HAM RADIO HORIZONS

A World Of Intrigue

November 1980 / $1.50

Security For Your Ham Gear

The Match Game: Antennas and Rotators

November: A Good DX Month

Charley's

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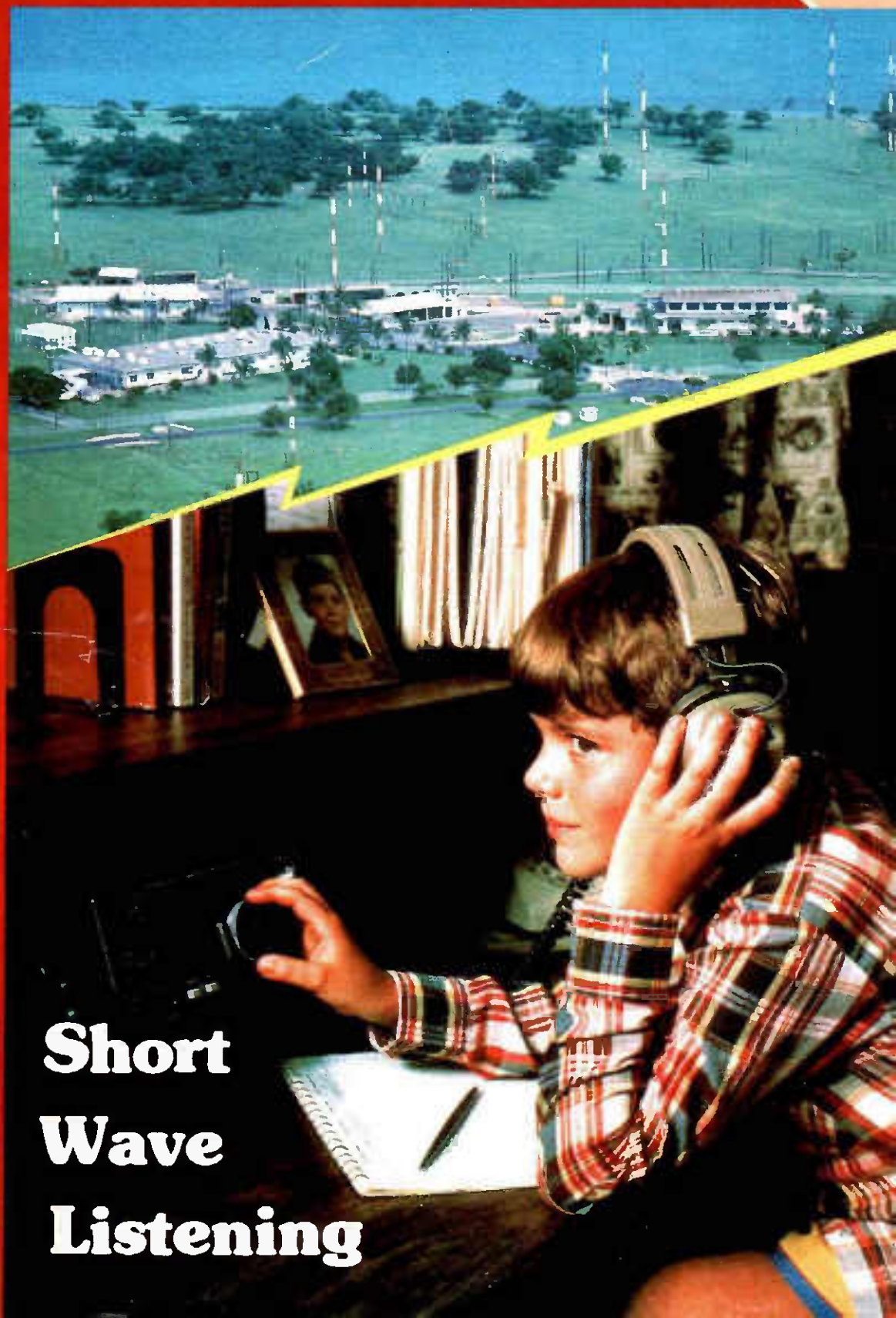
- and much more...



Short Wave Listening

SUPER RIG

NEW TEN-TEC

OMNI-C 9 Band Transceiver + HERCULES Solid-State KW Linear

TEN-TEC SUPER RIG IS READY. For every band, every band condition. With the latest in solid-state hf technology, the latest in features. To make communications easier, more reliable — super.

OMNI-C

The new model in this famous series. With new coverage and new features to make it better than ever!

All 9 HF Bands. From 160 through 10 meters, including the new 10, 18 and 24.5 MHz bands. Coverage you can live with—for years and years.

3-Mode, 2-Range Offset Tuning. Offset the receiver section or the transmitter section or the entire transceiver! In 2 ranges: ±500 Hz or ±4 kHz. For complete flexibility in fine tuning, a DX work, or net operations.

Seven Response Curves. Four for SSB, three for CW. With new switching to select the standard 2.4 kHz filter, optional 1.8 kHz SSB filter, 500 Hz or 250 Hz CW filters, and standard 450 and 150 Hz CW active audio filters. Up to 16 poles of i-f filtering plus audio filtering to handle any situation.

Built-In Notch Filter and Noise Blanker. Notch is variable from 200 Hz to 3.5 kHz with a depth of more than 50 dB. New noise blanker reduces ignition and line noise. Both standard equipment.

"Hang" AGC. New, smoother operation.

Super Specs. *Optimized sensitivity*—a balance between dynamic range and sensitivity (2 μV on 160 to 0.3 μV on 10 meters) *Greater dynamic range*: better than 90 dB. And a PIN diode switchable 18 dB attenuator. *200 watts input* on *all* bands! *100% duty cycle* on *all* bands for up to 20 minutes.

Super Convenient. *Built-In VOX* with 3 up-front controls. *Built-In PTT* control at front and rear jacks. *Built-In Zero-Beat* switch puts you on exact frequency. *Built-In Adjustable Sidetone* with variable pitch and level. *Adjustable ALC* for full control from low power to full output. *2-Speed Break-In*, fast or slow speeds to fit operating conditions. *Built-In Speaker* eliminates desk clutter. *Automatic Sideband Selection*—reversible.

Super Design. *All Solid-State and Broadbanded*—from the pioneer, Ten-Tec. *Modular* plug-in circuit boards. *Functional Styling* with convenient controls, full shielding, easy-to-use size (5¾"h x 14¼"w x 14"d).

Super Hercules Companion. Styled to match, plus separate receiving antenna capability, plus transceiver front panel control of linear's bandswitching (one knob does it all).

Full Accessory Line including filters, remote VFO, power supplies, keyers, microphones, speech processors, antenna tuners—all in matching color.

Model 546 OMNI-Series C.... $1189.

HERCULES

Amateur Radio's first full break-in solid-state kW linear amplifier. With the reliability you'd expect from the pioneer in high-power solid-state technology—TEN-TEC.

All Solid-State. No tubes. Instead, HERCULES uses two 500-watt push-pull solid-state amplifier modules with an output combiner. Super solid.

Broadband Design. No knobs, no tuning. From the pioneer, TEN-TEC. For fast, effortless changing of bands. Super easy.

Automatic Bandswitching when used with OMNI (the OMNI bandswitch also controls HERCULES bandswitching through a motor driven stepping switch). Super convenient.

Full Break-In. HERCULES puts the conversation back into high power CW operation—you can hear between every character you send.

Full Coverage. 160 through 15 meters plus four "AUX" positions for 10-meter conversion by owner and future band additions.

Full Gallon. 1000 watts input on *all* bands, 600 watts output, typical. Built-in forced-air cooling. Driving power: 50 watts, typical. Adjustable negative ALC voltage. 100% duty cycle for SSB voice modulation; 50% duty cycle for CW/RTTY (keydown time: 5 minutes max.) Continuous carrier operation at reduced output.

Full Protection. *Six LED status indicators* continuously monitor operating conditions and shut down the amplifier whenever any one exceeds set limits (the exciter automatically bypasses the amplifier under amplifier shut-down for barefoot operation). The six parameters monitored are: 1) overdrive; 2) improper control switch setting; 3) heat sink temp.; 4) SWR; 5) overvoltage/overcurrent; 6) rf output balance. *Two meters* monitor collector current, voltage, and forward/reverse power. And a highly efficient *automatic line voltage correction* circuit (patent applied for) eliminates the need for selecting transformer taps, prevents applying too high a voltage to final amplifier devices, becomes operative under low line conditions.

Super Power Supply. Provides approximately 45 VDC @ 24 amperes, operates on 105/125 VAC or 210/250 VAC. Tape wound transformer and choke reduce weight (50 lbs.) and size (7½"h x 15¾"w x 13½"d). Separate enclosure.

Super Styling. Designed to match OMNI, the HERCULES has the same height as OMNI, plus matching bail and matching colors. The front panel is simplicity in itself with two push-button switches (power and mode) plus two knobs (meter and bandswitch), and a "black-out" monitor panel (when unit is off, meters are unobtrusive). Amplifier size is 5¾"h x 16"w x 15½"d.

Model 444, HERCULES amplifier & power supply.... $1575.

Experience SUPER RIG at your TEN-TEC dealer, or write for full details.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862
EXPORT: 6715 LINCOLN AVE., CHICAGO, ILL. 60646

Rack Attack from DenTron

Components are the latest in communication systems adapting to your stations' needs. The DTR-3KA and DTR-1200L are equipped with heavy-duty handles for easy rack mounting and rack brackets that can be easily removed. The DTR-1200L linear amplifier provides 1200 watts SSB and 1000 watts CW input continuous duty. It features large 3½" shadow box, back lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers. The DTR-3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dry dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 OHM impedance. Component racks available at your DenTron Dealer.

DTR-1200L Linear Amplifier

Frequency Ranges:

80 Meter Band	3.45 - 4.6 MHz
40 Meter Band	6.00 - 9.0 MHz
20 Meter Band	10.00 - 16.00 MHz
15 Meter Band	20.95 - 23.50 MHz
10 Meter Band	Export Model

Modes: USB, LSB, CW, RTTY, SSTV
Power Input: 1200W - SSB, 1000W - CW
Power Requirements: 234/117 VAC 50/60 Hz
RF Drive Power: 150 Watts maximum and 65 watts minimum for 1 KW DC input.
DC Plate voltage: Idle + 2300V approximate
Duty Cycle: 100% SSB, CW, RTTY, SSTV
Input Impedance: 50 Ohms nominal
Input VSWR: 1.5 to 1 average
Output Impedance: 50 Ohms nominal
Antenna load VSWR: 2 to 1 maximum
ALC: negative going, adjustable from front panel
Spurious Emissions: IMD - greater than 30 db down
Harmonics - greater than 40 db down
Switchable 12VDC accessory output voltage
Multimeter:

Plate Voltage	0 - 3000VDC
Plate Current	0 - 500ma
Relative Output	Adjustable

Front Panel Plate Voltage Switching
FCC Type Accepted
Size: 5¼" H x 17" W x 13" D (19" W with rack brackets)
Weight: 46 pounds

DTR-3KA Antenna Tuner

Frequency Coverage: 1.8 - 30 MHz continuous
Built in 2 KW PEP Dummy Load - Forced Air Cooled
Input Impedance: 50 ohms (Resistive) to transmitter
Antenna Inputs
- Coax 1, 2 & 3 - unbalanced—may range from a few ohms to a high impedance
- Long wire - low to high impedance
- Balanced line - 75-660 ohms

Power Capability: 3000 watts P.E.P.
Wattmeter: 200 watts forward
2000 watts forward
200 watts reflected
Accuracy: ± 5%
Remote sensor box
3½" backlit meters
Dummy Load: with manual or automatic forced air cooling.
Integral 3KW Balun

DenTron
Radio Co., Inc
1605 Commerce Drive
Stow, Ohio 44224
(216) 688-4973

THIS MONTH'S HORIZONS

Shortwave Listening

Tired of the ho-hum of the daily soap opera on TV or radio? Is your daily grind beginning to get to you? Tune out your troubles and listen to the world. There's everything from music in foreign tongues to ship and aircraft messages to mysterious, coded messages that fit right into the plot of a thriller spy novel. The message starts on page 12.

Wire, Ropes, And Angles

There are those in the ham fraternity who believe in using power, and those who believe in using antennas. K1GZL is definitely an antenna man, and has used thousands of feet of wire and rope to prove it. Although using only a modest transmitter, his signal takes a back seat to no one. What's more, the added gain when he is listening doesn't hurt a bit. Charley's friend, W8HXR, tells what it takes to keep the air warm above a northern New Hampshire hilltop.

Security And Your Ham Gear

Home and vehicle burglaries are on the increase — up 28 per cent according to recent figures — and insurance costs are sure to increase just as well. There's a cheaper kind of insurance, however, called a security system. There are several kinds, and WB6NOA gives you a rundown on what each kind will do for you.

DX Horizons

November provides good DX activity on all bands. QRN levels are beginning to drop on the lower frequencies, and propagation conditions should be excellent. The *CQ* Worldwide DX Contest on the last full weekend of the month can bring many opportunities for improving your DX score, as many DX stations devote more of their time to operating on this particular weekend than any other.

Ham Radio Techniques

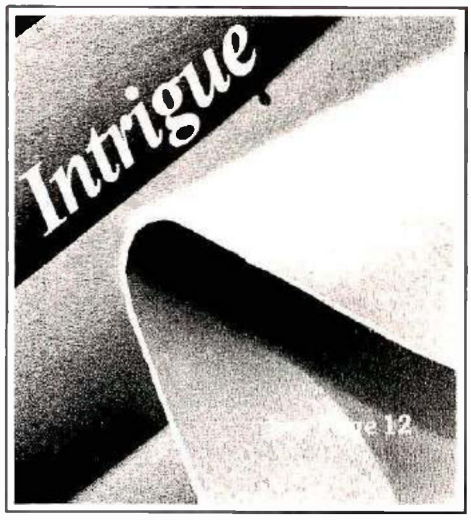
An explanation of the Quad antenna, and a couple of easy-to-build versions of it, occupies the pages of Bill Orr's column this month. Beam in on page 48.

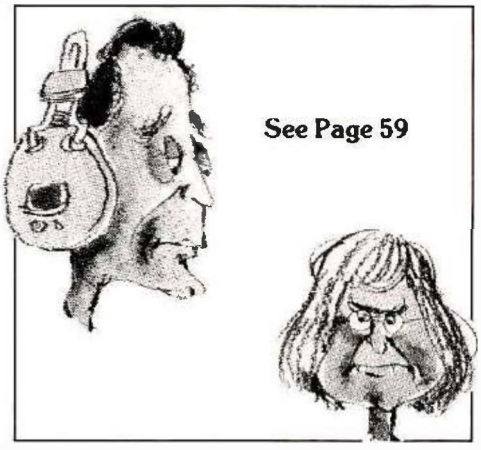
Antenna Spinners

You know about matching your antenna to your transmission line, but did you ever realize that there is another type of matching that needs to be done — antenna and rotator must get along well, too. The results of a mismatch can be inefficiency or, worse, broken gear teeth and other hardware. WB2IBE has taken a look at some of the more common twisters and provides a short text on their selection, care, and feeding. Your azimuth indicator should point to page 53.

DXer's Diary

What to do when the rare DX station goes away when you call him? No, crying, gnashing of teeth, and pulling of hair doesn't help. But, you can use your head for something other than a support for the earphones — some careful detective work will disclose what's in the mind of the DX operator, and you'll get together at last. W9KNI proves it on page 59.





The Cover

Shortwave listening, the gateway to electronics and ham radio for thousands, is this month's subject. Photo of the Poro Transmitter site, Philippine Relay Station, courtesy of Voice of America. Photo of Bill Grove listening in courtesy of his father, WA4PYQ.

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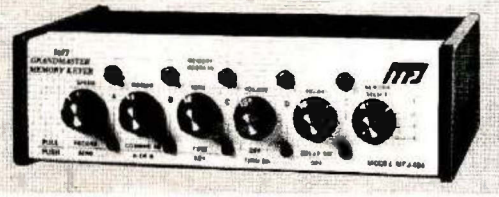
MFJ 941C Versa Tuner II

MFJ-941C
$84.95 (+$4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.
SWR + dual range wattmeter (300 & 30 watts full scale, forward and reflected power). *Sensitive meter* measures SWR down to 5 watts output.
More flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.
12 position efficient airwound inductor for lower losses, more watts out.
Built-in 4:1 balun for balanced lines. 1000v capacitor spacing.
Matches everything from 160-10 meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.
Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.
MFJ-945, $74.95, like model 941C but less ant. switch. Optional mobile bracket for either model is $3.

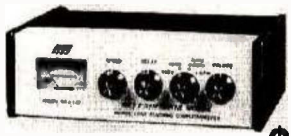
MFJ 484 "Grandmaster" Memory Keyer



MFJ-484
$139.95 (+$4)

Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).
Repeat any message continuously or with pauses of up to 2 min. LEDs show use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle.
Built-in memory saver — 9 V battery takes over when power is lost.
Iambic operation with squeeze key. Dot-dash insertion. Optional BENCHER paddle $42.95 +$4.
Dot-Dash memories, self-completing, jam-proof spacing, instant start.
Panel controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay (0-2 min.)/Repeat; rotary Vol/On-Off; Memory Select; Message Buttons select desired 25 ch. messages; Memory Reset button.
Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). Operates 12-15 VDC or 110 VAC with optional adapter, $7.95 +$2. Size 8x2x6". **MFJ-482, $99.95,** four 25 or 50+two 25 ch. messages; **MFJ-481, $89.95,** two 50 ch. messages. **Get the best seller keyers-MFJ "Grandmasters."**

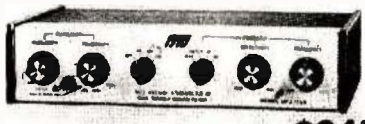
MFJ 410 "Professor Morse" Code Generator/Keyer



NEW LOW PRICE
Save $20
MFJ-410 Now Only **$129.95** (+$4)

Use it to learn, use it to operate. It sends *unlimited random code* in random groups for practice; *never repeats* sequences. And when you're on the air, it's a *full feature keyer.*
Vary speed from 5-50 wpm; meter readout.
Vary spacing; give fast sound to low speed.
Alpha or alphanumeric with punctuation.
Built-in speaker and phone jack; tone and vol. Ideal for classroom or private use.
Full feature keyer includes vol., speed, tone and weight controls, tune switch, dot-dash memories, keys grid block, cathode, solid-state rigs. Optional BENCHER paddle $42.95 + $4. Operates on 9-18 VDC, two 9 V batteries or 110 VAC with optional adapter $7.95 +$2. Size 7x2x6". **Get "Professor Morse"** — you'll never outgrow it.

MFJ Dual Tunable SSB/CW Filter "Signal Enhancer"



MFJ-752B **$84.95** (+$4)

Dual filters give unmatched performance.
The primary filter lets you *peak, notch, low pass or high pass* with extra steep skirts.
Auxiliary filter; *70 dB notch, 40 Hz peak.*
Both filters tune from 300 to 3000 Hz with variable *bandwidth from 40 Hz to nearly flat.*
Constant output as bandwidth is varied; linear frequency control.
Switchable noise limiter for impulse noise.
Simulated stereo sound for CW lets ears and mind reject QRM.
Inputs for 2 rigs, switch selectable. Plugs into phone jack. Two watts for speaker. OFF bypasses filter. 9-18 VDC, 300 mA or 110 VAC with optional adapter $7.95 +$2. 10x2 x6". **MFJ 751, $59.95,** similar, primary filter only, less high pass & noise limiter.

MFJ BEST SELLERS

favorite products from the world's leading manufacturer of amateur radio accessories

GMT Clock/ID Timer

MFJ-101
$29.95 (+$4)

24 hour, solid-state, blue 0.6" digits, ID timer sounds every 9 min (also a snooze alarm), regular alarm for skeds or to awaken, power-out/alarm-on indicators, ready to use on 110VAC, 50-60Hz, 6x2x3".

KW Dummy Load With Oil

MFJ-250
$29.95 (+$4)

Rated at 1 kW CW or 2 kW PEP for 10 min., half that for 20 min., cont. at 200 W CW, 400 W PEP, non-inductive 50 ohm resistor, quality transformer oil (no PCB), VSWR under 1.2:1 to 30 MHz, 1.5:1, 30-300 MHz, 2:1, 300-400 MHz. Coax conn., vent cap., 7½"h x 6⅝" diam.

300 Watt Antenna Tuner

MFJ-949B
$129.95 (+$4)

Does it all! Built-in dummy load, SWR, forward and reflected power meter, antenna switch, balun, matches everything from 1.8-30 MHz (coax, random wires, balanced lines), coax conn., binding post, 10x3x7".

TO ORDER PRODUCTS, CALL TOLL FREE
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- **Products ordered from MFJ are returnable within 30 days for full refund (less shipping)**
- **Add shipping & handling charges in amounts shown in parentheses**

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HAM RADIO HORIZONS

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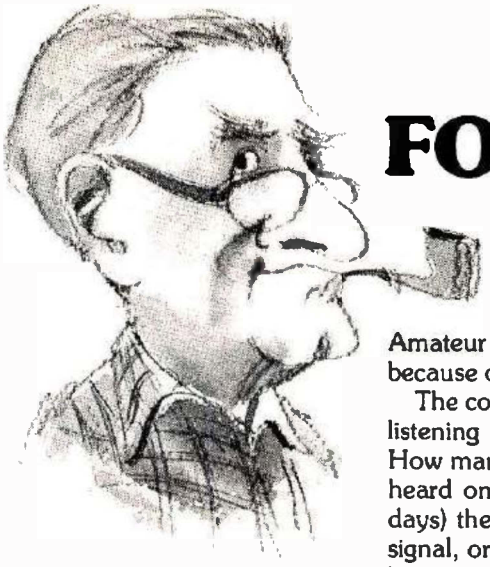

FOCUS & COMMENT

November, the month of football games, roast turkey, cool days and cooler nights, and excellent conditions on the lower Amateur bands; excellent DX opportunities on 160, 80, and 40 meters because of the decreased atmospheric noise this time of year.

The conditions are also excellent for exploring the realm of shortwave listening — and will stay so for the remainder of the winter months. How many of you got your start in Amateur Radio as a result of voices heard on a cold winter evening, as you scanned (manually, in those days) the shortwave broadcast bands, looking for a new station, a rare signal, or other entertainment during the weeks when you were housebound by weather or lack of other activity.

From comments I've heard, and a considerable number of letters and cards received over the years, my guess is that the majority of hams who first got their license just before or immediately after World-War II were "trapped" by inadvertently tuning a shortwave set into a ham band — 160, 75, and 40 meters were the popular a-m (amplitude-modulation) phone bands of those days. Then, too, many broadcast sets of the era would receive 160 without modification, and those that would not could easily be "stretched" by any service technician or a bold listener with a screwdriver and a bent for experimenting (another requisite for a budding ham!).

I guess what I am trying to point out is that our feature article this month — Shortwave Listening — is not really out of place. It's a fascinating world, and the new crop of equipment for the shortwave listener has features never dreamed of by the designers of yesterday's 1, 2, 3, or more tube "superdynes" that tuned in on an less-crowded world.

Better filters, a BFO for CW and SSB, fm reception capability, excellent stability because of phase-locked-loop design, digital readout, timers, tape-recorder connections — the list would make one drool.

Thanks to all these modern innovations in receiving equipment, plus general-coverage capability, the doorway is once again open for shortwave listeners to become interested in ham radio by virtue of "reading the mail" on the ham bands.

Why an SWL article in an Amateur magazine, you persist? Well, *Ham Radio Horizons* is read by other than Amateurs . . . my barber (a non-ham) keeps a copy on his waiting-room table. Many friends and acquaintances tell me that they read the magazine and then give it to a neighbor or friend (and quite a few new hams have been "hooked" in this manner). Libraries and schools have *HRH*, too, so the exposure is wide and varied, as it must be if we are to introduce more people to our great hobby. As the note at the start of the article says, let us hear from you so that *HRH* and the author will know how enthusiastic the world is about SWLing.

Another important point is brought out in this issue — security. We hear less and less about CB-set ripoffs of late, and the reason could well be the depreciation in the price of used equipment, especially the millions of almost useless 23-channel rigs. However, home burglaries and theft of TV, hi-fi, and other equipment is increasing, and this trend is reflected in the cost of insurance. As might be expected, there's a parallel boom in home-protection devices, and one of our authors explores this area for you.

It's true that no alarm device will prevent a determined professional burglar from getting what he wants, but the great majority of these crimes are committed by relatively inexperienced newcomers to the trade of thievery, "learning the trade" to support some habit or other. Why make it easy for them? A basic intrusion alarm is relatively easy to obtain and install, and just might save your new rig. An idea worth giving serious thought is to add fire protection to the alarm system — for two reasons. All too often, a burglar will set fire to a house to cover his tracks, and, in these days of alternative energy devices (wood stoves, etc.) a smoke or heat alarm can truly be a life saver.

So, have a ball in November. Get your hamshack or listening post ready for winter, stoke up the stove, or add a log to the fireplace, and enjoy some of the best atmospheric conditions of the year.

Tom

Thomas McMullen, W1SL
Editor

EITHER WAY YOU GO, IC-251A!

GO WITH QUALITY. GO WITH ICOM. GO WITH THE BEST.

The IC-251A is the newest addition to ICOM's all mode transceiver line. Like the matching IC-551, the IC-251A has dual digital VFO's, three memories, scanning (even SSB), and many other features you only get from ICOM.

Both units include the no backlash, no delay light chopper, similar to the IC-701, as a standard feature at no cost. Coupled to the microporcessor, this provides split frequency operation as well as completely variable offsets.

Check the specs, and you'll agree, either way you go, ICOM is simply the best.

SPECIFICATIONS

Listed below are some of the IC-551 specifications. **IC-251A**'s specs are identical except where noted **(In bold)**.

Frequency Coverage: 50~54MHz **(143.8~148.19MHz)**

RF Output Power:
SSB 10W PEP
(1~10W adjustable) **(10W)**
CW 10W
(1~10W adjustable) **(10W)**
AM 4W
(0~4W adjustable) **(—)**
FM* 10
(1~10W adjustable) **(1~10W)**

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

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

Selectivity: SSB/CW/AM
More than ±1.1KHz at -6dB **(1.2)**
Less than ±2.2KHz at -6dB **(2.4)**
(When Pass Band Tuning Unit is installed: less than 1KHz at -6dB)
FM* More than ±7.5KHz at -6dB
Less than ±15KHz at -60dB

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

Weight: 6.1kg **(5kg)**

Spurious Response Rejection Ratio: More than 60dB

HF/VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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Please send me: ☐ IC-551 specifications sheet; ☐ IC-251A specifications sheet; ☐ List of Authorized ICOM Dealers.

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All stated specifications are subject to change without notice. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

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Special SAROC Dunes Hotel & Country Club room rate is $35.50, plus room tax, includes telephone. Send deposit and request direct to RESERVATIONS MANAGER, Dunes Hotel & Country Club, 3650 Las Vegas Blvd. South, Las Vegas, NV 89109 or call toll free 1-800-634-6971

Clip and mail to SAROC REGISTRATION, P. O. Box 945, Boulder City, NV 89005 before December 20, 1980.

Enclosed is $ _____ check or money order (no cash) for _____ SAROC advance Registration

@ $16.00 each, and _____ extra main drawing tickets @ $1.00 each maximum of ten.

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I have attended SAROC ___ times. I plan to attend Friday Cocktail Party _____

I am interested in: ARRL, Cocktail Party, CW, DX, FCC, FM, MARS, RTTY, _____

I receive: CQ, HAM RADIO MAGAZINE, HAM RADIO HORIZONS, HR REPORT, QCWA, QST, RTTY, SPARKS/GAP, 73, WORLD RADIO, _____ Publications. Please circle the ones received.

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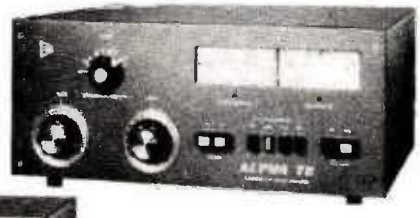
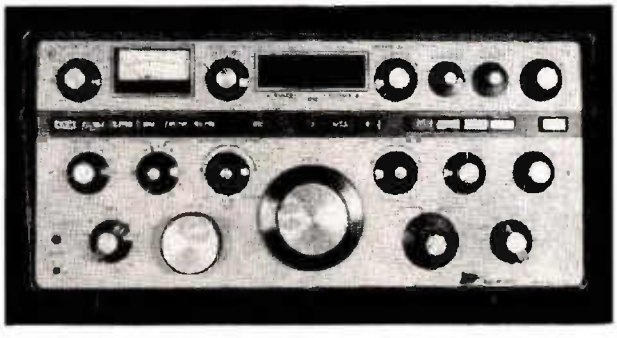
- Alpha 77DX: The ultimate amplifier for those who demand the finest.
- Eimac 8877 Tube — 1500 watts of plate dissipation.
- 4.4 KVA Hypersil®, removable, plug-in Transformer.
- Oil-filled, 25 mfd Filter Capacitor.
- QSK CW: Full break-in, (2) vacuum relays.
- Vacuum Tuning Capacitor.
- Ducted air cooling, large, quiet blower, computer grade.
- Warranty (limited) 24 months, tube by Eimac.
- Other ALPHA's: 78, 76CA, 76PA, 76A, 374A, 77SX (Export Only).



signal/one CX-11-A Integrated Station



Phone Don Payne, K4ID, for Special Prices, Brochure, and OPERATING EXPERIENCE on the CX-11A and Alphas.

PAYNE RADIO

Personal Phone — (615) 384-2224
P. O. Box 100, Springfield, Tenn. 37172

- POWER OUTPUT: 150 watts CW/SSB output all bands (2) MRF 422 Finals.
- OPTIONAL POWER OUTPUT: 200 to 225 Watts CW/SSB output
- SYNTHESIZED FREQUENCY COVERAGE: All amateur bands 1.8-30 MHz in full 1 MHz bands, plus 4 additional 1 MHz bands for future expansion.
- TWO PTO'S: Dual receiving, transceive on either, or split operation.
- QSK CW; Full break-in, vacuum relays. 300 Hz CW Filter built-in.
- SELECTIVITY: Two 8 pole plus one 4 pole filter deliver 20 pole 1.4:1 shape factor (6dB/60dB), plus post detection 1.5, 1.0, .4 and .1 kHz bandwidth.
- BUILT-IN A/C supply, 115/230V, 50/400 Hz, Hypersil® transformer. IF shift, noise blanker, RF clipping, CW keyer, notch/peak filter.
- SERVICING: Self service easiest of any transceiver by using gold-plated sockets for transistor and IC replacement.
- RELIABILITY: Less than 1% failure. 99% of problems resolved in field.
- QUALITY: All military and computer grade. 100% American made.
- PRICE $5900, mfg. by Signal/one Corp., Phoenix, AZ 85021.

Ringo Ranger II: We've made the best better.

The new Cushcraft Ringo Ranger II incorporates Cushcraft's latest design features for increased performance and greater operating pleasure. Ringo Ranger II is the most recent design from Cushcraft's engineering team. The wisdom of Cushcraft's founder Les Cushman, W1BX (50 years of licensed ham radio and antenna designing) plus the effort of Dave Olsen, K1WHS, world renowned active VHF/UHF enthusiast (first 2 meter EME WAC) and creator of many recent Cushcraft antennas have led to this superior design.

The new Cushcraft Ringo Ranger II is the longest lasting best performing 2 meter FM base station antenna. Check these features.

Ringo Ranger II incorporates proven features with new insulating materials and 5/8 wavelength decoupling section for increased gain and radiation isolation.

Covers entire band yet can be optimized for your section and favorite operating frequency.

Made from 6063-T832 corrosion resistant aluminum tubing. Does not have noisy "stovepipe" seams. Long life because it is not degraded by short exposures to salt. Low profile for best appearance and least wind

Strong enough to endure wind and ice storms. Built-in lightning arrester to reduce static noise and lightning hazard. Conveniently mounted and it fits nicely on towers with other antennas.

ANTENNAS	ARX-2B	144-174 MHz
	ARX-220B	220-225 MHz
	ARX-450B	435-470 MHz

Ringo Ranger II Conversion kit includes decoupling section with mounting ring, hardware, RG-8/U cable, new connector parts, plus a built-in lightning arrester. Easy upgrade for your Ringo Ranger.

CONVERSION KITS	ARB-2K
	ARB-220K
	ARB-450K

Available through dealers worldwide

cushcraft CORPORATION

The Antenna Company
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

NEWSLINE

MORE FCC LICENSE FEE REFUNDS are to begin shortly, as the Commission begins Phase II of its fee refund program. Under the Phase II program, all applicants who paid the FCC license fees of more than $4 but less than $20 between August 1, 1970, and February 28, 1975, are eligible for refunds. Almost all Amateurs who held licenses during that period should have a refund coming, but CBers, whose license was only $4, will not.

To Apply For A Refund, request an instruction book with refund form from any FCC Field Office, or write the FCC Fee Refund Program (Phase II), Box 19209, Washington, D.C. 20036. Specific questions about the program can be answered by calling a special toll-free number, (800) 424-2901. Applications will be accepted until December 15, 1982, though applicants are urged to submit requests before next September 1. As a very large number of requests are expected, applicants will experience considerable delay.

Phase I Of The Refund Program, recently completed, resulted in about $49,000,000 being returned to FCC licensees. Phase I covered only fees of $20 or above.

PLAIN ENGLISH AMATEUR RULES continue to move along at the FCC, with a draft covering the Amateur Satellite Service, and RACES as well, now circulating within the Commission. If this draft doesn't run into too much trouble, it's possible it could be out for public comment as soon as late fall. Plain English rules for both the CB and VHF Marine Services are already in effect, and the final version of the Radio Control rules should be out soon.

HAM RADIO MAGAZINE'S NEW EDITOR is Alf Wilson, W6NIF, who had joined the staff temporarily earlier this summer as technical editor. Alf, who'd long been one of Ham Radio's principal assistant editors under former Editor in Chief, W1HR, had come to New Hampshire just to help out in the difficult period following Jim's death in April. Happily for Ham Radio, he's now decided that he likes both the job and New Hampshire well enough to stay on

Concurrently, Tom McMullen, W1SL, has been named editor of Ham Radio Horizons. Tom was promoted from managing editor in recognition of his fine work in the recent redirection of Ham Radio Horizons toward the mainstream of Amateur Radio.

"OPEN CHANNEL" IS THE NAME proposed for the United Kingdom's CB-type service, to be situated just above 900 MHz. Discussions have been going on for some time among Western European nations concerning a UHF CB service, and West Germany proposed assigning 928-930 MHz to such a service in Geneva last year. As NATO frequency coordination also involves the United States and Canada, this British proposal could well indicate the spectrum slot and direction for an internationally recognized UHF CB service.

What This Might Mean to the Amateur service isn't at all clear at this time. In the U.S., an ad-hoc committee to prepare a proposal for a 900-MHz Amateur band was discussed and approved by the ARRL Directors at Seattle. The committee is to be made up of Amateurs with experience in UHF spectrum management, to be selected by League President W2HD.

RECREATIONAL AREAS MAY BAN 2-WAY radios, two Ohio Amateurs learned. Visiting "Valley Fair" in Shakopee, Minnesota (owned by Cedar Point in Ohio), with their families, the two were informed that they had to surrender their handhelds to park personnel or leave the park. Rationale for the demand was that the radios could be used to "set off a bomb." The park manager also told the two that 2-way radios were barred from all park property, including the parking lots—surely news to the millions of CB-equipped motorists who visit such facilities!

THE WINNERS OF SEVEN SCHOLARSHIPS administered by the Foundation for Amateur Radio have been announced by the Foundation. The scholarships, amounts, and winners are: the John W. Gore Memorial Scholarship, $900, WB4JZT; the Richard G. Chichester Memorial Scholarship, $900, WB8TDA; the QWCA Silent Key Memorial Scholarship, $900, KAØBSR; the Radio Club of America, Inc. Scholarship, $500, KAØDGT; the Edmund Redington Memorial Scholarship, $500, N3GP; the Edwin S. Van Deusen Memorial Scholarship, $350, WA2SFS; the YLRL Scholarship, $300, KA8CSM.

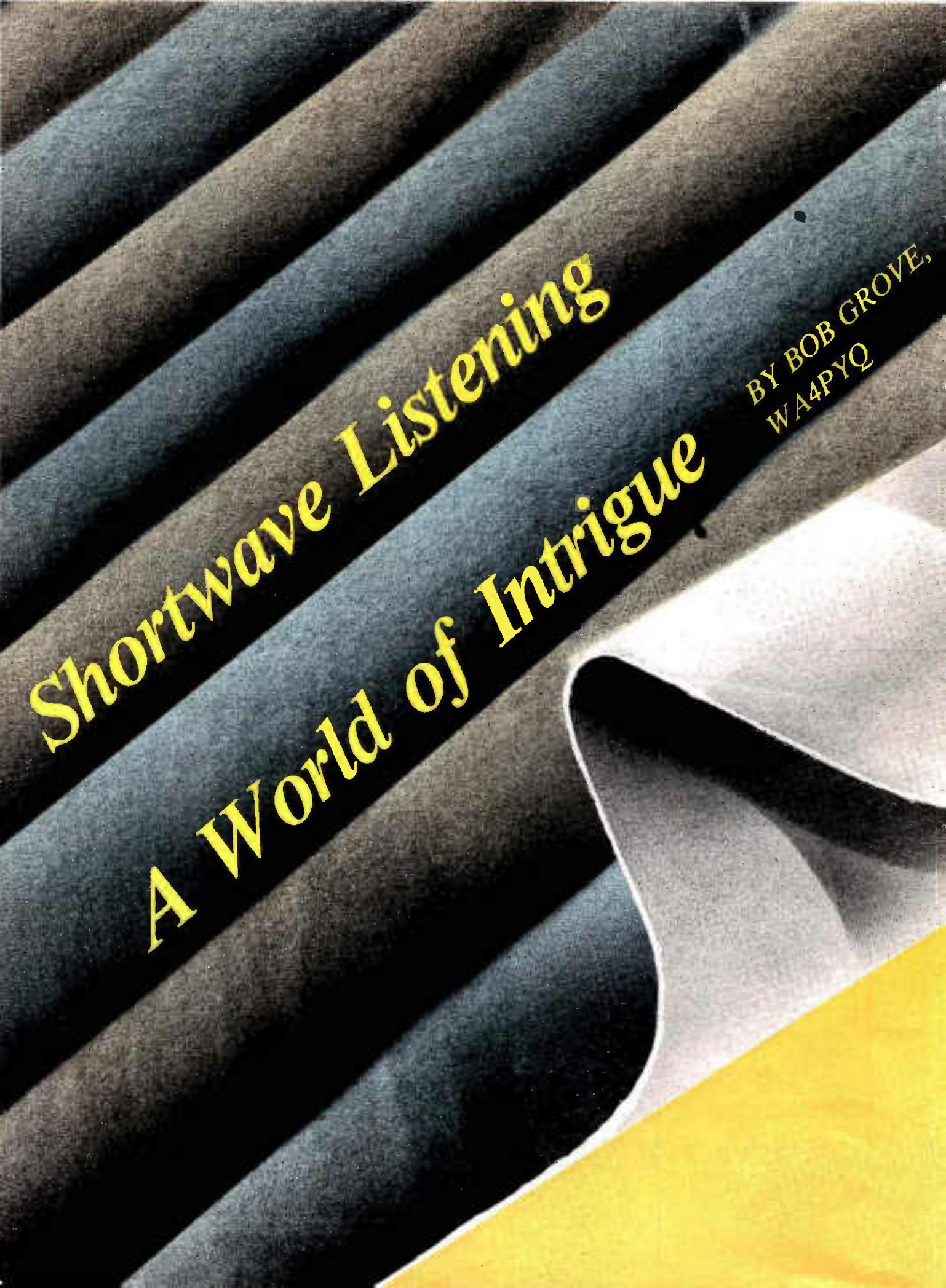
These Scholarships Were Open to all Amateurs holding at least a General class (or equivalent) license. Applications were received from 31 states and Denmark.

A NEW 10 GHZ DX RECORD, 757 km, was set July 12 when IØSNY/7 worked IW3EHQ/3 and I3SOY/3. Ten milliwatt Gunnplexers and one-meter dishes were used at both ends, from Brindisi on the south end to Col Visentin in the Italian Alps on the north. The former 10-GHz record, 633 km, was also held by Italians.

377,615 INDIVIDUAL AMATEURS were licensed in the United States by the end of July, continuing the increase noted every month this year.

Shortwave Listening
A World of Intrigue

BY BOB GROVE, WA4PYQ



Tune In — Everybody's Talking

This feature story is not only an introduction to some of the happenings outside the ham bands, but is a bit of an experiment, too.

Ham radio and short-wave listening are not really that far apart. Thousands of people got their introduction to the world of Amateur Radio when they came across some hams chatting away near one of the international short-wave broadcast bands. Curiosity kept them tuned in, and they became interested in what these guys were doing. Such inquisitiveness often led to a bit of study and the subsequent obtaining of an Amateur license of their very own.

The increasing use of SSB for Amateur voice communications on the high-frequency bands caused this introductory route to ham radio to become much neglected in the past few years, since most SWL receivers were meant for a-m reception only. New, more sophisticated and more sensitive receiving equipment is designed to receive SSB and Morse code, along with standard a-m broadcasts, and this ability to eavesdrop on ham conversations makes the curious SWL once again a candidate for an introduction to Amateur Radio.

The author of our SWL treatise is well known and active in the field about which he writes, and it is our pleasure to have him tell you a bit of the world he (and many thousands of others) listens in on.

He has asked for your reaction to the article, and we would like to second that suggestion. Let us know how you feel about the shortwave world. Not only will it tell Bob what your thoughts are but also will give us an idea of the direction of interest in the always changing world of communications and electronic hobbies. We anxiously await to hear your voice. You don't have to spend a lot of money on postage — a card will do just fine.

Editor.

Shortwave Listening

As active radio hams, many of us tend to ignore the world of communications outside our own bands. And yet, a considerable number of us first learned of Amateur Radio while listening to the exciting world of shortwave.

The fault is not entirely our own. Almost none of the present-day Amateur transceivers have general-coverage receiving provisions, so we spend our money in the most cost-effective manner we can, assuring ourselves of the best ham station we can afford.

Fortunately for us frequency browsers, there is a revolution going on in consumer shortwave receivers. New products by the dozens are now stocking the shelves of equipment dealers; many of these receivers offer hot performance at incredibly low prices.

Large-scale integration has been responsible for much of the abundance of high-quality, low-cost equipment. And as reluctant as many of us are to admit it, the CB boom was a strong catalyst in supporting the development of sophisticated microcircuitry which we now use in our own communications equipment. Frequency synthesizers, i-f strips, rf amplifiers, digital displays, and many other spinoffs from the CB industry have wended their way into our coveted rigs.

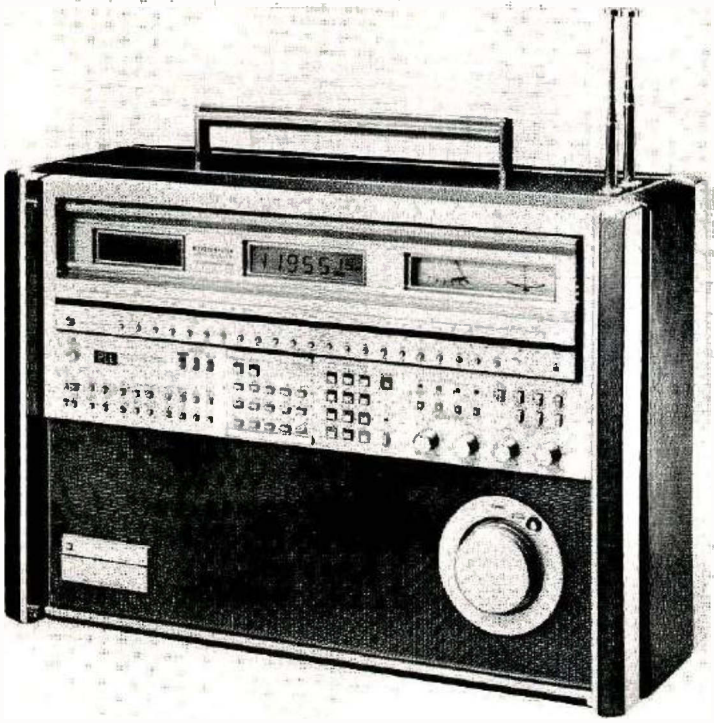
The New Breed

Not since the days of Hammarlund, Hallicrafters, Lafayette, and National have we seen such a parade of new shortwave receiving products streaming from the facilities of major manufacturers. Yes, they are mostly imported, but they carry the names of quality brands with which we are already familiar, such as Yaesu and Kenwood. Some bear the emblems of consumer-grade products like Radio Shack, Panasonic, and Sony. A few are domestic com-

The versatile NRD-515 from Japan Radio Company is available for $1395.00 from Gilfer Associates (P. O. Box 239, Park Ridge, NJ 07656). The accessory memory unit is an additional $250.00.

Although not designed for serious listening, the Heathkit SW-717 will provide an introduction to shortwave.

Luxury receivers are available for those with an unlimited expense account. An example of high quality is the National HRO-600 series.

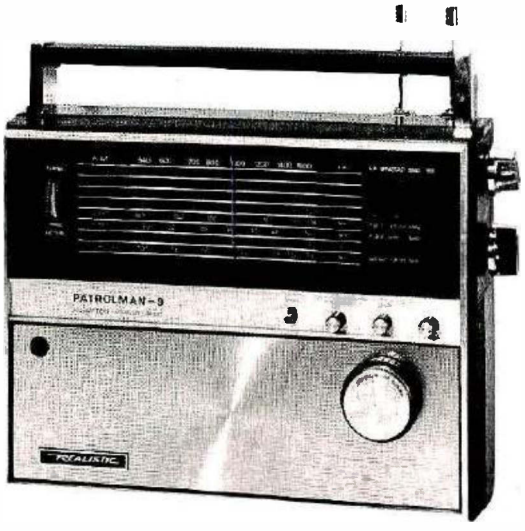


True luxury in a portable is Panasonic's RF-9000.

The Sony ICF-6700W has become a popular favorite with shortwave listeners.

Shortwave Listening

Yaesu's FRG-7000 combines digital frequency readout with reasonable cost.



A lot of listening is packed into some low-cost multiband portables, but don't expect top performance or single sideband CW reception. Shown here is Radio Shack's former Patrolman-9 (unfortunately no longer available, but you'll find them at flea markets or in bargain flyers).

Sony's massive CRF-33K is one of the most sophisticated portables ever manufactured. It works well, and it's expensive!

munications companies like Drake, Heathkit, and McKay-Dymek. A sampling of these receivers is shown in the accompanying illustrations.

A World of Listening

If you haven't been listening to the shortwave bands lately, you're missing out on a lot of excitement. Spies, smugglers, revolutionaries, military maneuvers, Coast Guard rescues, emergency relief, foreign embassies, and a host of other activities tax the imagination. Even Radio Moscow has changed its hard-line anti-American stance, now soft-selling Socialism through informative, educational programming.

WARC-79

Last year, the World Administrative Radio Conference met in Geneva, Switzerland, to discuss international band planning for the next 20 years or so. Contrary to the impression given by most Amateur Radio publications, they *did* discuss a few topics other than ham radio!

One of the biggest plums was the restructuring of the microwave bands for satellite communications; another was the shortwave broadcast frequencies. Quite unexpectedly (and happily) the United States was not vigorously opposed in its presentations by third world countries, and we were generally satisfied with the progress made at the meetings.

The final ratifications are yet to be made, and we are not likely to see implementation of decisions for some years to come, and when they do come, they will hardly affect our shortwave listening habits.

The Band Plan

The shortwave bands are known officially as the "high frequency spectrum" (HF) and include 3 through 30 megahertz. In practice, few shortwave listeners (SWLs) listen higher than about 24 MHz.

Frequencies below approximately 10 MHz are primarily active at night, while those above 10 MHz are best monitored during daylight hours. The reason for this is the effect of the sun's radiation on our ionosphere, that electrically-active upper layer of our atmosphere which reflects some radio wavelengths while absorbing others.

In order to assure all services an equal opportunity to take advantage of the changing propagation at various frequencies, allocations are made in blocks throughout the spectrum. For example, international broadcasting occupies eight exclusive frequency segments in the 49, 41, 31, 25, 19, 16, 13, and 11 meter bands. In addition, broadcasting may be heard sharing the lower-frequency "tropical" bands of 120, 90, 75, and 60 meters. These wavebands correspond to frequencies centered around 26, 21, 17, 15, 11, 9, 7, 6 5, 4, 3, and 2 MHz.

As you can see, broadcasters have an opportunity to plan their transmitting schedules to correspond with the most favorable propagation conditions for their target areas at any time of day.

How about the utilities?

In SWL parlance, "Utilities" refers to non-broadcast two-way communications. Virtually every service which squeezes a mike button to talk, or expects a radio reply to its transmission, falls into that category. Ships, pleasure boats, aircraft, military operations, government communications, point-to-point correspondence, and many other services fit into this enormous polyglot. The shortwave bands are filled with routine day-to-day traffic . . . and also with mystery!

The spies

Because of the reliability of shortwave frequencies for long range coverage, many political upheavals and insurgencies are choreographed over the airwaves. Naturally, we shouldn't expect to hear, "This is the CIA with the latest clandestine overthrow bulletin!" But knowing where to look and what to listen for can be very rewarding.

Since ham transceivers are extremely popular among subversives, much of the intrigue may be heard inside and outside the Amateur allocations. For long distance coordination, 20 meters is popular. Reportedly, Arab terrorists have been communicating at 14128, 14338-14348, and 14290 MHz (Black September group).

The numbers stations

Over the years, few unknowns have inspired so much controversy and speculation as the infamous (?) "numbers stations." Following a regular schedule, these powerful transmitters may be heard at all times of the day and night, any day of the week, and on dozens of alternate frequencies. While their contents differ, the format is the same. Most often, a woman's recorded voice will read a list of numbers. Typically, she will begin by announcing a two- or three-digit number, possibly the code of the party to whom the message is being directed. She then follows with a group count, informing the listener(s) as to how many 4- or 5-digit groups will follow. The message terminates abruptly, always without benefit of station identification!

Examples of these broadcasts are included on the informative cassette tape, "Sound Of Shortwave," available for $5.95 postpaid from Grove Enterprises, Box 156A, Brasstown, NC 28902.

Who are these phantoms? Are they plotting to overthrow some government? One of the broadcasters (heard on the hour at 3060 and fifteen minutes past the hour on 3090 kHz) has been traced by sophisticated radio direction-finding equipment to Havana, Cuba. Others are reported near Washington, DC; Tampa, Florida; and

even Portland, Oregon. Many others are scattered in foreign countries.

Do the numbers stations represent a threat? They have been monitored for over 20 years, so if their master plan is diabolical, they have certainly had enough time to implement it!

While most of these mysterious broadcasts are spoken in the Spanish language, some are in English, others are sent in CW. Still more may be heard in German and Slavik tongues.

Some frequencies most often reported include: 3060, 3090, 4670, 5812, 6772, 6840, 7341, 8418, 10570, and 14970 kHz. One avid Florida listener has reported over 300 different frequencies used over the last few years!

Perhaps one of our readers holds the key to this enigma that has been puzzling radio listeners for two decades. Won't you let us know?

The smugglers

No question about it, smuggling is a billion dollar industry. For the most part, contraband drugs, illegal alien immigrants, and weapons are brought from South America into the United States in boats and aircraft coordinated by conventional radio communications. While 20 meters is a popular spot for long-haul communications, 40 meters is used for closer work. Most of the chatter is in Spanish, but some speech is in English.

Are you thinking about hams organizing a direction-finding net to help our struggling law-enforcement agencies nab some of these purveyors of death? It's a big order; you would be informing on tough, ruthless, organized-crime activities.

Defense communications

With one-third of our Strategic Air Command perpetually airborne, worldwide radio communications are vital. Listen to SAC on any of several network frequencies, upper sideband: 4725, 6761, 9027, 11243, 13241, 15041, and 17975 kHz.

The US Navy is a big user of spectrum space — in fact, the biggest! Among the most commonly-reported Navy frequencies are 3265, 4702, 6697, 6723, 9002, 11186, 11195, 11198 and 11267 kHz.

In-flight aircraft

While continental air routes communicate on vhf and uhf, long-distance communications across the oceans are maintained on high frequency links.

Among the most active frequencies maintained by Aeronautical Radio Incorporated (ARINC) are: 6526, 10093, 13356, 17941, and 21996 kHz. Dozens of additional frequencies may also be heard in use by international air carriers.

Listening guides

A few publications stand out as being especially helpful and accurate for shortwave listeners. Three of these are listed below.

Federal Frequency Directory — Containing over 100,000 listings of US government communications agencies and locations in the 2-420 MHz spectrum, this directory is rapidly becoming the standard reference. It is extracted entirely from official government computer files; $14.95 plus $2.00 shipping and handling.

Confidential Frequency List — Concentrating on the 4-24 MHz shortwave spectrum, the CFL contains approximately 6000 of the most actively-reported utilities frequencies and their identifications; $6.95 plus $1.00 shipping and handling.

Both of these publications are available from Ham Radio's Bookstore, Greenville, New Hampshire 03048.

Radio Communications Guide — Features select lists of utilities communications in the most active hf, vhf, and uhf ranges. Some 2000 frequencies and their identifications; $6.95 postpaid from Handler Enterprises, P.O. Box 48, Deerfield, IL 60015.

Amateur Radio is frequently thought of as a goal, an end unto itself. Quite to the contrary, ham radio is but one step in the enlargement of the fascinating hobby of communications. Give shortwave listening a try!

„ICI LA SUISSE – SWITZERLAND CALLING

. . . and, a world of information

There's intrigue, and there's information. The shortwave bands carry a dizzying panorama of international programming. Twenty-four-hours-a-day, someone, somewhere, has a story to tell or a viewpoint to sell via shortwave broadcast. Most every nation you've ever heard of has a shortwave broadcasting facility, and many schedule daily, English-language programs beamed at North America.

News, editorials, music, language lessons, local features, and local color — it's all on the shortwaves.

HRH

Charley's Angles

BY JERROLD SWANK, W8HXR

The Accent is on Antennas

Antenna photos by Charley Morgan, K1GZL, and the photo of Charley at the rig is by Yves Zornio, KA1DMN.

There are 51 angles to Charley's antennas in Berlin, New Hampshire, which include:

A seven-element, 20-meter wire quad firing into Sweden.

A five-element, 15-meter wire quad firing at San Francisco.

A three-element, 20-meter wire beam toward the west.

A three-element, 20-meter wire beam directed down the east coast.

A three-element, 75-meter wire beam firing down the east coast.

The western-directed antennas fire across a valley with a drop-off angle of 12 to 15 degrees. The radio room is 750 feet (230 meters) above the valley floor, and 1835 feet (559 meters) above sea level.

These fixed antennas were chosen, rather than moveable or rotating ones, because of the desire for high gain with excellent front-to-back rejection. Also, large rotary beams would be impractical because of the high winds in the area. With a west or northwest wind over 35 miles per hour and snow falling at the same time, it will snow uphill at 5°. Can you imagine a rotating seven-element quad with a boom length of 80 feet (24 meters) in a wind which has reached 80 miles per hour?

Charley is a perfectionist when it comes to antennas. He does not need a so-called "California kilowatt;" a KWM-2 and a Heath SB-220 amplifier do the job nicely. Most of his time and money are spent improving his antenna array, thus he has not only an excellent transmitted signal, but an almost unbelievable receiving record. How would you like, for example, to give a 5 by 9 report to a station running 5 watts to a dipole in Bahrein on the Persian Gulf? That is on 20 meters — not 10.

Two incidents which remain in my memory show his dedication to antenna perfection: once when I was having dinner at Charley's former home in New Gloucester, Maine, he suddenly said, "Jerry, I hate to interrupt this meal, but I noticed that the reflector on my (40-meter) beam is about two inches low at one end."

He left the table and went out and pulled the rope to correct this error.

Another time I convinced him that the driven element on his 40-meter beam was not properly resonated because he said that the

SWR changed when he switched his amplifier in and out. I told him that it should be measured either at the center of the antenna element or at the end of a half wave line, with a grid-dip meter.

He later said that he had corrected it — he had climbed the 66-foot utility pole thirty times, and each time had lowered the antenna and trimmed it, until it was a perfect match. This, of course, cured the problem. It took just one day.

Whenever he found a spare piece of wire or foil, he buried it under the antenna. He even spread 2000 pounds of salt on the sandy ground in front of the antenna (at night) in a pine grove across the road.

When he and I were running phone patches for the men in Antarctica, the effort showed in his signals. In fact, he had, at one time, run phone patches for them with a DX-100 a-m transmitter (150 watts) on 40 meters.

I have a tape recording of Charley and me running patches, made at KC4VOS at Vostok, the Russian station in Antarctica, about 800 miles the other side of the South Pole. In spite of the fact that you can hear Charley on the tape complaining about the Stateside QRM, there is no sign of a single U.S. station on that 1-½ hour tape except for Charley's and mine. I was running my usual phased verticals and Charley his three-element wire beam. There must have been hundreds of kilowatt stations on the air, but not one can be heard on that tape. This shows what good antennas can do.

But now to the antennas in Berlin, New Hampshire.

In the construction of this new array, he was just as careful. You will see in the photos some little black things on some of the wires. These are such things as lengths of rubber hose, and in one case even a hammer, suspended on the wires to bring them into such perfect alignment that all wires seem to be a single wire. Another item used in appropriate places is a small glass jar weighted with just enough sand to cause the desired sag in the wire.

While each of these things may only add a tiny fraction of a dB, the total makes a very effective array.

Now, Charley, tell us about the 20 meter quad:

"Okay, Jerry. This antenna **(Fig. 1)** fires into Central Sweden, Southern Finland, Moscow, and

continues on a great circle route to Bombay, India. The half-power point runs just south of England through Central France, Rome, and down into Israel.

Method of support

"This seven-element, 20-meter wire quad is supported by various types of poles. When I moved up to this location in 1972, I had five utility poles trucked up here from New Gloucester, Maine. Four of these poles are 55 feet (16.76 meters) and one is 60 feet (18.29 meters). At the top of these poles are two-by-fours and two-by-six boards, plus a few pipes for additional height.

"Three of these poles are in a direct line, and the other two are somewhat off the sides. Between the tops of the three lined-up poles are ropes. Some of the quad elements are on the poles at the correct height — others are in between. The tops of the quad elements are 5 feet (1.52 meters) below the tops of the highest ropes. To line up the tops correctly, I had to climb to the top of the superstructure at one end of the quad and look through it so I could determine what adjustments would have to be made so that all elements looked, as much as possible, like one wire when looking though the top of the quad. There are pulleys on some of these upper ropes, where a rope from slightly above passes through to the top of the quad element slightly below. The distance from the top of the quad element can be adjusted by putting a piece of stranded ground wire on the rope, with about 2 inches (5 centimeters) sticking out to catch on the pulley when the rope is pulled up. This then requires climbing the pole to the very top again to look through the quad elements to see if they are properly lined up. Between the poles, just below the diamond shaped quad elements, runs another rope.

"This rope also has pulleys connected to it just below the quad elements, see **Fig. 2**. A rope from the bottom of the quad element runs through this pulley to a small pole down below. On this small pole, I have two nails sticking out to make a cleat, so that the rope can be wound on it, **Fig. 3**.

"This system has two advantages. By pulling or releasing the rope from the small pole, I can adjust the height of the bottom of the quad, again looking from the poles through the bottom until they are lined up. The other advantage is that wind hitting the back or front of the quad will not force the bottom of the quad far out of alignment. The sides of the quad are pulled out and the support ropes run to smaller poles made of relatively short tree trunks with two-by-fours added for additional support. These small poles are off the ends of the elements so that adjusting the ropes between the quad and the side poles allows the quad to assume a diamond configuration.

"After all this work had been completed, I noticed that the bottom section, where it slants up from the bottom, did not line up

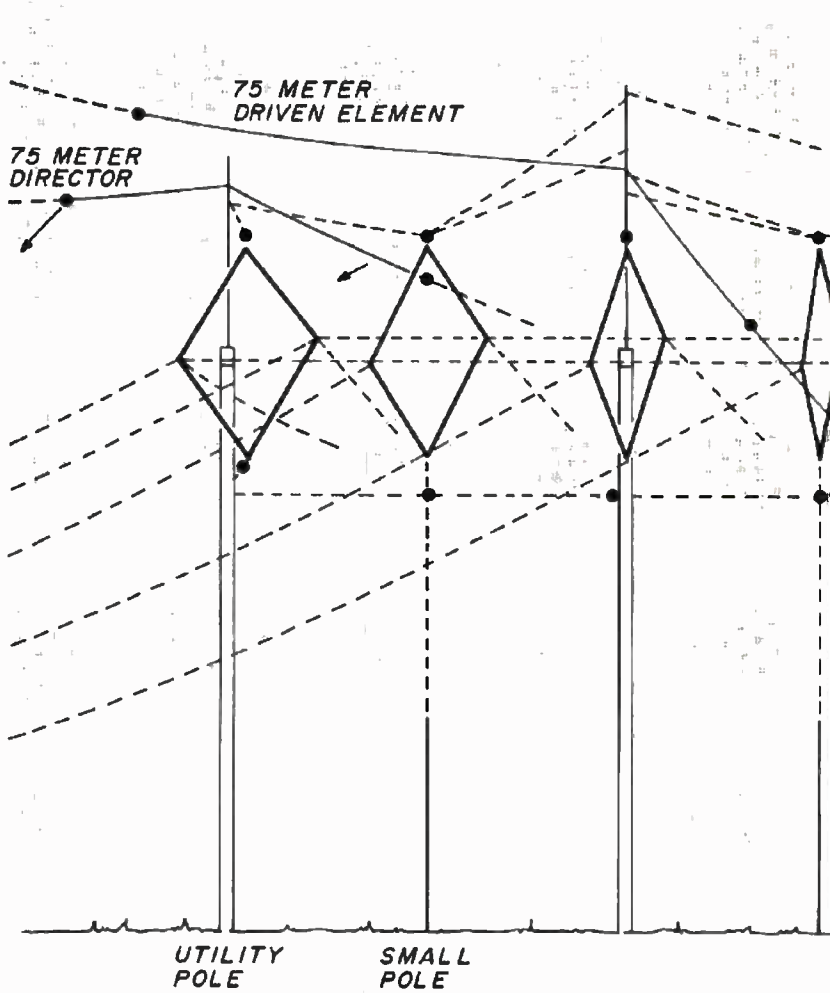


Fig. 1. K1GZL seven element wire quad to northern Europe — 20 meters.

as it should. So, I taped short pieces of rubber hose to the lower parts of the elements which were slanting up too high. Some of the quarter sections of elements had to be changed slightly. This was usually done by moving the sides lightly up or down. In some of the photos, you will notice other objects on the lower parts of the quad to help in the lining-up process.

"Except for the driven element, which is No. 12 (2.1 mm) insulated copper wire, all the elements are insulated No. 14 (1.6 mm) copper wire. Here are some dimensions:

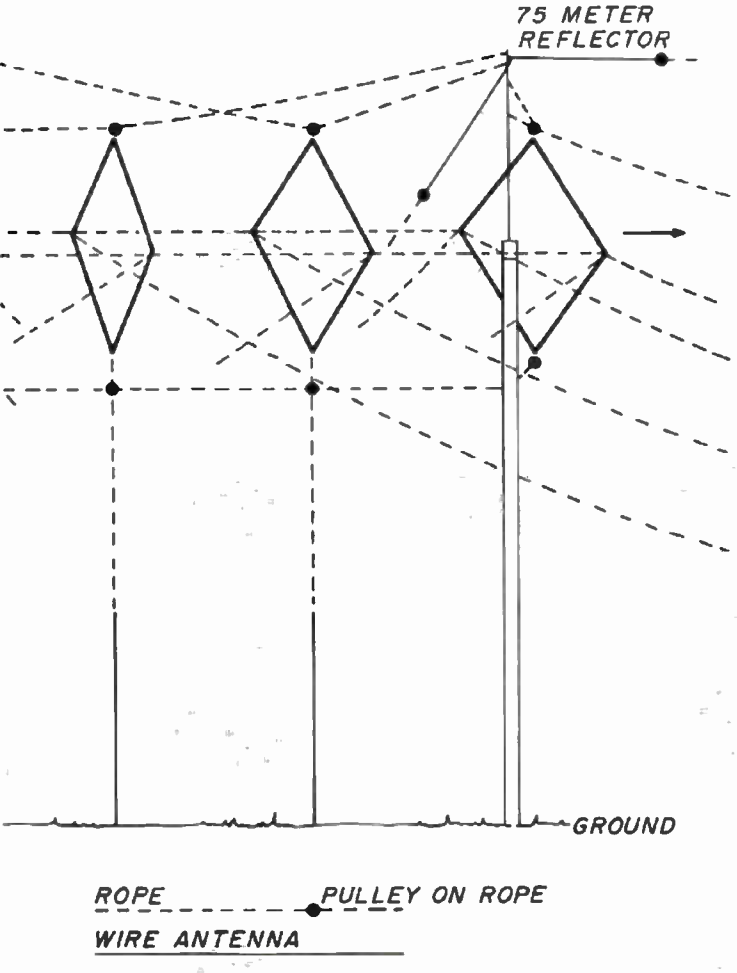
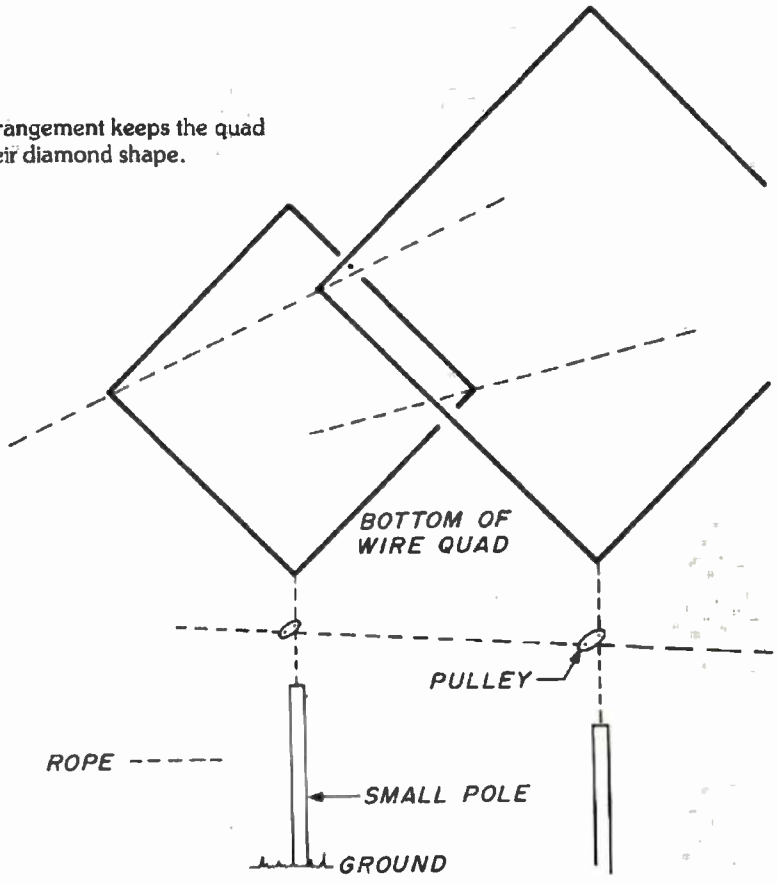


Fig. 2. This arrangement keeps the quad elements in their diamond shape.



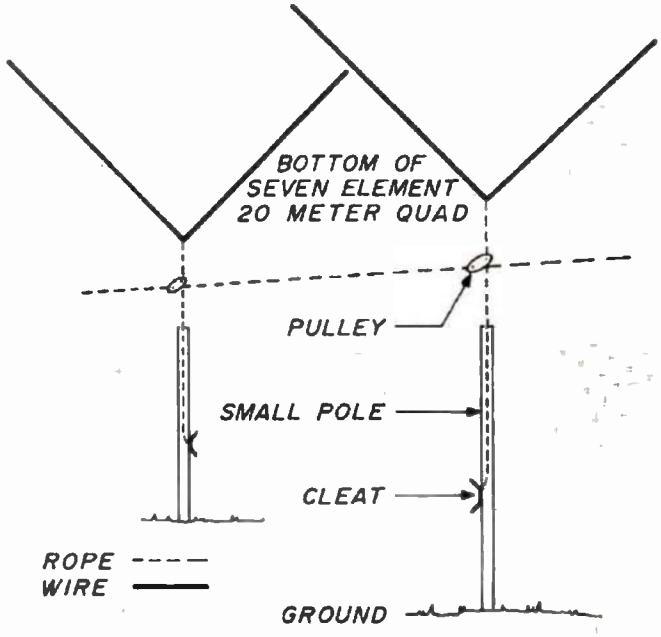


Fig. 3. This arrangement prevents wind from blowing bottom of quad out of alignment.

Spacing

Driven element to first reflector, 13 feet 4½ inches (4.08 meters).

First reflector to second reflector, 14 feet 10 inches (4.52 meters).

Driven element to first director, 10 feet 8 inches (3.25 meters).

First director to second director, 11 feet 2 inches (3.40 meters).

Second director to third director, 14 feet 10 inches (4.52 meters).

Third director to fourth director, 14 feet 6½ inches (4.43 meters).

"The total distance from the front to back of the quad (the "boom" length) is 79 feet 5 inches (24.21 meters). The quad is in a diamond configuration and is fed at the bottom. The bottom is 38 feet (11.58 meters) off the ground, and the top is at 60 feet (18.29 meters).

Element lengths

Driven element	66 feet 4¼ inches (20.22 meters).
First reflector	67 feet 11¾ inches (20.72 meters).
Second reflector	69 feet 9½ inches (21.27 meters).
First director	65 feet 3½ inches (19.90 meters).
Second director	63 feet 5 inches (19.33 meters).
Third director	63 feet 5 inches (19.33 meters).
Fourth director	63 feet 5 inches (19.33 meters).

"The SWR of the 20 meter quad is excellent throughout the phone band. Taking the velocity factor into consideration, I am using multiples of a half wave in determining the length of the feed line. The resonant frequency is very close to 14.280 MHz with an SWR of 1.1:1; at 14.200, the SWR is 2.0:1; at 14.300 it is 1.5:1. The SWR curve rises a bit more steeply on the low side of resonance.

"To resonate in the CW portion of the band, all of the quad elements will have to be lengthened. For each 100 kHz lower in frequency add 6½ inches (16.5 cm). The wire Yagis should only be lengthened 3 inches (7.6 cm) for each 100 kHz in frequency.

"The 20-meter quad has a three-element, 75-meter wire beam running overhead. It seems to have very little effect on the 20-meter quad.

75-meter beam

"This 75-meter wire beam, with the ends slightly drooping, is firing to the southwest, down the Atlantic seaboard toward Florida and Central America. At any time during the hours of darkness, it usually covers thirty states with an excellent signal. Like the other antennas, it is fed by 50-ohm coax with a quarter-wave bazooka. The top of all three elements are at 65 feet (19.8 meters). They droop down to 40 feet (12.2 meters). This antenna seems to work best with this degree of slant.

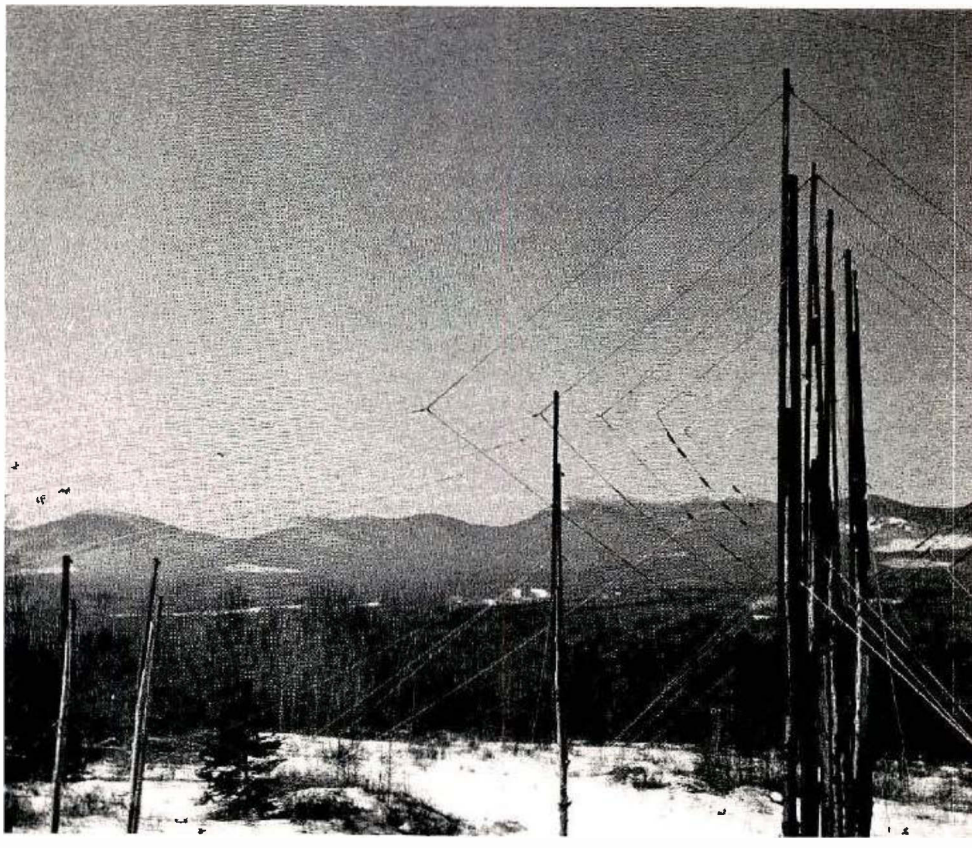
Spacing

Reflector to driven element, 42 feet, (12.80 meters).

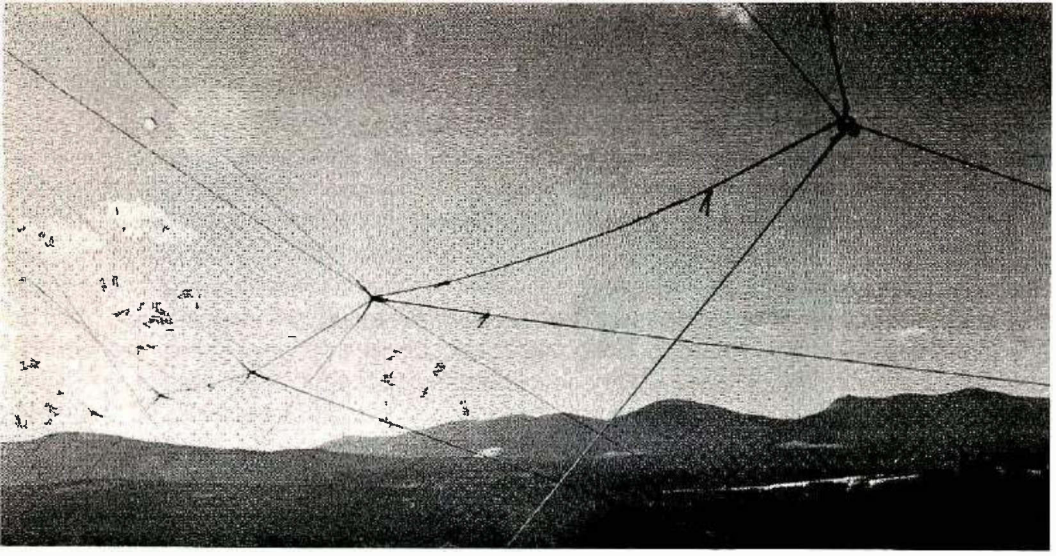
Driven element to director, 35 feet, (10.67 meters).

Element lengths

Reflector	125 feet 9 inches (38.32 meters).



View through the five-element, 15-meter quad toward San Francisco. The pole on the right supports the driven element of the 20-meter west beam.



Left, looking southwest toward the back of the seven-element quad, with the fourth director behind the camera. **Below left,** general view of the array at K1GZL, which uses more than 11,000 feet of polypropylene rope. Looking northwest, with one 20-meter, three-element wire beam firing west. **Below,** Charley Morgan with his Heath SB-220 amplifier and Collins KWM-2 transceiver. Father Moran, 9N1MM, of Katmandu, Nepal, once visited Charley to see first-hand what created the powerful signal from Berlin, New Hampshire.

Driven element	123 feet 2 inches (37.55 meters).
Director	119 feet (36.28 meters).

"The SWR at the resonant frequency of 3865 kHz is 1.3:1, at 3895, it is 2.0:1. The SWR rises more slowly as you go below the resonant frequency, reaching 2.0:1 at 3790. Every 100 kHz lower will require the antenna to be lengthened 3 feet (0.9 meters).

"Any good balun will do the job the linear balun, or bazooka, does on all of these antennas.

"The bazooka has a wire connected to the hot side of the driven element as close to the feed point as possible. The wire runs down along the coaxial line about one inch from the feed line.

"The length should be about 95 per cent of a quarter wave. On 20 meters, I am using 15 feet 8½ inches (4.79 meters). The wire is kept at about 1 inch (2.5 cm) spacing by pieces of garden hose taped between the feedline and wire. A good length for each piece of garden hose is 2 inches (5 cm). After the wire reaches this point from the center of the driven element it is simply taped to the outer braid of the coax.

"Incidentally, the elevation above sea level has nothing to do with the signal heading toward the ionosphere. The antenna height above the ground, and the slope of the land plus its conductivity, are very important factors. From here, the Presidential Mountain Range is in view — especially on clear days, not too far to the southwest. To the northwest, a small bit of northeastern Vermont can be seen. To the northeast, one can see a mountain in Maine. To the north I can view a little of southern Canada, so three states and two countries are visible.

15 meters

"The five-element, 15-meter quad, unlike the 20-meter quad, is fed at the top. The top is 30 feet (9.14 meters) off the ground. The bottom is only 15 feet (4.57 meters) up. The bazooka length is 10 feet 6 inches (3.2 meters).

Spacing

Reflector to driven element, 9 feet 2 inches, (2.80 meters).

Driven element to first director, 7 feet 7 inches (2.31 meters).

Angles

First director to second director, 7 feet 3 inches (2.21 meters).

Second director to third director, 9 feet 5 inches (2.87 meters).

Element lengths

Reflector	46 feet 9¼ inches (14.25 meters).
Driven element	45 feet 8¼ inches (13.92 meters).
First director	44 feet 5½ inches (13.57 meters).
Second director	43 feet ½ inch (13.11 meters).
Third director	43 feet ½ inch (13.11 meters).

"To check the effectiveness of this antenna, which is aimed at San Francisco, I put up a reference dipole at the same height as the top of the quad, also firing in the same direction. With the aid of a coaxial switch, I could instantly change between the antennas. The S-meter on my KWM-2 showed 15 to 20 dB difference in favor of the quad over the dipole toward San Francisco. Down toward Los Angeles, my S-meter showed 10 to 15 dB, and in the direction of New Orleans the dipole caught up with the quad. Florida is 5 to 10 dB stronger on the dipole than the quad. Europe is much stronger on the dipole, showing how much gain and directivity the quad has.

"There are two three-element, 20-meter wire beams in the array. One is headed southwest and the other is toward the west. Here are the specifications on these:

Spacing

Reflector to driven element, 13 feet, (3.96 meters).

Driven element to director, 12 feet, (3.66 meters).

Element lengths

Reflector	33 feet 10 inches (10.31 meters).
Driven element	32 feet 7½ inches (9.93 meters).
Director	31 feet 2¾ inches (9.53 meters).

PAØGHB mobile, Gerard Vervenne, Terneuzen, Netherlands, with his Swan 350.

"In front of these antennas, toward the west, the ground drops off at about 12 degrees. Also in front of these antennas, on the sloping ground, is a considerable amount of wire, and some metal, to aid the ground reflection. The wires are lying on the ground running north-south, to the west of the west antennas. They are two to three wavelengths long on 15 meters — spaced about one meter apart. This wire area is about 200 feet (61 meters) wide. I sincerely believe this helps the ground reflection by acting as a radio mirror. Firing west on 15 meters, I wanted to put out the maximum signal at about 15 degrees elevation for the strongest signal from the Mississippi Valley to the west coast and beyond.

"I thought I would try an experiment. By placing a mirror in front of a flashlight in a darkened room, and watching the light being reflected from the mirror — which was a little lower than the flashlight — I could control the angle at which the reflected light bounced off the mirror simply by tilting it. Tilting it down at 12 degrees, and watching the reflected ray, I could pretty well determine where to put the wires on the ground to get the best reflection centering on about 15 degrees. This has really paid off.

"The 20-meter antenna firing southwest is a three-element wire beam, 38 feet (11.58 meters) high, pointing down along the Atlantic coast to Florida and Central America.

"All of these antennas can be instantly connected to the transceiver through the coaxial switch. With the SWR being nearly identical on all three antennas, the loading is the same, and the rig does not need retuning once loaded to one of the antennas.

"This rapid switch certainly comes in handy when, as an example, someone asks if the frequency is in use. I simply switch to

the antenna where the asking station is strongest, and let him know that it is in use. This has been very helpful.

"The advantage over one beam can, at times, be very rewarding. If an incoming signal from Europe is stronger on the back of the west antenna than on the southwest antenna, he is certainly located in southern Europe, and the reverse is also true. Stations in the U.S. can also be fairly well located by switching to the various antennas and checking the incoming signal strength. In the case of slight background of U.S. stations when working into Europe, I can switch to one of the west antennas and the European station will practically disappear, and the U.S. station will take over with a very strong signal.

Results

"So, what good does this all do? During the November, 1978, ARRL sweepstakes my friend Jim Breakall, WA3FET, and Bruce Long, WA3PTU, operated multi-op from this station, and we came in first place. Most of the work was done with the 15-meter quad — at the time using four elements instead of five — and the three-element wire beam on 20 meters at 28 feet (8.6 meters) high. Some of the contest was operated on the southwest 20-meter beam and the 75-meter, three-element wire beam. I am convinced that trying to improve the reflecting surface in front of an antenna is certainly worth all the effort. The ground here is wet clay.

"And that, Jerry, is the antenna story."

I am sure that many of you can visualize the antenna arrays and the amount of effort Charley has put into them. I wish, however, that you could hear what I have heard from almost daily contacts and on the tapes Charley has made for me.

When I get on the air around 2130 UTC, and want to talk with Charley, I listen around 14.260 until I hear him talking to friends overseas, and I put on my amplifier and say, "W8HXR." Back comes, "Roger, Jerry." His signal is usually about S-9 plus 10 dB.

I then turn off my amplifier, and when he gets ready to talk to me, he uses one of the 20-meter beams, and I am 50 dB over S-9, barefoot. I thus get the benefit of his antenna as well as my own modest array.

On just one day, March 19, 1980, I heard the following:

First, Charley called CQ DX, and when he stood by there must have been hundreds of stations replying. It was not possible at first to single out just one. Finally, a single station emerged, DL7FC, Hein in West Berlin. There was heavy interference, but he was easy copy. He said that Charley's signal was so "tremendous" that he at first thought it was a local station.

Next was a mobile, PAØGHB, in Holland. His name is Gerard. He was lined up at the ferry slip. He said that Charley was 30 to 40 over S-9, and Charley was receiving him at the same strength, although he was only S-8 to me. He had picked up Charley earlier when he was going 100 miles per hour on the road from Rotterdam. Later, he received Charley at 10 over 9 while on the ferry. He was crossing the river to Goes, Holland, headed for his home in Terneuzan. He had a Hustler antenna and a Swan 350 in the car. I asked him to send me a photo of the mobile setup, which he did.

He had just returned from the world championship motorcycle racing — *on ice* — in Eindhoven! He said that the Russians won, as usual.

The next station was KØAX/DU2, near Clark Air Base, 65 miles from Manila, Phillipine Islands. His name is Tom and he is in the Navy.

Finally, after several other stations with equally strong reports in Budapest and Sweden, Charley was called by Igor, UK9CAE, 1400 kilometers east of Moscow, in the Ural Mountains. Igor has become a frequent contact, along with G3WRI in England. Igor said that Paul, G3WRI, and Charley were about the same strength — so dB over S-9.

Charley also has frequent contacts with Father Moran, 9N1MM, in Katmandu, Nepal, with equally strong signals both ways.

Such is the routine at K1GZL!

HRH

Gerard's car and Hustler whip, which puts out a strong signal.

More details? Ad Check page 78.

Thwarting the Ham Burglars

GORDON WEST
WB6NOA

Stop the ripoff before it starts

Protecting your ham radio shack and vehicle against break-in is now affordable. Recent advancements in microprocessor circuitry have lowered the cost of professional-type alarm systems to under $300. These are not toys, but rather sophisticated devices that sound off when you need them most.

Burglars

The ripoff

Far too many hams have had the experience of being robbed. Perhaps you're one of them; you pull into your driveway and discover that your front door is ajar. You hope it was the wind; a step inside, and you know it wasn't. The living room is a shambles . . . no more TV. Your video system is gone, along with your complete hi-fi set up . . . and those expensive new speakers!

You head for the radio room, hoping they may have overlooked your expensive ham equipment. All that's left are some ground cables and the cut ends of some RG-8/U that leads to the roof. They cleaned out your high-frequency rig, 30-ampere power supply, tuner, and wattmeter, and have even rifled through the drawers to find your new Kenwood handheld and its mobile amplifier. If only you'd had an alarm system . . .

Or, how about that quick dash into the drugstore to pick up some suntan lotion before your weekend outing. You're probably in there only five minutes, and when you return to the car, the door is ajar and the dome light is on. Maybe you didn't close it tight. You did — they didn't.

Your dash is clean of equipment. Not only did they find the obvious 25-watt, 2-meter rig, but they also followed the coax to your 160-watt amplifier, and even nailed your Bird wattmeter in the glove compartment. Once again, if only you'd had an alarm system . . .

Security systems

Until recently, security systems were affordable only by businesses. Seldom could you get by for less than $2,000, spent on completely taping all windows, doors, and vents with a loop security system. Everything was expensive — especially the labor involved in covering all possible entrances with silver tape. This perimeter type of security system is still in use today — and it's still costly. Maintenance is not all that easy on this type of system, either. Vibration will sometimes put a hairline fracture somewhere in the tape that completes the circuit; you can spend hours looking for the elusive break.

Let's take a look at some different types of systems, and you'll be surprised how affordable they are in providing you top-notch protection from intruders, and giving you confidence that, when you're away, your ham equipment will stay put.

PERIM-A-TRON™ by Universal Security Instruments, Inc.

Perimeter systems

Perimeter systems encapsulate your home, office, or vehicle with an entry warning alarm. When someone breaks the glass, the small metal tape breaks and the alarm goes off. In vehicles, opening a door will usually turn on the dome light. When the light comes on, the alarm goes off. Perimeter systems are good if the intruder uses a normal entry approach. However, if he climbs through the window of your vehicle, if he cuts a hole in a wall to enter your business, or if he slides through unprotected louvered windows to enter your home, the perimeter system will remain armed — but with the burglar inside.

Ultrasonic System Control Center

Seeker 1, Seeker Security System, Inc.

Zone protection systems

These systems cover a specific area that is susceptible to intruders:

Inside your vehicle;

Inside the trunk of your car;

In your living room, where you keep your gun collection;

In the radio room;

Inside your business, where valuable merchandise is kept;

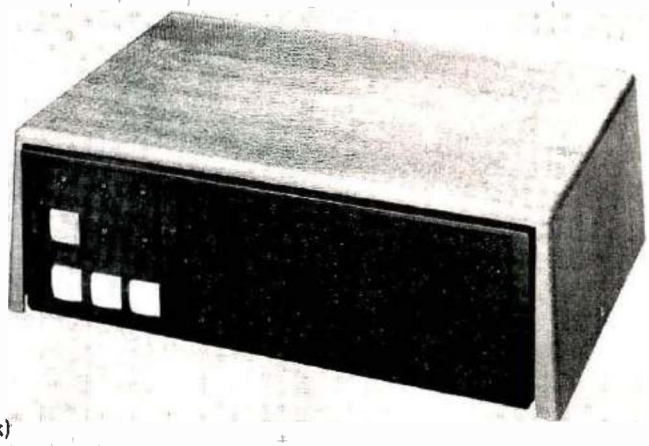
In a hallway, through which any intruder would have to walk.

There are two familiar types of zone protection systems on the market today. One is the ultrasonic alarm system, and the other is the radar alarm system. We should also mention the more exotic, and more expensive, types of zone protection systems, such as laser beams, infrared light sources, and normal light sources. These are not as popular as the ultrasonic or the radar alarm systems.

Ultrasonic systems

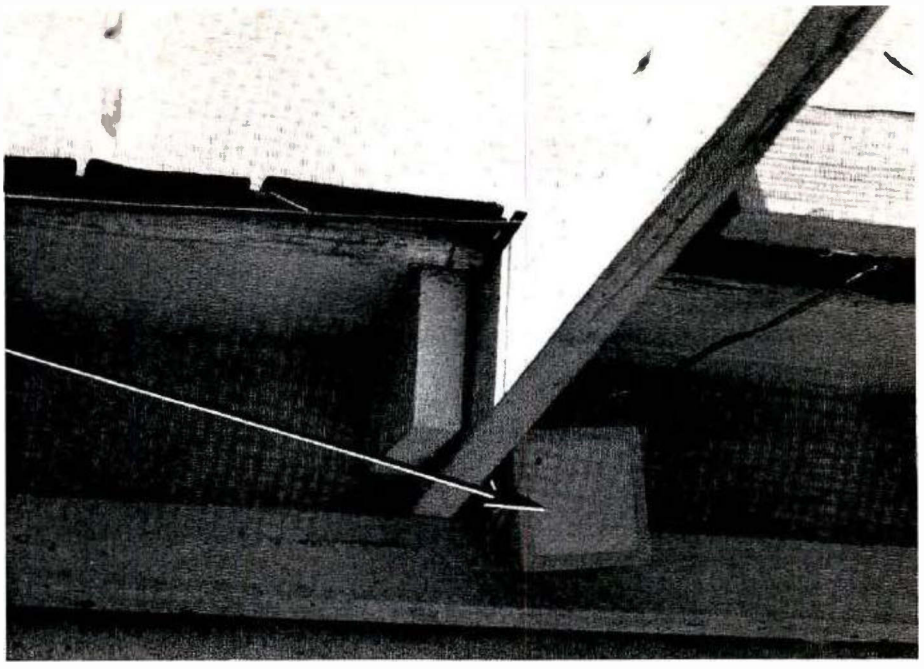
Ultrasonic systems usually consist of an ultrasonic transmitter and a separate ultrasonic receiver. The ultrasonic transmitter sends out audio waves of around 23,000 hertz, transmitted from an amplifier of approximately 2 watts. Some people can hear these ultra-high-frequency sound waves. Dogs will go bananas when the sound transmitter is aimed at them. And some people even complain of severe headaches when standing in a room protected by ultrasonic audio waves.

The receiver is pointed toward the ultrasonic transmitter from a distance of up to about 40 feet. Many times, you can bounce ultrasonic waves off of walls. A 2-watt ultrasonic transmitter can cover up to about 750 square feet of a concrete and steel warehouse. It will cover up to about 400 square feet of a normal room with carpets and curtains. When someone enters the protected room, the ultrasonic receiver detects a slight variation in the intensity and frequency of the returning



RF Field Disturbance System (Radio Shack)

Burglars



100 foot radar alarm sensor mounted outside to protect sliding glass doors.

sound waves. These variations are caused by blocking of the ultrasonic waves as well as by Doppler shift. The receiver usually contains an alarm system that sounds a very loud horn; it may also activate lamps or alert the police automatically by telephone. Most ultrasonic systems have an entry-delay feature that allows you to go over and safely switch off the alarm before it wakes up the whole neighborhood. Ultrasonic systems are relatively inexpensive — many are available for under $100.

Ultrasonic alarms do have some drawbacks that cause them to false trigger. Besides sounding off when an intruder enters the protected area, they may also go off on other occasions, in response to such "intrusions" as these:

Wind currents from an open window;

Moving draperies at an open window;

Air-conditioner wind currents;

Fireplace hot-air currents;

The tinkling of keys;

High-frequency noises from outside, such as disk brakes or emergency-vehicle sirens;

Nearby radio transmissions from your ham rig.

Because of the relatively low price of ultrasonic systems, plus the ease with which additional ultrasonic transmitters can be brought into the system, these alarms are still quite popular with those getting started by protecting a specific room.

Radar alarms

Radar alarm systems, like ultrasonic alarms, also protect specific areas. However, radar alarms do not emit acoustic waves; they transmit electromagnetic radio waves at a frequency of 10,525 MHz. This is the same frequency used by the police for their own radar equipment. Driving near a home protected by a radar alarm will immediately set off your radar speed detector!

The power output of a typical

100 foot white radar sensor protects three rooms all at once.

40 foot rectangular white radar sensor protects room and radio equipment.

radar-alarm transmitter is about 5 milliwatts. Larger transmitter horn assemblies may put out as much as 20 milliwatts. A 5-milliwatt radar-alarm system easily covers a distance up to 40 feet. Larger, 20-milliwatt radar systems may cover distances up to 100 feet. When translated into zone protection, a small radar system at 5 milliwatts easily covers a couple of rooms. The larger radar transmitter may cover up to four or five rooms — or even a complete 100-foot-long steel and concrete warehouse!

Although radar security systems are more expensive than ultrasonic systems, they have some distinct advantages for their slightly higher price:

They are immune to air currents and temperature thermals. This means they may be used outside.

Radar systems are immune to high-frequency tinkles, disk brakes, and mechanical-siren sounds.

Radar systems won't give you that sound-induced headache!

Radar waves can propagate through walls, curtains, glass, and other nonconducting materials. You can hide the radar transmitter behind anything that doesn't contain metal.

You can cover a much larger area with radar than you can with ultrasonic security systems.

Home alarm control box blends well with hi fi equipment with wood grain finish.

Fewer falsing problems with radar

Radar security systems have far fewer falsing problems than conventional ultrasonic security systems. Here are some examples.

A radar security system would work well in an open garage. Ultrasonic detectors would be set off by wind currents.

Let's say you need to protect an outside patio area. Birds frequent the area and many times will fly within inches of your security system. Ultrasonic detectors would probably be set off as the birds fly through the ultrasonic wave patterns. Radar detectors, on the other hand, would discount any fast-moving object, their microprocessor "brain" knowing that burglars normally don't travel at the speeds of 40 to 50 miles an hour! Sophisticated radar alarm systems can be set to sound off only when a detected object is moving at a predetermined speed. Some alarm systems detect only targets moving at two to five miles per hour. Someone moving, bending over, turning, or creeping in a protected area would certainly trip the alarm. A high-speed bird, or a fast-moving cat, would not trigger the radar alarm. Even passing vehicles would not create a problem, unless someone's going by pushing a car that's run out of gas.

Options

With both the radar and ultrasonic alarm systems, there are plenty of add-on options. Lights, bells, whistles — even remote panic buttons that let you sound the alarm from your bedside. Built-in battery back-up systems are available to keep the alarm functional in the event the burglar cuts off your ac power.

Almost every alarm system has a built-in entry and exit delay system. This lets you get to the little black box and turn it off before it denounces you as an intruder.

Car systems

Both the ultrasonic and the ra-

dar detector system may be capable of operating on 12 volts. Some will work well inside a vehicle.

Another interesting type of vehicle alarm is one that detects vibrations, glass breaking, or a door opening in a vehicle. Depending how you have it hooked up, it will either sound your horn or activate your pocket-sized beeper. The system works on CB radio-control frequencies, or at 72 MHz, and you can be as much as 2 or 3

Window decals warn of alarm protected premises.

miles from your vehicle and still receive the alarm on your beeper. It's ideal if you need to go up to your office but have to leave your car in a questionable parking lot. A special, coded signal is used to set off your beeper.

Do it now

Right now is the time for security system planning. A recent survey indicates that buyers of security systems are predominantly those who have recently been robbed. Why tempt fate with a ham shack full of equipment? Look into microprocessor-based security systems and find out what peace of mind it's possible to have, knowing your ham equipment is protected against theft.

HRH

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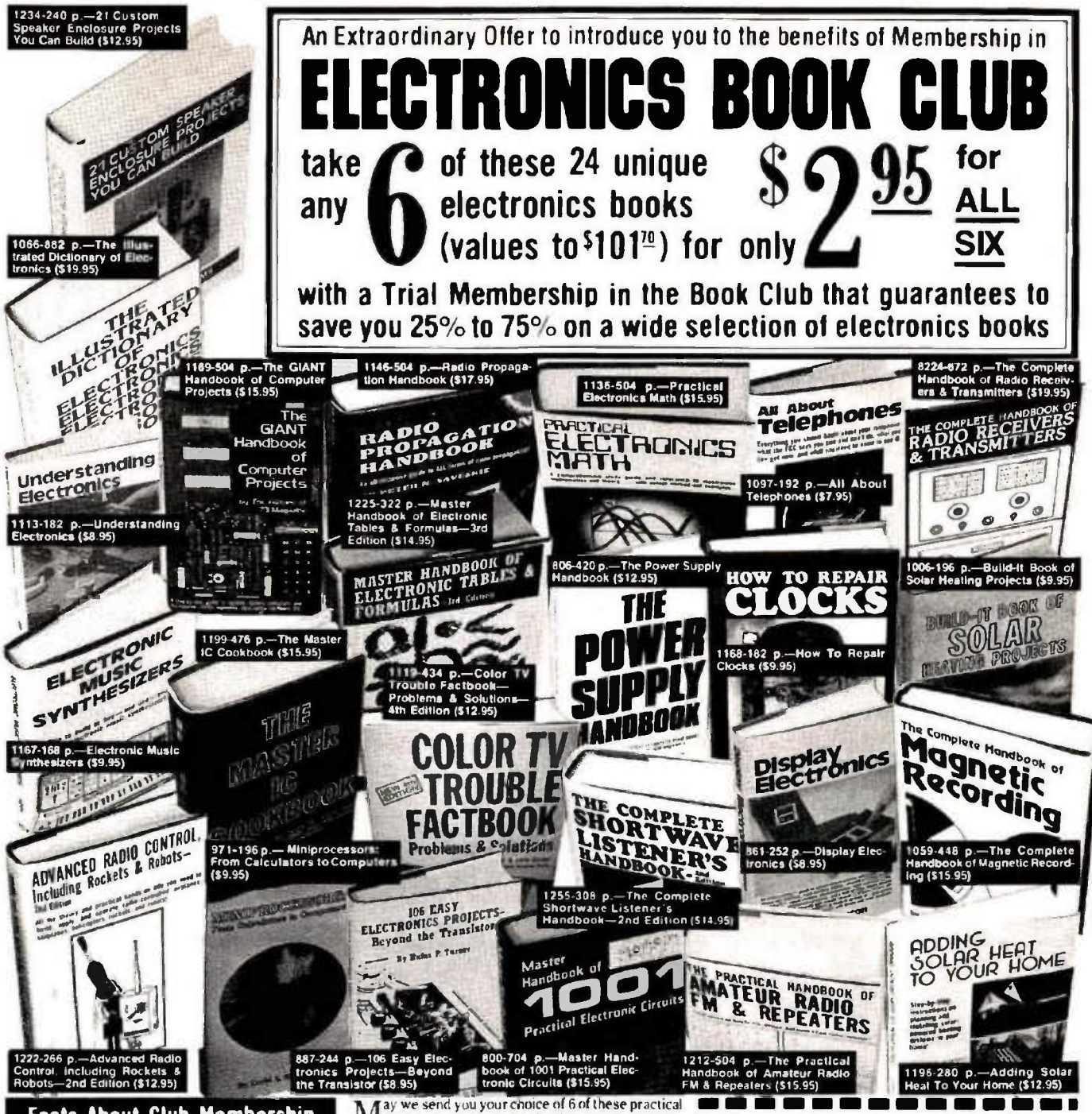

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Questions & Answers

Entries for this column must be by letter or post card, only. No telephone requests will be accepted. All entries will be acknowledged when received and those judged to be most informative to the most Amateurs will be answered by return mail. Questions must relate to Amateur Radio.

Readers are invited to send a card naming the question they feel is most useful in each issue. Each month's winner will receive a prize, and there will be a prize for the most popular question of the year. In case of two or more questions on the same subject, the one arriving here the earliest will be used.

A resounding thank-you to everyone who sent in a card, or tacked a note to their letter, registering a vote for the most useful question in previous issues.

The winner thanks you too, and the lucky guy for July is KA8COI with his question about voltages between pieces of equipment.

Ringing in my ears

When I use an audio filter with a narrow bandwidth, what causes the ringing sound? Is there anything I can do about it? — Ed Hall, AF3S.

The easy way to answer that is to say that the filter rings *because* of the narrow bandwidth. But, that wouldn't tell you much.

Tuned circuits tend to become "excited" by energy applied to them, and the sharper that tuned circuit is, the greater the effect of the excitement. Tuned circuits are sharp when there are few losses in the circuit, and they are broad when the losses are high. If there are few losses, the energy applied can flow within the circuit, and will stop when the natural resistance of the wire dissipates the energy. The classic example is a capacitor and inductor hooked in parallel. Charge the capacitor, then remove the voltage source. The energy on one side of the capacitor tries to get to the other, but, along the way it runs into the coil. The coil first opposes the current flow, then gives it a push, which results in the opposite plate now being charged. The current then tries to go the other way, and this keeps happening until the electrons are at rest and the charge is equal on both plates. This back-and-forth action is called the flywheel effect, with stored energy circulating back and forth much in the manner of the balance-wheel in a clock.

The new breed of filter uses ICs, and so closely imitates the action of the tuned circuit they replace that they, too, exhibit this "energy-storage" or "ringing" characteristic. Quartz crystals, used in filters at the i-f of your receiver, also have the same problem at narrow bandwidths.

There is not much you can do about it, since this characteristic is part of what makes a narrow filter work. It is possible to build filters that are sharp and do not have this ringing characteristic, but they are very, very expensive.

You could introduce some loss in the circuit by loading it down with resistors, but then it would not be narrow any longer.

One thing to try: since the greater the amount of energy you apply the longer it will ring, keep the volume down as low as you can and still copy the signal you want. Less energy (low volume) will shorten the "ring" time, and make things that much clearer. Try it with a tuning fork or a bell.

Belt it a good one and see how long it takes to stop ringing; tap it softly (less energy input) and it will become quiet in less time.

Mobile QSLs

When operating mobile or portable, what is the acceptable practice in QSLing? Does the operator use his regular QSL card? — Warren Tuiskula, KA1JL

Certainly, you can use your regular QSL card. All that's necessary is to show where you were when the contact was made. There's no legal requirement for anything on a QSL card, or even for the card itself — a QSL card is a courtesy to your fellow ham. Some hams collect them just for the fun of it, and others need them to validate a claim for an award or certificate of some sort.

Keeping that in mind, it is easy to just write your location on the card when you made the portable or mobile contact. Putting the county on the QSL is especially thoughtful, since many hams are working toward a County-Hunter's award or endorsements.

If you are going to be at one portable location long enough to make a number of contacts, an inexpensive rubber stamp giving the added information will save you a lot of writing. Leave your permanent address intact, however, so the other guy can send you one of his cards if he so desires.

"M1" or "/1"

I operate mobile CW quite a bit, and have signed "/M2" through "/M9" at various times. When I go to New England, I will sign "M1," but the country of San Marino is assigned M1 and I don't want to cause DX pile-ups when I am only in Vermont. Is "M1" okay in the first district? — Donald E. Wagner, W2QFC.

There is no requirement to place any modifier whatsoever after your call when operating mobile or portable. Read Section 97.84 of the FCC Rules, pertaining to station identification. The only modifiers you must append to your call are either the "interim" identifier (usually two letters) while you are waiting for your new ticket after upgrading, or the letters "RPT" or "R" if you are a repeater, (or "AUX" if you are an auxiliary station).

It makes sense, though, and is a courtesy to your fellow ham, to place a "/1" or whatever after your call, but there's no need to specify "mobile" or "M" unless you want to make a point of it.

Going in circles

What does circular polarization mean? What is the difference between right hand and left hand circularity? I've seen these terms several times when reading about the OSCAR satellites. — Richard Clark, KA9HTW.

Good question, and one that bothers a lot of people. You've seen hundreds of 2-meter Yagis with their elements all horizontal — that's horizontal polarization. You've seen some Yagis and most ground-plane antennas, as well as the whip on a mobile installation, with the elements vertical — that's vertical polarization. Both are called *plane* polarization, because the maximum radiation is in a relatively flat plane parallel to the element that is doing the radiation.

Now, suppose you have a horizontal element, and place a vertical element in front of it. If you feed both of them exactly the same, you will have bipolar radiation — half vertical, half horizontal. However, if you connect a short length of feedline between the two, with the length cut to pre-

cisely the right length, you will introduce a phase shift between the two antennas. The result is that one antenna receives its energy a bit earlier, or a bit later, depending upon your point of view (is a bottle half empty or half full?). This difference in phase creates "circular" polarization. There is still some vertical energy, and some horizontal, but there is also some at each angle in between.

Circularity direction is determined by the phasing line, and by which antenna receives the energy first. Right-hand circular means that the energy appears to rotate in a right-hand (clockwise) direction if you stand behind the antenna and sight along it in the direction it is pointing (IEEE definition). Left-hand is just the opposite, as viewed from behind the antenna.

Circular polarization is useful in overcoming signal fading caused by movement of the satellite. If OSCAR had a simple dipole, you would receive the signal loud and clear when the dipole was oriented the same as your receiving antenna, but when the satellite moved, causing the antenna to tilt to perhaps right-angles compared to yours, the signal could be as much as 30 or 40 dB weaker! With circular polarization, it doesn't matter what the position of the satellite is, there'll always be some signal for your plane-polarized antenna to receive. If you were to put up a circularly polarized antenna, you would be picking up energy from all angles, and you would note an increase of 3 dB over your plane-polarized antenna.

Sudden SWR

What are the most likely causes of a sudden loss of output power, with attendant increase in SWR, on just one band of a multiband dipole or vertical antenna? I have both a 20/15/10 dipole and a ground-mounted 18AVT vertical, and this has occurred on both recently. — Ralph Foster, N5BUW.

Since it happened on two different antennas, you can rule out any problem with the traps (unless you did something that clobbered the same band traps on both antennas). Also, since it happens on just one band, you can eliminate the coaxial cable as a suspect.

It sounds as though your rig is breaking into parasitic oscillation on one band. This could be because it doesn't like the load presented by the antenna on that frequency. Some final-amplifier stages will oscillate if they don't see a nice resistive load.

Get a wavemeter (most dip oscillators will work as a wavemeter, too), and the next time it happens, go looking for the radiation. It could be in a different part of the band, or completely outside the band (that's why the SWR is up — your transmitter is putting out energy on a frequency that the antenna isn't made for).

If you find this to be the case, ask the manufacturer for a cure, or, fool the transmitter into thinking the load is good by putting a Transmatch in the line. You could also change the length of the feedline by a few feet, but this could work either way — it might make matters worse, or better.

Suggested reading

The ARRL Antenna Book, 13th Edition, Chapter 12, "Antennas for Space Communications," American Radio Relay League, Newington, Connecticut 06022; $5 (plus $1 shipping and handling) from Ham Radio's Bookstore, Greenville, New Hampshire 03048.

HRH

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DX Horizons

By Bill Kennamer, K5FUV

DX Tips for Little Pistols

QRZ DX, a weekly DX newsletter which I edit, has as its motto, "DX Tips for Big Guns and Little Pistols." Since we started, many have asked when we would pass along the tips for the little pistols. There's no time better than the present, as conditions are about as good as can reasonably be expected for the next eight or nine years. Thus, a good operator with moderate equipment can work DX now by applying himself to its pursuit.

The first consideration in working DX should be your station, as the station itself will determine what type of operating you will do. DX can be worked with a dipole in the attic, but it's much more difficult, and you will miss some. However, you can still work DX. If you attack the problem with an attitude of "work smarter, not harder," you'll get your share of DX in your log.

Now, look around the shack. Do you have a 24-hour digital clock? If not, it's not too late to get it on the family Christmas list, as your log must be kept in UTC in order to fill out QSL cards, and also, a glance at the clock and writing in the time from a digital format is much better than making an incorrect interpolation from an analog type.

How about a good set of earphones? I've seen many operators trying to operate with loudspeakers, and they wonder why they can't hear the DX. Frankly, a loudspeaker just won't cut it for weak signals, or in heavy QRM. Earphones will increase your ability to hear weak signals significantly. A further word on earphones: Don't use the stereo type, as they are designed for wide frequency response. This is not desirable for communications service, as the audio bandwidth should be restricted to cut down QRM and low-frequency hum. Try something by Telex or Yaesu.

As far as the rig goes, it's not quite as important as some would have you believe. The important thing is receiver selectivity and overload tendencies. Overload can be helped by an attenuator, and selectivity by good crystal filters. After-market filters from companies such as Fox Tango Corporation are available for both SSB and CW, and models are made for most rigs. Audio filters may be used, but are not a cure-all, and should not be used in lieu of a good crystal filter. An audio filter is good for cleaning up the crud left after a good crystal filter, especially if it is the passive type that can't introduce hum and hiss of its own.

For the phone operator, a good microphone is essential. It must have a response tailored to your voice, and it must give audio punch for pile-ups. Some of the Japanese mics are greatly lacking in this respect, as they have too much low-frequency response.

So, your rig now has a good filter, you use a good mic on SSB, you're listening on a good set of headphones, and looking at a digital clock. Next, the antenna.

Stacked quads are nice, but not really necessary. It *is* necessary that any antenna you use be installed properly, and that good quality feedline is used. If coax is used, choose a brand that has very good braid coverage. RG-213

is preferable to RG-8 type, as it has good braid coverage and a non-contaminating jacket. RG-8 varies all over the ballpark as far as quality is concerned, and there's a certain nationally known electronics retail chain that sells coax that isn't even good for copper scrap.

Antenna installation can make a big difference in performance. A vertical antenna will perform well; in fact, one of the locals here worked 210 countries in nine months with one. However, radials are not optional, they are *mandatory*. A good compromise would be 36 radials up to 30 feet in length. Individual lengths may vary. In fact, some of mine are only 5 feet long. A five-band, trapped vertical is one of the better DX antennas for 40 and 80 if it is properly installed.

If a dipole or other wire antenna is used, install it for the lowest angle of radiation. A dipole performs better if installed as a sloper rather than as an inverted V. Also, the higher the better, up to a point.

For beam antennas, a tower should be selected which will allow one to go 70 feet, whether immediately or at some future date. This seems to be about the most usable height for all purposes, and also seems to give a substantial gain over a similar antenna at 50 feet.

With the station and antenna set up for maximum efficiency, the next place to start is the operator. The operator must be prepared to work either phone or CW, especially if he is not using an amplifier. Many countries considered rare are easily found on CW everyday. As a DX operator, you must have both patience and perserverance. You must be able to stay quietly on frequency without interrupting a QSO in progress, no matter how long you have to wait. The ability to concentrate and hear weak signals is not to be taken lightly. Many DX signals are weak, buried in QRM, and the one who hears them may work them; the one who can't, never will.

Now that I have at least passed over a few items for consideration, it's time for the actual DX tips. Although mostly applicable to the newer operator, I've heard many on the air that could improve their DX score by following a few:

- Spend time on the bands. I turn on the radio when I arrive home from work, check 10 meters, then go to 15 meters; the radio stays on until bedtime. If I'm watching TV, the band is checked at every commercial break. Otherwise, about every 20 minutes, I tune the band. Some nights, all evening is spent with the radio, constantly tuning. The basic idea is to find someone I haven't worked, hopefully calling CQ, or one I've worked and haven't received a card for, and work him before the pack finds him.
- Stay away from 20-meter phone unless you have a big antenna and big amplifier. This is an excellent band, offering everything in both propagation and exotic DX, but it's also an exercise in frustration much of the time. The same DX will appear on 15 meters, with much less competition. Ten meters is also excellent in the fall and spring, and is reliable to the South Pacific the entire year. Forty meters is also very good from sunset to sunrise, especially on CW.
- Read a DX newsletter. It's important to know what's happening, and what's going to happen. The most important part of a DX newsletter is the part that tells who's been heard, and where. In *QRZ DX*, I call it QSN (I heard you on . . . MHz). A sample section of QSN is reproduced here in **Fig. 1**. A study of several week's listings should turn up some interesting information. For example, a study would show that 3B8CF usually turns up on 21.027 or 14.027 MHz, sometime around 0300 to 0400Z almost daily. This is information that normally won't show in the main body of a newsletter, but can be found easily by comparison. In January of this year, I noticed VQ9KK was showing every morning at 1100Z on 7.005 MHz, so I tuned up the rig the night before, set the

Mike Smedal, A7XD, ex-EP2LI, passes out another of his thousands of QSO's from Qatar. Mike was the first foreign national with an A7X license (*photo courtesy of A7XD*).

The VP1A group from the 1980 ARRL DX Contest, Ambergris Caye, Belize. Members of the Kansas City DX Club had 7,500 QSO's during the contest, and worked under their individual calls before and after the contest (*photo courtesy of KØCS*).

alarm for 5:00 AM, and got up the next morning. Five minutes later (including time for the rig to warm up), he was in the log. If I had been merely tuning the band, it might have taken days or weeks before I stumbled onto that information.

- Work all DXpeditions. They're usually written about in all of the DX publications, usually use standard frequencies, and work at much higher QSO rates than natives. They're there to provide QSOs and QSL cards, so many rare countries can easily be worked, while some with only regular native operators can be quite rare.
- When it's time to DX, DX. Talking to other W stations gains you nothing when you're looking for DX. Most DX info passed over the air is fourth-hand hearsay, and, as such, is subject to some distortion. It's better to keep tuning rather than to stop and listen.
- Get up early. An extra 30 minutes in the morning is worth a lot, as most hams either won't make the sacrifice, or will spend it on 20-meter long path. Other bands may prove to be more advantageous.
- Work all DX contests. The dates and rules are in most of the magazines. The different contests bring out different segments of the DX world. For example, the All Asian and Seanet contests bring out rare Asian stations. The Romanian Contest brings out YO stations, and many rare Africans come out for the French contest. Learn the exchange sequence, and get in for a few hours.
- Obtain a DXCC list, and memorize the names of the countries and prefixes. It helps to be able to tune the band and instantly recognize a new country, and determine whether you need to work it or not.
- Avoid list operations. It takes no less power or antenna to make a list than it does to work a station, but waiting to get on, then waiting for the list to be run wastes a lot of valuable time, time you could better use to work something else. I have yet to hear any country on a list operation that wasn't available otherwise. The list does have one advantage. It attracts the competition like a magnet, allowing you to roam the band working somewhere else with little competition. Same thing with colossal pile-ups — look a few kHz away and find someone calling CQ with no takers.

These tips are very limited in scope, and designed merely to get you off the ground. How long would it take to work 100 countries? With proper diligence and dedication, working all bands and modes, you should be able to work 100 countries within two weeks. However, don't stop and celebrate after each new one. There's always another one waiting.

Hong Kong

Steve Hawley, WA4UAZ, who spent quite some time in Ecuador as WA4UAZ/HC1, and HD1A, will be in Hong Kong as VS6JR. He will be there for about two years, and plans to be as active as he was in all contests. QSL Steve via WA4QMQ.

Willis Island

Graeme, VK9ZG, continues

Fig. 1. QSN, a listing of stations heard and worked during a recent time period. By following the appearance of a country of interest, a good idea of current activity and probable frequency may be established.

15m

SVØAA/9	21.029	1 May	0215Z	WØ
A9XCE	21.028	29 Apr	0340Z	W1
XE3LPV	21.024	29 Apr	0340Z	W1
UL7HD	21.013	30 Apr	0156Z	W1
UJ8JAS	21.015	30 Apr	0213Z	W1
UM8MBA	21.013	30 Apr	0227Z	W1
KHØBKX	21.030	30 Apr	0229Z	W1
8Q7AW	21.035	30 Apr	0230Z	W1
HS1ALV	21.009	30 Apr	0236Z	W1
FG7AS	21.028	30 Apr	0340Z	W1
3B6CD	21.025	28 Apr	0345Z	WØ
EA9GK	21.030	24 Apr	0030Z	W1

with his operations from Willis Island, and has been active mostly on 20 meters, around 0700-1200Z. He's using an FT-101E with FL-2100 linear amplifier. The antennas in use are a horizontal vee beam for 80 and 40 meters, and a TH3 tribander. He will be there until December. QSL via VK3OT.

Malta

Fred, 9H1FN, is active each weekend on 40 and 80 meter SSB. He begins around 2300Z, and favors frequencies around 7.087 MHz or 3.772 MHz.

Seychelles

Bob, S79MC, has been very active over the summer, using mostly 15 meters. He is using a Collins KWM-2, and the antenna is a 1-1/2 wave "X-Q" quad at 70 feet. The QTH is Mahe, the main island in the Seychelles group.

Haiti

A group of Haitian Amateurs recently formed the Haitian DX Club. The club is giving a certificate to any Amateur working ten HH Amateurs. Any contact made since January, 1977, will count toward the award. A list of contacts showing date, time, mode, and exact frequency may be sent, along with $3, to the Awards Manager, HH2BM, Bernard Montes, Box 38, Port Au Prince, Haiti.

DX Club News

New officers for the Delta DX Association in New Orleans are: President, Mike Meyer, W5ZPA; Vice President, Louis Muhleisen, Jr., K5LM; Secretary, Russ Guidry, K5OA; Treasurer, Audry Collins, WA5FYQ.

The Long Island DX Association's new officers are: President, Carl Lindeman, W2TDQ; Vice President, Allen Singer, N2KW; Treasurer, Charles Wagner, WA2YUH; Secretary, Arthur Bernstein, N2KA; Corresponding Secretary, Robert Jackson, K2YGM. All correspondence should be sent to N2KA, 387 Ave. "S," Apt. 6D, Brooklyn, New York 11223.

Erik Sjölund, SMØAGD

Erik, SMØAGD, has given many DXers a new one in his travels over the last eight years. In the following letter, he tells of his most recent travels and his plans for the future.

"Dear DX-friends, I have returned to Sweden after my three-month journey through Africa. On this trip, I visited ten different countries and managed to get on the air from four of them:

March	13-19	Guinea Bissau J5AG
May	1- 4	Swaziland SMØAGD/3D6
May	6-10	Botswana A22GD
May	17-22	Rwanda 9X5LE

"The total ended up in some 9500 QSOs with 90 per cent on CW. 9X5LE is issued to Roland Lord, a Swedish missionary with whom I visited in Kigali, the capital city of Rwanda.

"All QSL cards go via SM3CXS: Joergen Svensson Berghemsvagen 11, S-86021 Sundsbruk, Sweden.

"I carried an ICOM IC-701 transceiver, a 14AVQ vertical, and a Bencher keyer with me all the way. Thanks to the Bencher, I enjoy CW a lot more now than I ever did before. The whole trip almost ended in a diaster, because on the return flight to Stockholm, my luggage — including all the logs — was lost somewhere enroute. It took a few days of worry before the luggage could be traced to a conveyer belt in Nairobi, where it had been moving around for some time. I do consider logbooks as valuable documents, and normally I carry them with me as hand-luggage, but this time I made the mistake of packing them in my suitcase. Well, now the logs are safe in the hands of SM3CXS.

"In recent years, my duties have taken me abroad approximately 50 per cent of the time. I visited some eighty countries and I have been operating under more than twenty different callsigns, beginning with CE3AOF/Ø and SM2AGD/CEØ from Easter Island back in 1972. I had a lot of fun during these years, and I enjoyed very much meeting so many radio friends both over the air and in person.

"But things are changing and for some time I will now be more permanently posted in Sweden. I will not have so many paid trips to all those exotic places any more, but it would be difficult to stop my DX ambitions. So, I am planning some DXpeditions together with SM3CXS and The Sundsvall DX Group. One of the target areas is China. A member of our group, SM3BHY, is stationed in Peking. He has established good relations with the Chinese authorities, and he has been in meetings with the former operators of BY1PK from the early 1960s. It will take time before our negotiations result in DX activity in China. There are many branches of Amateur Radio, and we have started on a very elementary level. This work is very interesting, and perhaps in a year or two we can help a BY station to show on the high-frequency bands. I am sure many other groups around the world are

working on similar projects, and something will develop sooner or later, because the Chinese are very interested. We must be patient. I already fear the pile-up; their first operators must be prepared for it.

"I would like to express my thanks to the DXers who sent many small contributions together with their QSL cards. After return postage was paid we had a small excess which has been saved in a fund. This money will be very useful for our future DXpeditions; thank you.

"It will take some time before we are able to realize some of our plans. In the meantime, you will find me in the crowd '5-kHz up,' trying to improve my own DXCC total which has been at a standstill since 1968."

Erik A. Sjolund

Here's David Guthrie, 5NØDOG, at his rig in Lagos, Nigeria, March, 1980 (*photo courtesy W4FRU*).

QSL Route

Station	QSL Via
AI5P/SV1	W3HNK
A4XCA	G4BWP
A7XGI	DL2MY
CN8CW	WA3HUP
CR9A	WB2KXA
CT2CE	AG1K
CX4CQ	CX3AN
C21AM	Box 66, Republic of Nauru
C31HD	F6BII
C31IR	F6AUS
C31OE	N6ECX
C31PP	DJ2ML
DF4GV/HBØ	DF4GV
EC9AA	EA1QF
EY2B	UK2BBB
FG7AK	Box 21, 97190 Gosier, Guadalupe
FK8DH	VE5AAP
FM7WO	WB4SXX
FWØDD	VE3ODX
GJ4JWA	Box 100, Jersey, Channel Islands
GU5DJI	ON7EJ
HC8KA	HC5KA
HM5KY	From 25 Feb., 1980, W4KGH
HP1XAT	WB3UGY
HS1ALV	HS1BG
HS4AMI	VE3DPB
HS5AID	AG6D
JT1BE	JT1KAA
JTØFU	Oleg, Box 639, Ulan Bator, Mongolia
J3AJ	W7LLC
J6LKU	VS6CT
J73D	W2OB
KC6DC	AD1S
KC6DE	AD1S
KG4HC	Harry Chamberlain, Box 12, FPO NY 09593
KG4WC	K4EXA
KS6AD/KH2	VE5QY
KV4AA	K6PBT
OA8AA	Richard Steele, Box 2492, Lima, Peru
OD5FK	Farouk Koleilat, c/o Trans Mediterranean Airways, Beirut Airport, Lebanon
OHØPS	OH1PA
OR6XB/LX	ON6XB
PJ2CC	28 Mar-30 Mar 1980 and 5 Aug-13 Aug 1980 *only*, WB3JRU
PZ1DR	WD4NBX
SVØAU	W3FYT
S79MC	N4NW
TG9XGV	K4CLA
TL8CR	YO9WL
TR8DX	F6ESH
T2AAC	JA1LCX
T3AC	W5RBO
T3AW	JA1LCX
T3AT	G3XZF
VE8MTD	VE4TZ
VK9XW	VK6RU
VP2KC	W9WBZ
VP2MO	KA4BOT
VP2MX	VE1ASJ
VP5AA	W4ZR
VP5JAX	JA2VUP
VP5WPX	WD4AUU
VP8WA	WA4JQS
VQ8ZR	G3KTJ
VQ9DM	K1BZ
VQ9CT	W6IMX
VQ9JC	PSC4, Box 17255, APO SF 96274
VS5GM	N2OO
VS6JR	WA4QMQ
WA1KRR/KHØ	AD1S
WAØTAD/OA8	N4CQ
XE1FR	W5QK
XT2AU	WA1ZEZ
ZC4MT	Mike, Box 416, Larnica, Cyprus
ZF2CD	W3ODJ
ZK1BD	ZL1SZ
ZL3MA/C	WB8WSM
ZL3QN	W4KGH
3A2HB	Direct with 3 IRC's and 5X7 envelope, or one dollar U.S., no envelope
3D2CC	VE6AKV
4A4MDX	XE1OW or XE1OX
4B4MDX	XE1OW or XE10X
4N1U	YU1EXY
5B4CX	OK2GMX
5H3KS	DK5EC
5W1BT	WA6AHF
5W1CR	ZL1BCG
5Z4WD	DF7GX
9H4P	N2DO
9K2DR	R. Roberts, Box 21944, Kuwait
9X5NH	DL8DA

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by William I. Orr, W6SAI and Stuart Cowan, W2LX

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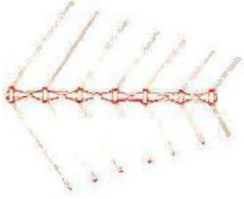

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Ham Radio Techniques

BY BILL ORR, W6SAI

No doubt about it. One of the most popular ham antennas for the high-frequency bands is the cubical quad. You'll hear a lot of them on the air and they all put out good signals.

Why is the quad so popular? Well, it puts out a very robust signal, is inexpensive and easy to build, and requires little, if any, adjustment to get it working properly. In areas of the world where aluminum tubing is hard to obtain and the construction of a Yagi antenna is out of the question, the quad, with its wood or bamboo construction is the only game in town.

The quad has been around a long time and a lot has been written about it.[1] Even so, it is "topic number one" whenever DX-minded hams gather together to talk about antennas.

As far as I know, the quad antenna is the only popular beam antenna that was not laboratory designed and tested by an antenna engineer. On the contrary, the quad is unique, a stroke of original thought, conceived by a Radio Amateur in one of the little-known areas of the world as an attempt to solve a problem. The success of the quad over the past years — the brainchild of W9LZX — in overcoming the myriad problems and difficulties of antenna design for a typical shortwave broadcasting station is worthy inspiration for any Amateur, as the story of the quad shows the true ham spirit of "make-do" and inspiration when confronted with "the problem that cannot be solved."

The quad

In 1939, a group of radio engineers from the United States traveled to the South American Republic of Ecuador to install and maintain the Missionary Radio Station HCJB, at Quito, high in the Andes mountains. The transmitter operated in the 25-meter shortwave band with a carrier power of 10 kilowatts. A large 4-element Yagi beam was built and aimed at North America to provide a powerful signal.

When the engineers arrived and got the station on the air, it was found that the combination of humidity and high altitude would be the station's downfall. The beam antenna reacted to the mountain atmosphere in a strange way. Gigantic corona discharges flowed from the tips of the Yagi elements; fiery streamers standing out in mid-air, and burning with a hiss and crackle. The element tips glowed with the heat of the arc, and large molten chunks of aluminum dropped to the ground as the fire slowly consumed the elements.

It became the lot of Clarence Moore, W9LZX, one of the engineers, to solve this problem. It

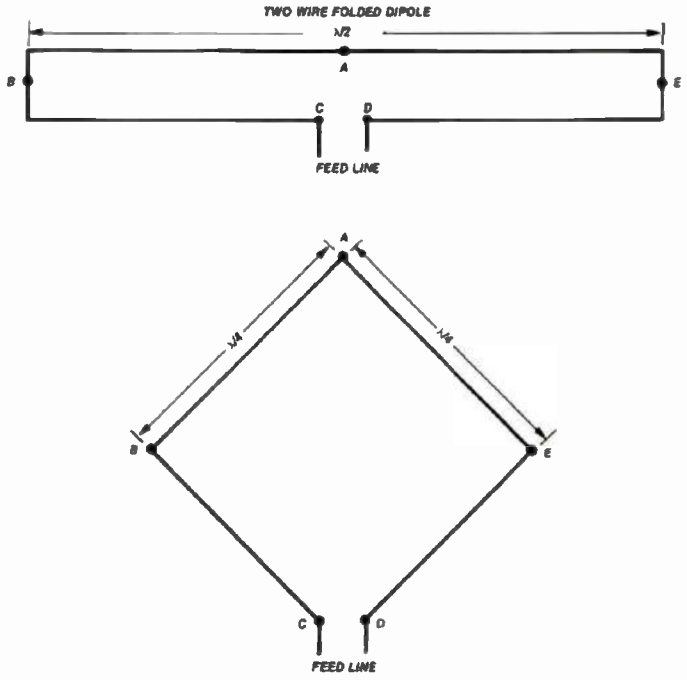


Fig. 1. W9LZX concept of the "pulled-open folded dipole." At top is a folded dipole. This antenna has the same general characteristics as a single-wire dipole except that the radiation resistance is four times as high. In addition, the bandwidth of the folded dipole is somewhat better than that of a single wire dipole. W9LZX opened the folded dipole to form a diamond-shaped loop a quarter wavelength on a side. The loop produces the same radiation pattern as the dipole but provides a power gain over the dipole of about 1.4 dB. Corresponding points on the two antennas are lettered. Quad loop may be square, circular, or diamond shaped with little change in performance.

was obvious that the easily ionized air at the two-mile elevation of Quito was causing the problem. Moving the station to a lower altitude was impossible. The die was cast, and HCJB was permanently settled in Quito.

What to do? Moore achieved a partial solution by placing six-inch diameter copper balls, taken from bathroom flush tanks, on the tips of each element. This helped a bit, but corona discharge still appeared on the antenna in damp weather. A whole new approach to the problem was required.

In the words of W9LZX, the idea of the quad antenna slowly unfolded to him, almost as a Divine inspiration. "We took about one hundred pounds of engineering reference books with us on our short vacation to Posoraja, Ecuador, during the summer of 1942, determined that with the help of God we could solve our problem. There on the floor of our bamboo cottage we spread open all the reference books we had brought with us, and worked for hours on basic antenna design. Our prayers must have been answered, for, gradually as we worked, the vision of a quad-shaped antenna grew from the idea of a pulled-open folded dipole (**Fig. 1**). We returned to Quito afire with the new concept of a loop antenna having no ends to the elements, and combining relatively high impedance and high gain."

A two-element quad antenna was hastily constructed and erected in place of the Yagi at HCJB. And it worked! The problem of corona was solved, and listener reports flooded the station, attesting to the efficiency of the simple antenna.

At a later date, Moore returned to the United States and was granted a patent on his unique antenna design. The spectacular rise of the quad from the wilds of Ecuador to use in radio stations throughout the world is well known, and today this simple and effective beam is one of the most popular performers on the Amateur high-frequency bands.

The single-loop quad antenna

A single quad loop makes an efficient and inexpensive bidirectional antenna that can be supported from a single mast (**Fig. 2**). In addition to providing good power gain over a dipole, the loop requires only a half-turn for complete coverage of the compass. It is light enough to be turned by a good TV rotator. Design of such an antenna is straightforward, and construction requires no special tools.

A light bamboo frame supports the loop wire in the vertical plane. Each side of the loop is about a quarter-wavelength long at the operating frequency, as shown in the dimension chart. The loop is broken at the middle of the bottom section for insertion of the coaxial feedline.

Loop Construction

The framework of the antenna is assembled from four lengths of bamboo attached at their large ends to a plywood center plate by means of U-bolts (**Fig. 2**). Each

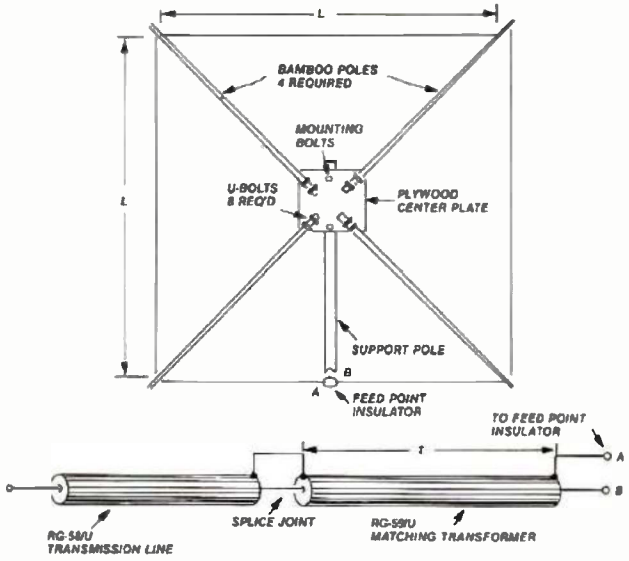


Fig. 2. The single-loop quad antenna. This simple, bidirectional antenna may be supported from a single pole and gives a worthwhile power gain over a dipole. Antenna is light enough to be handled by a single person. Wire length, drilling point, for the quad arms, and length of the matching transformer are given in the table. Make sure all joints in the coaxial line are waterproof. Antenna radiation is horizontally polarized.

BAND	L (SIDE LENGTH)		S (DRILLING POINT)		T (TRANSFORMER LENGTH)	
	FEET	METERS	FEET	METERS	FEET	METERS
10	8'3"	2.64	6'2"	1.88	5'10"	1.78
15	11'8"	3.56	8'4"	2.53	7'10"	2.39
20	17'8"	5.39	12'6"	3.81	11' 8"	3.61

NOTES:
1 — DIMENSION S MEASURED FROM DRILLING POINT TO CENTER OF SUPPORT PLATE.
2 — DIMENSION T INCLUDES 1" LEADS AT EACH END OF TRANSFORMER.

pole is wrapped with vinyl plastic tape between the joints to enhance the strength of the assembly and to retard splitting of the bamboo. Small holes are drilled near the tips to pass the antenna wire which is threaded through the holes after assembly of the framework. Each end of the loop wire is cleaned and the ends wrapped back upon themselves and soldered. Sufficient tension is imparted to the wires to keep them taut by loosening the center U-bolts and spreading the butt ends of the poles.

The 50-ohm coaxial feedline is connected to the loop through a short section of 70-ohm line (RG-59/U) which acts as a matching transformer (T) between the high impedance loop and the line. It is only necessary to cut this line to the indicated length for it to properly make the transformation.

The center plate is cut from 1/2-inch thick plywood, and given several coats of outside house paint or varnish to make it waterproof. Pay special attention to the edges, as water will attack the glue if the plywood is not well painted. Drill the plate for the U-bolts, and temporarily assemble the bamboo poles to the plate. Mark the exact center of the plate and measure out the distance on each pole. This is the spot where you will drill a hole in each arm to pass the antenna wire. Stretch the wire out in a straight line and temporarily attach it at the marks by means of string and tape. It should be a tight fit. If it seems too loose, you may have to mark a new hole a little farther out than the position you have just marked. When you have located the correct points, drill each pole carefully with a drill just slightly larger than the wire size. Now, pass the wires through the poles, attach at the center insulator at the bottom of the antenna and tighten things up. Don't change the wire length; that determines antenna resonance.

Open folded dipole

The quad loop may take a diamond, square, or circular shape. The shape of the antenna seems unimportant as long as much area as possible is contained within the wire configuration. Some Amateurs have had success with triangular-shaped "loops." This antenna array is termed the Delta Quad.

In any event, the simple loop, a quarter-wavelength on a side, exhibits a figure-eight radiation pattern similar to a dipole. Best of all, the loop has a power gain of about 1.4 dB over a dipole. The radiation resistance of the single loop antenna is about 125 ohms when it is mounted about 1/2-wavelength above ground.

The feed system

Cut the 70-ohm line to the length given, which allows 1-1/2-inches at each end to make connections. Strip 1-1/2 inches of black vinyl outer jacket off the line, unbraid the shield carefully, and then twist it into a pigtail. Carefully remove about one inch of the plastic center insulation to expose the end of the center conductor. One end of the 70-ohm transformer is attached to the ends of the loop (A-B) and the connections soldered. The other end is attached to the 50-ohm transmission line. Take care in making the splice as it is easy to melt the center insulation with a

soldering gun. To make the splice, twist the center conductors together and solder them. When cool, wrap the connection carefully with vinyl electrical tape, continuing the tape over the inner insulation at each end of the splice. The braid pigtails are now carefully twisted together and soldered. The last step is to wrap the splice with two layers of vinyl tape, overlapping the windings as you go, to make the joint waterproof.

The transformer and line should be supported from the center pole of the antenna to remove the weight of the line from the antenna joint. Tape the line to the pole center plate. The connection to the antenna wires should be made so that the pigtail takes the strain if the line is pulled. After completion, the end of the 70-ohm line should be sealed with bathtub caulk to make it waterproof.

Antenna installation

The loop antenna is quite light and may be handled by one person. If a metal mast is used, take care that the bottom wires of the antenna do not touch the metal. When you check the SWR on the antenna, you should be happy, as it probably will run less than 1.7-to-1 across any one Amateur band. The flat surface of the loop is aimed in the direction you wish to transmit or receive.

The two-element quad

By far the most popular loop antenna is the two-element cubical quad using a driven loop and a single reflector element (**Fig. 3**). The added loop provides additional signal gain and front-to-back ratio. Typically, such a configuration will provide about 7 dB gain over a dipole, and a front-to-back ratio ranging from 10 to 25 dB, depending upon reflector spacing and adjustment. These values compare well with those of a three-element Yagi beam. Better front-to-back ratio for the quad is achieved with a reflector element than with a director, and power gain is equal in either case.

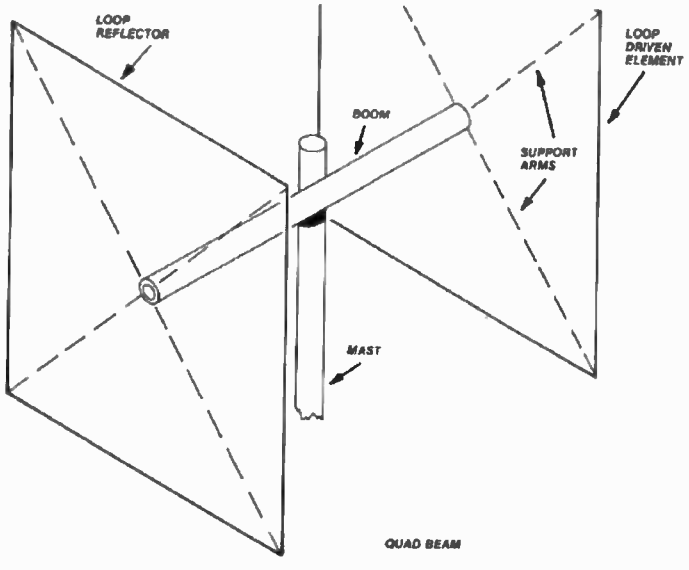
The radiation resistance of a two-element quad runs in the range of 60 to 75 ohms for element spacings of 0.1 to 0.15 wavelength, providing a good match for either a 50- or 75-ohm coaxial transmission line.

While not absolutely necessary, it is a good idea to use a 1-to-1 balun transformer between the line and the balanced quad element. It will make sure that your front-to-back ratio is not reduced by transmission-line pickup of unwanted signals from the rear of the array.

Building the quad antenna

Quad kits are available for the Amateur who doesn't have the time to scrounge up the necessary materials. The cheapest quad assembly, however, is a homemade structure constructed of bamboo arms and a wood frame, as shown in **Fig. 4**. Four bamboo poles are required for each loop, bolted to a wooden center plate as in the previously described antenna. The center plates in turn are bolted to opposite ends of a wood or metal boom that is attached to the support and rotating structure.

Plywood is an ideal material for the plates, but it is quite soft. Washers should be placed beneath all nuts to prevent them from digging into the wood. For 10, 15, or 20 meters, the boom may be a section of dry 2 X 2 lumber, well painted to protect it from moisture in the air. Sanding the boom before painting is a wise measure, as this will protect you from slivers and splinters during the assembly process.



DIMENSIONS FOR TWO ELEMENT QUAD BEAM				
ITEM	BAND			
	7 MHz	14 MHz	21 MHz	28 MHz
REFLECTOR	36'1" (11.0 M)	18'2" (5.54 M)	12'2" (3.71 M)	9'0" (2.75 M)
DRIVEN ELEMENT	35'1" (10.7 M)	17'8" (5.39 M)	11'10" (3.61 M)	8'10" (2.67 M)
SPACING	16'4" (5.9 M)	8'4" (2.53 M)	5'6" (1.69 M)	4'2" (1.28 M)

Fig. 3. The two element quad beam is composed of a driven loop element and a reflector loop, and provides a power gain over a dipole of about 7 dB. The front-to-back ratio ranges from 10 dB to 25 dB. This design provides a ratio of about 25 dB and allows sufficient bandwidth to perform well over the designated bands. It provides a good impedance match to either a 50- or 75-ohm transmission line. Wire sizes between No. 12 and No. 16 may be used.

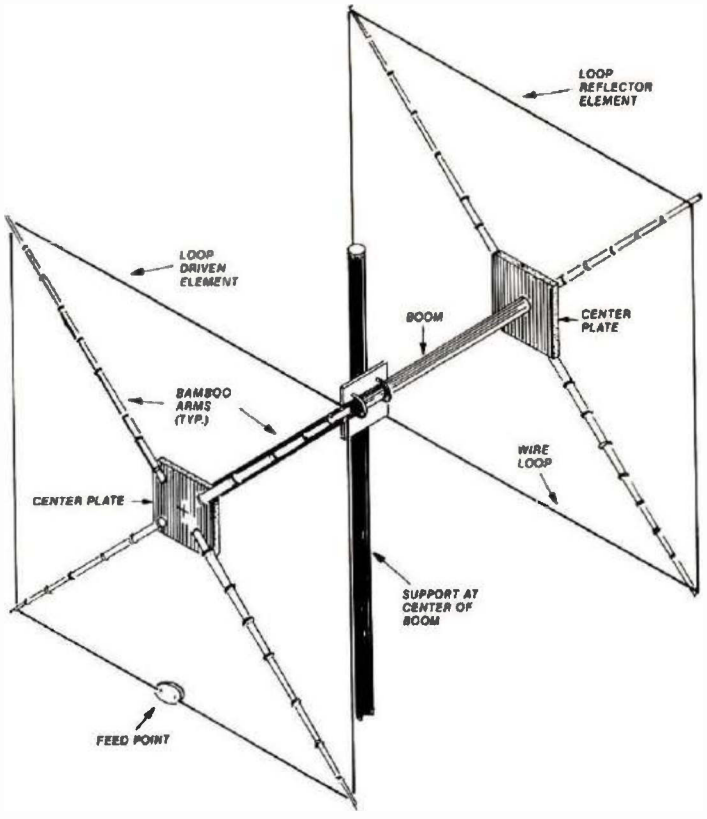


Fig. 4. Isometric view of two-element quad antenna. The driven-loop element is broken at the bottom for feedline attachment. Reflector loop is unbroken. Bamboo quad-loop assemblies are attached to ends of a wood or metal boom which is supported at the center. Important dimensions are given in Fig. 3.

The plates are attached to the boom by means of four plated-steel angle brackets mounted slightly off center on the boom so that the retaining bolts will not interfere with each other as they pass through the boom. Satisfactory brackets can usually be found in a hardware store.

You'll find the wood-and-bamboo framework is an unwieldy structure, having as much structural strength as a jellyfish. However, once the loops are strung in position, the assembly will magically become strong and amazingly rigid. Larger quads may require light Nylon ropes as tie lines between the top tips of the reflector and driven element. A lot depends upon your assembly technique and expertise in aligning the loops.

You should assemble the quad in a clear area. A short section of pipe mounted vertically in the ground will provide a temporary support for the antenna while you are making your final adjustments. Don't let the quad rest on the bamboo arms as this will place too much stress on the assembly.

Antenna installation

All dimensions of the quad are precut, so no in-the-air tuning adjustments are required The antenna should be mounted at least 30 feet in the air for best results. Optimum DX performance is obtained when the antenna is forty to fifty feet above the ground and there are no nearby telephone or utility lines. A crank-up tower is recommended. If guy wires are used to steady the tower, they should be broken into six-foot sections by strain insulators to prevent unwanted resonance effects that might interfere with proper antenna operation.

How does it perform?

That's the universal question about any new antenna. Determining actual antenna performance is a complicated matter. However, if the user can "hold his own" against similar arrays having the same transmitter power he can be reassured that most of the energy supplied to the antenna is doing some good! An SWR meter placed in the transmission line will give a good picture of antenna operation. Generally speaking, a quad antenna of this design will show an SWR reading of less than 2-to-1 across the operating band, with a reading of less than 1.5-to-1 at the design resonant frequency.

Bamboo?

While I was preparing this article, a ham friend asked where bamboo poles could be obtained. A quick check of the "yellow pages" of the telephone directory of a large city showed that bamboo was indeed listed and could be obtained from basket shops, tropical-furniture shops, handicraft shops, bamboo-fencing suppliers, and so-called overseas importers. In addition, in the past, bamboo poles have been obtained from rug stores, where the rugs are wrapped and stored on long poles. Alternatively, Fiberglass poles may be used (fishing poles?) and some Amateurs have used small-diameter PVC plumbing pipe for 10-meter quad antennas.

References

1. Bill Orr, W6SAI, and Stuart Cowan, W2LX, "All About Cubical Quad Antennas," Radio Publications, Box 149, Wilton, CT 06897. Available from Ham Radio's Bookstore for $4.75, plus $1 postage and handling.

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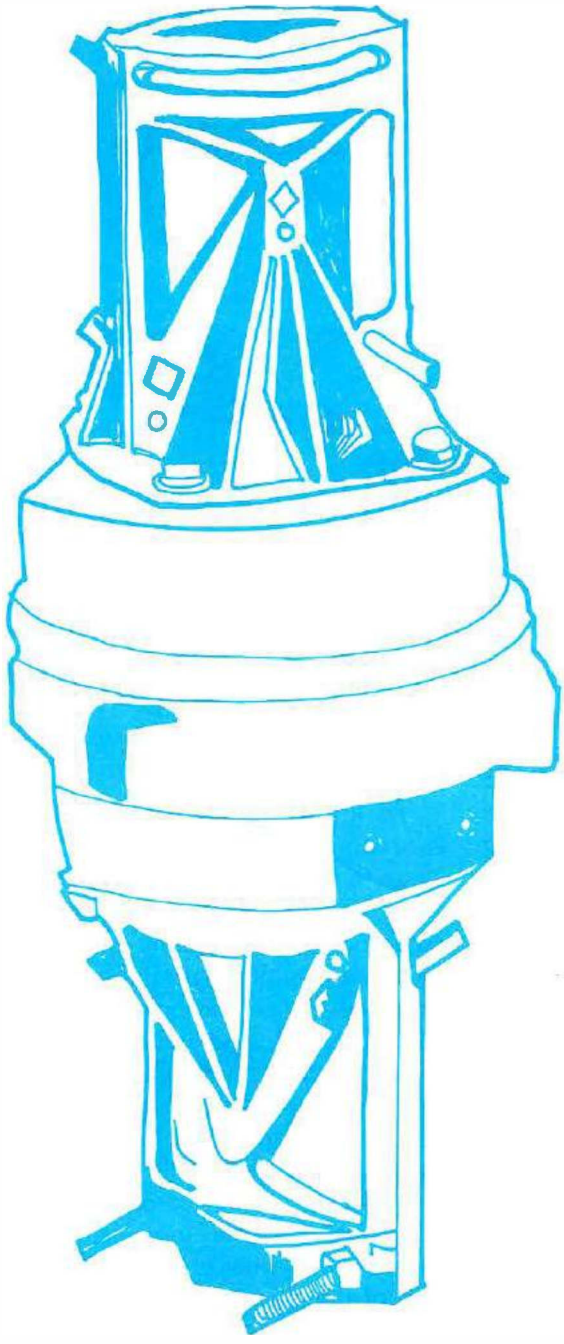
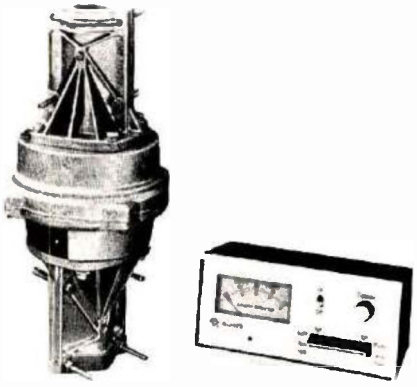


Rotators

An important part of your station is often neglected

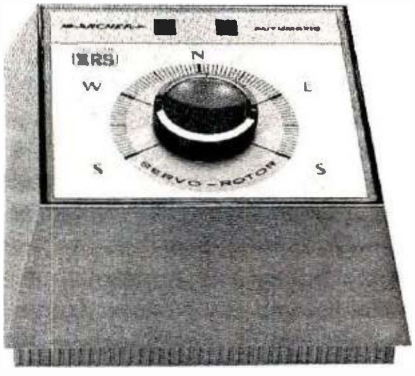
By JOHN EDWARDS WB2IBE

If there were a contest to elect the most ignored piece of Amateur Radio equipment, which item would you vote for? The speaker? On-off switch? VFO dial? How about your transmitter's finals? All very logical choices. There's one device found at many Amateur stations, however, which suffers so severe an identity crisis that even if you own one you probably never even think about it until it suddenly stops working — and then you really miss it! What is this poor station component, so neglected, yet so needed? Why, the antenna rotator, of course!



Above, a heavy-duty rotator with a heavy-duty control box. A meter readout and variable turning speeds are a couple of the extra "goodies" this Alliance Model HD-73 offers (*courtesy Alliance Manufacturing Company*).

Below, the Radio Shack 15-1220 features a pair of lights that indicate left-right turning direction and completion of antenna rotation (*courtesy Radio Shack*).

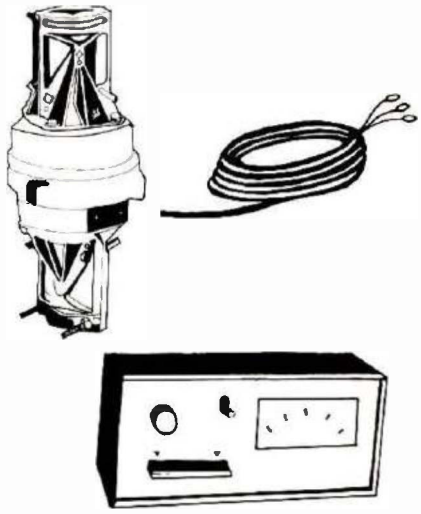


Call it a rotator, rotor, antenna twirler, or whatever, no single piece of ham gear does more work with less praise. At this point, all of you guys with verticals and dipoles are probably smirking and thinking: "Well, that's not my problem." Not quite true. If you've ever harbored the secret dream of someday improving your station and upgrading to a beam or quad, you know that it's your problem, too.

So, there it sits. Through the proverbial snow, rain, sleet, and gloom of night, your rotator awaits your beck and call to aim your trusty skyhook toward that rare DX. Only when it fails to do its job does it merit any attention. What exactly is a rotator? Obviously, it's that piece of machinery that turns your directional-type antenna from one setting to another. Yet, there's more to it than that. The rotator is actually a sophisticated device possessing the brute force to move an antenna array nearing the height of a battleship's superstructure, while maintaining enough finesse to aim that mass of metal right at a distant station.

Still, considering the crucial role a rotator plays in DXing, contesting, or even ragchewing, under less-than-perfect conditions, all too often the choice of a rotator is given second (or lower) priority. While the average ham may spend hours leafing through catalogs and questioning fellow Amateurs about the virtues of different types of antennas (as he should rightly do), the selection of an adequate rotating system is usually an afterthought. The conventional wisdom holds that anything that'll spin an antenna is good enough. However, a few short QSOs on 75 some evening can tell one the folly of this reasoning. The airwaves resound with teary tales of burned-out bearings, and money wasted on turning a small VHF beam with a heavy-duty rotator. The secret of buying the best rotator for your station lies in the type of antennas you need turned.

Rotator components



To know what sort of rotator best suits your station, you'll first have to know a bit about the way they work. When one speaks of rotators, one is actually referring to three distinct parts: the drive unit (the device that actually spins the antenna), the cable leading from the driver into your shack, and the control box. Each of these units plays a vital role, and a fault in any one can result in breakdown of the entire rotator system.

Taking a closer look, starting topside, the drive unit is that section of the rotator most subject to wear and tear and the elements. Unfortunately, it is also the most complex part of the system and the hardest to service. Whether it's mounted on top of a tower or mast or somewhere lower in the superstructure, the driver is, at best, in an awkward position to reach. Therefore, during the installation, it's important to get things done right the first time.

The manufacturer's instructions state that you should always inspect the driver before mounting it. Look it over carefully, taking heed of any damage that may have been done to the unit during

shipping. Once you're satisfied that the driver is in good physical shape, mount it on a solid surface (such as a workbench), and hook it up to the rotator cable and control box. Again, following the instructions, put the driver through a few complete cycles before installing it. Only after this ground-based trial can you be reasonably sure that the rotator is ready to work with your antenna.

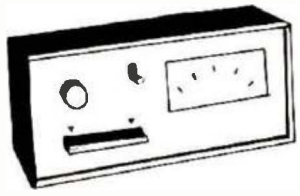
If you have the time and space, you might also wish to test the driver's water resistance. To do this, place your rotator in an open spot — such as a backyard or lawn — and gently spray it with a garden hose. (*Keep the control box far away from any possible water contact.* One errant splash can destroy many of the electrical components in the unit.) After the driver is wet, give it a turn or two. If you notice any hesitation or other problem during this test, there may be a leak. For weather protection, most rotators use a small plastic plate that mounts over the rotator-cable contact screws. Before permanent installation, be sure that this plate fits snugly against the driver's body, or you may end up with a shorting problem during wet weather, not to mention eventual corrosion of the cable wire and terminals.

Rotator cable

Depending on the model, a rotator will use from five to eight conductor cable; the exact number determined by the rotator's features and wiring system. Regardless of the quantity of conductors, most cable comes in a flat configuration — vaguely resembling TV lead-in. Regrettably, many brands of cable are not as strong as most Amateur transmission lines. Because of this, extra care should be taken to see that no section of the cable rubs against the edge of your house or tower. If this happens, after a remarkably short period of time, the cable's jacket will wear away exposing the conductors to open air.

Wiring a rotator is just like threading together any other electronics project — care and patience are of extreme importance. The driver and control box each have a set of terminals marked with identical numbers. Since each manufacturer has his own scheme for rotator wiring, we really can't go into specifics here, other than to stress the point of keeping the wires in correct order. Attaching a wire from the number one screw on the control box to the number three terminal on the driver, for instance, may necessitate sending the entire rotator back to the shop. Easy does it, and always double check before applying power.

Control boxes



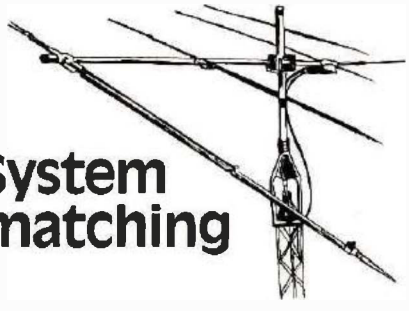
This brings us to the final element of the rotator system: the control box. In just about every way, the controller is the most esthetically pleasing part of the entire setup. However, it's a bad bet just to buy a rotator system on looks alone. While a controller's features can range from variable-speed controls to end-of-rotation LED indicators and a walnut-grain cabinet, remember, you really buy a rotator for the driver, not how well its control unit may blend into your shack's decor.

With this bit of advice aside, let's mention another peculiarity. For a reason best known to rotator manufacturers, heavy-duty rotators — those capable of moving

Table 1. Matching antenna systems to rotators. To help find the correct rotator to turn your antenna, here's a list of some popular rotator models followed by specific types of antennas. The figure after each rotator is the "wind load," and represents the maximum the unit can handle before suffering damage. The figures following the antenna models express the maximum load the system will apply to your rotator. Your job: match your prospective antenna to a suitable rotator.

Rotator Model	Load, Square Feet	Antenna Model	Load Square Feet
Alliance HD-73	10.7	Cushcraft A3 (Tribander)	5.6
Alliance U-100	4.0	Cushcraft Boomer (2m. 19 el.)	3.5
CDE CD45	2.5	Cushcraft Boomer (6m. 6 ele.)	4.8
CDE Ham 4	12.5	Mini Products (Hybrid Quad)	1.5
Radio Shack 15-1220	2.0	Wilson System 36 (Tribander)	8.6
Radio Shack 15-1224	2.0	Wilson System 40 (Tribander)	12.1
TET U.S.A. KR400	7.5		
TET U.S.A. KR2000	32.2		
TET U.S.A. KR600	16.1		
TET U.S.A. KR500	7.5		

something on the order of a triband beam and up — seem to have all the nifty options, while lightweight rotators tend to be Plain-Janes. This probably has something to do with rotator companies wanting to make their big-ticket items more appealing, but it puts the lightweight-antenna owner in a bind if he fancies a controller that does more than just show him his beam's direction. Now, if you want to buy a heavy-duty rotator to move that 2-meter beam just so you can get a better looking controller, that's between you and your wallet. However, if performance and not looks are what matters to you, then you'll want to get the best buy for your money.



System matching

Getting the best buy for your money means purchasing the rotator specifically suited to your needs. If you've been doing some shopping for directional-type antennas lately, you probably have a lot of manufacturer's literature on hand. Take a close look at some of these brochures; you'll note a statistic called "Surface Area" or "Wind Area." This specification is vital for matching an antenna to a rotator, since it tells the buyer just how much force the skyhook will exert on a rotator's mechanism. For example, a triband beam may have a surface area of 5.7 square feet, while a heavy-duty rotator will handle a system with up to 10.7 square feet of load. With this arrangement, you would have rotating power to spare, even enough to stack a small vhf beam on top of the tribander. However, if you were to use a light-duty rotator, capable of handling only 3 square feet of antenna, your rotator would groan, moan, and eventually self-destruct from the pressure. The principle involved is to use a rotator just slightly more powerful than needed to handle the job. **Table 1** will give you an idea of the sort of antennas you can use with various rotators.

Antenna rotators can handle different loads depending on whether they are mounted on a mast or in a tower. Besides adding height to your antenna system, towers also have the extra advantage of giving your rotator greater protection. Bolted tightly in its perch high above your shack, a tower-mounted rotator is in a much more secure position to handle the strain of turning your antenna than is its mast-mounted counterpart. Wedged between your roof and antenna with only two sections of mast for support, a mastheld rotator fights a continuous struggle against a wind-whipped antenna and an immovable house. While it's perfectly acceptable to mount your rotator on a mast, just remember to heed the reduced loading suggestions outlined in **Table 1**.

Braking

While we're speaking of rotators twisting between sky and earth, it's time to mention the most popular abuse inflicted upon rotators: improper braking. Consider the momentum generated by a huge beam in motion. If you've ever installed a vertical antenna for CB or ham use, remember how tricky it was to hold the assembled structure upright on your roof? One false move, and it felt like you and your antenna were going to take the quick way down! It's the same principle tightrope walkers use at the circus. The inertia produced by the balancing pole (held horizontally in their case) steadies the performer on the wire.

Because of this inertia it's strongly recommended that you shun the common practice of braking your antenna to a sudden stop and then rapidly backing it up after missing your target. Doing this is tantamount to reversing your car on an Interstate after missing an exit. The results on an antenna system can be just as destructive. If you're lucky, you'll only damage some of the rotator's gears and loosen a few mast bolts. On the other hand, if you're unlucky, inertia will keep the beam going in its original direction while the rotator reverses. Your only hope in this instance is to put on a hard-hat and shout, "Look out below!"

Maintenance

After your rotator has been performing its faithful service for a year or two, it's time to take a look topside and see how this most ignored part of your station is making out. You can include this check-up as a part of your periodic antenna maintenance schedule. While you're busy checking your antenna's traps, searching for stress fractures on your tower, and tightening the mast's mounting, give your rotator a look-see. Is there any physical damage to the unit? Are there any leaves or other debris caught around the collar where the mast and driver meet? Are all the screws, lockwashers, and other mechanical parts still in place? If there are any problems, be sure to attend to them at once. Winter has a way of sneaking up, and having your rotator break down in the middle of the DX season is definitely no holiday greeting.

Incidentally, just about every commercially made rotator on the market is lubricated for life, by the

manufacturer, so never go to your driver with an oil can in hand. That's one bit of "maintenance" your rotator can do without. All you'll probably end up doing is gunking up components that shouldn't be contaminated, over-lubricating other spots or, most likely, a combination of the two. If you suspect that the unit really does need oiling, send it back to the factory. Even so, many of the groans and squeaks you may hear from the ground during rotation are probably coming from the usual give and take of the antenna and masting, not the drive unit.

Elevation rotators

For most types of operating, the usual horizontal, or "azimuthal," rotator is fine for contacting stations all around the globe. But what do you do if the "station" you want to reach is flying over your house? That's the unusual problem faced by users of the OSCAR satellites.

To meet the special antenna-pointing demands placed upon the operators of these aerial relay stations, a new generation of rotators has been developed to tilt conventional beams above their traditional horizontal positions. Called "Elevator Rotators," these specially designed units can precisely move a Yagi from a level setting, up to 90 degrees, and even flip the antenna over a full 180 degrees until it's once again on line with the horizon — only now upside down.

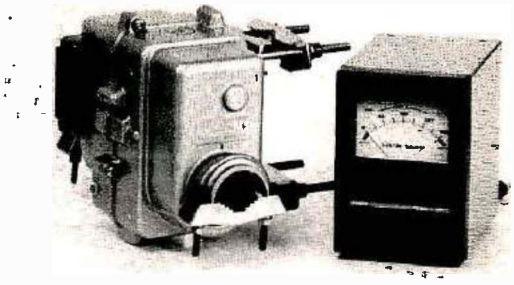
The rotator, which mounts on top of any conventional antenna mast, features a second set of brackets to hold a horizontal boom. On this rotating boom can be secured one, two, or even more vhf-uhf beams. The only limit to the number of antennas in any elevating system is the maximum load capabilities of the elevator and azimuthal rotators used to control the installation.

OSCAR beams are usually placed either on a separate mast, or on the very top of an existing antenna system. The reason for this special mounting procedure is twofold. Besides the physical law that dictates you should always stack antennas in an ascending order of frequency coverage, it would also be a waste of rotating power to tilt your entire lowband antenna set-up along with your OSCAR beam.

Rotator horizons

Although we often forget, being a Radio Amateur means searching for new horizons, forging into obscure territory where professionals, because of financial and time constraints, never bother to look. Just as fresh frontiers can be covered in propagation research and electronics design, rotator development is another area ripe for exploration. Perhaps the most exciting innovation to affect rotators in recent years has been the introduction of microcomputer-controlled antenna systems. In increasing numbers, Amateurs are hooking both their azimuthal and elevator rotators into home computer systems. With this space-age set-up, after plugging in the correct program, the antenna will automatically follow OSCAR's path, relieving its operator of any need to fiddle with settings.

This new technology isn't limited to satellite work — good old-fashioned DXing can also benefit from the micro's aid. Imagine just typing the name of a city or prefix into a computer, and having your antenna zero right in on target. Don't know where ST



An elevation rotator used for tilting vhf antennas and arrays toward OSCAR satellites (*courtesy TET U.S.A.*)

Table 2. Specifications and prices of some popular rotators.

Brand	Model	Duty	Mast size Inches, O.D.	Rotation Time Seconds	Degrees	Accuracy	Price
Alliance	HD-73	Heavy	1-3/8 to 2-1/2	60	360	5°	$119.95
Alliance	U-100	Light	1-3/8 to 2-1/2	60	360	5°	$49.95
CDE	CD45	Medium	1-1/2 to 2-1/2	60	360	5°	$110.00
CDE	Ham 4	Heavy	1-1/2 to 2-1/2	60	360	5°	$499.95
CDE	Tailtwister	Ex. Heavy	1-1/2 to 2-1/2	60	360	5°	$209.00
HyGain	HDR300	Heavy	1-3/4 to 3	60	395	1°	$499.95
Radio Shack	15-1220	Light	1-1/4 to 2-1/8	60	360	10°	$64.95
Radio Shack	15-1224	Light	1-1/4 to 2-1/8	60	360	10°	$52.95
TET U.S.A.	KR400	Medium	1-1/2 to 2-1/2	50	360	5°	$84.95
TET U.S.A.	KR2000	Ex. Heavy	2 to 2-1/2	67	370	5°	$289.95
TET U.S.A.	KR600	Heavy	1-1/2 to 2-1/2	53	360	5°	$139.95
TET U.S.A.	KR500 (Elevator)	Medium	1-1/4 to 1-5/8	61	180	3%	$149.95

land is? No matter, just punch in the prefix and the computer's video diplay will automatically tell you the country's name (Sudan, in this case) while simultaneously aiming your beam in the right direction. Perhaps, someday, we'll even have scanning systems that'll continuously rotate a beam while automatically picking up the best signal bearing — all without even making the operator look at his S meter. Time will tell.

Armstrong rotators

Elevator rotators, microcomputers — pretty fancy ways to turn an antenna, especially when you consider that until a few years ago the most popular antenna twister was the good old "armstrong rotator." No, this device wasn't named after Major Edwin H. Armstrong, inventor of FM radio, or some other famous wireless pioneer. Instead, it was actually named after an item found in almost any Amateur station. To use this type of rotator, bracket an antenna to the side of your house, making sure that its mast (which should be loosely held in the bracket) extends past your shack's window. Then, reach out with your *arm* and *strongly* turn the antenna in any direction you wish. Unlike conventional rotators, it's pretty hard to ignore the armstrong job. It's always "at hand," you might say.

For more information

Alliance Manufacturing Company, Inc., 22790 Lake Park Blvd., Alliance, Ohio 44601; 216-821-5360.

Cornell-Dubilier Electric Corp. (CDE), 150 Avenue L, Newark, New Jersey 07101.

Radio Shack, One Tandy Center, Fort Worth, Texas 76102.

TET U.S.A., 425 Highland Parkway, Norman, Oklahoma 73069; 405-360-6410.

HRH

DXer's Diary

Chapter 4

By BOB LOCHER, W9KNI

"FB8WH 21059 1319Z Jan 16"

"FB8WH 14057 0132Z Jan 18" from "The DXer's Tout Sheet," of January 24.

"Crozet Island - 46° South 51° East. Small Archipelago, French Dependency. Sub-antarctic zone of South Indian Ocean, 1,500 miles off South-East coast of Africa, made up of several small islands of volcanic origin." From "The Dictionary of Geography."

Crozet almost always appears in the top-ten-wanted-countries lists. Every few years, an operator joins the small team of French Scientists stationed there for a tour. But the work schedules are always demanding, and little time is spent operating.

Even then, operating is generally limited to SSB in the French portion of the phone bands. So, the appearance of a Crozet station — an FB8W — on 20 meter CW is cause for considerable excitement.

Certainly, such was the case for me. Crozet occupied a rather prominent space on my countries need list.

January 26th

I get home late today, and sit in my easy chair, sorting through the mail. Aha! My "DXer's Tout Sheet." A day early, even. Maybe that little gift for the mailman at Christmas did some good.

After the usual aggravation of half tearing apart the bulletin because of the epoxied-in staple, I give it the usual once over treatment. Almost immediately one item catches my eye:

"A new operator is reported on from Crozet, signing FB8WH. His name is Jean-Claude, and he expects to be on for six weeks. Most activity will be French SSB, but some CW has been promised. QSL's via F6BFH. Tnx F3AT."

"Note — Two reports of FB8WH have been received by DXTS. See the 'Shopping List' section for details."

Oh boy. That'll be a good one. I turn back to the "Shopping List" section of the Tout Sheet, where DX calls heard or worked are listed. Yes, there it is.

"FB8WH 21059 1319Z Jan 16
FB8WH 14057 0132Z Jan 18"

Oh boy. Let's see here. 1319Z — that's 7:19 a-m local time. Heck, I'm long gone from the house by that time. It should be a good path, though, and I'll certainly check it out over the weekend. Hmm. That 0132Z time on twenty meters. Now that looks a little better. It's too late for tonight, but you better believe I'll be there tomorrow.

But even if it's too late, I get up and go to the shack for a look around twenty. Nothing unusual turns up.

January 27th


Ham
Sweet
Ham
Arsen

I get home at my usual time, and my long-suffering wife has gotten diner ready a little earlier than usual. Though no ham, she knows a bit of what it's all about, and supports my habit as best she can — arranging meals at odd hours, tolerating phone calls in the middle of the night, putting up with alarm clocks at 2 a-m not to mention a tower in the yard. By 7 p-m/0100Z, I'm at the rig, tuning twenty.

My first problem is to figure out where to point the antenna. Crozet shows on the great circle map at 112°, but it's so near the antipodes that any path could work. A quick tune of the band shows that two major paths are open — the Northwest shot into Japan and Korea with very good signal strengths, and the usual fine evening opening into Central and South America.

I decide to try the Northwest path — I've been hearing FB8XS on Kerguelen coming in pretty well on that path, and I just don't think that that Southeastern path is going to open up that far.

I begin turning as I consider the situation. Okay — on twenty he showed up on 14057 kHz. Pretty high in the band, about as high as he was operating on fifteen. Some of those French stations seem to like operating up high like that. I remember snagging that FH8 up there right after it became a new country. The whole world was looking for him, but he was virtually ignored up that high. I got almost the whole DX club onto him, and nearly everyone got him. But that was without a frequency being published in "The DXers Tout Sheet."

Crozet is rare enough that it's probably a safe bet that a whole bunch of stations are at this very moment looking for him, just like I am.

I decide to start at 14,050 kHz, and go up from there using the intensive search pattern — take

every signal, and listen to it until both sides of the QSO are identified as not being what is sought. It's a slow process — especially when you have a lot of activity. Fortunately, tonight the area above 14,050 kHz seems quieter than it could be. I start tuning...

OK, there's a JA signing clear with a W7 — nice signal. Band must be okay. There's a JH7. Who's he onto? Oh, okay, a KL7. There's a CQ — from UAØZAC — okay, Siberian. Hmmm . . . a W6 turning it back to someone — let's see if we can hear a response — yes, there he is. It's an HM1, Korea. There's a CQ. Bit weak, but clear, and a nice fist. That's a goodie — it's 9V1JK. I cringe a bit as I call it on 2 meters. Hope he doesn't create much of a pileup. That would make a mess of the frequency.

I keep tuning. There's a WD5 calling CQ. I hear a YV4 of the back of the antenna, QSOing a WB4. There's a loud signal, going along at a pretty good clip. It soon becomes obvious that it's a couple old buddies having a good ragchew — not likely including Jean-Claude of Crozet.

I'm up to 14,075 kHz, and nothing yet. I take a real quick look up higher, but hear nothing but RTTY, so I hop back down to 14,050 and start tuning back up again.

Though it's been twenty minutes since I tuned there, it sounds pretty much the same. The JA is calling QRZ, the KL7 is calling CQ, and the UAØ is working a VE. I cross the 9V1 again — he signs clear and a mini-pileup begins. No locals, though. Guess nobody needed him. That's a help.

What's that signal? Must be stateside — it's too loud, and free of path noises — "RIG HR150 WATTS ES GP ANT TNX JEAN CLAUDE FOR QSO QSL VIA BUREAU 73 FB8WH DE WD5LNL SK."

Wow! That five's got him. I yank the VFO up to zero-beat the five, and kick the linear switch in, while at the same time strain to hear the FB8. Yes, there he is — loud, too.

"R 73 ROD ES TU SK WD5LNL DE FB8WH SK E E"

I pause a second before I begin my call — and my heart sinks. At least ten stations are calling him — and you can tell by the backscatter marks that they're all heavies — clean fists, clean signals and loud backscatter. I move my VFO quickly about one kilohertz up to try to avoid being covered, and call. I listen. Two fellows finish their calls quickly — then silence. Within a couple seconds, everyone starts calling again, myself included. Again, nothing. Oh, oh, it looks as if our bird has flown the coop. Can't say that I blame him.

I watch the frequency for almost half an hour — obviously with company, as one station gives a long, slow call — then another . . . but no cigar.

January 28th

Again, it's 0100Z, and once again, I'm at the rig. Gosh, that WD5 sure had himself a nice catch last night. Snagged him with 150 watts and a ground plane, too. Must have caught him calling CQ.

I set the receiver up on 14,050 and again begin that slow tuning up the band. Actually, it will go a little faster now. Having heard the FB8, I know what his signal sounds like — very clean and not too fast. That isn't a whole lot to go on, and I have to be careful not to be fooled by the speed, but at least I can rule out chirpy signals, and that's a help.

Conditions are not as good tonight. I hear JA's, but not as strong. I keep tuning. There's a KL7 — he's got fuzz all over his signal — must be some arctic aurora tonight. There's a KH6 off the side. Nice and clean. There's N6RJ calling CQ. Huh? He's one of the heavies — I normally only hear him in pileups; the band must be poor tonight. There's a KX6. Hmmm — if those mid Pacific stations are coming in that well so early, things must be a bit disturbed. It figures — tomorrow is Saturday.

I tune a while longer, but it becomes obvious that tonight is a lost cause, as the band slowly dies. I move to forty CW and get into a good ragchew.

January 29th

There must be a real storm in progress. The bands were dead this morning when I tried to look for the FB8 on fifteen CW. There was hardly a signal on the band, let alone an FB8. Tonight, twenty is a little better, but still no bargain.

Careful tuning unearths no JAs, no UAs, but I do find a DU2 in the Phillipines, and a 9M2 in Malaysia. N6RJ's calling CQ DX again, and the KL7 with the fuzz is weak, and still carrying the fuzz, trying to keep a schedule. I hear the same fellow ragchewing again with his pal. This time I catch their calls. One's a W6, the other a KA4. I keep tuning, but no FB8.

January 30th

More of the same, but conditions do seem a little better. Fifteen was virtually dead again this morning, but opened up weakly later in the morning. Twenty is showing definite improvement this evening, though. I hear some JAs again tonight. There's a 6Y5 on 14056, with a whole crowd of JAs in hot pursuit — that's a rare catch for those boys, and a difficult shot, too. Guess maybe conditions are a lot better. Huh? There's N6RJ calling CQ DX again. Maybe he's testing antennas?

I hear a JD1 on Ogasawara calling CQ — and no takers. Strange! A JD1 is always a good catch, one that a lot of fellows need — and there he is, going begging. I call it in on two meters, and call the JD1

to hold him until a couple of the fellows on two meters can get fired up.

The JD1 comes right back — he seems glad of the chance for a QSO. I keep the contact short; I want to keep hunting for the FB8W. As I sign clear, a very respectable pileup starts on the JD1. Looks like my 2-meter buddies got a fight on their hands. Oh well, he was easy for me — and barefoot at 150 watts too. But, then, I didn't need him. 'Twas ever thus.

I move on up a bit, tuning and listening. Hey!

"OK JEAN CLAUDE 73 ES TNX QSO QSL F6BFH OK AU REVOIR FB8WH DE KL7FBA SK"

As I yank the VFO up and turn on the linear, I listen — I only hear the traditional dit dit from the FB8. I pause . . . no one is calling . . . the JD1 must have caught all the attention. I call.

I finish my call and listen . . . I hear a loud signal just below me . . . "RJ N6RJ AR" So. I'm not alone. But no sign of the FB8. I call again. Nothing. We've lost him. I call a couple more times, as does N6RJ, but without result. I salute N6RJ with a 73, and QRT to get caught up on some homework.

January 31st

My first quick tune of the band shows conditions to be very good, even spectacular. Europeans are coming through with good signal strength even off the side of my quad. The JAs are very strong. KL7FBA isn't resting on his laurels — he's back trying to keep his schedule. N6RJ is back calling CQ DX. I hear JA's calling him, but there must be some one-way skip tonight — he's not answering them.

If that FB8 shows tonight, he certainly should be loud. As I sit there tuning, I ponder on the situation. Ol' Jean-Claude is certainly proving to be a tough nut to crack. And the funny thing is the people I have heard working him — the WD5 with 150 watts and a ground plane. The KL7 who seems to be more interested in a good ragchew with his buddy.

And me? I'd about give a left lung, and I've spent hours tuning and listening, and I have nothing to show for it.

As I muse, I find myself listening to N6RJ . . .

"CQ DX CQ DX DE N6RJ N6RJ N6RJ DX K"

Let's see what he snags here. Hmmm. There's a JA, there's a KG6 — hey! There's FB8WH! Calling N6RJ. Maybe he won't hear him, and will pick up the JA or the KG6, and I can snag the FB8. I quickly bring up my VFO.

Hah! I should be so lucky.

"FB8WH DE N6RJ R GE JEAN CLAUDE ES TNX QSO ES NEW COUNTRY . . ."

Huh? You'd think he was expecting the FB8 to call him.

Suddenly bells start ringing, lights start flashing. He WAS expecting the FB8 to call! Heck, he wasn't testing antennas. Or linears. Or propagation. He was trolling for big game — the FB8W, and he got him, too. He figured out what should have been obvious to me — the FB8 isn't interested in pileups — he hits and runs on CQs, like those of the WD5s or the KL7s. Aha!

As I sit there with a big grin, N6RJ signs, and I call the FB8, along with half a dozen others, and with the usual result — nothing. He's gone. But now I know what to do. Sure hope that none of those other fellows wise up too — too many loud CQs will only chase Jean-Claude away. Too many cooks spoil the broth.

February 1st

It worked! It was beautiful. I pointed the antenna Northwest, and ten minutes before the time of N6RJ's QSO the evening before, I started to call CQ, and I got him on my second CQ.

There was a horrendous pileup when I signed clear — music, music! I think the cover's been blown on my technique for Jean-Claude — there will probably be a pileup of CQs tomorrow night. If I have nothing better to do, maybe I'll come down and listen for a minute or two. Sure am glad that I figured it out ahead of the ravenous hordes.

While I sit there smiling about the trophy in my log, I reflect a bit. You know, nearly all the DX manuals warn that calling CQ DX is a waste of time. And, usually, they are correct. But there are times when a properly placed CQ DX can do wonders, especially higher in the bands, say about 50 kHz above the band's edge, and higher. There are a lot of rare stations that dislike pileups but who would like a nice QSO with a good operator with a decent signal. Some of them are even predictable, like FB8WH!

I flip on the 2-meter rig.

"So I was tuning across the band and I hear this loud CQ and it's 'KNI calling CQ DX. And you know what came back to him? FB8WH on Crozet. I didn't even know anybody was on from there, and 'KNI gets him on a CQ. Is that guy ever lucky."

I turn off the 2-meter radio and go upstairs for a cup of coffee. Lucky?

HRH

airTime

Rob Schneider, N6MR

Upper Chesapeake Bay Award

An Upper Chesapeake Bay award is offered by the Chesapeake Bay Radio Association of Perryville, Maryland, to all Amateurs confirming contacts with Chesapeake Bay club members. U. S. stations must work five club members (ten on vhf/uhf), DX stations must work three.

To apply for the award, submit logs showing station called, date, time (UTC), and frequency, along with $1 to Chesapeake Bay Radio Association, Inc., P. O. Box 357 Perryville, Maryland 21903.

International Police Association Contest

The British Section of the International Police Association Radio Club is sponsoring this year's IPARC contest, which will be on the air from 0700 to 1000Z and 1400 to 1800Z, November 8 and 9. IPARC members will try to work non-members, and vice versa, during the two-day affair.

Operation will be on all bands, CW and SSB. The highest scoring IPARC member, non-member, and SWL will be awarded a certificate and will be honored in the Award Chronicle of IPARC.

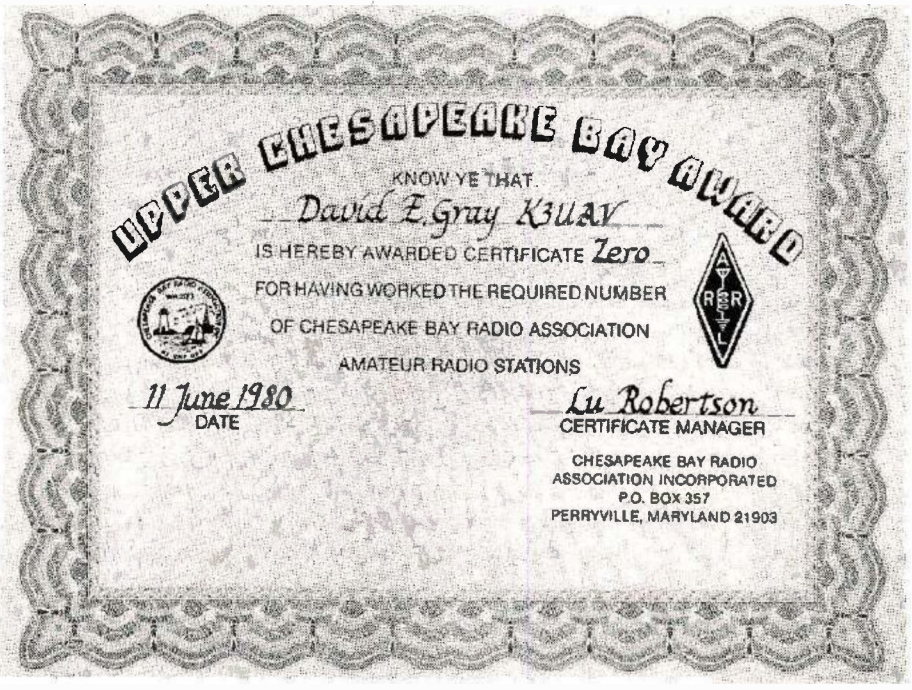
Entrants should call "CQ IPA," and exchange signal reports and serial contact numbers. IPARC members will precede their reports with "IPA," and U. S. member stations will also send a two-letter state abbreviation.

The most active contest frequencies should be: CW — 3575, 7025, 14075, 21075 kHz; SSB — 3650, 7075, 14295, 21295, 28650 kHz; SSB DX — 3775-3800 kHz.

For scoring, every completed QSO on 20, 15, and 10 meters counts 4 points, QSOs on 80 and 40 count 2 points, and 80/40 meter DX contacts count 8 points. The contest multiplier is IPA countries and U. S. IPA states worked per band (for instance, DL worked on five bands counts for a multiplier of 5). Total score is calculated by multiplying total points by the total number of IPA countries/states worked. Stations may be worked only once per band, and crossband or crossmode QSOs are not permitted.

Logs showing date, time, frequency, and QSO exchanges must be submitted no later than December 31, 1980, to IPARC Secretary Richard A. Ridley, G3UTX/G4IPA, 23 Greenacre, Worlebury, Weston-Sup-Mare, BS22-9SL, England.

HRH



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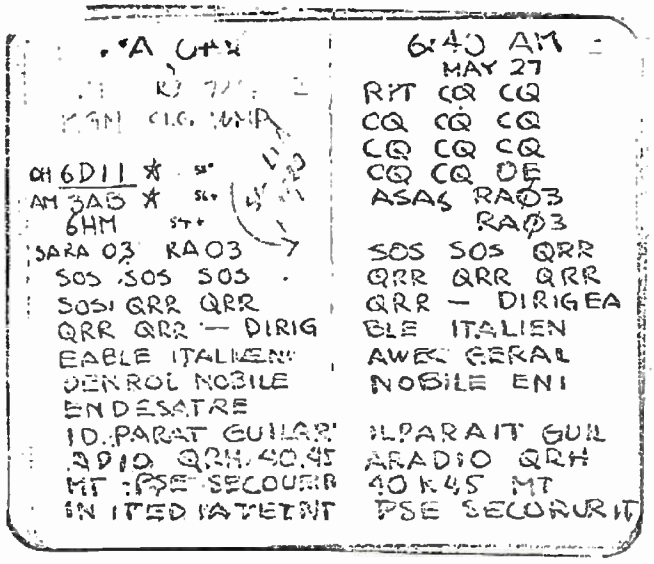
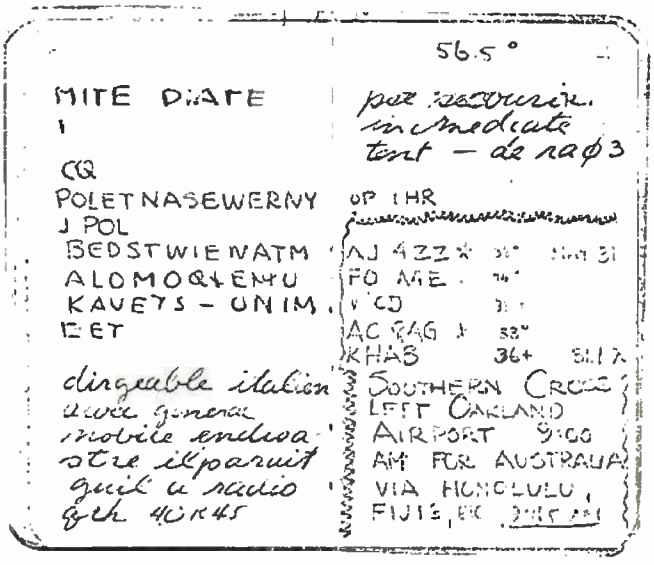




Dear Horizons:

This is a follow up on the article "The Forgotten Hero" in the May, 1980, *Ham Radio Horizons*.

Enclosed is a photocopy of a letter and log I received from David H. Atkins, W6VX, of Los Angeles, California. It seems an American Amateur did hear the SOS sent by the *Mobile*, but in that day and age, with people not understanding radio and its use, he was regarded by the newspapers as just another oddball.

We must remember, though, that radio was just getting started, and that many newspapers felt this was something that would put them out of business. It wasn't too long ago that the radio industry, as well as the motion pictures and newspapers, felt television would end their businesses.

Word getting through 50 or so years later that an SOS had been received — well, it didn't do much good for those floating on the ice.

Henry Morrison, W5RIY
Commerce, Texas

Copy of letter and log from David Atkins, W6VX, showing SOS and QRR from the *Mobile*. His letter states:

Dear Henry:

Your Biagi story was especially interesting to me. I know you will be interested in a copy of my log with an entry at 6:40 A.M. (1440 GMT) on the 27th of May, 1928. The SOS was copied on 40+ meters. The callsign was RAØ3. This may have been a Russian (6HM always operated near 7.010 MHz and my dial readings indicate 40 meters was the approximate wavelength of the distress message).

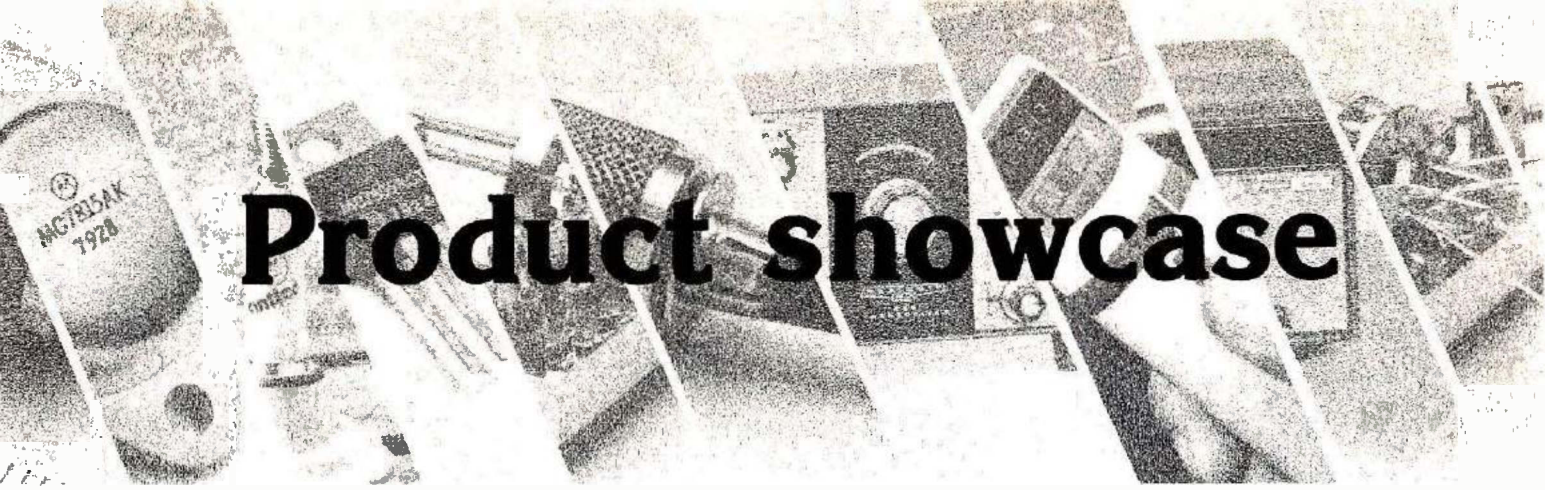
I phoned the nearest paper and got an "Oh yeah" response.

A couple of years ago, I met WB6JDY. Bill was a sea-going radio officer aboard a British ship near Melbourne in 1928. He'd also picked up disaster signals from the Mobile *mess on his "OVL.."*

I wonder what the airship's call sign was. Have looked for some record of the Italia *crash without luck. If Biagi is still around, maybe we could get some information?*

Thanks and 73.

Dave, W6VX



Product showcase

Spectrum Communications VHF Transceivers

Spectrum Communications Corporation has released its Professional Communications Line base-station and mobile transceivers for production, it was announced today by Joseph deCourcelle, president, who stated, "The new line is Spec Comm's response to our customers' increasing demands for a commercial line of transceivers which are very rugged, yet attractive and low in cost. These transceivers have been in operation for our international customers with exceptional results for several months, and we are now pleased to offer these recently FCC Type Accepted units for use in the U.S."

The PCL250 mobile unit and the PCL300 base station are 30 watt (nominal) transceivers with a 136-174 MHz range. Features include: excellent receiver sensitivity (0.3 μV), very wide receiver dynamic range for superior intermod rejection, eight-pole crystal filter and four-pole ceramic filter, "super-rugged" housing (1/8" aircraft aluminum), six channels, and the highest quality design, components, and workmanship throughout.

The PCL300 base station has a built-in ac power supply with optional auto-switchover to dc battery power, front-panel status indicator lights, optional receiver scanning function, pre-amp desk or hand-held microphone, and attractive wood grain housing.

Spectrum Communications Corporation is a leading manufacturer of quality, American made two-way radio products, specializing in professional communications line vhf and uhf repeaters and transceivers, Telephone Interconnect, and Touch-Tone* remote control units.

For further information, write Spectrum Communications Corp., 1055 W. Germantown Pike, Norristown, Pennsylvania 19401.

*Trademark of A.T.&T.

New DX-200 Communications Receiver

A new five-band receiver from Radio Shack lets you listen to news and entertainment from all over the world.

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Other features include LED band indicators, an antenna trimmer for best reception with any antenna, an rf-gain control that adjusts for best signal sensitivity, five-element ceramic filter for selectivity, lighted signal-strength meter and a built-in speaker.

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The receiver is single-conversion, with a 455-kHz i-f. Sensitivity is given as 1 μV for 10 dB S/N ratio, and selectivity, ± 4 kHz, -6 dB; ± 8 kHz, -40 dB. Operates on 120 Vac, 60 Hz. U.L. listed. In a steel cabinet with a molded front; size, 5¾ × 14½ × 8 inches.

The Realistic DX-200 Communications Receiver is priced at $229.95. Available exclusively from participating Radio Shack stores and dealers.

More details? Ad Check page 78.

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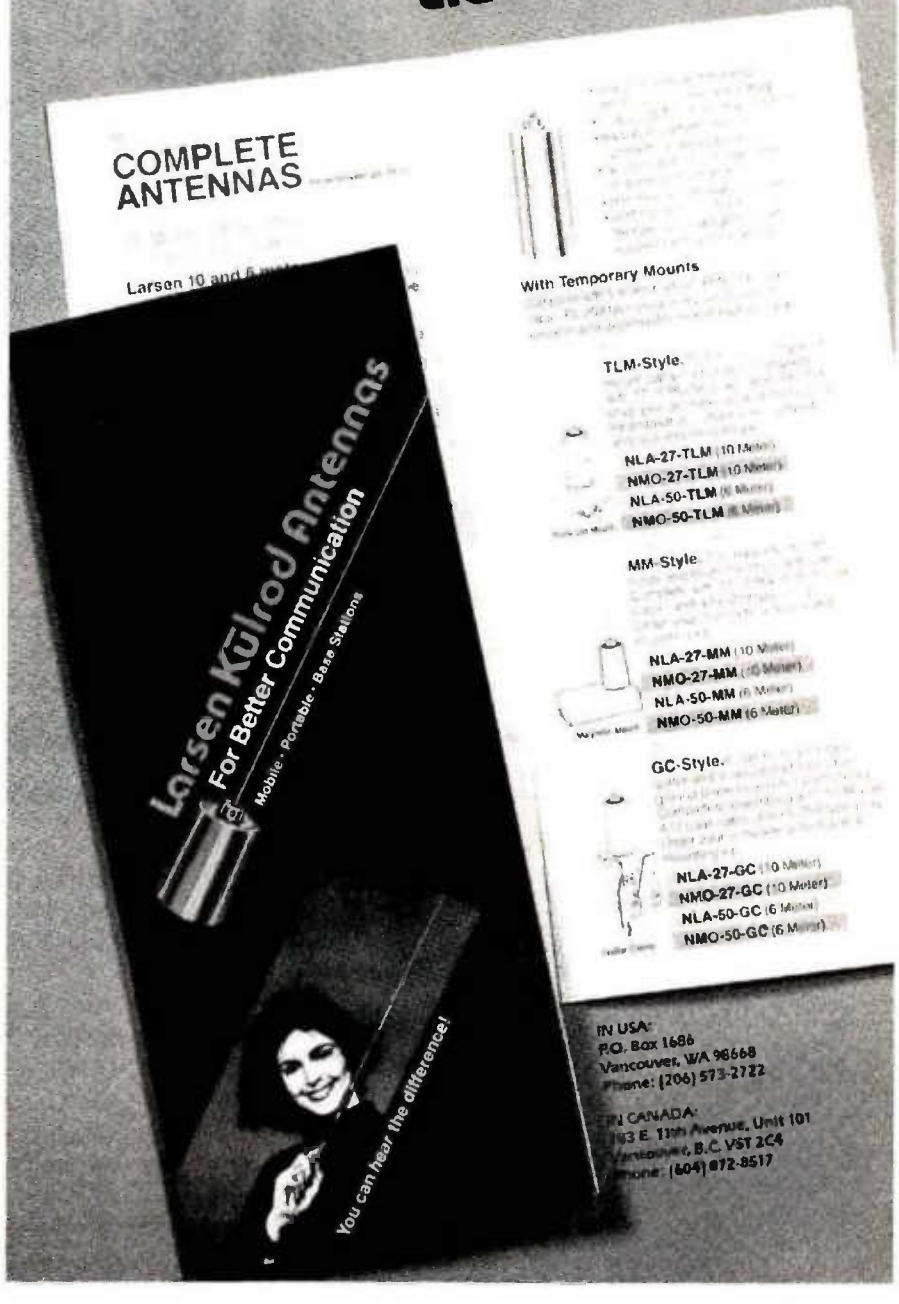
On top of that, Larsen's new Amateur Catalog is a handy pocket size so you can keep it with you. It also includes a complete price list insert so you'll have everything you need to order right in your pocket.

To get your free copy of Larsen's easy reading Amateur Catalog call or write to Larsen Electronics.

Larsen Electronics.INC



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TR7/DR7 modification information for transmitter coverage of WARC-MARS (transmit complete from 1.5 - 30 MHz). Color photo and description of modification. Takes minutes, no circuit board removal. $20.00 — Gene DeFoe, WA7SRI, Box 211, Shoshoni, Wyoming 82649.

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COMING EVENTS

MASSACHUSETTS: Framingham A.R.A. flea market, Sunday, November 9, 1980 at the Framingham Police Station Drill Shed. Doors open 9 A.M. Admission $1; Sellers: $5/table. Talk-in on 147.75/.15 and 146.52 simplex. Information Ron Esaika, K1YHM, F.A.R.A., P.O. Box 3005, Saxonville, MA 01701; tel: (617) 877-4520.

PENNSYLVANIA: Foothills, A.R.C. of Greensburg. Annual swap and shop on Nov. 8 at the St. Bruno's Church in South Greensburg. 9:00 AM - 5:00 PM. Prizes and much more. Talk-in on 146.07-.67 and .52 simplex. Dealers welcome. Advanced table reservations: Jim Yex, WB3CQA, (412) 258-3531. More info: Chuck Hamman, WB3HZM (412) 837-9194.

More details? Ad Check page 78.

NORTH DAKOTA SPECIAL EVENT BOOKLET. Eielson Radio Days 1980. Includes (free) multicolored certificate: Ben's Final Flight. Read Gleason's March 1980 HRH Arctic adventure story then order photo-filled booklet. Radios at North Cape is Gleason's account of communications during Carl Ben Eielson search. Remit $2.50 plus $1 for First Class Mailing. Keith Seaver, Portland, ND 58274 (701) 786-3931.

OVER THE HILLS and thru the woods to Wheaton Community Radio Amateurs Hamfest we go. For the bargains and buys and to meet all the guys, come to the best Winter Hamfest in the U.S.A. — January 25, 1981 — Plan on it. — N9YL

TENNESSEE: The Lakeway Amateur Radio Club will operate from the David Crockett Tavern in Morristown, Saturday, November 1 from 1300 UTC until 2200 UTC. Only SSB operation on the following frequencies, plus or minus QRM: 28.560, 21.360, 14.280 and 7.235 MHz. Amateurs and the general public are invited to visit the Tavern during operating hours. The call sign to be used is WD4PEQ. For a special certificate send $1.00 or 3 IRCs and a legal size SASE to: Davy Crockett DXpedition, Route 11, Box 28, Morristown, TN 37814.

MASSACHUSETTS: Framingham A.R.A. flea market, Sunday, November 9, 1980 at the Framingham Police Station Drill Shed. Doors open 9 AM. Admission $1.00. Sellers: $5/table. Talk-in on 147.75/.15 and 146.52 simplex. Information Ron Esaika, K1YHM, F.A.R.A., PO Box 3005, Saxonville, MA 01701. Tel: (617) 877-4520.

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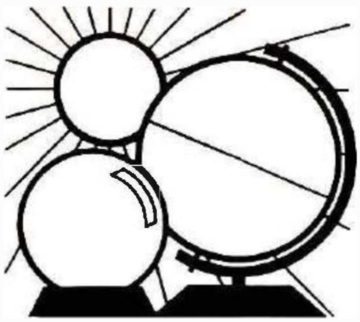

DX FORECASTER

Last-minute forecast

November is expected to be an active month, with solar activity giving rise to ionospheric and geomagnetic field disturbances. In particular, three periods of unusual activity are expected centered on the first, second, and third weeks of the month. Specifically, it would be interesting to look at the days surrounding the 5th, 10th, and 22nd for unusual conditions of radio propagation and weather. For moon-bouncers, perigee will occur on the 21st; full moon on the 22nd, and the new moon on the 7th. Keep your receivers tuned to WWV at 18-after-the-hour for the latest solar flux and geomagnetic data to help you plan your DX activities. In general, high flux and low magnetic-field values, or trends toward those directions spell favorable high-frequency band propagation.

Band-by-band conditions

Six and *ten meters* are likely to provide some excellent openings on several days during the month, when MUFs climb above 50 MHz. Look for strong signals during the afternoon and evening hours, particularly to South and Central America, and even into South Africa from the East Coast. West Coasters should stay alert for openings into the South Pacific at such times. *Ten* should provide some excellent long-haul DX, as well as many short-skip opportunities.

Fifteen and *twenty meters* will be jumping with signals most of the day and early evening as MUFs rise above 21 MHz shortly after sunrise until long after sunset between the U.S. and most areas of the world. Expect strong openings on most days for north-south propagation, and moderate to strong signals on east-west propagation. In particular, *twenty* will open sooner and stay open longer, with early-morning and late-afternoon signal peaks. *Fifteen* will not provide the 24-hour possibilities of *twenty*, but will excel at signal-to-noise ratio. Both bands will exhibit strong short-skip signals during daylight and early evening hours.

Forty and *eighty meters* once again become prime DX bands as summer static fads into oblivion. You will hear signals on *forty* around the clock, but the DX propagation begins at about sunset and lasts throughout the night. Look eastward after sunset, and westward before sunrise. Very strong north-south propagation between the U.S. and Africa, Central and South America, and even Pacific locations can occur on many days of the month. On *eighty*, the band opens somewhat later, with signals peaking after midnight on the transequatorial paths. Short-skip communications will prevail on both bands during the afternoon and early evening hours.

One-sixty meters — Welcome the top band back once more, as hours of darkness and sunrise provide some fine openings. You may expect slight problems from QRN, but many days of the month are likely to provide superb opportunities to work DX and short-skip stations.

As always, keep tuned to WWV at 18 after the hour for last-minute propagation information. Watch *trends* in the *A* values and solar flux index to see whether the bands are improving or deteriorating. Remember: high solar flux and low *K* and *A* numbers mean good DX propagation is likely.

HRH

GMT	PDT	WESTERN USA N	NE	E	SE	S	SW	W	NW	MDT	MID USA N	NE	E	SE	S	SW	W	NW	CDT	EDT	EASTERN USA N	NE	E	SE	S	SW	W	NW
0000	5:00	10	20	20	10	10	10	10	10	6:00	—	20	15	15	10	10	10	10	7:00	8:00	—	15	20	15	10	10	10	20
0100	6:00	10	20	20	10	15	10	10	10	7:00	—	20	20	15	10	10	10	10	8:00	9:00	15	20	20	15	15	10	10	20
0200	7:00	10	20	—	15	15	10	10	10	8:00	—	40	20	10	15	10	10	10	9:00	10:00	—	20	20	20	15	15	15	20
0300	8:00	10	—	—	15	15	10	10	15	9:00	—	40	20	10	15	10	15	15	10:00	11:00	—	20	20	20	20	15	15	20
0400	9:00	—	—	—	15	15	10	15	15	10:00	—	40	20	10	15	15	15	15	11:00	12:00	—	20	20	20	20	20*	15	20
0500	10:00	—	—	20	15	15	—	15	20	11:00	20	40	20	10	15	15	15	20	12:00	1:00	—	20	20	20	20	20	—	20
0600	11:00	—	—	20	20	15	—	15	20	12:00	—	40*	20	10	20	20	20	20	1:00	2:00	—	40	20	20	20	20	—	20
0700	12:00	20	—	20	20	20	40	15	20	1:00	—	—	20	10	20	20	20	20	2:00	3:00	20	40	20	40	20	20	20	—
0800	1:00	20	—	—	20	20	40	20	20	2:00	—	—	20	10	20	20	20	20	3:00	4:00	20	40	—	40	20	20	20	—
0900	2:00	20	—	—	20	20	40	20	20	3:00	—	—	—	10	20	20	20	20	4:00	5:00	20	40	—	40	—	20	20	—
1000	3:00	20	—	—	20	20	40	20	20	4:00	—	—	—	10	20	20	20	—	5:00	6:00	—	—	—	20	—	20	20	—
1100	4:00	20	—	—	40	20	40	20	20	5:00	—	—	—	10	20	20	20	—	6:00	7:00	—	—	—	20	—	20	20	20
1200	5:00	20	—	—	40	40	40	20	20	6:00	—	—	—	10	20	20	20	—	7:00	8:00	—	—	—	15*	—	20	20	20
1300	6:00	20	—	—	40	40	40	20	20	7:00	20	20	—	10	20	20	20	20	8:00	9:00	—	20	—	10	—	20	20	20
1400	7:00	20	20	—	20	—	20	20	20	8:00	20	20	—	10	—	20	20	20	9:00	10:00	20	20	10	10	—	—	20	—
1500	8:00	20	20	—	10	—	20*	20	—	9:00	15	15	—	10	—	—	20	20	10:00	11:00	20	15	10	10	—	—	20	—
1600	9:00	15	15	—	10	—	15	20	—	10:00	15	15	10	10	—	—	20	10	11:00	12:00	15	15	10	10	—	—	—	—
1700	10:00	15	15	10	10	—	15*	20	—	11:00	15*	15*	10	10	—	—	20	—	12:00	1:00	10	10	10	10	—	—	—	—
1800	11:00	15	15	10	10	—	10	—	—	12:00	15	15*	10	10	—	10	20	—	1:00	2:00	10	10	10	10	—	—	—	—
1900	12:00	15	15	10	10	—	10	—	—	1:00	15	15*	10	10	—	10	10	—	2:00	3:00	10	10	10	10	—	—	—	—
2000	1:00	15*	15	15	10	—	10	—	—	2:00	15	15	10	10	—	10	10	—	3:00	4:00	—	10	15*	10	—	—	—	—
2100	2:00	10	15	15	10	10	10	10	—	3:00	—	15	10	10	10	10	10	—	4:00	5:00	—	10	15	10	10	10	—	15
2200	3:00	10	20	20	10	10	10	10	10	4:00	—	20	15	10	10	10	10	—	5:00	6:00	—	15	20*	10	10	10	10	10
2300	4:00	10	20	20	10	10	10	10	10	5:00	—	20	15	10	10	10	10	10	6:00	7:00	—	15	20	15	10	10	10	10
NOVEMBER		ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN		ASIA FAR EAST	EUROPE	S. AFRICA	S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN			ASIA FAR EAST	EUROPE	S. AFRICA	CARIBBEAN S. AMERICA	ANTARCTICA	NEW ZEALAND	OCEANIA AUSTRALIA	JAPAN

NOTE: * Means look at next higher band for possible opening.

HAM CALENDAR

NOVEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 **ARRL Hudson Division Convention** — Pines Resort Hotel in South Fallsburg, NY — 7-9 **The Foothills A.R.C. Annual 'Swap & Shop'** — St. Bruno's Church in South Greensburg, PA — WB3HZM — 8 **Delaware QSO Party** — Delaware A.R.C. — Starts 1700 GMT Sat. November 8 — Ends 2300 GMT Sun. November 9 — AE3H — 8-9
Suncoast Amateur Radio Convention 80 — Bayfront Concourse Hotel, St. Petersburg, FL — WB4FYU — 1-2 **2**	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society Transmits Amateur Radio News** — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **West Coast Bulletin Edited & Transmitted by W6ZF** 8:00 PM PST 3540 kHz, A-1, 22 WPM **3**	**AMSAT Eastcoast Net 3850 kHz** 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT Mid-Continent Net 3850 kHz** 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT Westcoast Net 3850 kHz** 8:00 PM PDST (0300Z Wednesday Morning) **4**	**5**	**6**	**7**	**8**
Annual Fall Flea Market — Framingham, Ma. Police Station Drill Shed — K1YHM — 9 **9**	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society Transmits Amateur Radio News** — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **10**	**AMSAT Eastcoast Net 3850 kHz** 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT Mid-Continent Net 3850 kHz** 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT Westcoast Net 3850 kHz** 8:00 PM PDST (0300Z Wednesday Morning) **11**	**12**	**13**	**14**	**15**
The 23rd Annual Auction, Auctioneer 80 — Massillon Knights of Columbus Hall, Massillon, OH — WD8MIJ — 16 **16**	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society Transmits Amateur Radio News** — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **West Coast Bulletin Edited & Transmitted by W6ZF** 8:00 PM PST 3540 kHz, A-1, 22 WPM **17**	**AMSAT Eastcoast Net 3850 kHz** 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT Mid-Continent Net 3850 kHz** 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT Westcoast Net 3850 kHz** 8:00 PM PDST (0300Z Wednesday Morning) **18**	**19**	**20**	**21**	**22**
23 **30**	**Florida Ham News — Swap Net** By the Broward ARC 146.31-91 at 7:30 PM **Glenhurst Radio Society Transmits Amateur Radio News** — 222.66/224.26 MHz via WR2APG and 21.400 MHz USB **24**	**AMSAT Eastcoast Net 3850 kHz** 9:00 PM EDST (0100Z Wednesday Morning) **AMSAT Mid-Continent Net 3850 kHz** 9:00 PM CDST (0200Z Wednesday Morning) **AMSAT Westcoast Net 3850 kHz** 8:00 PM PDST (0300Z Wednesday Morning) **25**	**26**	**27**	**28**	**29**

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