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Amateur Radio

CQ

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This World's Biggest Antenna Seeks New Worlds To Talk To

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AMATEUR'S JOURNAL

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Faster, easier and more economical digital testing. That's what CSC's Logic Probes are all about. And that's what engineers, technicians and hobbyists need, to deal with the increased use and complexity of digital circuits.

Unlike oscilloscopes, meters and other conventional test equipment, CSC probes are *logic-state oriented:* Just touch the probe to a circuit node and *instantly* read logic state, detect level transitions, check duty cycles. And store high-speed, low-rep-rate events that even fast scopes miss.

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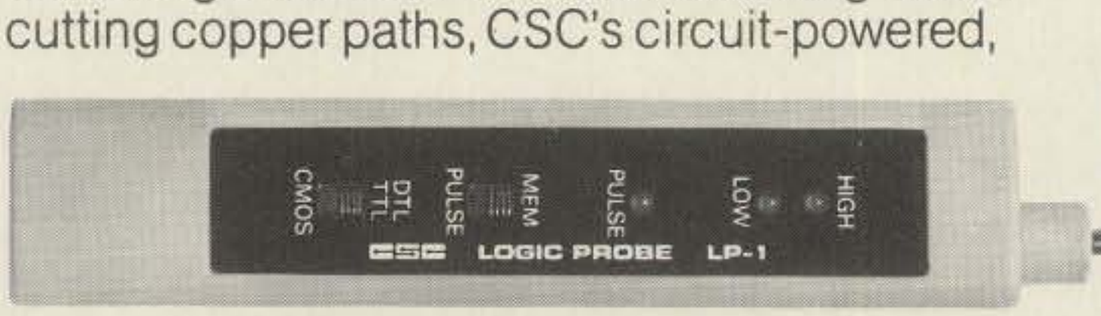

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LP-1 LOGIC PROBE. $44.95*

LP-1 has a minimum detectable pulse width of 50 nanoseconds and maximum input frequency of 10 MHz. This 100 K ohm probe is an inexpensive workhorse for any shop, lab or field service tool kit. It detects high-speed pulse trains or one-shot events and stores pulse or level transitions, replacing separate level detectors, pulse detectors, pulse stretchers and pulse memory devices. All, for less than the price of a DVM.

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LP-3 LOGIC PROBE. $69.95*

Our LP-3 has all the features of the LP-1 plus extra high speed. It captures pulses as narrow as 10 nanoseconds, and monitors pulse trains to over 50 MHz. Giving you the essential capabilities of a high-quality memory scope at *about 1/100th the cost.* LP-3 captures one-shot or low-rep-rate-events all-but-impossible to detect any other way. All without the weight, bulk, inconvenience and power consumption of conventional methods.

Use CSC's highly versatile logic probes for testing, debugging or servicing any type of digital circuit. They give you a lot of information about IC circuit conditions . . . and help you do more in less time. For less money.

NEED MORE INFORMATION? CALL 203-624-3103 to order, or for the name of your local distributor. Prices slightly higher outside U.S.A.

 Prices, specifications, subject to change without notice. *Manufacturer's suggested retail.

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CIRCLE 11 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 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

NEW, IMPROVED MFJ-941B HAS . . .
- More inductance for wider matching range
- More flexible antenna switch
- More sensitive meter for SWR measurements down to 5 watts output

$89.95

Transmitter 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.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B 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 lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

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

A 1:4 balun for balanced 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, balanced line, or random wire.

ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

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 fits 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 balanced line inputs (2), random wire input (1), and ground (1).

NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER.

$79.95 BRAND NEW

Same as MFJ-941B but less 6 position antenna switch.

NEW MFJ-944 HAS 6 POSITION ANTENNA SWITCH ON FRONT PANEL.

$79.95 BRAND NEW

Same as MFJ-941B but less SWR/Wattmeter.

NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz.

$69.95 BRAND NEW

Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

MFJ-901 VERSA TUNER MATCHES ANYTHING, 1.8 THRU 30 MHz.

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Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

MFJ-900 ECONO TUNER MATCHES COAX LINES/RANDOM WIRES.

$49.95 BRAND NEW

Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

MFJ-16010 RANDOM WIRE TUNER FOR LONG WIRES.

$39.95

1.8 thru 30 MHz. 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. Does not tune coax lines.

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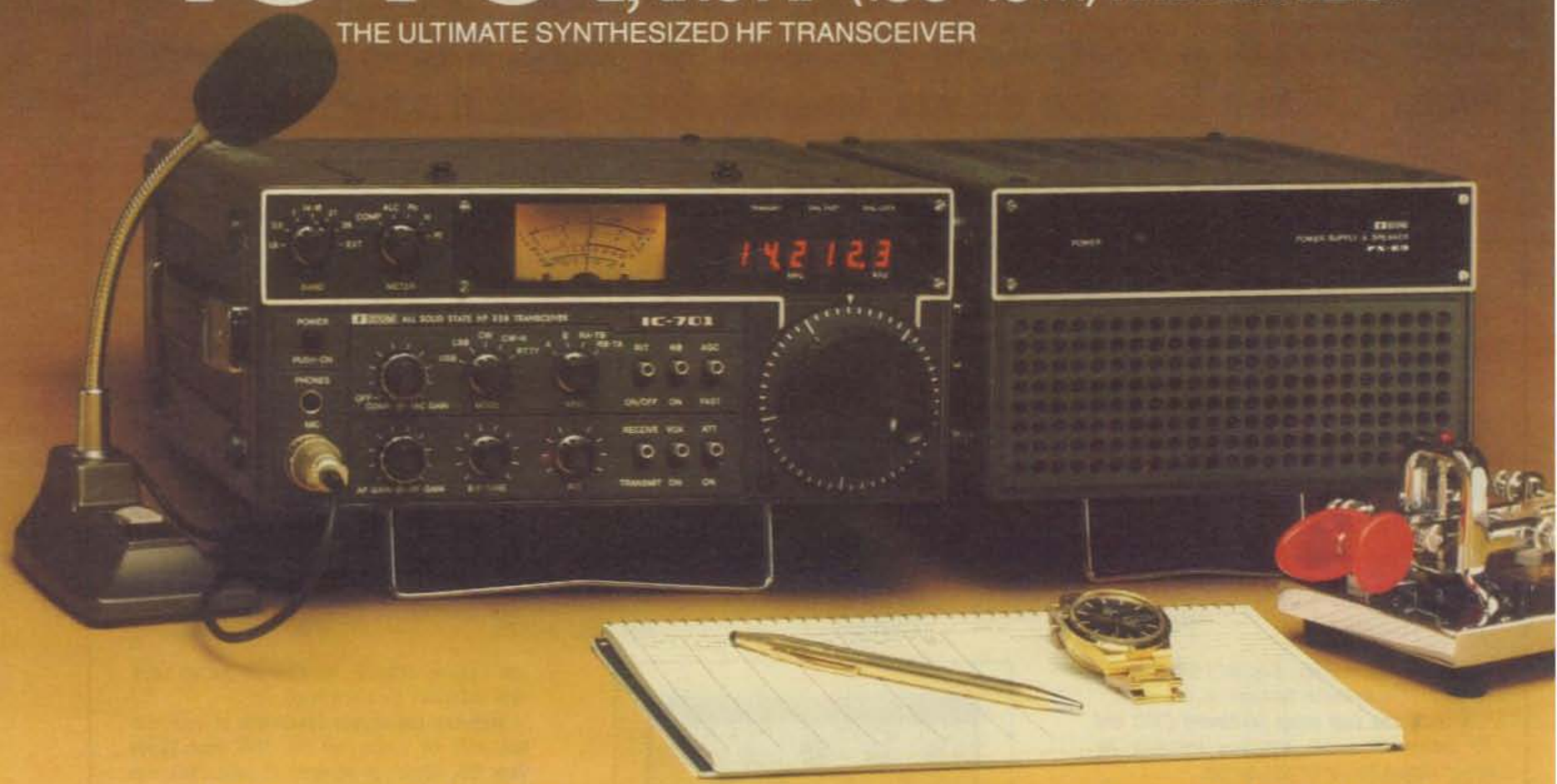
CIRCLE 38 ON READER SERVICE CARD

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

THE ULTIMATE SYNTHESIZED HF TRANSCEIVER



ICOM's superior LSI technology introduces the most advanced transceiver in the HF world, the IC-701! Now ICOM's famous One/Two Team of single knob frequency selection and dual VFO's leaps to the forefront of HF with an extremely compact, all solid state, fully synthesized, 100 W CONTINUOUS OUTPUT Maximizer of all modes and all bands, from 160-10M. The IC-701 is the ICOM breakthrough you've been waiting for: the future in HF.

- **Dual Independent VFO's Built-in:** At no extra cost, **two** digitally synthesized, independently selectable VFO's are standard with every **IC-701.**
- **100 WATTS OUTPUT:** The compact **IC-701** delivers an amazing 100 WATTS OUTPUT, from a completely solid state, no tune final, on all modes and all bands!
- **All HF Bands, 160-10M:** Fullband coverage of each of the six bands, plus some extra coverage for MARS.
- **Fully Synthesized Tuning:** No time-lag: no backlash: unbelievable bandspread, with 100 Hz per division and 5 KHz per turn.
- **Continuously Variable Bandwidth:** The **IC-701** provides all filter widths for SSB, CW, RTTY, and even SSTV.
- **Double Balanced Schottky Diode 1st Mixer** is standard to provide the finest receiver IMD possible in a Hamband transceiver.
- **RF Speech Processor:** This is an **IC-701** standard feature at no extra cost.
- **VOX; Fastbreak in CW; RIT; AGC; Noise Blanker; Full Metering;** and many more ICOM quality standard features come with your **IC-701** HF Maximizer.

The new IC-701 is simply the best HF transceiver ever made: that's all. For more information and your own demonstrations, see your ICOM dealer. The ultimate HF Maximizer is yours in your ICOM IC-701.

Sold complete, with base mic and AC power/speaker, as shown.

IC-701 meets FCC Part 97.73.

All ICOM radios significantly exceed FCC specifications limiting spurious emissions.

Specifications: ☐ Frequency Coverage: 1.8 MHz — 2.0 MHz; 3.5 MHz — 4.0 MHz; 7.0 MHz — 7.5 MHz; 14.0 MHz — 15.2 MHz; 21.0 MHz — 21.5 MHz; 28.0 MHz — 30.0 MHz ☐ Frequency Control: LSI based 100 Hz step Digital PLL synthesizer. Independent Transmit-Receive duplex on same band, standard with every radio. ☐ Frequency Readout: 6 digit LED 100 Hz readout ☐ Power Supply Requirements: DC 13.6 V ± 15% Negative ground current drain, 18 A max at 100 W output; AC power supply, speaker console for AC operation ☐ Antenna Impedance: 50 ohms unbalanced, VSWR 2.0:1 ☐ Weight: 7.3 Kg ☐ Size: (transceiver unit only) 111mm (h) × 241mm (w) × 311mm (d) ☐ RF Power Output: CW (A1), RTTY (F1), 100 W; SSB (A3J), 100 W PEP; Continuously adjustable 0-100W ☐ Emission Modes: A1, CW; A3J, SSB; F1, RTTY ☐ Harmonic and Spurious Output: more than 60 dB below peak power (meets FCC 97.73) ☐ Carrier Suppression: more than 40 dB down ☐ Unwanted Sideband: more than 40 dB down at 1000 Hz AF input ☐ Microphone Impedance: 600 ohms ☐ Receiving System: triple conversion, super heterdyne, with continuous bandwidth control (100 Hz — 2.4 KHz) ☐ Receiving Modes: A1, A3J (USB/LSB), F1 ☐ IF Frequencies: 1st & 3rd, 9.0115 MHz; 2nd, 10.7015 MHz; with continuous bandwidth control ☐ Sensitivity: better than 0.25 microvolts for 10 dB S+N/N ☐ Selectivity: SSB, RTTY, ± 1.1 KHz at −6 dB (adjustable to ± 0.5 KHz min), ± 2.0 KHz at −60 dB; CW, ± 250 Hz at −6 dB ± 700 Hz at −60 dB; CN-N, ± 100 Hz at −6 dB, ± 500 Hz at −60 dB (with Audio Filter) ☐ Spurious Response Rejection Ratio: better than 60 dB

HF/VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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CIRCLE 22 ON READER SERVICE CARD

DECEMBER, 1978 VOL. 34, NO. 12

The Radio Amateur's Journal

FEATURES

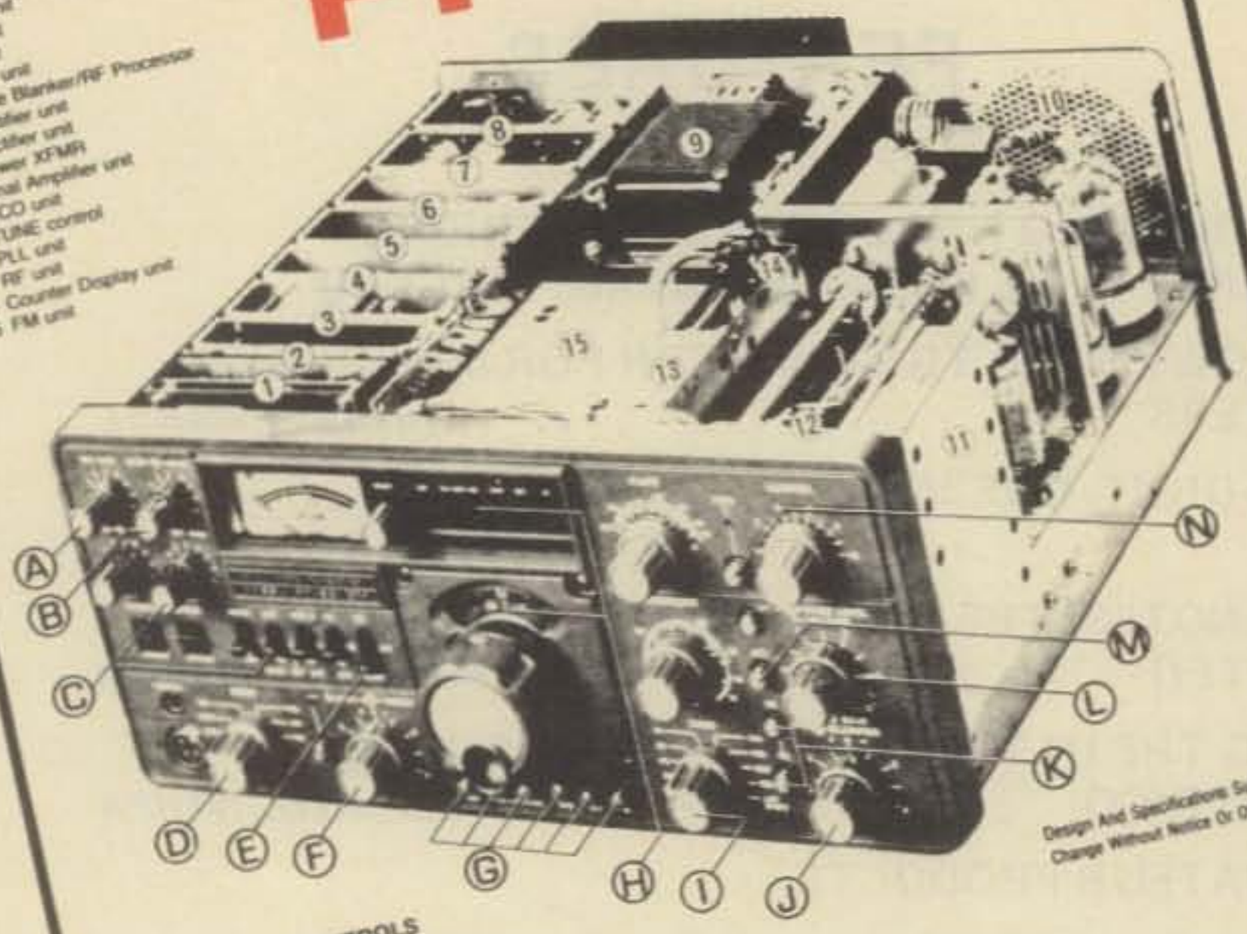
DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, NY 11050. Telephone 516-883-6200

CQ (Title registered U.S. Post Office) is published by Cowan Publishing Corp. Second Class Postage paid at Port Washington, N.Y. and other points. Subscription prices: one year $9.95, two years $16.95. Entire contents copyrighted Cowan Publishing Corp. 1978. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.

Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050

FT-901DM



FRONT PANEL CONTROLS

A Vox gain
B Carrier level/keyer speed
C Audio Peak Frequency system
D MODE switch (SSB, CW, FSK, AM, FM)
E Crystal calibrator/Noise blanker
F Rejection tuning/variable IF passband tuning
G Frequency memory system
H Digital plus analog frequency readout
I Band switch (160-10 meters + WWV/JJY receive)
J Clarifier control
K RX/TX Clarifier selector
L RF Processor level
M RF attenuator
N TUNE control (Places transmitter in "TUNE" condition for ten seconds, then returns to "receive" condition to protect final tubes from excessive key-down time)

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Digital Display	Option	Built-in
RF Speech Processor	Yes	Yes
Negative Feed Back On Final	Yes	Yes
3rd Order Dist. Products	-35dB	-31dB
Harmonic Spurs	-40dB	-40dB
Input Power SSB	200W (PEP)	180W (DC)
Input Power-CW	160W (DC)	180W (DC)
RX Sensitivity	.25uV for 10dB S/N	.25uV for S/N 10dB
IF Shift	Yes	Yes
Rejection Tuning	No	Yes
MDS	?	-137dB
Cross Mod Rejection	?	Better than 80dB immunity at 20KHz

	BRAND "X"	FT-901DM
Dynamic Range	?	90dB
Desensitization	?	Better than 90dB immu
Variable IF Width	No	2.4KHz to 300Hz
Keyer	No	Built-in
Audio Peaking Filter	No	Built-in
All Mode	No (No FM)	Yes
Memory	No	Yes
Provision for New Frequency	Yes	Yes
Modular Construction	No	Yes
Clarifier	Yes	Yes
DC Capability	Option	Yes Built-in
Automatic Mic Gain	No	Yes
Audio Frequency Peaking	No	Yes

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CIRCLE 52 ON READER SERVICE CARD

Zero Bias

an editorial

These are far from the Halcyon Days of amateur radio. Rather than a calming effect we are facing a change from what we have previously experienced. Rather than the slow gradual growth that amateur radio has traditionally seen, we now see more and more amateurs joining our ranks. We see technology change practically before our eyes and speak in terms and expressions that didn't exist a short while ago. Equipment today can truly be said to be over-engineered, going far beyond functional necessity in amateur radio terms and delving into the beauty of what can be done as a practical exercise in imagination. "Wouldn't it be nice to have" translates rather rapidly into an add-on feature in the next production run.

We as amateurs take a lot of this change as a matter of course. The whole concept of microprocessors, computers, digital displays and all sorts of very sophisticated hardware are almost taken for granted. The newcomer to amateur radio is almost forced to bypass the hard-wire stage, gaze quizzically at vacuum tubes and wouldn't even conceive of stripping down an old TV chassis for parts. Gone for the most part are the stores with row upon row of metal drawed cabinets housing "parts" each with its characteristic smell and feel. They have been replaced by blister-packed merchandise and row upon row of clear plastic drawers with miniature multi-colored "parts" sort of like a modern penny candy store. With the advent of "plastic money", equipment that could only have been dreamed about can be had now with plenty of time to pay for it.

By and large, the newcomer to amateur radio is coming to us via the ranks of CB. The fledgling Novice or Technician is accustomed to "talking" and is drawn to two meter f.m. There he/she can not only talk but also get to use some pretty sophisticated equipment, far more intricate than standard CB fare. The challenge comes a little later when the lure of talking at even greater distances surfaces and our amateur friend starts to think of the h.f. bands.

It is generally at this point that one starts to consider whether or not it is easier and more fun to build or to buy equipment. The old saw about amateurs not building anymore has some truth to it only with respect to the complexity of available gear. Granted that the first time builder is not about to tackle a complex transceiver from scratch, as a rule, he will probably start with station accessories or a kit. If he can get over the hurdle of digging into whatever equipment he already has, he might look to modifying and hopefully improving his existing station. Specific tools and test equipment generally come along little by little as needs arise. Some of our most popular articles in *CQ* were on the use of tools and test equipment.

This month our lead article features a transmitter that can be built by practically anybody. It's not super elaborate nor is it within the realm of state-of-the-art. It is designed to be simple and functional . . . to give you the experience and joy of building a rig and getting it on the air. I'd like to see more straightforward construction from all you builders out there. Let's give the newcomer something to cut his teeth on and give a few of us an excuse to dig out those old tools.

Ade Weiss rejoins us next month fully refreshed after a six month sabatical in England. I received his January column this week along with a list of what he accomplished while in England and I must say I am envious. It's a wonder he had any time left at all for amateur radio.

This note is a little late, but better late than never. Our own Frank Anzalone, W1WY, underwent surgery this September. At this time he should be in much better shape and feeling a lot better. You might take some time during this holiday season to send an additional card to Frank wishing him a speedy recovery.

I'd like to close by wishing you the happiest of holidays and the best of new years to come from all of us here at *CQ*.

73, Alan, K2EEK

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...pacesetter in amateur radio

The TS-520S, the most popular Amateur Radio transceiver in the world

...provides a foundation for an expanding series of accessories designed to please any ham... from Novice to Amateur Extra.

TS-520S

The TS-520S transceiver provides full transmit and receive coverage of all Amateur bands from 160 through 10 meters. It also receives 15.0 (WWV) to 15.5 MHz and another 500-kHz range of your choice in the auxiliary band position. With the optional DG-5, you have a large digital frequency readout when transmitting and receiving, and the DG-5 also doubles as a 40-MHz frequency counter. The TS-520S includes a built-in AC power supply, and, with the addition of the optional DS-1A DC-DC converter, it can function as a mobile rig. It features a very effective noise blanker, RIT, eight-pole crystal filter, 25-kHz calibrator, front-panel carrier level control, semi-break-in CW with sidetone, built-in speaker, heater switch, 20-dB RF attenuator and easy phone-patch connection. RF input power is 200 W PEP on SSB and 160 W DC on CW. Carrier suppression is better than —40 dB and sideband suppression is better than —50 dB. Spurious radiation is less than —40 dB. Receiver sensitivity is 0.25 μV for 10 dB (S+N)/N. Selectivity is 2.4 kHz at —6 dB/4.4 kHz at —60 dB and, with the optional CW-520 CW filter, is 0.5 kHz at —6dB/1.5 kHz at —60 dB.

See your local Authorized Kenwood Dealer for more information, and a super deal!

A great station . . . at an affordable price! The TS-520S with its companion accessories . . . including two new units. The AT-200 antenna tuner provides a versatile tool in any station. The other is the TV-502S, Kenwood's 2 meter transverter for SSB and CW operation from 144 to 146 MHz.

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TR-7600

...the radio that remembers

Even without its optional "Remote Controller", the TR-7600 gives you . . .

- Full 4-MHz coverage (144.000-147.995 MHz) on 2 meters
- 800 channels
- Dual concentric knobs for fast frequency change (100-kHz and 10-kHz steps)
- 5-kHz offset switch
- MHz selector switch . . . for desired band (144, 145, 146, or 147 MHz)
- Mode switch for operating simplex or for switching the transmit frequency up or down 600 kHz for repeater operation . . . or for switching the transmitter to the frequency you have have stored in the TR-7600's memory (while the receiver remains on the frequency you have selected with the dual knobs)

Actual size

- Memory channel . . . with simplex or repeater (plus or minus 600 kHz transmitter offset) operation
- Digital frequency display (large, bright, orange LEDs)
- UNLOCK indicator . . . an LED that indicates transceiver protection when the frequency selector switches are improperly positioned or the PLL has malfunctioned
- 10 watts RF output (switchable to 5 watts low power)
- Noise-cancelling microphone
- Compact size (only 6-7/16 inches wide, 2-7/16 inches high and 9-3/16 inches deep)

The optional Remote Controller, with a built-in microprocessor, provides more operating features to the TR-7600 2-meter FM transceiver than found in any other rig! With the Remote Controller attached to your TR-7600, you can . . .

- Select any 2-meter frequency
- Store frequencies in six memories
- Scan all memory channels
- Automatically scan up all frequencies in 5-kHz steps
- Manually scan up or down in 5-kHz steps
- Set lower and upper scan frequency limits
- Reset scan to 144 MHz
- Stop scan (with HOLD button)
- Cancel scan (for transmitting)
- Automatically stop scan on first busy or open channel
- Operate on MARS (143.95 MHz)
- Select repeater mode (simplex, plus transmit frequency offset, minus offset, or any of six memory transmit offsets)
- Select transmit offset (1 MHz/600 kHz)

The Remote Controller's display indicates frequency (even while scanning) and functions (such as autoscan, lower scan frequency limit, upper scan limit, error, and call channel).

Subject to FCC approval

TRIO-KENWOOD COMMUNICATIONS INC.
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in TEN-TEC's *all-new* hf transceiver—

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OMNI—THE *ALL-INCLUSIVE*. Because OMNI has it *all*. Designed to give you every advantage, every capability, whatever your operating specialty. Designed to give you new conveniences and new levels of performance. Designed to give you the world of Amateur Radio with a world of difference—the OMNI world of unique features. An unusual combination not found in any other.

FUNCTIONAL STYLING. The "look" you requested. "Clamshell" aluminum case clad in textured black vinyl. Complementary nonreflective warm dark metal front panel. Extruded satin aluminum trim bezel and tilt bail. Convenient controls. Fully shielded. And everything in a larger, easier-to-use size: 5¾"h × 14¼"w ×14"d.

TOTALLY SOLID-STATE. Sharing the TEN-TEC heritage of solid-state design leadership with its companion transceivers, the highly successful 540/544, OMNI has all the advantages of proven solid-state technology—reliability, long life, cool performance, better stability.

8-BANDS. The world now and in the future. OMNI covers 160, 80, 40, 20, 15, and 10 meters now (crystals included for all present Amateur bands, 1.8-30 MHz). And it has convertible 10 MHz and "AUX" band positions for the future.

BROADBAND DESIGN. Permits changing bands without tune-up, without danger of out-of-resonance damage to the final stage.

ANALOG OR DIGITAL READOUTS. OMNI-A features an analog dial with 1 kHz dial markings. OMNI-D has 0.43" LED readouts with the 5 most significant in red and the 6th in green to show 100 Hz increments.

BUILT-IN VOX AND PTT. Smooth VOX action with 3 easy-to-adjust front panel controls. PTT control is available at both front and rear panel jacks; an external microphone switch may be used.

BUILT-IN SQUELCH. Unusual in an hf rig, but handy for tuning or monitoring for a net or sked.

BUILT-IN 4-POSITION CW/SSB FILTER. 150 Hz bandwidth with 3 selectable skirt contours for optimum CW reception.

8-POLE CRYSTAL FILTER. 2.4 kHz bandwidth, 1.8 shape factor.

SEPARATE MODE SWITCH. Permits using *all* filters in *any* mode.

2-SPEED BREAK-IN. Switch to "fast" or "slow" receiver muting to accomodate any band condition or mobile operating.

2-RANGE OFFSET TUNING. Switch-select the ±5 kHz range for off-frequency DX work or the ±0.5 kHz range for fine tuning.

OPTIMIZED RECEIVER SENSITIVITY. Ranges from 2 uV on 160 m to 0.3 uV on 10 m (10 dB S+N/N) to achieve ideal balance between dynamic range and sensitivity.

GREATER DYNAMIC RANGE. Typically exceeds 90 dB to reduce possible overload from nearby stations. Also includes switchable 18 dB PIN diode attenuator for additional overload prevention.

WWV RECEPTION. On the 10 MHz band switch position.

FRONT PANEL CONTROL OF LINEAR/ANTENNA BAND-SWITCHING. Auxiliary bandswitch terminals on back panel for simultaneous control of external relays or circuits with the OMNI bandswitch.

BUILT-IN PHONE PATCH JACKS. Provide interface to speaker and microphone audio signals for phone patch connection.

BUILT-IN "TIMED" CRYSTAL CALIBRATOR. In the OMNI-A a pulsed 25 kHz calibrator desensitizes the receiver and provides an automatic 5 to 10 second "on" time for easy two-hand dial skirt adjustment.

BUILT-IN ZERO BEAT SWITCH. Permits placing your transmitted signal exactly on the listening frequencies of CW stations.

BUILT-IN SWR BRIDGE. The "S" meter electronically switches to read SWR every time you transmit to provide a continuous antenna check.

FRONT PANEL MICROPHONE AND PHONE JACKS.

ADJUSTABLE AUTOMATIC LEVEL CONTROL. For setting output power level from low power to full output, for retaining low distortion at desired drive power to linear amplifier.

SEPARATE RECEIVING ANTENNA CAPABILITY. Rear panel switch and jack connect receiving section to common antenna or separate receiving antenna. Also acts as receiving antenna by-pass when used with instant break-in linear amplifiers.

BUILT-IN ADJUSTABLE SIDETONE. Variable pitch and volume.

DUAL COMPRESSION-LOADED SPEAKERS. Larger sound output, lower distortion, no external speaker needed.

POWER INPUT. 200 watts when used with 50 ohm load. Proven, conservatively-rated, solid-state final amplifier design with full warranty for first year and pro-rata warranty for 5 additional years.

100% DUTY CYCLE. Ideal for RTTY, SSTV, or sustained hard usage.

PLUG-IN CIRCUIT BOARDS. For fast, easy field service.

POWER. Basic 12 VDC operation for convenient mobile use; external supply required for 117 VAC operation.

OPTIONAL ACCESSORIES. As all-inclusive as OMNI is, there are a few options: Model 645 Keyer, 243 Remote VFO, 248 Noise Blanker, 252M Power Supply.

Model 545 OMNI-A $899 Model 546 OMNI-D $1069

Experience the world of difference of OMNI, see your TEN-TEC dealer or write for details.

arma

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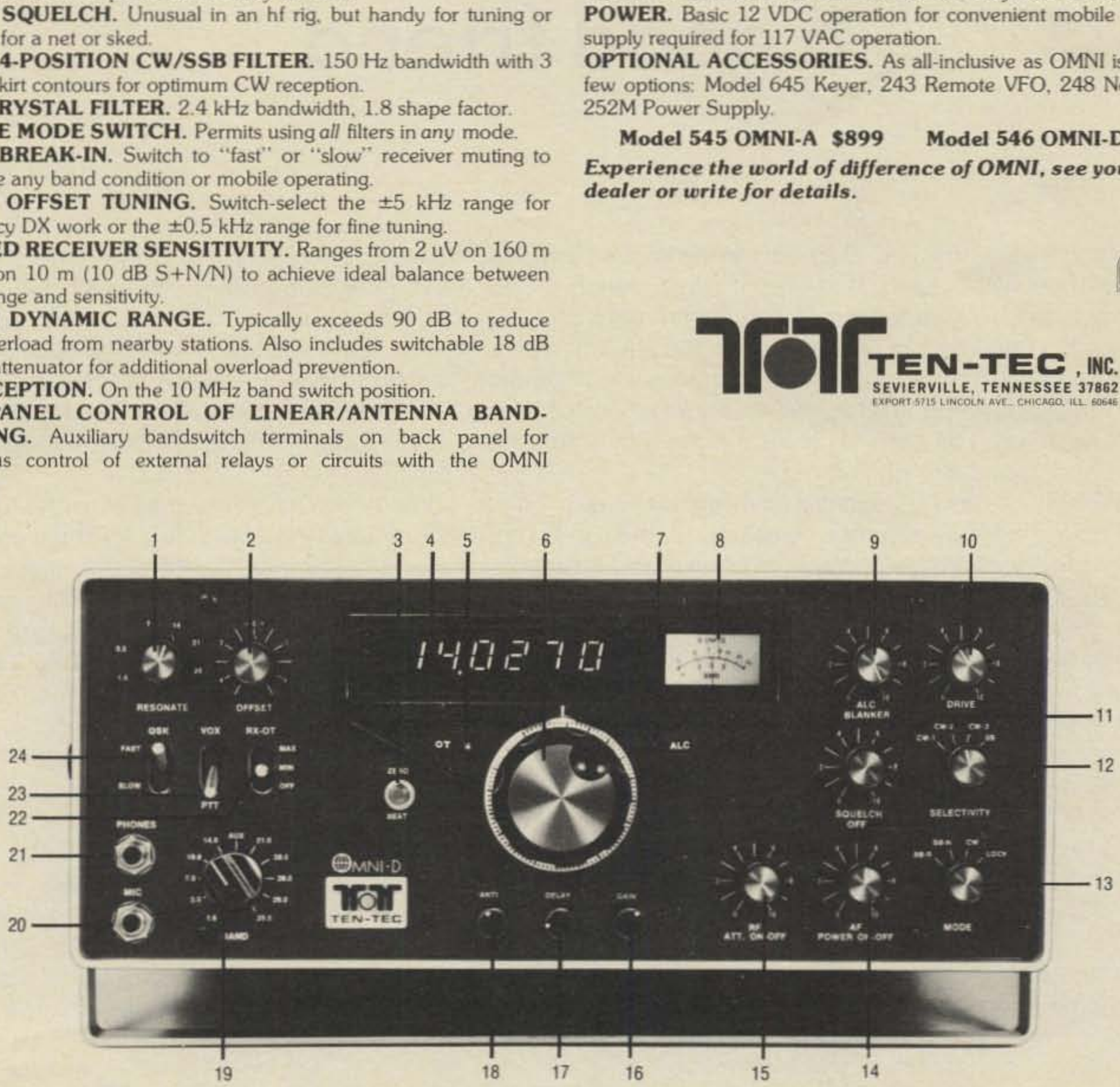

1 Receiver RESONATE control for peak sensitivity.
2 Receiver Dual Range OFFSET TUNING control for off-frequency work.
3 ZERO BEAT switch; spring-loaded, momentary contact.
4 6-Digit LED FREQUENCY READOUT for 100 Hz accuracy.
5 OFFSET TUNING LED indicates OT switch is "on".
6 MAIN TUNING KNOB; big, easy-to-grip with integral spinner.
7 AUTOMATIC LEVEL CONTROL LED indicates ALC-region operation.
8 Combination "S" and SWR METER, switches automatically.
9 Combination ALC control and NOISE BLANKER on/off switch.
10 DRIVE control for final stage.
11 SQUELCH combination on/off switch and control.
12 4-Position SELECTIVITY switch for SSB and CW.
13 4-Position MODE switch; automatic SSB Normal, Reverse, CW, and Lock (key down).
14 Combination push-pull POWER switch and AUDIO LEVEL control.
15 Combination RF ATTENUATOR on/off switch and control.
16 VOX GAIN control.
17 VOX DELAY control.
18 VOX ANTI-TRIP control.
19 11-Position BAND SWITCH.
20 MICROPHONE jack; hi-z input.
21 HEADPHONES jack.
22 RECEIVER OFF-SET TUNING SWITCH; 3-position: Max-Min-Off.
23 VOX-PTT SWITCH.
24 QSK (full break-in) SWITCH; 2-position: Fast-Slow.

Amateur Radio has lost a good friend

On Sunday, September 24, 1978 Lawrence W. LeKashman, W2AB passed away. He would have turned 58 in just another week. Larry was one of those dynamic people who leave an impact wherever they've been. His impacts on Amateur Radio have been many.

Larry was first licensed as an amateur at the age of twelve. Within just a few short years he became recognized throughout the world of ham radio as an outstanding contest operator and DX'er. His first call, W2IOP became synonomous with top operational performance. Over the years the call changed to W8IOP, W9IOP and back again as Larry's career moved him across the country. More recently W8AB, and finally W2AB were the calls Larry chose to use.

Back in 1944, while still a navigator in the Army Air Force, Larry approached my dad with the idea for a new ham magazine. CQ was that magazine. Although he couldn't officially accept a job on the magazine until his military discharge became final, Larry was, in effect, the first editor of CQ. When the first issue appeared in January of '45 his name didn't even appear on the masthead. The second issue carried a feature article by him, as did the third. By the time the April issue went to press Larry was officially CQ's Assistant Editor; a few months later and the title became Managing Editor. But it wasn't until the February, 1949 issue that Larry finally received recognition as CQ's actual editor. He remained with the magazine for about another six months, moving on the RCA as Sales Manager for the distributor products division.

After a short stint at RCA Larry moved on to bigger and better positions throughout the electronic industry. After many productive years as Vice President of Electro-Voice, he joined Bogen-Presto as Chief Executive Officer. Then back to E-V as President after Al Kahn's retirement. Next a move to Olson Electronics as President, then to Lafayette as Executive Vice President. And finally, back to Electro-Voice where he served as Vice President until his demise.

To know Larry was to like him. There was no way not to like this hardworking, energetic dynamo. If Larry had any fault it was that he worked too hard, putting in 16 to 18 hours a day right through the year. He commented to me once that his wife had begun to refer to him as a work-a-holic, and that he was considering slowing down to a normal ten or twelve hour work day. That was Larry. A fine executive, a superb salesman, but more important, a good friend to those of us in the industry who were fortunate enough to work with him.

Amateur Radio has lost one of its strongest supporters. Many of us within the hobby have lost a good friend. We'll miss you, Larry.

Richard A. Cowan, WA2LRO
Publisher, CQ

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YOU GOT IT
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550 MHZ COUNTER KIT

Performance You Can Count On

OPERATES ON

- Batt 6-C Size
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- AC Batt. Eliminator

$99.95

MODEL 3550 KIT

DSI OFFERS THE BEST OF TWO WORLDS . . . An unprecendented DSI VALUE . . . in a high quality, LSI Design, 550 MHZ frequency counter kit. And, because it's a DSI innovation, you know it obsoletes any competitive makes, both in price & performance. The basic 550 MHZ counter & time base are factory assembled, tested and burned-in. The problems of bad LEDS, IC's, capacitors, are a thing of the past with DSI QUIK-KIT®. But you can take pride in assembling the power supply, PC mounted selector switch, input connectors, and the final mechanical assembly of your 550 MHZ counter, into its' handsome cabinet. **GO WITH THE LEADER . . . BUY A DSI FREQUENCY COUNTER KIT. SAVE TIME & MONEY AND BE ASSURED IT WILL WORK THE FIRST TIME.**

SPECIFICATIONS

Time Base TCXO 1PPM 65° to 85°F
Frequency Range 50HZ to 550MHZ
Resolution 1HZ to 55MHZ, 10HZ to 550MHZ
Gate Time 1 second - 1/10 second
Sensitivity 25MV 150 & 250MHZ 75MV 550MHZ
Display Eight 1/2-inch LEDS
Input Two SO239 Connectors
Power 6C-Size Batt., 15HR, or 8.2VDC to 14.5VDC
Current 150 Ma standby 300 Ma operational

3550 KIT INCLUDES

- Pre-assembled, tested counter board
- Case, power supply, connectors, hardware
- Built-in prescaler & preamp
- Gate Light - Automatic Zero Blanking
- Automatic Decimal Point
- One to two hours assembly time
- One Year Warranty on all parts
- All new parts - not factory seconds or surplus

3550 Kit	$99.95
T-101 Telescopic Antenna	3.95
AC-9 Battery Eliminator	7.95
Cigarette Lighter DC Adapter	2.95

TERMS: Orders to U.S. and Canada, add 5% to maximum of $10.00 per order for shipping, handling and insurance. To all other countries, add 15% of total order. California Residents add 6% State Sales Tax.

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INTRODUCING NEW ATLAS

Tune in to the world of ham radio!

ATLAS RX-110...A high performance amateur band receiver at a fantastic low price!

THIS IS THE AMATEUR BAND RECEIVER YOU'VE BEEN WAITING FOR!

It's perfect for the newcomer to amateur radio who wants a low cost receiver to monitor all the action on the ham bands, or for the old timer who wants an extra receiver without having to spend a fortune.

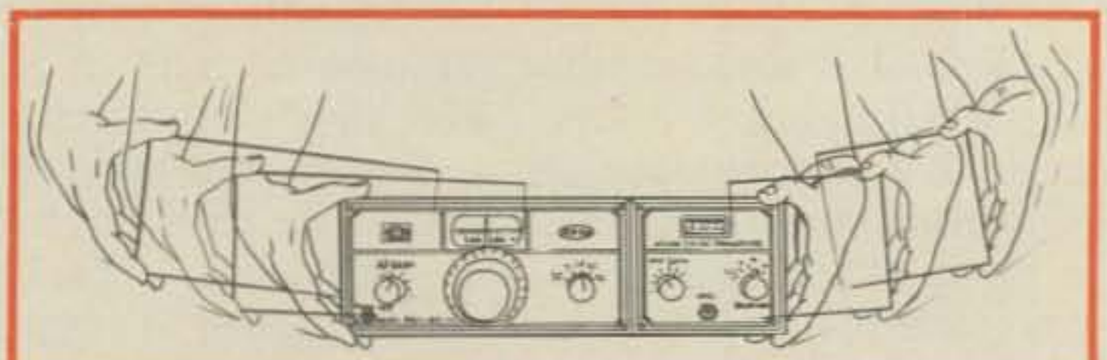
The Atlas RX-110 is all solid state and provides full coverage of 15, 20, 40 and 80 meters, and 28 to 29 MHz on the 10 meter band, with reception of CW Single Side Band. It is self-contained with its own AC supply and speaker and can also operate on 12 to 14 VDC.

The RX-110 offers well illuminated, easy to read tuning dial, velvet smooth tuning, and its handsome cabinet with attractive panel design is compact in size, and lightweight. Solid state design, with high sensitivity, selectivity, and dynamic range...make it comparable to receivers costing several times more. Yet because of its simplicity of design, and our well known value engineering, the cost is remarkably low.

SUGGESTED RESALE PRICE ..... $229.

AND HERE'S THE REAL CLINCHER!

We've made a matching solid state TX-110 transmitter module that plugs into the RX-110 and PRESTO! You have a 5 band transceiver at an unbelievable low cost!



With this completely new concept in receiver/transceiver design, we've produced a real breakthrough in low cost amateur equipment: A superb, low cost receiver to start with, and for the small extra cost of the TX-110 module, a complete 5 band CW-SSB transceiver!

THE EXCITING 110 LINE

A completely new concept in receiver/transceiver design!

RX-110 Receiver + TX-110 Transmitter Module: PRESTO! You have a complete 5 band transceiver!

WE'VE PRODUCED A REAL BREAKTHROUGH IN VERSATILE LOW COST AMATEUR EQUIPMENT!

- The Atlas 110 all solid state transceiver provides CW and SSB communications on 10, 15, 20, 40, and 80 meters with a choice of two power levels.
- The TX-110-L runs 15 watts input on 20, 40, and 80 meters; 10 watts input on 10 and 15 meters.
- The TX-110-H runs 200 watts input on 20, 40, and 80 meters; 150 watts on 15 and 100 watts on 10 meters.
- Full band coverage on 15 through 80 meters; 28 to 29 MHz on 10 meters.
- Semi-break-in CW with sidetone monitoring is a standard feature.
- PTT (Press-to-Talk) operation on SSB. Lower sideband on 40 and 80 meters. Upper sideband on 10, 15, and 20 meters.
- TX-110-L 15 watt module runs on AC supply in RX-110, so it is completely self contained, including speaker. Simply connect antenna, and key or mike.
- TX-110-H requires additional AC supply to supply high current for 200 watt amplifier (Model PS-110).
- 200 watt amplifier may be added to TX-110-L at a later date, thus converting it to a TX-110-H.
- Modular design provides much easier service and maintenance. With cabinets removed everything is wide open and fully accessible. This is a piece of solid state equipment you can work on yourself, if you wish, because you can get at everything with ease.
- The RX-110, TX-110-L, and TX-110-H will all run directly from a 12 to 14 volt DC battery supply for mobile or portable operation. When the two units are mechanically joined (brackets supplied with TX-110), the transceiver slides into a plug-in mobile mount, model MM-110.

SUGGESTED RESALE PRICES:

RX-110	**$229.**
TX-110-L	**$159.**
TX-110-H	**$249.**
PS-110	**$ 89.**

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Special Customer Service Direct Line
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MADE IN U.S.A.

Announcing

• The W2ONV "Delta/Slope" antenna article, which appeared in the August 1978 issue, has been a very large success. Author Bill Salerno wrote the CQ editorial staff recently that he has been buried with inquiries about this popular antenna. However, there seems to be some confusion with regard to the diagram published in Bill's article.

Because the antenna was so well received, we are publishing a more detailed diagram for those who feel the original illustration was no explicit enough.

• Blind amateurs who own (or who are interested in) Yaesu equipment can obtain free recordings of the Annual Sets of the International Fox-Tango Club's newsletters for the years of 1976, 1977, and 1978 by sending blank 90-minute casettes to Tom Warrenburg, Route 3, Box 625, Delavan, WI 53115. Tom, himself handicapped and struggling to pass the Novice examination, will transcribe the Newsletter from Master Tapes he has prepared and return the casettes. There is no charge of any kind, including postage in the USA, (outside the USA, please send postage).

The Newsletter contains much useful information about Yaesu equipment, including operation, modification, and servicing. Back issues are available through 1972 when the Club was first organized by N4ML. Recordings of all back issues are being made and will be available on the same basis when completed.

More information about the Club can be obtained by writing to N4ML, Box 15944, West Palm Beach, FL 33406 or listening to The Fox Tango Net, on Saturdays, 14.325 MHz beginning at 1700 UTC.

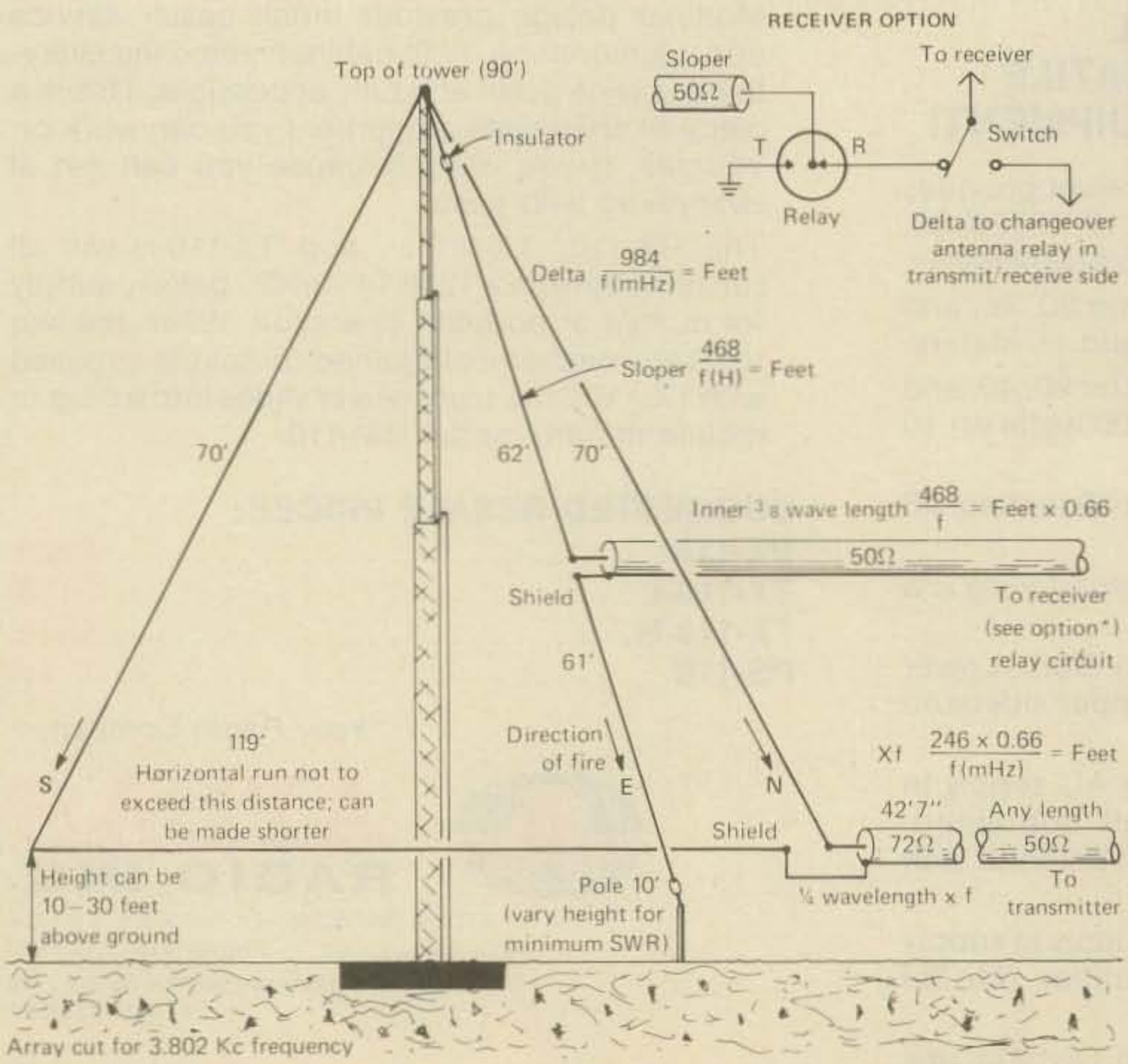
• The Foundation For Amateur Radio would like to announce the 1978 winners of the six scholarships which it administers.

The John W. Gore Memorial Scholarship ($750) to: Alicia Ann Moore, WB9LAD. The Richard G. Chichester Memorial Scholarship ($750) to: Katherine Hevener, WB8TDA. The QCWA Silent Key Memorial Scholarship ($500) to: John P. Georges, WA2MYU. The Young Ladies Radio League (YLRL) Scholarship ($300) to: Elizabeth K. Riemer, N7IT. The Radio Club of America, Inc. Scholarship ($250) to: James S. Storey, WB9NIO. The Edwin S. Van Deusen Memorial Scholarship ($250) to: David A. Newmyer, WB0NLA.

These scholarships were open to all amateurs holding at least an FCC General class license or the equivalent. This year applications were received from 24 states and Canada.

Information regarding the scholarships to be awarded next year will appear in the May 1979 issues of the major amateur radio publications.

• The Society of Wireless Pioneers will hold their annual Christmas CW QSO Party, Dec. 16-17, 1978. Suggestions or additional information about the Party as well as information about the Society, can be obtained from Party Coordinator, Bill Willmot, K4TF, 1630 Venus St., Merritt Island, FL 32952.



Shown with accessory touch tone pad

800 channels in the palm of your hand

Tempo presents the S1 SYNCOM...the world's first synthesized 800 channel hand held transceiver

This amazing pocket sized radio represents the year's biggest breakthrough in 2-meter communications. Other units that are larger, heavier and are similarly priced can offer only 6 channels. The SYNCOM'S price includes the battery pack, charger, and a telescoping antenna. But, far more important is the 800 channels offered by the S1. The optional touch tone pad shown in the illustration adds greatly to its convenience and we have available a 30 watt solid state power amplifier designed to give the SYNCOM S-1 the flexibility of operating as a mobile and base station as well.

SPECIFICATIONS

Frequency Coverage:	144 to 148 MHz
Channel Spacing:	Every 5 KHz
Power Requirements:	9.6 VDC
Current Drain:	17 ma - standby 400 ma - transmit
Batteries:	Ni-cad battery pack included
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")
RF Output:	Better than 1.5 watts
Sensitivity:	Better than .5 microvolts

SUPPLIED ACCESSORIES

Telescoping whip antenna, ni-cad battery pack, charger.

OPTIONAL ACCESSORIES

Touch tone pad, tone burst generator, CTCSS chips, Rubber flex antenna.

Price . . . $349.00 (or with touch tone pad . . . $399.00)

Tempo also offers a complete line of solid state power amplifiers, pocket receivers, the FMH-2, 5 & 42 portables, the VHF/ONE PLUS mobile transceiver, and the FMT-2 & FMT-42 remote control mobile transceiver. All available from Tempo dealers throughout the U.S. Call or write for full information.

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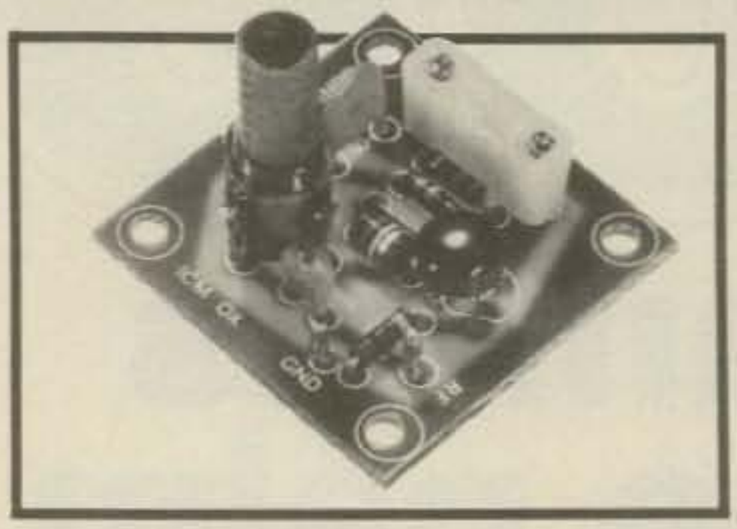
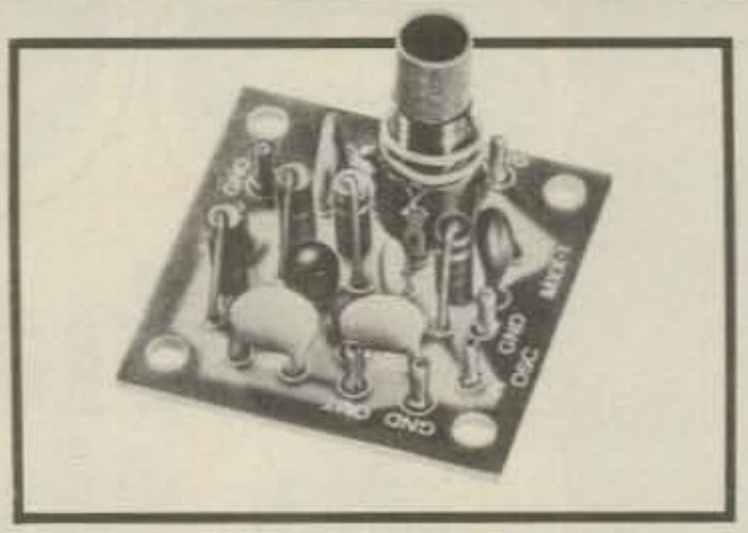


OX OSCILLATOR

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.

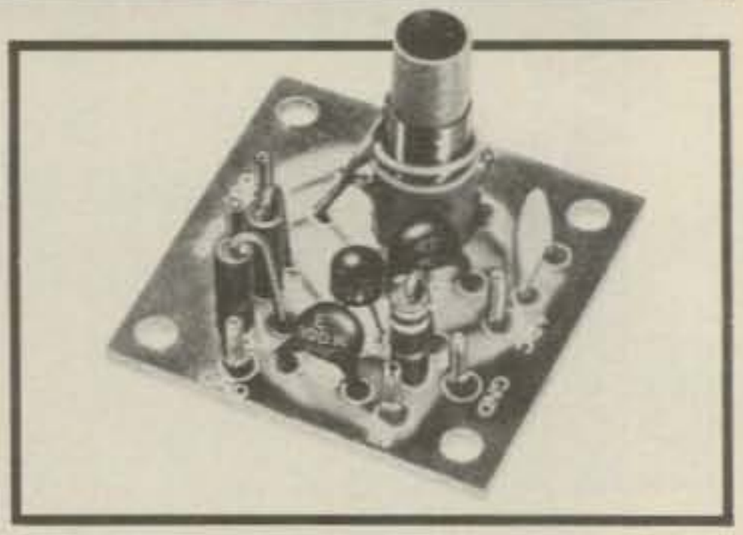
$4.95 ea.



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.

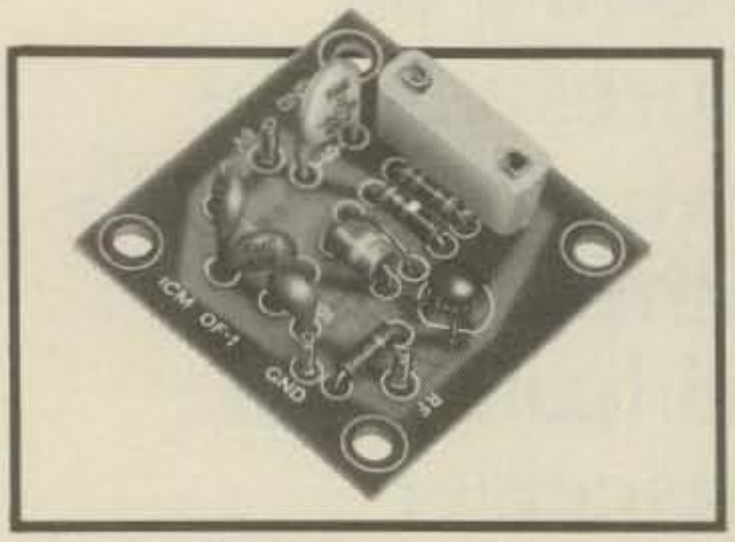
$5.50 ea.



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.

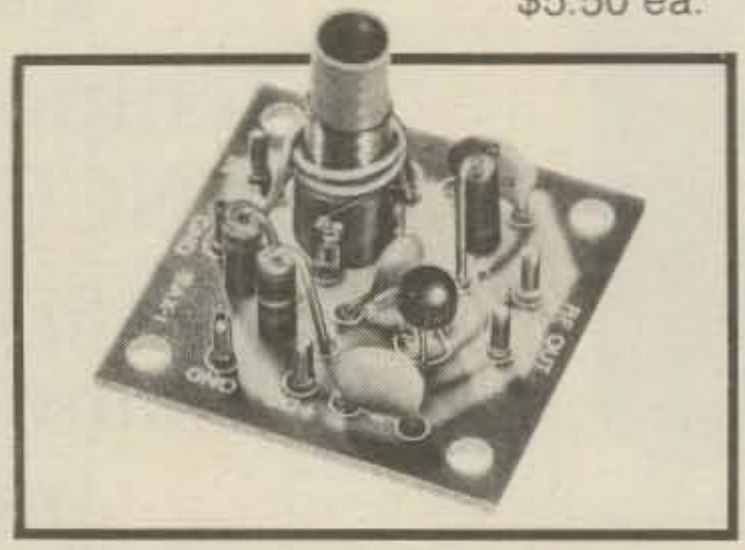
$5.75 ea.



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
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(HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo	
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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	
	Specify when ordering	$4.75 ea.

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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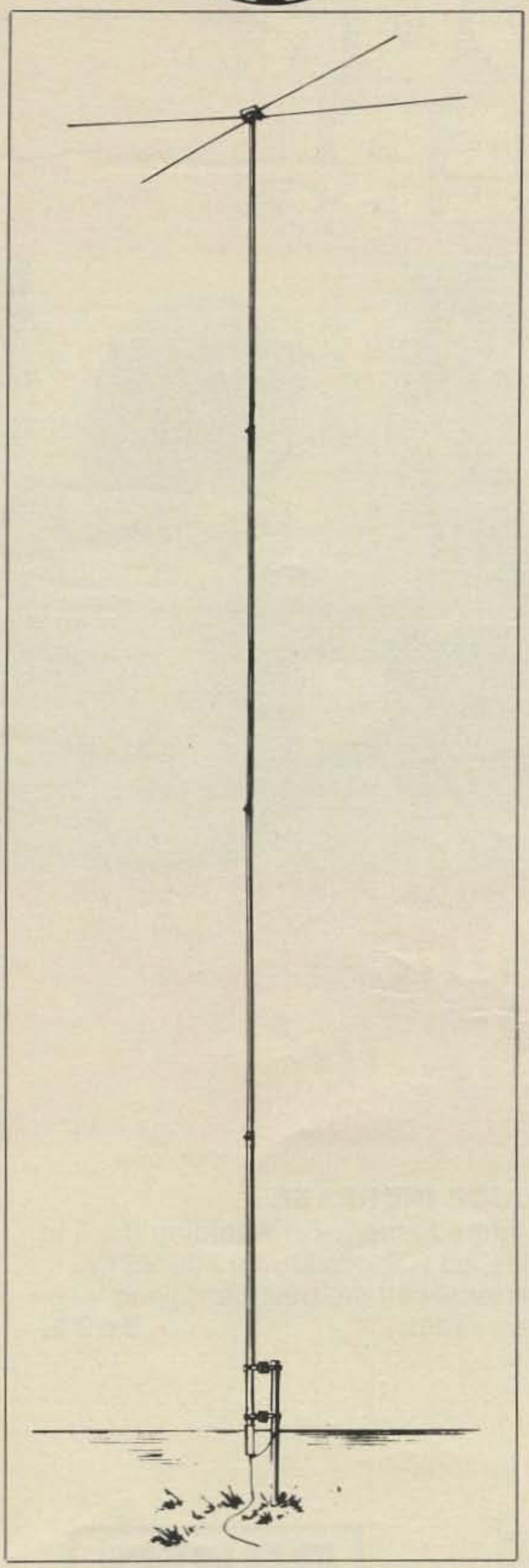
Oklahoma City, Oklahoma 73132.

International Crystal Mfg. Co., Inc.
10 North Lee
Oklahoma City, Oklahoma 73102

Presenting a Revolutionary New Concept:

The Ω HV-5 Dual-mode Antenna



The Omega-T HV-5 incorporates all of the features of our proven HV-3 triband 80/40/20 meter vertical. In addition it provides 10 and 15 meter coverage using balun-fed horizontally polarized V-dipoles as the antenna top-hat. Thus, the optimum polarization for DX is provided on all five bands. This, plus the following features, make the HV-5 the finest 5 band antenna ever offered to the amateur:

- **Performance** - The entire 30 foot top-loaded structure is utilized on 20, 40, and 80 meters, providing greater bandwidth and gain compared to typical trap verticals. Gain for exceeds that of verticals on 10 and 15 meters.
- **Power Handling** - Full legal power, SSB and CW.
- **Construction - Self supporting 6061T-6 extruded pipe—up to ¼"** wall thickness; stainless steel hardware and dipoles.
- **Ease of Installation** - Quick assembly and erection using tilt-up base mount to a pipe or post. Requires only a ground rod ground system at most locations.
- **Band Coverage** - All 5 bands provided with single transmission line feed—no switching required; broad bandwidth, 10 through 40 meters; 80 meter resonance easily changed at base matching unit in seconds; HP-2 plug-in matching unit available for 160 meter operation.
- **Value** - Model HV-5-$259.90; Model HD-2 for 10 and 15 meters only (same as HV-5 but less HP-F base matching multicoupling unit)-$209.95; HV-3-$169.99; HP-2 for 160 meters-$39.95. All items UPS shippable. Prices F.O.B. Richardson, Texas. See your amateur dealer or order direct.

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He'll be glad to demonstrate to you how simple it is to install SSTV in your station ...show you the high quality picture you get with the Robot 400, and let you see for yourself all the activity on the SSTV bands.

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CIRCLE 42 ON READER SERVICE CARD

DXpedition...The Ultimate Fantasy

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

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

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

Clipperton-L suggested price $599.50.
FCC type accepted.

CIRCLE 16 ON READER SERVICE CARD

DenTron
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Twinsburg, Ohio 44087
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Dedicated
to making amateur radio
more fun.

DSI Instruments Inc.

Performance You Can Count On

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INCLUDES TCXO ± 1 PPM

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INCLUDES OVEN TIMEBASE ± .5 PPM

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The 3600A, 3550W and 3240HH Frequency Counters represent a significant new advancement, utilizing the latest LSI Design . . . which reflects DSI's ongoing dedication to excellence in instrumentation, for the professional service technician and amateur radio operator. Before you buy a DSI instrument you know that the specification is. We publish complete and meaningful specifications which state accuracy over temperature and sensitivity at frequencies you need. And we guarantee those specifications in writing. **JOIN THE RANKS OF THOUSANDS OF SATISFIED CUSTOMERS. PLACE YOUR ORDER TODAY AND BE THE ONE ON FREQUENCY.**

DSI — GUARANTEED SPECIFICATIONS — MADE IN U.S.A.

Model	Frequency Range	Accuracy Over Temperature	@150MHZ	@250MHZ	@500MHZ	Number Of Readouts	Size Of Readouts	Power Requirements	Size
3600A	50HZ-600MHZ	OVEN .5PPM 50° to 100°F	10MV	10MV	50MV	8	.5 inch	115VAC or 8.2-14.5VDC	2⅛"H x 8"W x 5"D
3550W	50HZ-550MHZ	TCXO 1PPM 65° to 85°F	25MV	25MV	75MV	8	.5 inch	115VAC or 8.2-14.5VDC	2⅛"H x 8"W x 5"D
3240HH	2MHZ-250MHZ	3PPM 65° to 85°F	100MV	100MV	NA	7	.4 inch	4AA Batt.	5"H x 3"W x 2"D

ALL UNITS ARE FACTORY ASSEMBLED, TESTED AND CARRY A FULL 1 YEAR WARRANTY.

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The First Family of mobile amateur two meter antennas!

None can come close to us on the road. The Hustler family has a strong tradition of quality. Our performance gives you everything you want including maximum range, improved gain and better SWR at resonance.

Ours' is a lasting tradition, too. Hustler antennas are made of only the finest stainless steel and chrome plated components. So you get longer service life.

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CIRCLE 40 ON READER SERVICE CARD

THE SWITCH IS ON!

Not only is the big move to switch to the Wilson Mark Series of Mini-Hand-Held Radios, but now the witch is on the Mark!

Wilson Electronics, known for setting the pace in 2m FM Hand-Helds, goes one step beyond!

AT NO EXTRA CHARGE: all Mark Series Radios now will include a switch for you to control the ower of operation. This will enable you to use the high power when needed, then later switch to low ower to conserve battery drain for extended operation.

IN ADDITION: all Mark Series Radios now have an LED Battery Condition Indicator conveniently nounted on the top plate. A quick peek will reassure you of a charged battery in the radio.

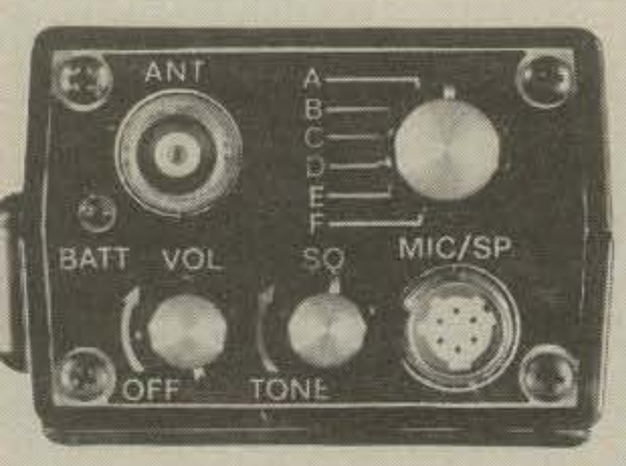
— NOW SWITCHABLE —

MARK II: ≅ 1 & 2.5 watts
MARK IV: ≅ 1.5 & 4.5 watts

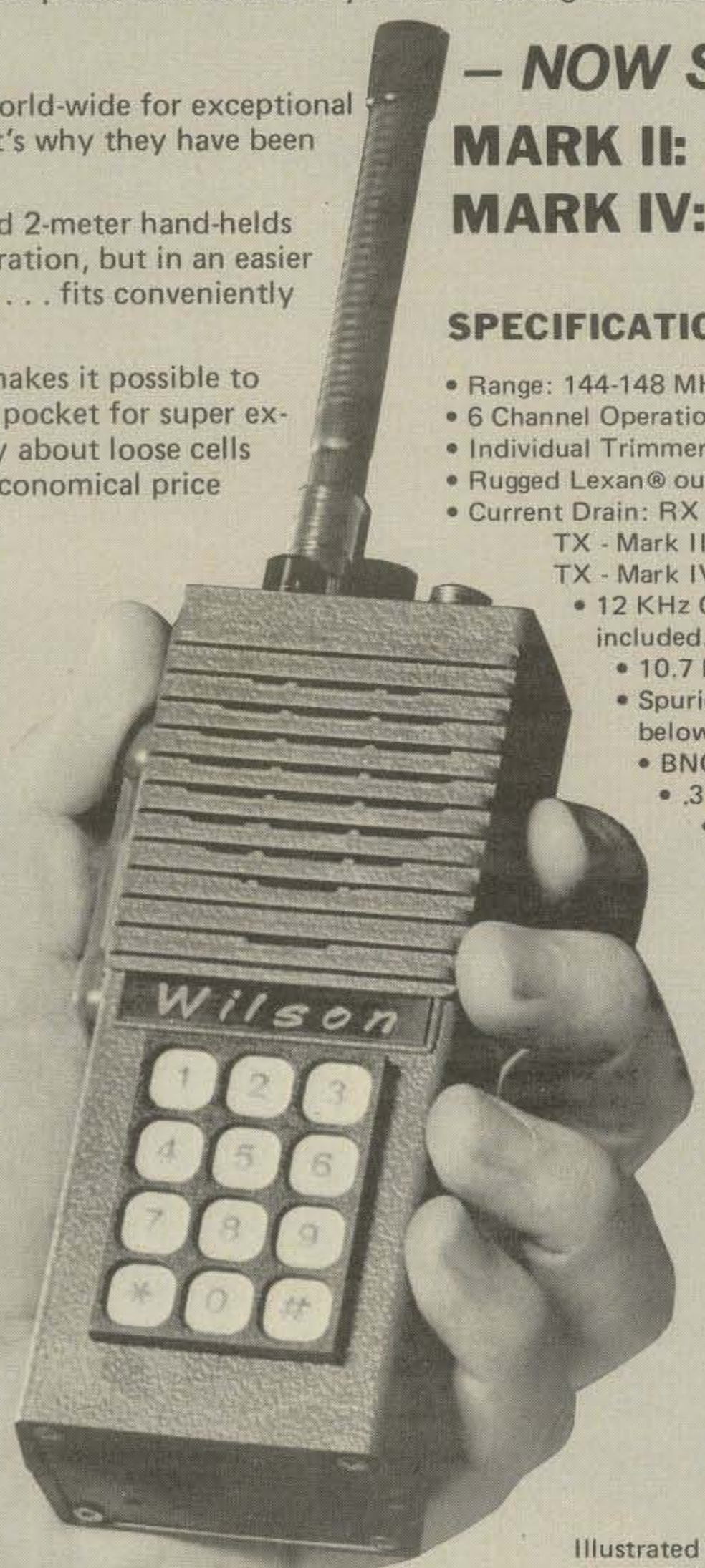
Vilson hand-helds have been known world-wide for exceptional uality and durable performance. That's why they have been he best selling units for years.

Now the Mark Series of miniature sized 2-meter hand-helds ffers the same dependability and operation, but in an easier o use, more comfortable to carry size . . . fits conveniently n the palm of your hand.

The small compact size battery pack makes it possible to arry one or more extra packs in your pocket for super ex- ended operation time. No more worry about loose cells horting out in your pocket, and the economical price nakes the extra packs a must.



Conveniently located on top of the radio are the controls for volume, squelch, accessory speaker mike connector, 6 channel switch, BNC antenna connector and LED battery condition indicator.



Optional Touch Tone™ Pad available.

SPECIFICATIONS

- Range: 144-148 MHz
- 6 Channel Operation
- Individual Trimmers on TX and RX Xtals
- Rugged Lexan® outer case
- Current Drain: RX 15 mA
  TX - Mark II: 500 mA
  TX - Mark IV: 900 mA
- 12 KHz Ceramic Filter and 10.7 Monolithic Filter included.
- 10.7 MHz and 455 IKz IF
- Spurious and Harmonics: more than 50 dB below carrier
- BNC Antenna Connector
- .3 Microvolt Sensitivity for 20 dB Quieting
- Uses special rechargeable Ni-Cad Battery Pack
- Rubber Duck and one pair Xtals 52/52 included
- Weight: 19 oz. including batteries
- Size: 6" x 1.770" x 2.440"
- Popular accessories available: Wall Charger, Mobile Charger, Desk Charger, Leather Case, Speaker Mike, Battery Packs, and Touch Tone™ Pad.

Illustrated is Wilson's BC-2 Desk Top Battery Charger shown charging the Mark Series Unit or the BC-4 Battery Pack only.

To obtain complete specifications on the Mark II and Mark IV, along with Wilson's other fine products, see your local dealer or write for our Free Amateur Buyer's Guide.

Consumer Products Division

Wilson Electronics Corp.

4288 South Polaris Avenue • P. O. Box 19000 • Las Vegas, Nevada 89119
Telephone (702) 739-1931 • TELEX 684-522

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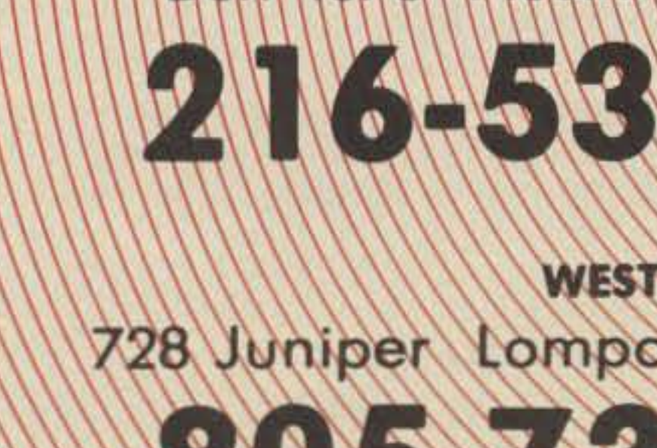

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Write For Used Equipment Sheets and Catalog

Maximum Legal Power... ALPHA Style!

It's yours in these great new powerhouses from ETO

There are many so-called "Maximum Legal Power" linear amplifiers on the market. Why do so many knowledgeable amateurs, after checking out (or even owning) other makes, ultimately choose ALPHA?

Well, "maximum legal power" can be misleading . . . it doesn't tell the whole story. Most manufacturers' ratings assume that amateur service is inherently intermittent, so terms such as "continuous" and "100% duty" may be meaningless unless explicitly defined. The result can be a power transformer or tube going up in smoke during a long operating period.

But every ALPHA amplifier is explicitly rated to run a full 1000 watts of continuous, average DC power input, in any mode, with No Time Limit (NTL).

You could leave your ALPHA **(any ALPHA)** all day with a brick on the key, at a kilowatt input (or at 2 KW PEP input, two tone SSB) without hurting it. In fact, you could leave it for weeks: last year we ran a standard ALPHA 76 key-down at a kilowatt for **18 days** without ill effect.

That's "Maximum Legal Power" . . . ALPHA style.

PLEASURE OF OWNERSHIP . . . ALPHA STYLE!

The pleasure of owning and using a new ALPHA is now even greater. There's rugged, handsome new metalwork . . . refined metering and push-button control systems . . . improved bandpass circuits in the no-tune-up models. One model combines the conveniences of no-tune-up operation **and** full CW break-in. Another brings ALPHA POWER to 6 meters.

ENGINEERING AND CRAFTSMANSHIP . . . ALPHA STYLE!

These new ALPHA models are pleasing to the eye . . . but the real beauty is **inside**, where engineering and craftsmanship tell the story. The husky components and basic circuitry are the same ones that kept the ALPHA 76 and ALPHA 374 so amazingly free of major failures.

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The new ALPHA 76A series is FCC type-accepted and available now. For details, descriptive literature, and fast delivery on a great new ALPHA, see your dealer or contact ETO direct.

And ask for a copy of our free guide, *"Everything You Always Wanted To Know About (Comparing) Linears . . . But Didn't Know Whom to Ask."*

ALPHA – Sure you can buy a cheaper linear . . . But is that <u>really</u> what you want?

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SX-117 Receiver	189
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SR-160 Xcvr	159
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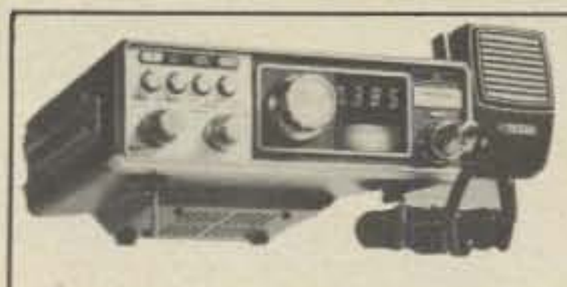

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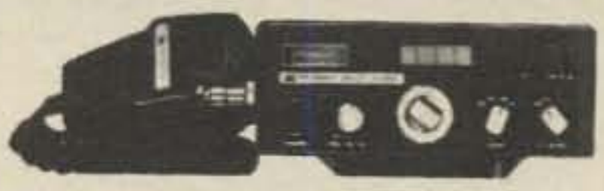

MIDLAND 13-510

Regular $399, save $50; or buy a Midland 13-513 at $499 (no trades) and take a $100 credit towards another purchase.

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Bearcat 210 Scanner $349, now $239.00 Super synthesized receiver, scans and searches over 16,000 different frequencies. Covers 32-50, 146-174 & 416-512 MHz.

Due to early closing dates for magazine ads, some items may be unavailable when you receive this publication. We will attempt to accommodate all orders whenever possible.

Power supplies cannot be sold separately from radios where offered as a combination package. Mail & phone orders welcomed. Bank Americard accepted. All units guaranteed.

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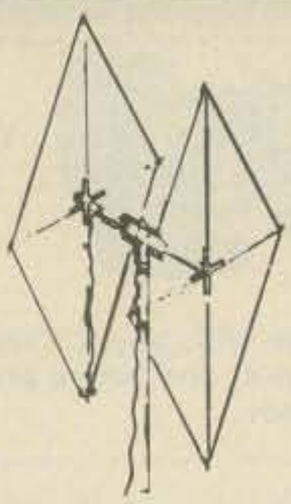

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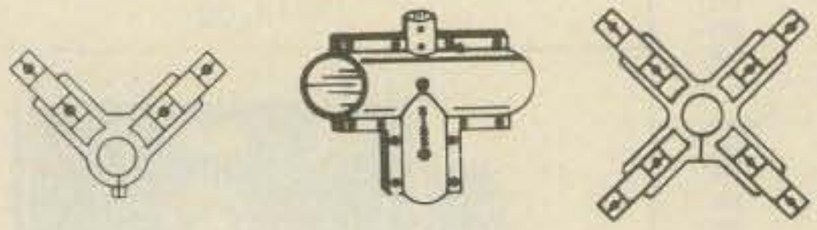

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DL-2	(2)	2" Hub V-Supports	
	(1)	2" Boom to 1½" Mast T-Mount	$24.69
DL-3	(2)	3" Hub V-Supports	
	(1)	3" Boom to 2" Mast T-Mount	$40.64

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	
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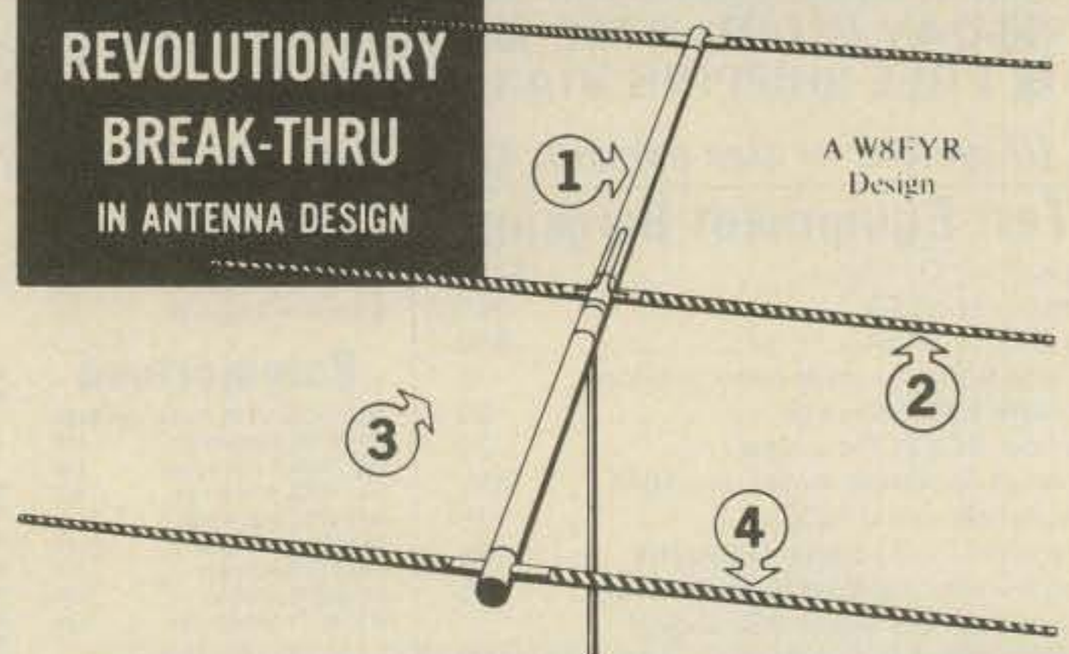

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2. ELEMENT LENGTHS 25% TO 35% SHORTER THAN METALLIC ARRAYS
3. PRECISION CONSTRUCTION, MINIMUM ASSEMBLY TIME.
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AND EXCLUSIVE FEATURES:

4. COPPER TAPE, SPIRALLY WOUND ELEMENTS COATED WITH DURATHANE
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Example:

3 Element 40 M	46 Lbs.	$589.50
3 Element 20 M	17 Lbs.	$249.94
3 Element 15 M	9 Lbs.	$192.45
3 Element 10 M	8 Lbs.	$149.95

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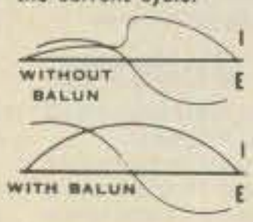
Kirk Broad Band Baluns are designed for matching an unbalanced line, such as coaxial cable, to a balanced antenna to produce a symmetrical wave form of equal intensity from the current cycle.



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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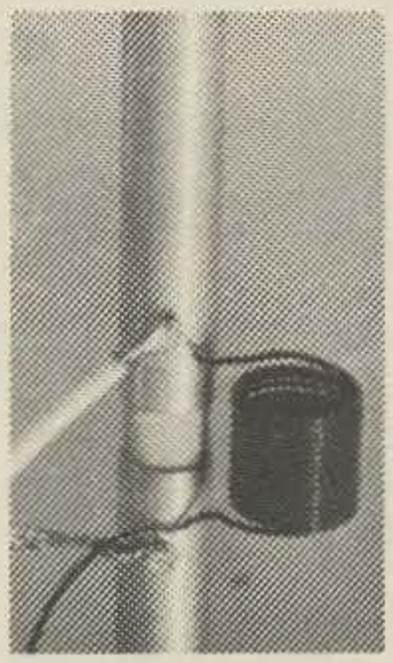
Model HF3V - - Automatic bandswitching 80-20 meters.

May also be used on 10 meters with low VSWR. Same rugged construction as models HF5V-II and HF4V-II. Will not operate on 15 meters without a tuner, but specifications are otherwise identical to those of model HF5V-II except as noted below. Comes complete with mounting post, base shunt inductor for d.c. grounding, RG-11/U matching section, and connectors for PL-259 and any length of 50-53 ohm cable.

Shipping weight: 10 lbs./4.5 kg.

Height: 25 ft./7.5 meters

$72.00



Model HF4V-II - - Automatic bandswitching 40-10 meters.

Entire radiator length is active on 40, 20 and 10 meters (full size quarter-wave resonance on 15 meters). Same construction and 40-10 meter specifications as model HF5V-II except as noted below. Comes complete with mounting post, base shunt inductor for d.c. grounding, RG-11/U matching section, and connectors for PL-259 and any length of 50-53 ohm cable.

Shipping weight: 9 lbs./4 kg.

Height: 25 ft./7.5 meters.

$72.00

$94.00

Low-profile antennas for mobile home parks and other restricted height areas! Same quality construction and 80/40 meter resonator circuits as used in the larger HF models; traps for 10 and 15 meter operation, but entire radiator length is active on all other bands. Both models complete with mounting post, base shunt inductor for d.c. grounding, and socket for PL-259 coax plug. May be ground or roof/tower mounted.

ELECTRICAL AND MECHANICAL SPECIFICATIONS:

Model HF5V-S - - Automatic bandswitching 80-10 meters.

Shipping weight: 9 lbs./4 kg.

Height: 16 ft./4.8 meters

Power Rating: legal limit SSB/C.W. 20, 15 and 10 meters; 1200 W PEP/500 W C.W. 40 meters; 500 W PEP/250 W C.W. 75/80 meters.

Feedpoint impedance: nominal 50 ohm all bands.

VSWR at resonance: 1.5:1 or less all bands.

Bandwidth for VSWR of 2:1 or less:
10 meters - - 1500 Khz; 15 and 20 meters - - entire band; 40 meters - - 150 Khz; 75/80 meters - - 30-50 Khz.

Wind survival rating (unguyed): 80 m.p.h./128 km.p.h.

Model HF4V-S - - Automatic bandswitching 40-10 meters.

Shipping weight: 8 lbs/3.6 kg.

Height: 14 ft./4.2 meters

Except for operation on 75/80 meters, all other specifications are identical to those given above for the HF5V-S.

$68.00

F5V-S HF3V HF4V-II HF4V-S

CIRCLE 20 ON READER SERVICE CARD

the super-compact

alda 103

only 3¼" high x 9" wide x 12½" deep • less than 8¼ pounds

ALDA 103, the trim little powerhouse with incredible performance for the price! ALDA 103 provides a full 250 watts PEP input for SSB operation, and 250 watts DC input for CW. And when it comes to performance, ALDA 103 is the hottest little transceiver going — all solid state, totally broadbanded and super-stable VFO.

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Semiconductors:	39 diodes, 23 transistors; 11 integrated circuits
Power Requirements:	Nominal 13.8 VDC input at 15 amps, negative ground only
Power Consumption:	Receive — 5.5 watts (includes dial and meter lamps); Transmit — 260 watts
Dimensions:	3-1/4" high x 9" wide x 12-1/2" deep (82.55 mm x 228.6 mm x 317.5 mm)
Weight:	8-1/4 lbs. (3.66 kg)

PERFORMANCE SPECIFICATIONS

Frequency Range:	80 meter band — 3.5 to 4.0 MHz 40 meter band — 7.0 to 7.5 MHz 20 meter band — 14.0 to 14.5 MHz
Modes:	CW; USB; LSB
RF Input Power:	SSB — 250 watts PEP nominal CW — 250 watts DC maximum (adjustable)
Transmitter:	
Antenna Impedance:	50 ohm, unbalanced
Carrier Suppression:	Better than −45 dB
Side-Band Suppression:	Better than −55 dB at 1000 Hz
Distortion Products:	Better than −26 dB
AF Response:	500 to 2500 Hz
Spurious Radiation:	Harmonics better than −45 dB below 30 MHz; better than −60 dB above 30 MHz
Frequency Stability:	Less than 100 Hz drift per hour (from a cold start at room temperature)
Microphone:	High impedance 3000 ohm
Receiver:	
Sensitivity:	Better than 0.5 watts audio output for 0.5 μV input
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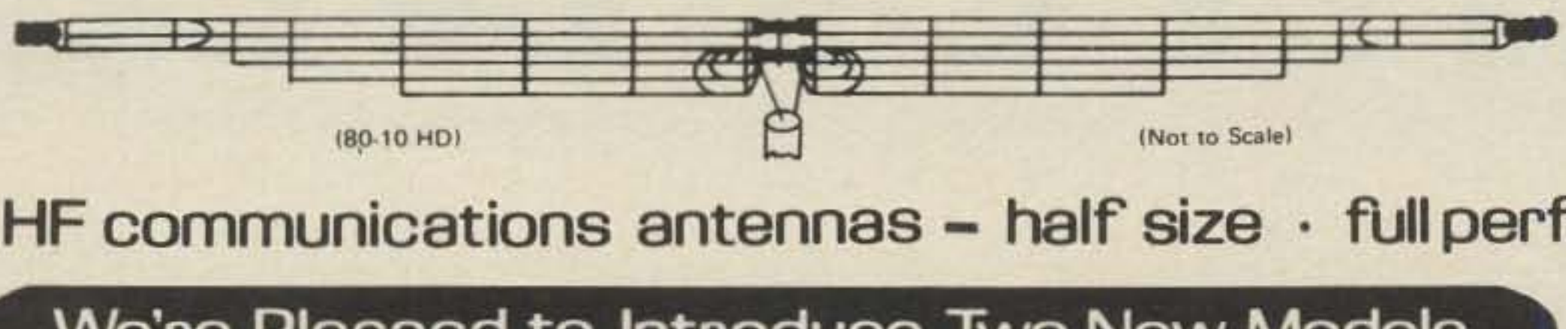

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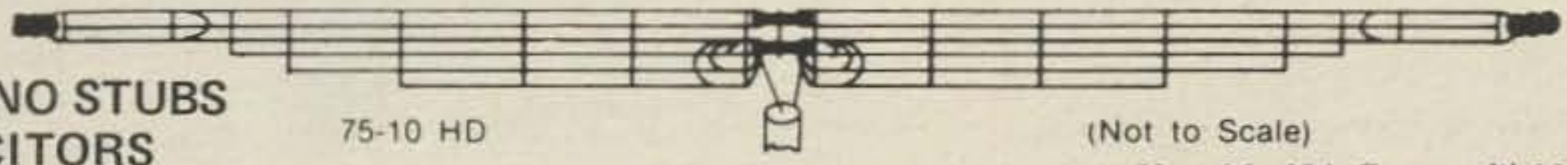

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75-40 HD (SP)	75/40	57.50	40/1.12	66/20.1
75-20 HD	75/40/20	66.50	44/1.23	66/20.1
75-20 HD (SP)	75/40/20	66.50	44/1.23	66/20.1
75-10 HD	75/40/20/15/10	74.50	48/1.34	66/20.1
75-10 HD (SP)	75/40/20/15/10	74.50	48/1.34	66/20.1
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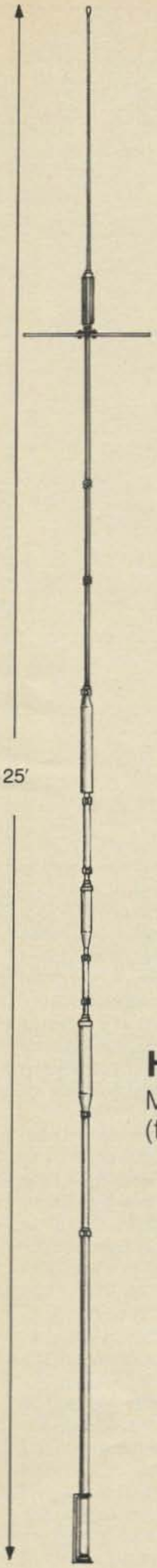

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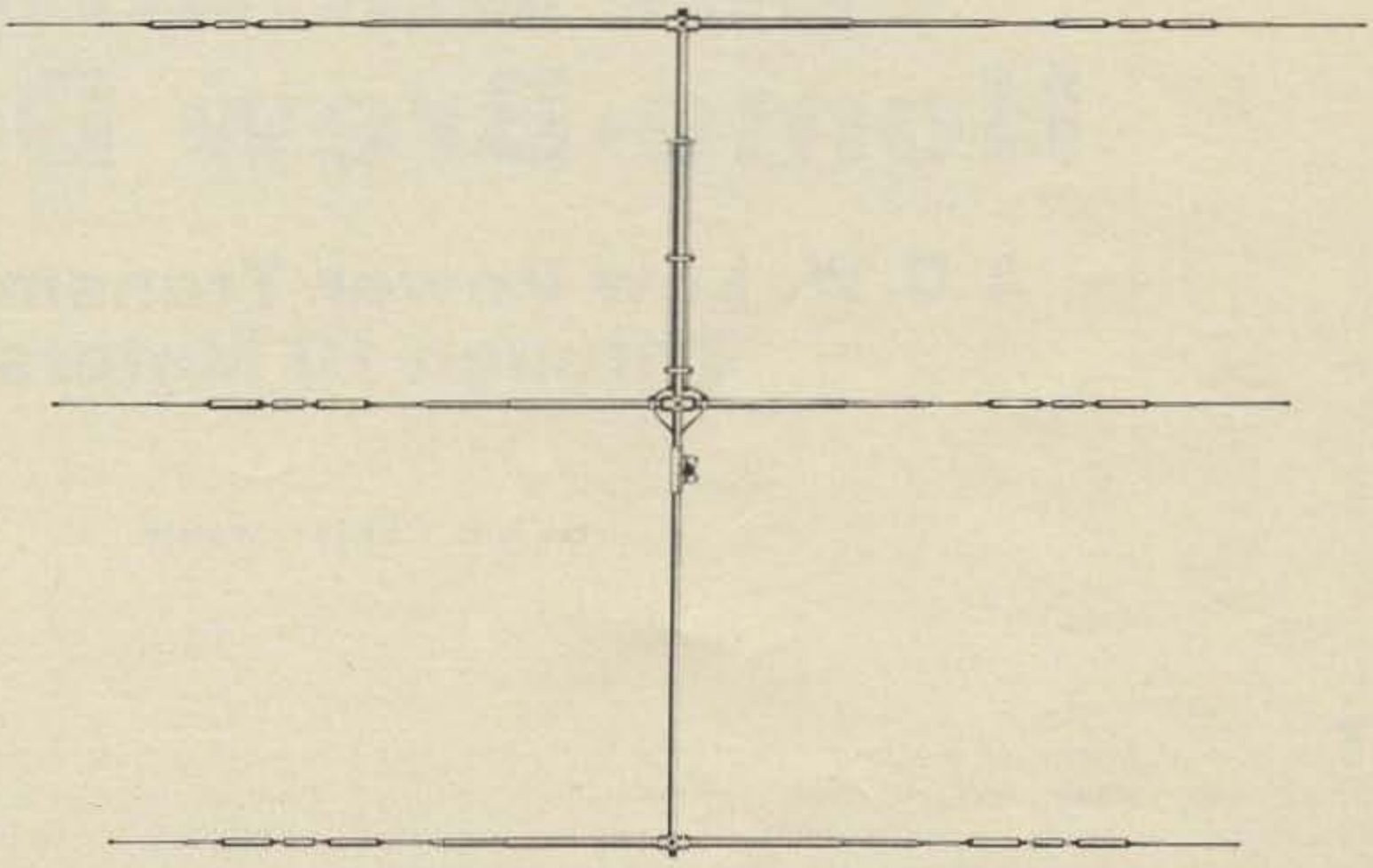

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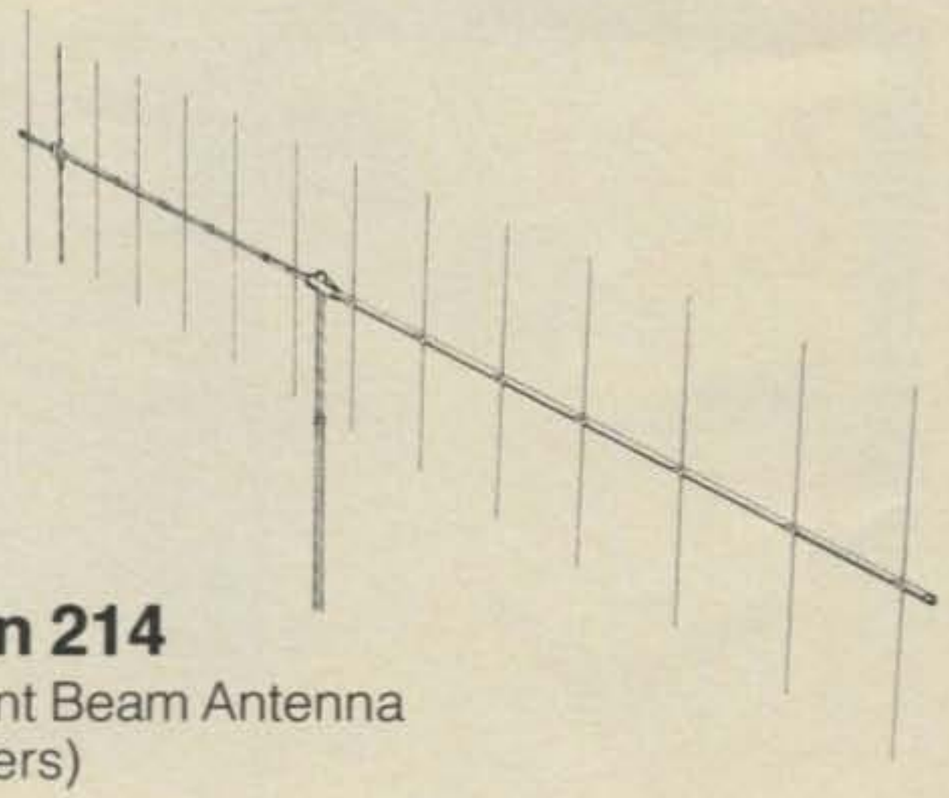

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There's a difference between home-building and home-brewing. Pre-packaged kits are home-built. Home-brewing involves your own research, design, finding of parts and components and, finally, putting the project together, testing it, debugging it and using it. Author Cebik describes the steps he took to home-brew his own transmitter.

A First Step From Just Building to Home-Brew Design

A C.W. Low Power Transmitter for 80 Through 10 Meters

BY L.B. CEBIK*, W4RNL

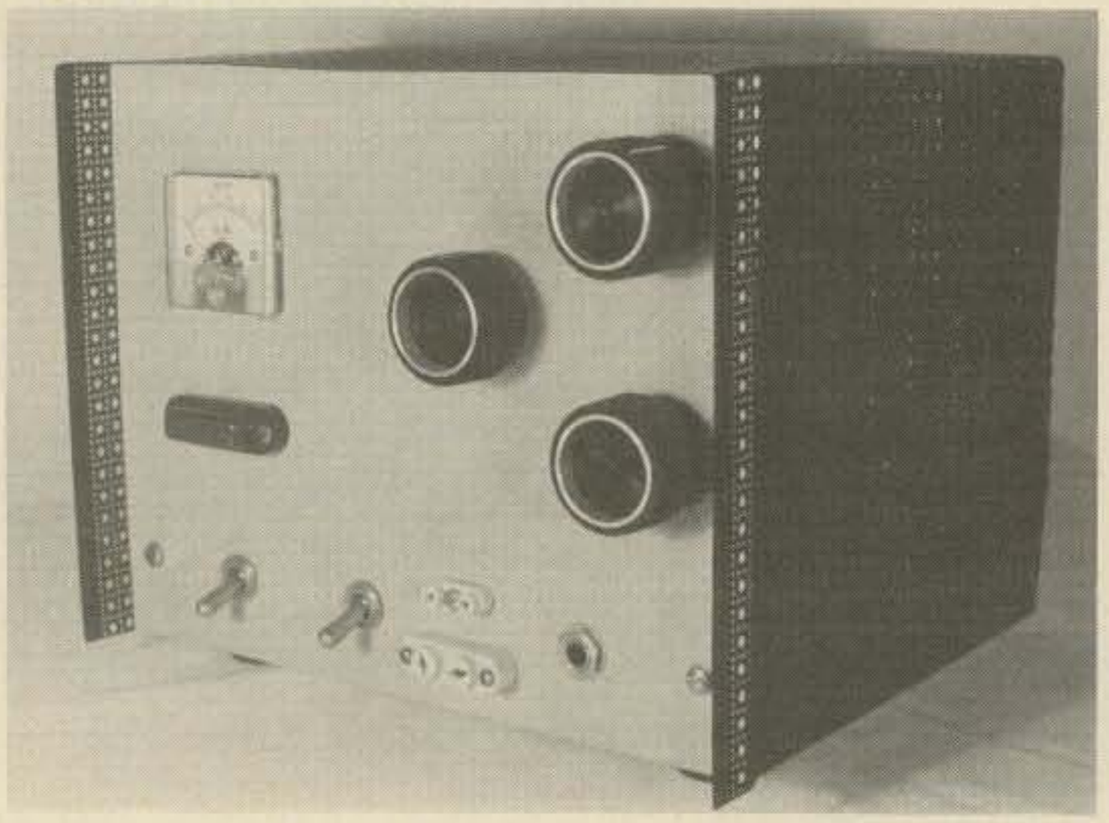
The casual builder of electronic gear has been reduced pretty much to designing and constructing station accessories. First receivers and then transmitters became too complex (so we thought) for non-engineers to design. And specialized components are ever harder to find. So we weekend builders content ourselves with reproducing small IC projects we see in the magazines. In the process, we may be losing our ability to do basic design work, even at the amateur level.

Although I have built projects ranging in complexity up to a TTL Morse Code typewriter, one of the most useful has been the following small old-fashioned tube transmitter. It has been useful for me as a standby rig; more significantly, it has been useful in teaching new amateurs the very basics of amateur design. One may quarrel with the principles I list at the end of this article, but they—plus the simple rig that has several stages and really works—have been effective in convincing new amateurs that they can actually do things like this for themselves.

So you may read this piece from at least two perspectives: 1) If you have only reproduced circuits and never tried to design something to fill your special needs, then some of the ideas here will take you to the next plateau in home-brewing (and there are many others beyond this one); 2) If you like low power, reliability, tubes, or a chance to use up some of the older parts in your junkbox, then a project like this one may appeal to you.

The transmitter to be described here is a 10 watt, band-switching rig for 80 through 15 meters that has good c.w. capabilities and is, except for a v.f.o., self-contained. The general aim behind the construction of this rig was to put together a transmitter to serve as a standby for the regular station equipment and as a primary transmitter for having fun through the use of low power. These general aims produced the following design objectives: 1) simplicity of circuitry and construction, 2) reliability, 3) c.w. only operation, 4) low power (but above the QRPp level), and 5) multi-band operation. The design that evolved is sufficiently versatile that it can be reproduced in numerous physical arrangements while still yielding reliable results. It is not too difficult for the beginner, who may wish to omit certain "frills," such as the T-R circuit or

*5105 Holston Hills Rd., Knoxville TN 37914



Overall view of the completed transmitter taken prior to the labelling of controls. Along the bottom of the panel are the AC switch, the crystal-v.f.o. switch, sockets for two types of crystal holders, and the key jack. To the upper left are a power on indicator light and a 0-100 mA meter; to the upper right are the band switch, p.a. tune control (top), and the loading control (botton).

the auxiliary 12 volt supply. Nor is it too small a challenge for the experienced builder who needs or wants a transmitter of this order.

The requirements for simplicity and reliability in this transmitter strongly suggested the use of tubes. Although solid-state technology has replaced tube technology, we should not lose sight of the fact that *tubes still hold some advantages for the casual builder*. Our long experience with tubes has produced a number of simple and reliable circuits which can be reproduced with confidence so that the end product will perform as expected. Since this formed one of the goals of this project, tubes (ones I had on hand) were selected for the transmitter. It will not be too long, however, before solid-state circuits give us equal confidence, even at power levels above a few watts.

Basic Transmitter Circuits

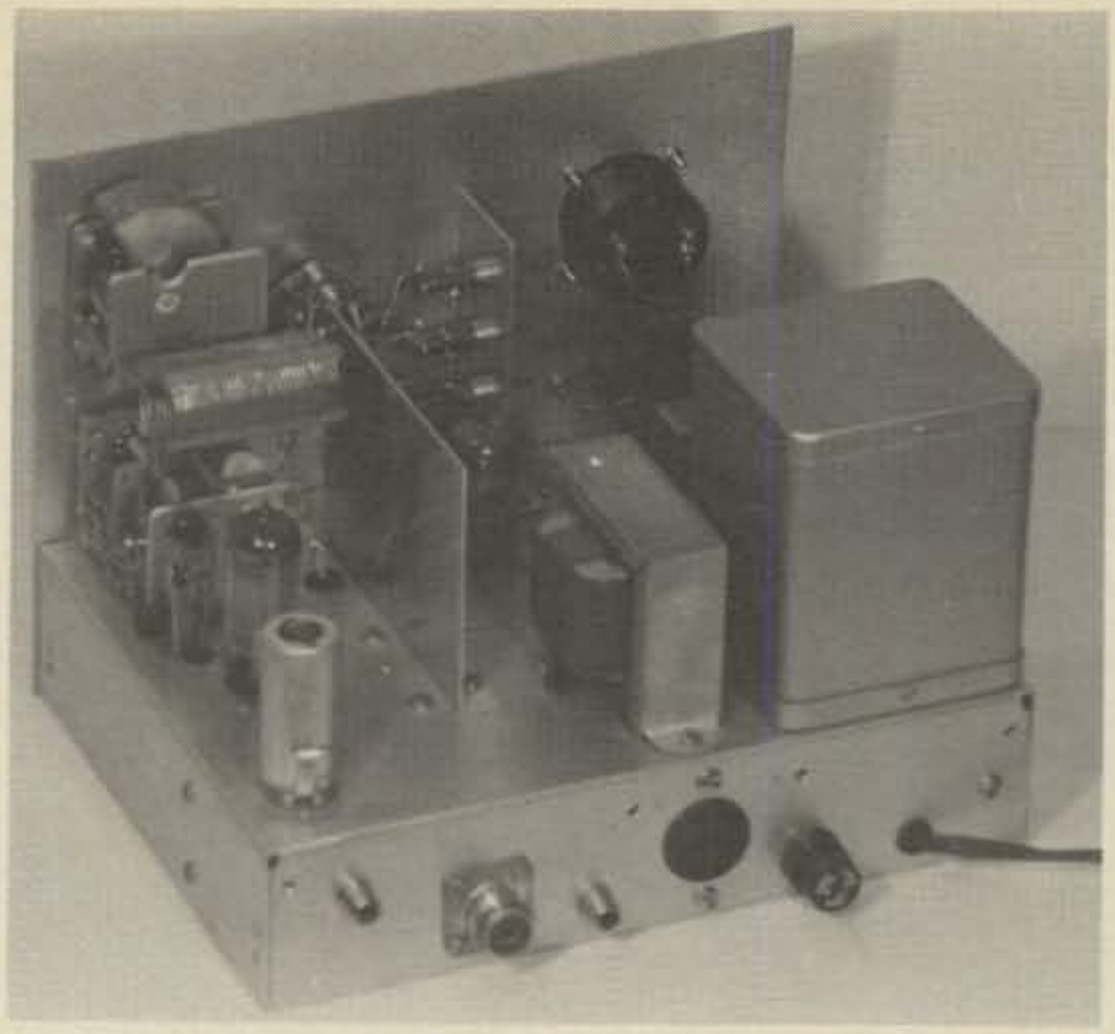
One should not think about this or any other electronics project exclusively in terms of the total package. Once the design objectives have been determined, the time has come to plan the work one circuit at a time. Planning is made easier in the present case because of our low power requirement and because we are using high impedance devices. We can work toward a maximum of simplicity without too much concern for problems such as driving power and impedance matching (except in matching the final amplifier to the antenna). If possible, we want to select the most basic circuits available without sacrificing performance standards.

The oscillator, for example, is a basic Pierce circuit. The output is untuned, eliminating the need for band switching in this stage. In addition, a simple s.p.d.t. switch converts the oscillator into an untuned buffer amplifier for a v.f.o. This particular frill can be omitted by anyone who is well stocked with crystals. The mica variable capacitor from the crystal socket to ground allows one to adjust the circuit so that even stubborn crystals will oscillate well and without chirp.

The multiplier stage again uses the most simple circuit available, a triode amplifier-multiplier. On 80 and 40 meters, the stage works straight through; on 20 and 15, it doubles and triples, respectively, with enough efficiency to drive the final amplifier. The only limitation is that the stage is not a good quadrupler, so 10 meters is omitted from the rig. In order to achieve a simplicity of another order—simplicity of tuning—the output of the multiplier uses slug tuned coils in a band pass arrangement, and one setting holds good for the c.w. portions of the bands used. Thus, no multiplier tuning control is required. Some means of frequency determination is needed during initial testing to assure that the output of the multiplier peaks with a reasonable setting of the coil slug. If such a peak is not found, adjust the capacitor value of the tuned circuit. For mechanical simplicity, the oscillator and multiplier consist of the two triode sections of a 12AT7. If one checks the tube pin arrangement, other r.f. dual triodes can be used just as effectively.

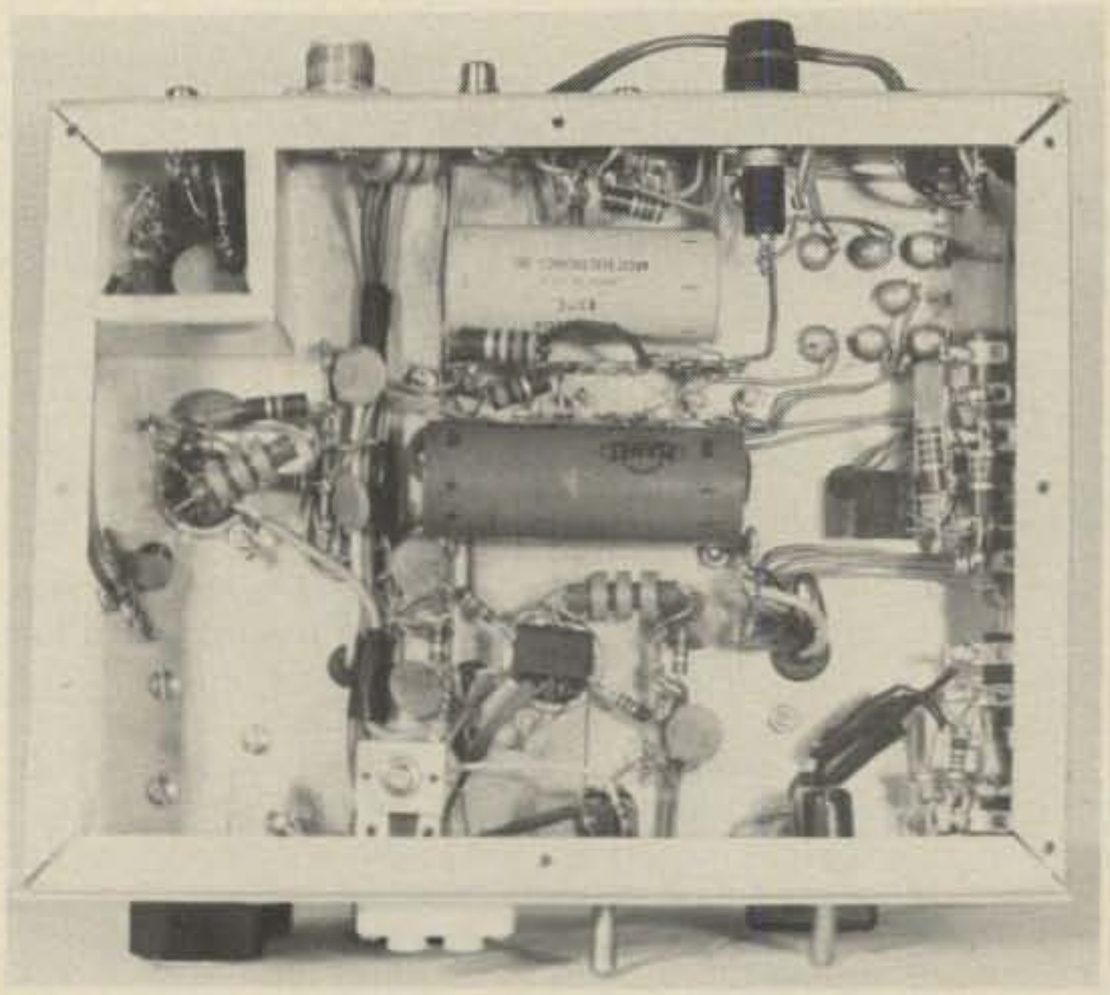
The final amplifier uses a reliable old pentode, the 5763, in a very standard circuit. The use of the pentode, plus a minor bit of shielding, obviates the need for neutralization, even on 15. The output circuit is a standard pi network. Since the only available loading capacitor was a two section receiving variable, additional capacitance is switched in as needed with a slide switch accessible through a hole in the side of the cover. With a three section variable, one can omit the switch. The band switch used is a two pole, six position unit, with only four positions used. The shield bisects the unit. However, a three pole, four position switch would allow the builder to switch in the proper loading for each band, but will reduce the range of capacitance available on the lowest bands to compensate for unusual antenna loading conditions.

The power supply for the basic stages of the transmitter uses a 300 volt center tapped transformer with a bridge rectifier. High voltage for the 5763 passes through a choke



Quartering rear view of the transmitter showing major parts placement. At the extreme left is the 5763 and pi network output. The shielded tube belongs to the T-R circuit. Beyond the shield is the 12AT7 and the multiplier tuned circuits. Along the right edge of the chassis are the transformers for the 12 volt, -50 volt, and h.v. supplies, with the choke just left of the h.v. transformer.

input filter and puts 265 volts on the plate, just enough for 10 to 11 watts input. A lower voltage is drawn from the center tap, and with a capacitive filter, it places 195 volts on the oscillator and multiplier plates. Components for the power supply were obtained from surplus sources, so filtering is over-designed and more than adequate. An alternative circuit, using a full wave rectifier and a 500 volt center tapped transformer is



General underchassis view of the transmitter. Power supply wiring is done on terminal strips along the right edge of the chassis and top (rear) central. Oscillator and multiplier wiring runs from the terminal strips to the tube socket lower (front) central. The final socket and terminal is to the left, with the T-R switch within the shield rear left. d.c. wiring is cabled between the tube sockets, and r.f. leads are either very short or are shielded.

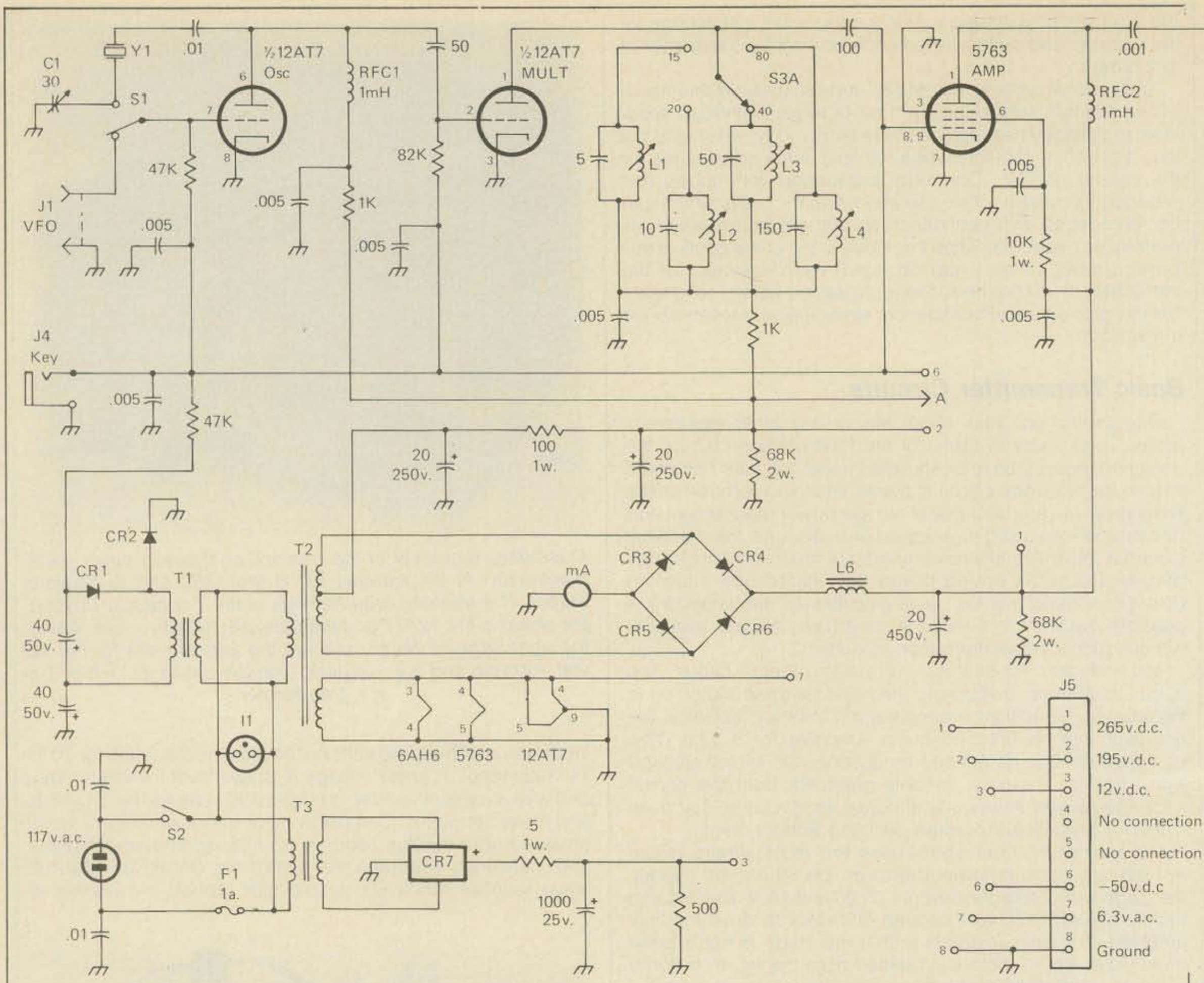


Fig. 1—Circuit diagram of the 10 watt, multiband c.w. transmitter. Decimal values of capacitance are in microfarads (μF) and are disc ceramic capacitors. Others are in picofarads (pF), except for capacitors with polarity marked, which are in microfarads and are electrolytics. Fixed values of resistance are ½ watt composition resistors except for those values where a higher wattage rating is shown. Every effort has been made to use easily obtainable components.

shown in fig. 2 in case a transformer similar to the one used here is not available.

The Extras

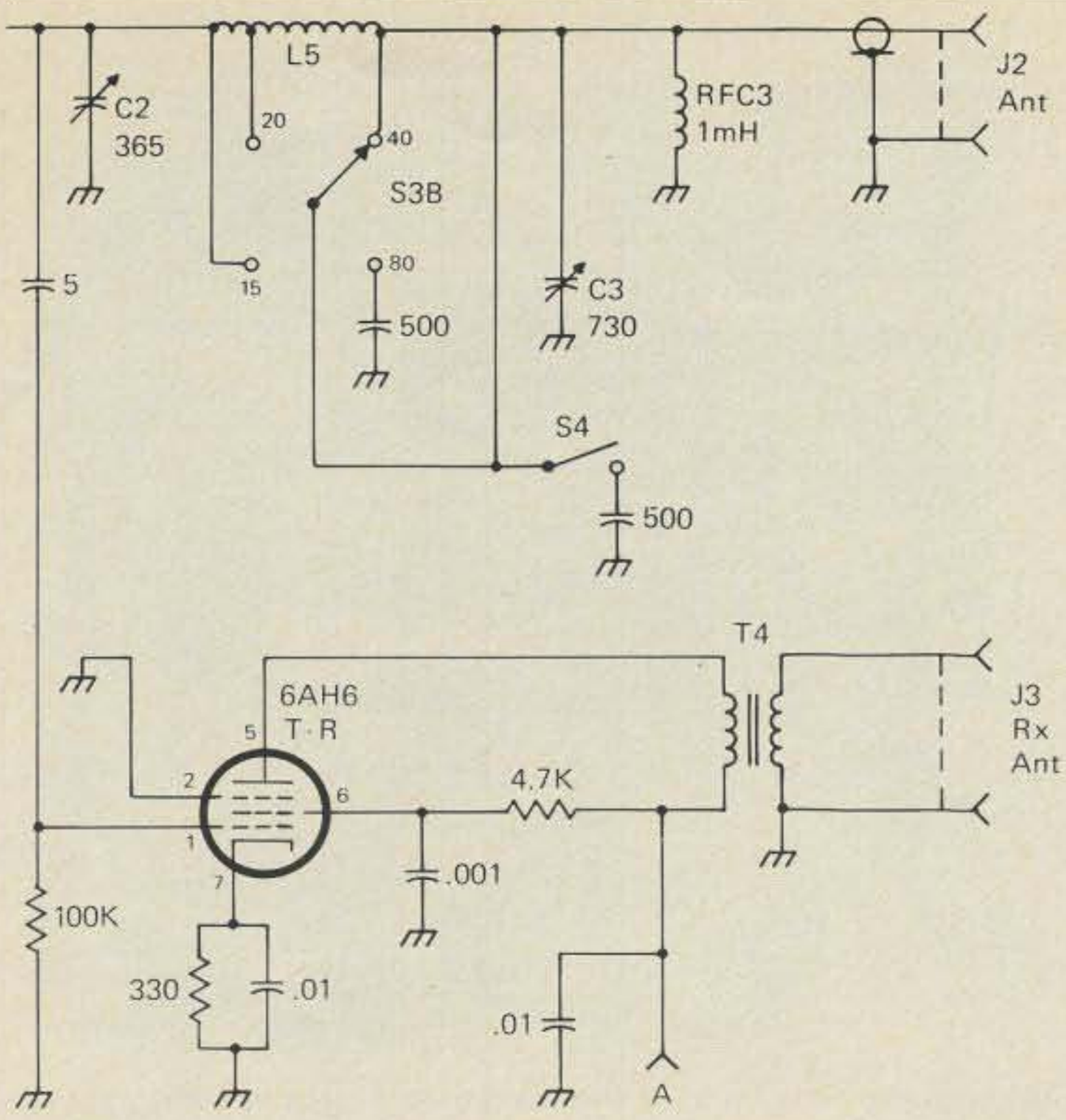
The basic transmitter is a modification of one originally described in the ARRL *Handbook*,[1] adding the multiplier for operation on 20 and 15, the switches for bandchanging, and the switch for v.f.o.-crystal operation. Several features considered important by this writer were added to improve the operation of the unit. They are optional, but recommended.

First, the transmitter is blocked grid keyed, through a source supplying something over -50 volts. The keying supply uses a voltage doubler circuit with the diodes and electrolytic capacitors oriented for negative voltage. The 24 volt transformer came from the junk box. Almost any -50 volt source will key the transmitter cleanly with little attention to shaping. However, one should still beware of clicks and be prepared to remedy them in accordance with the recommendations in the "Code Transmission" chapter of the *Handbook*. Blocked grid keying was selected because even at the low power used, cathode keying presents appreciable current across the key contacts. Key contact wear, the danger of shock, signal shaping problems, and spark filtering are all problems usually diminished by the use of blocked grid keying. In addition, it is also useful if one needs to key a v.f.o. Thus, I recommend it for all c.w. transmitters.

Second, the transmitter incorporates an electronic T-R circuit to permit break-in operation. It also eliminates the need for an antenna relay, thus cutting down the number of accessories needed to put the transmitter on the air. The circuit was taken directly from W1FBY's transmitter in October, 1971, *QST*,[2] and works well. Be sure, however, to shield the circuit as well or better than shown in the photos to prevent undue feed through to the receiver. Almost any small piece of ferrite may be used for the transformer in the 6AH6 output, one perfectly good version having been made from a piece of flat ferrite used in b.c. band receiver antenna coils.

Third, there is an accessory power plug in the rear of the chassis to power v.f.o.'s and other accessories. Not a great deal of power is available, but since the transmitter runs cool, 20 to 25 mils of current can easily be drawn from the accessory

[1]*A.R.R.L.* The Radio Amateur's Handbook, *1971, pp. 181 ff.*
[2]*Robert M. Myers, W1FBY, "A CW Man's Kilowatt," Part I.* QST, *October, 1971, pp. 15 ff.*



plug without harm. Because there was room on the chassis, a 12 volt d.c. supply was installed. The idea is to provide voltage for a solid-state v.f.o. to be used in conjunction with this transmitter while keeping the hum source—the transformer—away from the transistors. The arrangement works well, and regulation adapted to the needs of the particular v.f.o. used can be placed in the v.f.o. itself.

Fourth, the meter was added to read total current being drawn by the transmitter. By placing it in the negative lead of the bridge circuit, one can check the operation of all circuits, but no one of them individually. If one prefers, the meter can be placed in the plate lead of the 5763 to read just the final amplifier current. The choice depends upon what one considers most important. Since I use a s.w.r. meter to read relative power output, I adjust the plate tuning and loading to the point of maximum output (which matches well the point of plate current dip on all bands), so a reading of the precise amount of amplifier current plate current is not needed. In this rig the tube is being run well within its ratings. An output meter is recommended, but if one uses just a plate meter, loading the 5673 beyond 50 milliamperes is to be avoided.

Construction Notes

The entire transmitter fits on a 7 by 9 by 2 inch aluminum chassis. The photographs show the general layout. A 7 by 9 inch sheet was cut from 16 gauge aluminum to serve as the front panel, and a shell of Sears perforated aluminum was added for safety, shielding, and appearance. A bottom plate on the chassis, as well as four sheet metal screws along the top rear of the chassis, holds the shell in place. A two tone paint job (several thin coats of spray enamel) completes the job, with the exception of identification decals, which were added after the photos were taken.

The chassis and panel should have all holes cut and drilled before any parts are mounted. The tube holes were cut with chassis punches, the transformer's square hole was nibbled, and the meter hole was patiently cut with a drill mounted cutter. Holes for the crystal sockets (two are used to allow for both thick and thin pin crystals), toggle switches, and key jack were cut after the panel was fastened to the chassis in order to get the alignment exact. Then all the chassis hardware, transformers, and the choke were mounted.

The power supplies should be wired first. Wire them to the point of running leads to the terminal strips which serve each stage of the transmitter, but not to the tube sockets. This allows two important jobs to be accomplished before the r.f. stages are wired. First, the supplies can be tested to be sure they operate according to plan. Second, the power leads can be cabled neatly along the chassis edges and down the middle of the chassis between the 12AT7 and the 5763. Neatness at this point aids reliability by making servicing a great deal easier. The 12 and -50 volt supplies are wired to terminal strips mounted to one side of the chassis, while the main supply circuitry sits middle and rear on the chassis, behind the 12AT7.

Next, the r.f. stages should be added, one at a time. First, the oscillator should be wired and tested with any available crystal. RG175, thin coaxial cable, connects the v.f.o. input phone jack on the rear lip to the front panel switch. The mica trimmer is soldered to a terminal strip mounted to one of the crystal socket screws, and is accessible through a hole in the bottom plate. One setting should suffice for good operation with most crystals.

The multiplier stage requires that half the band switch be wired. The coils are mounted in a vertical row (80 at the bottom, 15 at the top) on a one inch wide strip of aluminum cut from an old chassis. Leads go through holes in the chassis (from the multiplier plate to the switch and from the power lead to the coils). A small plate cut from the same old chassis acts as a shield between the multiplier coils and the pi network of the final. Adjust each of the coils to peak in the center of each band used. A simple means of peaking is to put a small piece of wire in the grid pin of the 5763 (with no voltages connected to the 5763 socket). Using the station receiver S-meter, tune the coils to maximum reading.

Wire the final last. Since the plate pin of the 5763 is below chassis while the pi network is topside, leads pass through the chassis. The coil is mounted by its leads from the capacitors and the band switch. With four bands and thus five leads, mounting is secure, but may not be secure if fewer bands are used. Small coax connects the output of the pi network to the SO-239 coax fitting on the rear of the chassis. The slide switch was mounted vertically to the chassis top by bending one end of the metal mounting saddle at right angles. An r.f. choke at the antenna terminal provides safety in case the d.c. blocking capacitor fails.

Finally, wire the T-R circuit. A value of 5 to 8 pF to the grid of the 6AH6 should give plenty of coupling. The stage provides

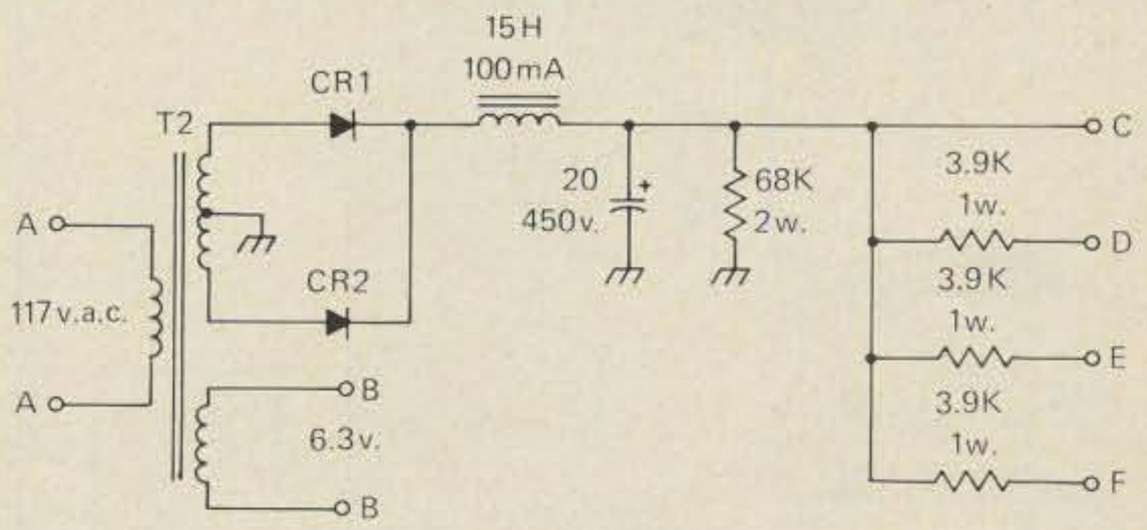


Fig. 2—Alternative main power supply.
T2 500 volt center-tapped, 50 mA; 6.3 volts, 1 A
CR1, CR2 800 PIV, .5 A silicon diodes
Notes:

- *A-A transformer primary, connect to 117 volt a.c. source.*
- *B-B 6.3 volts a.c., connect as in fig. 1.*
- *C connect to junction of .005 capacitor and 10k/1 W resistor in 5763 plate-screen circuit.*
- *D connect to point A in fig. 1 (plate-screen circuit of 6AH6)*
- *E connect to junction of .005 capacitor and 1 mH r.f.c. in oscillator plate circuit (remove 1k resistor)*
- *F connect to junction of .005 capacitor and B+ end of tuned circuits in multiplier circuit (remove 1k resistor)*

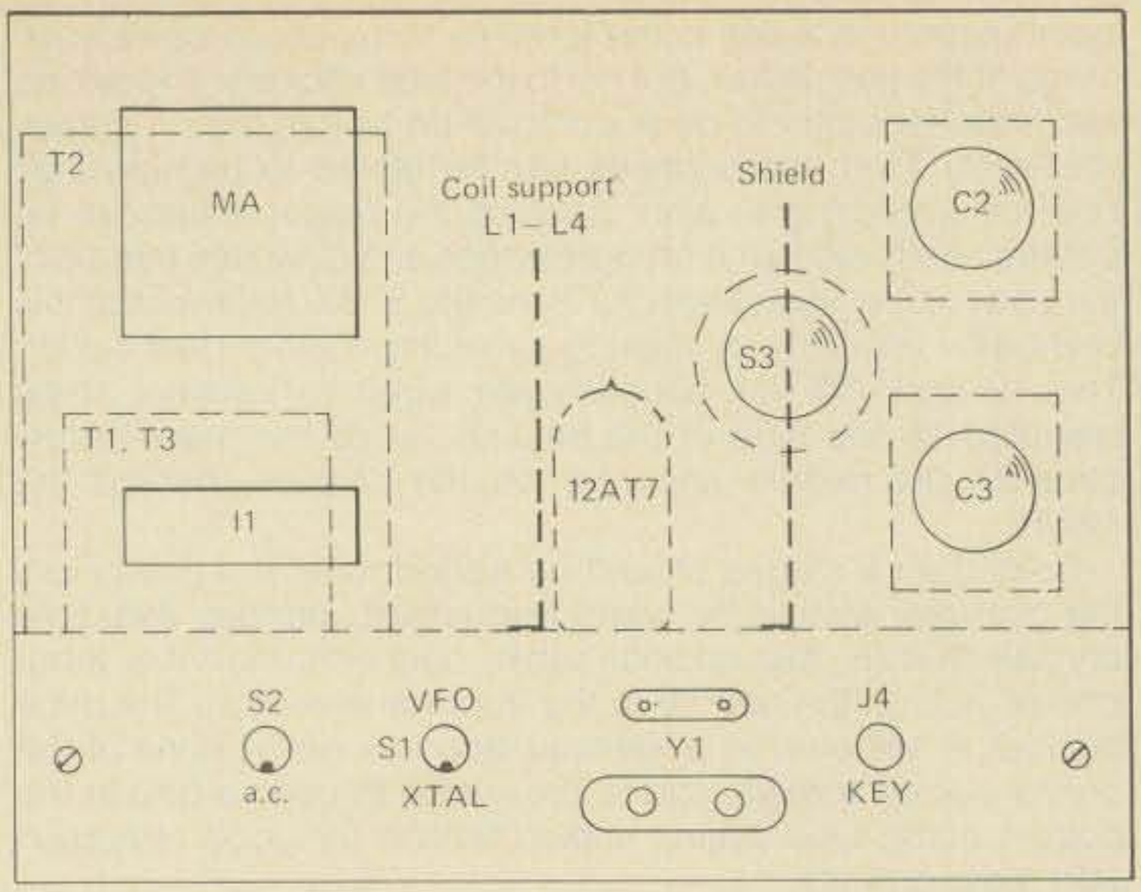


Fig. 3—Sketch of front panel layout with partial view of components mounted behind front panel. Solid lines represent parts on the panel; dashed lines represent parts behind the panel. Panel size: 9"x7".

receiver gain, and the position of the tap—between the blocking capacitor and the final amplifier tuning capacitor—aids selectivity. Add the shielding last, noting that the thin aluminum flashing is bent up and with a slight irregularity to make contact with the bottom plate.

Now add the knobs and start checking out the full transmitter on all bands. If all is well, put on the shell, wipe off the finger prints, and start operating.

Conclusion

A ten watt rig can be very effective, even in moderate QRM. Contacts have been made on all bands with this rig. I have

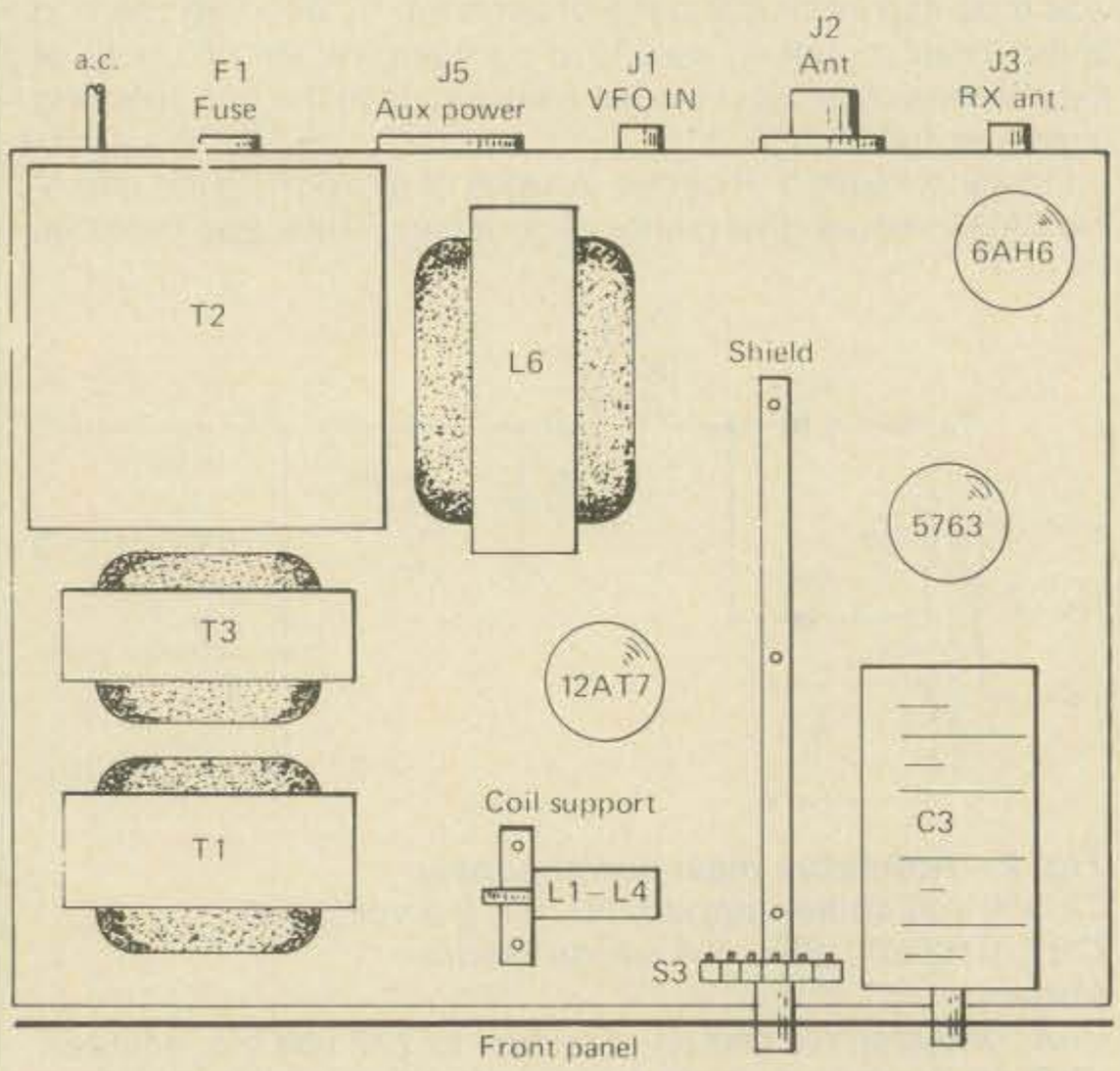
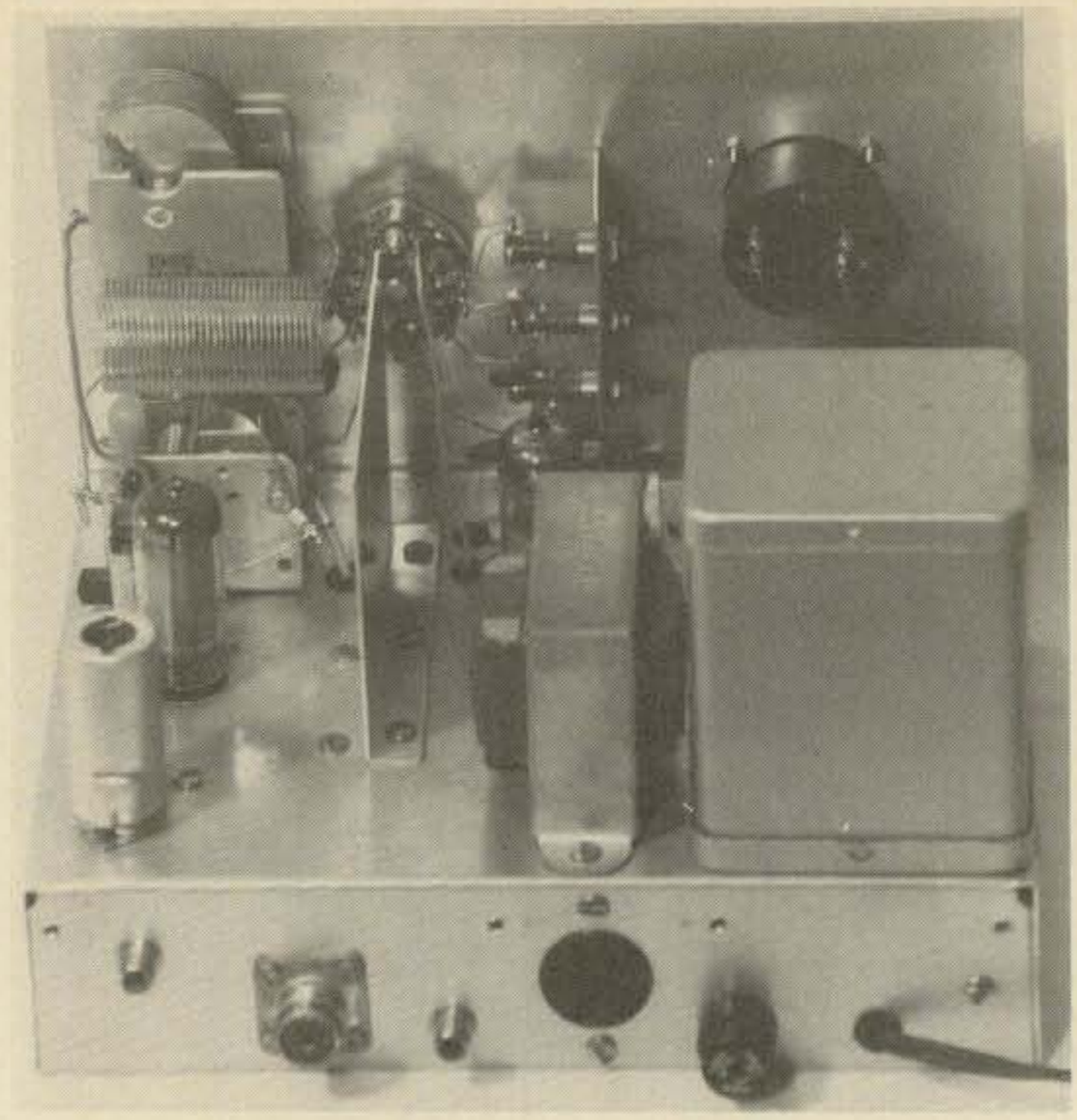


Fig. 4—Sketch of top chassis layout showing major components mounted on the chassis itself. C2 and L5 are mounted above C3. Below chassis, terminal strips are mounted on either side of the 12AT7 and on the shield side of the 5763 for component mounting. A shield of thin aluminum flashing surrounds the below chassis circuitry of the 6AH6, and the tube is shielded above chassis. Chassis size: 7"x9"x2".



An alternate rear view of the transmitter, also showing parts placement. Along the rear edge of the chassis are, from left to right, the receiver antenna jack, the antenna coax jack, the v.f.o. input jack, the auxiliary power socket, fuse, and line cord.

even had members of a state traffic net ask when I was going to use the rig when I was already using it. The difference between the received signal from this rig and the signal from the 100 watts I used for the regional traffic net is always less than two S units and mostly less than one S unit. Unlike working with milli-watt QRPp rigs, I do not have to worry about unanswered CQs or to look for only the strongest stations. I just wade in and start sending; the results are not noticeably less consistent than with 100 watts. That makes low power operation fun, and provides an intermediate stage in the move from

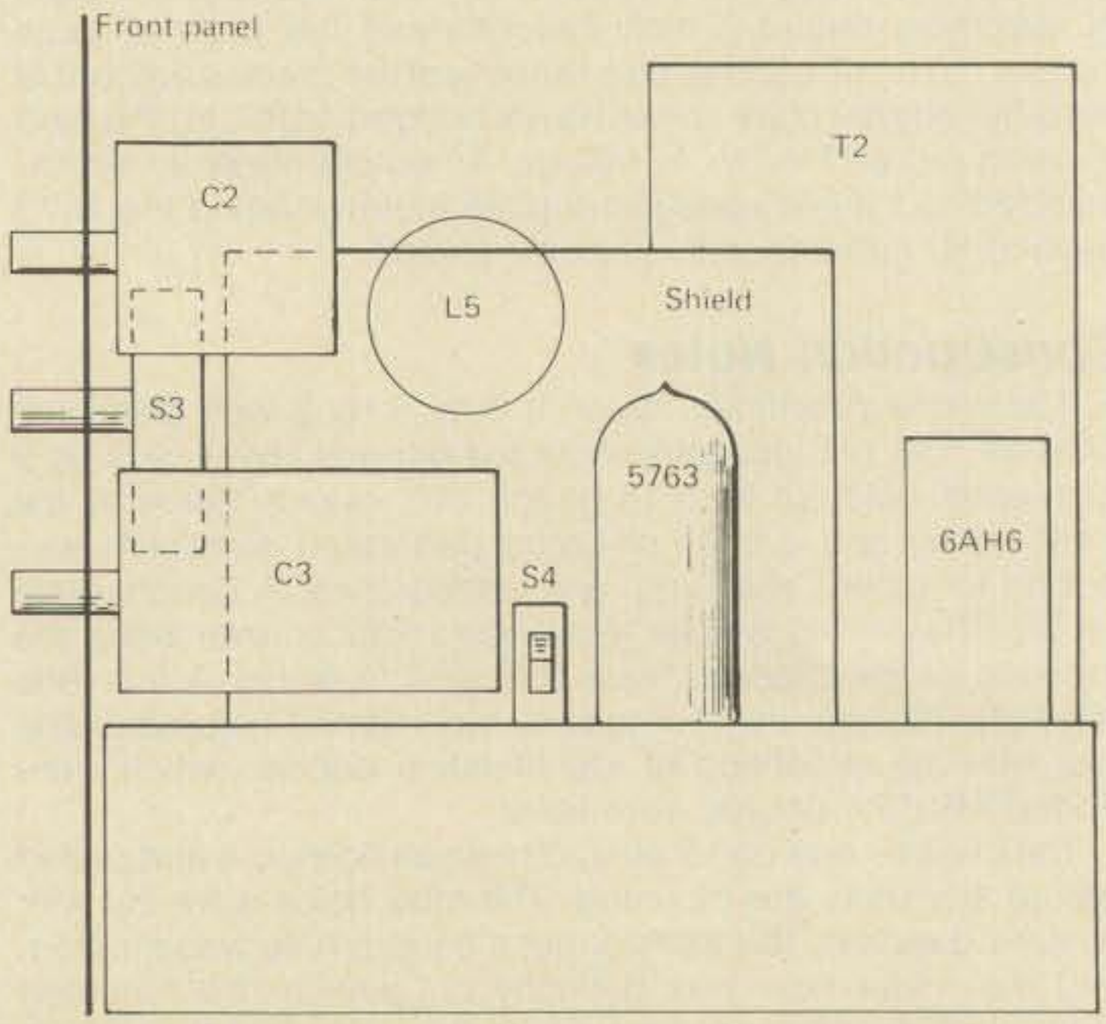


Fig. 5—Sketch of the right side of the transmitter showing the major components of the final amplifier. L5 is supported by its leads to S3 and to C2 and C3. The shield is mounted as closely as possible to S3, bisecting the two sections without shorting any terminals.

moderate power to full QRPp (less than 1 watt).

The simplicity of the circuits and of the operation of this rig make it one of the most reliable I have owned, and I have no hesitation about using it under emergency or field day conditions. In the end, however, perhaps it is less a rig to be reproduced exactly than it is a source of ideas for people who would like to start building.

As small as it is, the rig is still a good exercise in the basics of design. All it takes to design a project is to 1) set down one's objectives clearly, 2) determine what kind of circuitry blocks will fulfill the objectives, and then 3) search the available literature for circuits that will do the job required in each block. Once this is done, 4) gather your parts, 5) plan your layout, and then 6) build and 7) test a stage at a time. Occasionally, especially at steps 3) and 5), give attention to matters involving circuit interaction, whether that be a matter of drive power and impedance matching or a matter of shielding and isolation. These are good procedures to follow whether you are building a multi-function, multi-stage high power rig or a simple three tube transmitter like this one.

Parts List

C1	3-30 pF mica trimmer
C2	Single section minature variable, 365 pF (Miller 2111)
C3	Two section miniature variable, 365 pF per section (Miller 2112)
CR1, CR2	200 PIV, .5 A silicon diode
CR3-CR6	800 PIV, .5 A silicon diode
CR7	200 PIV, 2 A bridge rectifier
F1	1 A fuse, (Littlefuse 3AG)
I1	Neon panel lamp assembly with built in dropping resistor for 117 V AC
J1, J3	phono jack, single hole mounting
J2	female coax connector, SO 239
J4	open circuit phone jack
J5	octal tube socket
L1	3μH slug tuned coil (Miller 20A336RBI)
L2	5μH slug tuned coil (Miller 20A476RBI)
L3	9μH slug tuned coil (Miller 20A826RBI)
L4	13μH slug tuned coil (Miller 20A155RBI)
L5	31 turns, No. 20 wire, 1 inch diameter, 16 turns per inch (B&W Miniductor 3015), tapped at 16, 9, and 6 turns from the tube end for 40, 20, and 15 meters, respectively
L6	15 H, 100 mA filter choke
MA	0 - 100 milliammeter
RFC1-RFC3	1 mH r.f. choke, 100 mA rating
S1	SPDT toggle or slide switch
S2, S4	SPST toggle or slide switch
S3A, S3B	2 pole, 4 position rotary switch
T1	filament transformer, 24 volts, .5 A
T2	power transformer, 300 volts, center tapped, 100 mA; 6.3 volts, 1 A (Note: T2 was obtained from surplus sources; if a similar transformer is not available, the circuit for the main supply shown in Fig. 2 may be used with a 500 volt center tapped transformer, 6.3 volts, 1 A)
T3	filament transformer, 12 volts, 1 A
T4	20 turns, No. 24 enameled wire wound on a 1 inch long, ⅜ to ½ inch diameter ferrite core, with a secondary of 3 turns, No. 24 enameled wire over the cold end of the primary.
Y1	Fundamental-type crystal for 80 or 40 meters (International Crystal Mfg Co. or equivalent)

John Schultz comes up with the most interesting ideas. Here's one (or two) that can add flexibility to your test bench.

A Four-Digit, One-IC Voltmeter—Almost

BY JOHN J. SCHULTZ*, W4FA

A good frequency counter is one of the central items these days on any test bench. The instrument can be used alone for just frequency measurements or with accessory units for the measurement of other electrical parameters. This article presents an extremely simple accessory item that can turn anyone's frequency counter into a full 4-digit, digital voltmeter! The basic accessory requires only one IC and it will suffice for a wide range of applications. However, the basic circuit can also be expanded for greater accuracy and versatility.

*c/o CQ

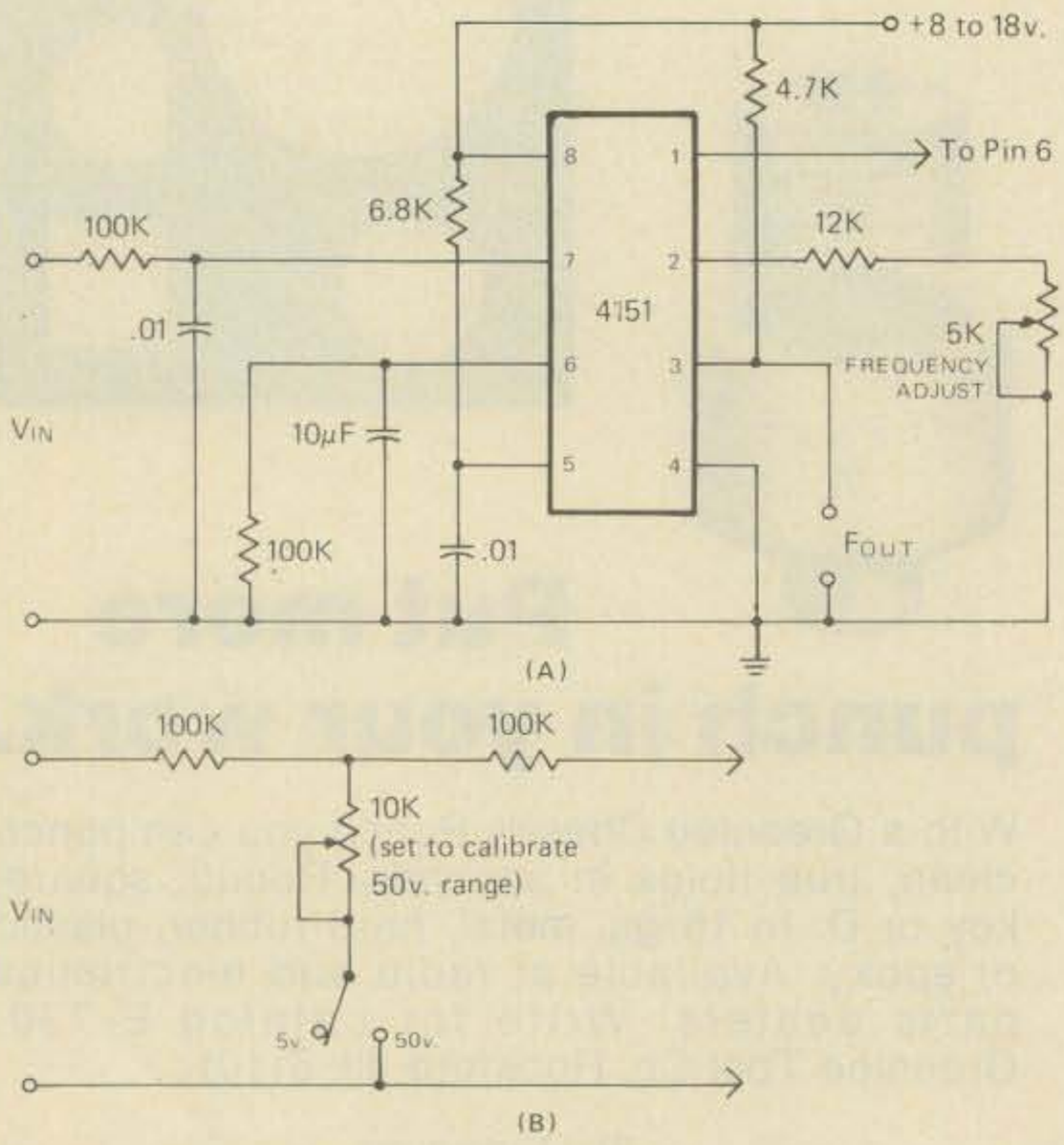


Fig. 1 — The RC4151 IC forms a simple voltmeter adapter for a frequency counter, as in (a). In (b) two voltage ranges can be added using a resistance divider.

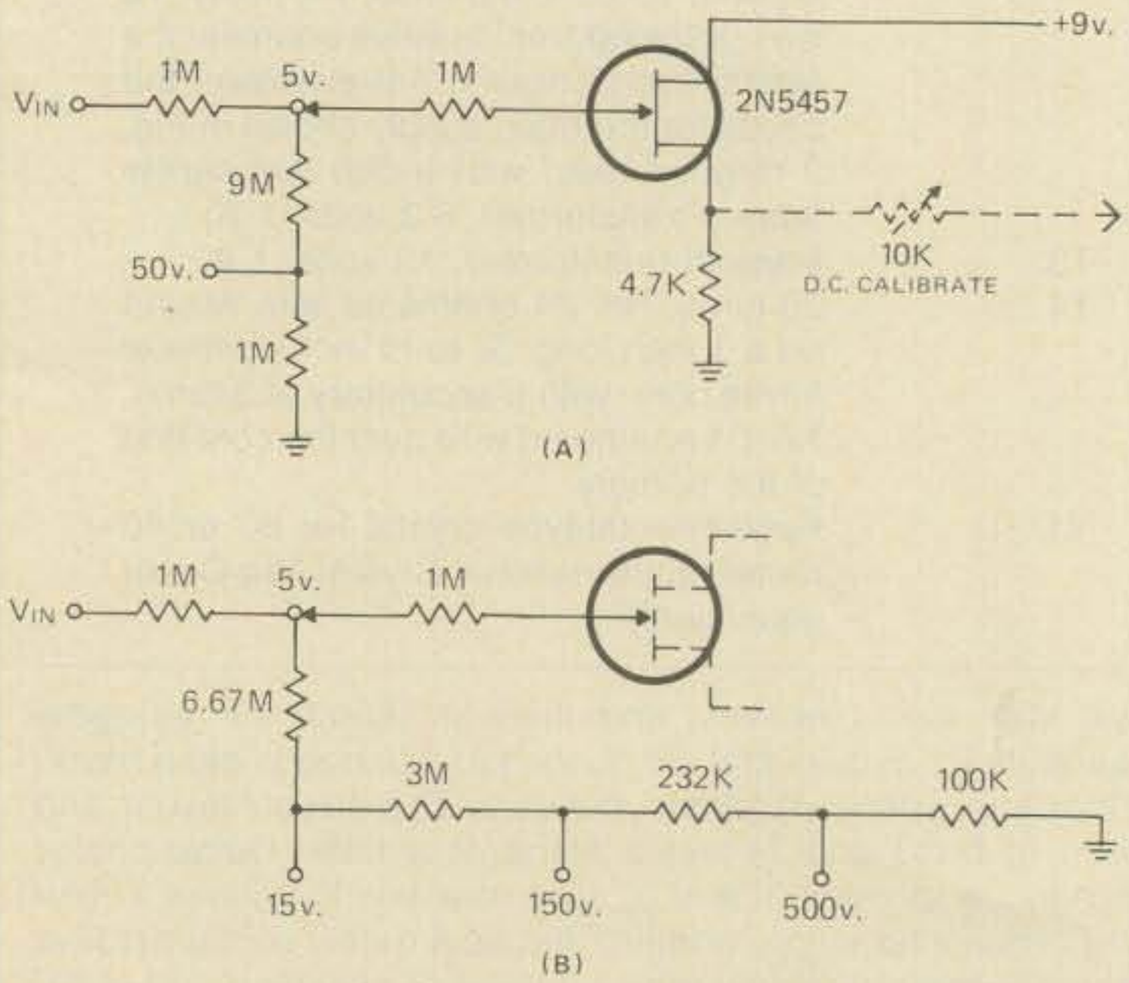


Fig. 2 — The input impedance of the adapter can be raised to 11 megohms by using an FET. Two possible voltage range divider networks are shown.

The heart of the unit is the Raytheon 4151 voltage to frequency converter IC. This is a low-cost, small, 8-pin package but it packs quite a bit of sophisticated IC technology inside. The output of the 4151 is a series of pulses of constant duration. The frequency of these pulses is proportional to the applied input voltage. For instance, if one applies an input voltage of from 0 to 10 volts, the output pulses will vary in frequency only from 0 to 10,000 Hz. The accuracy with which the output frequency tracks input voltage variations and how fast the output frequency changes when the input voltage is suddenly changed depends upon the IC's internal characteristics and also upon the external circuitry used with the IC.

Fig. 1(a) shows the most basic circuit for the 4151. Actually this circuit is complete in itself. By powering it with a simple 9 volt transistor radio battery, one has a complete accessory digital d.c. voltmeter adapter. The IC draws only abut 5 mA so such a battery will last quite a few hours. However, the maximum input voltage which can be handled is approximately 2 volts less than the battery supply voltage or, in this case, approximately 0 to 7 volts. One can raise the supply voltage to 15 volts if desired, and obtain the full input voltage range capability of 0 to 10 volts. A better solution might be to add the simple input voltage divider shown in fig. 1(b). In this case, one has two input voltage ranges available - 0 to 5 and 0 to 50 volts. By limiting the input to 5 volts one is assured of stable operation even when the battery voltage starts to decrease. The two voltage ranges cover almost all the voltage levels one is likely to encounter in transistorized circuitry and the resolution is more than adequate for almost any purpose. For instance, an input voltage of 0.468 will appear as 468 on the counter. An input voltage of 1.266 volts appears as 1266. The linearity error is about 1% and the response time is 135 milliseconds when the input voltage suddenly changes from 0 to 10 volts. The only adjustment that has to be done with the circuits is to set the trimpot for the highest frequency used. Using a known 5 volt source, set the trimpot to read 5000 on the counter with the adapter on the 0-5 volt range. In practice, the performance is better than that obtainable with most regular analog voltmeters.

The only possible drawback of the preceeding circuit is its relatively low input impedance. As it stands, it is perfectly usable for the great majority of purposes any d.c. voltmeter is used for on a workbench. Only when dealing with FET's or other very high impedance circuits will the input impedance prove a problem. In this case, a simple FET circuit can be used before the 4151 as shown in fig. 2(a). This will raise the input impedance to 11 megohms. The circuit of fig. 2(a) provides for only two input voltage ranges but one could, if desired, add a complete attenuator network as shown in fig. 2(b) to cover voltage ranges to 500 volts.

Once one has the basic d.c. digital voltmeter adapter working, it is possible to add all sorts of additional circuitry to it in order to achieve multimeter performance. It is a moot point, however, as to whether it is worthwhile doing so. The basic adapter is a very functional, accurate device for its purpose. But by adding a lot of additional circuits one could well end up with a hodgepodge unit of doubtful accuracy.

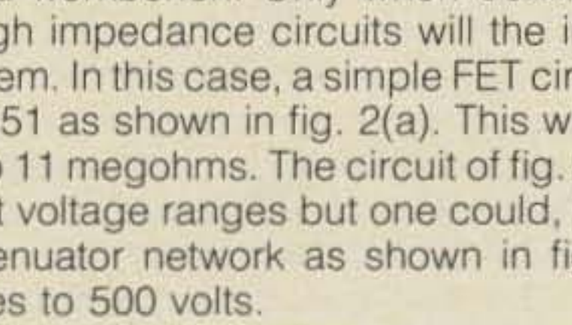


Fig. 3 — A very simple ohmmeter circuit can be added which is intended only for approximate resistance checks. An s.p.s.t. switch can disconnect the 9-volt supply when the adapter is used for its original function.

The only "add-on" feature that has proved of value in practice is a very simple ohmmeter feature. When using the adapter to check some circuitry it became very annoying to have to use another instrument to check the basic resistance of component. So, the basic ohmmeter circuit of fig. 3 was added to adapter. The circuit has all sorts of disadvantages and is *not* intended to be accurate. But it still has some usefulness for basic ohmic checks. 100k ohms resistance and below will read out fairly well in kilohms (e.g. 99k reads as 99). But above 100k the readings become useful only for crude check (e.g., 1 megohm will read out as 625 indicating only 625k ohms). Other ranges can be chosen if one wishes to concentrate what little accuracy is available differently (e.g., resistances below 10k ohms) by changing the series resistance used with the battery.

The construction of the adapter should be done using a shielded enclosure. A highly recommended form of construction is one using a Bud CU-3000A minibox with female BNC connectors at both ends of the enclosure. The battery for the adapter can be housed in the enclosure and the enclosure is large enough to accommodate an on-off switch and a range switch, if the latter is desired. A polarity reversing switch for the input to avoid having to reverse test leads is also useful. Note that a d.p.d.t. center-off slide switch can be wired to control the battery and also switch to either the voltmeter or ohmmeter function. The BNC connectors allow versatility in that the adapter, using a male-to-male BNC, can be situated at the frequency counter input on the adapter hand-held as a test probe with a shielded interconnnecting cable to the frequency counter input. There is nothing critical about the internal wiring of the adapter and it can be done on a small piece of perforated board stock. If the adapter is used in a strong r.f. field environment it may be necessary to add a r.f. choke at the input to prevent erratic readings on the frequency counter.

After some experience in using the basic adapter and if one has need for a really precision voltage to frequency converter, it is possible to modify the basic circuit for precision operation. A modified circuit is shown in fig. 4. In this case only an additional op-amp is needed plus some modified component values. The linearity of this circuit is 0.2% and it has a much faster response time than the basic circuit. Two adjustments are available in this circuit to set both the high and low frequency outputs. Set the 5k pot for the desired output frequency with maximum input voltage and the 200k pot for zero frequency output with zero volts input. CQ

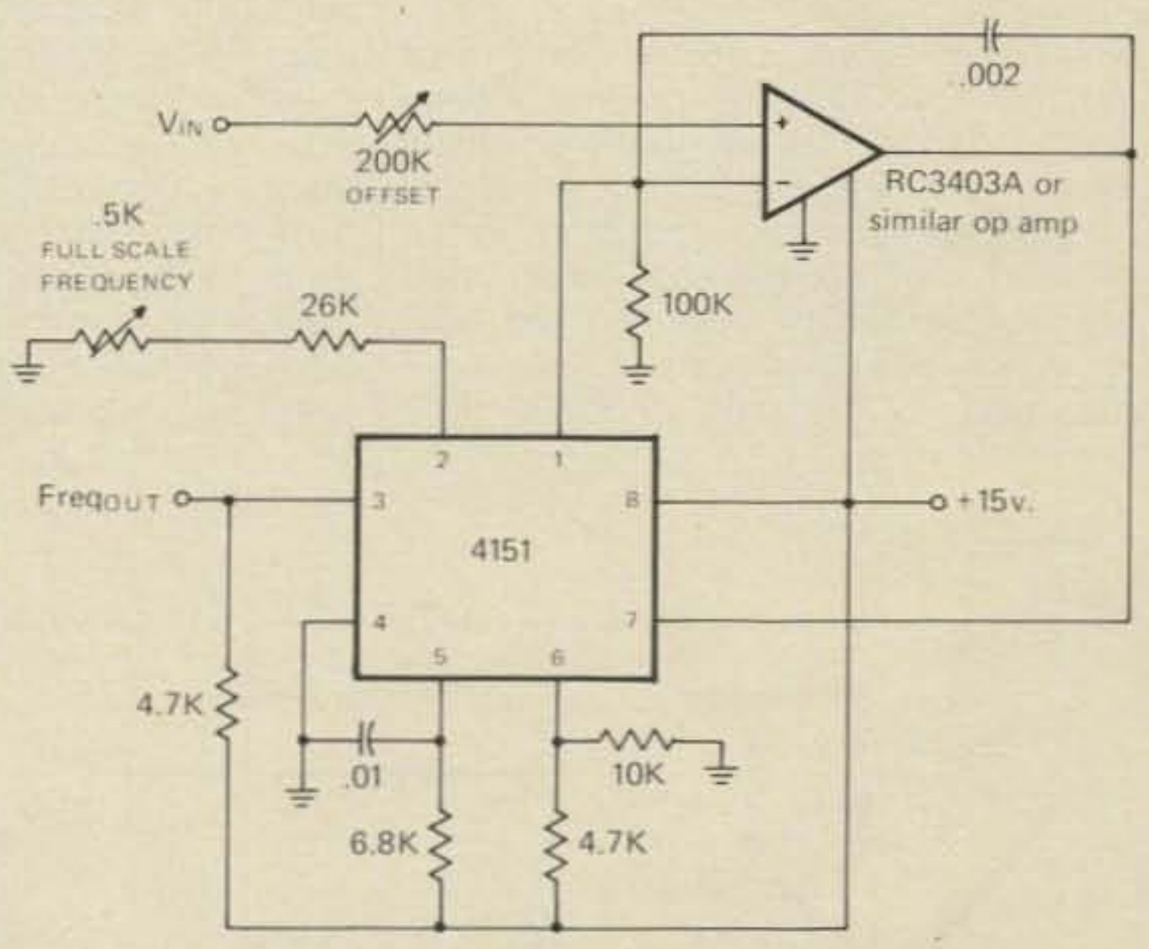


Fig. 4 — A more precise voltage-to-frequency converter can be formed by changing some circuit values and adding an op-amp.

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

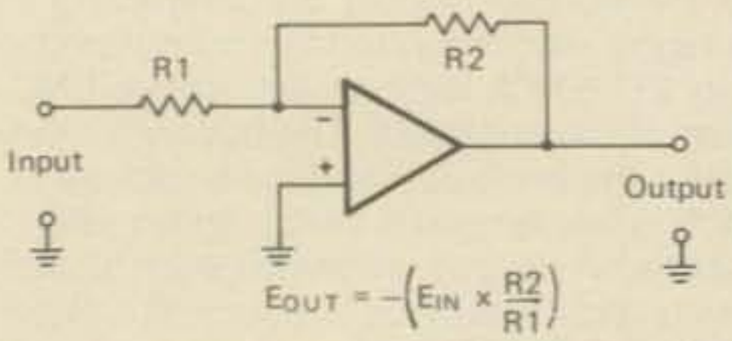


Fig. 1—Common inverting amplifier.

"The Operational Amplifier—Revisited"

One of the most versatile components available to the electronic experimenter is the operational amplifier—as we have seen in past columns. This device has so many uses that entire books have been written on its applications alone! This month we would like to present several interesting applications that may be of use on your next project.

Fig. 1 is a schematic diagram of the most common configuration for an operational amplifier, the inverting amplifier. Here, the output is equal to the input multiplied by the ratio of R2/R1. The output sign is reversed in this circuit. In our example, if $R_1 = 1K$ and $R_2 = 10K$, applying +1 volt to the input will result in −10 volts at the output.

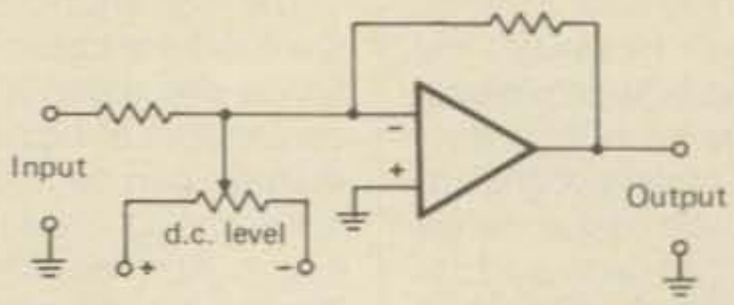


Fig. 4—Level changing circuit. The d.c. level of the output signal will be a function of the setting of the d.c. level pot.

An important point to note is that the impedance between the actual inverting input point and ground is zero (or very nearly so). This means that the voltage present is zero and if two resistors are used for separate inputs, as in fig. 2, there will be no interaction between inputs. At the output however, the two inputs will be mixed in the proportion to their input resistors and R_2. This allows us to make a very simple mixer for all sorts of signals, For example, in fig. 3, we have a 3 channel audio mixer that can be used to combine any three audio signals to a common output. There is no interaction between channels and each input has its own level control. As a further refinement, a master level control is also provided (Rm).

By varying the value of the input resistor to each channel, we can also "scale" its input with respect to the others. This would allow both high and low level signals to be accommodated in the same mixer. Such a circuit should be useful to electronic music buffs or could also be used for communications purposes. One could, for example, easily combine voice identifiers and remote receivers for a two meter repeater transmitter.

If one input to the inverting circuit is charged to a d.c. voltage as shown in fig. 4, we have a simple d.c. level control.

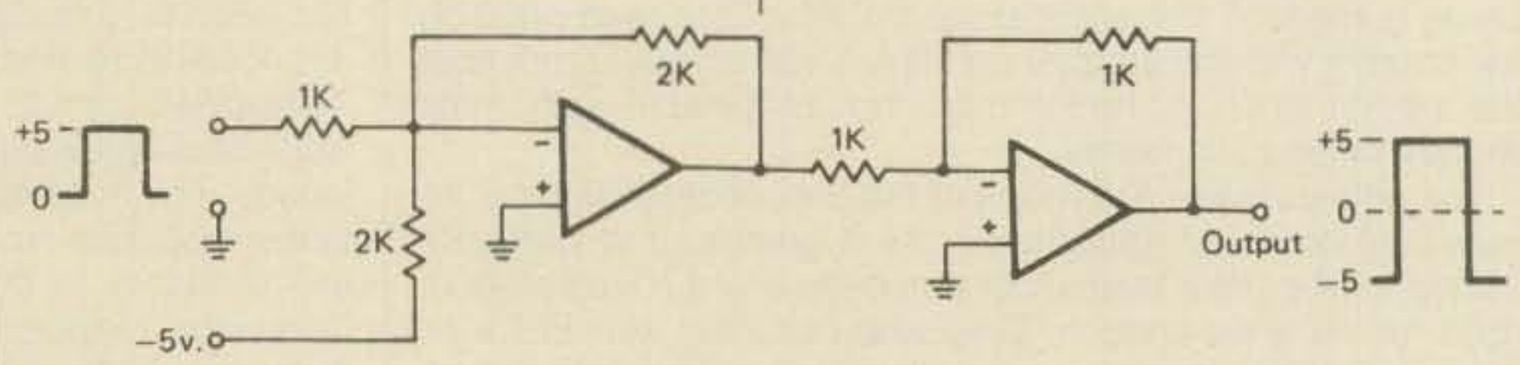


Fig. 5—Expansion of fig. 4 to a TTL to bipolar converter.

Since the output is always the sum of the two inputs, fig. 4 can take an a.c. signal, symmetrical at about zero and produce a signal that is all above zero, or below

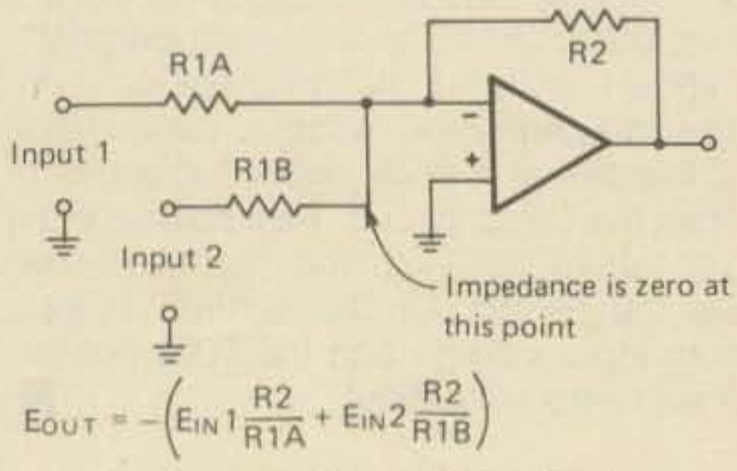


Fig. 2—Amplifier with two inputs.

Fig. 3—Three channel mixer, discussed in text.

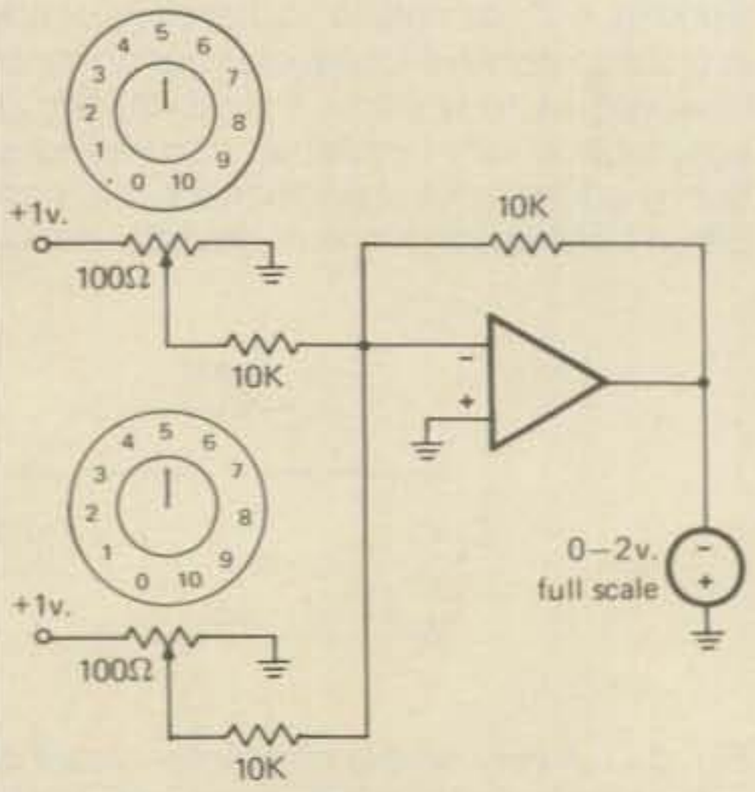


Fig. 6—Simple computing circuit showing a possible dial arrangement for the inputs.

zero as required. It can also be used to convert digital data such as TTL signals, to bipolar digital signals for telephone signal interfacing. A concept for a simple RS-232 type output driver is shown in fig. 5. Here a 5 volt TTL signal is converted to a ±5 volt signal. The gain of the digital channel is 2, giving 10 volts peak-to-peak, and the d.c. level of 5 volts assures ±5 volt outputs. This circuit inverts so a −1 inverting stage which has been added to restore the input polarity. The maximum speed of such a circuit is a function of the speed of the op-amp employed. Common 741 types will reproduce pulses in the tens of kHz. while faster ones, such as the LM318, will be necessary for operation around a megahertz or so.

All of the previous circuits are adding circuits. If the inputs were to be two d.c. voltages, the output would be the sum of the two voltages (up to the maximum that the amplifiers could deliver). This was the original intention for the op-amp—a computing circuit!

Referring to fig. 6, we have connected two potentiometers as voltage sources and an op-amp as a summer. Each input pot is linear and has a dial and knob calibrated from 0 to 1. The output is connected to a 0 to 2 volt meter. This meter will now indicate the sum of pot 1 + pot 2 to an accuracy only limited by the tolerances of the resistors used. If one pot is connected to a negative 1.0 volt supply, the circuit will now indicate the difference between the two pots. Finally, in fig. 7, we have a multiplier. Now, an output meter (0-10 volts) will indicate the product of the input and the setting of the feedback pot.

All of these circuits can be used to perform actual calculations if all dials and meters are properly calibrated. This concept can be employed by the experimenter to build analog calculators that can certainly supplement the popular digital calculators now being used by almost anyone. While not as accurate, these digital units, the op-amp calculator can be used with analog signals and an oscilloscope for true dynamic computations.

In conclusion, we have presented two such computing circuits as a simple guide to what can be done. Both are intended for illustration purposes and can probably be simplified.

The first circuit, fig. 8, solves the equation $y+m(x+y)$. The addition $(x+y)$ is carried on in the normal way, and the multiplication, by varying the feed back resistors. Inputs x and y do not have to be d.c. levels but can be waveshapes if desired.

The second circuit solves a well known equation, Ohm's law. The meter reads the value of E and the two pots set R and I. If you know any two parameters you can find the third by simply manipulating the pots and reading the meter.

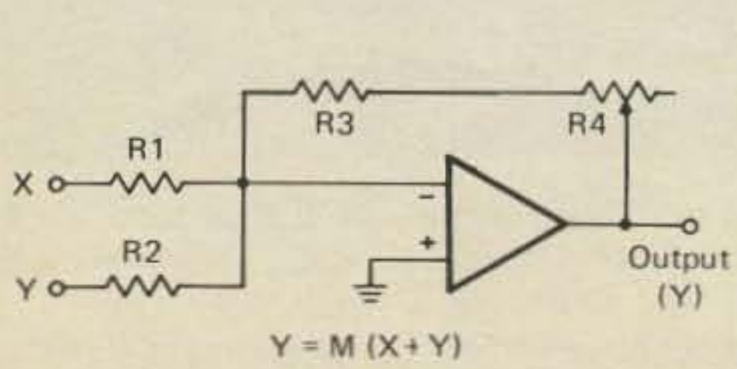


Fig. 7—Simple multiplication circuit.

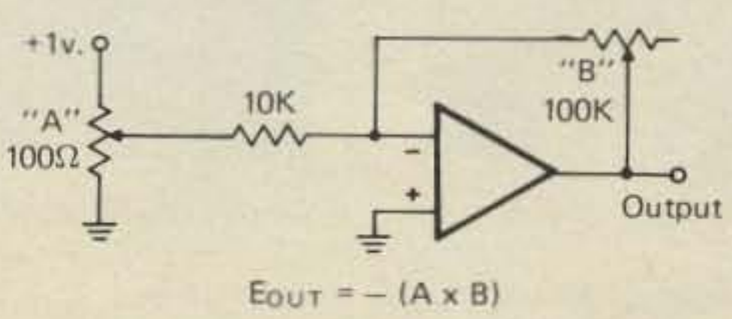


Fig. 8—Using an op-amp to solve an equation. The factor "M" is scaled by the setting of R_4.

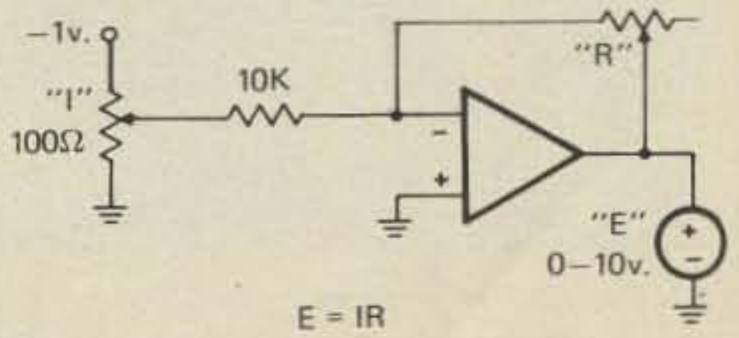


Fig. 9—Using an op-amp to solve a familiar equation.

Some of the most active and avid amateurs are members of the DXing community. However, all of their DX is limited to the confines of Mother Earth. Professor Horowitz has heard DX from the far reaches of outer space. Someday he hopes to have a QSO with intelligent life from afar. Read his fascinating story!

Chasing the Ultimate DX

BY PAUL HOROWITZ, Ph. D.*, W1HFA

The last few decades have seen a resurgence in the belief that other intelligent civilizations almost certainly inhabit our galaxy. This new interest in CETI (Communication with Extra-terrestrial Intelligence) has been spurred by several developments, in particular the findings that 1) the formation of planetary systems and multiple stars is probably the rule (rather than the exception, as had earlier been assumed) in the process of star formation, and 2) complex organic building blocks necessary for life are formed in abundance when ultraviolet light and electric discharges are passed through a flask containing the simple constituents which are believed to have comprised the early atmosphere on earth. This means that a suitable habitat for life and a mechanism for its origin may exist near many of the 200 billion stars of our galaxy. Thus, our sun and planet are ordinary; the galaxy may be teeming with life and technology.

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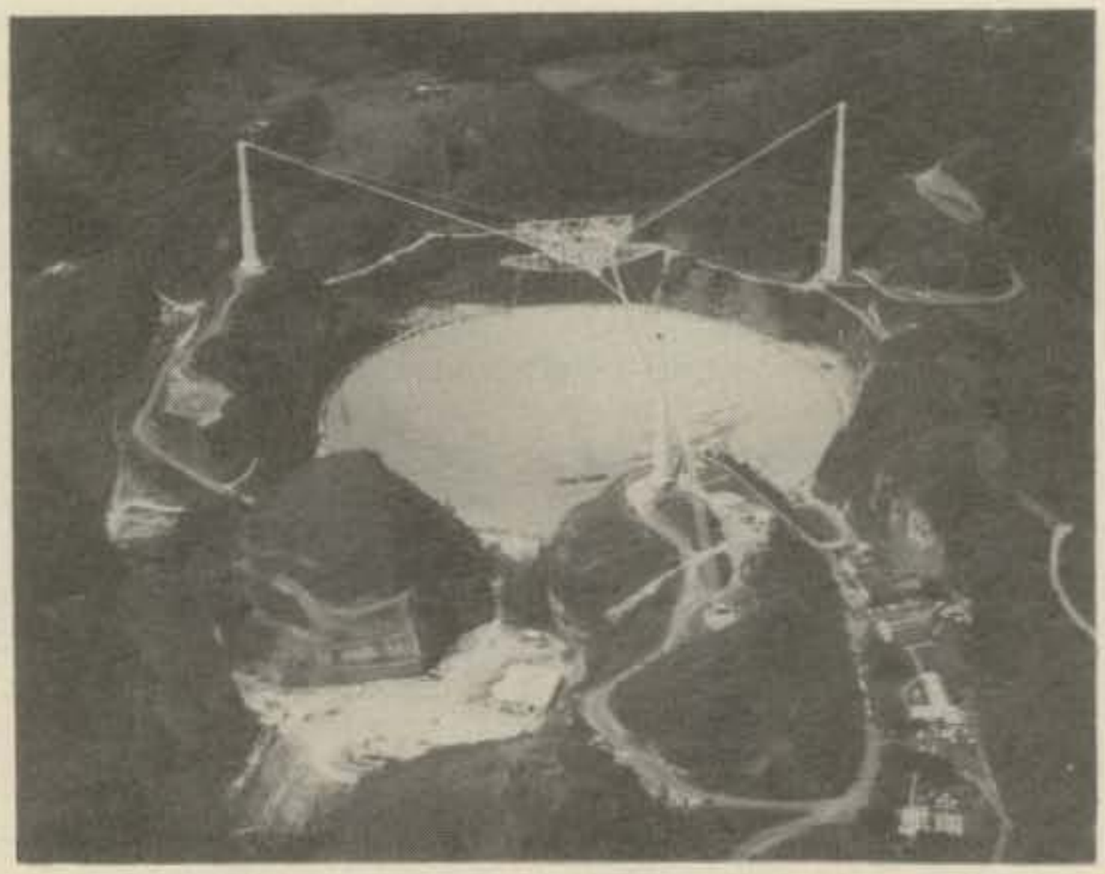
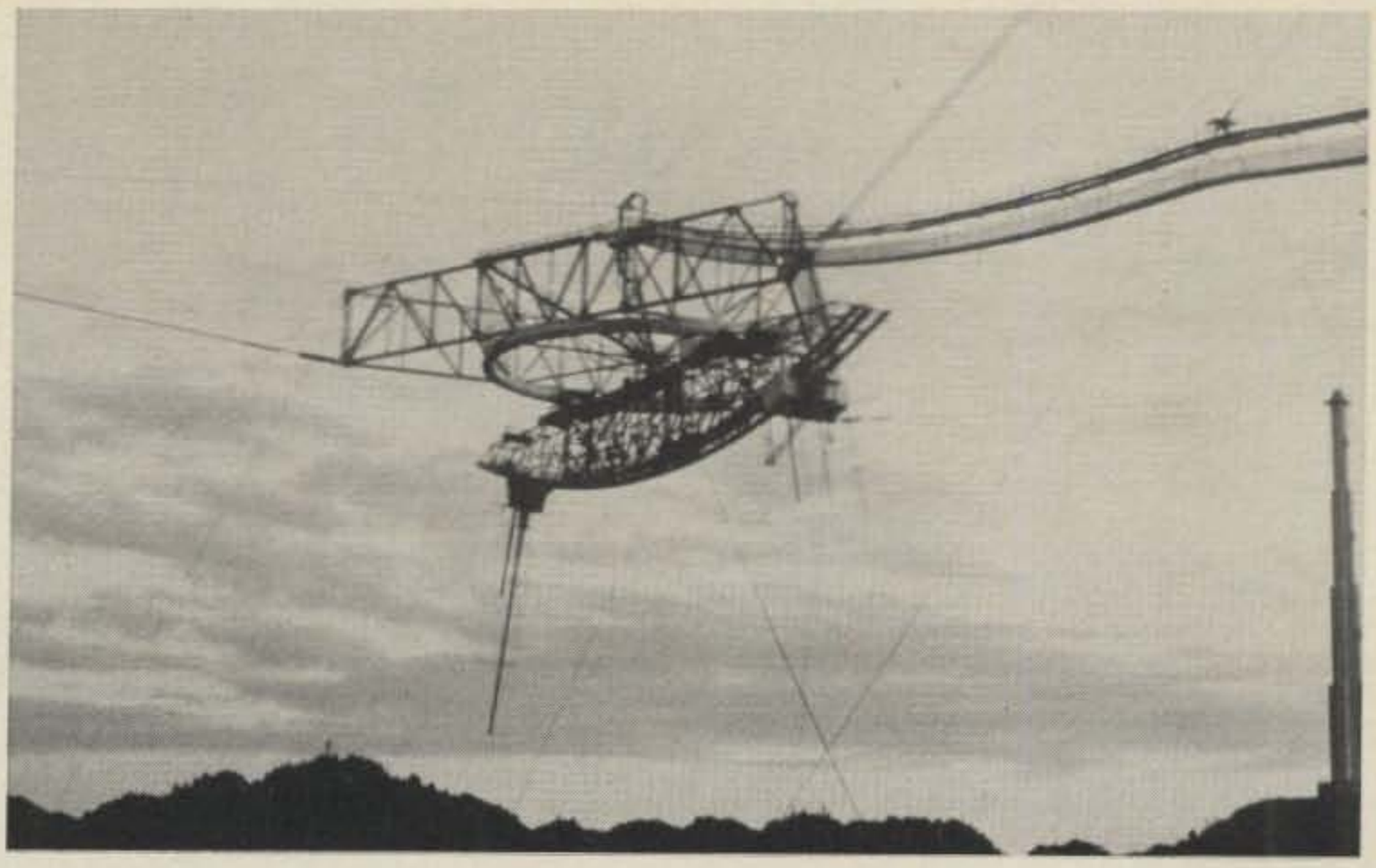
How might one snag this rarest of DX? Current opinion favors communication (not travel), probably at frequencies of 1 to 10 GHz on the basis of economy, i.e., most words per dollar. The classic paper on this subject is Cocconi and Morrison's publication in *Nature* in 1959, suggesting microwave communication near the frequency of the neutral atomic hydrogen "hyperfine" line at 1420.405751768 MHz (one of the most accurately known numbers in physics). This spectral line sticks out of the galactic continuum radiation like a giant frequency calibrator. It is the most abundant photon in the universe, it comes from the simplest and most abundant atom in the universe, and it is at a frequency close to the optimum for interstellar communication, given the spectrum of galactic background noise. Searches for signals at this frequency have been done in the last two decades, using large radio-

A view of the receiver room. The racks contain 100 separate stages so that a user can "custom patch" a receiver together. The author is in the process of doing just that.



An overall view of the Arecibo antenna. The dish is 1000 feet in diameter. The Arecibo Observatory in Arecibo, Puerto Rico, is part of the National Astronomy and Ionosphere Center, a national research center operated by Cornell University under contract with the National Science Foundation.



Left: A shot of the platform taken from the cable car. The emergency brake of the cable car can be seen hanging from the top. Above: A view of the platform and catwalk. A feed can be seen suspended from the lower left of the platform.

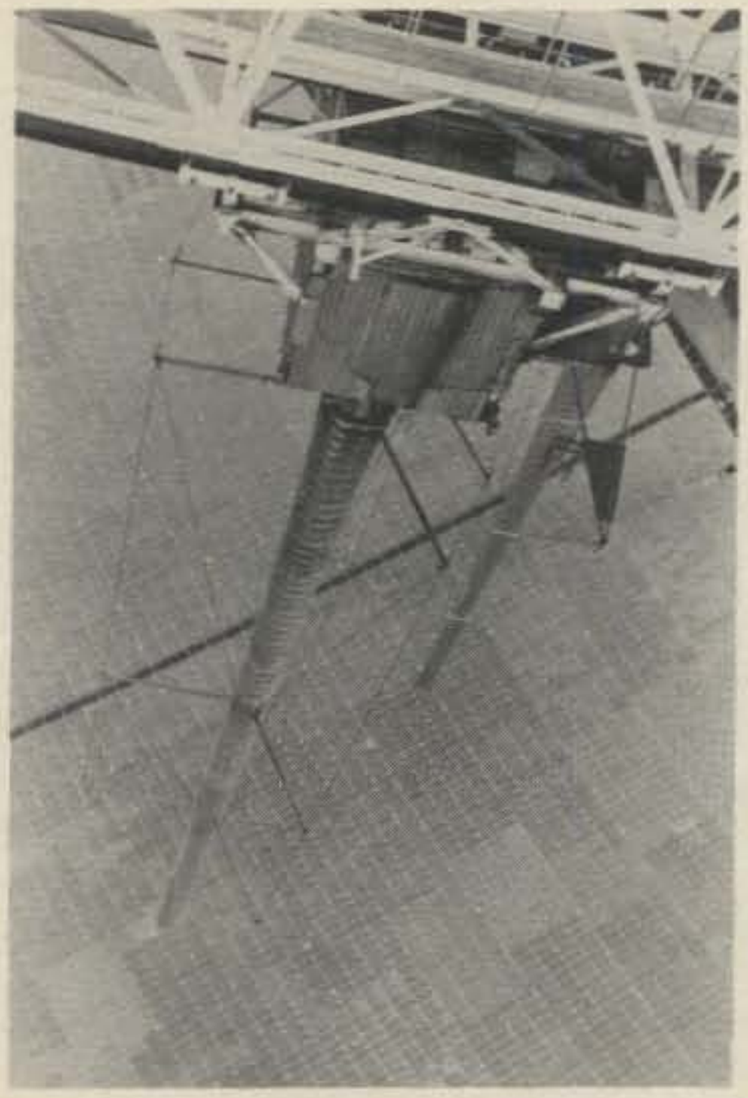
telescopes; these searches have looked, with resolution of about 1 kHz, for signals coming from the vicinity of nearby stars of type similar to our sun.

As any DX-er knows, c.w. gets you further, by virtue of narrower bandwidth. The Little Green Men on a faraway planet probably know this, too. With this in mind, the author decided to attempt the most sensitive search ever carried out for narrowband signals of extraterrestrial origin.

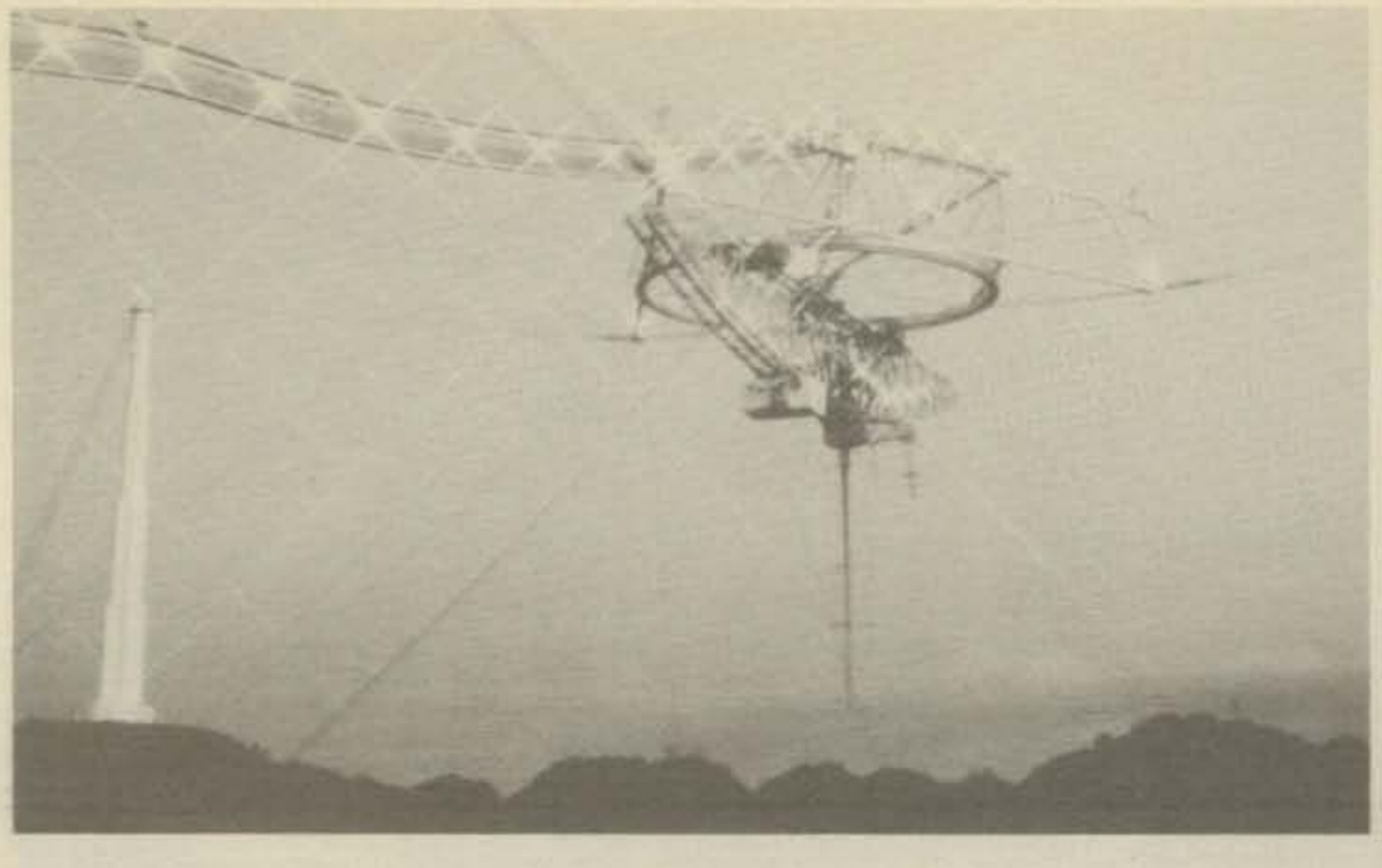
The first thing you need is a good antenna. The largest on earth is the spectacular 1000 foot dish at Arecibo, Puerto Rico. It sits in a giant "sinkhole" in Puerto Rico's Karst region, its 20 acre surface accurate to 5 millimeters, with a cluster of feeds on movable "carriage houses" suspended from an enormous 600 ton platform (a number of Arecibo's employees spend their entire workdays "upstairs"). It can steer 20° from the zenith in any direction, and has 68 dB gain at 1420 MHz. The author was lucky enough to obtain an invitation to search for signals with this magnificent instrument.

The next item to have is a good receiver. With these Arecibo is well-endowed, including maser and parametric amplifier front-ends, an assortment of mixers, oscillators, and IF's, and receiver "back-ends" consisting of baseband mixers, detectors, filters, correlators, and on-line digital processing equipment. In fact, they don't really have any "receivers"—what they have is a receiver "kit." You throw a few dozen BNC cables over your shoulder then connect up a receiver of your choosing from among dozens of pretty subassemblies (amplifiers, mixers, oscillators, filters, etc.). You soon develop skill at doing this rapidly, since it's done on your telescope time! The author usually managed to assemble this "receiver" in less than ten minutes.

What to look at, what frequency, what bandwidth? In this business one usually assumes "they" will be smarter than we are: The time that has passed since our civilization acquired radiotelescopes and radio technology is a thin slice of history indeed, and another technological civilization will likely have progressed beyond that slice. Given this likelihood, one can imagine a scenario in which the transmitting civilization sends



Left: This shot of a low frequency feed was taken by the author while leaning off the platform. In the photo a detail of the wave guide can be seen. Above: A view of workmen on the surface of the dish.

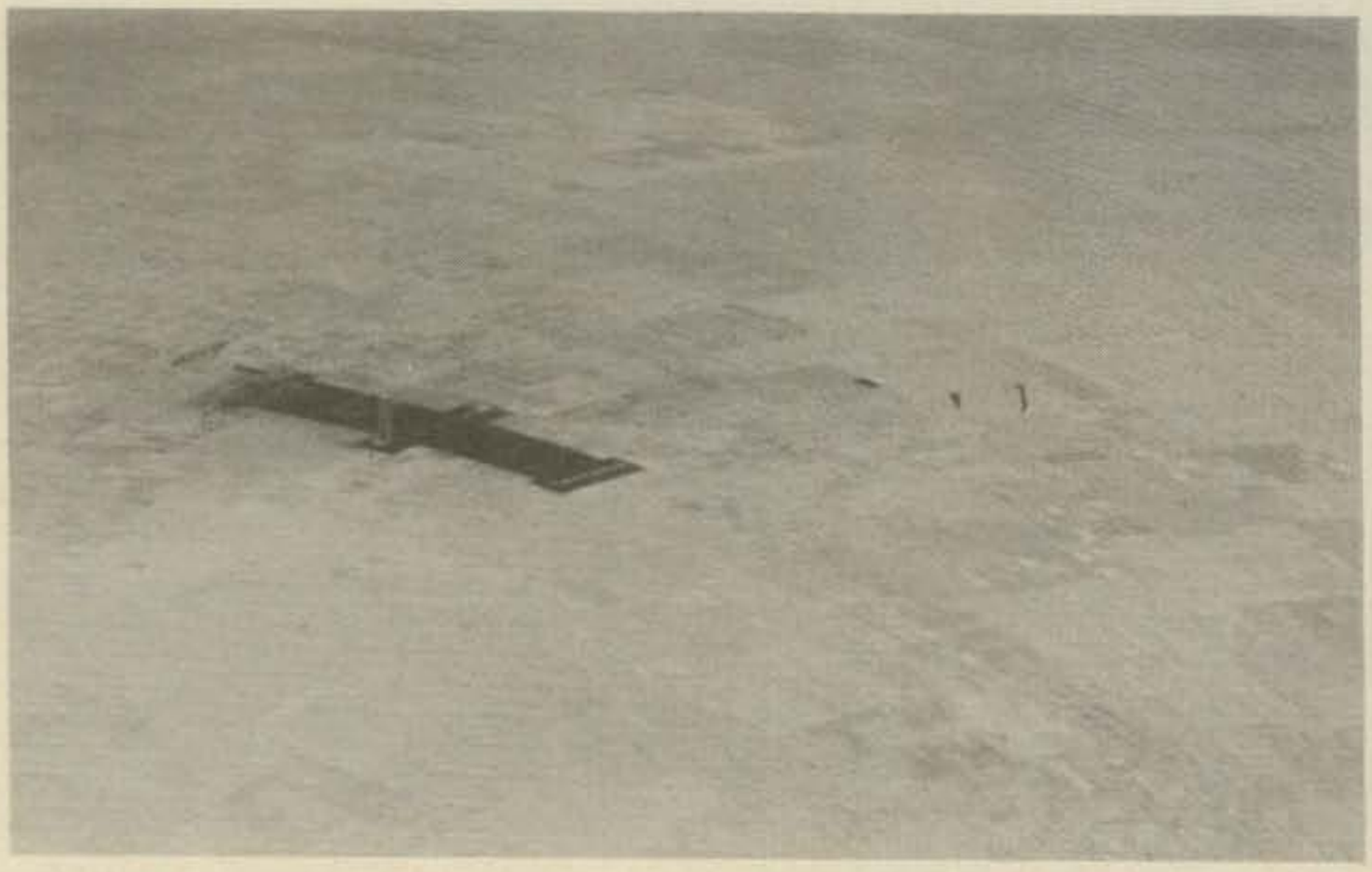


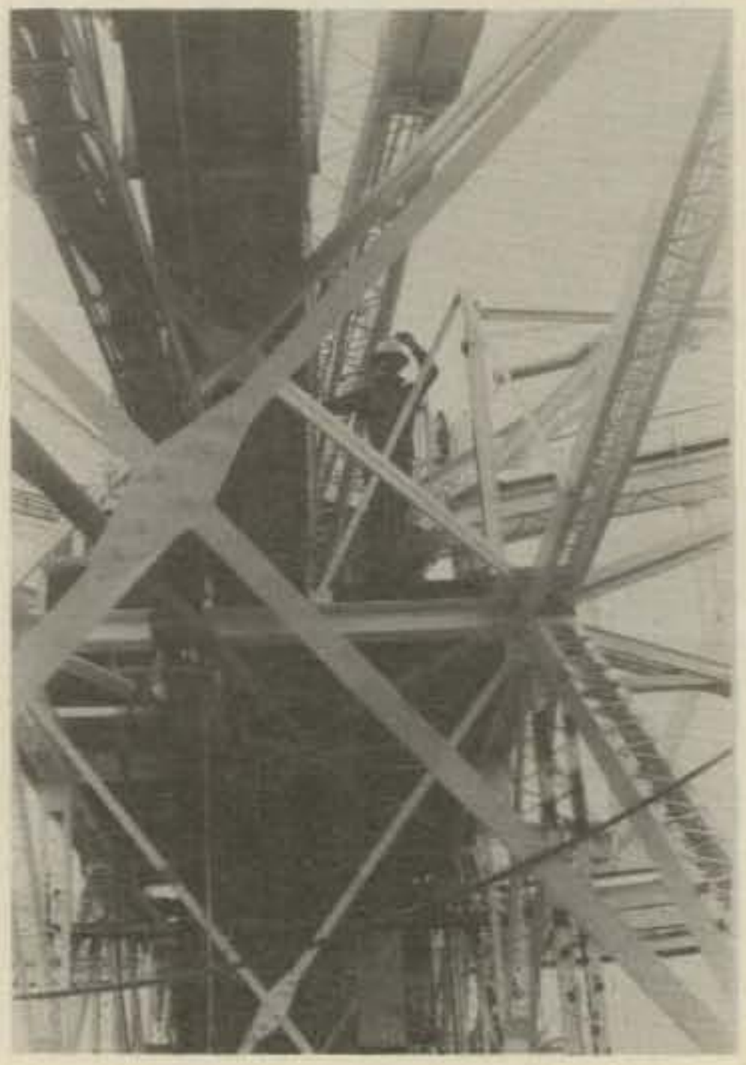
Above: A view of the platform and the catwalk as seen through the perforations of one of the dish's aluminum panels. Right: The size of the platform can be realized by comparing it against the man standing on it.

a narrowband beacon, directed at nearby stars known (to them) to be likely candidates for life, at a frequency such that it arrives in our solar system at the "true" hydrogen frequency. This they can do since they know our sun's velocity from solar line observations, and therefore can compensate for the Doppler shift. Our job, then, is simply to look at nearby sun-like stars at a receiver frequency corresponding to hydrogen frequency at the sun. Because of the earth's spin and orbit, this can be Doppler shifted as much as 150 kHz from the hydrogen frequency. At Arecibo, an on-line computer calculated the proper frequency every 20 milliseconds and set the local oscillator accordingly. The frequency must be set this often because the earth's spin causes the received frequency to drift at 0.15 Hz/second. The rubidium-referenced oscillators at Arecibo are stable enough to allow multichannel spectral analysis with resolution of 0.01 Hz at 1420 MHz; this is about the narrowest usable resolution, since fluctuations in the interstellar medium would spread any signal that much during its journey. The multichannel analyzer, incidentally, was synthesized by computer using the famous Cooley-Tukey "Fast Fourier Transform" operating on 131,072 sequential samples of the baseband mixer output. Total bandwidth was 1 kHz, resolved into bins of 0.015 Hz.

Previous searches have been plagued by false signals of terrestrial origin, which are, after all, "intelligent." A remarkable consequence of using ultra-narrow bandwith is that local interference is almost completely rejected. This occurs because the receiver, in a one-minute data-gathering run, is swept through about 10 Hz, smearing a narrowband interfering signal out over about 600 spectral channels. Only a narrowband signal which 1) is drifting in time in exactly the same manner as the receiver, and 2) remains on during the entire one-minute run, will appear in the final spectrum as a narrowband feature. For this reason QRM was never a problem during the search.

During three months at Arecibo (Jan-Apr, 1978) the author looked at all sun-like stars within 80 light years which are visible with the 1000 foot dish—185 stars in all. Sensitivity was 4×10^{-27} watts/meter^2 for easy detectibility in 1 minute (at least 10 minutes were spent on each star); this is at least 100





Above: A view of the surface of the dish. Right: Another view of a worker on the platform.

Above: A worker in "Donald Duck" boots attaching laser alighment targets to one of the 38,778 perforated 3' x 7' aluminum panels. Left: A view of the catwalk leading to the platform. A cable car also runs above the catwalk.

times more sensitive than any previous search, and corresponds to a signal with total power incident on the earth's disk of less than a millionth of a microwatt! An identical twin to the Arecibo dish, using transmitter power now available there (0.5 Megawatt, c.w.), would have been easily detected at 1000 light years distance.

Oh, the result, in case you hadn't guessed, was negative. But then, maybe this wasn't the season of their DX contest.

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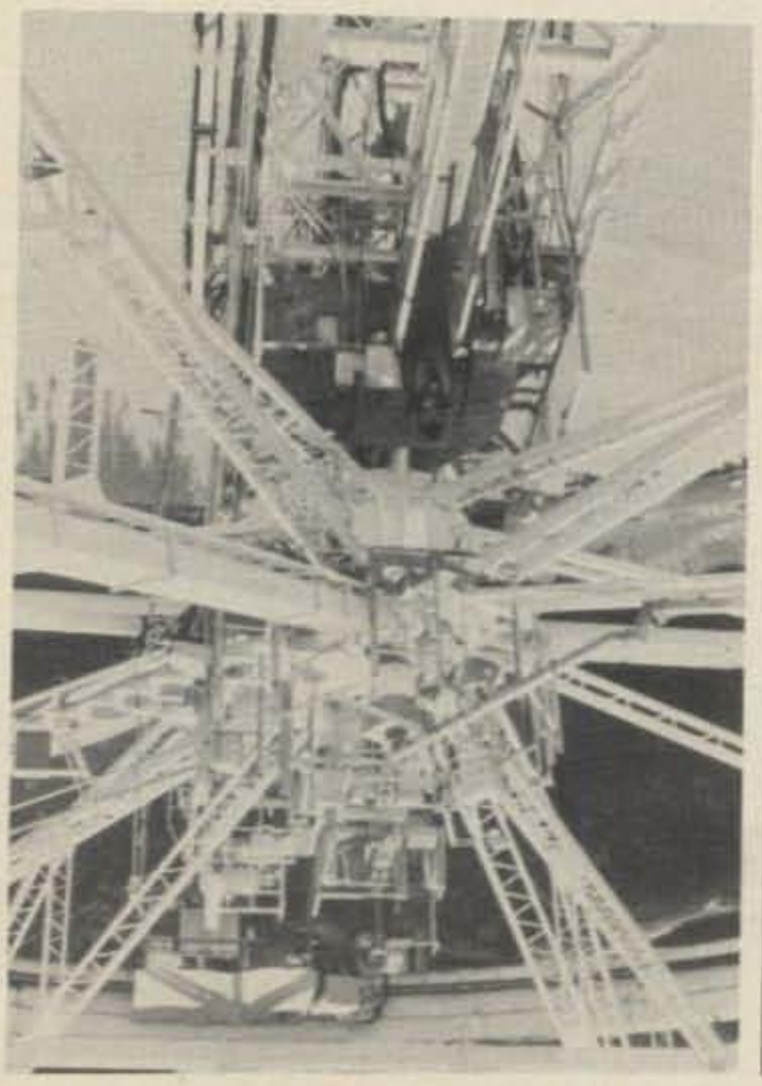
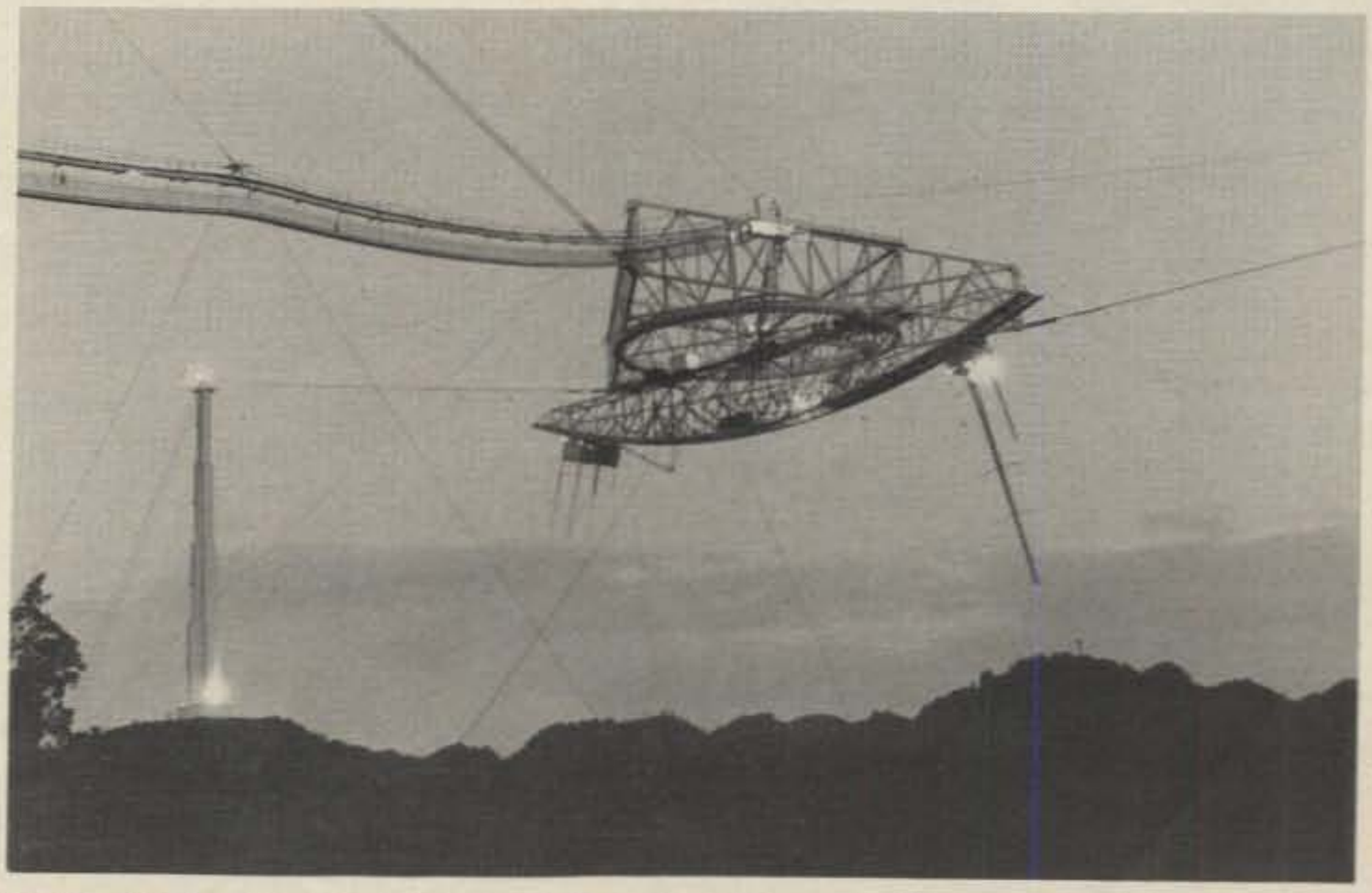
Interstellar Communication. A. G. W. Cameron, editor (Benjamin, New York, 1963; available in paperback). A nice collection of original articles (including Cocconi and Morrison's) on this subject, though a bit out of date.

Communication with Extraterrestrial Intelligence. C. Sagan, editor (MIT press, Cambridge, MA, 1973; available in paperback). This interesting volume contains the lectures and discussions of the first conference on CETI, held in the Soviet Union in 1971. You'll find wilder speculation here than in a formal article or book.

Project Cyclops: A Design Study of a System for Detecting Extraterrestrial Intelligent Life. B. M. Oliver and J. Bil-





Above: Another view of the catwalk and platform. Left: An underside view of the platform showing the intricate construction.

lingham, editors (NASA Contract Rep CR114445, 1973; available from Dr. J. Billingham, NASA/Ames Research Center, Code LT, Moffett Field, CA 94035). This large paperback volume presents in great detail the background information and arguments relevant to the detection of signals form extraterrestrial intelligence, culminating in the design of the "Cyclops Array," 1500 dishes each 100 meters in diameter. Though this grandiose antenna may never be built, this volume (comparable to the Shklovskii and Sagan book in scope) is an authoritative reference, and makes very enjoyable reading.

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Extraterrestrial Intelligence: An Observational Approach. B. Murray, S. Gulkis, and R. E. Edelson, *Science, 199*, 485 (1978). A survey of the problem and previous work, and a call for further searches.

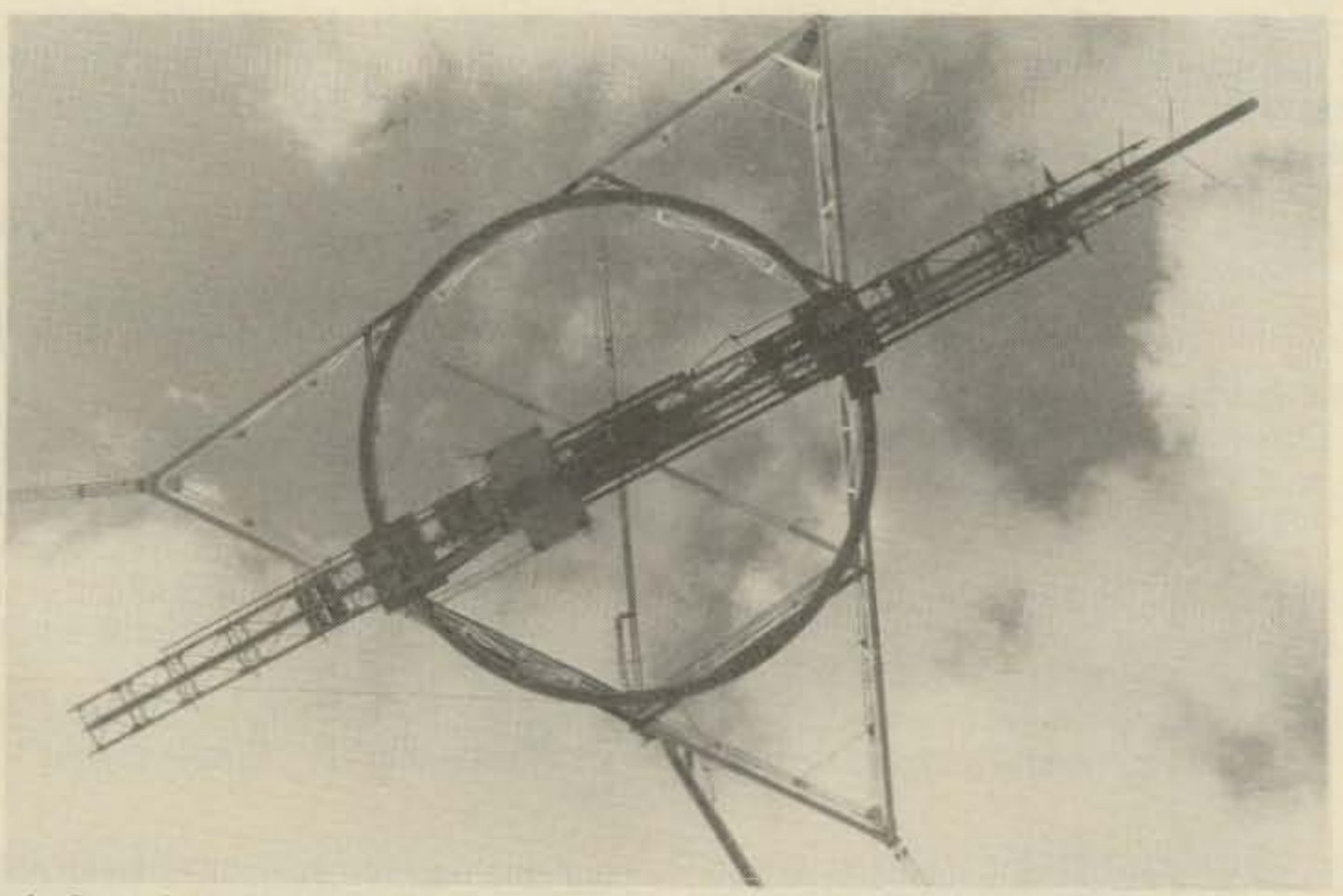
A Search for Ultra-Narrowband Signals of Extraterrestrial Origin. P. Horowitz, *Science, 201*, 733 (1978). A technical report on the author's search described in this *CQ* article.

Many of the Arecibo Observatory people are amateurs. Among the staff are—

K2IAO	Harold D. Craft	Director
WB2LFX	Don Rosenthal	Computer Programmer
KP4EPN	Mike M. Davis	Astronomer
W1KWR	Tom Dickinson	Microwave Engineer
KP4CMO	Rolf B. Dyce	Assistant Director
KP4EPM	Garred A. Giles	Scientific Services
KP4I	Jon Hagen	Ionosphere Scientist
W1FZJ/ KP4DJN	F. Sam Harris	Electronics Engineer
KP4EKA	Rey Velez	Telescope Operator
also . . .		
W1HOY	Helen Harris	(Sam's wife)
and some former amateurs . . .		
ex-KP4BEP	Domingo Albino	Transmitter Engineer
ex-VO2G	Robert T. Duquet	Computer Programmer
ex-KP4BER	Miguel Feyjoo	Electronics Engineer
ex-K1HNV	David vanWinkle	Platform Supervisor

Cover photo by Russell Hamilton, W2FXU, Cornell University.

CQ



Left: One of the three 300' towers used to support the platform above the dish. Above: A shot of the platform taken from the center of the dish. The platform is 500' above the dish. The azimuth arm rotates along the circular track.

New Amateur Products

The Radio Amateur Antenna Handbook *by Bill Orr, W6SAI and Stuart D. Cowan, W2LX*

Here's a book that every radio amateur will be interested in. Every conceivable antenna commonly used by amateurs is described and discussed by our hobby's leading antenna "maven."

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The price is $35 plus $2 for shipping. For more information write to Palomar Engineers, P.O. Box 455, Escondido CA 92025.

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

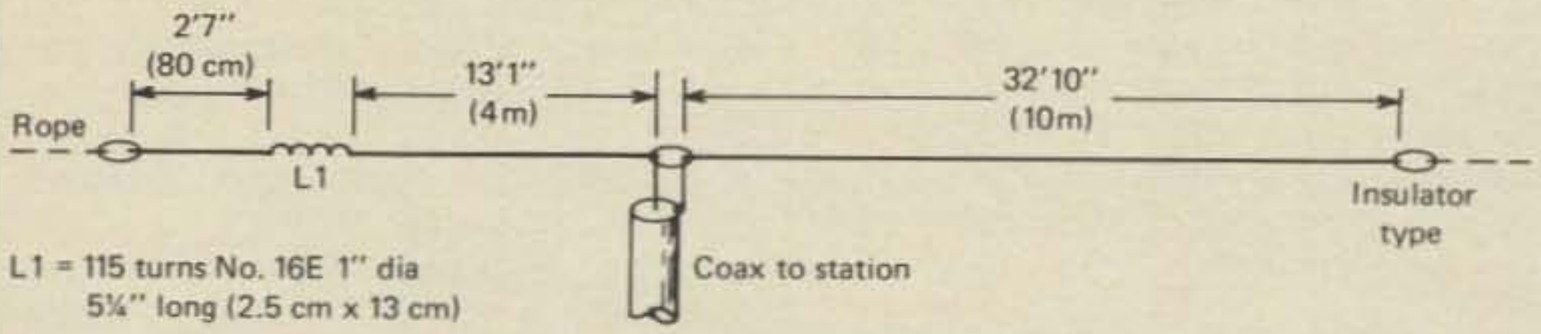


Fig. 1 — Short antenna tip beyond loading coil may be adjusted to move antenna resonance on 15 meter band. Antenna provides superior operation on both 15 and 40 meters. (Metric dimensions in parenthesis)

"Excuse me. I didn't know you had company". I closed the door to Pendergast's shack, but not too quickly to hear him call, "No, no! Come on in! I have a friend here I want you to meet". I entered the room. Sitting beside Pendergast at the operating table was a young fellow that I did not know. He had dark hair, a small beard and a quick and humorous look about his eyes. Pendergast rose and said, "I'd like you to meet a new radio amateur. Bill, this is Doctor Livingston I Presume. He's a dentist and just received his Novice license".

"Congratulations Doctor", I said shaking his hand. Doctor Presume grasped my hand and remarked, "You have been in Afghanistan, I see".

"A good point, Doctor", I replied. "And congratulations on your Novice ticket. Are you on the air yet?"

"Call me *Doctor Liv*", said my new friend. "No, I'm not on the air yet, but I soon will be. I was just chatting with Pendergast and I hope to swindle him into helping me put up an antenna".

48 Campbell Lane, Menlo Park, CA 94025.

Pendergast blushed with pride. "I'm always ready to help the humble beginner", he remarked.

"Pendergast, I love your humility", I said. "What do you have in mind for the good Doctor Liv?"

"Well, 15 meters is jumping these days. And 40 meters is always good for a local rag-chew. So I think that he should put up an antenna that would work on both bands".

"Agreed", I replied. "What do you have in mind?"

Pendergast thought a bit. "Well, how about a 40 meter dipole?

"That's resonant at the third harmonic, which is 15 meters. If Doctor Liv put up a 40 meter dipole, he could work both bands".

I turned to the good Doctor. "What kind of a rig do you have?"

"I just bought a *Kamikaze-200*. It's the new all-solid-state rig", He replied.

"Very nice"; I replied. "However, there's one problem. Most of the new solid state jobs don't like to work into any antenna system that has a high value of s.w.r. In fact, they protect themselves against high s.w.r. by a power reduction circuit. Thus: the higher the s.w.r. on the antenna, the less power output from the transmitter".

Dr. Liv frowned. "What's that got to do with using a dipole on its third harmonic?" he asked.

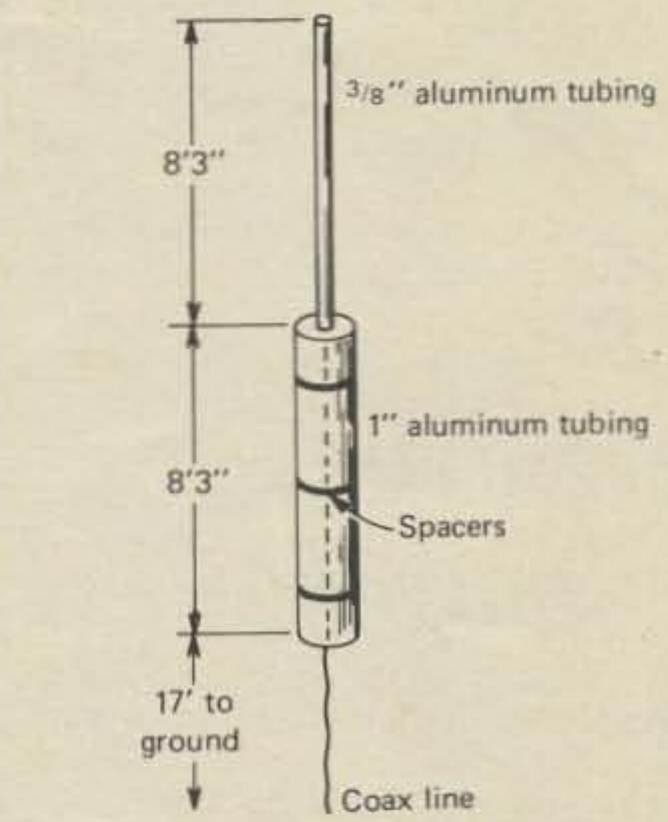


Fig. 3 — Vertical dipole for 10 meters. Shield of coax line is grounded to 1 inch tubing at center junction. Center conductor is attached to 3/8 inch whip. Insulating spacers hold coaxial line in center of lower section.

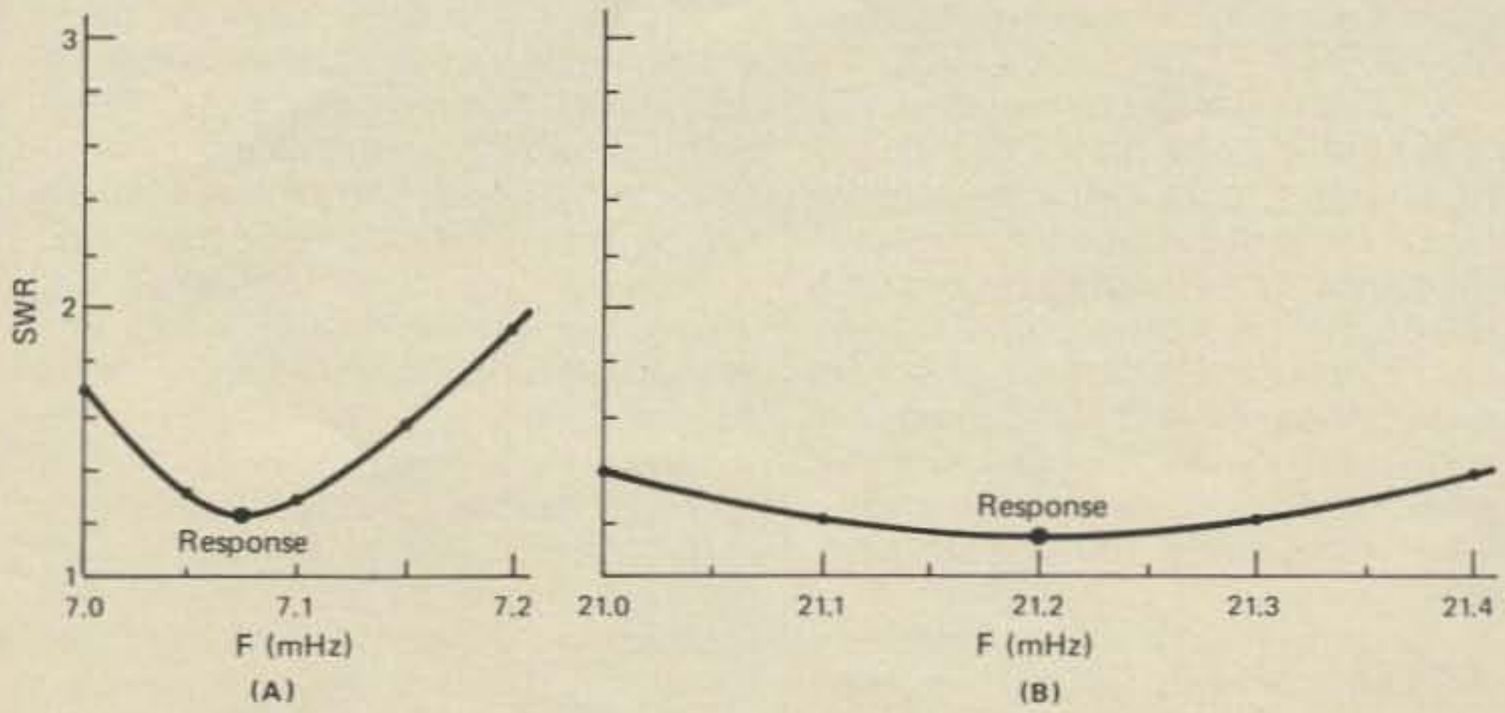


Fig. 2 — (A) Plot of s.w.r. on 40 meters. (B) Plot of s.w.r. on 15 meters.

"Simply this. Third harmonic resonance isn't quite three times the fundamental frequency. Let's say you have a dipole that is cut to be resonant at 7.1 MHz. You might think the third harmonic resonance would be three times 7.1 or 21.3 MHz. However, this is not the case. The third harmonic resonance actually turns out to be 21.8 MHz. This is far enough in frequency from the Novice band at 21 MHz. to cause s.w.r. problems with some types of solid-state equipment. And even some rigs that have tubes in the final amplifier (supposedly immune to high values of s.w.r. on the antenna system) might develop loading problems under such a condition".

"But I hear a lot of Novices on 15 meters that are using a 40 meter dipole", protested Pendergast.

"That may be so", I replied. "But there's a better way of doing the job that will provide operation on both 15 and 40 meters with very low s.w.r. on the transmission line"

With a flourish Dr. Liv produced a large, lined notebook.

"I'm taking your advice", he said with a smile. "Here's the start of my antenna notebook of good ideas".

"Well, this idea came from JA3CZV who wrote it up in the March, 1977 issue of *CQ-Ham Radio*, the Japanese amateur publication. Look at fig. 1. This is a 40 meter dipole with one branch shortened and tuned to resonance with a loading coil. The coil resonates the short side of the dipole to 40 meters but it upsets the current distribution on 15 meters to permit antenna resonance to occur at 21.2 MHz. instead of at 21.8 MHz. On 40 meters the s.w.r. readings for this antenna are below 1.6-to-1 across the c.w. band, rising to about 2-to-1 at 7.2 MHz. On 21 MHz., the s.w.r. is quite flat, running less than 1.4-to-1 across the whole band".

"Very interesting", said Dr. Liv, as he copied the drawing in his notebook. "Is there any adjustment to be made to the antenna?"

"If you want to move the resonance about at 40 meters, you trim or lengthen the short tip section after the coil", I replied. "Otherwise, leave it as it is".

"How do I plot a s.w.r. curve for this, or any other antenna?" asked the Doctor as he wrote busily in his notebook.

"All you need is an s.w.r. meter", I replied. "The little imported jobs that sell for under twenty dollars are just fine".

"I can see that you haven't been following the recent exchange rate between the dollar and the yen", observed Pendergast with a laugh.

I ignored the thrust. "The important thing to remember is that no adjustments to the transmitter, or changes in the length of the feedline, will affect the s.w.r. reading. The *only* thing that will affect the s.w.r. reading are changes made to the antenna. If you find that transmitter tuning, or changes to the transmission line affect the s.w.r. reading, then it is possible that something is wrong with the s.w.r meter or else you are measuring something else in addition to antenna parameters".

"I've heard from other Novices that you can change s.w.r reading by changing the length of the coaxial transmission line", observed Dr. Liv.

"You can change your *transmitter loading* by changing line length", I replied. "In fact, some fellows do just that. They cut short extension pieces of transmission line of various lengths and splice them to the main transmission line, thus changing the overall length of line between the transmitter and the antenna. And sometimes they find that a certain length of line loads the transmitter better than other lengths. This is very true, and it is a good technique to keep in the back of your mind when you run into loading problems. It is a quick and dirty means to load a transmitter that is working into a line having a high value of s.w.r. on it. But this sneaky trick doesn't change the *value* of the s.w.r. on the line, it merely changes the conditions of loading for the transmitter. If you are lucky, and hit the right line length, the transmitter may load up, regardless of the s.w.r. value. Now, that's not to be taken as a blanket statement! I'm only talking about *reasonable* values of s.w.r., say, less than 2-to-1. If you have a really high value of s.w.r. on the line, all bets are off and my statement is non-operative".

"That stunt doesn't always work", said Pendergast. It *usually* works with tube-type equipment that has both tuning and loading controls for the amplifier stage. By juggling line length, it is possible to get most pi-network tuned stages to load into a line having a reasonably high value of s.w.r. on it. And it is helpful with solid-state output stages, too. But many times it won't work on a solid-state rig, or if it does permit proper loading, the s.w.r. is still too high to prevent the transmitter from developing full output. And you can spend a lot of time looking for the "lucky" line length that may not exist!"

"Well, what can you do about it?", asked Dr. Liv. He reached in his pocket and took out the instruction booklet for his new *Kamikaze-200*. He thumbed rapidly through it and said. "Yes, here it is. It states that with an s.w.r. of 1.5-to-1 the output is 70 percent of normal and with an s.w.r. of 2.0-to-1 the output is 45 percent of normal. That's not so good. And as I understand it, every antenna is resonant at only one point in the band and the s.w.r. is lowest at that point. This means the s.w.r. is higher at other points in the band. Right?"

"That's right", I replied. "And this brings us back to the question you asked about running an s.w.r. curve for a given antenna. Let's take the antenna shown in fig. 1.

"You run an s.w.r. curve by measuring the s.w.r. at various points across the band. The s.w.r. meter instruction manual tells you how to make an s.w.r. measurement so I won't insult your intelligence by repeating that. It is common practice to make a measurement of s.w.r. every 50 kHz, starting at one end of the band and going to the other. On 10 meters, which is a rather wide band, the measurements may be made every 100 kHz. to save time.

"Write down the measuring frequency and also the s.w.r. reading. Then when you have gone across the whole band, you make up a graph. The s.w.r. measurements fall along the Y-axis and the frequency falls along the X-axis. Look at fig. 2. This is a plot of the s.w.r. measurements made for this Japanese antenna across the 40 meter band. Measurements were taken at 7.0, 7.05, 7.1, 7.15 and 7.2 MHz. Note that the curve is smooth and symmetrical. And note that the lowest value of s.w.r. falls between two of the measuring points".

Pendergast peered at the curve. "It looks to me as if the frequency of lowest s.w.r. is about 7.075 MHz.", he announced.

"That's right", I replied. "And if you went back and made another measurement at 7.075 MHz., that would verify this fact".

"I produced a second curve. "Here's the s.w.r. measurement of the same antenna on the 15 meter band. Points were plotted every 100 kHz. Note how broad the s.w.r. curve is. This is normal for an antenna working on the third harmonic".

"Have you ever though about using a vertical antenna?", asked Pendergast. "You can put up a triband vertical, or perhaps two separate ground planes. I like vertical antennas very much."

I reached into my desk drawer and brought out a bulky manuscript.

"This is a very interesting dissertation on vertical antennas", I said. "It is a military-sponsored investigation of the properties of vertical antennas for fixed-station use. Most of the information in the report is well known, but it brings out one important fact that has been overlooked these past few years, namely, that a vertical half-wave dipole can out-perform a ground plane antenna. The report summarized this fact by stating that an elevated dipole will improve low angle radiation by 3 dB to 5 dB over a ground plane antenna of equivalent height, and use of a vertical dipole is an attractive alternative to placing an extensive ground screen or radial system beneath a quarter-wave monopole".

"That sounds interesting", said Doctor Liv. "Do you have a practical example?"

"Look at the antenna in fig. 3", I replied. "This simple antenna provides more than 3 dB gain at low radiation angles than a ground plane with 40 radials mounted an equivalent height—seventeen feet—above ground. Now this is a simple antenna for 10 meters. And the dimensions can be scaled up for other bands, too"

"How do you feed this antenna?", asked Doctor Liv as he drew a picture of the vertical dipole in his notebook with a delicate touch.

"Well, if I was doing it, I would bring the coaxial line down inside the lower section of the dipole. It is easy to make spacers out of wood, or some insulating material, to space the coax right down the center of the tubing. That will prevent the field of the antenna from screwing up the proper

function of the coaxial line".

"Simple enough", said Pendergast. "Is there any magic height that the vertical dipole should be mounted above ground for best results?"

"The report had many charts of angle of radiation versus height of the dipole above ground. For best results the bottom of the dipole had to be a minimum of 0.5 wavelength above ground. Slightly better results were achieved at a height of 0.75 wavelength".

Pendergast frowned and said, "this is contrary to all published information on vertical dipole antennas. According to conventional wisdom, the higher the dipole above the ground, the less will be the low angle radiation".

"That's true", I admitted. "And that's one reason the investigation was run. It revealed the fact that when a vertical dipole is placed above the actual ground, which has mediocre conductivity, the radiation patterns are quite different from the patterns of a similar antenna placed above a perfect ground. And most theoretical studies and tests are done assuming a perfect ground. As you know, most tests are run on a v.h.f. antenna range which has a large copper sheet for a ground. But that isn't the way it is in true life. The best natural ground is sea water. But the conductivity of sea water is only a fraction of that of a copper plate. And the conductivity of soil is only a fraction of that of sea water. So the measurements made on an antenna over an ideal ground don't bear much resemblance to real life, where the antenna is mounted over lossy earth".

Pendergast breathed deeply. "Then all those pretty little pictures in the handbooks that show angles of radiation at various heights above ground just aren't true for antennas mounted above lossy ground?"

"I won't go so far as to say that", I rejoined. "This study only compares the performances of a ground plane antenna against a vertical dipole antenna. The study conclusively showed that the dipole out-performed the ground plane when both were mounted at least 0.5 wavelength above average soil".

"Well, I'll be dipped", said Pendergast. "Seems to me that the vertical dipole antenna is a lot easier to get up in the air than a ground plane with all those messy radials".

"Could be", I replied. "I hope some amateurs will try this antenna out and let me know their experiences with it. After all, the real proof is in how well the antenna really works. If this report is factual, I think we are in for some interesting antenna experiences!"

Doctor Presume shook my hand as he prepared to leave.

"Thanks for the bull session", he said. "I'll let you know how I come out with my experiments. CQ

a regular feature by

THEODORE J. COHEN N4XX

dateline... Washington, D.C.

The ins and outs of the Washington scene

Government report details skywave interference to CB

The National Telecommunications and Information Administration, an agency of the U.S. Department of Commerce, recently released a report entitled "Effects of Local and Skywave Interference on CB Radio Range" (L.A. Berry; NTIA-Report 78-1). The results of the investigation indicated that if the current solar cycle is average to above average in intensity, and if CB usage does not decrease, the operational range for CB transmissions in cities with populations less than 100,000 could be one-half of its present value during the daylight hours of non-summer days for about three years at the peak of the sunspot cycle. The study also suggested that skip interference will probably not be a concern to users of the 27 MHz. band who reside in metropolitan areas with populations of more than one million.

Perhaps the most startling result of the study is that at the peak of the sunspot cycle the range of CB transmissions in sparsely populated rural areas may be only one-sixth of their present range. Since about one-third of the U.S. population resides in small cities and rural areas, it is readily seen that a significant proportion of CB operators will experience skywave interference of sufficient magnitude as to reduce their transmission ranges by 50% or more.

Given the above, it does not take much insight to realize that as skywave interference increases, more and more pressure could be placed on our elected officials in Washington to provide frequencies in the v.h.f. or u.h.f. band for CB use . . . that is, to provide access to frequencies where skip is no longer a concern. Needless to say, the 220 MHz. band would satisfy this requirement, and at this writing, proposals to allocate portions of this band to the Mobile (including CB) service are still very much alive.

ARRL procrastinates on Washington representative

While the largest CB organization in the United Sates is strengthening its hand by moving its executive offices to the Washington, D.C., area, the American Radio Relay League has once again postponed the creation of a Washington office.

At the second meeting of the ARRL Board of Directors, held in 1978, a majority of the Board voted (Minute 76) to make the position description for a Washington representative, which had been prepared by the ARRL's President and General Manager, the task assignment of the Washington Coordinator. This vote followed a move by Director Egbert (Minute 66) ". . . to move forward in a positive and orderly fashion toward the establishment of a (Washington) Office;" Director Egbert's proposal, however, was nullified in Minute 76.

This action (that of delaying the creation of a Washington representative) is directly counter to the Board's instructions to the President and the General Manager, as stated in Minute 40 of the first meeting of the Board (January 1978). At that time, the Board instructed the President and General Manager to proceed immediately to establish the position of Resident Washington, D.C., Representative for the ARRL, and to seek a qualified candidate for this position.

It should be noted that Directors Gant, Holladay, McConaghy and Miller voted against the motion (Minute 76) to make the position description for the Washington Representative into the task assignment for the Washington Coordinator. Their vote, presumably, signaled support for the creation of a Washington office, and suggests, at the least, that four directors recognize the importance of ARRL representation in the Federal City.

CB'ers strengthen hand, move to Washington

The International CB Radio Operator's Association (CBA) recently announced that it has merged with the American Citizen Band Operator's Association (ACBOA/ALERT) to form the largest CB operator's organization in the United States.

According to Mr. Ron Hyden, Executive Director of CBA, the newly formed CBA/ALERT organization will enable both organizations to further their common goals. More specifically, these goals are:

to provide a strong, national-scale emergency volunteer network offering disaster assistance;

to increase educational activities with the goal of positive self-regulation by CB operators in cooperation with, and in adherence to, FCC rules and regulations;

to continue to work with federal authorities in eliminating radio-frequency interference (RFI).

The new organization, to be known as CBA/ALERT, will also cooperate with the Civil Defense Emergency Preparedness Agency and the American Red Cross to provide a comprehensive national network of CB volunteer operator teams to assist in the event of a regional or national emergency.

To strengthen the voice of CBA/ALERT, Mr. Ron Hyden also has indicated that he will move his office to Reston, Virginia, a suburb of Washington, D.C., where he will better be able to work with those federal agencies which impact on CB operations. CQ

*8603 Conover, Alexandria, VA. 22308

a monthly feature by

BILL WELSH, W6DDB

Novice

"How to" for the newcomer to Amateur radio

Sources of Aid for Prospective Amateurs

I have been writing this Novice column a short while but I have already become convinced that many readers are not Novices. Recent issues offered free copies of licensing course printed aids on subjects such as coaxial cables, sending and receiving DX QSL cards, and worldwide sources of code practice. About 300 requests were answered in two months with materials promptly sent to those supplying the usual large (10 by 12 inch) self-addressed and stamped envelopes. Approximately one-third of the requests came from amateurs listed as Novices in the present callbook or its supplement. More than half of the requests I received were from amateurs indicated to hold General or higher classes of licenses. I realize that some of the material offered may have been more interesting to those with a bit more technical background (and higher classes of licenses) than it is to Novices. Nevertheless, the response was extensive enough to be indicative of who reads this column, and it is not just Novices and aspiring Novices looking for help.

It appears reasonable that newcomers to amateur radio have very little to guide them to their limited sources of information. It also seems obvious that these Novices and aspiring Novices need the help and advice of established amateurs to get started as quickly and easily as is possible. I think that most amateurs do not communicate well with newcomers and it is hoped that this article will convince some amateurs to make an effort to be more communicative with Novices.

If you know someone who is a Novice, or who is preparing to be a Novice, try to imagine (or remember) just how strange and confusing the world of amateur radio is to a beginner. Don't make things worse by assuming the newcomer knows about the American Radio Relay League, ARRL Divisions, ARRL Sections, ARRL appointments, bugs, code speed rates (words per minute), *CQ* Magazine, Domestic/Foreign Callbooks, Domestic/Foreign postal rates, DX, FCC Rules and Regulations, FCC test procedures, *Ham Radio* and *H-R Horizons* magazines, International Reply Coupons, keyers, logs and logging, QSL bureaus (incoming and outgoing), QSL cards, *QST* magazine, shacks, signal reports, standard (ARL) messages, sticks (pencils), telegraph keys, telegraph mills (typewriters), *Worldradio News*, and *73* magazine. Make things easier for beginners by minimizing your use of amateur radio jargon and stating things in simple terms which can be understood by people who have no radio training. You'll do newcomers a very real service if you take the time to explain things in plain language. Please do not dazzle them with your jargon, because you may just be convincing them to try something else such as rock collecting or painting, in lieu of amateur radio.

I have instructed Amateur Radio Licensing Courses on a regular basis for a long time and I well realize how much material a newcomer must learn to become a licensed and active Novice. I am very appreciative of the recent boom in club licensing programs and I hope they will continue to flourish and improve. It is my belief that formal licensing courses provide prospective amateurs with a maximum amount of essential information with the least amount of wasted effort and time. Keep track of where and when amateur licensing courses are conducted in your area and pass this information along to anyone indicating an interest in becoming an amateur. It helps to keep course availability data with you at all times because it is liable to be wanted no matter where you go or what people you meet. It is advisable to know a specific person and telephone number to be contacted by those seeking formal licensing instruction. If you do not know where and when such courses are held in your area, simply advise prospective licensees to request this information from the ARRL, 225 Main Street, Newington, Connecticut 06111. The ARRL Club and Training Department does a good job of providing up to date information on this subject.

My major training effort has been directed towards club training but I realize that it is not always possible for aspiring amateurs to attend this type of group instruction. In these cases, it is often a

This is Rick Dittmer (WD9IRI) in his shack. Rick is a 24 year old USAF airborne radio operator based at Grissom AFB, Indiana. He earned WAS in the first few months he was licensed as a Novice and is working towards several DX awards. His SB-104A is used with an all-band vertical and dipole antennas.

*2814 Empire Ave., Burbank, CA 91520

situation wherein the newcomer just collects some books and struggles through the material without direction. A lot of amateurs have successfully prepared themselves to pass FCC examinations in this manner and many more will follow the same procedure in the future. This system does work but it is very time consuming and it can quickly kill the interest of would-be amateurs. If you know someone who is trying to prepare herself/himself to pass an FCC amateur radio license examination, please advise that person to consider one of the homestudy correspondence courses advertised by major electronic schools. Such courses are not very expensive and they do cover the essential material satisfactorily.

If you are one of those rare individuals who has the desire and time to help the newcomers to amateur radio, please understand that your help is very much needed by people in your area. Our amateur radio service needs the best people it can attract and some of the top amateurs are people who have benefitted from initial instruction on a one-to-one basis with some considerate and caring amateur. The advantages to such individualized instruction are obvious. The instructor is able to cover the material at whatever rate is suitable with the individual student; also, the student is automatically forced to participate in every discussion. If you provide this type of help, or if you intend to do so, it is advisable to set up a course outline and lesson plans to be sure all necessary material is covered in a logical sequence. If you are not sure what needs to be included, contact instructors in your nearest groups that conduct such courses; they should be willing to provide you with a set of their course material at little (or no) cost. If you can't get suitable material locally, you are welcome to request a free set from me; just enclose a large (10 by 12 inch) self-addressed envelope with two dollars to cover costs.

Most readers probably do not become involved helping newcomers obtain amateur radio licenses. If this is your situation, please realize that you will be helping if you simply tell these beginners where they can get the help they need. These people need a lot more than licensing help; they need to know about equipment, antennas, accessories, awards, operating techniques, and many other things. If you have the knowledge and time, your help will clear away many problems for newcomers. Whether or not you provide other personalized aid, you can do newcomers a good turn by directing them to known sources of good information, which are not plentiful.

CQ magazine has printed a lot of material to aid Novices since the Novice class license was established in March 1951. Novice Shack columns were written by Carl Drumm W2GJV (September 1951), Herb Brier W9EGQ (January 1952 thru July 1955), and Walt Burdine W8ZCV (August 1955). The name was changed from the Novice Shack to Novice and it was written by Walt Burdine W8ZCV (September 1955 thru February 1957), Don Stoner W6TNS (March 1957 thru January 1962), and again by Walt Burdine W8ZCV (February 1962 thru May 1966). The Novice column was not printed in the June 1966 thru the October 1973 issues of *CQ* but Herb Brier W9EGQ/W9AD wrote it with enthusiasm from November 1973 thru September 1977, when I picked up the mantle after Herb died. Herb, Walt, Don, Bill, and Carl wrote 90, 71, 59, 16, and 1 of these Novice columns, respectively. These 237 Novice columns contain a lot of interesting information for new amateurs of today, as well as the ones who will come along in the future. You will be performing a service to newcomers if you tell them about this excellent source of data on how things were, are, and will be for Novices. As is obvious from ads in this issue, Cowan Publishing has many publications that can help people prepare to pass FCC License examinations. A sim-

ple subscription to *CQ* will provide a new amateur with access to this Novice column, plus all the other good material printed in each issue.

Another excellent source of data for newcomers is the "New Ham News" published by ARRL. The ARRL publication, *QST*, is excellent and it is primarily intended for beginners. *QST* contains several ads of interest to both Novices and aspiring Novices. The league publishes the most extensive set of amateur radio publications that is available from any single source. A list of their publications can be obtained at no charge by requesting it from the ARRL.

Ham Radio magazine is definitely not the publication I would recommend to a newcomer to amateur radio, since it often contains highly technical articles. However, this fine organization also publishes *Ham Radio Horizons* which is a magazine written specifically for new amateurs. They also publish an excellent Novice Data Handbook.

73 magazine publishes several ads and articles of interest to new amateurs. They also provide code training tapes and a wide variety of helpful books.

The Novice column in Worldradio News is written by Armond Brattland-K6EA and it is another of the good sources of help to new amateurs. This excellent amateur radio newspaper provides unique coverage of amateur radio news in a manner that is interesting and informative to both amateurs and non-amateurs. Details are available by writing to 2128 28th Street, Sacramento, Calif. 95818.

Bring the preceding publications and columns to the attention of every newcomer you meet in person or on the air. There is no better way to bring these aids to the attention of new amateurs than for established amateurs to communicate this information to them. Please be an active communicator in this matter!

If you conduct Amateur Radio Novice Class Licensing courses, let your students know which sources of printed aids are available to supplement your instructions. It is useful to have samples of these items to enable students to evaulate them. It helps the newcomers if their instructor provides them with a printed list of these aids.

Tell aspiring amateurs that they can usually find out what their new callsigns are by checking the address labels on advertising they receive after passing FCC license examinations. Several amateur radio associated ventures purchase lists of new licensees and send ads. The address labels on these ads show callsigns and such ads can arrive before FCC licenses are received. Pass this well known fact along to newcomers because they have no other way to know there is a way they can learn their callsigns before their licenses are received from the FCC, and what amateur is not anxious to know his assigned call letters as soon as possible?! Communicate with anyone you know who is waiting for his/her first amateur license to arrive; let them know how they may determine their callsign a few days before the license arrives. If you serve as a volunteer examiner, let the applicant know about this matter.

The October 1977 *CQ* Novice column advises new and aspiring amateurs to make use of printed articles existing in major amateur radio publications to get a better understanding of subjects they need more help to understand. That column tells how to locate desired material by using the year-end index issues. Addresses of the major publications are included in that October column and non-Novice Licensees are urged to have that information on hand for the benefit of Novices and prospective Novices. It helps new people when established amateurs loan (or give) them issues of the major amateur radio publications for their perusal. I continue to receive comments related to this October Novice column and they can be summarized as requests for more information on sources of printed aids, other than *CQ*, *Ham Radio*, *QST*, and *73*.

Here is a list of the aids I believe are most useful to beginners in the field of amateur radio, with asterisks (*) used to highlight those items I believe are most effective. Material is grouped by subject matter.

Antennas

ABC's of Antennas — Sams
Ham and CB Antenna Dimension Charts — Sams

Introduction to Antennas — Allied
Simple, Low-Cost Wire Antennas — *HR*
*The ARRL Antenna Book — ARRL
73 Dipole and Long-Wire Antennas — *73* & Sams
73 Vertical, Beam, and Triangle Antennas — *73* & Sams

Catalogs

Allied Electronics — Allied

Amateur Electronic Supply
4828 W. Fond du Lac Avenue
Milwaukee, Wisconsin 53216

Amateur Radio Equipment Directory
Kengore Corp.
9 James Avenue
Kendall Park, N.J. 08824

Barry Electronics
512 Broadway
New York, N. Y. 10012

Burghardt Amateur Center
124 First Avenue, N. W.
P.O. Box 73
Watertown, S. D. 57201

Burstein-Applebee Co.
1012 McGee Street
Kansas City, Mo. 64100

*Harrison Radio Corp.
1978 Communications Catalog
20 Smith Street
Farmingdale, N. Y. 11735

Heath Company
Benton Harbor, Michigan 49022

Lafayette Radio Electronics
111 Jericho Turnpike
Syosset, L. I. N. Y. 11791

Newark Electronics
303 Monroe Avenue
Kenilworth, N. J. 07033

Olson Electronics
260 S. Forge Street
Akron, Ohio 44308

Radio Shack
730 Commonwealth Avenue
Boston, Mass. 02117

Code Instruction

Code Kit — ARRL
Instructograph Co.
Box 5032
Glendale, Calif. 91201
International Code Training System — Sams
Kantronics
1202 E. 23rd Street
Lawrence, Kansas 66044
Mastering the Morse Code — Ameco
Junior Code Course (Tape/Record)
Pickering Codemaster Co.
P. O. Box 396-B
Portsmouth, R. I. 02871
Special Novice Package — *HR*
The Herrman Company
Box 1101
Largo, Florida 33540
5 WPM Code Cassette — *73*

Dictionaries of Electronic Terms

*Dictionary of Electronics — Sams
Dictionary of Electronic Terms — Allied

Introduction to Amateur Radio

Electronics for the Amateur — Sams
From CB to Ham Beginner — Sams
How to be a Ham — Tab
*Novice Radio Guide — *HR*
*So you Want to be a Ham — Sams
101 Questions and Answers About Amateur Radio — Sams

License Manuals

Amateur Radio Incentive Licensing Study Guide — Sams

Amateur Radio License Study Guide — *HR*
Amateur Radio Novice Class License Study Guide — Tab
Electronic Communication — Ameco
Ham Radio Incentive Licensing Guide — Tab
Novice and General Class Amateur

License Questions and Answers Manuals *HR*
Novice Study Guide *73*
Radio Amateur Licensing Handbook
ALH Distributors
P. O. Box 27
Vancouver, B. C., Canada
Radio Amateur Questions and Answers License Guide Ameco
*The Radio Amateur's License Manual ARRL

Mathematics and Electronic Data
Basic Math Course for Electronics Allied
Electronic Conversions, Symbols, and Formulas Tab
Electronics Data Book ARRL
Electronics Data Handbook Tab
Electronics Math Sams
Electronics Reference Databook Tab
Handbook of Electronic Tables and Formulas Sams
Impedance Tab
Math for the Electronics Student Allied
Modern Electronics Math Tab
The Handbook of Electronic Tables Tab

Operating Data
*Callbook (Domestic and Foreign)
Radio Amateur Callbook, Inc.
925 Sherwood Drive
Lake Bluff, Illinois 60044
*How to Operate an Amateur Radio Station ARRL
The Radio Amateur's Operating Manual ARRL

Theory
A Course in Radio Fundamentals ARRL
Amateur Radio Correspondence Course
NRI Schools
3929 Wisconsin Avenue
Washington, D. C. 20016
Modern Electronics Cowan
*Radio Amateur Theory Course Ameco
Radio Electronics Made Simple Ameco
Radio Handbook Sams
*The Radio Amateur's Handbook ARRL
Tune in the World with Ham Radio ARRL
Understanding Amateur Radio ARRL

TVI/Interference
Consumer Electronics Service Technician
Interference Handbooks
*(1) Audio Rectification
*(2) Television Interference
Electronic Industries Association
2001 Eye Street N. W.
Washington, D. C. 20006
*How to Identify and Resolve Radio-TV Interference
Consumer Information Center
Pueblo, Colorado 81009

Mailing Addresses:

Allied — Allied Electronics
401 E. 8th Street
Fort Worth, Texas 76102

Ameco — Ameco Publishing Corp.
275 Hillside Avenue
Williston Park, N. Y. 11596

ARRL — American Radio Relay League
225 Main Street
Newington, Conn. 06111

Cowan — Cowan Publishing Corp.
14 Vanderventer Avenue
Port Washington, L. I., N. Y. 11050

HR — Ham Radio's Communications Bookstore
Greenville, N. H. 03048

Sams — Howard W. Sams & Co., Inc.
4300 W. 62nd Street
P. O. Box 558
Indianapolis, Indiana 46206

Tab — Tab Books
P. O. Box 40
Blue Ridge Summit, Penn. 17214

73 — 73 Radio Bookshop
Peterborough, N. H. 03458

The preceding listings are not complete. I have simply listed items I have on hand or have used recently. If you are aware of some item that is particularly helpful to beginners, please bring it to my attention for possible future use. The material in these listings is of interest to beginners. No attempt has been made to include items of interest to those attempting to upgrade to higher classes of amateur radio licenses. However, notes to the indicated companies will bring an excellent set of data on upgrading material.

It is hoped that this month's Novice column material will be passed along from those who know about it to others who need to use it. If experienced amateurs would bother to let newcomers know about the publications mentioned in this month's Novice column, they would have a much easier time attaining their Novice licenses. You can help our

amateur radio service by just letting prospective and new Novices know about these sources of information. When a newcomer asks an experienced amateur for information, it is easy enough to direct the Novice to existing sources of good data; please do not brush aside such requests since you could be brushing aside a would-be amateur. If specialized data is required, it is a simple matter to research end-of-the-year index issues to determine which magazine issues contain articles on the desired subject matter. It is now quite simple to make copies of a few pages to provide required information to someone who will be glad to have the help.

There are also about 24,000 government publications available and about 3,000 changes or additions occur each year. This mass of publications has been separated into about 270 categories (called subject bibliographies) to make it easier for potential users to locate desired material. Subject bibliography index SB-999 and price list 36 can both be obtained at no charge by requesting them from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Electricity and Electronics (SB-53), Radar and Radio (SB-172), and FCC Publications (SB-281) are three subject bibliographies which are likely to list publications of interest to all amateurs and prospective amateurs. All subject bibliographies are available in any desired quantities and at no charge from the address shown above. Most subject bibliographies are updated annually and updated issues will be supplied if one states that they are desired.

This column is intended to help Novices and prospective amateurs. This month's column was written in response to several requests for help in locating needed publications. It is hoped that you will put it to good use to help those who do not know anything about becoming amateurs.

Here are a few stations W6DDB recently worked on the Novice bands. WB1CGG David @ Dover Foxcroft, Maine, WA2OHD Tom @ West Islip, New York, WB3GTT Steve @ Jonestown, Penn., WD4FGX Terry @ Red Ash, Va., WD5EJC Tim @ Dallas, Texas, WB6TCO Allen @ Fair Oaks, Calif., WB7ECH Joyce @ Everett, Wash., WD8AOA Gary @ St. Joseph, Mich., WD9GRS Akinori @ Carol Stream, Ill., WDØDYH Martin @ Denver, Colorado

Novices are urged to submit good black and white pictures of themselves at their operating positions. If your photo is printed in a future Novice column, you will receive a year's subscription (or renewal) to *CQ*. A brief description of operating activities is needed with pictures submitted in this photo contest.

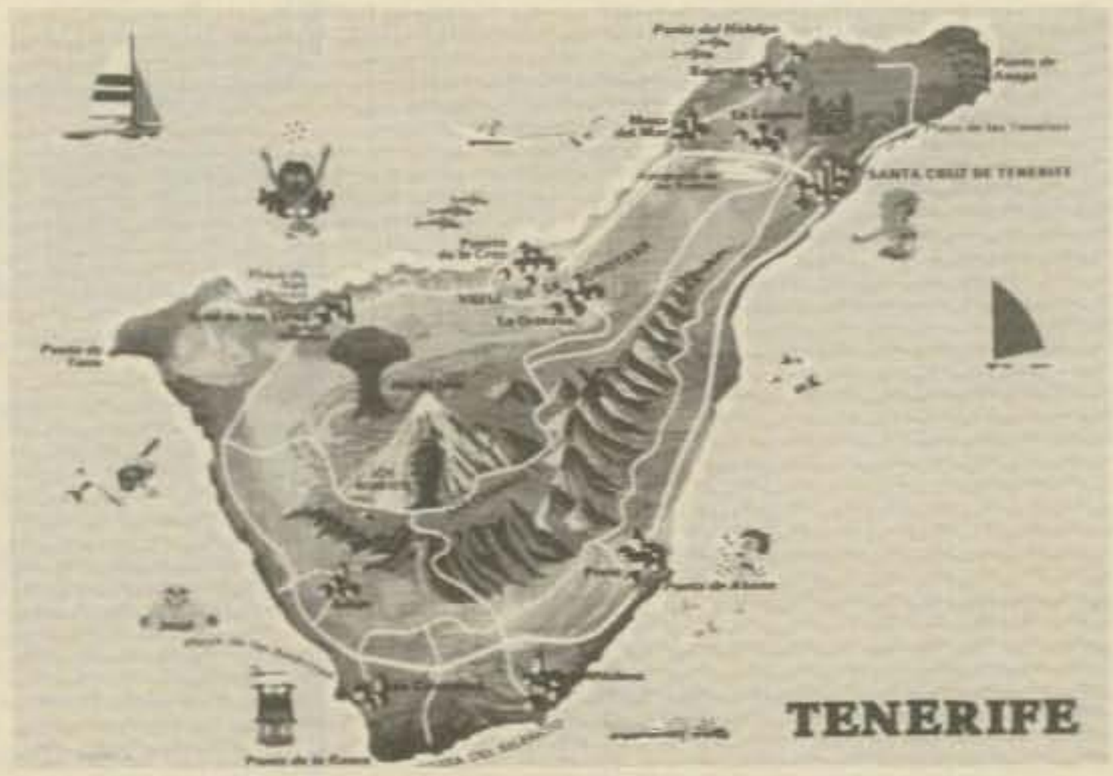
73, Bill, W6DDB

10,290 QSOs in 48 hours (that's 214 per hour!) added up to a total of 21,351,898 points in CQ's 1977 World Wide DX Contest. The new holders of the all-time record tell our readers how it was done.

The EA8CR Multi-Multi Contest Story

BY VILLE HILESMAA, OH2MM AND FERNANDO JUAN FERNANDEZ MARTIN, EA8CR

Nobody knows for sure where the best QTH for the *CQ* World Wide DX contest would be. However, it would seem that the ideal QTH should be in the southern hemisphere so that the propagation on the upper bands would last as long as possible in the autumn. It is well-known that the more to the North a QTH is located, the earlier the 10, 15 and 20 meter bands close in late October and November when the *CQ* World Wide DX Contest—the biggest and best of all contests—takes place. If a QTH is too far in the southern hemisphere, problems arise on the lower bands, that is, 40, 80 and 160 meters. If too far to the south, the distance to the densely populated amateur areas would be too far, so that the number of QSOs and multipliers would be low. Since the densely populated amateur areas are North America, Europe and Japan, easy access to at least two of these three areas is essential for achieving a good contest score. Also, the ideal QTH would not be located on these three continents (NA, EU, AS), because there would be too many one or two point QSOs. So, the "good" continents are South America, Africa and Oceania. This is where the great majority of the contacts available will count for three points.



Shown here is the island of Tenerife. Our contest QTH (marked X) was way up in the mountains far away from the not-so-understanding neighbors!

An important part of the contest preparation—eating well beforehand and having fun with great friends. Nothing can replace good friendship. From left: EA8CR, EA8IT, OH2MM, EA8BW, EA8LO, EA8OZ.

Here is the view to the west from Izana. The TV station and the peak of "El Teide" mountain are clearly visible through the thin, ever-clear air.

What then is the very best location for making a multi-multi world record? We felt that the two best places in the world would be the northern part of South America and West Africa. We ruled out Oceania since it is probably too far away from "everything." Although very impressive single-op results have been made from Oceania, contending multi-multi efforts have been lacking so far. Of course, all of the above is particularly applicable to the years of low sunspot activity. During the peak years, good all around propagation is found at the northern latitudes as well, so that the geographic location is less important.

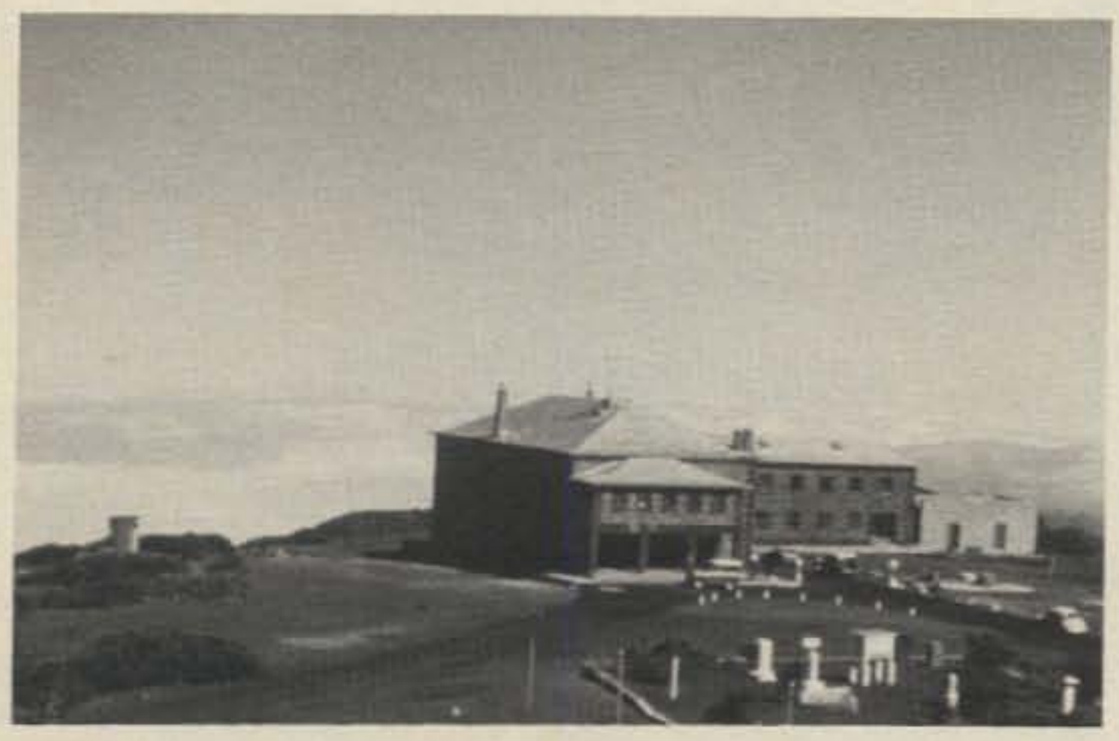
And so, we came to the conclusion that the Canary Islands are one of the best QTH's. They are located on the northern 28th latitude (the same as Florida and the southern corner of Texas). Europe is very close and boils in well on all bands. On the other hand, North America and the Caribbean are not far away either. The Caribbean is especially important since it is a potential source of a large number of multipliers. There are an ever increasing number of DXpeditions to the many beautiful islands there. Although Japan and Oceania are sometimes difficult places to get into from EA8, you never get everything. Knowledge of the propagation helps and most of the Pacific multipliers can be picked up.

Forming the EA8CR Team

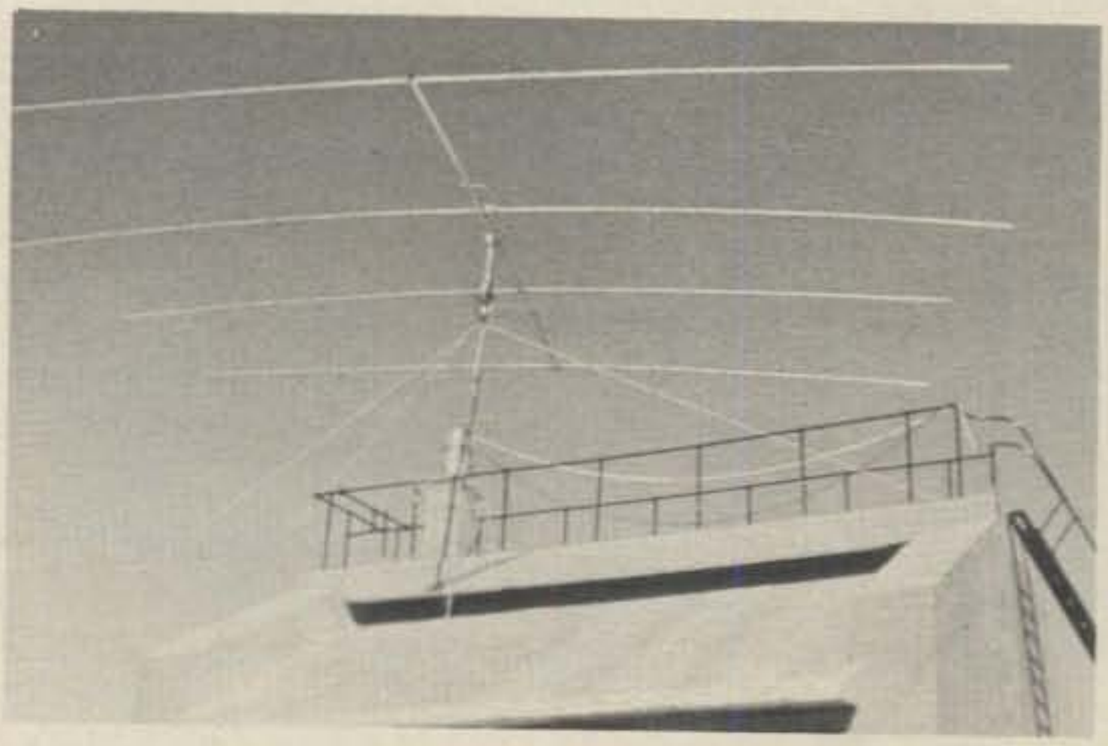
Up till now, almost all big contest efforts were realized on a single nationality basis. This is natural since planning such things usually requires long haul preparations. A concise, closely knit group can manage best. A multi-national effort implies several risks. There is the language barrier, differences in thinking, and a lack of understanding of the many peculiarities of the different cultures.

The formation of our group took a long time. Years passed and several contest men worked each other repeatedly. They got to know each other better and better. Finally these differences disappeared. We all became part of the same nation—the contest nation—and all barriers faded out.

The contest spirit has always been high in Finland. Serious efforts have been made every year within the last 20 years, such as OH2AM and OH5SM in the 60's, and OH1AA and OH2AW during the 70's. When the propagation was poor to Finland, the Finns went down to where the propagation was, and so, ZD3X, ZD3Z, and OD5IQ were put on the air. Every year, EA8CR was worked by the Finnish teams and gradually we became good friends over the air. Beginning in 1975, our contacts were no longer confined to contest QSOs. That was the year when concrete cooperation between us got started, the year when Ville, OH2MM, visited EA8CR. A couple of operations resulted in the 1975 *CQ* WW DX contests. A "big" operation has been in our minds ever since. Things culminated into definite plans when EA8CR visited Finland in the summer 1977. Our first action was to establish a goal. We knew that the Potomac Valley Radio Club operators held the world record for the CQ WW contest since 1974, when they used the call PJ9JR. We felt that the time for challenging their 19.5 million points had come. We shook hands in an idyllic restaurant in Helsinki and sealed the mutual agreement with a burning draught of the strongest Finnish vodka available.



That's our operating site—the observatory of Izana, located on a plateau well above the clouds.



Something wrong here? Nuts, the reflector and driven element have been interchanged on the 204BA.

Asleep at the switch? No, indeed. Here's how Miguel, EA8IT, looked as he strained his ears for a few last contacts on 40 meters during the last of the 48 hours . . .

Right in the thick of the action, Jorma, OH2KI/OH3XZ, puts the CQ machine on the 160m station, as Ville, OH2MM operates 15 meters in the background.

Searching for a Suitable Location on the Island

After a careful search, much thought and discussion, and an evaluation of the pros and cons of the many potential QTHs on Tenerife, a basically ideal location was found by the Canarian Island part of our team: The heights of Izana near the summit of "El Teide", an ancient volcano that rises up to 3718 meters (11000 feet) above sea level. The installation of Radio Television Española of the Canaries in Izana is located there. The important Observatorio Meteorologico del Servicio Meteorologico Nacional is also located at the summit. Izana is situated at about 2400 meters (7200 ft) above sea level. From there, one has a clear shot to the USA, to Europe and to most other parts of the world, with a sheer slope down to the sea in all directions except west. The only place around higher than Izana is the peak of El Teide. Fortunately, it is ten miles away, so that shadowing of the horizon occurs only to the west where the South Americans would be heard. And—can you imagine—the chief of the observatory was an amateur, EA8IY, who agreed to have his quiet place converted into a major multi-multi contest QTH, with more than ten antennas hung all over everything and more than ten amateurs literally taking over his territory. The choice of Izana was not an easy one though, due to several factors. First, the altitude meant hard climatic conditions, especially cold weather in the nights and possibly high winds. There might be problems in installing the antennas. Likewise, it might even be difficult to get up there because the serpentine road leading to the summit might be icy and dangerous, preventing all traffic up and down. All this was carefully evaluated using a multitude of data available directly at the observatory. Finally, the meteorologists considered the risk of bad weather in late October small enough to clear our operation.

There were other important things to be checked, too. Due to the height and the low atmospheric humidity, an elevated amount of QRN was suspected. A few nights spent up there working 80 meters dispelled that problem.

Then there was the possibility of interference. The Radio-TV transmitting station was only half a mile away! All bands were carefully checked in order to square out possible h.f. interference from the TV station. Also, numerous temperature, humidity, wind and solar registration equipment are in operation 24 hours a day at the observatory itself. Test transmissions on amateur bands were carried out. A slight amount of interference was found on a couple of the less important monitoring units. Fortunately, the staff thought that they could manage despite the interference during the contest weekend. Further, one commercial and one military communications link are located in the area as well, but they did not pick up any interference from our amateur band transmissions. All was looking great at this point, yet we still had a couple of things to check. We heavily loaded the a.c. line of the observatory building in order to see whether it was capable of supporting

By Saturday evening, we had already made 7000 QSO's. Fernando and Martti started getting an idea of the final result, as this modified sign indicates.

Here's 10 meters with Miika, OH2BAD, in action. Ten meter propagation was a pleasant surprise, and almost 3000 QSO's were made.

Martti, OH2BH, the CQ WW single op phone record holder, was responsible for the fine 20 meter effort of EA8CR.

On 80 meters, Fernando, EA8CR (left) and Luis, EA8BW, relax during the quiet hours. We couldn't get them to leave their chairs.

our power requirement. The a.c. cable was first fired up through the wall outlets. We found that the use of the old internal cables in the house would be dangerous. Since there was a breaker box at one end of the building, we decided to run a cable of our own to each station.

As you can see, a lot of work was put into the checkout of our future QTH. So, we would like to repeat a few things of vital importance that should be considered in every effort like ours:

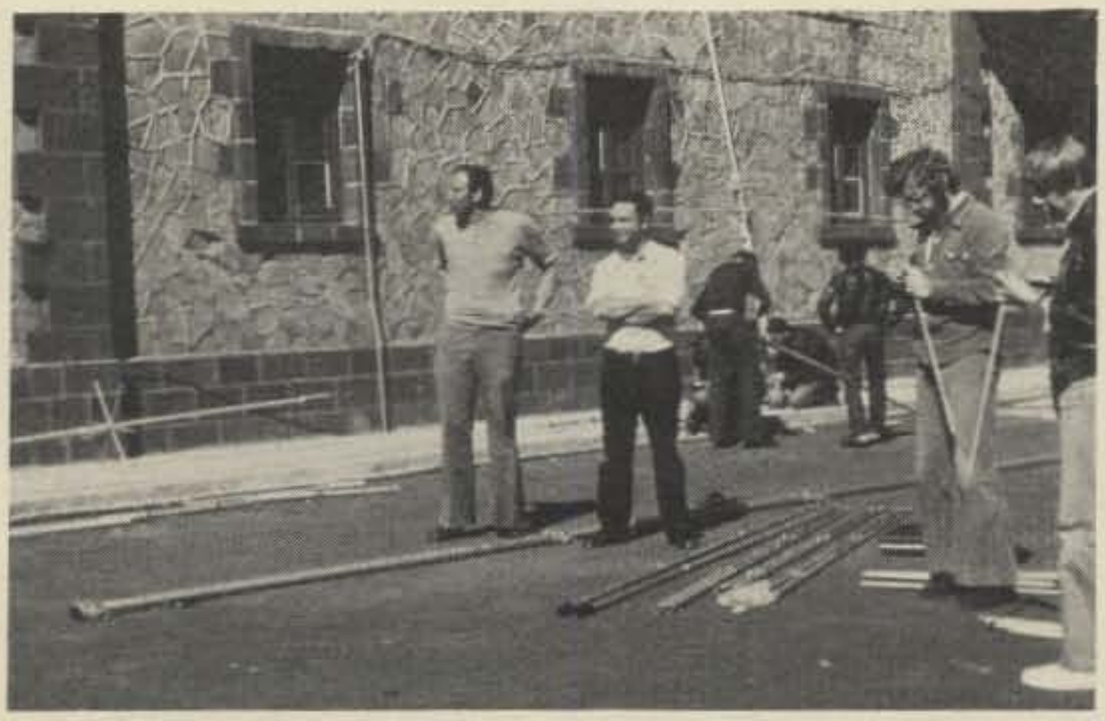
1. Be sure that the owner and staff of the future QTH completely understand how big and how many antennas you are going to put up.
2. Acquire enough weather information and estimate the risk of bad weather (rain, thunder, winds, frost).
3. Remember that RFI, TVI, or similar interference exists almost invariably. Make extensive tests and eliminate upcoming problems with a technical solution, such as a filter, or by agreeing on time sharing with the user of the interfered equipment. Every DXpedition should include a participant capable of instant RFI/TVI diagnosis and correction.
4 Make sure that the a.c. supply is sufficient, stable enough, and available at all times.

If you do not appreciate the need for such preparation, no amount of operating skill in the pile-up can guarantee you a first place in the contest. Remember when the second 48 hours comes up, the game is over. The winner is the guy who has worked out everything BEFORE the 48 contest hours are up.

Putting up the Station

Fortunately, the local EA8s felt sympathy to our effort and were willing to help. Ten complete RX-TX-linear sets were obtained, representing a variety of manufacturers: Drake, Yaesu, Collins, Heathkit, Dentron, ETO, Triton, Sommerkamp and so on. Three beams were acquired, namely a HY-Gain TH3MK3, a 204BA, and a 103BA. A 14AVQ and a Hustler 4BTV plus a lot of wire, dipoles, coax, etc. were also on hand. One of the most important and expensive investments was the a.c. cable which was to provide electricity to all stations in Izana. Several spare rigs were available, in addition, to fill in the event of failure.

The Finnish part of the team landed on Tenerife five days before the contest weekend. Fortunately, economical charter flights were available directly from Helsinki to the Canaries, otherwise the trip would have been rather expensive and would have included several plane changes. All the expenses were paid by the participants themselves. The Finns had a rather unusual combination of radio gear with them: A ten meter beam, a few headsets and crystals, and some filters and traps. Everything else was available locally. The Spanish and Finnish groups met in la Laguna. The final operator crew



Shown are Miguel, EA8IT and Fernando, EA8CR looking for a place for an 80m dipole. Miika, OH2BAD and Kari, OH2BKH are busy assembling hardware. In the background, Reijo, OH2EW and Jorma, OH3XZ all putting finishing touches on the TH3MK3 shown up against the wall, as Tomas, EA8-256OU, a young upward coming "star" in EA8 land, watches.

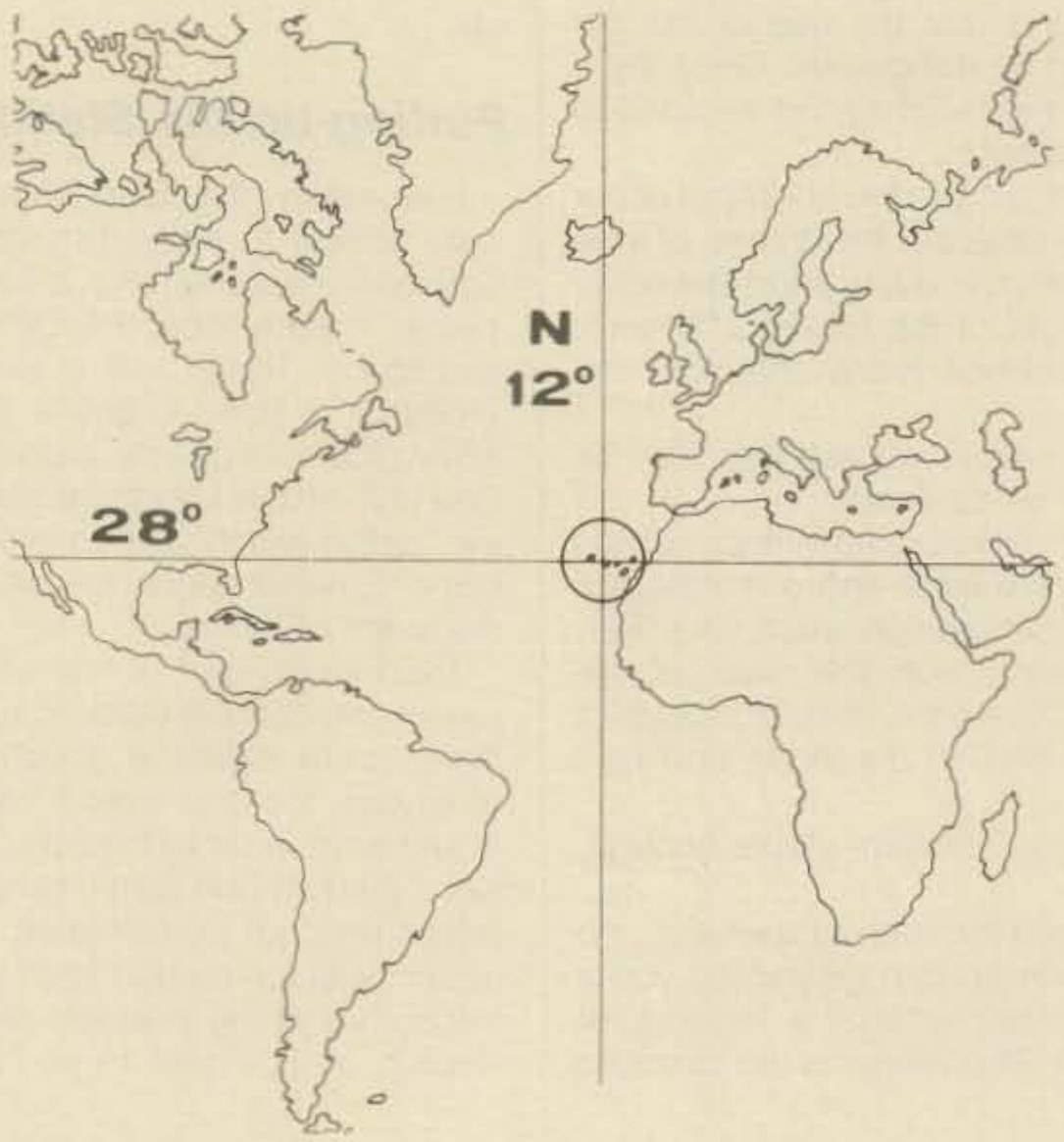
This is the QSL that will be sent sooner or later to all stations worked. If you don't get yours, just get in touch with OH2BAD.

The Gang and the Gear. Front row, from the left: Jorma, OH3XZ; Miguel, EA8IT; Fernando, EA8CR; Martti, OH2BH; Ville, OH2MM; Miika, OH2BAD; Back row, from the left: Luis, EA8BW; Julio, EA8OZ; Tomas, EA8-256OU; Jose Manuel, EA8LO.

consisted of ten men: EA8's BW CR IT LO OZ and EA8-256OU; OH3's BAD BH MM and OH3KI/OH3XZ. In addition, OH2s BE BKH EW and a few XYL's followed as general assistants.

Six cars and two trucks were loaded up with gear and a jolly crew of people. The spirit was high when the car caravan got on its way up to the mountains. Driving up there was an experience itself. First the hot sun down at the sea level, then a sudden dive into the thick clouds on the way up. At times a heavy rain almost stopped us. Finally, the cold, clear thin air of Izana appeared with the eternal sunshine above the clouds. We were heartily welcomed by EA8IY, Fernando Molina, the chief of the observatory and the rest of the staff.

The staff included Ramon, his charming wife and their little son and four big dogs. The cargo was rapidly unloaded so that the intensive installation work of the next four days could get started. Several teams were formed: A beam assembly team, a roof climbing team, an a.c. power cable team, an equipment installation team, a dipole-groundplane team and so on. Each day we were able to work from 8 a.m. to about 8 p.m. At night, the temperature fell down to zero C (32F), and the darkness inhibited all work outside. Because no heating and food were available in Izana, we drove every evening to Parador Nacional, a mountain hotel about 25 km (15 miles) from Izana. There we took showers and healed our sunburned faces. The traditional Spanish supper with at least four courses was waiting for us. We all sat around a big table, enjoyed the delicious food and drink, and made plans for the next day. The strategy for the contest operation itself was outlined, including the optimal distribution of operators and available equipment for each band. Short and long path propogation and the gray line openings were analyzed using own experience, propagation forecasts and logs from previous years.



Tenerife is located between America and Europe as shown. It is very advantageous for the CQ WW DX Contest, easily heard by both European and U.S.A. amateurs.

Problems, Problems . . .

Up they went, beam after beam, and wire after wire. By Friday evening everything was ready—or was it? First, the twenty meter beam was found to have a zero front to back ratio and its resonance point was below the c.w. band! Why? Thus, we found that the rotator was not able to turn the antenna. How was that possible? After careful observation of the antenna we discovered that it had been incorrectly assembled so that the driven element and the reflector had accidentally been interchanged. So, the beam was taken down in darkness just a few hours before the start of the contest and the mistake was corrected. The trouble in the rotator lay in the control box. Would you believe it was a brand new HAM-2—never used before. That taught us never to take anything along to a DXpedition in an unopened factory package! An urgent telephone call was made immediately down to Santa Cruz to Juan Luis, EA8JP. He graciously disconnected his own HAM-2 control box, jumped into his car, and drove up the tedious road to Izana in darkness. So, the rotator problem was solved and the twenty meter station was rescued.

Another antenna problem: The ten meter 3 element monobander, the 103BA, had been used only once before in a Gambian operation back in 1972. The settings had been carefully marked and the antenna lay unused in the garage of OH2BCP for five years. Now it was assembled again. That was easy enough due to the clear markings left on it. But wait, there was no mark showing on which end of the boom the reflector should be mounted! Drat it, the manual was missing too! There were two possibilities. Which one was right? First, we tried to get the information on the band. Several antenna experts gathered on the frequency but none had a 103BA. Despite the advice, no agreement was reached on 20M s.s.b. So, we had to toss a coin to decide which way to try it first. A good s.w.r. and front-to-back confirmed the correct assembly on the first try!

A great deal of attention was paid in choosing a location for each antenna. Antennas for different bands were located as far as possible from each other. Multiband antennas are generally not suitable for multi-multi, because they pick up a lot of r.f. on several bands—that is what they are built for. We

used a TH3MK3 for 15 meters because no monobander was available.

Whenever a multi-multi installation is made like this—*ex tempore*—there will always be some interference from one band to another. Certain receivers are easily blocked by signals from transmitters on other bands. Fortunately, we had a lot of different types of receivers available and we played musical chairs with them until the QRM was reduced to a minimum. Sometimes, the QRM from the other bands could be solved by inserting a simple trap, such as a coil and condenser, in series with the antenna input of the receiver. For example, 21 MHz transmissions blocked the 28 MHz receiver. A trap for 21 MHz was installed in the receiver front end and all QRM disappeared. The second harmonic from 7 Mc (7080 Kc) also blocked quite a large portion of the twenty meter band. The problem was minimized by locating the antennas far enough away from each other, and by choosing a linear with the maximum second harmonic attenuation for use on 7 Mc.

The Time Had Now Arrived for the Contest Itself!

It was midnight local time (same as GMT) when the contest started—and everything WAS ready. The pileup on the lower bands built up immediately. Ten and 15 meters were almost closed but hard shouting yielded a few QSOs thru the night. Early in the morning, 10 and 15 suddenly opened up and the Europeans attacked us as eagerly as hawks. A roaring, thick pile-up was generated on our frequencies. In the early afternoon the Europeans started fading out and the first Americans started to come through. On 10 and 15, a continuous pile-up lasted from 7 a.m. to 7 p.m. Twenty meters was open practically all the time, but good propagation on the upper bands had clearly reduced the activity there. One-hundred sixty, 80 and 40 were practically empty during most the daylight hours, but required continuous watch to pick up all possible African locals during the day.

Odd, but activity on Saturday and Sunday was different. Saturday was the day when the "real" contest operators showed up and spat their numbers out in rapid fire at each other with their big beams. Sunday was more peaceful. We got in touch with the "deep" layers of the pile-ups—that is, stations who asked what country EA was and "would you please repeat my report, was it 59 or 33?"

We had a main station and a second station side by side for each band except 160, which was worked by the second 15 meter station. Each second station had a separate antenna, a dipole. Two operators were devoted to each band except 10 and 160 which were run by two operators jointly. Everybody worked only his assigned band. We felt that it was best that way. Jumping from one band to another tends to generate confusion. The function of the second station was, of course, to pick up multipliers. However, that was sometimes a very annoying and difficult task for the second operator. The main station signal on the same band usually blocked his receiver. Just when he would get part of a rare call copied, a strong burst from the main station would wipe him out. Of course, that was to be expected because the listening dipoles were so close to the main station beams. Listening on the same band without interference while the main station was on would have required special filtering technology. Such front end crystal filters were not available to us. Hence, only a handful of multipliers could be picked up by the second stations. They did serve as instant reserve stations and, indeed, on 40 a TR4 and on 15 a SB220 ceased working and these were immediately replaced by the second stations. In any multi-multi effort, equipment trouble will always come up. You don't always know when and where, so be prepared. Remember you cannot afford to lose one minute out of those 48 hours.

Everything went smoothly for us until early Saturday evening. All of a sudden, the power disappeared on the 10, 15, 40 and 80 meter stations. The only band that was operational was 20. The observatory staff was notified immediately. No obvious trouble, such as fuses or loose cables were found. Deep distress enveloped us. Was this really the sad end to all our effort? Finally, we called the crew at the TV station next to us. EA8FA happened to on duty and rushed immediately to our QTH, understanding the urgency of our situation. He isolated our power problem to a transformer building a few hundred yards from our QTH. From there, all of the electricity was distributed to the Izana area. Due to the exceptional loading, overheating had occurred in one of the transformers and protection circuits had cut off the current. Our source of power was changed over to a transformer with a higher rating and finally, after 90 minutes, the heavy juice filled up all the gear again. Without that break we would have made at least . . . well, no speculations. That was our fault—we hadn't checked things well enough beforehand . . .

Just Who is a Good Contest Operator, Anyhow?

Lots of contest operators like to compare their "best hour," that is, how many QSOs were they were able to make in the pile-up. Of course, pile-up rates are very important. But, equally important is how many QSOs the operator gets when there is no pile-up. Those non-pile-up periods at EA8CR consisted of approximately half of the 48 hours on each band. During these quiet hours, multipliers have to be squeezed out of the band and countless frustrating unanswered CQs have to be called on an apparently dead band. A CQ tape machine is of great help and should be part of every modern multi-multi installation—yes, even in a rare location. A multi-multi station should be kind of a beacon, so that every casual visitor on the band finds him. Also, the main operator's chair should never be left unoccupied! That was the rule at EA8CR and it paid off. A good operator will tirelessly call CQ on the quiet band. He will break into every French speaking QSO party and pick up all those TR8's and FK8's. He is not depressed when making only 10-30 QSOs per hour. That may well be the ten QSOs more than the competitor is getting in a similar situation. There are a lot of guys who think that they are the best pile-up-ops in the world. Yet finding a good non-pile-up-op can be much more difficult.

The Future

The word is out that the Potomac Valley Radio Club is preparing revenge from Curacao. We wish them the best of luck. In fact, if anyone breaks our record, we know that they certainly will deserve it. It will take lots of hard work, planning, a better QTH, more sophisticated equipment, better operators, or all of the above to break our 21.3 million points.

The Credits

We want to express our deepest gratitude to the magnificent Fernando Molina, EA8IY and his staff—Ramon and his XYL—for letting us stay in their observatory; to Jesus, EA8FY, for substantial help in acquiring the power cable; to Gilberto, EA8FQ, for solving our a.c. power problem; and to Juan Luis, EA8JP, for lending us his new 204BA and bringing up the rotator control box. Our thanks also to the local delegation of URE for lending us equipment; and to Larry, N6AR for revising the English language version of this story. And last but not least—thanks to everyone who worked with us in the contest—without all of YOU working with us in the contest, we would have accomplished nothing.

Oh, by the way, the QSL manager for the contest period only is OH2BAD. He has already answered all cards sent direct. All other QSO's will be confirmed later with a special contest QSL via the bureau regardless of whether a card was received or not. CQ

Results of the 1978 CQ World Wide WPX SSB Contest

BY BERNIE WELCH,* W8IMZ

Highlights

UK9AAN —Highest All-Time Score

VC7WJ —Second World High Score

4T8V —First QRPp World Champion

CW3BR —A 3-Million Plus 28 MHz. Score

KP4RF —New World Multi-Single Record

The DX gods blessed us with outstanding propagation, a multitude of new prefixes, great participation and no Murphy! A super contest and we look forward to next year." This quote from the Canal Zone by Fred Regenitter, KZ5FR, sums up a large number of appreciate log comments. I agree and one thing's for sure, the 10 and 15 meter bands were terrific and should be even better in the 1979 contest.

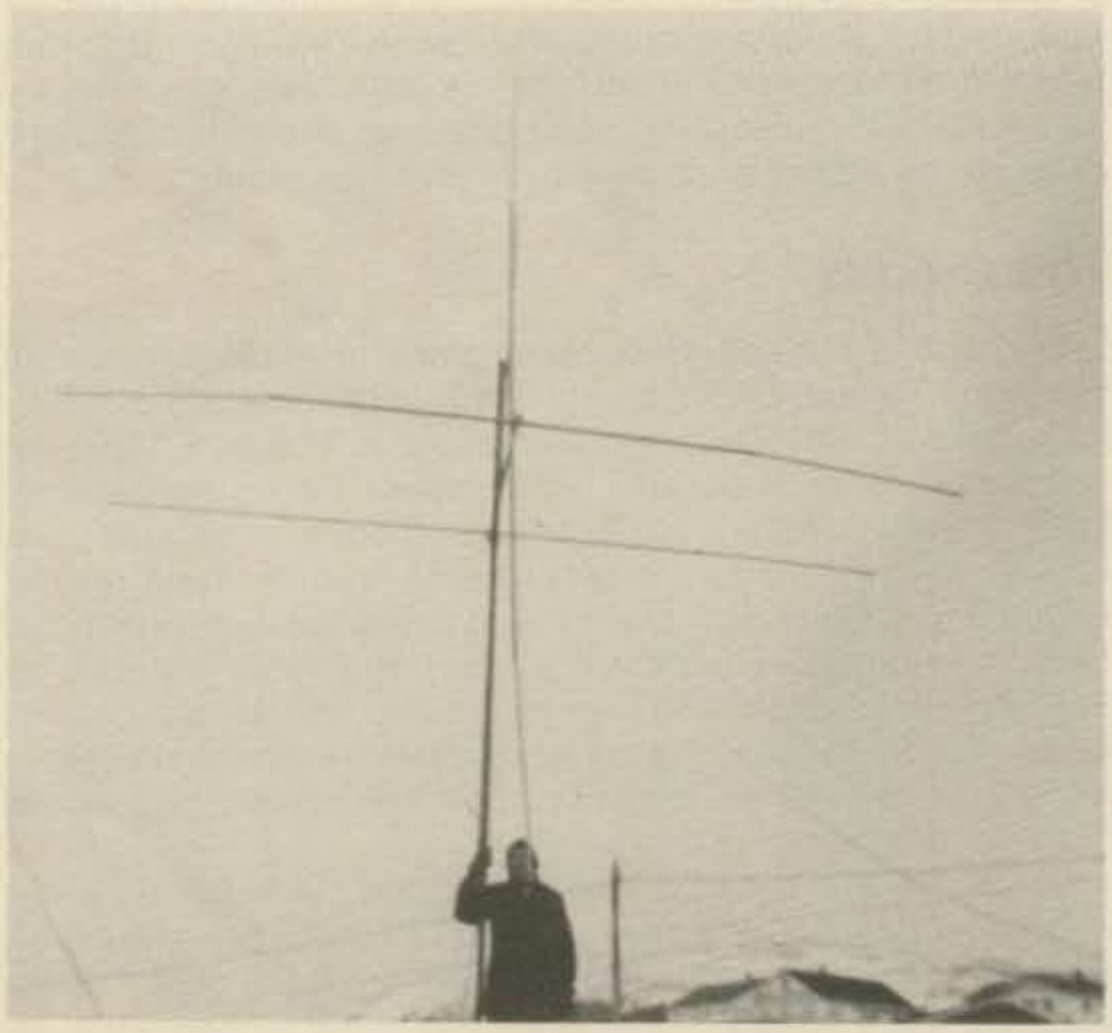
*7735 Redbank Lane, Dayton, OH 45424

This 22nd Annual Contest has replaced 1977's all time record year with the largest participation ever and with a twenty-three percent increase in the number of logs received.

Our available data indicates that it was possible for a station to have contacted over 600 different prefixes this year. The previous all time record of 517 held by DK2BI ('76 contest) was surpassed by UK9AAN with 532. K4VX was runner up with 519, followed by OG1AA—497; KP4RF—485; CG3AKG—470; UA9ACN—459; UK6APA—456; UK6LAZ—453; EI1AA—451.

All of this could have been even greater. Unfortunately, however, some areas of the world found band conditions diminishing on Sunday afternoon. Another deterrent factor was that this contest occurred on a religious holiday weekend. Some participants indicated that we should have changed the dates this year, however, in a large world wide DX contest such as this, stability of dates is most necessary. It won't fall on Easter again for seven years.

This was the year we initiated two additional classifications of competition,—the Club Competition and the QRPp* Section. The Western Washington DX Club is our very first Club Trophy Award winner. The competition was challenging. Other top battlers were the Toronto DX Club, The Potomac Valley Radio



Bob, FP0LK with the 10 and 15 meter quad he used with FP0BG.

The top African multi-single score was by Kari, OH2BC and DX Hall of Fame member Marty, OH2BH at CT3—Madeira Island. They set a new African record.

Club, and the DX Club of Puerto Rico. Our new QRPp Section proves that 10 watts input or less can successfully be a part of a large DX contest. Paul, 4T8V won our first QRPp World Wide Trophy. Ron, W8ILC is top USA scorer and will receive a special *CQ* award. Coming up close behind was Gene, N2AA. SK2KW, operated by Rainer, SM2DMU, acquired the top European score. Record high scores were attained in the multi-multi category. The highest score ever in a WPX SSB contest is 10,702,776 by the Asiatic Russian Club Station UK9AAN. The VC7WJ group established a new North American record with the second highest score ever of 9,389,696. OG1AA with 6,629,483 points is the new European record holder. The KP4RF multi-single score of 6,113,910 is the new world record for this category. The top world single ops are J.R., UA9ACN (All Band) and Yuri, CG3BMV (21 MHz.). Norman, YBØACT (28 MHz.) and V.W., ZL2ACP (21 MHz.) set new Oceanic records. European records have new owners also: Heinz, DK5WL (28 MHz.); Drago, YU3ZV (21 MHz.); John, ON4UN (14 MHz.); Seppo, OI1VR (All Band).

NFDXA past president Bill, WB4EYX packed his gear and went to the Turks and Caicos Islands in quest of a new 10 meter record as VP5WW. Rafael, CW3BR decided to try for a new record also on the same band. Results—CW3BR has the new world record and VP5WW has the new North American record.

As an indication of the over all high scores that prevailed, 137 stations scored over 1,000,000 points each. That's almost three times as many as last year. In fact, to keep track of all the new achievements you should check the current All-Time Records to be published in the Feb. 1979 issue of *CQ*.

Activity by a considerable assortment of prefix goodies, such as the large number provided by Canada and Finland, along with the following, contributed to the exceptional results of this year's WPX: XK6, DA4, LJ2, KZØ, 6F8, WP4, VC7, CT7, S8, GB3, DX4, J3, WN8, HD1, 4M5, 4A1, ON7, VB3, XF1, SK1 thru Ø, EA8Ø, LG5, RL7, CK1, IV3, OF1, PA1, 2, & 3, 4U1, CT9, PP5, HG5, 7 & 8, CG1 thru 7, 4T8, OG1 & 2, IN3, LF2, DUØ, RB5, PT7, GU3, LX, OI1 thru 3, HV1 & 3, RA4 & 9, ISØ, IT9, DT1 thru 7, WN4, AA4 and AA6.

The new USA "AA" and "N" prefixes saw a great deal of action. Other new prefixes like AB, KB, AL, NH, NP, WH, WL, WP, KH1 thru 9 and KP1 thru 5 should be available for the '79 contest—all thru the courtesy of the FCC.

Some stations failed to take the extra multiplier for contacts with PAØERW/LX which counts as LXØ for WPX. Prefix credit for VE7CQX/SU would be SUØ. All portable suffixes that contain no numerals should be assigned an arbitrary Ø, for WPX Contest and Award purposes. How about those great around the clock pile-ups by rare and semi-rare DX stations such as: JT1, CR9, 9K2, 9L1, FY7, BV2, S8, KM6, FS7, TF3, CEØ, VP5, ZK1, SUØ, KG6, EP2, FPØ, YBØ, CT3, CN8, D4, HL9, HS1, P29, 4X4, ST2, TR8, TU2, VP8, VR4, YJ8, YKØ 5Z4, 7P8, 9V1, 9G1, JY5, EA9, and VU2. They provided many with a new DX country and it's appreciated.

The number of contest expeditions doubled. To these contesters who go above and beyond the call of duty to make the WPX even better, we, unfortunately have but one trophy to award. This is the toughest decision of the contest. This year's winner is GD5CGV, operated by a group from West Germany—DF7FH, DJ3BG and DJØUP. Mort, W1UQ and Claire, K1YL took time from their vacation at St. Maarten to contest as PJ8UQ and PJ8YL. To make it even more interesting Mort journeyed to the French side of the island, about one mile, and gave many an extra multiplier as FGØDDB/FS7. Doc, W2BBK as PJ8AA, managed to squeeze the contest into his family vacation. We were happy to be a part of their vacations. From Bolivia, Phil, CP1AT reports that this was his last one from the QTH for some years, as he is returning to the USA. He has been a veteran of this contest for many years and provided prefix chasers with the special CPØ in our '77 contest. We hope Phil will find time to enter the '79 event with his USA call.

Established in 1959, Morokulien is a fictitious country that exists exactly on the border between Norway and Sweden. It is of special interest to amateurs as it is the home of two very unique prefix stations, LG5LG and SJ9WL. The name Morokulien is a combination of Norwegian and Swedish words for "fun". And fun is what Ulf SMØGNU and Lars, SMØGMG experienced in our '77 contest as SJ9WL and again this year as LG5LG.

These Outback DX Club members did a fine job and came up with the fourth highest European multi-Single score this year. They said they hope to have a special call again in the next WPX Contest. QSLs for LG5LG go to LA2ZN. Send along at least 3 IRCs which are used as a contribution for handicapped radio amateurs. This year's largest computerized log was the 4U1ITU operation by: Holger, DL7SP; Martin, DC7GL; and Wolf, DL7RT with assistance by Wolf's XYL, Heidi. They felt their effort was well worth the trip from West Berlin to Geneva even though they had to put up some low band antennas in heavy snowstorms and repair a baked tune condenser with Heidi's nail file. They said European 160 meter contacts were

The all band, 2 million plus score by Al, G3FXB was the largest from Engalnd.

Here is Terry, N6CW, holder of a new USA 21 MHz. record and 2nd World High score.

Two super contesters display their '77 WPX Contest trophies presented at the Contest Forum '78 Hamvention. Pedro, KP4RF and his multi-single group and Yuri, CG3BMC, each set new records in '78. Watch for them in Dayton in '79.

not as plentiful this year. QSLs for this operation only go to DL7RT. By the way, Wolf is also 3AØHK. Will it be Monaco in the next WPX Contest?

In the wondering and wishing department, we wonder who will be the first to establish a single op. all time record score for Africa, Asia, Oceania and South America on 1.8 MHz. It's hard to believe that there is still no 3.5 MHz. record for Africa. Also, it would seem that now is the time for some eager USA group to up-date the multi-multi category, as this year many multi-single and single op. record scores were higher than the current multi-xmitter scores.

Rumors tell us that a special, never before used, Asiatic prefix "EX9" may be initiated in the next one.

As a result of the thousands of requests received over the past five years for a WPX C.W. Contest—it's gonna happen!! The first will be held on the 26th and 27th of May 1979 (GMT), and on the last full weekend in May, thereafter. Current SSB forms and summary sheets can be used by indicating "CW" thereon, or you can make your own, using our basic format. Rules will be generally the same as for the SSB contest and should be published in the Jan. '79 *CQ*. The WPX SSB Contest will continue to be held on the last full weekend in March. We need additional trophy and plaque donors for the new WPX CW. Any club, group or individual desiring to donate please contact W1WY as soon as possible.

European contesters have indicated they would like a trophy for their continent (Single op, Single Band/ All Band). So how about it? Do we have any European donors?

I am happy to report that I have been appointed Contest Forum Moderator for the 1979 Dayton Hamvention, scheduled to be held April 27, 28, & 29, 1979. We appreciate the tremendous turnout of over 500 at the Forum last year. The many complimentary comments pertaining to the program are greatly appreciated also. The program was one of the best that I have had the privilege of presenting, and the program of '79 should be just as enjoyable. Plans include Frank Anzalone, W1WY, *CQ* Contest Chairman and Alan Dorhoffer, K2EEK, *CQ*

The DA4CC group provided a truly unique prefix on the h.f. bands. (Left to right) Bill, DA4CC, Bob, DA1GR, Walt, DA1BD and Pat, DA2AA. Walt's XYL, Mickey was the Go Fer. Op. DA1QS is not shown.

Editor for the presentation of trophy awards; members of the *CQ* Contest Committee; ARRL Contest Advisory Group; and other well known contest personalities, plus a surprise or two. Those of you outside the continental USA who are planning to attend the Hamvention, please contact W8IMZ as soon as possible as we would like to introduce you and perhaps, include you in our forum program. If you like contests, you'll love this forum.

Over 200 photos were received this year with logs, but regretfully, we are only able to use a small portion in this article. We will use a number of them in our "Contest Corner" in conjunction with the publishing of the '79 WPX rules. Also, in the near future I plan to have a special contest article in *CQ* and will make good use of some of the photos. Please keep sending them along with your logs. We do our best to publish as many as possible, when the opportunity arises.

Official log forms and summary sheets are always available from the *CQ* office by sending SASE and IRCs. Please send your requests early.

As per our usual policy, the Certificate Awards will be in the mail at the earliest possible date.

We cannot begin to acknowledge each individual, group, club and agency responsible for making this an outstanding event. We assure you the efforts are greatly appreciated and hope that you will continue to support us in both the WPX S.S.B. and C.W. contests in 1979. Please send in your log, regardless

WPX Contest Veterans: (Left to Right & Frank, W1WY, CQ Contest Chairman; Steve, WBØRET, now KØCS, Kansas City DX Club Contest Manager; and Floridian Myron, WB4VQO got together at the '78 Hamvention. This year Steve holds the highest score for the USA Ø district.

of the number of contacts or score. This is so very important for our computation of the final results.

I especially want to acknowledge our *CQ* Contest Chairman, Frank Anzalone, W1WY, whose tireless and enduring efforts for more than twenty-five years are greatly responsible for *all* of the *CQ* Contests reaching the heights of popularity that they now enjoy.

The tremendous work load this year in cross-checking, computing, and preparing these results would not have been finalized in time to meet our December issue deadline without the dedicated help of my XYL, Eleanor, who clerically assists us. A Final—Final!—The promised photos of the ops. at UK9AAN had not arrived at press time!

Hope to work ya in the next one. . . .

73, Bernie, W8IMZ

Random Contest Comments

"Love to have 9N1, EP2, VQ9, A4X, C5, OY8, S79, SV1, YBØ, 9K2 answer my CQ's! . . . WA1SQB. Funniest story—Having son admire our garage door automatically going up and down at the same rate as my transmissions . . . W1HZH. Finished up 10 meters for 5 Band DXCC . . . WB2AIO. W8LRL very tough competitor (160 meters) . . . K2BQ. Looking forward to CW WPX next year . . . W3LPL, op K3NA. Really enjoyed contest.

I had the pleasure of presenting Jack. K8YZW his '77 USA Single Operator—Single Band Trophy at the Contest Forum, '78 Dayton Hamvention. Jack, now K8XX along with Alex, WD8NLS won the 8th district honors this year in the multi—single category. (W8IMZ)

European Multi-Multi Record Champion Operators of OG1AA (Left to Right) Hannu, OH1LG; Lauri, OH1HU; Pekka, OH1TV; Arto, OH1NH; Reijo, OH1MD and Pertti, OH1LW. (In Front) Timo, OH3ZE. The operator Reijo, OH1NM is not pictured.

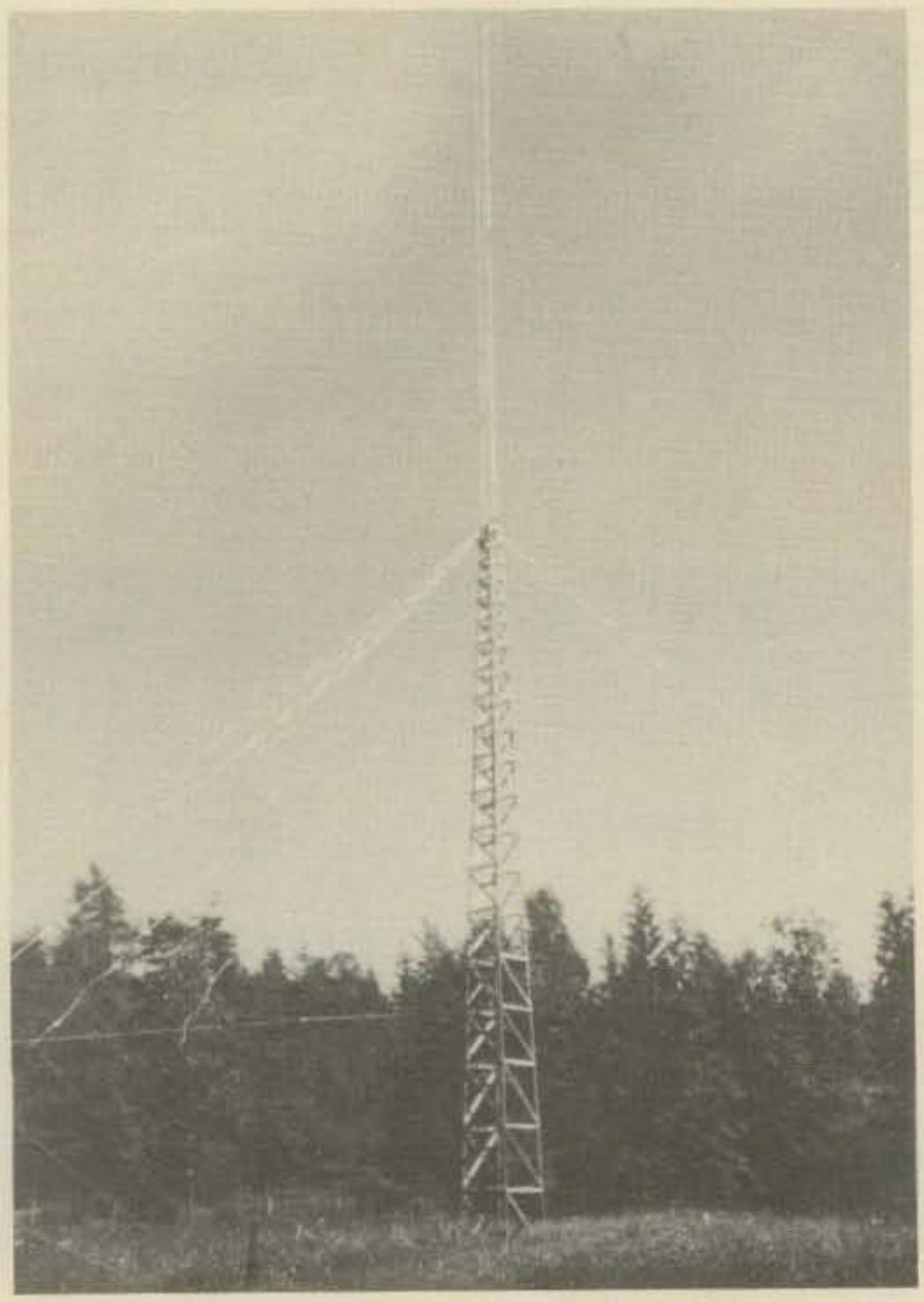
Much more fun than the ARRL DX test . . . WB3DKT. 1st WPX Contest—I feel I have better chance having new WD4 call sign. Good for us newcomers . . . WD4LCO. My old age and temperament are not what they used to be . . . W4SQ. Real fun contest. Got about 60 new prefixes for WPX Awards. This is one of the best contests going . . . N4MM. ST2HF hiding his 50 watts and dipole at 28772 . . . N4KG. Would like to see a *CQ* stateside only contest—maybe an SS type? . . . AA4NC. Amazed to work all those JA's on 40-M . . . WA5IYX. My first real DX on 40 meters . . . WD5EWP. Single op should have 38 hours for operating . . . W6HX. Worked ZL2HE and LU1HE back-to-back . . . N6HE. Got call from "F" station—reminded me he was my first 6W8AE QSO, 14 yrs. ago . . . K6YRA. KM6FC was a new 160 meter 2XSSB country . . . K6SE. Who pulled the plug Sunday? . . . N7DX. JA6XMM was 5X5 with one watt . . . W7FP. Ice storm Saturday put best SWR at 3:1. Slowed QSO rate a bit. Looking forward to CW WPX next year from Europe—G5??? . . . N8ET. Would like to see FCC reconsider issuing special event calls to promote more WPX activity with additional prefixes . . . W8RSW. Love to work DX. Total DX contacts as a Ham is over 16,000 . . . K8IQQ. A 2 hr. JA run record for me . . . WB8ALP. Can't wait for the thing to start; By Saturday afternoon, I wonder why I am still there; and I don't want to see it end Sunday at 2400 GMT!! . . . W8FF. If I could hear them, I could work them—up goes a beam for next year . . . WB9SMU. JA's are super operators!! . . . K9HDE. Working on EA9 (CEUTA) with my trusty vertical . . . WØSEM. It's a shame the Clipperton group was too good for the contest . . . KØLW. It was a good test for my new beam . . . CG1RY. Worked WD8JTW as No. 1000 QSO, his No. 300—we both reached our goals at the same time!! . . . CG3HHS. Snow static bad on Mar. 26th (1.8 MHZ) . . . VE3BBN. Most contacts I have ever made in any contest . . . VE4RP. The *CQ* WPX and *CQ* WW are the best contests around . . . VE6AGV. Being asked to QSO—with three different prefixes (VE7/VC7/CG7) kind of threw me . . . VC7AZG. I will continue to subscribe to *CQ* as long as it maintains its DX Contests! . . . VE7IG. If there is going to be a BY operation it will be a Chinese operator first. Guess who? . . . VE7BC op. VE7XR. Got special prefix license to operate the contest . . . KZØDX op KZ5JM. My first *CQ* Contest . . . XF1A. I spent a lot of time explaining that WP4 is

Tom, 9K2EX of Kuwait, gave many a new prefix and DX country. Very FB.

CLUB COMPETITION

Western Washington DX Club	**13,256,472**
Toronto DX Club (Canada)	10,798,450
Potomac Valley Radio Club	9,446,003
DX Club of Puerto Rico	7,975,618
Outback DX Club (Sweden)	5,253,197
North Florida DX Assn.	4,104,036
Yankee Clipper Contest Club	3,947,700
Rhein Ruhr DX Assn. (FRG)	3,514,088
Scorpion DX Group (D.R.)	2,432,388
Northern Californi Contest Club	2,290,800
YU DX Club (Yugoslavia)	2,108,712
North Texas Contest Club	1,743,127
Frankford Radio Club	1,678,257
Murphy's Marauders	1,591,317
Southeastern DX Club	1,449,001
Ill-Wind Contesters	1,319,096
Michigan DX Assn.	1,316,012
Southern California DX Club	1,295,286
Fraser Valley DX Club (Canada)	1,254,681
Kansas City DX Club	891,180
Dayton Amateur Radio Assn.	848,445
Northern Ohio Amateur Radio Assn.	5 3,286
Danish DX Group (Denmark)	500,138
Alamo DX Amigos	351,036
SP DX Club (Poland)	348,086
Buffalo Area DX Club	187,479
Mountain Amateur Radio Club	146,185
South Jersey Radio Assn.	60,660

Puerto Rico . . . WP4BDL op KP4AM. Much snow, ice, and wind—it was like erecting antennas at the North Pole . . . FPØLK op WB2RLK. Celebrating Las Palmas 500th anniversary, hence the EA8Ø prefix . . . EA8ØURE. Most stations not listening for low power Africa (hi) . . . S8AHC. Very interesting to note the propagation pattern. It really was great fun . . .



This 80 meter vertical with the top at 118 feet is one of the fabulous 13 antennas at VC7WJ.

ZS6PI. Missed Bernie (W8IMZ) on 10 & 15 meters . . . VU2DK. Thanks for such a fine contest. Looking forward to many more times . . . 4Z4UX. I worked 8 new countries . . . JA4XKL. I'm very happy. I worked VP5WW . . . JH6WHN. QRM (Jamming) was very heavy (7MHz) . . . JA2BAY. I'll be on 160 next year

. . . PT7WA. WB6WTA/KG6 on Guam was so pleased to work me that my small entry was justified. . . . CEØAE. Feel fortunate to be allowed the use of HD1A—will try to reactivate the call next year . . . QSL via WA4QMQ . . . HD1A op WA4UAZ/HC1. Real participation next year—very interesting . . . FY7BC. How fast this contest has grown . . . CW3BR. This contest is a form of incentive to the country and the prefix . . . YY4YC. VE7CQX/SU never heard me although I spent hours calling him. It is still one of the best contests . . . YV5EED. Underestimated ten meter potential—wish I had gone multi op . . . VK3OT. My first WPX contest since 1971. Watch out for *BIG* Multi-Band effort in '79 . . . VK4LX. Most enjoyable as usual, age 69 now . . . VK5MF. Other than having to use a hand held mic and balance the logs on my lap in the cramped front seat of a motor home and having a vertical antenna and battery/generator power, it was a great contest and lots of fun . . . KH6WF. Never made so many contacts on one band only throughout my terms in Far East (9M2CJ, 9M6CJ, YBØACH) . . . YBØACH. I wonder how long before working 10 with a piece of wet string. Hi . . . ZL1AGO. 6 continents in 5 hrs., 35 minutes with only 15 watt (10 meters) . . . OE1SBA. Greatest WPX contest ever . . . ON4XG. Thanks for the WPX award from 1977 . . . LZ2VP. My single op score is well in excess of rivals G3WAS M-Op last year . . . G3FXB. ZK1DR a gotaway on 10M . . . G4BBA. My purpose was to get 2500 QSOs—I got 2554 . . . QI1VR. Practically no W's came thru the second day . . . OG2MM. The multiplier check is twice the contest job. Cheerio . . . OI3XZ. 4 ele. phased verticals on the ice. First night was hard—had feed line broken under ice in the water and was "boiling" sea water the whole night—Hi! . . . OF1IJ. Working CR9AJ with dipole on balcony, 1st floor, 4M from ground level . . . FØSE. Many eggs were found around the rig . . . DK8AX. I worked my first W6/VE6 on 10 meters . . . DK5WL. Only W stations are not heard on 40 meters . . . DL8QS. Most heart warming were the comments from stations who remembered the voice and asked if I was KA6YL . . . DA1GF. Special patience award for VK3BBS . . . DA1QH. 1st time I've ever worked JA's short path—look forward to participating next year . . . ZB2BL. Pleased to see 28 MHz open, lovely band to work . . . GU3YIZ. 7MHz is very QRM . . . HA3HV. Conditions great—I'm well over the 1970 European record—but somebody else did better, Hi . . . IV3PRK. Sunday, wind was blowing at over 100 MPH and suddenly, after two days in the wind, the 42 ft. boom of my 6 el beam broke just above the rotator, switched to a G.P.—what a difference! . . . I4BFY. The new prefix for my region does a very fine job in this contest . . . IN3FJT. Still only 2 PA1 stations active. No new PA1 calls from now on . . . PA1GRE. As always, the whole world was on . . . LA4MV. Rig refused to work 10 meters. Really nice to be back . . . LA5QK. Many stations "fast ops" not using call signs—we lose the time and they will have many duplicate QSOs . . . SP3DOI. Always my pleasure to use a special prefix in the contest . . . CT7UA op CT1UA. Disastrous propagation on 40 M to W/K . . . YO3BEJ. Could not work 40 & 80 because a high construction crane brought down my dipole 5 hrs. before the contest began

. . . EA1PT. There is too much splattering and compressing nowadays on SSB . . . SMØDJZ. After 1000 QSOs had to leave to go to the YU3 hamvention—came back next morning to finish contest . . . YU3EY. Nice contest with Clipperton hunting in rest time . . . YU1GMN op YU1QEF. We are very glad to operate this contest each year. All boys were ops of 4J3A in 1976 . . . UK3ABB op UV3CC. Competition with VC7WJ generated some extra energy here. Plans are to activate a new high Ground plane and to erect a stacked array for 10 meter band . . . UK9AAN op UA9AN.

U.S.A. TOP SCORES

SINGLE OPERATOR

All Band	K2SS	2,527,044
All Band	W3LPL	2,380,284
28 MHz	K5JA	1,007,774
28 MHz	WA8QOY	933,432
21 MHz	N6CW	2,104,914
21 MHz	W1ZA	1,869,200
14 MHz	W3GG	305,118
14 MHz	W7FP	229,000
7 MHz	WA8LXJ	51,754
7 MHz	WA4DCP	44,726
3.8 MHz	N6VI	104,784
3.8 MHz	W8SQ	18,326
1.8 MHz	W8LRL	4,914
1.8 MHz	K2BQ	4,488
QRPp	W8ILC	353,466
QRPp	N2AA	301,920

MULTI OPERATOR

Single Xmtr	K4VX	4,150,443
Single Xmtr	K1RU	1,918,660

TOP SCORES
SINGLE OPERATOR

ALL BAND

UA9ACN	**3,31 ,488**	UB5WE	2,140,983
9L1CA	2,678,728	HD1A	2,119,488
K2SS	**2,527,044**	G3FXB	2,101,440
W3LPL	2,380,284	**CG3EUP**	**2,091,990**
HI8MOG	2,291,256	IV3PRK	1,964,240
OI1VR	2,214,459	I3MAU	1,957,200
K7RI	2,200,200	N1GL	1,904,750

SINGLE BAND

28 MHz		21 MHz	
CW3BR	**3,203,514**	**CG3BMV**	**2,445,366**
VP5WW	2,043,486	**N6CW**	**2,104,914**
PY3CB	1,922,018	YV5CVE	1,947,996
YB0ACT	1,784,079	W1ZA	1,869,200
VK3OT	1,504,008	VE7IG	1,819,104
HK4YR	1,068,500	YU3ZV	1,717,443
K5JA	1,007,774	N5AU	1,630,816
14 MHz		**7 MHz**	
ON4UN	2,122,999	CG3IXE	345,032
KZ5FR	2,039,456	OZ5EV	262,484
YY4YC	1,848,396	VE3ECP	248,848
ZB2BL	1,598,828	JA2BAY	238,700
OH8OS	1,549,458	OZ5VT	235,334
DK3DJ	1,549,422	OF1IJ	196,924
CG7BGK	1,517,876	UP2OU	194,756
3.5 MHz		**1.8 MHz**	
YU3DBC	405,270	VE3BBN	26,264
DM4VUG	178,416	W8LRL	4,914
HA4KYB	143,736	K2BQ	4,488
VC7SZ	134,456	**QRPp**	
OK3ZWA	118,404	**4T8A**	**397,800**
DM4WPF/P	117,122	**W8ILC**	**353,466**
N6VI	104,784	N2AA	301,920

MULTI OPERATOR

SINGLE TRANSMITTER

KP4RF	**6,113,910**	**LG5LG**	**3,720,392**
UK6APA	4,700,904	EI1AA	3,446,993
CG3AKG	4,607,410	DT7DK	3,334,222
CT3/OH2BC	4,377,450	UK2GKW	3,333,360
YU2CDS	4,204,970	UK6LAZ	3,234,873
K4VX	4,150,443	XK6WQ	3,233,615
UK3ABB	4,021,245	VB3KRK	3,073,152

MULTI TRANSMITTER

UK9AAN	**10,702,776**	KL7HR	4,877,882
VC7WJ	**9,389,696**	DX4JA	3,788,515
OG1AA	6,629,483	PP5CIT	1,764,158

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

QRPp
—SECTION—
WORLD WIDE

4T8V	**A**	**397,800**	**658**	**204**
		(Opr. OA8V)		
W8ILC	**A**	**353,466**	**572**	**269**
N2AA	**A**	**301,920**	**465**	**255**
SK2KW	**A**	**191,880**	**425**	**234**
		(Opr. SM2DMU)		
W6PQZ	**A**	**118,426**	**303**	**154**
WA2ZWH	**A**	**75,504**	**188**	**143**
F8AYV	**A**	**74,260**	**248**	**158**
I3VFJ	**A**	**59,392**	**207**	**128**
ON6NL	**A**	**56,068**	**238**	**131**
G3FTQ	**A**	**33,136**	**213**	**109**
JH8DEH	**21**	**32,204**	**141**	**97**
WA2RHA	**28**	**22,000**	**100**	**80**
GM3RFR	**A**	**18,306**	**104**	**81**
WA6VNR	**21**	**13,500**	**106**	**60**
PA0NRD	**14**	**8,296**	**100**	**68**
KA6RO	**28**	**7,130**	**65**	**46**
JH8KAN	**28**	**5,291**	**57**	**37**
UA3DEA	**28**	**3,584**	**40**	**32**
UA3ZED	**A**	**3,534**	**46**	**31**
UB5DAG	**3.6**	**2,878**	**36**	**29**
OZ1AYY	**14**	**1,785**	**52**	**35**
SM0JDR	28	147	8	7
SM2DMU	A	60	6	6

SINGLE OPERATOR
NORTH AMERICA

United States

N1GL	**A**	**1,904,750**	**1690**	**401**
WA1SQB	**A**	**1,591,317**	**1590**	**377**
W1DYH	"	236,736	404	216
N1XX	"	25,752	120	87
W1WY	"	19,800	101	75
W1CNU	"	5,586	50	38
W1CKA	**28**	**549,909**	**761**	**279**
		(Opr. W1LJ)		
W1ZA	**21**	**1,869,200**	**1762**	**400**
		(Opr. K1OME)		
W1HZH	**21**	**313,856**	**486**	**256**
N1AS	"	159,900	348	205
W1PM	"	28,324	103	97
W1IBI	"	17,272	101	68
WB1AJX	"	260	13	13
W1SRE	"	24	4	4
K1RB	**14**	**5,504**	**48**	**43**
W1BB	1.8	8	2	2
K2SS	**A**	**2,527,044**	**2252**	**388**
K2BMI	**A**	**1,678,257**	**1682**	**357**
N2GC	"	94,608	250	162
WA2LJM	"	72,884	220	137
W2FGY	"	60,360	181	120
W2LEJ	"	46,284	147	114
N2VW	"	35,512	133	92
WA2TJF	"	2,850	34	30
WB2PXA	"	1,296	25	24
W2CJX	"	300	12	12
K2VV	**28**	**351,538**	**600**	**209**
WB2AIO	"	14,744	87	76
W2UL	"	160	8	8
WB2VYA	**21**	**1,104,983**	**1228**	**323**
W2IQL	**21**	**295,757**	**445**	**253**
WA2PAT	"	9,150	62	50
K2MN	"	7,632	56	48
WA2AOG	**14**	**172,735**	**350**	**193**
W2MYA	"	89,600	224	160
K2BQ	**1.8**	**4,488**	**193**	**68**
W3LPL	**A**	**2,380,284**	**1911**	**444**
		(Opr. K3NA)		
DK5AD/W3	**A**	**836,247**	**921**	**323**
N3UN	"	323,595	502	255
WB3CFD	"	146,185	308	173
W3ETB	"	72,432	199	144
K3KA	"	42,864	148	114
WB3DKT	"	16,170	101	70
N3RL	"	11,165	70	55
WA3VIL	"	1,428	37	28
WB3IKP	**28**	**7,650**	**60**	**50**
K3KG	**21**	**1,178,004**	**1200**	**356**
WA3VUQ	**21**	**431,460**	**613**	**270**
K3RL	"	84,888	211	162
N3RC	"	2,494	34	29
W3GG	**14**	**305,118**	**472**	**253**
N4WW	**A**	**1,587,900**	**1530**	**395**
AA4VK	**A**	**927,424**	**1015**	**337**
N4NX	"	344,170	541	254
K5ZD/4	"	255,996	383	222
W4PAK	"	214,110	379	195
WA4VDE	"	135,366	311	154
W4UYC	"	130,185	306	165
N4UF	"	106,216	269	142
W4EI	"	98,750	243	158
WA4KCR	"	78,156	212	156
WD4LCO	"	76,560	224	145
W4KMS	"	38,259	138	109
WA4NTP	"	13,780	90	65
WB4BZR	"	13,317	78	69
N4YJ	"	11,900	85	68
W4WEG	"	7,344	53	48
K4TRH	"	4,520	47	40
WA4OPV	"	4,446	41	38
W4SQ	"	4,017	41	39
WB4WHE	"	3,003	47	39
N4UH	"	616	15	14
N4MM	**28**	**680,400**	**790**	**324**
N4KG	**28**	**479,402**	**693**	**283**
WA4DRU	"	138,574	298	193
WA4QHV	"	125,280	293	174
WB4KRH	"	84,360	236	148
K4CG	"	83,439	230	127
		(Opr. K3WUW)		
N4BP	"	42,401	196	109
WA4YNP	"	8,477	65	49
WD4JNS	"	6,437	63	41
W4LVM	**21**	**690,580**	**874**	**292**
WB4HNC	**21**	**86,086**	**230**	**154**
WB4ORP	"	85,221	221	153
WB4VQO	"	5,460	66	60
WB4OZH	**14**	**115,335**	**255**	**165**
WA4AXT	**14**	**35,226**	**138**	**103**
WA4HNL	"	20,720	105	80
W4EEO	"	3,196	34	34
WA4DCP	**7**	**44,726**	**184**	**107**
N4RA	**3.8**	**11,536**	**90**	**56**
AA4NC	"	1,856	36	29
K5UR	**A**	**1,403,468**	**1419**	**382**
K5UA	**A**	**480,072**	**718**	**241**
WA5TAP	"	470,334	721	258
K5DB	"	163,614	339	201
WA5IYX	"	100,660	259	140
WD5EWP	"	93,936	213	152
WD5CSK	"	68,820	239	124
W5OB	"	60,580	237	130
K5DEC	"	33,572	143	109
W5FO	"	18,375	100	75
K5RF	"	4,920	47	41
W5EIJ	"	2,520	35	28
W5YB	"	1,449	23	23
K5JA	**28**	**1,007,774**	**1274**	**302**
N5DY	"	23,944	114	82
WD5GUP	"	14,606	93	67
N5AU	**21**	**1,630,816**	**1719**	**352**
WB5YLT	"	16,480	98	80
WD5EGK	"	630	21	21
W5OSJ	**14**	**11,573**	**71**	**71**
WD5BZI	7	986	22	17
N6OP	**A**	**1,443,045**	**1949**	**255**
		(Opr. WA6DGX)		
W6HX	**A**	**1,072,076**	**1262**	**271**
W6OKK	"	264,678	550	186
W6BJB	"	171,094	476	121
K6XP	"	53,750	156	125
WA6TKT	"	43,228	148	101
WA6UFY	"	32,107	129	97
W6TDO	"	26,967	149	89
N6JM	"	8,103	74	37
K6NA	"	5,922	52	42
N6MU	28	31,581	137	99
W6YMH	**28**	**20,382**	**114**	**79**
N6HE	"	144	9	8
N6CW	**21**	**2,104,914**	**2312**	**322**
WA6JUD	**21**	**796,424**	**1350**	**226**
K6HNZ	"	654,804	1242	188
K6YRA	"	534,990	841	255
N6VI	**3.8**	**104,784**	**300**	**118**
K6SE	**1.8**	**1,380**	**44**	**30**
K7RI	**A**	**2,200,200**	**2442**	**285**
K7NN	**A**	**1,172,062**	**1503**	**302**
W7JYW	"	367,104	758	192
N7AM	"	168,480	464	156
K7NF	"	108,647	438	83
N7DX	"	62,700	300	76
WB7NVO	"	14,527	103	73
W7BQG	"	7,344	53	48
W7RIR	"	5,724	46	36
WB7SXF	"	2,886	54	37
WB7UEY	"	2,592	50	36
K7WQD	"	2,275	26	25
K7RS	"	2,175	33	29
WA7RUY	"	1,875	27	25
N7XX	**28**	**401,763**	**959**	**157**
K7IDX	"	78	6	6
W7AYY	**21**	**97,950**	**262**	**150**
W7FP	**14**	**229,000**	**410**	**229**
N8ET	**A**	**413,466**	**633**	**274**
N8JW	**A**	**360,000**	**517**	**250**
W8IMZ	"	288,880	501	230
W8QVU	"	114,550	268	158
WD8CJQ	"	101,970	279	165
W8PTG	"	82,215	230	135
W8QGP	"	44,982	145	126
W8RSW	"	42,334	136	122
WB8YQX	"	35,280	130	105
K8IQQ	"	35,217	144	91
WD8ALG	"	17,748	92	68
WD8DFP	"	12,834	76	62
W8WT	"	12,597	80	57
WD8JSC	"	12,411	75	63
WB8WTP	"	11,529	83	61
WA8NDL	"	9,450	61	54
WD8DNJ	"	8,736	64	52
WD8IZC	"	7,680	57	48
WB8URG	"	7,285	57	47
WD8BYA	"	6,624	57	48
WD8AHS	"	6,594	53	42
W8CBA	"	5,376	46	42
WD8CMU	"	4,788	48	42
WD8DPB	"	4,080	44	34
W8CIJ	"	4,070	40	37
WB8HKK	"	2,573	35	31
WB8VMV	"	2,387	34	31
WB8VZX	"	1,925	27	25
W8YLJ	"	848	18	16
WA8QOY	**28**	**933,432**	**982**	**356**
WB8ALP	**28**	**591,327**	**762**	**297**
WD8KFR	"	14,586	80	66
WD8ODD	"	11,484	70	58
W8SJU	"	7,052	57	43
K8CV	"	2,222	35	22
WD8KND	"	1,653	31	19
WD8AJK	"	714	17	17
W8FF	**21**	**1,216,350**	**1426**	**306**
WD8CRY	**21**	**478,660**	**736**	**260**
WA8NDE	"	39,576	135	102
WB8ZRL	"	4,292	40	37
K8GSR	14	5,760	47	45
W8LHV	"	5,289	45	43
WA8LXJ	**7**	**51,754**	**165**	**113**
W8SQ	**3.8**	**18,326**	**131**	**77**
W8LRL	**1.8**	**4,914**	**170**	**63**
K8CFU	**1.8**	**952**	**52**	**34**
WA9P8K	**A**	**791,520**	**1112**	**272**
WB9VJU	**A**	**63,787**	**266**	**136**
W9WI	"	32,864	140	104
W9QWM	"	18,732	112	84
WB9SMU	"	3,219	46	37
K9UR	"	2,277	34	33
K9IAP	"	945	22	21
WB9BCR	"	207	9	9
W9LT	**28**	**568,302**	**742**	**294**
W9LKI	"	37,648	139	104
WB9WFJ	"	23,904	113	83
K9DXB	"	468	14	13
K9HDE	**21**	**502,425**	**739**	**261**
WB9EBO	"	21,725	99	79
K9BQL	"	12,627	73	61
K9ARZ	**14**	**28,126**	**120**	**98**
WB0RET	**A**	**483,328**	**798**	**256**
W0GNX	**A**	**105,280**	**242**	**160**
W0CDC	"	96,850	243	149
W0JU	"	79,785	207	135
W0YK	"	52,771	185	113
WA0DCB	"	36,252	126	106
WD0AOW	"	23,751	111	91
WB0KWI	"	17,324	89	71
WB0ZEB	"	16,296	187	97
WB0MPH	"	5,715	59	45
K0NN	**28**	**30,644**	**130**	**94**
W0SEM	"	3,150	43	30
K0LW	**21**	**50,050**	**161**	**110**
WA0VBW	"	34,132	166	106
W0UYL	**14**	**40,194**	**217**	**126**
W0YR	"	6,954	67	57
K0LD	"	2,378	30	29

Alaska

KL7AF	**14**	**96,652**	**246**	**146**

Canada

CK1AW	**A**	**56,168**	**180**	**118**
VO2CW	**21**	**154,344**	**375**	**177**
VE1BNN	**28**	**87,696**	**296**	**112**
CG1RY	**14**	**833,952**	**1270**	**292**
CG3EUP	**A**	**2,091,990**	**1746**	**411**
VE3GD	"	34,726	134	97
VE3EZU	"	13,390	75	65
VE3FEA	"	10,974	70	62
VE3IPS	**28**	**14,807**	**97**	**67**
CG3BMV	**21**	**2,445,366**	**2173**	**402**
CG3BBH	**14**	**989,086**	**1080**	**371**
CG3HHS	**14**	**478,676**	**912**	**242**
VE3DUS	"	24,832	100	97
VE3MV	"	11,160	72	60
CG3IXE	**7**	**345,032**	**725**	**118**
VE3ECP	**7**	**248,848**	**608**	**103**
VE3BBN	**1.8**	**26,264**	**140**	**49**
CG4SW	**A**	**999,416**	**1126**	**328**
VE4KM	**A**	**736,854**	**1155**	**254**
VE4RP	"	545,383	764	241
VE5AAO	**28**	**154,662**	**429**	**149**
CG5RA	**21**	**1,084,854**	**1432**	**282**
VE6MP	**A**	**1,082,040**	**1420**	**284**
VE6AGV	**A**	**511,520**	**954**	**230**
CG6BBC	**14**	**32,384**	**166**	**88**
CG6LB	**7**	**25,172**	**118**	**58**
VE7CMK	**A**	**967,944**	**1501**	**248**
VE7AV	**A**	**284,406**	**477**	**214**
VC7AZG	"	279,240	508	195
VC7AZC	"	7,497	57	51
CG7CIB	**28**	**585,760**	**1587**	**160**
		(Opr. VE7BPB)		
VC7COR	"	51,709	302	83
VE7IG	**21**	**1,819,104**	**1917**	**336**
CG7BGK	**14**	**1,517,876**	**1985**	**314**
VE7BC	**14**	**1,300,068**	**1887**	**294**
		(Opr. VE7XR)		

VE7AQF	"	708,576	1219	244
VC7SZ	**3.5**	**134,456**	**318**	**98**
Canal Zone				
KZ0DX	**28**	**834,496**	**1328**	**272**
		(Opr. KZ5JM)		
KZ5FR	**14**	**2,039,456**	**2047**	**391**
Dominican Republic				
HI8MOG	**A**	**2,291,256**	**2578**	**363**
HI8EDS	**A**	**141,132**	**347**	**163**
HI8MDB	"	23,828	117	74
HI8LC	**7**	**38,868**	**100**	**79**
HI8GBG	**3.5**	**88,110**	**216**	**99**
French St. Martin				
FG0DDB/FS7	**A**	**29,504**	**237**	**64**
		(Opr. W1UQ)		
Guatemala				
TG9RZ	**A**	**23,556**	**137**	**52**
Mexico				
6F8J	**A**	**319,646**	**692**	**181**
XF1A	**A**	**25,996**	**121**	**67**
XE1MEX	"	9,396	64	58
XE1LLS	**28**	**388,128**	**1158**	**156**
Puerto Rico				
KP4WI	**A**	**1,461,560**	**2026**	**305**
WP4BDL	**14**	**400,148**	**810**	**217**
Sint Maarten				
PJ8UQ	**A**	**35,776**	**159**	**86**
		(Opr. W1UQ)		
PJ8AA	**A**	**11,139**	**105**	**47**
		(Opr. W2BBK)		
PJ8YL	**14**	**27,390**	**147**	**83**
		(Opr. K1YL)		
St. Pierre & Miquelon				
FP0LK	**A**	**1,014,917**	**1625**	**263**
		(Opr. WB2RLK/VE1)		
Turks & Caicos Islands				
VP5WW	**28**	**2,043,486**	**2669**	**321**
		(Opr. WB4EYX)		
AFRICA				
Canary Islands				
EA8BURE	**A**	**21,052**	**93**	**76**
Rep. of Cape Verde				
D4CBC	**A**	**1,203,232**	**1206**	**304**
Sierra Leone				
9L1CA	**A**	**2,678,728**	**2564**	**344**
Madeira Is.				
CT3BD	**A**	**742,665**	**1003**	**231**
Rep. of South Africa				
S8AHC	**A**	**19,698**	**110**	**67**
ZS6PI	**28**	**202,980**	**400**	**170**
ASIA				
India				
VU2DK	**A**	**1,615,334**	**1551**	**371**
VU2ACD	**A**	**831,908**	**1127**	**292**
Iran				
EP2TY	**A**	**144,546**	**271**	**142**
Israel				
4X4IL	**28**	**993,616**	**1313**	**281**
4Z4UX	**28**	**426,496**	**737**	**196**
Japan				
JA6BSM	**A**	**1,611,864**	**1636**	**366**
JA7AMK	**A**	**667,758**	**925**	**273**
JH6EFI	**A**	**392,931**	**578**	**243**
JA6WSB	"	327,107	545	227
JA7YFB	"	153,720	292	183
		(Opr. JA7WBW)		
JR2FNL	"	115,275	276	145
JA8SW	"	110,260	266	149
JA0WUU	"	108,487	251	157
JA5SIX	"	103,512	262	152
JF1SEK	"	88,032	242	131
JA4GXS	"	66,930	208	115
JA5NYF	"	66,621	187	159
JA0TEN	"	51,272	180	104
JA0VHI	"	42,824	162	101
JA7BAL	"	39,900	155	95
JA0FMB	"	31,486	124	91
JA1JCA	"	30,660	151	70
JA5CEK/6	"	28,046	136	74
JA4JCY	"	22,119	111	73
JH0BDK	"	18,368	111	64
JH1AMP	"	15,594	80	69
JH0BQX	"	14,674	102	58
JA7JNF/1	"	13,939	103	53
JA1AAT	"	13,440	112	42
JA3JKI	"	10,761	83	51
JG1UZD	"	9,672	65	52
JJ1SNV	"	8,850	77	50
JA3BBG	"	5,880	55	40
JI1TWZ	"	4,840	57	40
JA3MFE	"	1,782	32	22
JH4UOG	"	1,512	34	28
JA3BCT	"	1,296	24	24
JA4XKL	"	1,120	22	20
JH4WVQ	"	1,037	21	17
JR6HNE	"	928	22	16
JH1AJT	**28**	**373,813**	**784**	**187**
JA2JSF	**28**	**155,875**	**439**	**145**
JA7BSK	"	151,638	433	127
JA4UDP	"	60,168	216	109
JG1FJT	"	51,184	192	112
JF3GKE	"	45,308	196	94
JE2TFR	"	35,854	164	91
JH6WHN	"	33,528	159	88
JR3CVO	"	26,230	130	86
JJ1EZY	"	8,100	82	54
JR6DUL	"	7,568	68	43
JA1FO	"	1,680	28	21
JA6LLO	**21**	**1,344,902**	**1375**	**338**
JH1XYB	**21**	**752,571**	**1079**	**243**
JF1HOH	"	739,260	1005	270
JR1WHW	"	498,180	775	228
JH3GRE	"	207,015	415	185
JH2HFD	"	162,520	352	170
JK1ACX	"	140,280	348	167
JH4DIT	"	100,788	244	148
JR3CVJ	"	85,869	216	141
JA7NVF	"	74,763	250	117
JH1UUT	"	71,757	217	119
JF1XRB	"	70,756	200	133
JH3FWZ	"	69,368	211	116
JA0VBJ	"	66,924	208	117
JF3KNQ	"	50,794	165	109
JA7CXF	"	47,998	164	103
JF2AFJ	"	27,334	126	79
JF3NLQ	"	27,150	142	75
JR6CMS	"	11,468	84	61
JA2ITH	"	9,918	70	57
JH4CBM	"	8,268	65	52
JH4MVB	"	6,946	51	46
JH2AGC	"	5,207	47	41
JH3FHR	"	4,104	40	36
JA6PL	"	3,852	42	36
JR2NEA	"	3,828	42	33
JA7JGD	"	3,596	40	31
JH4PPQ	"	1,380	29	20
JE2VNE	"	288	13	8
JA1CVP	"	75	5	5
JA2HLX	**14**	**370,004**	**567**	**233**
JH1OCO	**14**	**255,471**	**463**	**201**
JA2QVQ	"	52,211	173	109
JA6CM	"	40,299	150	101
JA4BKL	"	9,632	70	56
JA3XGZ/6	"	9,100	67	52
JA2OJ	"	8,216	58	52
JA6YY	"	5,888	56	46
JA2TKO	"	5,640	55	40
JA9SV	"	3,456	39	32
JA5UBW	"	3,146	48	26
JK1LUY	"	2,233	33	29
JH2EVL	"	1,449	23	21
JG1RDV	"	1,200	26	20
JA4EII	"	1,071	23	21
JA1RDP	"	243	9	9
JH4DRB	"	21	3	3
JA2BAY	**7**	**238,700**	**402**	**154**
JA9CWJ	"	1,950	26	25
JA1KSO	3.5	17,464	103	59
KA6DX	**A**	**113,458**	**294**	**142**
KA6KJ	**28**	**262,235**	**535**	**179**
Kuwait				
9K2EX	**A**	**1,470,239**	**1423**	**347**
Macao				
CR9AJ	**A**	**118,272**	**578**	**132**
Mongolia				
JT1AN	14	6,120	79	40
U.S.S.R.				
Asiatic				
UA9ACN	**A**	**3,319,488**	**2083**	**459**
UK9OBI	"	350,665	689	233
		(Opr. UA9OO)		
UA9AED	"	235,752	513	209
UW9VH	"	63,050	181	130
UA9CBO	"	47,306	172	109
UA9UDR	"	10,506	171	51
UW9SG	"	1,460	25	20
UK9WBD	"	468	22	18
		(Opr. UA9WR)		
UA9OGF	**28**	**100,400**	**795**	**100**
RA9CIU	**28**	**51,875**	**520**	**83**
RA9CFI	"	22,750	251	70
UA9YAT	"	14,304	242	48
UA9MDJ	"	7,832	68	44
UA9MCX	"	1,584	32	18
UA9CIH	"	884	35	26
UA9ADF	**21**	**204,776**	**557**	**179**
UA9TS	**14**	**445,770**	**692**	**254**
UV9WF	"	320,229	555	221
UA9QAQ	"	7,052	59	43
UA9OS	"	2,145	41	33
UW9CL	**7**	**55,200**	**135**	**80**
UA0CCW	**A**	**23,288**	**103**	**82**
UA0SGL	**28**	**49,966**	**546**	**83**
UA0LFK	"	36,700	155	100
UA0UBG	"	16,225	261	55
UA0UBA	**21**	**200,694**	**768**	**166**
UA0SAU	**14**	**439,040**	**814**	**256**
Armenia				
UG6GAF	**28**	**527,456**	**1026**	**212**
UG6LQ	**14**	**98,690**	**284**	**139**
Azerbaijan				
UD6DFD	**A**	**952,555**	**1152**	**295**
UD6DKZ	**28**	**520,482**	**934**	**223**
UD6DER	**14**	**14,400**	**75**	**72**
Georgia				
UF6VAG	**A**	**1,855,008**	**1794**	**342**
Kazakh				
RL7PCV	**28**	**132,804**	**826**	**119**
UL7PBY	**28**	**94,962**	**408**	**133**
UL7EAF	"	77,857	426	113
UL7DBA	"	44,462	304	94
UL7TA	"	4,750	56	38
UL7TAC	"	559	15	13
UL7JAW	**14**	**210,288**	**459**	**208**
UL7IBC	**3.5**	**42,120**	**122**	**60**
Kirghiz				
UM8MAO	**A**	**277,130**	**767**	**214**
UM8NNN	**28**	**17,157**	**130**	**57**
UM8MAU	**14**	**13,050**	**99**	**50**
Tadjik				
UJ8JCL	14	171	9	9
Uzbek				
UI8LAF	**28**	**58,860**	**188**	**108**
EUROPE				
Austria				
OE5CWL	**A**	**818,850**	**1101**	**309**
OE1SBA	"	17,250	100	75
OE1JHA	**21**	**68,607**	**222**	**121**
Azores				
CT1TE/2	28	3,480	81	40
Belgium				
ON4XG	**A**	**245,754**	**455**	**222**
ON4UN	**14**	**2,122,999**	**1916**	**433**
ON6JG	**3.5**	**79,060**	**282**	**134**
Bulgaria				
LZ2EE	A	209	13	11
LZ1AD	**28**	**4,320**	**45**	**32**
LZ2ES	**14**	**85,974**	**325**	**178**
LZ1CJ	**14**	**27,930**	**190**	**114**
LZ1EP	"	2,257	53	37
LZ1FJ	"	108	10	9
LZ2VP	**3.5**	**11,960**	**113**	**52**
Czechoslovakia				
OK2YAX	**A**	**409,706**	**696**	**242**
OK2BTI	**A**	**244,950**	**620**	**230**
OK2JK	"	243,936	502	242
OK2BSA	"	183,502	414	209
OK1KZ	"	172,185	425	195
OK3YCA	"	52,644	259	123
OK1KIR	"	48,158	190	121
OK1XG	"	30,210	173	95
OK1EP	"	29,592	126	108
OK3TDN	"	20,610	110	90
OK2DB	"	17,974	114	86
OK3TAB	"	17,024	100	64
OK3TOA	"	7,205	63	55
OK1FCA	"	4,230	50	47
OK2BEF	"	2,065	36	35
OK2PBG	"	1,332	28	18
OK3CAW	"	184	9	8
OK1WT	**28**	**334,980**	**698**	**180**
OK1DWA	**28**	**183,700**	**393**	**167**
OK3EA	"	33,384	147	78
OK1JWA	"	3,937	43	31
OK1KYS	"	1,380	23	20
OK1CIJ	"	390	13	10
OK2BJR	**21**	**237,460**	**580**	**155**
OK1KUR	**21**	**174,417**	**465**	**141**
		(Opr. OK3CMR)		
OK2SLS	"	19,738	101	71
OK2XA	"	8,925	73	51
OK1DKS	"	4,392	43	36
OK2PEQ	**14**	**27,930**	**160**	**98**
OK2PEG	"	9,261	116	63
OK1DAM	"	3,854	72	47
OK3CKY	"	2,576	55	46
OK2BNK	"	620	21	20
OK3IR	"	225	15	15
OK2BPK	"	119	7	7
OK2QC	"	35	5	5
OK2ABU	**7**	**21,912**	**147**	**83**
OK3ZWA	**3.5**	**118,404**	**416**	**143**
OK3CGP	**3.5**	**62,178**	**293**	**129**
OK1AFB	"	62,000	257	124
OK2HI	"	57,500	258	115
OK3YCL	"	50,576	227	116
OK2SRA	"	39,770	200	97
OK1AZR	"	34,216	186	94
OK1MNV	"	15,708	125	66
OK1AEM	"	13,804	120	58
OK1MIZ	"	1,914	35	29
OK1OVP/P	"	30	5	5
Denmark				
OZ6DT	**A**	**85,725**	**250**	**127**
OZ4HW	**A**	**61,908**	**252**	**134**
OZ9ZS	"	32,218	147	89
OZ7DX	"	20,097	109	87
OZ7XU	"	18,278	100	74
OZ3KE	"	16,112	101	76
OZ2DM	"	2,772	36	33
OZ5BS	"	2,320	31	29
OZ7QV	"	1,525	29	25
OZ7SG	**28**	**21,744**	**134**	**72**
OZ8PK	"	3,630	42	33
OZ7NQ	21	1,820	29	26
OZ8XW	14	240	12	12
OX3RC	"	48	4	4
OZ5EV	**7**	**262,484**	**501**	**211**
OZ5VT	**7**	**235,334**	**470**	**209**
England				
G3FXB	**A**	**2,101,440**	**2134**	**352**
G4CNY	**A**	**1,243,143**	**1507**	**319**
G3YBH	"	644,910	993	249
G4CVZ	"	315,462	692	203
G5CEY	"	201,432	507	154
		(Opr. K9NB)		
G2AJB	"	59,568	252	136
G3NT	"	31,080	183	111
G8DI	"	22,572	170	99
G3XFW	"	21,758	108	86
G4DMN	**28**	**566,754**	**1106**	**177**
G4DKT	**28**	**164,688**	**471**	**141**
G3TOE	"	136,017	403	119
G4BBA	"	57,096	185	117
G4AHO	**21**	**78,446**	**273**	**122**
G3TKR	"	24,510	125	86
Finland				
OI1VR	**A**	**2,214,459**	**2554**	**351**
OH3YI	**A**	**1,545,819**	**1747**	**337**
OH2XD	"	503,325	869	225
OH7SC	"	161,395	374	191
OH2YY	"	116,564	352	181
OH8PF	"	96,944	318	166
OH2BOI/3	"	65,411	240	149
OH7NW	"	63,510	236	145
OH2KP	"	51,745	205	131
OH3PB	"	49,875	193	133
OH2VZ	"	11,408	78	62
OH2BAC	"	9,849	73	49
OH5PA	"	9,794	66	59
OH2BSL	"	4,802	63	49
OH5YX	"	4,176	46	36
OH1EH	"	1,218	22	21
OH6PA	"	105	7	5
OH3FT	"	84	6	6
OH2BSS	"	48	4	4
OH1KB	**28**	**14,762**	**95**	**57**
OH2UBF	"	4,173	44	39
		(Opr. OH2EQ)		
OG2MM	**21**	**1,553,439**	**2184**	**251**
OH6JW	**21**	**1,254,596**	**1828**	**259**
OH2BZ/1	"	1,180,960	1688	244
OH2BCP	"	1,174,912	1669	268
OH1MA	"	814,260	1372	205
OH1KF	"	486,328	840	212
OH5RP	"	26,226	119	93
OH2JQ	"	11,700	91	65
OH8OS	**14**	**1,549,458**	**1789**	**354**
		(Opr. OH8UT)		
OI3XZ	**14**	**1,400,080**	**1669**	**370**
OH8MV/6	"	612,264	1002	263
OH2BQL	"	45,617	167	121
OH2BNG	"	6,344	69	52
OH3AA	"	999	27	27
		(Opr. OH3TQ)		
OF1IJ	**7**	**196,924**	**464**	**182**
OH6GO/8	"	26,460	137	90
OH1ZK	"	10,152	80	54
OH3JR	3.5	1,056	26	22
France				
F8WE	**A**	**449,330**	**659**	**343**
F6EXQ	**A**	**211,797**	**442**	**233**
F6ENT	"	116,932	325	164
F6DLM	"	113,220	323	185
F6BVB	"	107,901	323	171
F5RC	"	74,328	258	163
F6DRP	"	13,013	107	77
F6DEO	"	8,723	75	61
F5RD	"	5,424	85	48
F6BJA	"	4,092	45	33
F8QB	**28**	**66,000**	**252**	**88**
F0SE	**14**	**6,000**	**86**	**60**
F6EMP	"	3,807	73	47
F6FKQ	"	3,744	69	52
Germany (FRG)				
DJ0NU	**A**	**714,752**	**1136**	**256**
DL8PC	**A**	**501,725**	**595**	**329**
DK6PY	"	380,057	656	241
DK7ZT	"	305,528	550	211
DK8AX	"	258,359	524	239
DF3TJ	"	233,709	684	217
DL7PD	"	214,182	453	219
DK3IU	"	156,558	418	194
DL1NX	"	39,195	166	117
DL1YA	"	36,858	160	118
DK8KC	"	23,650	132	86
DF2HL	"	23,144	129	88
DF6QF	"	21,280	122	112
DK5KJ	"	21,021	120	77
DF2KD	"	14,384	103	62
DL8IH	"	608	16	16
DK5WL	**28**	**774,430**	**1266**	**215**
DL7AA	**28**	**155,196**	**363**	**162**
DK7XN	"	25,620	119	84
DK5VO	"	22,074	118	78
DK5WN	**21**	**381,808**	**714**	**196**
DJ9ZB	**21**	**133,002**	**341**	**162**
DK8FS	"	104,194	311	118
DJ8OL	"	98,892	267	134
DF1QQ	"	70,587	274	93
DK3JU	"	22,330	110	77
DK3BJ	**14**	**1,549,422**	**1616**	**378**
DF1DX	**14**	**46,004**	**215**	**124**
DK7DN	"	35,568	200	114
DF2OF	"	31,472	227	112
DF6XB	"	20,381	169	89
DF3ZL	"	18,042	160	93
DF5SF	**7**	**52,030**	**237**	**121**
DL8QS	"	27,540	144	85
DK5WQ	"	5,928	62	52
DK6WA	**3.5**	**84,392**	**335**	**137**
DA1GF	**A**	**468,441**	**696**	**279**
DA1QH	**14**	**75,168**	**311**	**162**
Germany (GDR)				
DM4RDA	**A**	**391,936**	**647**	**256**
DT3SIC	**A**	**284,791**	**540**	**247**
DT4TEK	"	245,300	514	223
DT2AJH	"	154,376	410	184
DT5UUL	"	125,560	308	146
DM2DKK	"	99,699	321	167
DT4BK	"	85,848	330	146
DM3UH	"	73,788	232	129
DM3ZEN	"	65,070	285	135
DM4UCN	"	64,192	290	136
DM5TGL	"	58,960	262	134
DT2BBN	"	57,915	230	135
DT3SB	"	55,704	227	132
DM2BRK	"	48,144	251	118
DM3VFC	"	39,790	186	115
DT2BTO	"	39,556	154	116
DT3BE	"	38,092	151	107
DM3UPL	"	26,574	142	103
DM4LE	"	26,312	146	104
DM2CJJ	"	25,296	159	102
DT2YLO	"	23,936	119	88
DT3VAA	"	22,360	157	104
DM4NH	"	22,360	113	104
DT2BGC	"	18,408	111	78
DM5JBN/				
3HN	"	13,203	122	81
DM4PSN	"	12,950	104	70
DT2BDN	"	12,150	96	75
DM2DEO	"	10,230	64	56
DM5RNH	"	9,306	88	66
DM4QL	"	9,180	82	60
DM4UVL	"	8,400	94	60
DM5VVL	"	7,644	69	52
DM5PBN	"	6,333	76	65
DM3ZNN	"	6,204	59	44
DM5XIG	"	6,188	79	52
DM3TNA	"	5,940	70	54
DM3XM/				
3WYJ	"	4,464	46	36
DT2BPF	"	3,825	53	45
DM5BH	"	3,597	37	33
DT4YEL	"	3,400	40	34
DM5ZDL	"	1,392	31	58
DM3UFJ	"	851	24	23
DT3XM	"	810	18	15
DM4OLG	**28**	**43,329**	**153**	**101**
DT2CMF	"	6,396	55	41
DM2DGO	**21**	**1,011,124**	**1560**	**226**
DM2CDL	**21**	**192,376**	**482**	**139**
DT3OML	"	15,052	100	53
DM2BFK	"	9,152	69	52
DT2BLI	"	5,382	57	39
DM3NGB	"	1,675	25	25
DM2EHL	**14**	**16,490**	**150**	**85**
DM2FLN	**14**	**11,690**	**118**	**70**
DM3MMO	"	3,720	45	40
DM4ZKF	"	2,880	40	36
DT3LE	"	2,556	51	36
DM4ZTH	"	2,449	65	31
DM2BBC	"	493	19	17
DT2BOO	**7**	**18,096**	**130**	**78**
DM4NEE	"	6,820	71	55
DM4VUG	**3.5**	**178,416**	**498**	**177**
DM4WPF/P	**3.5**	**117,122**	**394**	**157**
DM3VGC	"	102,370	393	145
DM2CRB	"	88,704	339	144
DM4WKF	"	64,080	280	120
DM4YSL	"	51,504	254	116
DT2AUJ	"	16,284	129	69
DM2FJM	"	4,182	50	41
DM3XPE	"	2,584	40	34
DM2CUJ	"	1,508	29	26
DM0SWL	"	600	20	20
Gibraltar				
ZB2BL	**14**	**1,598,828**	**1988**	**319**
Guernsey (Channel Is.)				
GU3YIZ	**28**	**114,056**	**385**	**106**
GU4EON	**3.5**	**102,200**	**346**	**140**
Hungary				
HA5NP	**A**	**566,649**	**1004**	**279**
HA0KLU	**A**	**399,296**	**808**	**272**
		(Opr. HA0MM)		
HA3GO	"	136,757	377	163
HA7KSR	"	83,855	325	155
		(Opr. HA7UG)		
HA1ZD	"	69,954	244	131
HA7PL	"	28,227	144	97
HA7PQ	"	18,444	125	87
HA6NP	"	16,728	101	82
HG8UT	**28**	**13,965**	**85**	**57**
HG7MW	**28**	**10,296**	**76**	**52**
HA5OC	**14**	**59,700**	**328**	**150**
HA5LZ	**14**	**55,695**	**260**	**141**
HA6NN	"	28,776	190	109
HA3HV	**7**	**54,752**	**205**	**118**
HA4KYB	**3.5**	**143,736**	**460**	**159**
HA0HW	**3.5**	**101,388**	**394**	**142**
HA7UX	"	52,020	284	102
HA5MX	"	8,160	90	51
HA5KP	"	1,650	38	25
Italy				
IV3PRK	**A**	**1,964,240**	**2048**	**344**
I3MAU	**A**	**1,957,200**	**2124**	**336**

I6NOA	**A**	**1,256,409**	**1445**	**333**
I2MQP	"	499,122	730	263
I3VJW	"	277,920	594	180
I8INW	"	7,973	99	67
I4BFY	**28**	**538,956**	**977**	**198**
I6PLN	**28**	**511,872**	**961**	**186**
I1POR	"	508,698	1000	177
I4GZV	"	351,936	829	144
I3JTC	"	148,474	418	122
I7LMR	"	76,670	245	100
I5PZQ	**21**	**493,116**	**1019**	**174**
IN3FJT	**21**	**476,070**	**843**	**210**
I0GPY	"	258,720	533	196
IV3HSN	**14**	**1,440,257**	**1729**	**343**
I8KPV	**14**	**233,700**	**539**	**246**
I7KKS	"	**156,170**	**469**	**194**
I8TCW	"	**47,286**	**272**	**142**

Luxembourg

LX1FN	**A**	**31,108**	**131**	**101**
PA0ERW/LX	"	20,210	128	86
LX1AJ	"	3,036	43	33

Netherlands

PA0IJM	**A**	**100,650**	**338**	**150**
PA3ACE	**A**	**46,767**	**227**	**119**
PA0SMS	"	42,960	173	120
PA0CYW	"	4,788	42	38
PA0LEG	"	3,248	33	29
PA0RDB	"	2,025	36	27
PA0TV	"	1,323	22	21
PA1GRE	28	1,206	23	18
PA0RRS	**3.5**	**72,498**	**294**	**129**

Norway

LA4MV	**A**	**187,166**	**496**	**203**
LA1NG	**A**	**167,056**	**394**	**212**
LA5QK	"	93,694	332	158
LA7VV	"	28,355	167	107
LA5KW	"	21,624	153	106
LA2AD	"	17,112	130	93
LA5YV	"	10,082	85	71
LA5KO	"	8,904	77	53
LA7JO	"	7,680	60	48
LA7EO	"	126	7	7
LA2ZN	**14**	**115,478**	**380**	**181**
LA1L	"	13,148	116	76
		(Opr. LA2TO)		
LA5BV	"	3,168	53	44
LA9ZV	**28**	**37,076**	**151**	**92**
LA2CQ	"	7,049	64	53
LA4WV	"	2,739	56	33

Poland

SP5ALP	**A**	**201,590**	**512**	**190**
SP5IVC	**A**	**122,320**	**350**	**176**
SP6COE	"	48,498	208	118
SP9HXK	"	12,462	100	67
SP5ALV/5	"	1,680	36	35
SP3DOI	**28**	**270,270**	**505**	**195**
SP9AGW	**21**	**30,600**	**195**	**85**
SP8GQU	**14**	**255,850**	**556**	**238**
SP2FAP	**14**	**96,380**	**360**	**158**
SP4DGN	"	29,070	146	90
SP3BIP	**7**	**15,840**	**107**	**72**
SP5KMB	**3.5**	**16,728**	**137**	**68**
		(Opr. SP5IXI)		
SP6UK	"	14,700	109	70

Portugal

CT7UA	**A**	**92,950**	**256**	**143**
CT1RE	"	1,485	27	27
CT4GO	**3.5**	**42,200**	**175**	**100**

Romania

YO6KEI	**A**	**538,538**	**897**	**286**
		(Opr. YO6AWR)		
YO3JJ	**A**	**143,820**	**362**	**188**
YO8ATT	"	61,056	251	144
YO6KBM	"	57,447	260	117
YO8FZ	"	14,212	96	68
YO6BJV	"	10,608	105	51
YO7APM	"	6,844	84	59
YO9HP	"	3,914	43	38
YO2BIC	"	2,967	51	43
YO9KAG	"	2,220	35	30
		(Opr. YO9HP)		
YO3JW	**28**	**322,784**	**665**	**176**
YO2II	**14**	**68,388**	**252**	**139**
YO3QO	"	4,335	65	51
YO3BEJ	**7**	**93,888**	**311**	**144**
YO3KSC	"	3,248	49	29
		(Opr. YO8AZQ)		
YO8BDQ	"	70	7	7
YO6LV	**3.5**	**13,970**	**84**	**55**

Sardinia

IS0MVE	**28**	**280,554**	**722**	**138**

Scotland

GM4GPN	**A**	**223,027**	**562**	**211**
GM4ELV	"	37,170	195	126

Sicily Is.

IT9WPO	**A**	**150,829**	**401**	**203**
IT9RYJ	**28**	**34,968**	**150**	**93**

Spain

EA1PT	**A**	**1,144,848**	**1411**	**368**
EA2QU	"	85,323	309	119
EA2IA	21	147	8	7

Sweden

SM5AOE	**A**	**1,345,900**	**1624**	**313**
SM7CZL	**A**	**72,787**	**251**	**143**
SM4EEA	"	24,108	113	84
SM0ATN	"	21,672	100	86
SM5FTH	"	18,318	104	86
SM7ISG	"	17,710	119	77
SM5CSS	"	17,580	112	60
SM0CGO	"	12,282	101	69
SM7FSV	"	5,280	50	44
SM2DYS	"	2,688	50	32
SM5FBL	"	960	21	20
SK0MG	"	810	20	18
		(Opr. SM0DJZ)		
SM6DER	"	616	15	14
SM7RS	"	360	12	10
SM0DJZ	**28**	**25,200**	**118**	**80**
SM5ERK	**28**	**23,544**	**125**	**72**
SM4DQE	"	23,422	98	98
SM3DNI	"	16,065	103	63
SM6BXV	"	8,544	60	48
SM5DYC	"	6,437	55	41
SM6DJI	"	1,560	26	20
SM3CJA	"	714	17	14
SM5IKQ	"	396	15	11
SM2HZQ	**21**	**168,589**	**416**	**211**
SM7ABL	"	32,580	135	90
SM5RE	"	9,063	74	53
SM0FIB	"	5,125	55	41
SM2DLZ	**14**	**1,294,098**	**1629**	**353**
SM5CMP	**14**	**227,750**	**526**	**250**
SM2HAK	"	46,767	200	131
SM7FYM	"	10,586	76	67
SM7TV	"	5,768	90	56
SM5CVC	"	147	7	7
SM5CXN/M	"	140	10	10

Switzerland

HB9APF	A	4,970	51	35
HB9UD	"	3,375	49	45

Wales

GW5BI	**28**	**46,763**	**174**	**101**
		(Opr. GW3GHC)		
GW3SLA	**14**	**68,529**	**287**	**159**

Yugoslavia

YU2RJV	**A**	**407,056**	**804**	**247**
YU5FGF	"	139,092	398	201
YU3TYX	**28**	**692,520**	**1054**	**232**
YU2RQG	**28**	**495,759**	**950**	**181**
YU2BOP	"	173,808	407	153
		(Opr YU2OB)		
YU2EZA	"	141,102	387	134
YU2CQ	"	71,000	249	100
YU2CBK	"	51,624	170	108
		(Opr. YU2RNQ)		
YU1NZW	"	26,600	123	76
YU1SF	"	6,669	59	39
YU1NZR	"	248	13	8
YU3ZV	**21**	**1,717,443**	**2205**	**273**
YU2HS	**21**	**1,470,960**	**2240**	**227**
YU1OON	"	14,688	112	72
YU3EY	**14**	**1,412,760**	**1572**	**366**
YU1GMN	**14**	**695,952**	**921**	**324**
		(Opr. YU1QEF)		
YU1OQI	"	19,488	176	96
YU1ONT	"	5,974	88	58
YU3DBC	**3.5**	**405,270**	**691**	**237**
		(Opr. YU3TPX)		
YU3TOJ	"	7,968	85	48

U.S.S.R.
European

UA3SAQ	**A**	**1,605,550**	**1817**	**326**
UA3QAQ	**A**	**557,260**	**1012**	**298**
UV3DN	"	462,910	753	238
UA3DDF	"	204,736	546	224
UA3TN	"	166,788	341	226
UA3PAZ	"	136,344	342	156
UA1MU	"	131,130	331	186
UA3VCP	"	86,663	240	157
UA3SAL	"	59,671	227	123
UA3EAL	"	31,832	166	92
UV3FD	"	28,800	163	90
UA1AET	"	21,412	160	106
UA3VFI	"	19,656	104	91
UV3CH	"	12,740	104	70
UW6NU	"	6,216	64	56
UA4PBX	"	2,580	46	43
UA3TAM	"	1,225	27	25
UA1CAS	"	504	14	14
UA6LED	**28**	**208,438**	**464**	**178**
UA3AGG	"	10,650	75	50
UA6HGK	"	10,441	104	53
RA4HDE	"	3,842	41	34
UA6ADC	**21**	**706,008**	**1245**	**276**
UA3DFK	**21**	**252,960**	**570**	**170**
UW1AE	"	174,408	385	172
UW6LC	"	17,068	93	68
UA3AEX	"	884	21	17
UA6LBQ	**14**	**1,126,906**	**1480**	**362**
UW1CX	**14**	**1,029,608**	**1414**	**358**
UA6APP	"	509,652	870	324
UA1AAP	"	509,020	850	310
UA3ST	"	114,791	360	191
UA3AH	"	49,530	201	130
UV3GZ	"	3,952	54	52
UA1OE	"	560	16	14
UA6RB	"	532	14	14

Estonia

UR2RAM	**28**	**34,853**	**149**	**91**
UR2JL	"	13,082	84	62
UR2QD	**14**	**1,457,752**	**1716**	**376**
UR2FQ	**14**	**1,072,692**	**1511**	**332**
UR2MG	"	1,005,296	1359	332

Kaliningrad

UA2WJ	**14**	**23,004**	**133**	**108**

Latvia

UQ2GDQ	**A**	**1,222,564**	**1505**	**329**
UQ2CR	**14**	**33,048**	**200**	**108**

Lithuania

UP2NV	**A**	**1,387,740**	**1725**	**303**
UP2AV	"	36,701	180	107
UP2BBF	"	23,496	160	89
UP2BAO	"	1,512	26	24
UP2PAD	**28**	**13,671**	**80**	**63**
UP2BBD	"	828	20	18
UP2SA	**21**	**1,002,588**	**1731**	**201**
UP2OU	**7**	**194,756**	**481**	**181**
UP2ER	**3.5**	**40,140**	**201**	**90**

Moldavia

UO5AP	**A**	**95,485**	**316**	**169**
UO5GR	21	9,512	78	58

Ukraine

UB5WE	**A**	**2,140,983**	**2180**	**377**
UB5UCJ	"	73,872	215	144
UB5ML	"	20,056	130	92
UB5ABJ	"	12,136	103	82
UB5AAQ	"	1,248	29	26
UB5LYL	"	1,189	33	29
UB5IIA	"	350	15	14
RB5ITS	**28**	**324,891**	**660**	**191**
UB5CDF	**28**	**75,565**	**225**	**127**
RB5FBB	"	72,963	242	121
RB5TBA	"	55,699	191	109
RB5IOV	"	48,600	187	100
UB5VCD	"	15,000	91	60
UB5VAZ	"	14,136	93	62
RB5TBR	"	12,354	79	58
UB5ZDM	"	6,320	56	40
UB5VCK	"	1,998	28	27
UB5VAA	"	1,218	24	21
UB5VK	"	252	10	9
UB5HDX	**21**	**110,387**	**323**	**167**
UB5ABK	**21**	**27,588**	**138**	**92**
UB5XBU	"	1,944	33	27
UT5IK	**14**	**29,151**	**163**	**123**
UT5HP	**14**	**24,428**	**133**	**124**
UB5VAW	"	10,318	107	77
UB5IHO	**7**	**71,064**	**206**	**141**
UB5WAL	"	23,652	126	81
UB5UBJ	**3.5**	**42,688**	**212**	**92**
UB5VBY	"	36,080	189	88

White Russia

UC2AFA	**14**	**731,142**	**1082**	**302**
UC2BF	**28**	**8,477**	**63**	**49**

Oceania
Australia

VK2AOI	A	75	5	5
VK2XT	**21**	**453,112**	**1020**	**152**
VK3WW	**A**	**75,970**	**250**	**107**
VK3OT	**28**	**1,504,008**	**1730**	**297**
VK3BID	"	38,610	198	65
VK4ADC	**A**	**524,595**	**880**	**205**
VK4NCH	**A**	**85,890**	**412**	**70**
VK4PJ	"	2,754	35	27
VK4VU	**28**	**268,656**	**787**	**116**
VK4LX	**28**	**165,807**	**764**	**81**
VK4NCP	"	103,155	536	65
VK5MF	**A**	**454,059**	**777**	**201**
VK5SW	"	110,799	323	117
VK6NE	**A**	**462,636**	**745**	**213**
VK6IH	"	198,000	527	132
VK6NCW	**28**	**28,560**	**119**	**85**

Guam

WB6WTA/KG6	**A**	**255,360**	**606**	**133**

Hawaii

KH6IJ	**A**	**1,760,064**	**2757**	**206**
KH6WF	**28**	**604,350**	**1327**	**153**
KH6GMP	**21**	**540,572**	**1239**	**149**
KH6XX	**3.8**	**305,080**	**471**	**115**

TROPHY WINNERS

WORLD—Single Operator, Single Band. Jack Reichert, W3ZKH Trophy. Won by: **Rafael Ponce de Leon Z., CW3BR.** (28 MHz)

WORLD—Single Operator, All Band. North Florida DX Association Trophy. Won by: **J.R. Grebnev, UA9ACN.**

WORLD—Multi-Operator, Single Xmtr. Ted Thorpe, ZL2AWJ Memorial. Awarded by Don Miller, W9WNV. Won by: **Station KP4RF. (Oprs. KP4DSD, KP4EAJ, KP4EHO, KP4EHP, KP4ES, KP4RF).**

WORLD—Multi-Operator, Multi Xmtr. Chuck Swain, K7LMU Memorial. Awarded by Don Miller, W9WNV. Won by: **Club Station UK9AAN. (Oprs. UA9AN, UA9ACZ, UA9AEN, UA9AIS, UL7LEZ, UW9BY, and 6 Assistants).**

WORLD—QRPp. Dayton Amateur Radio Association Trophy. Won by: **Station 4T8V. (Opr. Paul M. Wyse, OA8V).**

CANADA—Single Operator, Single Band. Garth Hamilton, VE2VY Trophy. Won by: **Station CG3BMV. (Opr. Yuri Blanarovich VE3BMV).** (21 MHz)

CANADA—Single Operator, All Band. Gene Krehbiel, VE7KB Trophy. Won by: **Station CG3EUP. (Opr. Garth Hamilton, VE3EUP).**

U.S.A.—Single Operator, Single Band Joe Johnson, W5QBM Memorial. Awarded by: The Richardson Wireless Klub. Won by: **Terry Baxter, N6CW.** (21 MHz)

U.S.A.—Single Operator, All Band. Bob Epstein, K8IA Trophy. Won by: **David Donnelly, K2SS.**

WORLD—Club Competition. Bud Abraham, VE1VR Memorial. Awarded by the Canadian DX Association. Won by: **Western Washington DX Club.**

WORLD—Expedition. Contest Director's Award by Bernie Welch, W8IMZ. Won by: **Station GD5CGV. (Oprs. DF7FH, DJ3BG, DJ0UP.)**

SPECIAL CQ AWARDS—STATIONS VC7WJ, W8ILC and **LG5LG.**

North American, 28 MHz. Champion, Bill VP5WW.

	Indonesia				
YB0ACT	28	1,784,079	2016	297	
YB0ACH	28	566,580	937	213	
	Midway Is.				
KM6FC	28	491,350	1103	155	
	New Zealand				
ZL1ADI	A	1,736,035	2227	257	
ZL1AGO	28	546,674	1221	157	
ZL2ACP	21	956,208	1222	264	
	Philippines				
WA4MOA/DU2	A	400,492	1147	118	
	SOUTH AMERICA				
	Argentina				
LU1HE	A	671,068	1153	254	
	Bolivia				
CP1AT	A	57,116	162	131	
CP5MP	A	22,910	107	79	
CP5NK	"	3,648	41	32	
	Brazil				
PY8HP	A	70,993	201	127	
PY3EE	"	9,600	81	40	
PY3BHB	"	7,650	55	51	
PY2FND	"	5,334	48	42	
PY5CA	"	1,824	31	24	
PY3CB	28	1,922,018	1962	329	
PY5YC	28	224,472	400	188	
PY2FOS	"	190,356	372	174	
PY1ZBJ/8	"	104,430	300	118	
PY2BZD	"	101,126	294	118	
PT7WA	"	13,224	78	58	
PY5EG	21	979,040	1150	290	
PY1DHN	21	50,490	183	99	
PY2FUP	7	39,680	95	80	
PYZWAM	3.5	4,680	33	30	
	Chile				
CE3BYL	14	126,898	322	134	
	Colombia				
HK6CPI	A	1,176	22	21	
HK4YR	28	1,068,500	1442	250	
	Easter Is.				
CE0AE	A	3,330	37	30	
	Ecuador				
HD1A	A	2,119,488	2138	332	
		(Opr. WA4UAZ/HC1)			
HC1EE	A	1,527,550	1797	274	
HC1AK	"	140	7	7	
HC1BI	28	160	8	8	
HC1BU	21	549,249	830	223	
	French Guiana				
FY7BC	28	165,150	392	150	
	Neth. Antilles				
PJ2FR	28	950,386	1248	257	
	Paraguay				
ZP5RS	A	37,539	140	97	
	Uruguay				
CW3BR	28	3,203,514	2992	361	
	Venezuela				
OA4PQ/YV5	A	350,488	622	193	
YV5DDY	"	100,485	234	145	
YV4GD	28	482,295	689	237	
YV5CVE	21	1,947,996	2118	306	
YY4YC	14	1,848,396	1731	363	
YV5EED	"	16,905	85	69	

MULTI-OPERATOR SINGLE TRANSMITTER

United States			
K4VX	4,150,443	2752	519
K1RU	1,918,660	1624	430
N4KE	1,678,616	1561	424
K3UA	1,456,512	1441	384
N2WT	1,424,256	1400	384
W6YRA	890,442	1419	222
K8XX	836,400	936	340
WN8QII	521,532	917	297
W4SME	334,305	514	255
W6CN	143,836	362	154
WB0BMB	139,594	380	182
WB6JOD	98,070	354	105
NORTH AMERICA			
KP4RF	6,113,910	5164	485
CG3AKG	4,607,410	3394	470
XK6WQ	3,233,615	3295	385
VB3KRK	3,073,152	2730	424
VP9IB	2,222,766	3141	322
VE6ASI	1,275,309	1782	279
VE8CFS	604,428	911	241
4A1EM	597,456	1083	216
FP0BG	481,714	925	214
CG4VV	321,594	772	186
AFRICA			
CT3/OH2BC	4,377,450	3619	385

JA3YKC	673,876	839	287
JA3YOO	650,832	853	273
JA6YFT	592,036	720	283
JA8YAU	544,224	754	275
JA3YEJ	2,697	35	31
EUROPE			
YU2CDS	4,204,970	3456	430
LG5LG	3,720,392	3295	431
EI1AA	3,446,993	3088	451
DT7DK	3,334,222	3001	422
OK1KCU	2,766,252	2830	348
HG5A	2,647,984	2681	359
PA2TMS	2,487,608	2269	424
HA9KOB	2,446,096	2540	391
DL0JK	2,304,264	2393	402
GD5CGV	2,079,879	2244	381
G8JC	2,050,290	2330	327
4U1ITU	1,865,924	2030	386
SP6PZB	1,792,800	1908	360
DL0UE	1,789,259	1778	379
OG2AA	1,718,360	1887	380
SP5PWK	1,664,640	1902	320
SK7CE	1,526,430	1625	365
OH4RH	1,492,161	1860	309
SK7HW	1,393,204	1353	379
YU4EXA	1,147,392	1331	384
LZ2KIM	1,107,227	1312	341
SM7WT	1,044,024	1272	328
SK3HK	901,824	1189	308
SP9KRT	811,078	1100	283
SK6CM	802,256	1162	266
DA4CC	796,290	1057	285
HA6KVB	792,745	1132	331
TF3IRA	774,473	1392	301
HA3KNA	646,866	976	297
HA7KLG	643,314	1012	289
OK3KAP	588,775	907	275
HA4KYH	347,415	667	265
HA5KKN	340,032	698	253
OK1KKH	268,570	576	235
DM4ZA	242,550	700	225
HA5KHE	223,300	602	203
ON7YL/P	179,760	477	214
DM4IH	174,932	506	202
DM4YK	169,233	434	197
HA3KHC	160,680	510	195
LJ2L	150,744	358	132
HA5KDW	144,976	451	208
OK2KZT	127,970	375	191
OH2IO	126,882	352	159
OK1KCI	119,972	393	178
OK3KWK	100,024	297	188
DM4NJ	94,710	330	165
OK3KJJ	71,920	300	145
GB3CCL	66,930	266	115
GU3HFN	58,190	238	115
DT6AJ	45,994	212	122
OK1KTW/P	45,368	235	106
SP9PDF	36,848	191	94
OK3KFO	24,600	144	100
DT4JA	22,784	129	89
SK6HA	20,713	133	77
OK3RMW	19,805	139	85
YU1ECD	18,848	108	62
LZ1KWZ	15,678	132	67
OK2KWI	9,408	81	64
OK1OXP	5,136	68	48
OK1KOB	4,859	58	43
YO8KAN	2,520	45	35
OCEANIA			
KH6JMK	1,720,030	2566	202
ZL2AH	125,818	349	133

U.S.S.R. CLUB STATIONS

ASIA			
UK9UAO	1,031,213	1593	307
UK9WBI	654,094	1010	266
UK9HAC	642,026	1190	242
UK9FAA	623,004	811	269
UK9SAZ	69,405	229	105
UK9MAB	22,270	111	96
UK0SAV	137,440	444	160
UK7AAH	35,144	139	92
UK6FAA	13,260	94	60
UK7JAC	928	20	16
EUROPE			
UK6APA	4,700,904	3763	456
UK3ABB	4,021,245	3652	405
UK2GKW	3,333,360	2910	430
UK6LAZ	3,234,873	2870	453
UK5MAF	2,643,210	2684	387
UK5IAZ	2,322,340	2411	415
UK6LEZ	2,095,920	2271	360
UK2BBB	1,921,616	2190	332
UK4WAR	1,908,160	2286	335
UK3AAC	1,555,671	1869	353
UK4WAB	1,435,704	1787	326
UK3ABO	1,227,741	1476	317
UK4FAV	992,073	1288	347
UK3ACW	987,477	1250	303
UK3NAA	869,000	1221	316
UK2PCR	779,400	1296	300
UK4LAC	740,491	1277	311
UK5EAQ	682,005	1062	285
UK5QAV	680,130	1082	330
UK2BAG	650,796	991	281
UK4PCF	387,942	724	249
UK2FAD	216,920	480	220
UK2BAS	194,220	422	166
UK1NAD	187,575	609	205
UK2PRC	186,912	418	177
UK3QBM	152,810	437	185
UK3AAH	113,960	343	154
UK5QBE	99,756	330	163
UK3YAV	69,720	300	140
UK5HAB	61,438	185	139
UK2RAQ	57,815	236	155
UK6LKP	50,715	200	115
UK3WAF	50,432	218	128
UK3XAK	49,256	237	131
UK3DBV	47,946	206	131
UK3TBF	36,462	169	103
UK5VBB	35,640	146	108
UK3ACM	31,668	137	91
UK5WAA	26,362	145	98
UK2IAJ	16,856	136	86
UK2AAG	14,688	90	72
UK4UAC	14,364	103	76
UK4YYY	11,376	102	79
UK3DAU	4,840	49	44
UK3DBT	3,906	48	42
UK3TAY	3,388	57	44
UK5UBB	3,100	36	31
UK6AJN	975	23	15
UK2AAA	312	14	13
UK5WAZ	234	14	13

MULTI-OPERATOR MULTI-TRANSMITTER

WORLD-WIDE

UK9AAN	10,702,776	7063	532
VC7WJ	9,389,696	7396	436
OG1AA	6,629,483	5122	497
KL7HR	4,877,882	4673	386
DX4JA	3,788,515	3727	335
PP5CIT	1,764,158	2129	374
KG6FAE	1,483,398	2607	193
KG400	1,354,934	2028	238

JA1YFL	832,120	1088	293
JA2YFY	296,424	533	207
SK1AQ	124,542	291	153
SP6PAZ	77,816	268	142

The following station logs were used for cross-checking. Check logs are always appreciated. Thank you.
CT1LV, CX9CO, DM6AC, DT4SI, KL7IRT, KP4KK, LA9CT, OX3XM, RA9FBZ, SL6BF, SM1CXE, SP5ELA, UA3TCI, UA3XAN, UA6LXZ, VE3IPR, WA1ORP, W6OJW, W7IM, W8EWS, WA8WXT, WB8TJS, WD8CIQ, WD8ILM, WA9GFR, W0WUU, YO4BZC, and SWL Stations: France—REF 22-725; Portugal—CT0447.

STATION OPERATORS

Multi-Operator, Single-Transmitter

K4VX & CX1EK/W4, K3EST. **K1RU** & K1YXK. **N4KE** & W4FDA, N4UF. **K3UA** & WA3JFW. **N2WT** & WA2SFB, N2RN. **W6YRA**: N6KN, WA6TKO, WB6WKY, WD6BAY. **K8XX** & WD8NLS. **WN8QII** & K8HLT, K8JK, K8US, N8VT, WB8LFO, WB8PYZ, WD8AQI, WD8LIU, WD8OFG. **W4SME** & W4BSO. **W6CN** & WA6DCT. **WB0BMB** & WB0TNY, WB0YBC. **WB6JOD**: WA6OSQ, WB6CJE, WD6DXH, W6LC. **KP4RF** & KP4DSD, KP4EAJ, KP4EHO, KP4EHP, KP4ES. **CG3AKG**: VE3AKG, VE3BVD, VE3KZ. **XK6WQ**: VE6KW, VE6WQ. **VB3KRK**: VE3EDC, VE3HFS, VE3JAY, VE3KRK. **VP9IB** & VP9IV, G4BKI/VP9. **VE6ASI** & VE6JA. **VE8CFS** & 1 Opr. **4A1EM**: XE1EM, XE1VOZ. **FP0BG**: WB2RLK, VE1AIH. **CG4VV**: 5 Oprs. **CT3/OH2BC** & OH2BH. **JA3YKC**: JA3ODC, JA3REU, JA3UPK, JE3MXQ, JH3JRB, JH3PKS, JH3PRR, JR3KEG. **JA3YOO**: JE3SEN, JE3TYR, JF3KFS, JF3SEL, JF3SWV, JR3MIU. **JA6YFT**: JH6NAC, JH6OKN, JH6RNJ, JR6LBE. **JA8YAU**: JA8FPX, JA8UXL. **JA3YEJ**: JE3RGF, JR3IRR, JR3STC. **YU2CDS**: YU2CT, YU2RMN, YU2RNC, YU2RQX, YU2RTM. **LG5LG**: SM0GNU, SM0GMG. **EI1AA**: EI2BB, EI2CN, EI3CP, EI6CW. **DT7DK**: DM2AYK, DM2CEK, DM2DUK. **OK1KCU**: OK1AGN, OK1AHV, OK1AVU, OK1JST. **HG5A**: HA5FM, HA5FN, HA5GF, HA5HO, HA5ML. **PA2TMS** & PA2161, PA3347. **HA9KOB**: HA9PV, HA9RB, HA9RU + 1 Opr. **DL0JK**: DF7FR, DK1DU, DK2XX, DK6FT, DK8ZL. **GD5CGV**: DF7FH, DJ0UP, DJ3BG. **G8JC**: G3TQD, G3TQZ, G3UMV, G4BYB, G4DXD, G8ASO. **4U1ITU**: DL7RT, DL7SP, DC7GL. **SP6PZB**: SP6FAF, SP6FIH. **DL0UE**: DF2OK, DF2OU, DJ4GO, DL3LU, DL7BI, DL8RL, DD3OR. **OG2AA**: OH2BNJ, OH2BNP, OH2BQS, OH2BQZ, OH2BRW, OH2DS. **SP5PWK**: SP5BSV, SP5BT, SP5CIC, SP5CJT, SP5CLK, SP5DER, SP5DZI. **SK7CE**: SM7BGK, SM7ECM, SM7EQL, SM7FJE, SM7GWN. **OH4RH** & OH4OO. **SK7HW**: SM7BUR, SM7DBD, SM7EKU, SM7IFK, CX1AAC. **YU4EXA**: YU1OIF, YU1OIQ, YU4BT, YU4VDM, YU4VFO, YU4VKZ, YU4VPA. **LZ2KIM**: 3 Oprs. **SM7WT** & Group. **SK3HK**: SM3AFR, SM3CER, SM3DXC. **SP9KRT**: SP9FKQ, SP9HMF. **SK6CM**: SM6CJK, SM6COZ, SM6CYU, SM6EOI. **DA4CC** & DA1BD, DA1GR, DA1QS, DA2AA. **HA6KVB**: 4 Oprs. **TF3IRA**: TF3CW, TF3JB, TF3KB, TF3KX, TF3SB, TF3TF, TF3UA, TF3US, TF3YH. **HA3KNA**: HA3NS & 6 Oprs. **HA7KLG**: 5 Oprs. **OK3KAP**: OK3CGI & Club Group. **HA4KYH**: HA4XX, HA4YO,HA4YQ. **HA5KKN**: HA5KN & 4 Oprs. **OK1KKN**: OK1VY & Club Group. **DM4ZA**: DM4VZA, DM4WZA. **HA5KHE**: HA5NQ, HA7SU, HA7UI, & 2 Oprs. **ON7YL/P** & ON5CC, ON5ZB, ON5ZW, ON6XN. **DM4IH**: DM2AUH, DM4PIH, DM4WIH. **DM4YK** & DM4YYK. **HA3KHC**: 4 Oprs. **LJ2L**: LA5SH, LA7ZN. **HA5KDW**: HA5KI, HA7SQ. **OK2KZT**: OK2BIQ, & Club Group. **OH2IO** & 1 Opr. **OK1KCI:** Club Group. **OK3KWK**: OK3TEI & Group. **DM4NJ**: DM4QNJ, DM4VNJ. **OK3KJJ**: OK3CKY & Group. **GB3CCL**: G3FVC, G4ALG. **GU3HFN**: GU3MBS, GU4ASO, GU5CIA (K5MM), GU8OVO. **DT6AJ**: DM6NAJ, DM6OAJ. **OK1KTW/p**: OK1AAE & Group. **SP9PDF**: SP9BMQ, SP9-2712. **OK3KFO**: OK3CXW & Group. **DT4JA** & DM4YJA. **SK6HA**: SM6HIO, SM6HLZ, SM6HYE, SM6IBF. **OK3RMW**: OK3YCM & Group. **YU1ECD**: 2 Oprs. **LZ1KWZ**: Club Group. **OK2KWI**: OK2-26672 & Group. **OK1OXP**: Club Group. **OK1KOB**: Group. **YO8KAN**: YO8ME, YO8MI. **KH6JMK** & KH6HIF, KH6JEO, KH6JKP, KH6JRX. **ZL2AH** & 1 Opr. **UK9UAO**: UA9UGS, UA9UTV, UA9-130137. **UK9WBI**: UA9WO, UW9WR, UA9-084508. **UK9HAC**: UA9HBH, UA9HBQ, UA9-158377. **UK9FAA**: Club Group. **UK9SAZ**: 3 Oprs. **UK9MAB**: 2 Oprs. **UK0SAV**: 3 Oprs. **UK7AAH**: RL7AAV, UL7-17979, UL7-179111. **UK6FAA**: UF6-01274, UF6-012284. UK7JAC: 3 Oprs. UK6APA: UA6APH, UA6APL, UA6APW, UA6ARA. **UK3ABB**: UA3ABZ, UA3AEX, UA3AGF, UA3XAC, UV3CC, UA3-170834, UA3-170888. **UK2GKW**: UQ2ON, UQ2-03783, UQ2-0371035. **UK6LAZ**: UB5-073113, UB5-073470, UA6-101152, UA6-150262. **UK5MAF**: UB-5MAK, UB5MDC, UY5LK, UB5-059200, UB5-059577, UB5-0592, UB5-05922. **UK5IAZ**: RB5IXF, UB5IDZ, UB5-073342, UB5-073474, UB5-0731151, UB5-0731619. **UK6LEZ**: 6 Oprs. **UK2BBB**: UP2BAS, UP2BAO, UP2BAV, UP2BBB, UP2MB, UP2-038422. **UK4WAR**: 8 Oprs. **UK3AAC**: RA3ACE, UA3AAH, UA3AGX, UA3-170352. **UK4WAB**: 3 Oprs. **UK3ABO**: UV3GM, UA3-170189, UA3-170796. **UK4FAV**: UA4FBL, UA4FCM, UA4-148273. UA4-148286. **UK3ACW**: UA3AAU, UA3ABD, UA3ADO, UA3ADY, UA3AEZ, UA3-170499. **UK-3NAA**: 4 Oprs. **UK2PCR**: UP2PAV, UP2PCI, UP2BCR, UP2BCT, UP2BDF, UP2BEG, UP2-038728, UP2-0381541. **UK4LAC**: UA4LAR, UA4-164212, UA4-164213. **UK5EAQ**: 5 Oprs. **UK5QAV**: 6 Oprs. **UK2BAG**: UP2BAA, UP2BZ, UP2DT. **UK4PCF**: 3 Oprs. **UK2FAD**: UA2-125206, UA2-125411, UA2-125465. **UK2BAS**: UP2PAJ, UP2-038609. **UK1NAD**: UA1NAY, UN1-0884, UN1-088384. **UK2PRC**: UP2-038517, UP2-038829. **UK3QBM**: UA3QBX, UA3QDR, UA3QDW. **UK3AAH**: UA3ACV, UA3DHH, UA3DNK. **UK5QBE**: Club. **UK3YAV**: 3 Oprs. **UK5HAB**: UB5HBB, UB5-07173, UB5-071330. **UK2RAQ**: 4 Oprs. **UK6LKP**: UA6LLT, UA6-150330, UA6-150331. **UK3WAF**: 3 Oprs. **UK3XAK**: Club. **UK3DBV**: 3 Oprs. **UK3TBF**: 3 Oprs. **UK5VBB**: UB5VBM, UB5-0664. **UK3ACM**: 3 Oprs. **UK5WAA**: UB5WCJ, UB5-068420, UB5-068443. **UK2IAJ**: UC2ICK, UC2-00852, UC2-00883. **UK2AAG**: UC2-009105, UC2-009490, UC2-009496. **UK4UAC**: 3 Oprs. **UK4YYY**: Club. **UK3DAU**: 2 Oprs. **UK3DBT**: Club. **UK3TAY**: UA3TBK, UA3-122727, UA3-122729. **UK5UBB**: UB5-065271, UB5-065750. **UK6AJN**: UA6AJG, UA6-1011538. **UK2AAA**: 3 Oprs. **UK5WAZ**: UT5DL & Club.

MULTI-OPERATOR, MULTI-TRANSMITTER

UK9AAN: UA9AN, UA9ACZ, UA9AEN, UA9AIS, UL7LEZ, UW9BY, Assistants—UA9AGR, UA9AIT, RA9AIL, UA9-165965, UA9-1651289, UA9-1651290. **VC7WJ**: VE7CGY, VE7KE, VE7WJ, VE7ZZ, K7SS, K7TU, W5XZ, W7EJ, W7NG. **OG1AA**: OH1HU, OH1IG, OH1LW, OH1MD, OH1NH, OH1NM, OH1TV, OH3ZE. **KL7HR** & KL7CBT, KL7FAP, KL7IAK, KL7IUM, KL7IVE, KL7IVO, KL7IWE, KL7IXZ, KL7IYB, KL7RA, KL7UN, 2 Cptr Techs. **DX4JA**: JA6AQ, JA6BGA, JA6CNL, JA6RJK, JA6SVP, JA6UBK, JA6UKR, DU1GF, DU1ROD. **PP5CIT**: PP5AAG, PP5AD, PP5AIM, PP5AJ, PP5BR, PP5CAX, PP5MQ, PP5NL, PP5WAL, PP5WB, PP5WBW, PP5ZZ, 1 Swl. **KG6FAE**: KG6JIA, KG6JIB, KG6JIL, KG6JIR, KG6JJI, WA0JRZ, WB4MIB, WB5MNB, WB5PMQ, WD8OUZ. **JA1YFL**: JA0JCJ, JR2BNF. **JA2YFY**: 10 Oprs. **SK1AQ**: SM1CJV, SM1CXE. **SP6PAZ**: SP6JYQ, SP6HEK. **KG4OO** & WG4BL, WG4DI, KG4XX + 1 op.

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

When you search your soul it's a lonely road—
That wanders the path of time,
But when you search out DX and its mysteries
There are others who want to know."
(Author Unknown)

Effective Jan. 1, 1979, the *CQ* DX Department, in cooperation with the *CQ* DX Awards Advisory Committee, is announcing the most challenging DX award of the next decade *Five Band WAZ*.

Applicants who succeed in presenting proof of contact with the 40 zones of the world on the 5 high frequency bands; 80, 40, 20, 15 and 10 meters, will receive an engraved plaque in recognition of this achievement. Further, as this will be an arduous task requiring much dedication and hard work, and may be very difficult except for the most skilled and well-equipped DXers, primarily due to the problem in working all zones in the 3.5 MHz band, CQ's 5-Band WAZ will be a 2-step award. The first step will be within the capability of most DXers, the second step will be bridged with endorsement stickers.

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

*Here is Geoff Watts reading the February, 1977 issue of **CQ** which announced his election to the prestigious DX Hall of Fame. Geoff has been Editor and Publisher of the DX News-Sheet for over 15 years and founded the Islands-On-The-Air (IOTA) award. His home QTH is in Norwich, Norfolk, England.*

The first step in the 5-Band WAZ program will be to contact and confirm 100 zones on any combination of the 80, 40, 20, 15 and 10 meter bands. For example, 40 zones on 20 meters, 40 zones on 15 meters plus 20 zones on 10 meters, or 20 zones on each of the 5 bands, or any similar combination. A handsome certificate will be awarded to each DXer submitting proof of contact with 100 zones, after which an endorsement sticker will be issued for each additional 10 zones. Beginning at the 150 zone level, an Honor Roll will be established for those intrepid DXers working toward the ultimate goal of 200 zones and a full 5-Band WAZ. Honor Roll standings may be submitted in any number.

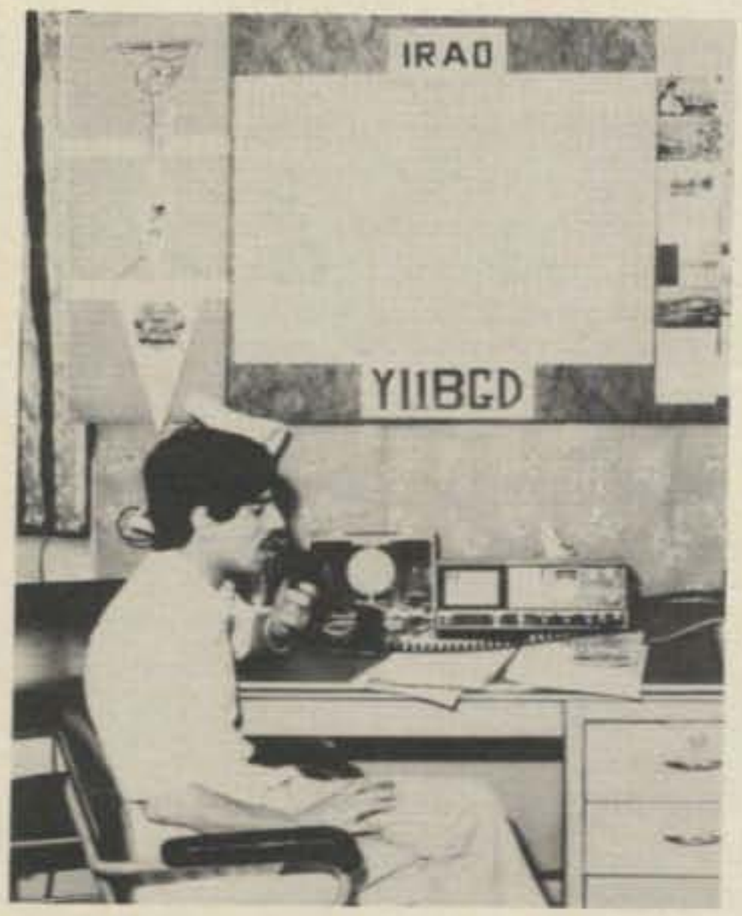
Five-Band WAZ will be offered for any combination of c.w., s.s.b., phone or RTTY contacts, mixed mode only. Separate awards will *not* be offered for the different modes. Contacts must be made after 0000 GMT, Jan. 1, 1979. Proof of contact shall consist of proper QSL cards checked *only* by the WAZ Award Manager. The following overall rules apply to the 5-Band WAZ Award Program:

1. The official CQ WAZ Zone Map, and the printed zone list which follows these rules, will be used in determining the zone in which a station is located.

2. Confirmations must be accompanied by a list of claimed zones showing the call letters of the station contacted within each zone. The list should also clearly show the applicant's name, call letters, and complete mailing address.

3. All contacts must be made with licensed, *land based*, amateur stations operating in authorized amateur bands.

4. All contacts submitted by the ap-



Majid, YI1BGD, using an Atlas radio, giving the DX community the long awaited "YI" QSO. QSL via R.C. Baghdad, Scientific Center, P.O. Box #5864, Baghdad, Iraq. (Photo courtesy, Harvey, W2IYX, LIDXA)

Henri, FB8ZM located on Amsterdam Island, shown here whitling down the ever present pile-up. QSL's go to W4LZZ, (Photo courtesy Jack, W2LZX)

The WAZ Program
Single Band WAZ
15 Meter C.W.

6 . . . JA4DLP
7 . . . JE1HJJ

20 Meter C.W.

57 . . . W2LZX
. . .

15 Meter Phone

6 . . . JA4CUY
. . .

20 Meter Phone

158 . . . K4PHE
159 . . . LU7MAL
160 . . . N8JW
161 . . . I7RNH
162 . . . WB4QGI
163 . . . VE3MV
164 . . . K7RS
165 . . . WB4IUX
166 . . . K5UR
167 . . . G3TOE

All Band

1505 . . . K6EDA
1506 . . . I5PAC
1507 . . . CX3BR
1508 . . . CX6AM
1509 . . . I1JS
1510 . . . W8GIO
1511 . . . WB4EDD
1512 . . . WB8IAY
1513 . . . N5FG
1514 . . . K5TVC
1515 . . . W7ELU
1516 . . . OZ2QL
1517 . . . G4DJC
1518 . . . WA8AHU
1519 . . . VO1CU
1520 . . . VE4SW

C.W. Phone/Mixed

4324 . . . YU1GMN
4325 . . . JE1HJJ
4326 . . . JA2TK
4327 . . . K6RSY
4328 . . . PA0CLN
4329 . . . LU7XP
4330 . . . JA4PPR
4331 . . . F8QB
4332 . . . N0EL
4333 . . . WA0TKJ
4334 . . . YU2RVL
4335 . . . SM0DJZ
4336 . . . VE6CV
4337 . . . OK1WT
4338 . . . W1AGA
4339 . . . N5FG
4340 . . . N9OK
4341 . . . WB8AAX
4342 . . . N4HU
4343 . . . OK1XN
4344 . . . OK3KAG
4345 . . . EA2OP
4346 . . . ON4JV
. . .

All Phone

544 . . . I1PAC
. . .

The complete rules for all WAZ awards 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 Awards Manager, 1044 S.E. 43rd St., Cape Coral, FL 33904.

plicant must be made from within the same country. It is recommended that each QSL clearly show the station's zone number.

5. Any altered or forged confirmations will result in permanent disqualification of the applicant.

6. Include with the application a $3.00 processing fee plus a self-addressed envelope with sufficient postage stamps or international reply coupons to return the QSL cards by the class of mail service desired and indicated. International reply coupons equal in redemption value to $3.00 are acceptable. (At the 1978 rate of 20¢/IRC, 15 coupons would be required.)

7. Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of this award will be final.

8. All applications should be sent to the WAZ Award Manager or to *CQ* Magazine.

9. Zone maps, printed rules and application forms are available from the WAZ Award Manager or from *CQ* headquarters. Send a self-addressed, stamped envelope or a self-addressed envelope and 2 international reply coupons.

The following list of zones is presented as a guide. Any questions will be decided by the zone map. For rulings on borderline areas, consult the WAZ Award Manager.

Zone 1. Northwestern Zone of North America: KL7, VE8-Yukon, the VE8-Northwest Territories Districts of Mackenzie and Franklin, and the islands west of 102° including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northwestern Zone of North America: VO2-Labrador, that portion of VE2-Quebec north of the 50th parallel, and a portion of the Northwest Territories-VE8 east of longitude 102°. The latter includes part of the District of Franklin and the islands of King William, Prince of Wales, Somerset, Bathurst, Devon, Ellesmere, Baffin and the Melville and Boothia Peninsulas.

Zone 3. Western Zone of North America: VE7, W6 and the W7 states of Arizona, Idaho, Nevada, Oregon, Utah and Washington.

Zone 4. Central Zone of North America: VE3, VE4, VE5, VE6, the W7 states of Montana and Wyoming, WØ, W9, W8 (except W. Va.), W5 and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America; FP8, VE1, VO1, that portion of VE2-Quebec south of the 50th parallel, VP9, W1, W2, W3, the W4 states of Florida, Georgia, South Carolina, North Carolina, and Virginia, and the W8 state of West Virginia.

Zone 6. Southern Zone of North America: XE and XF.

Zone 7. Central American Zone: FO8-Clipperton, HP, HR, KS4, KZ5, TI, TI9, VP1, TG, YN and YS.

Zone 8. West Indies Zone: CM/CO, C6A, FG7, FM7, HH, HI, J3, KG4, KP4, VP2, VP5, KC4-Navassa, PJ2M/FS7, PJ2E, PJ2S, and YVØ-Aves.

Zone 9. Northern Zone of South America: FY7, HK, PJ2, PZ, 8R, 9Y4, and YV.

Zone 10. Western Zone of South America: CP, HC, HC8, and OA.

Zone 11. Central Zone of South America: PY and ZP.

Zone 12. Southwest Zone of South America: CE.

Zone 13. Southeast Zone of South America: CX, LU, VP8 and Antarctic prefixes.

Zone 14. Western Zone of Europe: CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HB, LA, LX, ON, OY, OZ, PA/PI, PX, SM/SL, ZB2, and 3A2.

Zone 15. Central European Zone: FC, HA, HV, I, IT, IS, OE, OH, OK, SP, UA2, UP, UQ, UR, YU, ZA, ZB1/9H1, 9A1.

Zone 16. Eastern Zone of Europe; UA1, UA3, UA4, UA6, UA9-Bashkir & Chkalov, UB5, UC2, UN1, and UO5.

Zone 17. Western Zone of Siberia: UA9-Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotav, Omsk, Tyumen, plus UH8, UI8, UL7, and UM8.

Zone 18. Central Siberian Zone: UA9-Novosibirsk, Tomsk, Kamerovo, and Altai; UAØ-Krasnovarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

Zone 19. Eastern Siberian Zone: UAØ-Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangle Island, and the Soviet Kuriles.

Zone 20. Balkan Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.

Zone 21. Southwestern Zone of Asia: EP, HZ, MP4, 9K, VS9 (except Maldives and Socotra), YA, YI, 4W1, UD6, UF6, UG6, and AP-West Pakistan.

Zone 22. Southern Zone of Asia: AC3, AC5, CR8, 4S7, VU (except Andaman and Nicobar Islands), 9N1, and S. Bangladesh.

Zone 23. Central Zone of Asia: AC4, the BY provinces of Sinkiang, Kansu, and Hinghai, JT1, and UAØ-Tanna Tuva.

Zone 24. Eastern Zone of Asia: BY (except the provinces in Zone 23), BV,

They rolled out the red carpet in Helsinki for Doc Rosen, WA2RAU. Left to right are Doc; Miiko, OH2BAD; Leena, OH2BE (XYL of OH2BH); Martti, OH2BH; Art, WA4NTP; Ville, OH2MM; and Armes, OH2NB. After confirming YI1BGD, Doc has worked them all and WA2RAU is at the top of the Honor Roll.

CR9 and VS6.

Zone 25. Japanese Zone: HL/HM, JA/KA, and KR6.

Zone 26. Southeastern Zone of Asia: HS, XV, XW, XZ, 3W8, and VU2-Andaman and Nicobar Islands.

Zone 27. Philippine Zone: DU, KC6, and KG6.

Zone 28. Indonesian Zone; CRØ, VR4, VK9 (except Nauru, Norfolk Is. and Christmas Is.), VS5, 8F, and 9M.

Zone 29. Western Zone of Australia: VK6, VK8, and VK9-Christmas Is.

Zone 30. Eastern Zone of Australia: VK1, VK2, VK3, VK4, VK5, VK7, and VKØ-Macquarrie Is.

Zone 31. Central Pacific Zone: KB6, KH6, KJ6, KM6, KP6, KW6, KX6, VK-Nauru, VR1, VR3, and ZM7.

Zone 32. New Zealand Zone: FK8, FO8, (except Clipperton), FU8/YJ, KS6, VK9-Norfolk Is., VR2, VR5, VR6, ZK1, ZK2, ZL, and 5WI.

Zone 33. Northwestern Zone of Africa: CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.

Zone 34. Northeastern Zone of Africa: ST, SU, and 5A.

Zone 35. Central Zone of Africa: CR4, CR5-Guinea, EL, TU, TY, TZ, XT, ZD3, 5N2, 5U, 5V, 6W8, 9G1, and 9L1.

Zone 36. Equatorial Zone of Africa: CR5-Sao Thome, CR6, EAØ, TJ, TL, TT, TN, TR, 9Q5, 9U5, 9J, ZD7, and ZD8.

Zone 37. Eastern Zone of Africa: CR7, ET2, ET3, FL8, 6O1, 6O2, 5H3, 5X5, 5Z4, and 7Q7.

Zone 38. South African Zone: ZD9, ZE, and ZS.

Zone 39. Madagascar Zone: FB8, 5R8, FR7, VQ8, VQ9, and VKØ-Heard Is.

Zone 40. North Atlantic Zone: LA-Jan Mayen, LA-Svalbard, OX, TF, and UA1-Franz Joseph Land.

The KA Callsign Problem

Since the 1940's, U.S. Forces personnel in Japan have been issued callsigns with the prefix, KA, in 2X1, 2X2, or 2X3 format by the military authorities. There are presently assigned stations using KA1, KA2, KA3, KA5, KA6 and KA8 prefixes.

In 1978, the FCC began issuing KA prefix callsigns to stations within the 48 contiguous states, resulting in a major QSLing problem. The Far East Auxiliary Radio League (FEARL), which handles cards for U.S. Forces personnel in Japan, reports that its QSL Bureau has received many QSLs for stateside KA stations. As the FEARL Bureau has only limited funds it is returning these cards to the states by bulk mail which delays their delivery.

FEARL asks that, until a permanent solution is found, all QSLs for KA stations should be clearly marked to show whether it is destined for Japan (APO or FPO address), or to a stateside station.

Anyone with suggestions for correcting or relieving this problem is asked to contact Ralph H. Fellows IL, KA2RF, Box 2785, APO San Francisco, CA 96328.

HM3LR has confirmed the Republic of Korea for many lucky DXers on both phone and c.w. If you work him, QSL via WA6OET. (Photo via K6XP)

"It's 2000 GMT and things are jumping on 20. Right on 14237 is Stan. WB2AYP in QSO with another African station. I interrupted their rag chew with 'Break, break, WB2AYP this is TT8SM, do you read? Over." No response so maybe I wasn't getting into the states after all. 'Break, break, WB2AYP this is TT8SM, do you read, over?' Then the reply, 'Stand by breaker, will pick you up in a minute.' At least I knew I was getting into the states at last. Stan and the other station kicked it back and forth another minute till finally 'OK, lets stand by and see who the breaker is, go ahead breaker.' I came back 'Roger, WB2AYP this is TT8SM, do you read? over.' For a few seconds no answer, no come back, no nothing. 'QRZ, would you please repeat your call?' And, 'Roger, Stan this is TT8SM, how do you copy?' Followed by 'TT8SM I copy you fine, but I don't believe it, a TT8 on the air.' We chatted for a while, then passed it to the other African station who was my second contact, after which we stood by to see if any other station on frequency wanted to work a TT8. I have never heard such a pileup in my life. It seemed that the whole world was on one frequency howling to work Chad. The receiver just wouldn't handle it and I finally had to shut down for some sleep after asking Stan to have a sked set up for 1900 hours Zulu the next day.

"When I came on at sked time the pack was waiting and I set out to see how many I could work in the shortest possible time. I tried every type of operation I could imagine. Lists, free for all, call areas, you name it, I tried it. Many people don't like lists, but at times that is the only way to get through to the states. The W/K's are 5 by 7 but the Europeans on the north/south path are 60/9. At those times I would take one list from the states and another list from Europe. Split frequency operation would have been much better but no equipment.

"A few times when skip was short I would have a ragchew. On one occassion a TJ, a U6, a 7X and myself had a 4-way roundtable for 30 minutes, but when

The CQ DX Awards Program

S.S.B.

596 . . . F5GW
597 . . . W2HAC
598 . . . EA6DE
. . .

C.W.

321 . . . K7RI
322 . . . N5FG
323 . . . W4OEL
. . .

S.S.B. Endorsements

310 . . . W9DWQ/315
310 . . . W4EEE/314
310 . . . VE3MJ/313
310 . . . IØZV/311
300 . . . K6JG/309
300 . . . F2MO/308
300 . . . ZL1AGO/303
275 . . . OE3WWB/288
275 . . . N6AW/283
275 . . . JH1VRQ/282
150 . . . WB3HAZ/159
. . .

C.W. Endorsements

300 . . . W9DWQ/306
300 . . . K6JG/305
300 . . . N6AV/303
250 . . . W4OEL/268

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.

This unusual view looks over the shoulder of Helmut Baumert, DL1QT, one of Germany's most active prefix hunters and contest stations. Almost every DXer's wall has Helmut's card. (Photo courtesy Bob, K6XP)

The WPX Honor Roll

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

Mixed

1745	W4WV	1350	K2VV	1062	DL1MD	902	K6DT
1683	K6JG	1346	W4BQY	1055	I6SF	872	DL1CF
1651	F9RM	1302	PAØSNG	1030	W8CNL	859	W4BYU
1650	K6XP	1258	K5UR	1028	W6ISQ	849	G3DO
1501	YU2DX	1254	W9FD	1025	N4NO	848	I3ANE
1477	VE3GCO	1250	WB4KZG	1020	IØJK	844	WØSD
1476	ON4QX	1229	AA4A	1016	SM7TV	831	JA1AG
1475	W2NUT	1208	N6CW	1015	WØSFU	827	JH1VRQ
1433	W9DWQ	1200	N6AV	1008	WA1JMP	814	PY4OD
1431	W3PVZ	1181	W8ROC	1000	SM6DHU	811	W9WHM
1428	W7LLC	1133	N2AC	960	K4KQB	811	YU3EY
1428	N4MM	1123	I2PHN	950	W4IC	811	W6NJU
1428	W2NC	1107	WØAUB	949	WA6TAX	807	W9ZTD
1425	YU1BCD	1100	YU1AG	923	K5DB	807	WA2AUB
1368	W8LY	1094	WAØKDI	918	YU1ODS	803	N6JM
1358	W4CRW	1081	N6JV	906	W3YHR	793	W6ANB
1350	DJ7CX	1070	K6ZDL	902	K7NHG	791	IT9AGA

782	K8LJG						
782	K2ZRO						
782	YU4EBL						
750	K8UDJ						
749	WA5LOB						
749	CT1LN						
735	PY4AP						
733	KØBLT						
713	WA6EPQ						
706	PAØVB						
705	UA3FT						
622	OE6RP						
600	WB9CGL						

S.S.B.

1547	F9RM	1124	PAØSNG	941	WB2NYM	818	W3DJZ
1540	W4UG	1107	ZL3NS	923	CT1PK	817	OK1MP
1505	IØAMU	1086	HP1JC	916	IT9JT	801	YU1AG
1415	K6JG	1059	WB4SIJ	909	PY3BXW	800	W4IC
1374	IØZV	1050	K2VV	900	WB4KZG	783	K8SQE
1263	I8KDB	1034	K5UR	896	DJ7CX	765	G3DO
1250	N4MM	1033	DL9OH	889	OE2EGL	765	W2NC
1200	I8YRK	1031	DK2BI	884	WØYDB	747	WA5LOB
1181	K2POA	1017	F2MO	881	W3YHR	720	W6YMV
1158	I4ZSQ	975	WA6TAX	863	N4UU	719	YU1ODS
1142	W9DWQ	967	I2PHN	850	N2SS	717	W4BQY
1137	YU1BCD	948	DL1MD	822	W6RKP	708	WB6DXU

702	IØMBX						
702	CX2CN						
686	JH1VRQ						
670	N2AC						
653	I4LCK						
623	ZP5RS						
613	CR7IK						

C.W.

1383	W8KPL	1044	W4BQY	953	K6ZDL	790	SM5BNX
1350	W8LY	1044	G2GM	913	N4NO	768	W4BYU
1297	ON4QX	1040	N6JV	905	N4MM	754	W4IC
1296	K6JG	1031	DJ7CX	902	YU1AG	716	YU1ODS
1268	DL1QT	1030	W3ARK	900	K2VV	703	I5IZ
1255	W2NC	1012	VO1AW	829	I6SF	700	WB4KZG
1220	K6XP	1006	WA2HZR	825	IT9AGA	698	OK2BLG
1165	YU1BCD	976	WAØKDI	824	W6ISQ	694	PY4OD
1158	W9FD	976	N2AC	812	K7ABV	693	OK2DB
1126	W2HO	972	W2AIW	809	VK3AHQ	676	SMØGMG
1104	N4UU	964	K5UR	800	VO1KE	660	DL1MD

649	KH6HC						
649	K2ZRO						
647	W9OYZ						
629	K1LWI						
600	OK2QX						
600	VE4OX						

we broke up there were hundreds standing by, some even tried to work all 4 of us at one whack.

"Some have questioned the different names I used. I am Scotty at home and used Scotty from 9H1. However, many Europeans seemed to find that name hard to understand and I discovered that the name 'Jack' got through very well and I used it from TT8 and 5A.

"The propagation from TT8 and 5A was very interesting. First it would open to the east coast and the W4's would come in first and stay the latest. Then the opening would move west but become progressively shorter, staying open to the 6's for only a few minutes if at all. Occasionally there would be one-way skip with stations calling on 14237 and not hearing my replies. Just before leaving I worked a few VK's by the long path.

QSL Information

The following would like to be QSL Managers for any interested DX Station:

Manny, SV1IW at his Crete Island QTH, from where he made over 2,000 QSO's on 10, 15 and 20 meters, this past July 4th. QSL via P.O. Box 3751, Athens, Greece. (Photo courtesy, Jack, W2LZX)

When he is not off to some exotic port, Jacques, W4LZZ can be found at his home QTH, digging for DX or getting QSL cards out to those who have worked, FR7BE, FB8ZM and FB8ZN, for whom he acts as QSL Mgr. When not at home, Jacques is also known as ETUSE and ST2ZZ. (Photo courtesy, Jack, W2LZX.

The WPX Program

Mixed

672	JH3XCU	674	JA7FFN/1
673	JA3DGC	675	W4HG

S.S.B.

1077	W4MNZ	1080	I8YGZ
1078	JA3XRC	1081	K2XA

C.W.

1720	WB3CQN	1722	DL1VW
1721	JA7FFN/1	1723	YV1OB

VPX

148 ... ONL 4003

Endorsements:

Mixed: 400 JH3XCU, JA7FFN/1, W4HG. 500 PAØTO. 600 WA2FKF. 650 N8BM, K2XA. 700 JA3DGC, WAØTKJ. 750 IT9LMK, VE3DMC. 800 W2MP. 900 K6DT. 1250 K5UR, W9FD. 1450 N4MM, W2NC. 1550 W2NUT.

SSB: 300 W4MNZ, JA3XRC. 350 I6WOL, I8YGZ. 450 EP2TY, K2XA. 500 CT1QZ. 550 WA2FKF. 600 WA2AUB, ZP5RS, W2MP. 700 W4BQY, W7KOI. 900 PY3BXW, PK1MP. 1000 F2MO. 1100 ZL3NS. 1250 N4MM.

CW: 300 WB3CQN, DL1VW. 350 JA7FFN/1. YV1OB. 400 K2XA. 450 WB8ZRV, N4YB. 500 G3FVC, W2MP. 600 W1DMD. 650 W9NO. 900 YU1SF. 950 K5UR. 1050 W5MCO. 1150 W9FD.

10 meters: W4MNZ

20 meters: I2DMK, JA7FFN/1, K2XA.

80 meters: I2DMK, W2NC.

Africa: JH1VRQ

Asia: JA7FFN/1, VE3DMC, K2XA.

Europe: JA7FFN/1, OK1AGN, SM6AYM, N4YB, K2XA.

No. Amer.: W4MNZ, K2XA.

Oceania: JA7FFN/1.

So. Amer.: W7KOI.

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 (foreign stations send extra postage for air-mail) envelope to "CQ WPX AWARDS", 5014 Mindora Dr., Torrance, Calif. 90505. U.S.A.

WA1GXE, Gary Mitchell, P.O. Box 1003, Fairfield, CT 06430.
WA1GFJ, Gabriel F. Gargiulo, 17 Whitney St., E. Hartford, CT 06118
WB4RIS, James D. Robinson, 8023 Galveston, Jacksonville, FL 32211

A35WL—Via P.O. Box 27, Nukualofa, Tonga Republic, South Pacific
A4XGB— To G4CTQ, *not* W4CTQ (Tnx N4TX)
CE3XV—c/o WA3NGS
CT2AX—Via P.O. Box 206, Ponte Delgado, Azores
DF7GF/5H3—To P.O. Box 296, Arusha, Tanzania
DX4JA—c/o P.O. Box 118, Kurume, 830 Japan
EL1I—Via VE1RY, Stan Parsons, 144 Sussex Ave., Riverview, N.B. E1B 3A7, Canada
ET3PG—To P.O. Box 21321, Addis Ababa, Ethiopia
GD5CAA (by K3RV, 1978 CQ Worldwide C.W. Contest)—c/o WA3ZAS
GU3HFN—Via P.O. Box 100, Guernsey, Channel Islands, United Kingdom
H5AA—To Private Bag 2001, Montshiwa, Bophuthatswana
HL9UB—c/o Connie Mercer, HHB-½ ADA, APO San Francisco, CA 96601

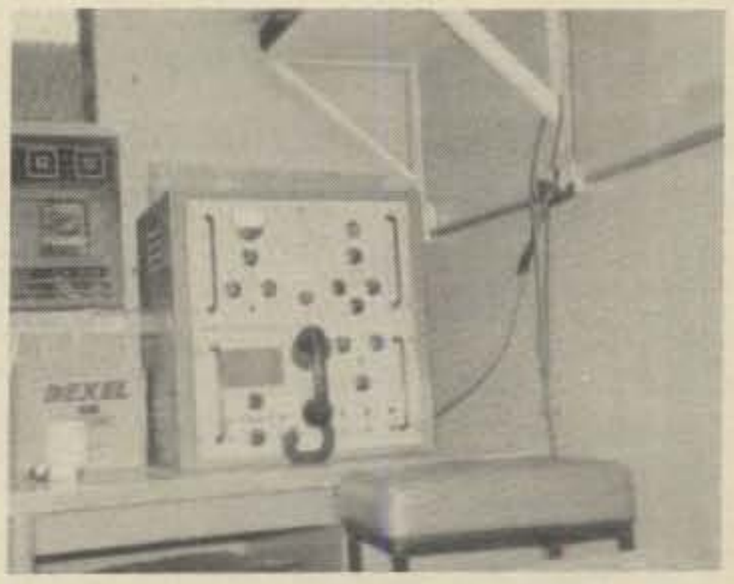
Emilio "Mel" Cugnini, LU7MAL, of Chacras de Coria, Argentina is a DX leader in the southern hemisphere. Mel recently qualified for S.S.B. WAZ and Single Band WAZ. (Photo via W4KA)

HI8JDH—Via P.O. Box 1157, Santo Domingo, Dominican Republic
HP2XHQ—To Box 367, APO New York, N.Y. 09837
HZ1HZ—c/o P.O. Box 1999, Jeddah, Saudi Arabia
J3AJ—Via W7LLC
K4SQT/HU—To SFM, P.O. Box 21, FPO, New York, N.Y. 09527
K9PNT/DU and K9PNT/4D2—c/o P. Hunsberger, PSA #1, Box 1864, APO San Francisco, CA 98286
K0AX/DU2—Via WB4OSN
KA8FY—To Dennis Obrian, Patrol Sqdn 50, FPO San Francisco, CA 96601
KC6MM—Via Box B, Ponape, Eastern Caroline Islands 96941
KG4DS—c/o WB4DKQ
KZ5GH—To WA6IJZ
M1P—c/o P.O. Box 25, San Marino
OX5AA—Via Box 1025, APO New York, N.Y. 09023
P29RA—To P.O. Box 7128, Boroku, Port Moresby, Papua-New Guinea
SV0WA—c/o Box 2139, APO New York, N.Y. 09223
TG5NW—Via P.O. Box 1, Quiche, Guatemala
TI8BP—To WA9UNR
VK2AGT/LH—c/o Dick Hoffman, Lord Howe Island, NSW Australia 2898
VK6UI/5N2—Via P.O. Box 1543, Onitsha, Nigeria
VP2LEU (Jan. 31-Feb. 7, 1978)—To K6SVL
VP2MT—Via WB8LDH
VP2MBB—c/o VE3ECP
VP2MUZ—To W8UVZ
VP2SAB—Via W2MIG
VP2VDS—To W1WPW
VP2VEN—c/o K5GOE/6, Woody Charlton, 515 Curtis St., Albany, CA 94706
VP5CNL—Via W8CNL
VR4AJ—Via P.O. Box 151, Honiara, Solomon Islands
VR4BF—To 35 Hays Walk, Cheam, Surrey SM2 7NQ, England
VR4CF—c/o P.O. Box 6, Honiara, Solomon Islands
WB6MNH/8R1—Via Box 893, Georgetown, Guyana
WD8AAS/TG9—To Scotty Tenney, #8, Calle 7-86, Zone 9, Guatemala City, Guatemala
YB7ACW—c/o P.O. Box 75, Balikpapan, Indoneisa
YN5JAR—Via Box 122, Jinotepic, Nicaragua
YS1RVE—To WA0JYJ
ZF1XW—c/o Bob Billings, RR 1, Bridgewater, Nova Scotia B4V 2V9, Canada
ZF2BC—Via WD4AXM
ZK2AS—To P.O. Box 83, Alofi, Niue Island
ZM7AH—c/o Jim Henderson, 13490 Mount Hood, Reno, Nevada 89506
ZP5YW—Via WA3HUP
3D6BL—c/o Joe Ely, Box 1472, Mbane, Swaziland
5U1UN—Amateur Radio Club, United Nations, Box 20, New York, N.Y. 10017
5H3BP—To P.O. Box 1022, Dar Es Salaam, Tanzania
5T5PG—c/o P.O. Box 231, Nouakchott, Mauritania
5W1BL—Via 5245 Queenswood Drive, Salt Lake City, Utah 84118
5W1BN—To KH6JEB
5Z4QK—c/o Motoichi Yamada, Prov. Fisheries, Box 1094, Kisumu, Kenya
8R1R—Via Malcolm, Department of State-Georgetown, Washington, D.C. 20520
9G1JU—To E. Saoud, P.O. Box 1835, Kumasi, Ghana
9V1TP—c/o Mr. Ball, American Embassy-Singapore, FPO San Francisco, CA 96699

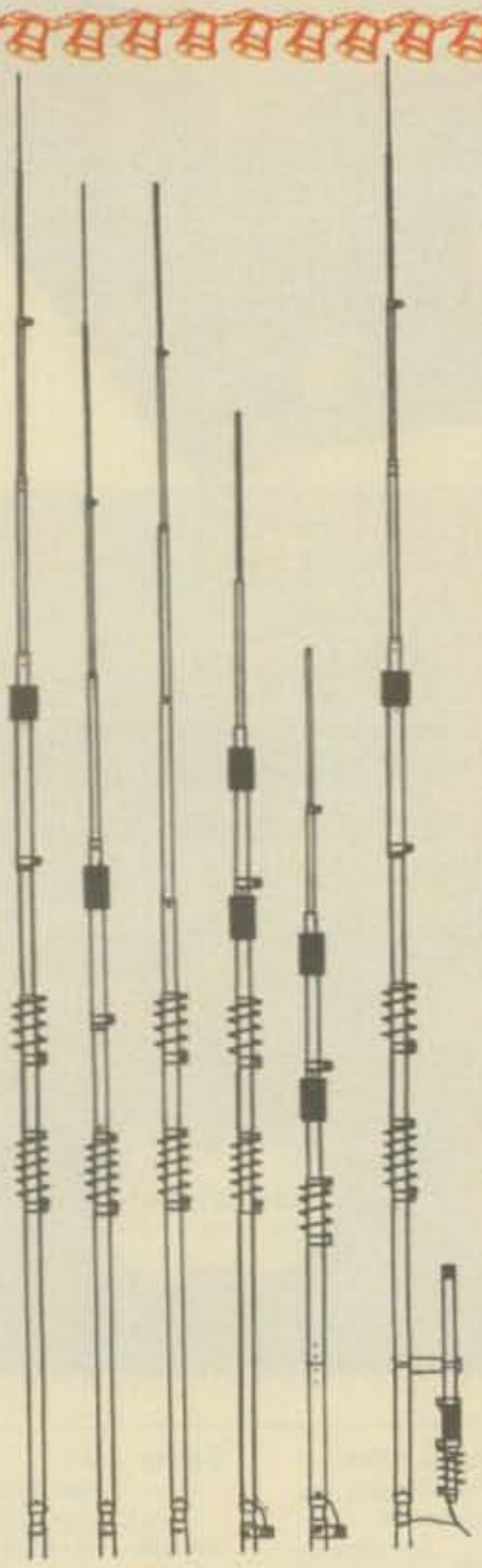
73, John, K4IIF

If you need South Africa on 160 meters, listen for Peter Botha, ZS4PB, who has given many a happy top-band DXer a new one on either c.w. or s.s.b. (Photo courtesy Stew, W1BB)

Here are three of the new trainee operators with Majid at YI1BGD, from left to right: Kamal, Majid, Mohamed and Dhia. (Photo courtesy Harvey, W2IYX, LIDXA)



This is the rig used in the Republic of Chad by Thomas S. Meadows, K5CO/TT8SM. For the complete poop see the accompanying article "The Scotty Meadows Story." (Photo via W2LZX)



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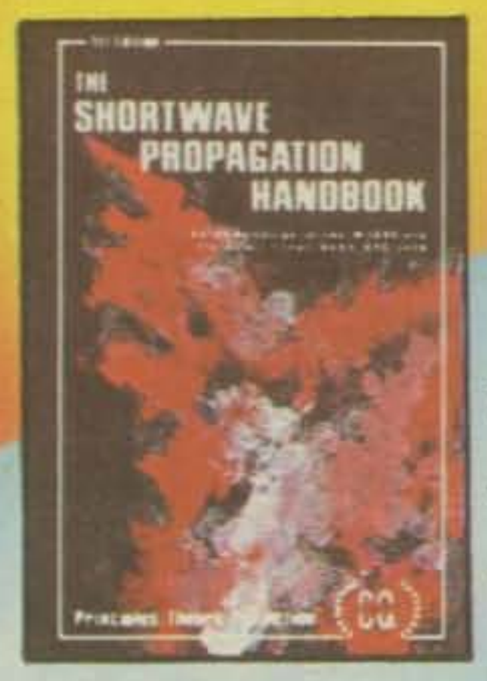

BY GEORGE JACOBS, W3ASK AND THEODORE J. COHEN, N4XX

THE SHORTWAVE RADIO PROPAGATION HANDBOOK

George Jacobs and Theodore J. Cohen, the two leading authorities on Propagation have teamed up to produce what will be the definitive work on this fascinating subject. For the first time anywhere, propagation is explained in simple language whereby the average reader can fully understand, use, and produce their own propagation data. This truly is must reading for the radio amateur, shortwave listener, and all others who make use of the shortwave radio spectrum.

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a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

The "Story of The Month", for December as told by Walt is:

Walter G. Burdine, W8ZCV.
All Counties #147, 4-29-76.

"I am a 63 year old disability retired U.S. Civil Service "Phlunquey", a single country boy that is the proudest and happiest ham in the good old U.S.A.

"I am proud because I am a member of the ICHN and MARAC and happy because this membership accepts me as one of the greatest groups of hams in the world.

"I owe so much to so many, that in my condition I'll die badly in debt, but few are going to harbor any ill feelings.

"How can you ever pay each mobile operator that went out of his way to get you a needed county? Everyone was just as important as the other. We seem to forget that without the 2000th, there would be no 3075. Everyone was important.

SPECIAL HONOR ROLL
ALL COUNTIES
#191 John Gohndrone, N7TT 8-27-78.
#192 Alexander P. Marion, W2CUE 9-2-78.
#193 M. A. "Ukie" Urquiza, W4SWW 9-5-78.

"And thanks to all who QSLed, no QSL no county, as I found out on quite a few counties. *A confirmation is required.* By the way, there is above a 95% QSL return. A special thanks to W6CCM and WA2AEA for their QSL bureaus.

"I owe a special thanks to Ralph Alley, W9JR, Fontana, Wisconsin, who in one trip gave me the last county in 8 states—Illinois, Missouri, Mississippi, Alabama (no QSL before), Georgia, North Carolina, Virginia, and Kentucky. Meade County, Kentucky being my last county. Thanks to W8WT and WA4LSU for riding along to help on this trip, at times. Thanks also to Riley, WAØCEL for coming up with data and card for a Minnesota County that I had failed to record right, while blind with a 3 months eye operation.

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

"Two Bon Homme, South Dakota contacts failed with the paste board, but Robbie, K4RQX, offered to drive from Houston to get that one. Bob, WØKMH got it, sent a card, and I finally received Worked All USA Counties #147, April 29, 1976.

Worked All Zone 14 Countries Award—WAZ14CA.

"I worked K1VSJ in all Rhode Island Counties and K5VYT in all New Mexico Counties.

For a diabetic with 8 heart attacks, near blind and deaf, do you think I'll ever be able to pay off? I'll be pitching though. 73 & 88, Walt."

Awards Issued

John Gohndrone, N7TT—N7TT/W2 (W9IRH and ex-W7KWC) finally decided to catch up on his paper work (he had USA-CA-500-#151 12-16-62) and he acquired USA-CA-1000 through 2500 endorsed all SSB, all mobiles, all 14 MHz. Also USA-CA-3000 endorsed all SSB, all mobiles, and all counties, Mixed.

Alex Marion, W2CUE, as he put it, in just under 25 years, also made all counties.

Ukie Urquiza, W4SWW (now in California) found time to apply for USA-CA-3000 and all counties.

Bob Lamberton, WA3QNT was issued USA-CA-2500.

Jack Johnson, WD9AXF added USA-CA-1500 and 2000 to his collection.

Dave Bishop, WB9QNX claimed USA-CA-1500.

Ernest Gutermann, K6CR applied for USA-CA-1000 endorsed all A-1.

Nathan Rosen, W2-6893 (SWL) collected USA-CA-500 and USA-CA-1000.

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

Derrick Webber, G3LHJ.
Stephen Bird, WA7LHZ.
Arthur Geyer, ZF2AG, #1 to ZF—Cayman Island.

Worked "Laen W" Award—WLW.

USA-CA HONOR ROLL

3000		1500		500	
N7TT	212	WD9AXF	372	G3LHJ	1270
W4SWW	213	N7TT	373	WA7LHZ	1271
2500		WB9QNX	374	ZF2AG	1272
N7TT	269	1000		6893	1273
WA3QNT	270	K6CR	492		
2000		N7TT	493		
WD9AXF	319	W2-6893	494		
N7TT	320				

Awards

CQ Awards & Custodians are:
Worked All Zones: **(WAZ)** Leo Haijsman, W4KA, 1044 Southwest 43 Street, Cape Coral, Florida 33904.
Prefix Awards **(WPX, VPX, WPNX):** Robert Huntington, K6XP, 5014 Mindora Drive, Torrance, California 90505.
CQ DX Awards: Rod Linkous, W7OM, 5632 47th Avenue S. W., Seattle, Washington 98136.
United States of America Counties Award **(USA-CA):** Ed. Hooper, W2GT, P.O. Box 73, Rochelle Park, N.J. 07662.

Note: For full information on above Awards, send s.a.s.e. to Custodian.

The WB9RCY/Mobile Plaque: A plaque is now available to any United States or Canadian Amateur Radio Station for confirmed contacts with ARS WB9RCY/Mobile in 500 Counties. The same plaque is available to other DX stations for confirmed contacts in 200 Counties.

Canadian Provinces, Forests, Government Districts, Municipalities and Counties may be counted along with United States Counties.

Send a list of Counties worked and confirmed, listed consecutively by date, with your signature. There is no charge to the recipient for this plaque, and dates of contacts may be any time after October 26, 1976. Dorothy says: "Thank you for riding along with us, we enjoy your company. At this time #1 went to my OM, Wayne N9WA (he does all the driving on our trips, so I decided he should have #1 with special qualifications). Number 2 went to WA6MAR, #3 to W7KOI, #4 to WA1UVX. and #5 went to WA2WCW".

Worked ITU Zones 17/18 Award—W-ITU-Z17/18-A.

SWL Club Activity Awards Program (Sweden): All awards available to radio amateurs and SWLs.

Worked "Laen W" Award (WLW): The Award is issued in four (4) classes:
Class A: European stations work 20 stations in "Laen W".
Rest of the world work 15.
Class B: European stations work 15.
Rest of the world work 10.
Class C: European stations work 10.
Rest of the world work 6.
Class D: European stations work 5.
Rest of the world work 3.
Send application with GCR (General Certification Rule) and 10 IRCs or 2 U.S. dollars ($2.00) to: SWL Club Activity, Fack 55, S-780 40 Mockfjard, Sweden.
Stickers for Classes C, B, and A cost 2 IRCs each. List showing "Laen W" stations for 1 IRC.

Worked All Zone 14 Countries Award (WAZ14CA): The Award is issued in three (3) classes.
Class A: Work 27 Countries in *CQ* Zone 14.
Class B: Work 22 Countries.
Class C: Work 15 Countries.
Send application with GCR and 10 IRCs or 2 US dollars ($2.00) to SWL Club Activity, Fack 55, S-780 40 Mockfjard, Sweden.
Stickers for Classes B and A cost 2 IRCs each.
Countries located in *CQ* Zone 14 are: CT1, CT2, C31, DA/DF/DJ/DK/DL, DM, EA, EA6, EI, F, G, GD, GJ, GM, GU, GW, HB9, HBØ, LA, LX, ON, OY, OZ, PA/PI, SK/SL/SM, ZB2, 3A, 4U/Geneva.

Worked ITU Zones 17/18 Award (W-ITU-Z17/18-A): The award is issued in three (3) classes.
Class A: Work all Countries in ITU Zones 17/18.
Class B: Work 7 Countries (must include TF).
Class C: Work 5 Countries.
AOM/B endorsements.
Send application with GCR and 10 IRCs or 2 US dollars ($2.00) to: SWL Club Activity, Fack 55, S-780 40 Mockfjard, Sweden.
Countries located in ITU Zones 17/18 are:
ITU Zone 17: TF.
ITU Zone 18: JW, JX, LA, OH, OHØ, OJØ/OHØM, OY, OZ, SM.
Amateur Radio Stations in "LAEN W" for WLW AWARD, stations were active as of December 1977 and earlier:
SK4: AO, BW, DM, EO, GW, GJ.
SL4: BP, ZH.
SM4: AHG, AJG, AK, ALB, AMC, AMM, ANK, ANQ, ANU, ANV, AOH, AQL, ARJ, ASI, ATR, AUU, AVP, AWF, AWU, AZA, AZJ, BEL, BGT, BJX, BPD, BPU, BQA, BRX, BTJ, BVC, BZN, CBO, CGM, CGP, CHM, CIM, CJM, CLR, CNN, CQQ, CSF, CUJ, CUQ, CUW, CVS, CYO, CYR, DAQ, DAT, DFD, DFH, DHO, DIG, DJO, DN, DNX, DOG, DQE, DQM, DWA, DWP, DY, EDK, EEA, EGD, EIK, EJR, EJT, EJZ, ELM, ENH, EPK, EPR, EQR, ERY, ESA, ETB, ETF, ETO, EWO, EWP, EWS, EXN, EXZ, EZG, FCD, FDV, FEO, FGE, FGZ, FHV, FIV, FJK, FJV, FKE, FKK, FLK, FOC, FPH, FPO, FPR, FTM, FTQ, FVL, FXQ, FZC, FZQ, GAU, GDB, GDN, GF, GFL, GGD, GGI, GHK, GIB, GIJ, GIS, GJS, GJT, GL, GND, GO, GOT, GTB, GTK, GWI, GX, GYN, GZK, GZS, HCF, HCG, HCM, HFI, HHO, HIX, HLB, HMH, HOD, HQE, HVK, HVP, HW, HSY, HTV, IAS, IAW, ICY, IED, IGL, IJ, IKX, IL, IO, IRB, IRX, ISJ, INN, IWD, IXW, JD, KF, KM, KW, KZ, MD, OJ, RR, TD, TO, TU, WQ.
SM4-/P: AIO, AW, AWC, AWD, AWV,

BMA, CEZ, CTI, DMD, DXO, EFW, EHV, ENS, FMT, FVE, JN, RQ.

Notes

Regarding MARAC, Tom, WAØYJL is now Awards Custodian, and Bob, WAØYJL is Editor of the Newsletter.

Sorry to report the passing of Harry McNutt, K8KOM on September 1. As many of you know, Harry was one of the early members of the original 40 meter County Hunters Net. Story and photograph of Harry on page 98 of *CQ* of July 1967. Thanks to Walt, W8NXN for the information.

Well it appears that the Nortown Amateur Radio Club has again fallen behind on issuing their awards. It seems that periodically they have custodians who do *not* take care of things . . . but then bad publicity gets them back on track. So, fellows get going!

Here is the strange story about Bill Shannon, who apparently fooled many of us, even the FCC, for awhile. At one time he apparently had the call as a Novice, of WA6GFH, but since then he has *used* the calls of W6VK, W6NV, which are genuine calls but *not* assigned to him and the holders are *not* County Hunters. He also used KL7NV. In 1975 he applied and

Julio, CT1ZW and Ad, CT1RM.

received USA-CA-500, 1000 and 1500 as W6VK, he also had 10-X-#3157, YLSSB #8956 and MARAC #660. He also did some mobile work and DX-pedition work so *do not* use W6VK, W6NV, or KL7NV QSOs for your USA-CA Applications. Thanks for the several who passed the data to me.

Well here it is again, just about the end of 1978. It has been a good year for County Hunters and also DXers.

Let us make 1979 an even better year, and I hope Santa Claus brings all the QSLs and new equipment you desire. How was your month/year?

73, Ed., W2GT.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 56.7 for August, 1978. Daily values ranged from a low of 26 on August 21st to a high of 100 observed on the 31st. This monthly level of solar activity results in a 12-month smoothed sunspot number of 63, centered on February, 1978. The sunspot cycle is measured by the level of smoothed sunspot number, and the present cycle continues to increase at a relatively rapid pace.

A smoothed sunspot number in the high 90's is expected during December.

The present cycle, Cycle 21, began during March, 1976. The smoothed sunspot numbers recorded during its first two years are shown below.

Progress Of Sunspot Cycle 21

Date	SSN
March, 1976	12
April, 1976	13
May, 1976	13
June, 1976	12
July, 1976	13
Aug., 1976	14
Sept., 1976	14
Oct., 1976	14
Nov., 1976	14
Dec., 1976	15
Jan., 1977	17
Feb., 1977	18
March, 1977	20
April, 1977	22
May, 1977	24
June, 1977	26
July, 1977	29*
Aug., 1977	33*
Sept., 1977	39*
Oct., 1977	45*
Nov., 1977	51*
Dec., 1977	55*
Jan., 1978	60*
Feb., 1978	63*

*Provisional values, may be subject to slight change.

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

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for Dec., 1978

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 9-10, 22, 31	A	A	B	C
High Normal: 3-4, 8, 12, 21, 29-30	A	B	C	C-D
Low Normal: 1-2, 6-7, 11, 17-18, 20, 23, 26-28	B	C	D	D-E
Below Normal: 13, 15-16, 19, 24-25	C	D	D-E	E
Disturbed: 14	C-E	D-E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagaion 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 and day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good (B) on the 3rd and 4th, excellent (A) on the 5th, etc. Conditions during the CQ WW CW DX Contest should be above normal on Nov. 25 and low normal on the 26th.

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.

December should be an excellent month for DX propagation conditions. Expect seasonally higher daytime frequencies and improved DX conditions to many areas of the world on *6, 10, 15* and *20* meters during the hours of *daylight*. There are longer hours of darkness during December and considerably lower static levels, which should result in improved DX conditions on *40, 80* and *160* meters to many areas of the world during the hours of *darkness*.

The present sunspot cycle has risen to a level where fairly frequent 6 meter F-2 layer DX openings can be expected during December. The band should peak towards Europe and in an easterly direction an hour or two before Noon, towards Africa at about Noon, towards Central and South America and the Caribbean area during the early afternoon, and towards the Pacific, Australasia and the Far East during the late afternoon. Best days on which to expect *6* meter DX openings are those expected to be High or Above Normal.

Expect *10* meters to open to most areas of the world when conditions are at least Low Normal, with some exceptionally good openings possible when conditions are High or Above Normal. At times, signals may reach exceptionally strong levels. Signals should peak towards Europe, Africa and in an easterly direction before Noon, towards Central and South America and the Caribbean area during the early afternoon, and towards the Pacific, Australasia, the Far East and Asiatic areas during the late afternoon.

Look for exceptionally good DX openings on *15* meters to all areas of the world when conditions are Low Normal or better. The band will probably open to many southern and tropical areas even when conditions are Below Normal. This is a daytime band, with signals peaking about an hour or so after they have peaked on *10* meters, from the same geographical areas.

Expect good openings on *20* meters to just about every area of the world during a two-to-three hour window beginning at sunrise, when conditions are Low Normal or better. Signals should peak again towards Europe and in an easterly direction around Noon, towards Africa during the late afternoon, towards Central and South America and the Caribbean area during the late afternoon and into the early evening, towards the Pacific area, Australasia, the Far East and Asiatic regions during the early evening and towards Antarctica and other extreme southern areas during the evening to about 10 p.m. When conditions are High or Above Normal, expect the band to remain open somewhat longer to each geographical area. Look for openings

towards southern and tropical regions even during periods of radio storminess.

Good DX openings on *40* meters should begin during the late afternoon and continue through the hours of darkness, until shortly after sunrise. The first signals should come from Europe and an easterly direction several hours before sundown, and they should peak an hour or two before Midnight. After sundown, signals from Africa, Central and South America and the Caribbean area should gain considerably in strength. Signals from the Pacific area, Australasia, the Far East and Asiatic regions should begin to pick up in strength an hour or so after Midnight, and peak just before local sunrise.

Good DX openings to most areas of the world are also expected on *80* meters between the sundown and sunrise period. Signals should peak at about the same time that they do on *40* meters, from similar geographical areas, but they will often be weaker and noisier.

December should be a good month for *160* meter DX conditions. The band should open towards Europe and in an easterly direction beginning about 8 p.m. in all time zones, and lasting until about 2 a.m. in the EST zone; 1 a.m. in CST; Midnight in MST and 11 p.m. in PST. Some openings towards the south, particularly to Central America and the Caribbean area, are possibly also to the northern countries of South America, should be possible from about 10 p.m. to 2 a.m. in all time zones. Openings towards the Pacific, Australasia and the Far East favor west coast stations, but it's worth the time to look for these openings in all time zones between 4 a.m. and sunrise. Remember the old rule of thumb for *160* meter DX openings; conditions peak about the time that the sun begins to *rise* at the *easternmost* terminal of a DX path.

For *short-skip* openings during December of less than 250 miles, try both *80* and *40* meters during the day, and *80* and *160* meters at night. For openings between 250 and 750 miles, *40* meters should be best during the day, and both *80* and *160* meters at night. Between 750 and 1300 miles, try *20* during the day, *40* meters during the early evening, and *80* later in the evening and until the sunrise period. Try *40* meters again for about an hour or so after sunrise. For openings between 1300 and 2300 miles, *20* meters should be best during most of the daylight hours, with *15* meters not too far behind, and with *10* meters running a close third. Try *40* meters during the early evening and until an hour or two after Midnight, then check *80* meters until sunrise. Try *40* meters again for an hour or so after sunrise.

V.h.f. Ionospheric Openings

Big news this month should be the F-2 layer DX openings expected on *6* meters during the hours of daylight. Best times to check for these openings have been given earlier in this column. A secondary seasonal peak in sporadic-E ionization should also result in some short-skip openings on this band between distances of approximately 800 and 1300 miles.

Trans-equatorial scatter, or TE openings on 6 meters should fall off somewhat during December, but some openings should still be possible between the southern half of the USA and deep South America. TE openings generally take place during the evening hours, and they usually peak between approximately 8 and 11 p.m.

Expect quite an upturn in meteor activity during December. *Geminids*, a major meteor shower, should begin on December 13 and last for about three days. Maximum intensity is expected at approximately 4 a.m. EST on December 14, with an expected meteor rate of about one a minute. This should permit fairly good meteor-type communications on both *6* and *2* meters. A second, but somewhat less intense shower called *Ursids*, is expected later in the month. It

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates the best time to listen for 160 meter openings.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:
(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days
Refer to the "Last Minute Forecast" at the beginning of the 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 *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 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 10db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

should take place on December 22 and 23, with its peak occurring at about 7 p.m. on the 22nd. A meteor rate of approximately 15 an hour is expected during the peak period.

There is a good possibility for unusual short-skip openings on both 6 and 2 meters during auroral activity that is likely to occur when conditions are either Below Normal or Disturbed. Check the "Last Minute Forecast" at the beginning of this column for those days during December that are expected to be in these categories.

The Editor of this column would like to take this opportunity to extend his warmest wishes to readers everywhere, for a Merry Christmas and a very Happy New Year.

73, George, W3ASK

December 15, 1978—February 15, 1979
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

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

McMurdo Sound, Antarctica	*Nil*	06-09 (1) 16-18 (1) 18-20 (2) 20-21 (1)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (2) 02-04 (3) 04-06 (1) 06-08 (2) 08-09 (1)	00-05 (1)

*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.

December 15, 1978- February 15,1979 Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

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

December 15, 1978-February 15, 1979 Time Zone: PST (24-Hour Time) WESTERN USA TO:

Western & Southern Europe & North Africa	07-08 (1) 08-10 (2) 10-11 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	22-00 (1) 00-03 (2) 03-06 (1) 06-09 (2) 09-11 (3) 11-14 (2) 14-16 (1)	18-21 (1) 21-00 (2) 00-01 (1) 19-23 (1)*
Central & Northern Europe &	07-09 (1)	06-07 (1) 07-09 (2) 09-10 (1)	16-18 (1) 22-00 (1) 00-02 (2)	17-22 (1) 22-00 (2) 00-01 (1)

European USSR			02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (1)	19-23 (1)*
Eastern Mediterr-anean & Middle East	07-09 (1)	07-08 (1) 08-10 (2) 10-11 (1)	22-00 (1) 00-03 (2) 03-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1)	18-21 (1)
Western Africa	08-09 (1) 09-11 (2) 11-13 (4) 13-14 (3) 14-15 (2) 15-l6 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1) 00-03 (2)	18-22 (1)
Eastern & Central Africa	09-10 (1) 10-12 (2) 12-14 (1)	08-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	08-13 (1) 13-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	18-20 (1)
Southern Africa	08-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1) 00-02 (1)	18-20 (1)
Central & South Asia	17-19 (1)	07-10 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	05-07 (1) 17-20 (1)
Southeast Asia	09-11 (1) 14-15 (1) 15-17 (3) 17-18 (2) 18-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-18 (3) 18-19 (2) 19-21 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	03-08 (1) 04-06 (1)*
Far East	14-15 (1) 15-16 (2) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-14 (1) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	02-04 (1) 07-08 (1) 08-11 (2) 11-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	00-01 (1) 01-03 (2) 03-06 (3) 06-08 (2) 08-10 (1) 02-08 (1)*
South Pacific & New Zealand	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-23 (4) 23-00 (3) 00-02 (2)	22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 00-03 (1)* 03-06 (2)* 06-07 (1)*
Austral asia	10-13 (1) 13-15 (2) 15-17 (3) 17-19 (2)	08-09 (1) 09-12 (3) 12-15 (2) 15-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	18-20 (1) 20-22 (2) 22-02 (1) 02-05 (2) 05-06 (1) 06-08 (2) 08-10 (4) 10-12 (2) 12-14 (1)	01-03 (1) 03-06 (2) 06-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	07-08 (1) 08-09 (2) 09-10 (3) 10-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (2) 07-09 (4) 09-13 (2) 13-15 (3) 15-19 (4) 19-20 (3) 20-00 (2) 00-06 (1)	17-18 (1) 18-19 (2) 19-23 (3) 23-03 (4) 03-04 (2) 04-05 (1) 19-20 (1)* 20-22 (2)* 22-00 (3)* 00-02 (2)* 02-04 (1)*
Peru Bolivia, Paraguay Brazil Chile Argentina Uruguay	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-13 (3) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-22 (3) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1) 06-07 (1) 07-08 (2) 08-09 (1)	20-22 (1) 22-01 (2) 01-04 (1) 22-02 (1)*
McMurdo Sound, Antarctica	*Nil*	06-09 (1) 14-16 (1) 16-19 (2) 19-21 (1)	16-18 (1) 18-20 (2) 20-00 (3) 00-04 (2) 04-06 (1) 06-08 (2) 08-10 (1)	23-05 (1)

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

My comments this month will be very brief. About the time I was preparing this Column I was put out of circulation by a week's stay in the hospital and the convalescing period that followed.

A few complaints have been received from contestants in the 1977 WW DX Contest that their scores were not listed in the results. Sorry fellows, if your call was not listed we just did not receive your log.

With the deterioration of the postal service it is most important that you get your logs in the mail as soon as possible. Air Mail is a must for overseas entries in order to beat the Holiday rush.

As a suggestion, bulky stateside multi-multi entries might try United Parcel Service. I have found them most reliable.

Normally we would be running the CQ 160 Contest rules in this issue but find it impossible to do it this year. However they will be given in details next month which will still give you plenty of time before the contest.

The dates are firm, 2200 GMT Friday January 26 to 1600 GMT Sunday January 28. Rules will be the same as they have been these past many years. The only questionable items at this time are the trophy donors.

Best wishes for the coming Holidays.

73 for this time, Frank, W1WY

Spanish DX Contest

Phone: Dec. 2-3 C.W.: Dec. 9-10
Starts: 2000 GMT Saturday
Ends: 2000 GMT Sunday

It's the world working the Espanoles on phone and c.w. in this one. This year for the first time phone has been included and will be held on a separate week-end.

Only single operator operation is permitted on all bands 3.5 thru 28 MHz.

Exchange: RS(T) plus a three figure QSO number starting with 001.

Scoring: Contacts between EA stations and the Phillipines and Hispano-american countries are worth 3 points. Following prefixes will be considered 3 pointers. DU, CE, CM/CO, CP, CX, HC, HI, HK, HP, HR, KP4, LU, OA, PY, TG, TI, XE/XF, YN, YS, YV, ZP or equivalent prefixes.

Between EA and all other non-Hispano and non-European countries 2 points.

Between EA and Europeans 1 point. (WAE boundries.)

Multiplier: For EA, each DXCC country worked on each band. All others use EA call districts worked on each band.

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

Awards: Gold, Silver and Bronze medals to the first 3 place winners, phone and c.w., in Spain and overseas stations. And certificates to first place winners in each country. A minimum of 100 points required to qualify.

14 Sherwood Rd. Stamford, CT 06905

Calendar of Events

Nov.	**25-26**	**CQ WW DX C.W. Contest**
Dec.	1-3	ARRL 160 Meter Contest
Dec.	2-3	International Island Contest
Dec.	2-3	Telco. Pioneers QSO Party
Dec.	2-3	Alexander Volta RTTY
†Dec.	2-3	Spanish Phone Contest
Dec.	2-3	Tops 80 Meter Contest
Dec.	3	10-X Net QSO Party
Dec.	2-4	Connecticut QSO Party
†Dec.	9-10	Spanish C.W. Contest
†Dec.	9-10	Hungarian Contest
Dec.	9-10	ARRL 10 Meter Contest
Dec.	16-17	S.O.W.P. QSO Party
Jan.	13-14	Marconi ARI C.W. Contest
Jan.	**26-28**	**CQ WW 160 DX Contest**
Jan.	27-28	Marconi ARI Phone Contest
Feb.	17-18	YL-OM Phone Contest
Mar.	3-4	YL-OM C.W. Contest

† Not official

Include a summary sheet with your log showing the scoring and other pertinent information, the usual signed declaration that rules and regulations have been observed, and your name and address in Block Letters.

Your entry must be postmarked no later than Feb. 15th to: U.R.E. International Contest, P.O. Box 220, Madrid, Spain.

ARRL 160 C.W. Contest

Starts: 2200 GMT Fri., December 1
Ends: 1600 GMT Sun., December 3

This will be the 9th annual Top Band Contest organized by the ARRL. Activity will be between state-side stations, VE's and also DX. However, DX to DX does not count.

Exchange: RST and your ARRL section or country if it's a DX station.

Scoring: Contacts between stations in ARRL sections earns 2 points, with other areas 5 points. The multiplier is determined by the number of ARRL sections worked, (74 possible) plus VE8 and each DX country.

Awards: Certificates to top scorers in each section and each country.

Keep the DX Window (1825-1830) clear of state-side operation, that's where you will find the DX stations calling. They will be listening 1800-1805 or on frequencies they specify. Look for KH6's at the top of the band, 1995-2000. They also will be listening down at the low end. (KH6's are also permitted to operate in the 1800-1810 segment.)

Results of 1977 OK DX Contest

All Band

K4BAI	1980
N4EY	822
WØBMM	576
W3ARK	558
W1CNU	468
N4OL	316
W1OPJ	216
VE1MX	1232
VO1AW	1110
CY4VV	645

7 MHz.

WB2KQO	186

14 MHz.

K8PYD	39
VE7DTD	30

21 MHz.

N2IT	2405
WB2VWW	786
WA2ZVH	595
K2PF	120
W3CBF	63

Don't overlook the 1830-1850 portion of the band, activity there is usually much lighter than the bottom 25 kHz. (Check U.S. 160 Regs. for availability and restrictions.)

The usual grounds for disqualification; violation of rules, excessive duplicate contacts etc. will prevail. A large s.a.s.e. to ARRL will get you the necessary forms to make log keeping easier.

All entries must be postmarked no later than Dec. 29, 1978 and go to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, Conn. 06111.

International Island Contest

Starts: 0001 GMT Sat. December 2
Ends: 2400 GMT Sun. December 3

This is a new one organized by the Whidbey Island Amateurs, but unfortunately it has been scheduled on an already overcrowded weekend.

Rules are rather lengthy and detailed and it is necessary for you to have a IDX island list to score your log. Therefore it is recommended you send a s.a.s.e. to WB7BFK for details.

The following are the rules in brief.

Operation can be made by both single and multi-operator, all bands, phone and c.w.

Winners of 1978 Bermuda Contest

VP9IB	1,246,080
GW3NWS	235,480
K1DG	91,905
VE3BMV	78,515

Exchange: RS(T) and DXCC country or IDX island for those on the island list.

Scoring: One point for DX contacts, 10 points if it's an IDX island. Each IDX island worked on each band counts as a multiplier. (A station may be worked only once for QSO points regardless of the band or mode.)

Power Multiplier: 100 watts input or less, multiplier of 4. A multiplier of 2, if input is 101 to 299, 1.5 if it's 300 to 499 watts, none if 500 or over.

Final Score: Total QSO points × Island multiplier × power multiplier.

Awards: For each mode and class, to top scorers in each U.S. State, VE province, DXCC country and each IDX Island.

Mailing deadline for logs is January 4th to: Bill Gosney, WB7BFK, 2665 N. 1250 East, Oak Harbor, Whidbey Island, Wash. 98277. Include a large s.a.s.e. or 3 IRCS for DX.

Telephone Pioneers QSO Party

Starts: 1900 GMT Sat. December 2
Ends: 0500 GMT Mon. December 4

This is the 14th annual party sponsored by the Stanley S. Holmes Chapter in which telephone pioneer amateur operators will be able to contact other members in the United States, Canada and in foreign countries. (F2CA will be looking for stateside QSOs.)

Exchange: Contact number, chapter name and number.

Scoring: One point for each exchange with a Pioneer in any chapter. And one point for each different chapter worked.

The same station may be worked on more than one band, but only one mode per band.

Frequencies: Phone—3965, 7275, 14295, 21365, 28675, 50.100 to 50.250, 144.275 to 145.500. C.W.—3565, 7065, 14065, 21065. Also any frequency permitted by FCC regulations for RTTY, SSTV, 160, etc.

Be sure to indicate your chapter name on your log and mail no later than January 15th to Gene Przebieglec, WB2ZMU, Stanley S. Holmes Chapter #55, Telephone Pioneers of America, 100 Central Avenue, Kearney, N.J. 07032

Alexander Volta RTTY Contest

Starts: 1200 GMT Sat. December 2
Ends: 1200 GMT Sun. December 3

This is the 14th annual RTTY Contest organized by the Associazione Radioamatori Italiani of Como. Use all bands 3.5 thru 28 MHz. The same station may be worked on each band for QSO and multiplier credit, however contacts between stations in the same country have no value.

Exchange: QSO no., RST and CQ Zone.

Points: Contacts between stations in the same Zone count 2 points, with stations outside own Zone according to points in the Exchange Point Table. If made on 7 MHz. double the value, and triple if made on 3.5 or 28 MHz.

Multiplier: Of one for each country worked on each band. (ARRL list and each W/K, VE and VK call area.)

Final Score: Total exchange points × total multiplier × total number of QSOs. You can add 1000 bonus points to the final score for each I/IS/IT station you work on all bands.

Awards: Appropriate awards for the 3 top scorers. Points made in this contest will be included in the "World RTTY Championship" for 1978.

There is also a SWL category with the same rules as above.

Entries must be received before January 20,1979 therefore air mail is recommended. They go to: A.V. RTTY Contest, c/o SSB & RTTY Club, P.O. Box 144, 22100 Como, Italy.

10-X Net QSO Party

1200 to 2400 GMT Sun. December 3

This is a new one organized by the Flatland Farmer chapter of the 10-X International Net.

Activity will be found between 28700 and 28800 MHz.

Contacts with stations not holding a Flatland Farmer certificate are worth one (1) point, two (2) points if with a certificate holder, and three (3) points if station is a Charter member. (This information will be included in the exchange.)

You can qualify for a certificate by working two Flatland Farmer certificate holders. Write to Lou Reik, WB9YJE, 804 Commercial St., Danville, Ill. 61832 for details.

Party certificates will be awarded to 1st, 2nd and 3rd place winners in each U.S. call area including KH6 and KL7. Also to other outside and overseas areas. There is a special award to the top scoring station world wide.

Mailing deadline for your log is January 15th and they go to; Mike Reik, WB9YJF, 304 McKinley St., Westville, Ill. 61883

Connecticut QSO Party

Starts: 2000 GMT Sat. December 2
Ends: 0200 GMT Mon. December 4
(Rest period 0500 to 1200 Dec. 3)

The Candlewood A.R.A. is the sponsor of this party. Their club station W1QI will operate c.w. on odd hours and s.s.b. on even hours.

The same station may be worked on each band and mode, including Oscar as a separate mode. Mobiles in each county change.

Novices should identify themselves by /N as part of their call. Mobiles should also identify their county of operation.

Exchange: QSO no., RS(T) and QTH. County for Conn., ARRL section for others.

Scoring: One point per QSO, 2 points if it's with a Novice, 3 points for Oscar contacts, and 5 points for club station W1QI contacts.

Multiplier: ARRL sections for Conn. stations. Out of state stations use Conn. counties. (max. of 8) DX stations may be worked for QSO points but used only *once* as a multiplier.

Frequencies: CW-40 kHz. up from bottom of each band. SSB-3927, 7250, 14295, 21370, 28540. Novice-3725, 7125, 21125, 28125.

Awards: Certificates to top scoring single and multi-operator stations in each Conn. county, and each ARRL section. (min. of 5 QSOs) Special certificates for Conn. mobiles operating outside their home county. (min. of 20 out of state QSOs)

A Worked All Conn. Counties certificate will be awarded for working all 8 counties.

Include a large s.a.s.e. for a copy of the results and mail your log by January 3rd to: CARA att: Fred Porter, W1VH, 169

Carmen Hill Road #2, New Milford, Conn. 06776

ARRL 10 Meter Contest

Starts: 0000 GMT Sat., December 9
Ends: 2359 GMT Sun., December 10

This is the 6th annual 10 meter contest organized by the ARRL, and even in this period of low sunspots it has gained wide popularity.

It's a worldwide activity in which DX stations are permitted to work other DX. You are not limited to working W/K's and VE's only. The same station may be worked once on phone and once on c.w. No cross mode however. A maximum of 36 hours of operating time is permitted out of the 48 hour contest period

Exchange: Stations in the 50 U.S. states and Canada send RS(T) and a consecutive contact number starting with 001. (KP4, KV4, KZ5, KG6 and etc. use a contact number) Stations not land-based give their ITU region.

Scoring: Each completed, QSO is worth 2 points, 4 points if it's with a Novice or Technician. The multiplier is determined by the U.S. states, VE call areas, DXCC countries and ITU regions worked. (non-landbased stations.) (U.S. and Canada not counted as a country.)

Frequencies: C.W.—28000-28050 Novice—28100-28150. S.S.B.—28500-28600. A.M.—28800-28900. Oscar contacts also permitted.

Awards: Certificates to the highest scoring single operator entry in each ARRL section, VE call area and DX country. Multi-operator and Novice awards will be given if three or more entries in a section are received.

As with all ARRL activities it is recommended that you send a large s.a.s.e. for appropriate log forms and instruction sheets.

Mailing deadline for entries is January 5th . ARRL Communications Dept., 10 Meter Contest, 225 Main Street, Newington, Conn. 06111

Hungarian C.W. Contest

Starts: 1600 GMT Sat., December 10
Ends: 1600 GMT Sun., December 11

It's the world looking for HA's on all bands, 3.5 thru 28 MHz. on c.w. in this one.

Operation will be in three classes: Single operator, single band and all band, and multi-operator all band. (Club stations are considered as multi-operator.)

Exchange: RST plus a contact number starting with 001. In addition the HA's will send two letters to identify their county.

HA counties: BA, BP, BE, BN, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA, (Total 20 on each band)

Scoring: One point for each HA contact. And a multiplier of one for each different HA county worked on each band. (Same station may be worked once on each band.)

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

Awards: Certificates to the first place winners in each country and in each class.

Include a summary sheet with your log and the usual signed declaration. Send within six weeks after the contest (approx. Jan. 21st) to: Radio Amateur League of Budapest, P.O. Box 2, H-1553 Budapest, Hungary.

Tops 80 Meter C.W. Contest

Starts: 1800 GMT Sat., December 2
Ends: 1800 GMT Sun., December 3

This is the TOPS C.W. Club's annual contest, and as the title indicates the activity will be on 80 meters. For the contest it will be between 3.5 and 3.6 MHz, with DX on the low end.

Entries may be single or multi-operator.

Exchange: RST plus a contact number starting with 001.

Scoring: Contacts within own country, 1 point. With stations on the same continent but a different country, 2 points. With stations on other continents, 5 points. Contacts with HQ stations, GW8WJ or GW6AQ, are worth 25 points. (Each call area in W/K, VE/VO, UA and VK count as separate countries.)

Final Score: Total QSO points multiplied by number of different prefixes worked. (Same as WPX.)

Enclose a s.a.e. and IRC for copy of results.

Mailing deadline for your entry is January 31st to: Peter Lumb, G3IRM, 14 Linton Gardens, Bury Saint Edmunds, Suffolk IP33 2DZ, England.

S.O.W.P. C.W. QSO Party

Starts: 0000 GMT Sat., December 16
Ends: 2400 GMT Sun., December 17

The Society of Wireless Pioneers will be holding their annual winter QSO party and this year have gone back to their traditional c.w. mode.

There will be no set exchange or any scoring system. It's just a social "get-together" to exchange Holiday greetings.

Activity will be found in the General portion of each band, about 55 kHz up from the low edge of the band.

Since there is no scoring and no awards are being made no logs are requested.

Listen for the S.O.W.P. Net at 1500 GMT on 14125 MHz. c.w. each Thursday for more details.

Additional information can be obtained from Bill Willmot, K4TF, 1630 Venus Street, Merritt Island, FL 32952

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NOVICE

POWER SUPPLY

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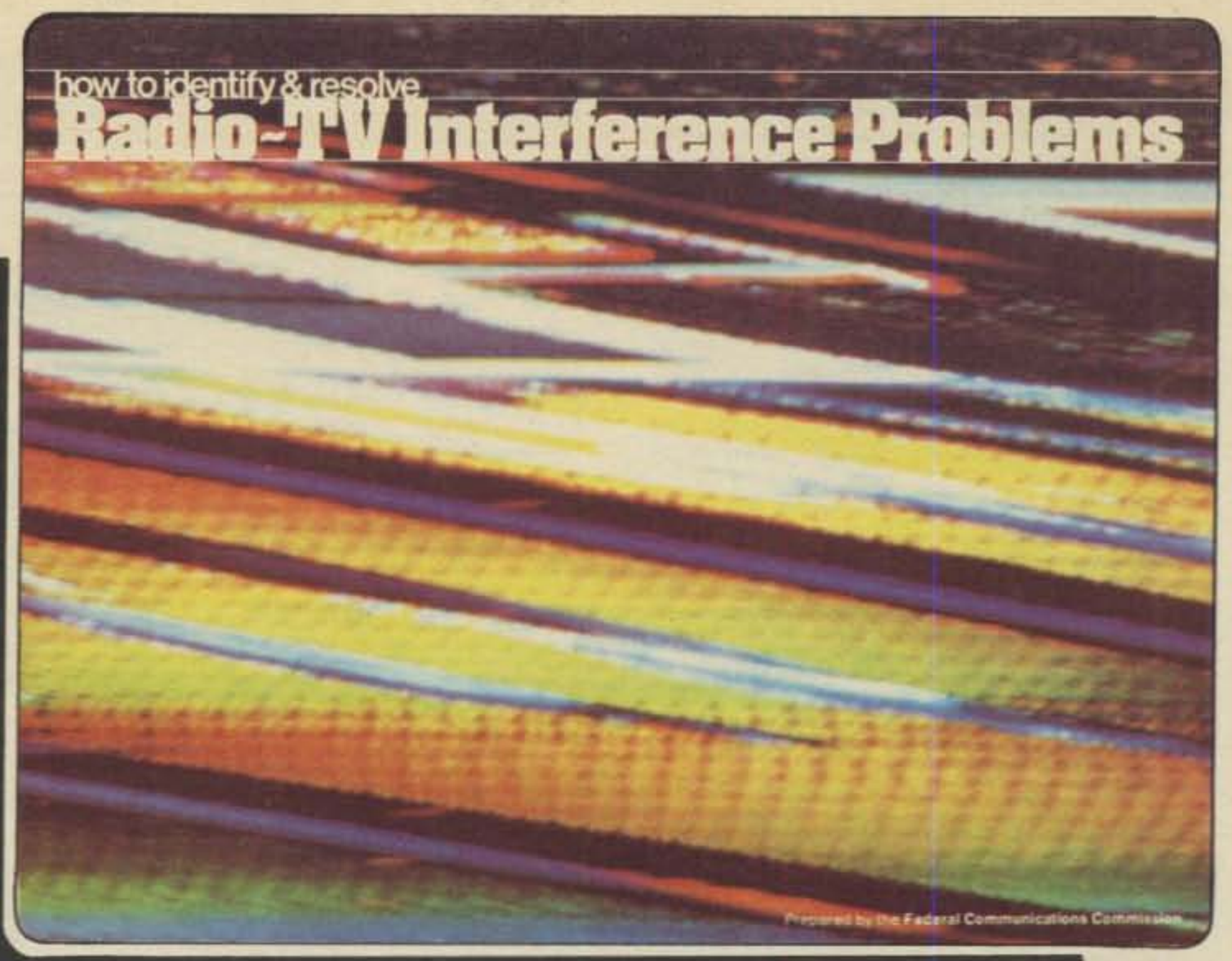
QRP

SLOW SCAN TELEVISION

TEST EQUIPMENT AND MEASUREMENTS

TRANSMITTERS AND TRANSMITTING

Let the FCC's own Radio-TV Interference booklet be your club's first line of defense on the TVI front.



For the first time here's an easy-to-read guide showing all of the classic TVI symptoms and their cures.

Use it as a "handout" by the local TVI committee, defuse tricky "irate neighbor" situations, help the local TV repair shop root out RFI/TVI problems in your area.

This top-quality booklet (40 pages 10¼ x 8") is available in quantities of 12 at $9.00 plus $1.00 shipping. Single copies are available for $1.25, postpaid. Note that the FCC offers the self-same booklet for $1.50 per copy with no quantity discount.

Prepared by the Field Operations Bureau of the Federal Communications Commission and reprinted at low cost by the Publishers of CQ, the booklet offers guidelines for the amateur, non-amateur and CBer alike in dealing with RFI and TVI. A dozen full-color illustrations show most interference patterns with descriptions and solutions for each problem.

The booklet should be on your "must" list for reading and your "do" list to help eliminate the problem. Order a dozen copies today!

CQ 14 Vanderventer Ave. Port Washington, N.Y. 11050

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SOUND SWITCH: Trigger circuits by clapping hands, whistling, etc., Control lamps, appliances, or use as effective burglur alarm. Completely assembled, with microphone: ONLY $5.00; two for $9.50-sent Air Mail; performance guaranteed; personal cheques accepted. Michael Wagner, POB 3382-Q, Station B, Calgary T2M 4M1, Canada.

YOUR PICTURE ON YOUR CALL CARD: 128 copies of any size photo reduced to 1" x 3/4" to fit call card. ONLY $5.00; two photo copies processed for $9.50; originals returned; sent Air Mail; personal cheques accepted. Michael Wagner, POB 3382-Q, Station B, Calgary T2M 4M1, Canada.

RECEIVE LISTS Regularly $5/yr. Surplus Parts, P.O. Box 7057, Norfolk, VA 23509.

MERRY XMAS AND HAPPY NEW YEAR from W0CVU. On the air since 1913. The world's finest hobby.

TRAVEL-PAK QSL KIT—Send call and 25 cents: receive your call sample kit in return. Samco, Box 203, Wynantskill, N.Y. 12198.

TUBES: All brands, Jan, Com, Antique, surplus. Send your want list to P.O. Box 4357, Compton, CA 90224, (213) 774-1255.

VP2M Land DXpedition! House with HW-101, SB200. Rebuilt Hy-Gain quad at 65 ft. $135 weekly winter, $90 summer. $40,000 for keeps. Great for retirement. 'Doc' Beverstein, 60 Amsterdam, Toronto, M4B 2C2 Tel (416) 755-2117.

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MOBILE IGNITION SHIELDING provides more range with no noise. Available most USA engines, some imports. Free literature. Bonding straps on sale now. Estes Engineering, 930 Marine Dr., Port Angeles, Wash. 98362.

FREE FULL Color QSL Card Catalog. Cards, Inc., Drawer P, Lexington, N.C. 27292.

"DX-pedition" XYL approved? VP2M QTH for rent. Beautiful brandnew house. 2 1/2 acre tropical garden overlooking Caribbean and mountain. Swimmingpool, 3 bedrooms, maidservice. Hamshack and antenna farm. VP2MF, Box 272, Plymouth, Montserrat, West Indies.

REPLACE RUSTED ANTENNA BOLTS with stainless steel bolts. Small quantities, free catalog. Elwick, Dept. 297, 230 Woods Lane, Somerdale, N.J. 08083.

COLLECTOR wants callbooks and handbooks before 1946. Write for my offer. State condition and year. WB6DQJ, P.O. Box 5333, Walnut Creek, CA 94596.

ROBOTICS Newsletter. $8 yearly. Published monthly. International Institute for Robotics, Box 615A, Pelahatchie, MS 39145.

CLUB CALL PINS 3 lines 1 1/4 x 3 1/4 $1.55 each call, first name and club. Colors black, blue, or red with white letters. (Catalog). Arnold Linzner, 2041 Linden Street, Ridgewood, N.Y. 11227.

SELL: Heath HW-8 with A.C. factory checked, aligned. Excellent condition. $150/best. Leonard Hayden, WB7SHD, 642 N.W. 33rd., Corvallis, Oregon 97330, (503) 753-3684.

GREBE CR, series receivers of the 1920's in any condition, partial or complete, and any custom built commercial short wave receivers of 1920 to 1930's. C. Byrnes, 1201 Sycamore Terrace, Space 102, Sunnyvale, CA 94086.

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.

FREE ELECTRONICS SURPLUS Catalog. Bargain Packed. Fascinating items, many never before advertised. ETCO-003, Box 762, Plattsburgh, N.Y. 12901. Surplus Wanted.

QSLs with Class! Unbeatable quality, reasonable price. Samples: 50 cents refundable. QSLs Unlimited, 1472 SW 13th Street, Boca Raton, FL 33432.

CUSTOM EMROIDERED EMBLEMS, your design, low minimum, Emblems, Dept, 10, Littleton, New Hampshire 03561.

WANTED: Hallicrafters S-1 through S-7, H8PA, 5-T, SX-10, SX-12, and other early Hallicrafter gear, parts, and manuals—any condition-for private collection. Price and condition first letter. C. Dachis, WD5EOG, 4500 Russell Drive, Austin, Texas 78745.

WANTED: Galaxy AC400 power supply. Will buy or have Galaxy G1000 for trade. DC supply never used. Jim Hazelrigg, Rt. 2, Box 32, Barboursville, W. VA 25504, (304) 736-9337.

BEARCAT 210 $219.95. Bearcat 250 $299.95. Regency Touch 10ch $199.95, 16ch $219.95. Kenwood TS820S $1048. TS520S $699.95. Prices include shipping. Visa/Master. SASE (large) speeds a free price list. McDonald Electronics, Box 1385(C), Rohnert Park, CA 94928, (707) 544-4388.

NOSTALGIA BUFFS and Old Radio Fans copies of rare 1943 edition 36 page Allied's Radio Builder's Handbook; circuits, theory, and inspiration for the beginner. Great for gifts! $6.95 postpaid. Ohio residents add sales tax. R.A. Russ Co., Box 601, Fairborn, Ohio 45324.

LOUISIANA HAMFEST. November 12, 1978, West Monroe Civic Center, Prizes, swap tables, exhibitors, fun for the family. AE5V, 500 McMillan, West Monroe, LA 71291.

FOR SALE: Wide base 56 ft. tower, Tilt base, Ideal for large antennas. Reasonable. Ken Teeple, Rt. 3, Box 15A, Elgin, Illinois 60120, (312) 695-7236.

WANTED: Henry 3-IC-A linear amplifier, must be in mint condition. K6RMM, S. Kurtzman, 2305 Liveoak Meadow Rd., Malibu, California 90265, (213) 456-9608.

PHOTOS wanted of rare or unusual U.S.-manufactured long-range communication receivers (or permission to photograph same) for use in communication receiver history covering 1918-1978. H.L. Chadbourne, 530 Midway Street, La Jolla, CA 92037.

FOR SALE: AN/URC-32A SSB HF xceiver 2-30 MHz simultaneous sideband xmit capable. 10 units best offer. Dave Hunt, RFD 1, Box 24A, Dresden, Maine 04342.

ROCHESTER HAMFEST & NY State ARRL Convention will be held on May 25-27, 1979. Add your name to the mailing list. Send QSL to Rochester Hamfest, Box 1388, Rocheter, NY 14603. Phone (716) 424-1100.

LOOKING for old Lionel trains. Interested only in "O" gauge, excellent to like new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap readio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call (516) 883-6200.

WANTED: Source for 5FP7, 5AHP7, Y0KE. Socket, mounting hardware. Also info used SSTV monitors Dealers. Darcy Brownrigg, Chelsea, Quebec, J0X 1N0 Canada.

FOR SALE: Cushcraft A147-22, stacked 11 element 2 meter beam. New in carton. $70. A. Dorhoffer, K2EEK, 14 Vanderventer Ave., Port Washington, NY 11050.

FOR SALE: Hy-Gain 18AVT-WB, 10-80 meter trap vertical, new in sealed carton, $70. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

SELL: Yaesu FT-401B, mike, speaker/patch, key, $400. WD4HXW, Ga. Tech., Box 31498, Atlanta, GA 30332.

LOWEST PRICES on Amateur Radio and accessories. Example: Kenwood T820S $1049.95 plus more. Write for a price quote today. Unit 65 Communication, P.O. Box 312, Mansfield Center, Conn. 06250.

WANTED: Antique Glass-Looking for old milkglass-purple, slag, carmel, and green-twon. Tell me what you have. I pay the highest prices. Write Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

SALE: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake. $40. Schultz, Box "L", FPO New York 09544.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., 44 Main St., Saugus, MA 01906, (617) 233-1234.

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.

SELL: CQ Magazines complete. Reasonable offers, cash or trade. Nagle, 12330 Lawyers Rd., Herndon, VA 22070.

WANTED: Pre-war issues of Short Wave Craft magazine. Bill Orr, W6SAI, Eimac, 301 Industrial Way, San Carlos, CA 94070.

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.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SELL: 2 meter 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: Tektronix 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.

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.

FOR SALE: Ham gear, test equipment, books, magazines. Cleaning house. Send s.a.s.e. for list. I. Schwartz, K2VG, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

CQ AND QST 1950-1975 issues for sale. Send SASE if ordering 73, Ham Radio, or other CQ and QST issues. One dollar minimum order and all issues cost 25 cents each, including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire Ave., Burbank, CA 91504. Available issues and refund sent within one month.

CERTIFICATE FOR PROVEN Two-Way Contact 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 Ave., Burbank, CA 91504.

SELL: HQ-215 $225, SX-190, $150, TI SR-52 $125, 60 mm telescope $100. K9UKX, 51625 Chestnut Rd., Granger, IN 46530.

WANTED: Heath HW-16 transceiver in excellent condition, state price. Caswell Davis, 601 Delmar, Apt. 2, San Antonio, TX 78210.

CLEANING UP SHACK: Transmitters, receivers, accessoreis, etc. Send s.a.s.e. for list. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

GOV'T SURPLUS Sig. Generators AN/USM27B and other electronics, RTTY, for sale cheap or trade. Setails/list SASE to: DT-CQ, Box 9064, Newark, NJ 07104.

WANTED: Early amateur equipment. State condition, make , model, and price. H.F. Schnur, 115 Intercept Ave., North Charleston, SC 29405.

DXers! Ham sentences in 54 languages on your outgoing DX QSLs get results. K3CHP.s DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

FOR SALE: Central Electronics 600L linear amplifier, $400. or trade for Yaesu FL-2100B. KA8BIE, (517) 739-8168, Bruce.

WANTED: Heathkit HW-16 or HW-101 transceiver. State condition and price. Frank Varano, 37 South Market St., Shamokin, PA 17872.

TYPEWRITER, Navy WW 11 type, wanted by W.D. Ennis, WB7PUG, 3094 Disney Dr., Idaho Falls, Idaho 83401.

FOR SALE: Precision resistors, approx 15,000 new unused, 2 cents each. Send s.a.s.e. for available sizes. Jim Groll, W7KRW, 1137 West 10th Pl., Mesa, AR 85201.

TRADE: Tram D-42 or SBE-45 base 40 channel CB for good used receiver. Hammarlund, Kenwood, etc. A. Jones, S 16 R Menendez Pidal, El Senorial, Rio Piedras, PR 00926.

GONSET Communicator II with VFO/Preamp. 2 meter very clean, $85. CQ and QST 30 year collection best offer. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

WANTED: Hams under age 18, for young OMs Net, Sunday, 14290-2000 GMT. WB1ANT, 145 Grove, Norwell, MA 02061.

JOHNSON: GN2 Thunderbolt, $675. Pick-up only. Kenwood TV-502 with pre-amp, $190. Celm Duval, 33727 Brwonlea, Sterling Hgts., MI 48077, (313) 268-2467.

WANTED: Urgent, QSL One million needed. Send QSL Cards to: Philip Steven Kurland, P.O. Box 1686, New Haven, CT 06507.

HEWLETT PACKARD 608 sig. gen., $300, H.P. 312C wave analyzer, $500, Brand new big prop pitch meter, $90. K6OP, 129 Club Dr., San Carlos, CA 94070.

MFJ Versa-Tuner II, mint just bought by mistake. 5 way unit new this year. Used once, $55. Harry, WB1FTQ, Phone (203) 688-1749.

NOVICE All-American certificate: Work a novice in all 10 call areas. Send list and $1. K6ASI, 25 Rudnick Ave., Novato, CA 94947.

FOR SALE: 75A3 (0.8, 3.1) cal, $225. 32V3, $175. Valiant I, $100. HQ-210, $325. J.W. Craig, W1FBG, 29 Sherburne Ave., Portsmouth, NH 03701.

TEST EQUIPMENT collector's surplus, HP, GR, Tek. Excellent stuff. Free lsit. PhD, 5220 Carlingford, Riverside, CA 92504.

WANTED: Books or magazines dealing with early radio or amateur radio. State condition and price. H.F. Schnur, 115 Intercept Ave., N. Charleston, SC 29405.

COLLINS: Late KWM2, $695. 516F2, $125. Dick Shideler, 3731 Evergreen, Visalia, CA 93277.

PEOPLE interested in future es scientific things should wirte me about forming a group on 40 meters. Steve, WD8DAS, 823 Irvington, Massillon, OH 44646.

Please send all reader inquiries directly

ADVERTISER'S INDEX

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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.

THE CHRISTMAS GIFT OF A LIFETIME!

YAESU ANNOUNCES THEIR SENSATIONAL COMPUTER AGE CPU-2500R/K 2-METER 25 WATT TRANSCEIVER

Again, Yaesu, THE RADIO, takes a giant step forward with their computer age 4-bit Central Processor Unit controlling the Phase Locked Loop. It allows selection of 800 PLL channels with touch button station selection built into the optional keyboard mike . . . *PLUS* automatic scan, up or down across the entire 2 meter band . . . *PLUS* four memory channels . . . *PLUS* optional tone squelch encoding . . . *PLUS* tone burst . . . *PLUS* high SWR and reverse voltage polarity protection . . . *PLUS* 3/25 watts of power . . . *PLUS* fixed ±600 KHz offsets . . . *PLUS* programmable offsets . . . *PLUS* tone pad microphone option . . . *PLUS* bright 3/8" LED six digit frequency display and another LED for memory display . . . and much more.

The CPU-2500R/K is a space age radio for discriminating amateurs utilizing the latest solid state techniques and it's on your dealer's shelf today!

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EIMAC's new Pyrogrid can run hotter so your transmitter can run better.

No easier way to generate 50 kW for AM, FM, and VHF-TV service.

The pyrolytic graphite grid in EIMAC's newest tough tetrode, the 4CX40,000G, has triple the screen dissipation of earlier tetrodes. Which means:

1. A previous limiting factor in tetrode design, screen dissipation, is virtually eliminated.
2. Primary grid emission is eliminated.
3. Secondary grid emission is eliminated, improving linearity.
4. Hot and cold spacing between grids remains constant, allowing closer spacing between elements and improved performance.

High gain, better reliability.

With over 20 dB power gain, EIMAC's Pyrogrid 4CX40,000G tetrode can follow a solid state driver, allowing a smaller, more efficient transmitter.

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Available today for tomorrow's single tube transmitters.

For complete information about the tough new EIMAC tetrode for tomorrow's AM, FM broadcast and VHF-TV linear amplifiers, contact Varian, EIMAC Division, 301 Industrial Way, San Carlos, CA 94070. Telephone (415) 592-1221. Or any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.

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