanks, W2GLB, 3 Honey Lane West, Miller Place, NY 11764.

Novice *(from page 60)*

This completes the first part of the three part grounding article. Each of the three parts contains information that is useful without the remaining parts but it is hoped that the entire article will be read to obtain maximum benefit.

Although Novice licenses are now being issued for five year terms and are now renewable, they are not automatically extended past the printed expiration date shown on the license. Novice license renewal is no different than renewal of any other class of amateur radio license. If your Novice license is about to expire, submit your renewal application within the last 90 days of the present license term. If you request renewal 30 to 90 days prior to the expiration date, you are allowed to continue operating even if your renewed license has not been received by the expiration date. In this case, your old (expired) license and a copy of your form 610 renewal application serve as your temporary authorization for continued operation. If you do not apply for renewal at least 30 days before the license expires, you are off the air, (when it expires) until the renewal license is received. Any Novice whose license expired within the last year can submit an application for license renewal and obtain five more years of Novice operating privileges without examination.

I have been fortunate enough to recently contact the following stations in the Novice bands:
WB1HIH Dick @ Williamstown, Mass., WA2JXC Jerry @ Rochester, N. Y., WB3KNP Roger @ Erie, Penn., WD4RWG @ Thomasville, Al., WD5FJW Ron @ Midlothian, Texas, WD6FYG Mike @ Sherman Oaks, Cal., WB7PVL Don @ Orofino, Idaho, WD8KPO Derald @ Canton, Ohio, WB9WPR Cliff @ Kankakee, Ill., WBØPVW Ed @ Kansas City, Kansas

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

73, Bill, W6DDB

DX *(from page 71)*

QSL Information

A2CAB—Via WA2LOR
A4XGB—To W4CTQ
A6XB—c/o K1DRN,
A9XCA—Via W2GHK
A9XCS—To K4CG
A9XK—c/o K2NJ
AP2HQ—Via NØAR
C21AU—To WA6AHF
C5AAF—c/o WB4ZNH
CT1FL—Via W3HNK
CT2SH—To W3HNK
DA1BD—c/o W8IMZ, 7735 Redbank Lane, Dayton, OH 45424
DA4CC (March 25-26, 1978 only)—Via W8IMZ
DU6AH and DU6RH—To W7PHI
EA6BG—c/o W4JVU
EA8CR—Via K9KXA
EA8QR—To W2HNK
EL2EV—c/o W3HNK
EL2T—Via K4BAI
EL5F—To WD9GHS, 4002 Beasley Drive, Bloomington, IN 47401
EP2DE—c/o K2RW
EP2LI—To WA4PYF, 2760 Davidson Drive, Lithonia, GA 30058
FGØCSC—Via WA6VNA
FHØFF—To WA4CWG
FPØBG—c/o VE1AIH
FPØLK—Via VE1ASJ
GU5BYY—To N5RM
HC8EE—c/o WA8TDY
HI8LAP—Via W3HNK
HZ1TA—To W4UL
J3AO and J3AP—c/o W4YHE
JY9EC—Via K4IZE
KØAX/DU2—c/o WB4OSN
KC4AAB, KC4AAD and KC4AAE—To WB6MAB
KP4KD and KP4RF—c/o W3HNK
OY1A—Via W6TCQ
OY1R—To W2KF
OY3H—c/o W3HNK
OY5J—Via WA3HUP
PYØFN—To WA3HUP
VE1AJC/SU—c/o VE1AIZ
VE7CQX/SU—Via VE1RU
TR8AC—To WB4RZM
TU2AK—c/o W6VZA
VK9NK—Via W6EDN
VP1CK—To W2BKG
VP2EM—c/o W3HNK
VP2GS—Via W4HOO
VP2KN—To W7OK
VP2LEU (Jan. 31 - Feb. 7, 1978)—c/o K6SVL, 28403 Covecrest Drive, Rancho Palos Verdes, CA 90274
VP2SDR—Via K6SDR
VP2VDQ—To W3HNK
VP2VEN—c/o K5GOE/6, Woody Charlton, 515 Curtis St., Albany, CA 94706
WP4BDL—Via KP4AM
YI1BDG—c/o YU1NZV
YS1GMV and YS1JWD—To W3HNK
ZB2G—c/o K2FJ
ZE4JS—Via W3HNK
ZK1CY—To W6KNH
ZL4LR/A—c/o Bill Barr, N4NX (ex-K4KZP), 305 Alpine St., Roswell, GA 30075
ZP1XR—Via W7VRO
ZP5CD—To W3HNK
3D6BD—c/o K1AGB
4X4UH—Via W3HNK
7X5AB—To W2KF
8P6FV—c/o W3HNK
8R1CB and 8R1IW—Via W2MIG
9D5A—To WA6AHF
9H4L—c/o W3HNK
9K2DX—Via W6LV
9K2FX—To Leo Haijsman, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904
9M8TH—c/o W6UOU
9N1MM—Via W3KVQ

73, John, K4IIF

Awards *(from page 74)*

with the following stations are valid for the certificate: PDØDHT, PAØRBI, PAØKRL, PDØCJV, PDØEGH, PE1AEK, PEØBMW, PE1BDY, PAØELH, PAØTSN, PI1HTG, PAØHJV, PAØSMW, PEØJPM, PAØCBA, PAØADD, PE1BGZ, PAØDIN, PAØKID, PARYL, PEØLIA, PAØAAH, PAØDUO, PAØTDW, PE1AUL, PAØHN, PAØPUY, PAØJDN, PE1AZX, PE1AYZ, PAØVVH, PAØVDK, PAØLSK, PEØHPO, PAØAHS, PE1AVF, PAØGMJ, PAØWH, PAØPTR, PDØDCM, PAØTOD, PAØTP, PAØINE, PEØNYJ, PDØATG, PAØGWL, PA2PPG, PI1JON, PEØGRD, PAØJWR, PEØJWN, PAØRDB, PE1BAC, PDØCIB, PAØTGA, PAØEHW, PEØDSI, PAØMZ, PAØABC, PE1AHF, PAØADS, DF1EP, PEØPWN, PA3ADJ, PE1BJV, PDØDHB, PAØDXR, PDØCCP, PE1AEJ, PAØTHJ, PDØDNJ, PDØDHC, PE1AVS, PEØETW, PDØBAC, PAØLWZ, PAØWPA, PAØEHL, PDØCEF, PA3ABA, PDØCCY, PAØWWA, PE1AQS, PAØDZI, PAØLMC, PE1AZH, PAØHKG, PI1MHN. In the future, all QSLs valid for the certificate will be so marked with a stamp.

Notes

The fifth annual Midwest MARAC Mini-Convention, October 13, 14, 15 at the Holiday Inn, Wasusau, Wisconsin 54401. All county hunters welcome — get full details from Tom Ross, K9GTQ, Route 1, Box 137 A1, Irma Wisconsin 54442.

By the time you read this, I hope and pray that all our sick County Hunter friends will be feeling better and back on the Nets. How was your Month?

73, Ed., W2GT.

Math's Notes *(from page 63)*

ment after being completely encapsulated in epoxy and then slipped into a short length of Teflon® tubing. Remember, it is at live voltage potential and must be insulated as is the rest of the circuit. Fig. 5 shows mounting details of the thermistor.

Since this circuit only operates on positive half cycles, the maximum power supplied by the oven winding is within "non-roasting" levels and the entire unit gives a good account of itself.

When building the unit you can use other thermistors, just be sure that the value of the pot and the series resistor is equal to the thermistor resistance near the lowest temperature you will operate at (room temperature), and the value of

the series resistor alone is equal to resistance of the thermistor near the highest temperature you wish to attain with the values shown. Our 800 watt oven goes up to 250°F—just over the MIL-SPEC maximum temperature range. As a finishing touch you should add a laboratory type thermometer through a hole drilled in the housing for temperature measurements.

73, Irwin Math, WA2NDM

Zero Bias *(from page 5)*

sure beats the alternative. If we look at amateur radio as only a refuge from the outside world and its pressures, a pleasant pastime to relieve our cares of the day then we relegate it to a "never-never" land of egocentric fantasy.

What may evolve for 220 MHz. is anybody's guess. Perhaps there might be some sort of use on a shared basis, amateur and CB. Perhaps the Communicator Class will be installed here, again on a shared basis. Perhaps the entire package will be turned over for CB use exclusively. Whatever the changes may be, they will require funding and that's another hurdle. One personal hurdle to overcome is that this is not a form of punishment but an example of what is good for the "greatest numbers", and for too long relied on de facto representation from Newington to air our voice in Washington. Neither fact worked towards enhancing the amateur position.

Amateur radio is growing, not only here but around the world. The type and quality may be alien to some of us who might prefer "the good old days" but it is the shape of things to come. Hopefully the amateurs of this generation will adopt a "get involved" attitude and question ineffective leadership and seek means for redress and input to and from the system. Perhaps as a start, we should look at ways of eliminating the appointment methods used in selecting FCC Commissioners and institute a system of either competitive examinations and/or engineering background requirements. The job and responsibility calls for more than just a political "payoff" from the party in favor. What do you think?

For those of you who are interested in obtaining copies of *Alternatives For Future Personal Radio Services,* Volume 1 sells for $6.00 (order number PB-280938) and Volume 2 sells for $9.25 (order number PB280939). Both are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

"Happy Birthday Good Buddy"

For those of you who monitor the calendar and Almanacs to spot obscure holidays hoping for either a day off from work or some witty trivia to toss out at the office, September marks the 20th anniversary of the Citizen Band Service. Specifically the date to circle is September 11, 1958, for on that date FCC Docket 11994 (released in 1957) came into effect. September 11, 1958 was the first "on-the-air" day for the CB Service.

A lot has happened in the past 20 years to mold and shape what we call CB and it looks like more changes are in the offing. The remarkable growth in the past few years may only be the tip of the iceberg if and when 220 MHz. becomes available. It is somewhat unrealistic to espouse a similar growth potential for amateur radio but amateur radio is in fact growing. We need a "shot-in-the-arm" in terms of large numbers of licensees to remain a viable asset to the Government. It is not unrealistic therefore to think in terms of a future "Com-

munication Class" license for amateur radio to provide those large numbers we sorely need. It will be brought up again, it will be argued bitterly from many points of view and in all likelyhood it will come to be. Just as the dire predictions cast before the adoption of the Novice license proved to be false, and a new era was introduced to amateur radio, so I hope and expect that a similar bounty can happen to amateur radio by enlarging our ranks dramatically at this time rather than waiting to see what happens.

73, Alan, K2EEK

Announcements *(from page 6)*

• **Norfolk, VA** – The Tidewater Radio Conventions, Inc., would like to announce their Hamfest, Computer Show, and Flea Market to be held on September 23 and 24, 1978, from 0900 to 1800. Over 60,000 sq. ft. of indoor exhibit and flea market space will be available. Tailgating will be $5 a day, $7.50 for both days which includes general admission. Flea market tables will be $10.00 a day. Advance admission is $2.50, $3.50 at the door. Talk-in, W4NV 146.52 and local repeaters. Write: TRCI, P.O. Box 9371, Norfolk, VA 23505, for more information.

• **Ellettsville, IN** – The First Annual Hoosier Back Yard Hamfest, sponsored by WR9AFY, will be held on Sunday, September 10, 1978, at Phoenix Farm, St. Hwy 46 W., at the west city limits of Ellettsville, approx 9 miles west of Bloomington. Time: from 8 a.m. to 4 p.m. Admission will be $1 per person over 12. For advance sales send s.a.s.e. to: CBC, 7391 W. Highway 46, Ellettsville, IN 47429. Talk-in K9KTH, touch tone 7 on WR9AFY, and QSY signs.

• **Arlington Heights, IL** – The Northern Illinois DX Association will host the W9 DXCC Convention on September 9, 1978, at the Arlington Park Hilton. A full program for DXers is planned, including Hugh Vandergrift, WA4WME, of the Clipperton Team. For more details, write: Howie Huntington, K9KM, 75 South Burr Oak Dr., Lake Zurich, IL 60047.

• **Butler, PA** – The Butler County Hamfest, sponsored by the Butler County ARA, will be held on Sunday, September 10, 1978, from 11 a.m. to 4 p.m., at the Butler County Farm Show Grounds, adjacent to the Butler Roe Airport. Check-ins on 90/30 and 52 simplex. For further info, contact: Cliff, WB3 CDA, Secretary, 107 Randy Dr., Butler, PA 16001 or John, K3HJH.

• **Adrian, MI** – The Adrian Hamfest will be held on September 24, 1978, at the Lenawee County Fairgrounds in Adrain. Tickets are $1.50 in advance and $2.00 at the gate. Tables will be $4.00 for a full table and $2.00 for a half table. Trunk sales will be $1.00 per space. For tickets, table reservation and further info, write: Adrian Amateur Radio Club, Inc., P.O. Box 26, Adrain, MI 49221 or phone Bob or Sally, Fay-Sword Enterprises, (517) 265-8016.

• **Mt. Clemens, MI** – The L'Anse Creuse ARC proudly presents its 6th Annual Swap and Shop on September 17, 1978, at the L'Anse Creuse High School in Mt. Clemens. Time: from 0900-1500. There will be prize drawings hourly, and plenty of food and parking. Talk-in on 14769.09 and 146.52. Tickets will be $1.50 at the door and $1.00 in advance. Send s.a.s.e. to: WB8ZME, 35751 Dunston, Sterling Hts., MI 48077.

Clipperton *(from page 49)*

meet the *Phillippa* at the dock to facilitate our unloading operation there. Dr. Caillet also ordered Hugh to fly to the National Burns Center in Hugh's home town of St. Louis because an infection in Hugh's burns could not be treated at sea.

After an evening of sightseeing in the port and the refueling of the yacht, what was left of the Clipperton team started the three-day trek up the coast on the traditionally turbulant waters off Baja California. The mood was a rather somber one because the Clipperton team felt incomplete after the departure of a third of its members and because the difficult passage forced us to lie low to avoid becoming any more seasick than we were. Although Roy had done a good job as cook during our trip, the French could not take much more of the American menus. Olivier and François prepared crêpes and the French staple of steak et frites, which we all enjoyed.

Once again, just as Jeff had predicted we reached San Diego on schedule early on the fourth of April. As the customs officials were trying to decipher the language in the French passports, we could hear the amateurs on the local repeater trying to figure out where we were. When we pulled into our final berth many of the same members of the San Diego DX Club that had been on had to bid us farewell three weeks, 3500 miles and tens of thousands of signal reports before were there to welcome us back to the United States. As we unloaded the equipment and dispursed to the homes of various amateurs in the San Diego area, we unavoidedly felt as though we were conquering heroes returning from a successful campaign to recount experiences that one might enjoy only as the result of an unusual journey. At the same time, we felt that we had never left the amateurs who had remained in the United States because we were always with them on the air. The only difference the trip had made on our relationship with the amateurs of the world is that it helped us understand each other better, and in that sense the distance between us had acutally brought us closer together.

The following evening the eight Frenchmen, all of the American operators except Hugh Vandegrift in St. Louis, and the captain and crew of the *Phillippa* were warmly greeted by a standing-room only crowd of members of the San Diego DX Club. That club feels a special interest in Clipperton because of its support for 1958 FO8AT Clipperton DXpedition. One of the 1958 operators, Bob Bucaro, W6KSJ, was there and asked me whether I felt as he did that Clipperton was a place that one would not want to visit twice for fear of pressing one's luck too far. I had to agree with him, because our DXpedition had been so successful that luck was certainly an element leading to the good results.

During the two-weeks that followed the French and I moved northward first to Los Angeles where we were invited by Dave Morgan, K6DDO, to address the Adventurers Club on the Clipperton DXpedition. Although that club is a non-amateur group, it showed great interest in our experiences because it is difficult to find a more off-the-beaten-track destination than Clipperton. More than one person in our audience came up to me to say that he thought that our expedition had been a real adventure, and that seemed to be a remarkable comment considering the number of places that the club's members have visited.

Jacques, Alain, François and Jacky then moved up the coast with me to attend a meeting of the Northern California DX Club, one of the greatest supporters of the DXpedition and certainly one of the most distinguished DX groups in the world. Doug Murray presented a set of slides from the DXpedition, and as he explained some of the scenes in his witty, crisp manner it was interesting to see the DXpedition from the same vantage point as the audience and to try to realize that it was we who were on the island less than two weeks before.

I wondered what the difference was between my eyes seeing the slides and the eyes of others who could not be there that were seeing the pictures. I concluded that there really was no difference between my reactions to what I saw and anyone else's impression, but there was a difference of view about what could not be seen that evening, the moments of excitement, disappointment, comfort and displeasure that only some one who had planned and executed a DXpedition could understand and that no equivalent of a thousand words could be worth. To those of us who were at Clipperton, the memory of those moments is the most important result of the DXpedition because it will remain with us long after all record of our operation is plowed over by greater efforts and even after our Clipperton QSL cards start to be thrown away.

Following Doug's slide presentation we were able to meet with many of the members of the club, most of whom we had worked many times on the air. Among them were Lloyd and Iris Colvin, W6KG and W6QL, who said that they would have 25 cards for us. Lloyd paid us the supreme compliment of saying that he thought that the FOØX operation was the greatest DXpedition in history, quite a statement from one of the top DXpeditioners of all time. Geoff Watts wrote the same thing about Clipperton in his *DX News Sheet*, and when two DX Hall of Fame

members on opposite sides of the world say that same thing at the same time about your DXpedition, you feel as though you must have done something right.

The following days were spent visiting amaterus in California including Hugh Cassidy, WA6AUD, where we saw where he edits and prints the *West Coast DX Bulletin*. Although the French enjoyed their visits with amateurs, it was apparent that since this was their first trip to the United States they saw their travels in the West as much in terms of an adventure as Clipperton. What they were most interested in seeing in America was not the most unusual sights but the most typical places and things in American life. After we went up through Sacramento to the mountains and later to the Lake Tahoe area they seemed impreseed with the great variety of climate and scenery they could see in just one of the 50 states. Later, after a visit to Reno and Virginia City Alain, François and Jacques drove separately to Death Valley while Jacky and I returned to Sacramento to sort out the mountains of correspondance that had piled up during the DXpedition. Since my departure for San Diego a month before, over $3500 in contributions had come in, an amount which helped us meet a portion of the expenses left by the DXpedition.

Although the French were getting very short on cash and time after over a month away from home, I managed to convince them to stay for the International DX Convention which was held this year in Visalia. Although, strictly speaking, the International DX Convention is a regional affair, California has more government-licensed amateurs than any country in the world except the United States itself, and with the "cream" of the California DX crowd normally in attendance there, many amateurs from all parts of the United States and around the world come there each year to give that convention a truly international character.

It was a great pleasure to get the reactions of many of the really "big guns" about our operation from the island and to exchange with them anecdotes from previous experiences gained at a great number of countries of which Clipperton is only one. Lloyd Colvin surprised us once again with a letter that he had discovered in the legendary collection of Colvin QSL cards and DX memorabilia. The letter was written by a prospective amateur in France eight years before who stated that his greatest desire would be to one day operate from Clipperton Island. Although a hundred months had faded the written expression of that dream, we knew that the determination of that one among thousands of shortwave listeners had only been strengthened by the passage of time because this letter was signed by Jacky Billaud.

At the end of a weekend series of DX discussions and presentations it was my pleasure to introduce the four French operators as well as Don, Herb and Doug to that breakfast crowd of many of the best-known personalities in the DX world. It was a novelty to compress into a 15-minute speech the events of an entire year and to address them on a subject that at the same gathering a year before was considered only a distant possibility. One of the most interesting qualities of the DX hobby is that the most unexpected events can take place with little or no notice, and even as I was speaking another "impossible" country, Iraq, was appearing

on the air for the first time in many years as the result of the efforts of previously "unknown" Yugoslavian amateurs.

Doug Murray narrated a presentation of a composite of our best slides that we had assembled late the night before. Doug did such a good job at pleasing the crowd that I had the impression that he had been practicing for this show for many years. In a sense he had been, and now all the enthusiasm for the DX hobby through the years was now being released publicly through the reality of our mission's story.

The dispersal of those attending a DX convention, unlike the end of most of most other reunions, does not leave a feeling of letdown because DX gatherings are only a way of celebrating relationships that continue on the air every day of the year. Immediately following the International DX Convention each of the participants in the Clipperton DXpedition would be home in different cities to tell in different languages their own versions of the story which we will always share. Although another Clipperton DXpedition is probably some years away, our feeling of comradship will not allow us to accept that we will not be working on a common goal again.

Was the Clipperton DXpedition the greatest of them all? That only the amateurs of the world can decide. All we know for sure is that we did our best.

At the same time, the Clipperton mission seems difficult to describe without using superlatives. Never before in the history of DXpeditions had such a large group of amateurs come from so many different places and backgrounds to a place so far away with such widespread support to accomplish a single goal. The Clipperton team and its countless friends around the world who were a part of the Clipperton story can be justly proud of a great accomplishment in the greatest of all hobbies.

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GENERAL RADIO 546-C audio frequency microvolter, converts audio oscillator into calibrated sig. gen. Excellent condition, with manual, $70. W6TDA, Ph.D., 5220 Carlingford Ave., Riverside, CA 92504.

WANTED: Building instrcutions and operating manual for Heathkit 10-18 scope, to copy and return or purchase. FC Bergquist, 104 Sarver Dr., Leesville, LA 71446.

RADIO BOYS BOOKS By Allen Chapman wanted. R.W. Randall, K6ARE, 1263 Lakehurst Rd., Livermore, CA 94550.

THREE vhf ARC-5 xmtrs; 50, 144, 200 MHz w/power supply, modulator $60. Ameco converters: 50, 144, 220 w/ac $65. WA2PCL, 101-23 Lefferts, Richmond Hill, NY 11419.

NEEDED: Manual for old Globe King AM-CW transmitter using pair of V-80D finals. WD5FJA, Box 355, Stroud, OK 74079.

WILSON WE-800, s/n 12521811, with 10 "no brand" white Ni-Cads and flex antenna with UHF ell connector and UHF to BNC connector. Also homebuilt battery charger with 723 IC. Mitt Nodacker, WA7TFE, Box 2632, Pocatello, ID 83201.

WANTED: Old Galaxy V for missionary use over seas. I can repair them. Charles F. Frost, K5LBU, 618 Ecotr St., Denton, TX 76201.

WANTED: Schematic and operation manual for Graymark 506 model B 2-Band receiver to buy or borrow. J. Decker, 5720 W. Arkansas, Lot no. 12, Arlington, TX 76016.

SELL: Harvey Wells SM-1, model PI. xmfrs, Textronics manuals, 512, 453, 575/175, 321, 545 scopes, etc. SASE for list. W3SUE. 4602 Pickwick Dr., Wilmington, DE 19808.

MUSEUM PIECE. KAAR Conelrad. Every radio museum should have one. Like new. $150. W0CVU. 1500 Center Point Rd., NE, Cedar Rapids, IA 52402.

SELL/TRADE: Heathkit oscilloscope model 10-4540. Exc condx. Trade for Gen Coverage receiver. Prefer R390A or what have you. Steve Beckman, 3411 Schuler Dr., Bossier City, LA 71112.

WANTED: Barlow-Wadley receiver have tested equipment, new tubes. VO1HH, Box 500, Carbonear, NFLD, Canada.

WANTED: RCA Telegraph key Tie Bar. Sever, 248 Sheraton Dr., NW, North Canton, OH 44720.

CB QSL Trader, XM42-17713, Box 564, Downsview, Ontario, Canada M3M 3A9.

HEATH HP1144 12 volt 20 amp power supply for SB104A $75, Jerry Van Vactor, 1435 Fifth St., Spearfish, SD 57783.

FOR SALE: Heath HW-2036 2 meter transceiver with Micoder II and HW2036-3 base station power supply. $240.00. Cushcraft A147-22, stacked 11 element 2 meter beam, $70.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Power supply for Multi-Elmac Trans Citer model A.F. 67. John Chase, 3005 38 Ave., North, St. Pete, Fla.

COMPLETE STATION FT101E, w/cw filter, fan, Murch Ultimate Transmatch. Drake W4, W1AW Balun and cables, used 10 hrs. lost interest, $745 firm. Oran Mills, 313 Clinton Ave., Brooklyn, NY 11205.

ROHN TOWERS—Buy wholesale from National Distributors, 48' foldover tower, $471.50 freight paid, 25G sections $33.86 each, 45G sections $54.89 each, 48' BX free standing $240.67. Order now and beat August 1 price increase. Hill Radio, 2503 G.E. Rd., Bloomington, IL 61701, (309) 663-2141.

CYSTALS: SASE my list. K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

ZENITH TRANSOCEANIC. Messiner Signal Shifter. Extra nice, $30. (U-ship). Plug-in coils for FB-7X SASE only. J. Speer, 1400 Melrose, Norman, OK 73069.

QSL CARDS Ham/CB low price. Reprints, design your own. P.O. Box 462, Frederick, MD 21701, (301) 662-7753 after 5 p.m.

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SELL: 3600-0-3600 1 A. 110-220 $40; Chokes: 4 Hy 2 A $30; 8 Hy 1 A $30; Fil Xfmr 7.5 V 45 Amp, Sola Regulated 190-240, $25. Paul Bittner, W0AIH, 1616 South St., Eau Claire, WI 54701.

FOR SALE: ASR 32 with stand, paper punch and reader. Perfect condx. $300. Pick up only. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

SELL: SB620 scanalyzer $120, SB600 w/24 Hr. digital clock, $25. KH6DX, 91-926 Akaholo St., Ewa Beach, HI 96706.

QSLs-Top Qality-Samples 35 cents. Includes Rubber stamp. Info-Ebbert, Graphics, Dept. 4, Box 70, Westerville, OH 43081.

BANDIT III Mobile linear, 250w, 1000 SSB, could use as base. New, never out of box. Paid $350, sell for $250. Arnie Rihn, (715) 568-4361.

WANTED: Heathkit CB-1 and "Tener". Also need manual for "Tener". Ed Morrsion, K9HLT, Box 175, Blandinsville, IL 61420.

WANTED: Type "N" and "C" coaxial connecotrs and "LN" type plugs; and Amphenol MS-3113H 10-6P plugs. Charles T. Huth, 146 Schonhardt, Tiffin, OH 44883.

HW-8 built-in power supply, audio amp and speaker. Ten-Tec Transmatch, QRP SWR meter, all in Sansonite case, $200. WB7QZA, 1251 W 20th Place, Yuma, AZ 85364.

FL-8A Radio Filter, Swithcable, $12 postpaid. H. Anderson, 816 N. Cedar, Colorado Springs, CO 80903.

SWAN X-1 needed. H.L. Anderson, 816 No. Cedar St., Colorado Springs, CO 80903.

WANTED: Any National recevier, Hallicrafters HT-44, HA-10 preselector. T.N. Colbert, WA8MLV, 1800 Rhodes Rd., No. 612, Kent, OH 44240.

DRAKE R4B receiver in Absolutely perfect condx. $300. Marvin Feldman, KH6DL, 705B Wright, Wheeler, AFB, HI 96786.

FOR SALE: B & K 415 "new" generator, in original carton, complete, $395.00. Wincharger, new, heavy-duty, 12 volt, 200 watt, wind generator with ten foot tower, $395. Hickok 215 pocket semiconductor tester, in carton, $69.00. L.R.E. HA-260, 120 watt, mobile, 2 meter, linear amp., $95.00. Precision-E200C signal generator, used, $35.00. Contact Sal Francione, W1HFL, France Radio Electronics, 14 Broadway, Milford, Conn. 06460.

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SELL: Antique amateur receiver. Crosley model 51. Book type tuning condensor. 2 type 01A tubes. Perfect condition. K.D. Klenk, W3LSE, 420 Bob St., Johnstown, PA 15904.

SELL: Complete Collins KWM1 with AC and DC supplies, mobile mount and speaker $300. Heath SB610 monitorscope $90. Ameco SWR model BU $25. Ameco PCLP preselector $25. Waters Compreamp no. 359 $25. All excellent condx. Add shipping. W2GUJ, 314 Smith St., Freeport, NY 11520, Tel. (516) 378-8173.

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RECORDS, classical LP's, unscratched, wanted to buy. Junker, Box 99412, San Francisco, CA 94109.

FREE ELECTRONICS SURPLUS Catalog. Bargain Packed. Fascinating items, many never before advertised. ETCO-003, Box 762, Plattsburgh, N.Y. 12901. Surplus Wanted.

WANTED: Good used Heath HW-16 with or without VFO. Darrell Hohensee, 217 N. Hamilton, Pratt, Kansas 67124.

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The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June 1976. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., NW, Albuquerque, NM 87114. Please enclose $1 to cover cost of printing and mailing. The one and only book abaout YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50, postpaid.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906. (617) 233-1234.

WANTED: Regency VHF police scanner. W9DDL/W9SS, 5006 N. Second St., Loves Park, IL 61111.

SELL: Heath SB-102 transceiver with ac supply. Mint condx. $375. B. Nastoff, 320 W. 56th Pl., Merrillville, IN 46410.

FOR SALE: Ampex videotape recorder working but sold as is. $165. 1" tape $15/hr. WA2OJT, Al Szablak, 6 Cromwell Pl., Utica, NY 13502. (315) 724-4868.

MINOX Model III-C subminature camera with flash unit. Brand new units in factory boxes. G. Alfred Dodds, 874 Pepperwood Lane, Brunswick, OH 44212.

CQ AND QST 1950-1975 issues for sale. Send s.a.s.e. if ordering 73, Ham Radio, or other CQ and QST issues. One dollar minimum order and all issues cost 25 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

CERTIFICATE FOR PROVEN Two-Way Radio Contacts with Amateurs in all ten (10) USA call areas. Award suitable to frame and proven achievements added on request. SASE brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

WANTED: High-voltage transformer for HT-37. Want FPM-300 in good condition. Roberts, 5520 Porter, Wichita, KS 67204.

SELL: Drake TR4CW transceiver only 3 months old. Including: AC4 power supply, 34PNB Noise blanker installed, matching speaker and Shure 444 Mic., $900. WB2VJF, Wm. D. Shevtchuk, 1 Lois Ave., Clifton, NJ 07014.

WANTED: HQ-120 and Babcock MT-5B manuals. W4ZFH, 140 W. Gilpin Ave., Norfolk, VA 23503.

FOR SALE: PTT Handset with dynamic microphone element, $15. Crystal pair (52/52) for Midland 13-505 transceiver, $4. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

LIKE NEW YAESU STATION: FR-101 (digital) receiver with cw filter, SP-101B speaker, FL-101 xmtr with RFP-101 speech processor, $1100. Al Johnson, K1IK, Box 77, West Dover, VT 05356. (802) 464-5566.

COMPUTER KITS from $95.00, ICC, 2114 S. Prairie, Pueblo, Colo. 81005.

HALLICRAFTERS HA-6 transverter (6 m) with P-26 power supply and cables $175. Heath oscilloscope calibrator, $15. Viking BP-61 record/playback amplifier, $10. Rystl adjustable crossover network 16 ohm $8.50. All FOB, in exc condx. T.K. Brown, RD 1, Box 102, Forksville, PA 18616.

FOR SALE: HW 202, $150. HW2021 HT many xtras, $175. 450 repeater (Mot). K1WXX, 53 Sherman Ave., Meriden, CT 06450.

HEATH SB-620 scanalyzer, $125; Heath AF-1 Audio Freq. Meter, $15; Wanted: G.E. Master 450 RX and TX strip. Also 150 MC TX strip. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

WANTED: 4KC mechanical filter for R390A. D. Oldenburger, 2219 E. Boulevard, Bismark, ND 58501.

GOV'T SURPLUS Sig. Generators AN/USM27B and other electronics for sale cheap or trade. Details/list SASE to: DT, Box 9064-CQ, Newark, NJ 07104.

FOR SALE: Collins 32S1 and 75S1 in exc condx. Best offer. R.B. Rennaker, 1011 Linda Dr., Kokomo, IN 46901.

HALLICRAFTERS PS-150 DC mobile power supply, $45, prepaid. Hallicrafters MR-150 mobile mount for SR-150 or SR-400, new, unused, $15, prepaid. J.R. Shank, 21 Terrace Lane, Elizabethtown, PA 17022.

FOR SALE: Robot 70 and 80. New Videcon. Like new, $300. Prefer pick-up. Murphy, WD4AYH, (404) 942-0483.

EIMAC SK-300 new, $87. ITT/Jen. Vac. Relay RJ1A, new, $37, Transco Remote Coax switch DPDT, No. 1460-822, new, $40. SASE list. A. Emerald, 8955 Swallow Ave., Fountain Valley, CA 92708.

SALE: 32 ASR w/stand, perfect condx, $300, Kenwood 520 w/xtal filter & matching external VFO., $600, Clegg 22 Mark 2, $125, Clegg 22, $65, Ameco 6 & 2 xmtr w/matching VFO, $125, Globe VFO, 160 to 6 meters, $50. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355, (212) 461-5933.

BE FIRST TO KNOW precisely when and where to work all the choice DX. Bi-weekly LI DXA DX Bulletin has: Hot DX News, Time and Frequency of each goodie, QSL Info, Propagation Forecast, and more, Send business size SASE for free sample copy or $8 for 1-year domestic subscription. Long Island DX Association, DX Bulletin, PO Box 173, Huntington, NY 11743.

WANTED: Commercial outdoor type 50 ohm dummy load; 2 kw or greater. Rod, W7OM, 5632 47th Ave., SW, Seattle, WA 98136.

SELL: 2 mtr FM Sonar transceiver, AC P/S, mobile bracket $175. Heath HW-32A with spare tubes $65. George Pataki, WB2AQC, 34-24 76th St., Jackson Hgts., NY 11372.

SALE: Sony ICF-5900W multi-band receiver designed for SWLs. Like new condition w/manuals. $100. Schultz, W4FA, Box "L", FPO New York 09544.

FOR SALE: Old issues of Ham Radio, 73, CQ, QST. Some complete runs. Send s.a.s.e. for lists and prices. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

HW-202 w/built-in Sadlin scanner, crystals; ITC Multi-2000; Bearcat 101 scanner. All good condition. Karl Thurber, W8FX/4, 233 Newcastle Lane, Montgomery, AL 36117.

WANTED: Galaxy 2000 Linear 40-10 trap vertical. Sell CV-89 Ratt Converter. Sam Horton, W4NVJ, 1271 Foxhall Dr., Winston Salem, NC 27106.

WANTED: Hallicrafters HT-45/pwr, HA-10, any National receiver, working or not. Sell: Johnson Ranger. T.N. Colbert, 1800 Rhodes, No. 612, Kent, OH 44240.

LOOKING FOR old Lionel trains. Interested 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.

FOR SALE: Spectra Physics 137P 2mw laser tube, brand new, never used, $80. G.R. 572B 1 kHz Hummer, $15. Irwin Math, 320 Northern Blvd., Great Neck, NY 11021.

SSTV AND PHOTOGRAPHERS—Make offer; 1 each, like new, Fujitar lenses—135 mm, f 4.5—telephoto 35 mm, f 3.5—wide angle. Cary Cowan, c/o CQ Magazine, or call (516) 883-6200.

BYTE, Drink and be merry at the Tidewater Hamfest, Flea Market and Computer Show, Norfolk, Virginia. September 23-24. Over 60,000 sq. ft. of exhibit and flea market space. All indoors. All air-conditioned. Write TRCI, P.O. Box 9371, Norfolk, Virginia 23505.

HELP: Need vibrator for my Novice rig. Gonset G77 trans/modulator unit. Cornell-Dubilier Type 6VL10. Working or not. Gary Clouse, WA6TIA, 5068 E. Carmen Ave., Fresno, Calif. 93727.

WANTED: Extra coils for SW-3 receiver. have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eiamc, 301 Industrial Way, San Carlos, CA 94070.

EZ DOES IT BEST. Deals, that is, on Yaesu, ICOM, Drake, Swan, Cushcraft, Larsen, KLM, DenTron, VHF Engineering, and Wilson. For new or used gear, call, see or write, W0EZ, Bob Smith Electronics, RFD No. 3, Hwy 169 & 7, Fort Dodge, Iowa 50501, (515) 576-3886.

QSLs with Class! Unbeatable quality, reasonable price. Samples: 50 cents refundable. QSLs Unlimited, 1472 SW 13th Street, Boca Raton, FL 33432.

FOR SALE: Tektonix 535 oscilloscope with dual trace and fast rise-time plug-ins. Very good condition. $425. Prefer local pick-up. Irwin Schwartz, K2VG, c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

ELECTRONICS SUPPLIES...Radio accessories, etc. Send for catalog today. 25 cents. ACE Electronics, PO Box 8171, New Fairfield, CT 06810.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts. Small quantities, free catalog. Elwick, Dept. 281, 230 Woods Lane, Somerdale, N.J. 08083.

WANTED: Pre-war issues of Short Wave Craft magazine. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Collins 51-R receiver (VHF). Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

WANTED: Antique glass—Looking for old milkglass—purple, slag, carmel, and greentown. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Hammarlund HQ100A with manual, up to $100 depending on age and condition. Dallas Lankford, 1524 Don, Tyler, Texas 75701.

ADVERTISER'S INDEX

NEW READER SERVICE SYSTEM

To speed information to you on products shown in CQ advertising, a new computerized Reader Service System has been designed. For additional information on a particular ad in this issue, tear out the Reader Service postcard bound between pages 84 and 85, and circle the numbers on the card which correspond with the Reader Service numbers listed on the INDIVIDUAL ADS. DON'T CIRCLE THE PAGE NUMBERS! Fill in your name and address, and mail. We'll have your information on the way in short order.

Q Meter *(from page 57)*

$$Z_{in} = \lim_{Z_l \to \infty} Z_o \left[\frac{Z_l \cosh \gamma s + Z_o \sinh \gamma s}{Z_o \cosh \gamma s + Z_l \sin \gamma s} \right]$$

$$Z_{in} = \lim_{Z_o \to \infty} \left[\frac{Z_l \cosh \gamma s}{Z_l \sinh \gamma s} \right] = Z_o \coth \gamma s \qquad \text{(A3-3)}$$

As we are going to limit the use of the equation to the half-wave line, the susceptance will be zero (or the reactance infinite). Under this condition, the input resistance on a series basis will equal the input resistance on a parallel basis which will also equal the reciprocal of the conductance. Mathematically,

$$Z_{in} = R_{s\,in} = R_{p\,in} = 1/G_{in} \quad \text{or} \quad G_{in} = \frac{1}{Z_{in}} \qquad \text{(A3-4)}$$

Since the 821 measures conductance, it is desirable to use conductance. Hence eq. (A3-3) becomes

$$G_{in} = \frac{1}{Z_{in}} = \frac{1}{Z_o \coth \gamma s} = \frac{\tanh \gamma s}{Z_o} \qquad \text{(A3-5)}$$

In connection with eq. (A3-2) we said γ was a complex number $\gamma = \alpha + j\beta$. Hence eq. (A3-5) becomes

$$G_{in} = \frac{\tanh (\alpha + j\beta)s}{Z_o} \qquad \text{(A3-6)}$$

From a table of hyperbolic identities, it can be shown that

$$\tanh (a + b) = \frac{\tanh a + \tanh b}{1 + \tanh a \cdot \tanh b}$$

Making this substitution

$$G_{in} = \frac{1}{Z_o} \left[\frac{\tanh \alpha s + \tanh j\beta s}{1 + \tanh \alpha s \tanh j\beta s} \right] \qquad \text{(A3-7)}$$

$$G_{in} = \frac{1}{Z_o} \left[\frac{\tanh \alpha s + j \tan \beta s}{1 + j \tanh \alpha s \tan \beta s} \right]$$

Since we have limited this equation to a half-wave line, the electrical length will be 180° and the tan 180° = 0. Thus

$$G_{in} = \frac{\tanh \alpha s}{Z_o}$$

If the losses are assumed low, but not zero, αs will be small and we can use the approximation $\tanh \alpha s = \alpha s$ so

$$G_{in} = \frac{\alpha s}{Z_o} \qquad \alpha = \frac{G_{in} Z_o}{s} \qquad \text{(A3-8)}$$

Eq. (A3-8) gives the attenuation in nepers per the same unit of length as s, which is inches in the example I gave in the text. To change nepers to dB, multiply nepers by 8.686. Hence

$$\alpha_{dB/\text{unit length}} = \frac{G_{in} Z_o \cdot 8.686}{s_{\text{units of length}}} \qquad \text{(A3-9)}$$

Since transmission line attenuation is usually specified in dB/100 feed and the line length measured in inches, multiply eq. (A3-9) by 1200, as there are 1200 inches per 100 feet. This yields eq. (10) in the text.

$$\alpha_{dB/100\,ft.} = \frac{G_{in} Z_o \cdot 8.686 \cdot 1200}{s_{\text{inches}}} \qquad \text{(A3-10)}$$

If it is desired to have the attenuation in dB per 100 meters and the line length is measured in meters, multiply eq. (A3-9) by 100.

$$\alpha_{dB/100\,m.} = \frac{G_{in} Z_o \cdot 8.686 \cdot 100}{s_{m.}} \qquad \text{(A3-11)}$$

It is important to remember the restrictions on eq. (A3-10 or 11). These are (1) the length of line, s, must be one-half wavelength, and (2) the losses must be small, $\frac{1}{G_{in}} \leq 5 Z_o$ EO

New YAESU FT-7 20 Watt
Solid State 80-10 Meter HF Transceiver

The all-solid state FT-7 mobile transceiver provides high performance on the 80 through 10 meter bands. The operator may select upper or lower sideband or CW operation, and the compact package provides many features engineered for convenience while mobile. A single knob provides all transceiver tuning, and the state-of-art noise blanker minimizes impulse-type noise often found in mobile applications. The FT-7 is designed for operation directly from 12 volt car battery or Yaesu's FP-7 DC Power Supply.

YAESU FT-227R
144-148 MHz 800 Channel "Memorizer"

● One knob channel selection, 144-148 MHz ● Memory circuit that allows instant return to any frequency selected ● Fully synthesized in 5 KHz steps ● 600 KHz offset plus any split using memory circuit ● Built-in tone burst ● Optional tone squelch encoder/decoder ● Selectable 10 watt/1 watt output ● Operates directly from 12 volt car battery or Yaesu's FP-4 Power Supply

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578

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CIRCLE 35 ON READER SERVICE CARD

FT-225RD 2 METER TRANSCEIVER DIGITAL READOUT

ALL MODE. SSB CW. AM FM
SOLID STATE
PLUG IN MODULE

NEW ON 2 FROM YAESU

A compact versatile transceiver for the dedicated two-meter DXer, the built-in memory and twenty-five watt output puts the FT-225RD far ahead. See it at your dealers today, or write for our 1978 full line catalog.

SPECIFICATIONS:

General

Frequency Range: 144-145 MHz, 145-146 MHz, 146-147 MHz, 147-148 MHz
Frequency Readout: Digital readout to 100 Hz, analog display resolution better than 1 KHz.
Modes of Operation: LSB, USB, CW, AM, FM
Frequency Stability: Within 100 Hz during any 30 minute period after warmup. Not more than 20 Hz with 10% line voltage variation.
Intermediate Frequencies: 1st IF = 10.7 MHz; 2nd IF = 455 KHz.
Antenna Impedance: 50 ohms unbalanced
Repeater Split: 600 KHz installed, any split up to 1 MHz with optional crystal.
Power Requirements: AC 100/110/117/200/234 Volts
DC 13.8 Volts, negative ground
Power Consumption: AC Receive 30 VA
Transmit 160 VA at full output
DC Receive 1.2 Amps Transmit 6.5 Amps
Size: 280mm (W) × 125mm (H) × 315mm (D)
Weight: Approximately 9 kg

Receiver

Sensitivity: SSB/CW 0.3 uV for 10dB S/N
FM 0.35 uV for 20dB QS
AM 1.0 uV for 10dB S/N
Selectivity: SSB/CW/AM 2.3 KHz at 6dB down
4.1 KHz at 60dB down
FM 12 KHz at 6dB down 28 KHz at 60dB down
Image Response: Better than —60dB
Spurious Response: Better than 1 uV at antenna

Price And Specifications Subject To Change Without Notice Or Obligation

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YAESU

The radio.

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CIRCLE 36 ON READER SERVICE CARD

678A

EIMAC tubes win a place in Rockwell-Collins' HF-80 systems.

Rockwell-Collins chooses EIMAC tubes again.

To power their new HF-80 family of 1 to 10 kW hf single sideband radio equipment, Rockwell-Collins needed tubes as well-constructed and reliable as the HF-80 system itself. That's why they went with EIMAC, the way they have for every hf system they've built since 1958.

The deciding factors—EIMAC's quality, backup, availability and customer acceptance.

The new HF-80 equipment ranges from operator-attended receivers and transmitters to fully automated, remotely located communications stations. The HF-80 is used worldwide in business, military and general government communications. So Rockwell-Collins needed tubes with worldwide availability and technical back-up. EIMAC's proven customer acceptance and well-established reliability were more pluses.

The HF-80 uses EIMAC's 4CX1500B at 1 kW, 4CX5000A at 3 kW, and 4CX15000A at 10 kW with EIMAC's 4CX350A as drivers.

For more information on what makes these and other EIMAC tubes so special, contact Varian, EIMAC Division, 301 Industrial Way, San Carlos, California 94070. Telephone (415) 592-1221. Or contact any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.

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