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Amateur Radio

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THE RADIO AMATEUR'S JOURNAL

KENWOOD
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Small wonder.

Processor, N/W switch, IF shift, DFC option

TS-130S/V

An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP applications.

TS-130 SERIES FEATURES:

- **80-10 meters, including three new bands**
  Covers all Amateur bands from 3.5 to 29.7 MHz, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz. VFO covers more than 50 kHz above and below each 500-kHz band.
- **Two power versions . . . easy operation**
  TS-130S runs 200 W PEP/160 W DC input on 180-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands. Solid-state, wideband final amplifier eliminates transmitter tuning, and receiver wideband RF amplifiers eliminate preselector peaking.
- **Built-in speech processor**
  Increases audio punch and average SSB output power, while suppressing sideband splatter.
- **CW narrow/wide selection**
  "N-W" switch allows selection of wide and narrow bandwidths. Wide CW and SSB bandwidths are the same. Optional YK-88C (500 Hz) or YK-88CN (270 Hz) filter may be installed for narrow CW.
- **SSB narrow selection**
  "N-W" switch allows selection of narrow SSB bandwidth to eliminate QRM, when optional YK-88SN (1.8 kHz) filter is installed. (CW filter may still be selected in CW mode.)
- **Sideband mode selected automatically**
  LSB is selected on 40 meters and below, and USB on 30 meters and above. SSB REVERSE position is provided on the MODE switch.
- **Built-in digital display**
  Six-digit green fluorescent tube display indicates actual operating frequency to 100 Hz. Also indicates external VFO or fixed-channel frequency, RIT shift, and CW transmit/receive shifts. Also analog sub-dial for backup frequency indication.
- **IF shift**
  Allows IF passband to be moved away from interfering signals and sideband splatter.
- **Single-conversion PLL system**
  Improves stability as well as transmit and receive spurious characteristics.
- **Built-in RF attenuator**
  For optimum rejection of intermodulation distortion.
- **Built-in VOX**
  For convenient SSB operation, as well as semi-break-in CW with sidetone.
- **Effective noise blanker**
  Eliminates pulse-type interference such as ignition noise.
- **Built-in 25-kHz marker**
  Accurate frequency reference for calibration.
- **Compact and lightweight**
  Measures only 3-3/4 inches high, 9-1/2 inches wide, and 11-9/16 inches deep, and weighs only 12.3 pounds. It is styled to enhance the appearance of any fixed or mobile station.

Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.

Ask your Authorized Kenwood Dealer about the compact, full-featured, all solid-state TS-130 Series.

NOTE: Price, specifications subject to change without notice and obligation.

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- PS-30 base-station power supply (remotely switchable on and off with TS-130S power switch).
- SP-120 external speaker
- VFO-120 remote VFO
- MC-50 50kΩ/500Ω desk microphone

Other accessories not shown:

- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- AT-130 compact antenna tuner (80-10 m, including 3 new bands)
- MB-100 mobile mounting bracket
- MC-30S and MC-35S noise cancelling hand microphones
- PC-1 phone patch
- TL-922A linear amplifier
- HS-5 and HS-4 headphones
- HC-10 world digital clock
- PS-20 base-station power supply for TS-130V

- SP-40 compact mobile speaker
- VFO-230 digital VFO with five memories

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT / COMPTON, CA 90220

Hand-shack.

Synthesized, big LCD, 10 memories, scanning, DTMF Touch-Tone®

TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.
- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 2.0 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF (Touch-Tone®) encoder**
  Uses all 16 buttons of keyboard while transmitting.

- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Subtone switch**
  Activates subaudible tone encoder (not Kenwood-supplied).

- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "MO" memory.
- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **Extended operating time**
  With LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output), for longer operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Microphone PTT and audio terminals
Charger terminal
Earphone Jack

STANDARD ACCESSORIES INCLUDED:

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- AC charger
- Hand strap
- External-microphone plug
- Earphone

NOTE: *Price, specifications subject to change without notice and obligation.*

OPTIONAL ACCESSORIES:

- ST-1 base stand (shown) which provides 1.5-hour quick charge, 4-pin connector for dynamic microphone, and SO-239 antenna connector.
- BC-5 DC quick charger (1.5 to 2.0 hours)
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook

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TR7/DR7 all band transc'vr.

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New commercial grade transc'vr provides full 9 band coverage.

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KENWOOD

TS-130-S

CALL FOR YOUR SPECIAL PRICES ON ALL OF THESE OUTSTANDING ITEMS

(and other well known Kenwood ham products)

TR-2400

TS-520-SE

TS-830-S

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25W OUT FROM TR-2400 w/American Radio "324"

TR-2400 plugs directly into compact assembly. Linear amp features V-Mos pwr transistor, gives 25W RF across band w/1.5 watts drive. Built-in amp/spkr boosts audio more than 2W. Also current limited charger for TR-2400. 12VDC @ 4A. Socket for ext PTT mic.

$199.95 FREE SHIPMENT (UPS Brown)

MIRAGE B-1016 2M AMPLIFIER

160 W OUTPUT SSB, FM, CW.

REG. 279.95 $249.95

Freq. range: 144-148MHz • RF out: 160W nom. (10W in). • RF power in: 5-15W • DC operating pwr: 13.6VDC @ 20-25A • Intermittent duty cycle • Built-in receiver pre-amp. Automatic internal or external relay keying.

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MASTHEAD

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CQ The Radio Amateur's Journal

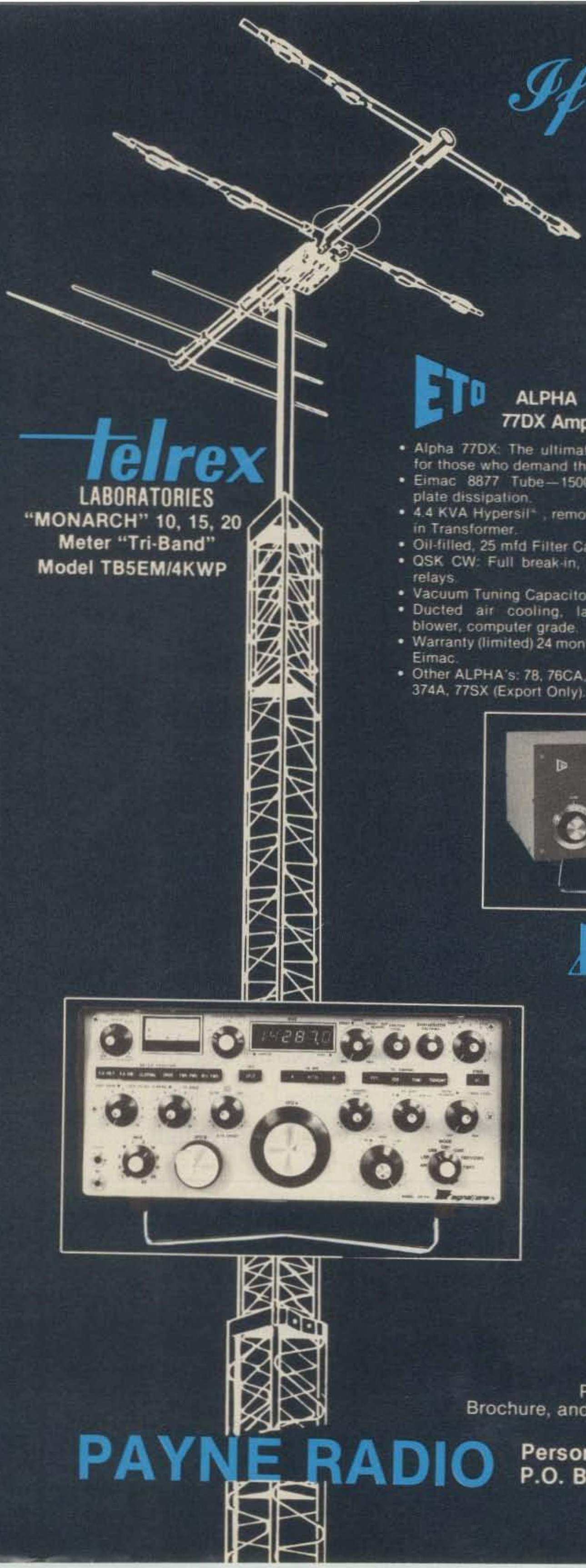
ON THE COVER: Besides postage stamps, San Marino can boast of having a winning DX team in 9A1ONU. Check the exciting Contest story and results starting on page 12.

MARCH 1981 **VOL. 37, NO. 3**

FEATURES

DEPARTMENTS

If You Want The Finest



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Meter "Tri-Band"
Model TB5EM/4KWP

ETO ALPHA
77DX Amplifier

- Alpha 77DX: The ultimate amplifier for those who demand the finest.
- Eimac 8877 Tube—1500 watts of plate dissipation.
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Integrated Station

- 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 band width.
- 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.

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PAYNE RADIO

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CIRCLE 90 ON READER SERVICE CARD

Announcing

● **Delaware Valley Flea Market** - The Delaware Valley Radio Association, W2ZQ, will hold their 9th annual flea market on Sunday, March 15 from 8 a.m. to 4 p.m. at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, in Lawrence Township. Advance registration is $2.00, $2.50 at the gate. Adequate indoor and outdoor flea market areas. Sellers are asked to provide their own tables. Prizes and refreshments. Talk-in on 146.07/67 and 146.52. For additional information or tickets write to: DVRA, P.O. Box 7024, West Trenton, NJ 08628; s.a.s.e. please.

● **ERAA QSO Party** - The Edison Radio Amateur's Association (ERAA), WA8SVA, of southeastern Michigan will host a QSO party to commenorate ERAA's 40th anniversary. Operations will begin 1400Z March 14, and will end 0200Z March 15 (0900 to 2100 EST, March 14). Those wishing to participate should exchange signal report and state with the ERAA QSO party group. Phone operation only: suggested frequencies (MHz)—3.930, 7.240, 14.300, 21.400, 28.800, 146.52 simplex, and 144.73/145.33 (ERAA repeater). The ERAA QSO party group will be operational from Thomas Edison's first power station, Station A, in the historic Greenfield Village, Dearborn, MI. QSL via WA8SVA, 12806 Royal Grand, Detroit, MI 48239. Participants will receive a certificate by enclosing a business-size s.a.s.e.

● **Tradefest '81** - Penn Wireless Assn. Inc. will hold its Tradefest 81 on Sunday, March 29 at the National Guard Armory Southhampton Rd. and Roosevelt Blvd. (Rte.#1) ½ mile south of the Penna. Turnpike exit #28. Sellers space 6′ × 8′ $5. Bring tables, limited number of power connections, $3. General admission $3. Prizes, refreshments, rest areas, displays, and surprises. Talk-in on 146.115/715 and .52. Contact: Thomas Gallagher, WB3DJF, P.O. Box 734, Langhorne, PA 19047.

● **Lake County Hamfest** - The Lake County Amateur Radio Association is sponsoring its third annual hamfest on Sunday, March 29 at the Lake County High School in Madison, Ohio. Commercial exhibits for the amateur and computer enthusiast, plus flea market, prizes, and refreshments. There will be over 24,000 square feet of indoor space, and tables/display space is 85¢ per lineal foot. Admission is $2.50 in advance and $3.50 at the gate (send s.a.s.e. before March 14 for advance tickets). Talk-in on 147.81/.21. For more information, contact Lake County Hamfest Committee, 5555 Anaconda Rd., Mentor, OH 44060.

● **35th Annual Lawton-Fort Sill Hamfest** - This event will take place on April 4 and 5 at the Sandpiper Inn, Lawton, Oklahoma. No charge for dealer and swap tables. Events include flea market, MARS meetings, and QCWA breakfast. Banquet on Sunday. For registration information, write to W5KS, Box 892, Lawton, OK 73502.

Zero Bias

AN EDITORIAL

As I mentioned last month as we were about to embark on the *CQ* Jack Daniels Relief Column, I would tell you about my trip and the folks at Ten-Tec. The trip started off with my having to explain to the security guards at La-Guardia Airport what I was doing with several bottles of liquid in my attache case. "Bringing coals to Newcastle" I said, trying to explain that I was only returning something to Tennessee that was made there apparently only for export.

I arrived at Knoxville and after renting a car started the 25 or so mile drive to Sevierville, home of Ten-Tec. The countryside is magnificent with rolling hills and mountains. Not far away is the town of Gatlinburg, which is at the entrance to The Great Smoky Mountain National Park. The mountains dominate the horizon in that area, and in the early morning the "smoke" or clouds or whatever it is that creates that phenomenon produces a beautiful panorama that's hard to describe. Early my second morning there I took a drive closer to the mountains and just stopped along the road to simply stare at them for a while, trying to take it all in. Of course, I forgot to take my camera along on this trip.

Ten-Tec is on the main highway just on the other side of Sevierville (named for the first Governor of Tennessee, John Sevier). Jack Birchfield, K4JU, the President of Ten-Tec, had told me to listen in on 13/73, the Knoxville machine, in case I got lost. There isn't much simplex operation in that area due to the mountains. I didn't get lost and got to Ten-Tec in short order to meet with Jack, Dan Tomcik, K4HYF, and Tom Salvetti, WD4FVU. Most of the afternoon was taken up with a plant tour where I saw the Omnis, Deltas and Hercules 444s being assembled. I followed the process from the basic metal work to the finished product, each step with its corresponding quality checks and individual cycling and testing. They also fabricate metal parts and cabinetry for other companies in and out of the electronics industry.

The next day I got the tour of the service facilities, engineering and met a lot of the fellows in what I would guess is sort of the think tank. No, I don't have the inside scoop on anything new, but we did talk over the possibilities of future products. As is typical on my trips, I get to meet far more people than I can keep track of and names begin to jumble. What I should do is take notes. An interesting sidelight to the trip was that I had the occasion to drive with Jack and Dan in their respective cars and found out that they were both avid mobile c.w. operators. Jack especially astounded some DX station by telling them he was operating mobile.

It was a terrific couple of days and almost like a mini-vacation for me to experience the hospitality and the scenery of Tennessee.

The Good Old Days, Sort Of

With the demise of Cortlandt Street and with Canal Street turning into an antique and hardware center in New York, it's become harder and harder to find those exotic electronic goodies that nourished the imagination. Gone are the little sub-assemblies, strange parts, surplus whatchamacallits that sold for a few bucks that you just had to have. Well, you can relive some of those days, the days of the Olsen, B&A, McGee Radio era of catalogs, by sending away for the ETCO Electronic Things Mail Order Catalog No. K. I received one in the mail this week and it brought it all back.

I guess you could assume that there must be factories in strategic areas turning out "close-outs," broken or incomplete sub-assemblies and really interesting items that don't really relate in your mind to finished products. Who cares; it is a feast for your mind. Do yourself a favor and send for one; it's free. Write to them at: ETCO Electronics U.S.A., North Country Shopping Center, Route No. 9 North, Plattsburgh, New York 12901.

CQ's Role

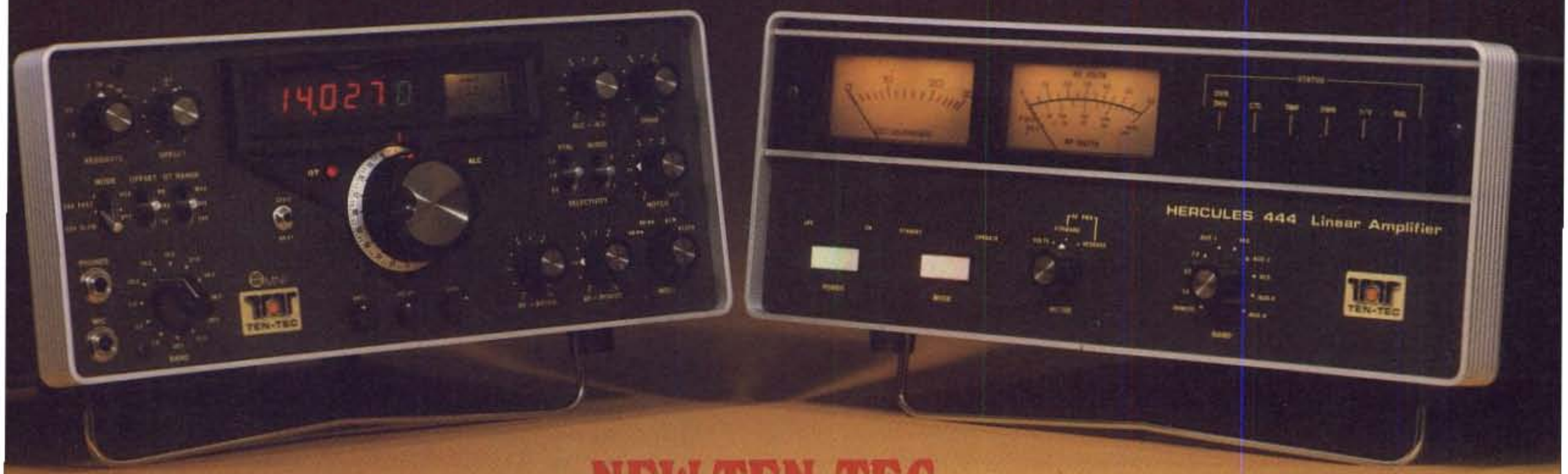
CQ traditionally has been known for its Contests and Awards and as primarily a DXer's magazine. Although this to a large degree is true, we do cover a lot of territory beyond those areas. Surveys, including our own last year, show that the biggest group of amateurs can be classified as "generalists." This means that they don't really identify themselves with any particular aspect or mode of amateur radio, but on the other hand get just as much enjoyment out of amateur radio as those who tend to specialize. The next largest group of amateurs (and there are lots of groups) are the DXers, the Contesters and the Award seekers, who comprise one group. These two groups (the generalists, and the DXers, Contesters and Award seekers) in particular represent a span of moderate operating time to concentrated operating time with the principle distinction being how that time is spent. I guess if we had to define a role for *CQ* or a working philosophy, it would be to expose the amateur to the many ways that time can be filled. I'm not speaking of empty hours or meaningless bits of trivia that add nothing to one's life, but the expression of enjoyment and accomplishment as seen through our columns and features each month. It's there if you want to do it, think about it or simply take a casual interest in reading about what your fellow amateur is doing. Part of this role is teaching or simply making material available to learn about something new. Learning the hard way is just that, the "hard" way.

The "new blood" in amateur radio and some of the tired "old blood" need refresher courses and basic courses from time to time just to be aware of what's going on in the outside world, to broaden one's outlook, sharpen one's skills and perhaps learn not to step on one's neighbor's toes. It's being able to look at an exotic piece of new equipment and having an idea of how it works and how it's used, not necessarily how to design it. It's seeing the possibilities and deciding whether or not it's for you in any form.

All of our regular writers and columnists have something valuable to say,

(continued on page 97)

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.

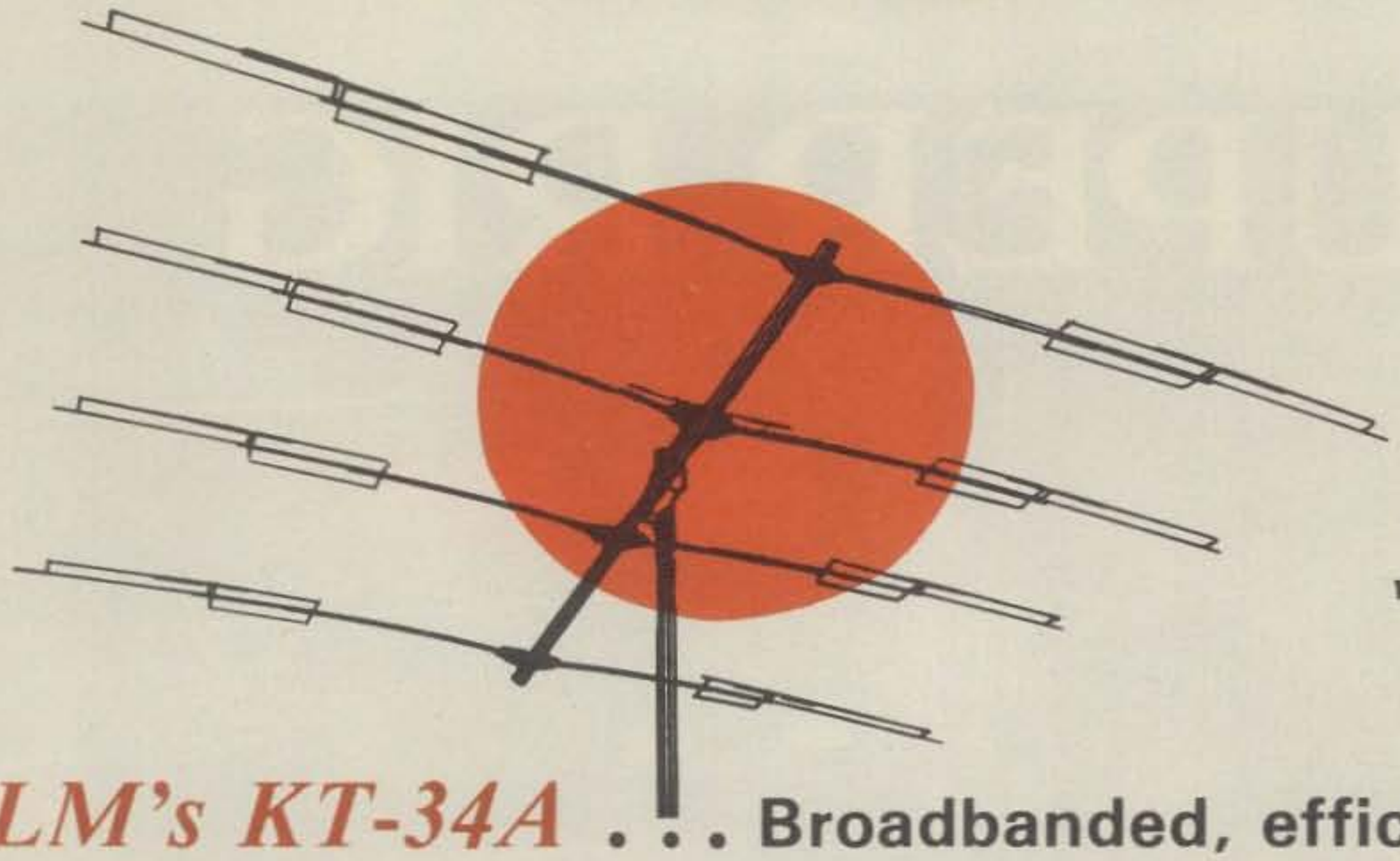
Super Power Supply. Provides approximately 45 VDC @ 24 amperes, operates on 105/125 VAC or 210/250 VAC. Tape wound transformer and choke reduce weight (50 lbs.) and size (7½"h x 15¾"w x 13½"d). Separate enclosure.

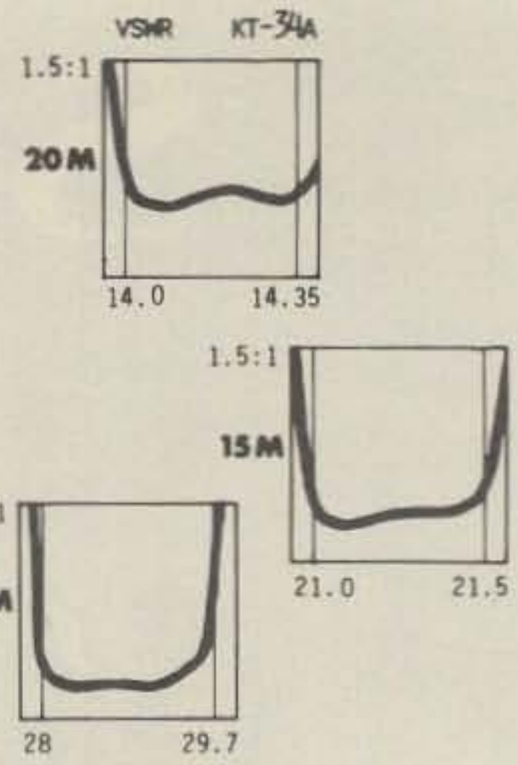
Super Styling. Designed to match OMNI, the HERCULES has the same height as OMNI, plus matching bail and matching colors. The front panel is simplicity in itself with two push-button switches (power and mode) plus two knobs (meter and bandswitch), and a "black-out" monitor panel (when unit is off, meters 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: 5715 LINCOLN AVE., CHICAGO, ILL. 60646





KLM's KT-34A . . . Broadbanded, efficient, compact!

What makes the KT-34A so different from a conventional tribander? Basically, the traps, coils, and capacitors have been discarded in favor of lossless linear-loading and Hi-Q air capacitors, all composed of aluminum tubing! These allow the KT-34A to handle 4KW PEP at an unusually high level of **efficiency**. The linear loading also makes full 1/4-wave elements possible on 10 and 15 meters, and brings 20 meters much closer to the desireable 1/4-wave than any conventional tribander (the sketch below shows the remarkable metamorphosis of the KT-34A design).

Two driven elements are employed to make the KT-34A unusually **broadbanded** (a concept applied to most KLM antennas). VSWR and performance remain nearly constant across each of the three bands (see the VSWR charts). A KLM balun is supplied to allow direct feed from your 50 ohm coax.

Structurally, the KT-34A is built tough. No boom support is required. All the aluminum, including the boom, is strong weather resistant 6063-T832 alloy. All the hardware is stainless steel except for the mounting U-bolts. Virtually indestructable Lexan insulators support the elements and insulate them from the boom. Rotation is possible by most any ham rotor. Wind balance and wind survival are excellent. Boom length is only 16 feet.

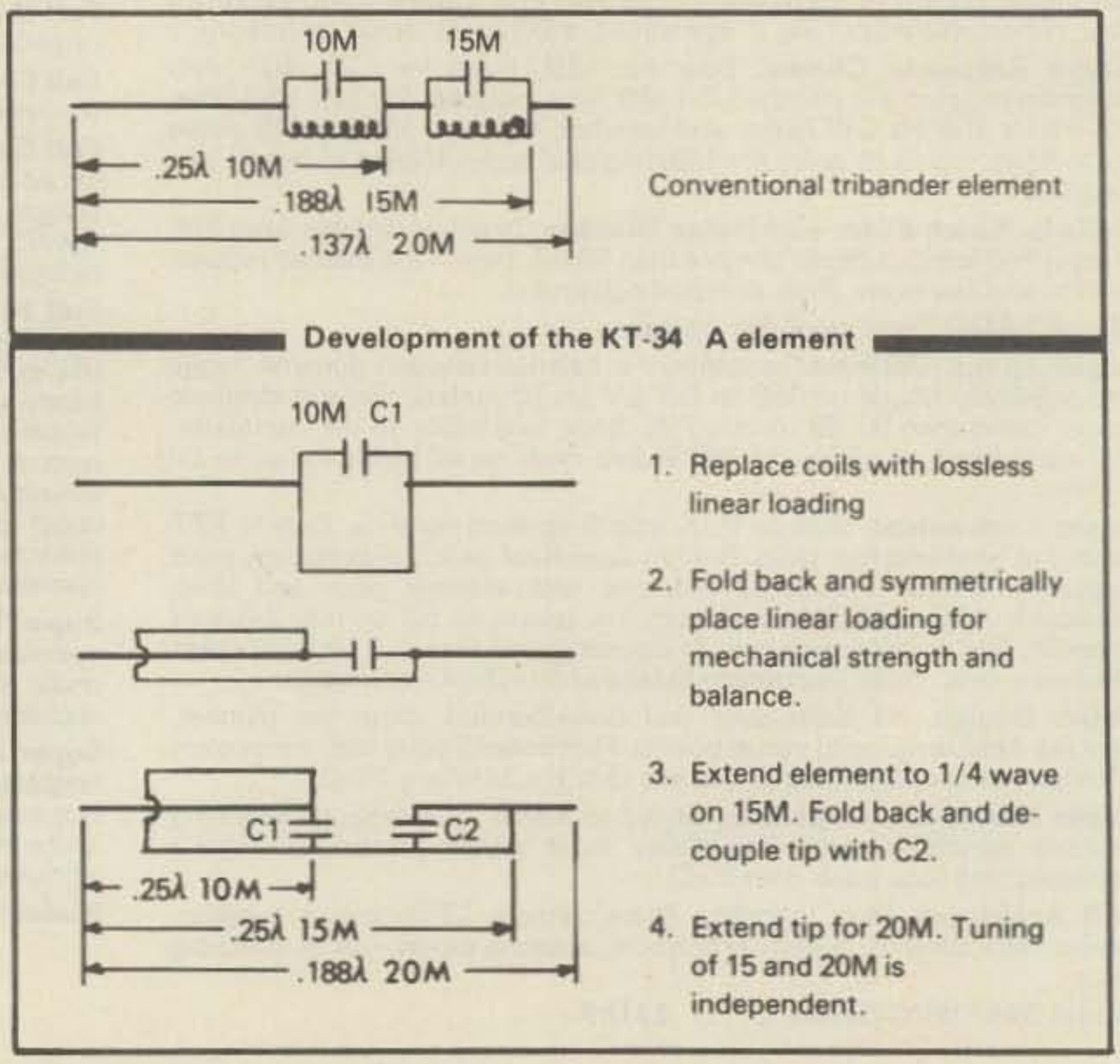
To meet your future needs, the KT-34A is easily expandable. The KT-34XA Upgrade Kit, which adds two new elements and doubles the boom length, produces substantial increases in performance. Your KT-34A cannot become obsolete!

A great deal of thought and care has gone into the design of this antenna. It's not just another "me too" tribander, but one developed from modern techniques, materials and engineering. We hope you will give it a try. We know you won't be disappointed . . . .

KT-34A SPECIFICATIONS

Frequencies of operation:
14.0-14.350 MHz
21.0-21.450
28-29.750
Gain: 7 dBd ± .3 dB across each band
F/S: 30 dB
F/B: 20 dB
Feed impedance: 50 ohms with balun supplied
Power rating: 4KW PEP
Boom: 16 ft. x 3" O.D.
Mast: for 2" O.D. (standard)
Element length: 24 ft. average
Turning radius: 16 ft.
Wind area: 6 sq. ft.
Wind survival: 100 MPH
Suitable Rotors: TR-44, Ham "M", HD-73, KR-400, etc.
Price: $389.95

KLM P. O. Box 816, Morgan Hill, CA 95037



CIRCLE 6 ON READER SERVICE CARD

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CIRCLE 92 ON READER SERVICE CARD

Results of the 1980 CQ World Wide WPX SSB Contest

BY BERNIE WELCH*, W8IMZ

FANTASTIC! TERRIFIC! STUPENDOUS! OUTSTANDING! These all describe this year's event, which reached the all-time peak activity that produced the largest number of logs ever received for an s.s.b. weekend during the 24 year history of the contest. A goodly number of contestants expressed opinions about band conditions, with a majority indicating that these were the best they had experienced during the current DX contest season.

The old saying "records are made to be broken" certainly held true, since 36 all-time records were smashed. The one-million plus score has almost become a matter of fact, rather than an accomplishment of a few "big guns." As an example, 242 stations are in this elite group, which is an increase of 77 over last year.

Who would have ever thought a few short years ago that a station could qualify for the WPX Award/Honor Roll during one weekend of the WPX contest? Operating high up in beautiful San Marino, the champion multi-single station, 9A1ONU, established the new prefix record of 723. Also, 13 stations worked 600 or more prefixes, while 40 acquired 500 plus. In addition, an unbelievable 287 easily topped the 300 mark, which is needed for the initial WPX Award. (Please note that Bob Huntington, K6XP, is the manager of the WPX Awards and the Honor Roll.) Spain joined the prefix parade with more than an average supply of new delights. The Russian Special Olympic prefixes were plentiful. Others like Mexico, Poland, Venezuela, Belgium, Brazil, Yugoslavia, Hungary, Panama, Ecuador, Portugal, Honduras and England provided a varied and exciting assortment. The new East German "Y" prefixes, with their many numbers, contributed greatly to the new prefix record. However, noticeably absent were specials normally used by the Finnish and Canadians. We hope they will return soon. The FCC's current call sign issuing policy has been a major factor in contributing to the increased popularity of the WPX, as the USA now has more different prefixes active in the contest than any other country.

Our available data indicates that the possibility existed for a station to have contacted over 950 different prefixes.

Around the clock pile-ups are traditional and continue to prevail as was truly evident by DX stations such as: HZ1, JT1, 5B4, HS1, UM8, 5W1, VQ9, FY7, TG9, VP9, JD1, C6, VP2, CO2, FS7, EA8, EA9, EL2, CT3, 4X4, HM1, 9K2, OH0, EA6, 9H3, KH2, DU2, KX6, YC1, 9Y4, TF3, FM7, T3, VP5, VS6, 9X5, 5T5, PJ2, 7X4, FO0, 3V8, TU2, OD5, JW7, VU2, JY3, PJ2, PZ1, D4, D68, AH2, ZL3, 8P6, AH8, J6, UJ8, UI8, VK4, NP2, VP8, ZK1,H31, ZS3, OY8, etc. You probably worked enough countries during this 48 hour period to qualify for CQ DX or DXCC Awards.

TG9GI set the new world high QRPp record, while N2AA did the same for the USA. 160 meters was an extra special bright spot with more activity and entries than ever before. VE3JAY is now the top scoring station on the top band, while W8LRL continues to be the USA leader. We still need "firsts" on 1.8 MHz for Africa, Asia, Oceania and South America. Congratulations go to CT3BD, whose 80 meter operation from Madeira Islands established a first African record.

Expeditions are always an important part of the contest scene. The K8ND and WD8ALG journey to Anguilla, operating as VP2E, won for them the Trophy Award. Many thanks to PJ2CC, VP2EEU, FG0DYM/FS7, IY4FGM, OH0AM, VP2VGB, HI6XQL, OH3JR/OH0, 9A1ONU, JK1JEQ/JD1, VP2MGQ, SM0AQD/OH0, W2STM/VP9, W1BIH/PJ2, OH0XZ, and W9VA/KP4 and the ops for their expedition contribution to the contest.

A new trophy being awarded as of this year is for South America, Single Operator All Band. The donor is none other than "Mr. QRPp," Ron Moorefield, W8ILC. We need trophy donors. If you are interested, please contact W1WY or myself, W8IMZ.

May I suggest that you acquaint yourself with the new rule changes which will be effective with the WPX SSB Contest scheduled for the weekend of the 28th and the 29th of March, 1981 (GMT), especially the part that pertains to the Multi-Op, Single Transmitter category, which now contains a 10-minute requirement, without exception. Also, there is a requirement for an alphabetical/numerical check list of prefix multipliers to be sent along with each contest log. The rules are published in the January '81 *CQ* magazine.

Each year we receive suggestions that contestants feel if implemented would improve the contest. Currently, we have a large number wanting to extend the length of operating time for the single operator category from 30 to 36 hours. Let me know your opinions by dropping me a line directly, or via *CQ* offices.

*7735 Redbank Lane, Dayton, Ohio 45424.

More and more contesters and DX-ers are finding their way to the Contest Forum at the Dayton Hamvention. In my opinion, last year's program was among the best. It was great to see so many of you in attendance. I am happy to announce that I will be back moderating a big '81 Contest Forum. At this early date (Nov. '80) we have already three of the most current spectacular contest expedition slide shows scheduled. Plans also include several popular contest personalities, contest trophy award presentations, contest committee members from ARRL and *CQ*, plus a representative from the National Contest Journal. The dates of the next Dayton Hamvention are April 24, 25, and 26, 1981. The Contest Forum is from 9:00 a.m. until 12 Noon, Saturday morning, April 25th. I am looking forward to seeing many of you DX and USA contesters. Come and enjoy the fun and say hello. Let's have an eyeball QSO.

The big DX Forum is scheduled for the same date, immediately following the Contest Forum, in the same room with over 1200 seats, from 12 Noon until 4:30 p.m.

Much appreciation to Bob Cox, K3EST, for his assistance with the '80 CW results. Effective with the **'81 WPX Contest, ALL LOGS—SSB** and **CW**—large or small, should be sent to either the *CQ* office, or directly to me at my address, shown on the first page of this article.

Sample cover sheet and log forms are available from *CQ*. Statesiders send s.a.s.e.; all others send self-addressed envelope and IRC's.

We are in need of one or two additional working assistants for the WPX Contest Committee. If you live in or around the Dayton area and are active and interested in DX contesting, and most important, have the time to donate, please contact me (W8IMZ) as soon as possible.

This year's working assistants were: Ron Moorefield, W8ILC; Ray Alea, KB8JF; and newcomer Steve Bolia, N8BJQ, plus Karen Schneder—certificate awards; and my XYL, Eleanor. These are all outstanding individuals devoted to a bigger and better WPX contest for your enjoyment.

Thanks so very much for the many kind words regarding my continuance as the CQ WPX Contest Director. I will try to do my best.

See ya in the '81 WPX SSB pile-ups from the Turks and Caicos Islands. I plan to operate 20 meters, single-op, with my call, VP5BER. On 10 meters will be Dick, K4UTE/VP5A; 15 meters, Bill, WB4EYX/VP5WW; and on 40 meters, Ron, N4KE/VP5B. We'll be going for new North America records.

73, Bernie, W8IMZ

Random Contest Comments

"I tried 40 and 80 but nobody copy me. Hi. Hi. (QRPp)...TG9GI. 76 countries in one weekend (QRPp)...W4DR op. W4PFM/OA8V. Worked my last one for WAS (QRPp)...OR8KD op. ON6NL. Completed DXCC QRPp in the test...AB0X. Contests are still fun after 48 years of active operating (QRPp)...W9PNE. QRPp op's don't buy finals, just medicines for sore throats and hair color to cover the gray after the contest. Hi. Another great one *CQ*...WA3FNK. The WPX is the absolute best contest for QRPp operation, wish it came twice a year...KA5N. Had surprising band conditions both days (QRPp)...UR2RHF. Bernie, thanks for staying on with contest. I completed WAZ and 15 meter DXCC...K1RB. Best hour 115 QSOs...WB1ANT.

I missed the PY special prefixes...WA2AUB. My first contest ever with no dupes...KB2DE. Nice to be a sought after station for a change...WV2ZOW. Lots of activity—a DXer's dream...WB3DNL. Feel like a DX station on 40 M with my call—now I know what they go through...AG3H. Finally broke a million...K4KZZ. A great way to celebrate my first anniversary in amateur radio—first licensed 3-29-79...N4CMJ. Many remarks about the old Swan Island call...KS4K. Biggest thrill—working HS1ABD! New country and zone...AK4T. Best contest I have ever operated...KT4W. Could not stay awake for the VK's and JA's—enjoyed contest on 80 meters very much...KG4W.

Thrills—being called by 9N1MM, JT1KAG and VU2CBG in middle of evening JA run...K5MR. Outstanding test as always! Well supported by DX stations...K5DB. 40 meters horrible for DX due to QRN and VE crowd under 7.1...WA5IYX. Very heavy thunderstorming for more than 12 hours...W50B. Worked 6 continents on one UTC day ...WD5BEP. Didn't work W8IMZ or any other W8...K1DWQ/5. Fantastic conditions—JA's are super operators...K5ZD. Bernie—My compliments on your years of service for the contest. Amateurs like yourself have made a great hobby ...AC6V. Nearly 70 years old—not able to stand grind of constant plugging—have to get my beauty sleep...W6BYH.

Waited too long before looking for USA

The San Marino special event station for UNICEF, 9A1ONU, is the Multi-Single World Champion. Ops: (standing L To R) I4ZSQ, I4LCK, I6PLN, I4LEC, I0MXM, I4VOS, (seated) I4VEQ, I4USC and I4ADS. I4RYC, I4BFY, M1C not in photo.

At Fairbanks, Alaska, the KL7IRT Multi-Multi Trophy winners. (L to R) KL7JHN, WL7AGG, KL7IRT, KL7GL, AL7Z, KL7ENY, WD0FIR. Ops not in photo are KL7AY, AL7AK, KL7R, KL7BA, KL7JIZ and KL7AZJ.

The new Caribbean/Central America Trophy was won by Station H31LR, operated by Obie Johnson, HP1XOJ, ex KZ50J. It was an All Band, North America record.

Wallace, W8LRL, located in West Virginia, is the all-time USA Record Holder on the top band. His other 160 meter accomplishments include WAC, WAS, WPX-380 prefixes, 31 zones, and 147 countries worked. How about that?

A first time Single Op Single Band effort by Mike, WB8IFP netted him the 2nd Top Score in the USA 8th District on 21 MHz.

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

QRPp
—SECTION—
WORLDWIDE

TG9GI	**A**	**855,336**	**1182**	**314**
N2AA	**A**	**808,080**	**818**	**370**
W4DR	**A**	**492,002**	**596**	**311**
		(OPR: W4PFM/OA8V)		
OR8KD	**A**	**365,928**	**595**	**237**
		(OPR: ON6NL)		
OK3IAG	**A**	**249,964**	**532**	**253**
VK6NDZ	**A**	**165,165**	**400**	**143**
AB#X	**A**	**156,950**	**319**	**215**
HA3MY	**A**	**131,047**	**340**	**193**
PA#DUA	**A**	**115,552**	**249**	**184**
G3FTQ	**A**	**99,008**	**388**	**182**
DL5TS	**A**	**72,141**	**212**	**139**
GM4ELV	**A**	**40,135**	**189**	**115**
W9PNE	**A**	**33,813**	**149**	**117**
GM3RFR	**A**	**33,800**	**128**	**104**
DJ5KB	"	31,702	156	131
WA3FNK	**A**	**30,008**	**124**	**88**
K3VY	"	29,140	112	94
UA4PBX	**A**	**11,172**	**100**	**84**
W2STM/VP9	**A**	**10,498**	**73**	**58**
KA5N	**A**	**9,372**	**91**	**71**
OE1SBA	**A**	**7,560**	**61**	**56**
SM#GKF	**A**	**2,340**	**38**	**30**
UA4WBQ	"	2,052	43	36
WA7NSM	"	1,462	42	34
JH1EFA	"	1,026	23	18
LA5QC	"	348	18	16
JH4UTP	**28**	**168,260**	**320**	**188**
N#BNY	**28**	**167,232**	**322**	**208**
W5YVK	**28**	**132,496**	**328**	**182**
N#AJZ	"	122,794	263	179
WA#VBW	"	88,234	207	157
WA6POC	"	80,178	245	161
DK8EW	**28**	**42,456**	**152**	**116**
DF4RD	"	36,800	151	100
WB7SUZ	**28**	**23,912**	**127**	**98**
UA4FDJ	**28**	**14,661**	**104**	**81**
JH#ALB	**28**	**5,670**	**52**	**45**
SM7ACN	**28**	**4,028**	**47**	**38**
UR2RHF	"	3,094	39	34
RA3DOP	"	960	22	20
UC2ACK	"	270	11	10
WB4BBH	**21**	**59,882**	**189**	**158**
WA1POZ	**21**	**43,434**	**160**	**127**
LA7ZN	**21**	**26,580**	**115**	**115**
JK1JEO/JD1	**21**	**9,823**	**199**	**47**
JA#BMS/1	"	2,784	36	29
PA#NRD	**14**	**14,400**	**142**	**96**
I1RBJ	"	2,726	61	47
OK1DKW	3.5	1,860	33	30

SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

K1AR	**A**	**3,703,194**	**2537**	**531**
W1CF	**A**	**2,624,460**	**1988**	**498**
		(OPR: K1UA)		
N1GL	"	2,338,182	1807	482
AG1C	"	1,842,885	1583	459
AF1O	"	1,158,958	1115	383
AB1U	"	349,605	529	255
W1LQO	"	257,280	397	240
W1FG	"	191,287	351	197
N1AFC	"	75,710	257	113
WA1ZAM	"	73,370	189	145
K1RB	"	58,652	168	124
W1WY	"	30,000	119	100
WA2ORV/1	"	1,984	33	31
WA1UZH	**28**	**1,159,070**	**1183**	**410**
WB1ANT	**28**	**935,180**	**833**	**380**
K1KJT	"	445,440	591	290
WA1FCN	"	125,837	267	179
N1AEQ	"	89,586	219	162
KA1CVM	"	85,094	216	157
K1WJ	"	84,816	218	144
W1PLJ	"	5,560	50	40
W1PWK	"	1,491	24	21
WB1EAZ	"	234	10	9
KA1EP	**21**	**471,859**	**616**	**307**
W1PCD	7	54	9	9
W1BB	1.8	32	6	4
K2SS	**A**	**3,109,825**	**2308**	**474**
W2YV	**A**	**2,928,254**	**2102**	**518**
		(OPR: N2NT)		
WA2AUB	"	467,258	579	317
KB2DE	"	255,148	402	227
N2SS	"	196,608	342	192
AC2J	"	137,740	314	194
WA2LJM	"	90,118	221	157
K2JF	"	45,312	153	118
WB2PXA	"	28,952	128	88
KA2HTH	"	25,536	116	96
WV2Z0W	"	7,524	69	57
WB2MCB	"	1,464	25	24
N2RM	**28**	**2,311,156**	**1810**	**521**
		(OPR: N2ME)		
WB2QEU	**28**	**474,032**	**572**	**344**
KA2CLQ	"	124,405	297	179
W2KZE	"	121,176	250	162
WB2TKD	"	60,480	167	135
W2QKJ	"	49,776	136	136
KN2QWO	"	48,642	161	134
WA2KIR	"	9,211	67	61
N2ALK	"	6,384	57	48
N2WT	**21**	**1,921,266**	**1652**	**423**
WA2PHA	"	73,950	195	150
W2DAU	"	10,659	68	57
WB2MDZ	"	135	9	9
		(OPR: N2AHW)		
AD2J	14	1,836	32	27
K2HPV	"	1,680	29	28
W2XQ	**1.8**	**1,476**	**65**	**41**
K2BQ	"	352	26	22
WB3DNL	**A**	**1,941,100**	**1621**	**470**
W3FA	**A**	**1,904,984**	**1567**	**454**
		(OPR: WA3ZAS)		
N3GB	"	1,122,030	1089	390
WA3VUQ	"	1,027,378	993	374
K3HPG	"	664,377	721	357
AG3H	"	323,765	481	293
N3RL	"	300,933	433	261
WB3DJF	"	59,777	154	113
AG3S	"	7,500	53	50
WB3IET	**28**	**586,560**	**707**	**312**
WB3GXD	"	20,400	93	75
KB3FZ	14	1,219	24	23
K3UA	3.5	4,704	72	56
K4KZZ	**A**	**1,001,088**	**935**	**384**
K4CTY	**A**	**872,871**	**884**	**381**
WA4QMQ	"	671,759	787	353
N4IB	"	482,361	539	311
N4CMJ	"	372,625	497	275
W4UYC	"	287,039	450	239
K4BAI	"	207,424	341	224
W4SME	"	169,533	323	207
WD4EXG	"	167,262	317	183
WD4RCO	"	157,011	321	199
W4EI	"	138,000	281	184
W4PTT	"	103,190	233	170
WB4PHW	"	81,639	208	141
K4OD	"	80,884	211	146
W4KMS	"	76,664	186	148
WA4OPV	"	62,594	190	119
K4JRF	"	50,388	167	114
KS4K	"	46,998	159	126
WD4EPX	"	33,858	145	99
WB5YLT/4	"	31,164	130	106
AK4T	"	25,632	110	89
W4BV	"	13,560	86	60
N4MM	"	7,436	58	52
W4NOS	"	192	8	8
KT4W	**28**	**1,636,540**	**1398**	**470**
N4KG	**28**	**1,498,344**	**1387**	**447**
WB4KRH	"	268,180	447	253
WB4VQO	"	150,000	288	200
W4OGG	"	10,248	64	56
W4ZTW	**21**	**366,210**	**514**	**313**
K4EZ	"	207,644	340	244
WB4FOT	"	66,693	191	141
N4KE	**7**	**172,912**	**337**	**202**
KA4DSL	**7**	**110,176**	**307**	**176**
KG4W	**3.5**	**101,386**	**302**	**163**
N4RA	"	14,560	121	91
WD4GCE	"	2,592	64	54
K5MR	**A**	**1,803,221**	**1695**	**427**
K5NW	**A**	**1,635,008**	**1485**	**433**
AF5K	"	1,013,061	1112	399
AE5Y	"	703,755	935	351
K8TE/5	"	468,526	691	317
KB5FU	"	385,113	783	303
K5DB	"	349,020	537	277
K5FUV	"	246,684	406	244
WA5IYX	"	225,302	461	242
W5LSF	"	175,189	335	203
WA5SOG	"	174,336	356	192
KE5M	"	156,520	415	215
KA5W	"	137,376	308	212
N5JJ	"	127,664	293	202
K5DEC	"	121,520	293	196
WD5FLK	"	45,045	151	117
W5OB	"	22,310	113	97
W5SOD	"	11,343	71	57
W5EIJ	"	2,160	45	45
AB5N	"	1,410	36	30
WD5BEP	"	697	18	17
W5YQ	"	627	20	19
K5JA	**28**	**1,737,042**	**1542**	**447**
WA3OVC/5	**28**	**384,475**	**540**	**325**
K1DWD/5	"	273,962	443	257
N5BET	"	198,575	403	235
K5RF	"	189,772	343	227
KB5KZ	"	131,338	291	194
WD5IOE	"	117,775	272	175
W5EIJ	"	3,168	56	44
N5AU	**21**	**1,660,917**	**1292**	**493**
K5ZD	**21**	**596,298**	**853**	**298**
W5LKP	"	145,544	264	226
WD5GKD	"	65	5	5
W5FO	**14**	**1,007,678**	**1033**	**431**
W5WMU	**14**	**892,296**	**923**	**408**
KA5DAC	"	384	17	16
KB5QO	**7**	**26,322**	**104**	**82**
N5JB	"	5,394	32	31
K5UR	**3.5**	**136,686**	**414**	**209**
K6HNZ	**A**	**2,151,507**	**2071**	**381**
N6ND	**A**	**827,989**	**989**	**310**
AC6V	"	414,888	923	293
WA6NHB	"	206,703	463	194
W6BJB	"	201,790	463	170
WA6UFY	"	196,144	390	208
WA6TKT	"	125,347	288	163
N6HE	"	110,399	338	213
W6BYH	"	99,560	241	152
N6UW	"	46,748	165	124
WD6FLB	"	45,506	166	122
K60Q	"	27,050	188	50
W60UL	"	10,880	70	64
KB6FN	"	9,715	72	67
W60KK	"	7,776	63	48
K6FM	"	4,332	40	38
W6KBD	"	2,670	36	30
K60YE	**28**	**2,029,131**	**1949**	**423**
		(OPR: WA6VEF		
AI6V	28	1,957,020	2123	386
WB6MBF	"	329,268	527	276
N6HR	"	214,965	425	255
W6YMH	"	206,934	489	182
W6BIP	"	92,254	258	193
W60VO	"	25,080	110	88
W6NXB	"	1,395	33	31
WA6EKL	**21**	**2,109,104**	**2028**	**386**
WA6LFF	"	615,615	867	273
WA6DBC	**14**	**564,760**	**775**	**280**
W6CN	"	163,011	349	201
WA6KTZ	**7**	**81,360**	**182**	**120**
WB6JMS	"	8,190	77	63
N6VR	**3.5**	**7,316**	**67**	**59**
K6SE	**1.8**	**3,410**	**95**	**55**
AE6U	**1.8**	**3,360**	**77**	**48**
WA6EKJ	"	702	55	27
AI7B	**A**	**3,117,435**	**2870**	**411**
N7DF	**A**	**2,414,398**	**2218**	**413**
W7JYW	"	761,670	1147	279
WB7BNP	"	331,992	628	212
W7GUR	"	240,012	435	226
W7CB	"	129,344	290	172
K7NW	"	120,320	306	188
K7LZJ	"	115,415	293	205
W7TWL	"	87,516	276	143
WB7RFC	"	77,099	243	163
KA7BAY	"	56,992	176	137
WA7ZWG	"	45,426	150	113
KL7FDQ/W7	"	27,140	161	118
K7RS	"	21,902	120	94
W7RIR	"	12,096	85	64
W7EKM	"	6,732	67	51
AK7J	"	40	10	10
N7ABJ	**28**	**504,528**	**800**	**276**
W7AYY	**28**	**218,064**	**445**	**177**
WB7QFH	"	193,800	465	152
K7UR	"	155,408	387	176
WB7PSP	"	17,821	111	71
K7IDX	"	9,328	74	53
WA7STA	"	2,992	39	34
KA7AUH	**21**	**649,736**	**997**	**241**
W7LXR	"	114,855	272	155
W7EYR	"	3,060	36	34
W7ISX	**14**	**727,947**	**925**	**297**
W7FP	"	285,417	470	279
K7PM	"	3,996	38	36
KB8JF	**A**	**1,207,644**	**1131**	**471**
K8CW	**A**	**839,420**	**854**	**380**
W8TWA	"	570,149	689	281
N8ATR	"	376,134	522	278
N8BJQ	"	349,845	499	281
W8IMZ	"	302,708	492	266
WD8KXN	"	298,740	457	260
N8TN	"	191,470	354	205
N8AC	"	178,105	328	199
W8UPH	"	170,544	353	186
K8IQQ	"	81,928	209	154
N8AHK	"	70,356	235	164
N8ASM	"	68,911	204	137
WB8PAT	"	65,142	180	141
W8CIJ	"	54,412	160	122
AB8L	"	53,124	165	114
WB8SIQ	"	40,685	140	103
KB8IO	"	36,708	118	114
W8LKG	"	34,400	122	100
WD8JAB	"	28,968	120	102
W8ANM	"	28,458	135	102
WD8ECA	"	21,756	99	74
WB8QIJ	"	21,754	101	73
KB8DB	"	18,492	73	67
K8MR	"	8,060	61	52
WD8LCE	"	7,314	60	46
K8LDS	"	3,745	40	35
N8II	**28**	**1,440,285**	**1244**	**435**
W8TA	**28**	**947,159**	**944**	**383**
N8AKF	"	721,752	791	366
KB8PK	"	376,798	515	293
WB8TLI	"	234,734	362	241
WA8QIY	"	126,000	277	180
WD8MRF	"	70,347	187	131
KB8JD	"	35,000	133	100
W8MUA	"	26,299	137	91
WD8MJR	"	21,546	139	54
WA8NDE	"	17,388	90	69
N8AFV	"	6,348	57	46
N8JW	**21**	**1,761,563**	**1569**	**409**
WB8IFP	**21**	**865,865**	**1076**	**332**
K8TUY	"	3,200	37	32
K8NA	**14**	**1,229,436**	**1108**	**444**
N8BKX	"	630	15	15
KB8MU	"	234	9	9
W8SQ	**7**	**18,468**	**97**	**81**
K8JK	3.5	3,956	45	43
W8LRL	**1.8**	**6,956**	**160**	**74**
W9LT	**A**	**1,433,208**	**1219**	**449**
AI9J	**A**	**1,430,483**	**1247**	**461**
K9BG	"	447,096	577	312

KB9EW	"	212,135	380	203
WB9TDR	"	69,580	199	142
AI9P	"	53,724	162	121
N9BEM	"	16,188	101	76
WA9GFR	"	10,388	67	53
KA9AUS	**28**	**315,808**	**471**	**284**
KB9AW	"	96,976	228	176
WB9EBO	"	64,235	179	145
KA9DLZ	"	3,720	40	40
WD9IIX	**21**	**493,640**	**643**	**301**
WB9IWN	"	4,998	50	42
WA9YXY	"	3,597	42	33
K9CLO	**14**	**281,302**	**497**	**283**
WB9TIY	**3.5**	**53,200**	**299**	**140**
WD9DCL	**1.8**	**2,200**	**128**	**55**
WA8TKJ	**A**	**473,600**	**609**	**296**
WB8ISW	**A**	**315,216**	**482**	**264**
KN8KCW	"	162,504	400	244
WB8ZRL/8	"	31,588	111	106
WA8DCB	"	21,588	106	84
KB8U	"	4,602	40	39
K8CL	**28**	**664,400**	**916**	**275**
N8CC	**28**	**152,100**	**318**	**169**
K8TLM	"	47,838	142	119
WB8FHS	"	38,194	114	113
N8ASN	"	6,512	50	44
KB8C	**21**	**561,788**	**726**	**334**
W8UYL	**14**	**171,633**	**345**	**231**
KA8FPJ	"	6,955	68	65
AG8U	**3.5**	**64,372**	**414**	**154**
K8CS	"	59,584	259	152

ALASKA

KL7JAF	**A**	**63,248**	**196**	**118**
AL7Y	**28**	**104,493**	**225**	**183**
WL7AAN	**21**	**1,122,566**	**1390**	**298**
KL7AF	"	455,280	610	271

ANGUILLA

VP2EEU	**A**	**575,910**	**1065**	**237**

(OPR: W5IJU)

BAHAMAS

C6ACY	**A**	**4,516,893**	**3597**	**489**

(OPR: WA7UWE)

C6ANR	**28**	**18,216**	**113**	**69**

CANADA

VO1AW	**A**	**30,485**	**125**	**91**
VE1CCC	**28**	**240,051**	**481**	**213**
VE1BNN	**1.8**	**2,575**	**31**	**23**
VO2CW	**A**	**1,927,120**	**1614**	**442**
VE2FU	**7**	**478,848**	**464**	**232**
VE3GCO	**A**	**1,888,016**	**1319**	**464**
VE3JTQ	**A**	**591,798**	**642**	**318**
VE3DUS	"	429,975	550	273
VE3FEA	"	237,133	388	221
VE3MV	"	59,182	172	127
VE3EZU	"	57,687	162	123
VE3IZH	"	12,528	72	58
VE3BMV	**28**	**2,796,255**	**2120**	**495**
VE3FRA	**14**	**1,014,492**	**993**	**389**
VE3EEW	**7**	**413,324**	**537**	**191**
VE3IKN	**3.5**	**152,076**	**285**	**138**
VE3JAY	**1.8**	**72,696**	**233**	**78**
VE3ABG	**1.8**	**67,928**	**250**	**74**
VE3BBN	**1.8**	**25,376**	**122**	**52**
VE4RP	**21**	**90,751**	**243**	**151**
VE5AAD	28	1,276	26	22
VE6AGV	**A**	**789,600**	**1045**	**300**
VE6KW	**21**	**2,960,091**	**2332**	**459**
VE7FJ	**A**	**1,095,325**	**1349**	**275**
VE7BSM	**A**	**429,632**	**670**	**224**
VE7AZO	"	269,460	483	180
VE7CVR	"	137,750	390	125
VE7NI	"	4,060	40	35
VE7DQS	"	3,185	38	35
VE7BGK	**28**	**2,598,178**	**2805**	**374**
VE7DET	"	157,724	376	172
VE7CML	**21**	**2,973,955**	**2691**	**395**
VE7IN	**21**	**1,978,830**	**2029**	**349**
VE7VX	**14**	**601,839**	**822**	**287**

CUBA

CO2JA	**14**	**69,129**	**195**	**125**

DOMINICAN REP.

HI8LC	**21**	**56,156**	**158**	**139**

GUATEMALA

TG4NX	**7**	**107,206**	**204**	**121**

MEXICO

4A2MX	**A**	**2,076,125**	**1733**	**425**
6H1MEX	**A**	**1,913,152**	**2182**	**358**
6F1VOZ	"	914,577	1539	249
6E1J	**28**	**978,156**	**1119**	**324**

MONTSERRAT

VP2MGO	**21**	**2,943,574**	**2495**	**482**

(OPR: N4MO)

PANAMA

H31LR	**A**	**5,391,396**	**3805**	**558**

(OPR: HP1XQJ)

PUERTO RICO

W9VA/KP4	**28**	**93,654**	**365**	**121**
KP4WI	**3.5**	**364,994**	**406**	**203**

ST. MARTIN

FG8DYM/FS7				
	28	**3,304,752**	**2815**	**484**

(OPR: W4GSM)

VIRGIN IS. (BRITISH)

VP2VGB	**28**	**1,018,930**	**1205**	**295**

(OPR: K7SE)

VIRGIN IS. (U.S.)

NP2AE	**A**	**345,470**	**850**	**193**

AFRICA

CANARY ISLANDS

EA8TY	**A**	**295,536**	**376**	**262**
EA8JE	**28**	**793,476**	**1011**	**279**

CEUTA & MELILLA

EA9EO	**A**	**1,816,848**	**1395**	**396**

LIBERIA

EL2AV	**A**	**3,444,666**	**2166**	**498**

MADEIRA ISLANDS

CT3BD	**3.5**	**181,412**	**230**	**133**

ASIA

CYPRUS

5B4HF	**A**	**898,092**	**802**	**404**
5B4EP	**28**	**116,070**	**299**	**159**

ISRAEL

4X4VL	**A**	**2,509,713**	**1944**	**431**
4X4UH	**28**	**2,718,760**	**2221**	**440**
4Z4ZC	**7**	**36,414**	**100**	**63**

JAPAN

JR1WHW	**A**	**2,207,104**	**1908**	**401**
JH1EAQ	**A**	**1,991,724**	**1839**	**393**
JA2IVK	**A**	**1,220,083**	**1119**	**373**
JA1ELY	"	808,556	1080	272
JA1IDY	"	787,520	864	320
JA6CNL	"	724,489	793	323
JF1SEK	"	544,768	711	266
JA6BIF	"	387,552	519	264
JA1VPO	"	306,774	432	247
JJ1LWF	"	276,168	470	222
JR3XEX	"	216,739	410	193
JA5PEE	"	203,390	361	215
JA2OVQ	"	199,549	343	203
JK1QKQ	"	178,296	317	204
JR1JUR	"	177,230	389	185
JH1UUT	"	162,985	314	185
JI1PCN	"	139,564	305	164
JA1JVN	"	137,085	264	195
JA8SW	"	123,861	264	159
JA8FMB	"	122,257	237	179
JH7AJY	"	99,900	239	148
JH1LSS	"	82,008	239	134
JF3CCN	"	71,694	195	126
JA1ALX	"	68,249	171	139
JG3GQA	"	60,914	202	133
JA4AQR	"	57,933	166	123
JA6AKV	"	53,072	172	107
JA1IZ	"	43,656	140	107
JA1GTF	"	36,259	128	101
JA8EZR	"	30,014	121	86
JA4JKD	"	22,869	105	77
JA2EZR	"	22,190	109	70
JH6WIW	"	21,096	104	72
JJ1JJD	"	19,116	91	81
JH7JDB	"	12,238	75	58
JJ1GXY	"	12,144	122	69
JA1NOD	"	9,849	76	49
JA9XBW	"	9,381	60	53
JL1XLB	"	5,822	52	41
JG3VEI	"	5,762	49	43
JA4EII	"	2,496	32	26
JH2XTV	"	1,518	23	22
JA5CPO	"	1,365	23	21
JG3WND	"	520	20	13
JH6VCJ	"	444	15	12
JA3BCT	"	396	12	11
JF3PHY	"	168	8	7
JH1VRQ/P	"	18	3	3
JA6AUH	**28**	**1,784,613**	**1573**	**393**
JA7BSK	**28**	**1,351,680**	**1325**	**352**
JK1IYM	**28**	**1,241,100**	**1291**	**350**
JE3EPK/8	"	986,244	995	354
JH7JGG	"	834,960	867	355
JH1AGU	"	723,492	781	324
JH3GRE	"	593,776	732	296
JF3KNQ	"	400,862	527	266
JA8MKZ	"	385,848	515	276
JH2JUK	"	378,780	568	236
JA3EQC	"	367,521	546	231
JA1JKG	"	339,200	545	212
JH1ARC	"	237,762	438	189
JL1BLW	"	202,446	359	207
JA3BBG	"	189,357	318	213
JL1CGL	"	186,381	370	177
JJ1WPU	"	179,982	360	198
JA1FO	"	114,636	246	164
JA3HGL	"	112,797	267	151
JH7WKQ	"	100,350	244	150
JE3FUN	"	97,314	232	147
JA1EEG	"	75,072	210	136
JG3XKP	"	73,788	211	129
JA6PL	"	54,960	165	120
JH2OAN	"	42,432	138	104
JH4QJT	"	33,761	131	91
JA8OOE	"	32,680	125	95
JH1NHY	"	32,305	128	91
JK1NSR	"	26,622	118	87
JA3HUL	"	17,500	94	70
JA7GAX	"	14,940	84	60
JA1AAT	"	11,832	70	58
JR3QCT	"	8,550	63	50
JA9JKL	"	7,050	55	47
JA3MDI	"	4,095	40	39
JE3CRA	"	2,200	31	25
JA7FMZ	"	408	12	12
JH1FJK	"	108	6	6
JF2LTH	"	20	4	4
JR6RWY	**21**	**492,975**	**812**	**313**
JA60KB	**21**	**1,125,672**	**1226**	**408**
JA5JCC	21	436,540	541	299
JH5FXP	"	314,056	567	296
JK1PLZ	"	302,489	453	257
JK1VSP	"	264,096	429	252
JH7RVD	"	235,334	433	209
JF3NLQ	"	164,010	343	213
JG3KKY	"	163,986	331	181
JA1DCO	"	151,590	310	186
JA8CIY	"	150,588	288	188
JA8DHI	"	125,280	272	174
JK1FWR	"	113,900	251	170
JM1FHL	"	91,020	253	148
JR4BVD	"	90,244	207	154
JK1JSB	"	64,134	203	126
JH8CZQ	"	55,660	183	121
JF3PLF	"	40,934	162	97
JH8CWX	"	34,740	145	90
JH4PPQ	"	30,527	131	89
JF1FTU	"	24,240	119	80
JA1HQS	"	22,436	103	79
JI1AJK	"	21,406	106	77
JM1HXU	"	20,075	106	73
JH8FGM	"	20,022	103	71
JM1CPA	"	18,084	100	66
JE3XWJ	"	13,824	79	64
JR1IGA	"	12,780	75	60
JF2PHW	"	10,476	71	54
JA4PWH	"	9,792	67	51
JR4HVF	"	9,063	76	53
JH7PWS	"	8,364	56	51
JF2AFJ	"	5,358	51	47
JM1HEW	"	5,130	51	38
JA6AQV	"	2,880	32	30
JG3JXW	"	2,100	33	25
JK1VVP	"	1,875	27	25
JH5KKM	"	1,872	28	26
JR7RHT	"	870	20	15
JA8JK	"	765	20	17
JG3LLS	"	559	15	13
JM1DUH	"	85	7	5
JA1YFL	**14**	**1,092,564**	**985**	**396**

(OPR: JA8JCJ)

JR1RCR	**14**	**620,574**	**777**	**293**
JA5MOU	"	294,742	447	259
JA5UBW	"	152,096	311	194
JA3AOL	"	58,438	187	122
JG3RDO	"	24,840	135	92
JA2TKO	"	22,041	111	79
JA6YY	"	16,827	98	71
JA4NOV	"	126	8	7
JA2BAY	**7**	**237,800**	**455**	**164**
JA6LCJ	**3.5**	**5,760**	**51**	**45**

KOREA

HL9KE	**A**	**2,231,046**	**2120**	**414**
HM1TR	**21**	**376,512**	**678**	**296**
HL9TU	14	1,463	27	19

KUWAIT

9K2DR	**A**	**519,929**	**674**	**277**

MONGOLIA

JT1AN	21	3,636	45	36

OGASAWARA IS.

JI1KMY/JD1	**21**	**22,236**	**207**	**68**
JD1AMA	**21**	**21,409**	**133**	**79**

SAUDI ARABIA

HZ1HZ	**A**	**812,922**	**847**	**327**

THIALAND

HS1ABD	**A**	**1,944,603**	**2056**	**433**

70-15-16

It was great discussing contests during the '80 Dayton Hamvention with these top ops. (L to R) Frank, 9Y4VU is the winner of this year's new South America Single Op Single Band Trophy. On my left Ed, N3ED, during the Contest Forum, received the trophy award for the Frankford Radio Club's HKØCOP Expedition. (Photo via WB4VQO)

Jay, N3AW, President, Frankford Radio Club, receives the W3RJ Trophy from CQ Editor, Alan Dorhoffer, K2EEK at the Contest Forum, '80 Dayton Hamvention. (Photo via W8IMZ)

At the '80 Dayton Hamvention, Hawk and I chatted about the outstanding participation from Aland Island. His SMØAQD/OHØ Multi-Single was 11th world high. The Single-Op stations DK5XN/OHØ, A/B;OHØXZ, 28MHz; OH3JR/OHØ, 21 MHz; and OHØAM, 14 MHz each attained 1 million plus scores. It was the most OHØ activity ever during a WPX contest. Thanks—W8IMZ.

U.S.S.R.

ASIATIC

UA9MR	**A**	**1,265,670**	**1507**	**369**
UA9OO	"	714,760	799	334
UA9UAR	"	82,960	273	170
UA9UTF	"	53,535	205	129
UA9HBA	"	24,190	113	82
UA9UPS	**28**	**1,007,109**	**1532**	**353**
UA9YE	"	852,321	1000	361
UA9OBS	"	295,470	501	245
RA9OEU	"	243,040	569	224
RA9FIA	"	71,709	178	159
UA9FDL	"	28,390	114	85
UA9CMS	"	24,934	102	91
UA9BQ	"	12,740	85	52
UA9FBV	"	4,171	51	43
RA9CIU	"	1,518	25	22
RA9FBZ	"	48	4	4
UA9MO	**21**	**550,550**	**766**	**286**
UA9XWU	"	127,834	294	161
UA9OS	"	47,676	147	116
UA9UOF	"	26,280	142	90
UW9CL	"	19,952	109	86
UA9TS	**14**	**70,856**	**206**	**136**
UA9AKJ	**3.5**	**46,104**	**123**	**68**
UA8AD0	**A**	**63,791**	**356**	**123**
UA8PJ	"	55,460	191	118
UA8CEY	"	38,967	180	93
UA8CCW	"	20,898	88	81
UA8ABC	"	5,966	54	38
UA8SAU	"	324	12	9
UA8SGL	**28**	**760,430**	**1020**	**341**
UA8KBO	"	263,672	724	184
UAØKAJ	"	258,960	653	195
UAØADR	"	152,556	374	174
UAØSGJ	"	67,848	305	132
UAØAAZ	"	13,560	78	60
UAØICM	"	8,415	86	51
UAØQCT	"	7,810	90	55
UA8QWB	**21**	**1,122,078**	**1791**	**346**
UA8LEO	**14**	**458,320**	**671**	**272**

ARMENIA

UG6LT	**14**	**209,718**	**419**	**183**
UG6JJ	"	108	6	6

AZERBAIJAN

UD6DER	28	1,026	19	18

GEORGIA

UF6QAC	**21**	**207,584**	**446**	**227**

KAZAKH

UL7LAW	**28**	**1,012,368**	**1089**	**393**
RL7PCV	**28**	**426,569**	**740**	**247**
UL7EAF	"	132,588	405	174
UL7GBP	"	5,292	49	36
UL7QF	**21**	**993,000**	**1517**	**331**
UK7GAL	"	3,232	35	32
		(OPR: S. YEVENKO)		
UL7PBY	**7**	**22,624**	**79**	**56**

KIRGHIZ

UM8MAO	**A**	**33,750**	**133**	**90**

TADJIK

RJ8JCF	**28**	**451,360**	**710**	**248**
UJ8JCQ	**28**	**285,480**	**561**	**234**

TURKOMAN

UH8HAI	**A**	**114,348**	**265**	**156**

EUROPE

ALAND IS.

DK5XN/OH8	**A**	**1,125,948**	**1210**	**404**
OH8XZ	**28**	**2,230,179**	**2252**	**357**
		(OPR: OH2KI)		
OH3JR/OH8	**21**	**1,605,317**	**1774**	**371**
OH8AM	**14**	**1,595,552**	**1772**	**419**
		(OPR: OH2BBM)		

AUSTRIA

OE2VEL	**A**	**623,918**	**697**	**314**
OE5CWL	"	133	7	7
OE3KTA	**28**	**211,055**	**404**	**191**
OE5CUL	"	168,168	463	132
OE3NPW	**14**	**815,100**	**985**	**380**

BALEARIC IS.

EA6EW	A	1,701	29	27
EA6DL	**28**	**158,295**	**407**	**183**

BELGIUM

OR6VK	**A**	**846,993**	**1122**	**371**
OR7ZV	**A**	**498,490**	**690**	**395**
OR4XG	"	292,950	494	270
OR7YD	**28**	**104,673**	**336**	**123**
OR5FV	**21**	**32,634**	**155**	**98**
ON6EB/M	"	240	12	12
OR6JG	**3.5**	**440,818**	**589**	**259**

BULGARIA

LZ1HP	**A**	**28,336**	**144**	**92**
LZ2ND	"	600	21	20
LZ2VU	**14**	**553,755**	**892**	**335**
LZ2VP	"	250,542	638	279
LZ2YJ	"	5,060	68	55
LZ2LF	"	24	4	3

CZECHOSLOVAKIA

OL7RZ	**A**	**3,632,040**	**2702**	**513**
OK2YAK	**A**	**968,604**	**1077**	**354**
OK1MSN	A	655,830	893	270
OK2TBC	"	644,061	854	319
OK3CJC	"	603,680	761	343
OK3EA	"	499,576	685	308
OK1AVD	"	290,750	632	250
OK1KZ	"	249,360	480	240
OK3CEM	"	161,001	390	201
OK2BSG	"	157,076	302	214
OK8ABR	"	89,784	329	172
OK3CKY	"	68,607	283	189
OK2BBI	"	68,016	192	156
OK1XC	"	67,326	218	147
OK3PQ	"	38,988	149	108
OK1XG	"	38,556	170	119
OK1FCA	"	25,806	118	102
OK1EP	"	16,198	97	89
OK2BJU	"	15,300	84	68
OK2SWD	"	14,600	69	73
OK1AAE	"	5,808	51	44
OK1IBL	"	5,508	55	36
OK2BJR	"	5,092	49	38
OK1AOU	"	4,032	64	48
OK3EQ	"	2,077	33	31
OK2PAM	"	1,674	36	31
OK1AMB	"	1,034	23	22
OK1TA	**28**	**2,647,546**	**2444**	**374**
OK3CFA	**28**	**736,803**	**987**	**261**
OK1DLA	"	95,370	249	165
OK2KWI	"	39,216	165	86
OK2QX	**21**	**235,097**	**405**	**233**
OK3JW	**21**	**201,802**	**393**	**214**
OK2BQL	"	197,457	414	183
OK2SLS	"	145,673	327	209
OK3CKF	"	50,419	195	127
OK3ZFB	"	44,800	198	112
OK2ABU	"	37,800	150	108
OK1ASQ	"	10,688	71	64
OK1PCL	"	1,428	24	21
OK3FON	"	768	17	16
OK2SGW	"	133	7	7
OK1FV	**14**	**452,194**	**707**	**311**
OK1AMI	**14**	**387,940**	**499**	**326**
OK2JK	"	298,321	575	269
OK1CIJ	"	102,704	330	196
OK2SPS	"	85,956	251	156
OK3YK	"	73,211	280	179
OK1ARI	"	56,889	261	147
OK1AJY	"	11,826	100	73
OK1OFA	"	10,080	109	72
OK2BBJ	"	7,750	72	62
OK1AGN	**7**	**188,976**	**358**	**186**
OK3TOA	"	8,236	70	58
OK1AVU	**3.5**	**138,746**	**389**	**173**
OK3YCL	**3.5**	**96,096**	**340**	**156**
OK2HI	"	66,196	255	134
OK1DVM	"	52,432	234	116
OK1MIZ	"	6,500	69	50
OK1DDS	1.8	98	7	7

DENMARK

OZ5EV	**A**	**1,795,560**	**1714**	**390**
OZ3SK	**A**	**1,794,048**	**1653**	**384**
OZ1CCM	"	160,060	398	184
OZ1AXG	"	39,710	159	110
OZ5JR	"	6,288	53	48
OZ1DM	"	3,003	45	39
OZ3FC	"	2,883	36	31
OZ1BUR	"	180	15	12
OZ6XR	**28**	**256,500**	**528**	**171**
OZ5GY	"	14,160	111	60
OZ3KE	"	6,302	55	46
OZ6IC	"	1,725	25	23
OZ1ZE/A	"	1,122	22	17
OZ1FAO	"	403	13	13
OZ7SG	21	303	11	10
OZ3ZK	**3.5**	**10,764**	**78**	**69**

ENGLAND

G3VAO	**A**	**480,396**	**754**	**294**
G2AJB	"	74,094	251	159
G4DMN	**28**	**1,796,208**	**1786**	**368**
G4BWP	**28**	**1,758,820**	**1818**	**340**
G3XBY	"	977,184	1212	288
G4DKT	"	121,511	298	169
G4AHO	**3.5**	**96,100**	**324**	**155**

FINLAND

OH1VR	**A**	**3,242,103**	**2730**	**437**
OH4SD	"	198,528	444	176
OH1CQ	"	148,944	376	214
OH2KP	"	129,332	321	217
OH3WU	"	80,613	250	159
OH7SC	"	76,720	225	140
OH6PA	"	72,414	213	149
OH1EH	"	68,000	230	100
OH7NW	"	65,688	213	161
OH9VE	"	24,644	137	101
OH2BTG	"	24,255	155	99
OH2VZ	"	11,100	75	60
OH1DA	"	7,296	62	57
OH2CZ	"	5,248	46	41
OH2BSV	"	4,950	63	50
OH2BSS	"	3,564	38	33
OH5AD	"	1,584	25	24
		(OPR: OH5LK)		
OH1PU	"	65	5	5
OH1IJ	**28**	**1,309,233**	**1484**	**309**
OH2FS	**28**	**360,910**	**665**	**193**
OH7XY	"	307,780	591	220
OH2BTI	"	78,548	230	146
OH6ZH/1	"	62,964	192	132
OH4TY	"	45,859	173	121
OH4PW	"	21,672	112	84
OH5OQ	"	243	9	9
OH3UJ	"	192	8	8
OH2RG	**21**	**2,483,300**	**2356**	**380**
		(OPR: OH2BRW)		
OH2YY	**21**	**1,524,762**	**1707**	**381**
OH2JQ	"	79,220	229	170
OH1PS	"	36,580	157	118
OH6DH	"	31,784	164	116
OH3TQ	"	21,420	106	102
OH1JP	"	940	21	20
OH3CU	"	851	25	23
OH5YX	"	15	3	3
OH2AA	**3.5**	**96,100**	**278**	**155**
		(OPR: OH2BNP)		
OH3PB	"	31,948	175	98
OH5NG	**1.8**	**760**	**21**	**19**

FRANCE

F6FBQ	**A**	**404,250**	**660**	**275**
F6EXQ	**A**	**206,910**	**408**	**242**
F6ENT	"	76,459	202	157
F8QB	"	60,830	210	154
F2RO	"	19,656	104	63
F6FNA	"	6,840	70	60
FZVO	**21**	**39,330**	**173**	**114**
F6FJE	"	19,210	108	85

GERMANY (FRG)

DK5AD	**A**	**1,079,544**	**1100**	**372**
DJ2YE	**A**	**341,122**	**524**	**254**
DJØUP	"	202,787	353	247
DL8FP	"	199,692	349	258
DJ3EJ	"	192,464	376	235
DL7PD	"	189,630	364	245
DF2RG	"	183,502	400	209
DK5DS	"	182,967	424	213
DL1KAV	"	148,470	420	202
DK5KJ	"	30,264	130	104
DK5OS	"	1,159	22	19
DL8PC	**28**	**2,214,912**	**1928**	**412**
DF8XC	**28**	**293,832**	**500**	**212**
DK5WQ	"	130,174	272	194
DF6LO	"	124,775	317	161
DF1OY	"	103,800	286	150
DL6QT	"	18,426	85	74
DJ4YH	"	5,371	49	41
DJØUY	**14**	**101,703**	**301**	**203**
DK8AX	**3.5**	**19,844**	**132**	**82**
DK3FB	**1.8**	**16,560**	**145**	**72**
DL8UI	"	418	23	19

GERMANY (GDR)

Y52WG	**A**	**612,436**	**813**	**341**
Y25PL/A	**A**	**498,004**	**871**	**314**
Y24NO/A	**A**	**436,568**	**613**	**242**
Y59UN	"	350,336	600	272
Y47ON	"	279,292	501	262
Y44ZK	"	234,876	487	222
Y37UF	"	145,961	490	227
Y38YE	"	138,740	396	140
Y34YC	"	112,077	348	189
Y35ZJ	"	110,176	316	176
Y44VC/p	"	108,488	350	191
Y22RK	"	105,492	351	177
Y45SA	"	104,576	260	172
Y51ZA	"	88,049	270	169
Y41ZH	"	76,638	251	159
Y25TO	"	73,134	192	102
Y44XD	"	58,872	301	132
Y32ZF	"	54,912	204	143
Y22WK	"	39,861	252	129
Y24ZG	"	35,581	146	119
Y37WJ	"	29,250	139	90
Y67UH	"	28,801	128	83
Y54ZL	"	26,334	129	114
Y37XJ	"	24,990	112	85
Y43VL	"	22,440	131	102
Y21HB	"	17,739	98	81
Y36ZM	"	13,351	103	79
Y59ZF	"	12,225	88	75
Y26HO	"	11,968	115	88
Y49WF	"	11,968	86	68
Y54ZI	"	11,180	77	65
Y57TH	"	10,496	76	64
Y86YL	"	10,070	80	53
Y55XL	"	6,440	60	40
Y21ZB	"	6,254	77	59
Y55XG	"	3,963	55	53
Y23IL	"	3,840	40	40
Y23OH	"	3,040	37	37
Y25XH	"	3,008	32	32
Y21JH	"	2,628	39	36
Y22DG	"	2,580	30	30
Y24GE	"	2,573	33	31
Y43ZN	"	2,204	30	29
Y62ZH	"	2,016	37	32
Y34YF	"	1,972	66	52
Y22YJ	"	1,911	40	39
Y38YK	"	1,586	27	26
Y26WI	"	1,360	45	34
Y43XL	"	1,122	23	23
Y41ZM	"	648	18	18
Y33TA	"	330	16	15
Y23ZF	"	297	11	11
Y53YF	"	273	14	13
Y51YF	"	242	12	11
Y33VA	"	220	10	10
Y57QM	"	210	10	10
Y38ZG	"	168	16	7
Y32OK	"	133	7	7
Y57YL	"	45	5	5
Y54VA	**28**	**601,290**	**809**	**270**
Y27FN/A	**28**	**444,096**	**740**	**216**
Y22TO	"	260,580	446	215
Y26EI/A	"	84,864	243	136
Y31SM	"	82,110	220	138
Y37ZE	"	75,480	212	136

Y37ZB	"	61,124	197	118
Y49UH	"	38,514	169	98
Y25FG	"	34,592	146	92
Y32RE	"	31,407	143	87
Y53WL	"	16,640	94	65
Y42ZL	"	6,680	67	40
Y37WE	"	4,180	40	38
Y76WN	"	3,190	39	29
Y56ZA	"	2,295	38	27
Y25RE	"	972	22	18
Y38ZA	"	800	18	16
Y62QN	"	504	16	14
Y53ZL	"	168	8	7
Y65TN	"	80	6	5
Y38YL	**21**	**63,216**	**215**	**144**
Y87XL	"	39,556	176	116
Y22FK	"	7,544	68	46
Y48ZF	"	520	14	13
Y43XO	**14**	**258,804**	**619**	**252**
Y26KN	"	28,435	172	121
Y39YA	"	14,620	119	86
Y22GC	"	12,382	105	82
Y23UA	"	4,848	60	48
Y25BL	"	2,318	40	38
Y26GN	"	1,007	19	19
Y2200	**7**	**10,140**	**86**	**65**
Y32YN	**3.5**	**164,164**	**458**	**182**
Y67XL	**3.5**	**150,304**	**481**	**176**
Y24CE	"	2,516	40	34
Y23DH	"	2,260	40	35
Y27HL	"	1,344	28	24

GREECE

SV8AR	**A**	**842,625**	**1097**	**375**

GUERNSEY (C.I.)

GU3YIZ	**A**	**230,776**	**456**	**182**

HUNGARY

HA5KBM	**A**	**985,125**	**1073**	**375**
		(OPR: JENO VAGO)		
HA2KMX	"	302,892	550	258
		(OPR: LASLLO CSEPANYI)		
HAØIG	"	61,336	207	136
HA9RU	**28**	**2,458,477**	**2290**	**383**
HG8KQX	**28**	**1,076,748**	**1260**	**318**
		(OPR: F. DEIM)		
HG9KPU	"	257,706	486	206
		(OPR: B. MIHALY)		
HA3HV	"	76,708	230	127
HA3HX	"	46,827	168	99
HG4XS	"	1,260	22	21
HA5GR	**21**	**165,851**	**382**	**203**
HA4XH	**14**	**1,109,250**	**1264**	**375**
HA1TQ	"	186,240	556	240
HA2MN	"	50,100	234	150
HA2MV	"	8,190	96	70
HA8KDA	**3.5**	**56,000**	**247**	**125**
		(OPR: L. ELEK)		
HA5KKO	"	48,024	223	116
		(OPR: I. FUJOP)		

IRELAND

EI1AA	**A**	**1,526,475**	**1561**	**425**
		(OPR: EI2BB)		
EI7CC	**28**	**265,290**	**489**	**222**
EI1DH	**21**	**82,492**	**291**	**164**

ISLE OF MAN

GD4HOX	**21**	**21,620**	**154**	**92**

ITALY

I6FLD	**A**	**3,300,804**	**2557**	**468**
IV3PRK	**A**	**2,947,725**	**2601**	**397**
I6NOA	**28**	**1,823,229**	**1783**	**369**
I2AT	"	392,370	605	246
I8GZO	"	85,556	287	146
I6ZJC	**21**	**927,936**	**1085**	**324**
IV3HSN	**14**	**2,091,012**	**1988**	**462**
I5FCK	**14**	**1,308,622**	**1276**	**422**
I8KPV	"	871,812	1112	366
I4NBS	"	75,420	327	180
I5NPH	**7**	**1,619,706**	**1056**	**363**
I2VRN	"	973,914	802	321

MALTA

9H3BA	**28**	**424,434**	**671**	**254**

NETHERLANDS

PAØFAW	**A**	**186,924**	**385**	**222**
PAØLIE	"	50,874	203	139
PAØYN	"	6,240	56	48
PAØTO	"	1,984	32	32
PAØINE	"	1,825	30	25
PA1GRE	"	1,155	21	21
PAØTV	"	171	9	9
PI1PT	**28**	**5,461**	**47**	**43**
PAØCF	"	560	14	14
PAØTVU	"	200	9	8
PAØRRS	**21**	**89,262**	**232**	**171**
PA3AWB	**14**	**68,229**	**306**	**171**

NORWAY

LA7JO	**A**	**2,536,638**	**2103**	**442**
LA9PT	**A**	**300,514**	**513**	**262**
LA9GX	"	166,665	388	205
LA2AD	"	59,494	211	151
LA9CQ	"	57,116	240	131
LA2GN	"	40,386	173	106
LA2CQ	"	10,290	78	70
LA6ZW	"	3,567	41	41
LA3EX	"	3,392	70	32
LA5WN	"	2,100	32	28
LA4HH	"	1,440	35	24
LA1KQ	"	1,428	28	28
LA2YT	"	540	22	20
LA5KO	"	160	8	8
LA9HW	**28**	**238,518**	**480**	**189**
LA6VM	"	67,134	222	134
LA8BX	**21**	**24,598**	**136**	**98**
LA4WV	"	9,333	87	61
LA2ZN	**14**	**109,386**	**349**	**206**
LA4KO	"	6,380	70	58
LA5YJ	**7**	**237,300**	**398**	**210**
LA5QK	**3.5**	**39,900**	**174**	**114**

POLAND

SP6IHE	**A**	**400,445**	**700**	**283**
SP7AWA	**A**	**203,400**	**443**	**225**
SP2AYC	"	173,880	467	210
SP9BLF	"	105,020	316	178
SP6EQZ	"	102,816	307	168
SP9AKD	"	77,100	222	150
SP2ZFJ	"	68,391	223	149
SR6CZ	"	68,096	238	152
SP6DMT	"	47,596	153	146
SR5ES	"	40,020	144	116
SP3DUE	"	24,225	149	95
SP1GHW	"	22,506	133	93
CT1DW/SP5	"	21,252	128	84
SR9FLY	"	20,659	102	73
SP2JUU	"	19,462	109	74
SR9ZD	"	18,216	114	92
SR6HAY	"	16,184	86	66
SP9EVP	"	13,081	131	103
SP9CTW	"	11,115	68	65
SP3IOE	"	7,182	93	54
SP6ECA	"	6,960	59	48
SP2FWC	"	5,292	50	42
SP5ENA	"	4,725	54	45
SR9BDQ	"	4,368	48	42
SP9AID	"	3,424	37	32
SP6AYP	"	555	17	15
SP6HRK	"	105	7	7
SP3DOI	**28**	**3,097,000**	**2796**	**380**
SR7ADS	**28**	**445,328**	**754**	**208**
SR7FTP	"	168,020	373	155
SP9FSH	"	58,016	180	112
SP5PB	"	25,276	129	71
SP6AGD	"	23,408	110	77
SP9AOA	"	7,252	54	49
SP9ADU	"	7,130	63	46
SP3CMA	"	5,760	47	45
SP3IBS	"	1,518	24	22
SP7CMR	"	290	11	10
SP9HWN	**21**	**153,360**	**449**	**180**
SP9JRZ	"	4,120	42	40
SP6JYQ	"	1,029	24	21
SR9BQJ	**14**	**399,652**	**670**	**293**
SR8GWI	**14**	**120,333**	**394**	**210**
SP9PEZ	"	110,320	374	197
		(OPR: SP92962)		
SR6FRQ	"	78,320	310	176
SP5EAQ	"	36,456	139	98
SP3PLC	"	20,381	127	89
SP7FQI	"	8,050	84	70
SP9EMU	"	6,936	97	68
SP5FLB	"	5,247	68	53
SR9BRP	"	4,462	56	46
SR9EEE	"	4,160	60	52
SP5IYV	"	4,134	65	53
SP9JBE	"	3,724	72	49
SR8DYS	"	2,948	56	44
SP8DYY	"	2,752	40	32
SP4JCP	"	828	20	18
SP7EJS	"	494	14	13
SP3GVX	"	400	17	16
SR9EMI	**7**	**14,112**	**96**	**72**
SR7CDG	"	8,208	87	54
SR5ALP	**3.5**	**168,388**	**489**	**178**
SR6DVP	**3.5**	**85,009**	**336**	**149**
SP1GZF	"	75,600	284	135
SR8EMO	"	54,412	237	122
SP9HZF	"	38,844	183	117
SP5INQ	"	22,098	125	87
SR6UK	"	11,300	89	75
SP7PBC	"	8,052	82	61
SR7CKF	"	9	3	3
SP9DH	1.8	84	7	7
SP2FAP	"	32	4	4

PORTUGAL

CT4QB	**A**	**606,400**	**981**	**320**
CT7AL	**A**	**302,081**	**547**	**247**
CT1AEW	"	2,925	40	39
CT4NH	**28**	**1,300,915**	**1385**	**385**
CT4UE	**28**	**1,033,502**	**1289**	**346**

ROMANIA

YO7APA	**A**	**105,625**	**321**	**169**
YO6AFP	"	69,782	215	146
YO6MD	"	56,388	202	148
YO6XA	"	34,668	170	108
YO5AVP	"	5,400	48	40
YO6OO	**28**	**56,760**	**190**	**110**
YO8FR	**14**	**84,258**	**290**	**186**
YO2II	**14**	**71,260**	**266**	**140**
YO3JW	"	70,040	240	170
YO8BSE	"	23,940	140	95
YO4AYE	"	4,160	54	52
YO3KSC	**7**	**35,148**	**170**	**101**
		(OPR: YO2BKG		
YO3JU	"	836	20	19
YO6KEB	**3.5**	**103,934**	**322**	**157**
		(OPR: SANDU		
YO6LV	"	32,970	160	105
YO8BGY	"	18,954	122	81
YO8CGR	"	16,576	120	74

SARDINIA

IS8WON	**21**	**562,071**	**844**	**309**
IS8QDV	**14**	**116,180**	**453**	**185**

SCOTLAND

GM5AXY	**A**	**12,358**	**90**	**74**
GM3RAO	**28**	**585,112**	**849**	**244**

SHETLAND IS.

GM4GPN	**A**	**799,140**	**1019**	**380**

SICILY IS.

IT9VOC	**28**	**999,194**	**1311**	**298**

SPAIN

EA2IA	**A**	**3,628,661**	**2547**	**509**
EG1ABT	**A**	**1,736,000**	**1813**	**434**
EG5ET	"	538,200	818	325
EG5FP	"	377,804	669	206
EG1QH	"	280,746	601	162
EA1JO	"	50,400	222	140
EG3WZ	**28**	**1,247,064**	**1682**	**273**
EC4BN	**28**	**86,655**	**296**	**159**
AN5ANR	"	79,695	249	161
EA2HW	"	20,202	102	78
EA1DM	"	3,204	40	36
EG3NA	**21**	**413,941**	**678**	**311**
AN2OJ	**21**	**258,066**	**541**	**243**
EG4AM	**14**	**324,890**	**588**	**255**
EG7AKQ	**14**	**161,896**	**432**	**196**
EG4CN	"	76,995	296	177
EA2CR	"	15,903	115	93
EG7ALG	**7**	**75,920**	**193**	**130**

SWEDEN

SM6CVT	**A**	**1,127,844**	**1250**	**354**
SM5CMP	**A**	**963,033**	**1104**	**391**
SM2IXM	"	894,887	1243	343
SM5CSS	"	720,375	854	339
SMØDJZ	"	516,284	705	337
SM7AIO	"	67,032	223	168
SMØCGO	"	59,472	224	144
SM5AAY	"	45,240	163	116
SM5BDV	"	33,495	140	105
SM4BTF	"	16,510	100	65
SM3CJA	"	9,601	73	61
SM7TV	"	8,279	62	57
SM3DMM	"	3,750	59	30
SM6HAB	"	2,870	37	35
SM5IKQ	"	2,460	34	30
SM7FSV	"	1,493	28	27
SM6HTC	"	1,211	23	23
SM5DQC	"	936	18	18
SM6JAO	"	672	16	14
SM6GQQ	"	644	18	14
SM6JVQ	**28**	**408,948**	**670**	**212**
SM2HEF	**28**	**223,008**	**440**	**184**
SM6FAX	"	212,264	475	169
SM5KDM	"	150,304	360	176
SM7IMK	"	62,992	204	127
SMØBDS	"	41,820	157	102
SM6KJG	"	39,066	164	102
SM7HSP	"	31,042	140	83
SMØCHA	"	24,192	116	72
SM3KWS	"	12,936	74	66
SM2CDF	"	4,305	47	41
SMØMC	"	3,700	38	34
SMØFM	"	3,535	37	35
SM5RE	"	1,564	28	23
SM7BOL	"	300	10	10
SL7AT	"	243	9	9
SM2ITW	"	90	6	5
SM5GMG	**21**	**2,192,940**	**2034**	**393**
SM2HAK	**21**	**1,504,629**	**1550**	**399**
SMØJOQ	"	39,162	163	122
SM7AIL	"	23,250	115	93
SM4BTF	"	16,698	91	69
SM6ID	**3.5**	**31,458**	**168**	**107**
SM6JY	"	200	10	10

SWITZERLAND

HB9AOO	**28**	**1,132,544**	**1730**	**224**

WALES

GW4BLE	**A**	**546,120**	**807**	**246**
GW4HBK	"	51,475	221	145

YUGOSLAVIA

YT2D	**A**	**5,291,218**	**3335**	**587**
YU2OB	**A**	**362,544**	**558**	**312**
YU7ECD	"	317,856	506	264
YU2OM	"	286,200	539	216
YU1NZW	"	163,068	349	214
YU3TKT	"	137,670	289	195
YU7NZR	"	61,640	181	134
YU7SF	"	53,430	241	137
YU5XAF	"	22,080	114	96
YU4WST	"	9,920	74	64
YU3TRI	"	3,296	35	32
YU3MY	**28**	**3,530,016**	**3133**	**412**
		(OPR: YU3EY)		
YU7BCD	**28**	**2,027,650**	**1902**	**379**
		(OPR: YU7OOI)		
YU1OBA	"	853,582	890	346
YU3DJK	"	763,686	1013	266
		(OPR: YU3TXU)		
YU2RGN	"	754,848	942	288
YU7PEF	"	109,158	295	138
YU4FRS	**14**	**2,091,740**	**1819**	**445**
YU1OFT	**14**	**848,040**	**1081**	**382**
YU3APR	"	93,624	385	188
		(OPR: YU3TAH)		
YU1PKC	"	3,936	48	41
YU3FK	**3.5**	**229,548**	**496**	**222**
YU4VBR	**3.5**	**217,752**	**466**	**211**

A new 28 MHz All-Time Asiatic record by David, 4X4UH. Vy FB.

Brice, W9PNE, a very active WPX QRPp contester, won the USA 9th District Certificate Award.

HM1TR is the Korean high scoring 21 MHz station. Jon says he hopes to use the new HL1 prefix in up-coming contests.

Andy, SM2GET checking the computer printout used to avoid dupe prefixes and stations at SL2ZZU.

U.S.S.R.

EUROPEAN

UA3DFK	**A**	**1,050,322**	**1305**	**377**
RW1AE	**A**	**919,632**	**1173**	**357**
RX1DJ	"	357,700	1225	292
RX3HR	"	337,221	650	267
RW3DH	"	278,052	417	282
UA3TN	"	186,300	485	270
UA3DDF	"	100,035	418	195
UV3MM	"	68,248	184	152
UA6AKT	"	57,252	206	156
RZ1ADN	"	41,745	161	121
UA3TAG	"	32,240	189	130
UA3PBY	"	31,512	149	104
UA3PDA	"	30,140	145	110
UA4CDC	"	28,665	129	105
UW3ZU	"	27,456	147	96
RZ3AGG	"	25,872	133	77
UA6ALT	"	25,704	143	108
UA4CO	"	20,000	112	80
UW3DZ	"	18,711	110	81
UA3TCI	"	17,372	109	96
UA3DJS	"	12,928	80	64
UV3CS	"	12,160	89	80
UA6AKB	"	8,142	70	59
UA4CM	"	7,072	73	68
UA3TAM	"	4,160	71	52
UA3QBP	"	4,059	48	41
UA3TCH	"	3,200	42	40
UA3IDT	"	1,056	24	23
UZ3TG	**28**	**533,316**	**984**	**294**
RA3DKE	**28**	**476,862**	**707**	**267**
RZ3AHF	"	259,505	573	215
UA3SBW	"	208,445	407	235
UA6ARK	"	170,382	402	219
UW6DR	"	169,116	579	204
UA4CZ	"	150,234	384	219
UA6AJG	"	118,160	333	211
RA3DPD	"	115,740	300	180
UA3LCU	"	105,525	241	175
RA3YCR	"	105,444	252	174
UA4QM	"	100,100	330	175
UA6UDB	"	79,464	272	172
UA6LXL	"	77,308	211	154
UA3DAT	"	34,937	199	161
UA3DLD	"	28,576	121	94
UA6LDJ	"	18,905	123	95
UV3NB	"	15,656	100	76
UA3TFA	"	9,985	64	49
UA4FCZ	"	9,976	75	58
RA3DOU	"	9,460	71	55
UW3UG	"	8,260	65	59
UA4HFG	"	7,236	62	54
UA4HFR	"	1,276	26	22
UA6AJF	"	858	23	22
UA3DAL	"	540	18	18
UA3DGI	"	464	17	16
UA1AWZ	"	231	11	11
UA3TDK	"	162	10	9
RW3FW	**21**	**2,918,564**	**2486**	**452**
RV3GM	**21**	**2,460,260**	**2450**	**422**
UA6LLT	**21**	**1,336,346**	**1378**	**418**
UA3QDW	"	885,924	1126	351
RZ3AKC	"	870,048	1306	342
UV3DN	"	762,600	1057	328
RX1MU	"	519,137	851	307
UA4ACP	"	47,570	222	142
UA3PAZ	"	46,230	182	138
UV3AP	"	24,900	129	100
UK1AAA	"	20,928	120	96
		(OPR: UA1169471)		
UA3QAQ	**14**	**577,914**	**905**	**366**
RX3HK	**14**	**514,228**	**1039**	**341**
RZ1AET	"	314,874	599	306
RX3DR	"	296,752	616	272
UA1CAI	"	235,431	466	259
UW3EH	"	170,100	439	252
UA4AEE	"	11,480	108	82
RV3HD	"	11,152	104	82
RZ3DFG	"	8,976	110	66
UK3DBA	"	2,697	39	31
		(OPR: P. SOKOLOV)		
UA3DEA	"	2,652	44	39
UA3ZBZ	"	2,414	39	34
UW4CI	"	1,175	35	25
RV3FD	**7**	**48,556**	**193**	**122**
UA3EAL	"	11,468	84	61
UA6LHU	**3.5**	**14,880**	**119**	**62**
UA4UBC	"	14,688	115	68

BYELORUSSIA

RZ2ACA	**A**	**2,289,231**	**1986**	**441**
UC2OAV	**A**	**271,268**	**533**	**292**
RZ2BF	"	12,948	84	78
UC2LBE	"	363	13	11
UC2OCH	**28**	**42,624**	**158**	**111**
UC2AFA	**21**	**85,624**	**253**	**154**

ESTONIA

RU2QD	**A**	**4,595,472**	**3389**	**504**
UR2RSA	"	10,962	124	87
RU2AW	"	10,962	80	63
UR2FQ	**28**	**645,660**	**899**	**255**
UR2RAM	"	491,921	924	233
RU2RER	"	5,494	64	41
RU2RCU	**7**	**169,650**	**423**	**195**
RU2CW	**3.5**	**62,872**	**257**	**116**
UR2RHK	"	42,228	231	102

KALININGRAD

UA2EC	**21**	**328,016**	**524**	**247**

LATVIA

UQ2CR	**A**	**99,671**	**383**	**187**
UQ2HO	"	14,129	83	71
UA2MU	"	748	19	17
UQ2GDO	**28**	**1,353,198**	**1614**	**303**
RQ2GAI	**28**	**256,662**	**509**	**189**
UQ2GGS	"	175,560	383	168
UQ2DZ	"	141,426	299	162
UQ2OP	"	35,464	174	104
UQ2GBR	"	21,093	107	79
UQ2IV	"	2,520	38	28
UQ2MF	**21**	**15,276**	**85**	**76**
UQ2GBU	**1.8**	**650**	**21**	**13**

LITHUANIA

UP2BAR	**A**	**1,783,631**	**1760**	**383**
UP2BEL	**A**	**446,071**	**723**	**307**
UP2BFE	"	109,335	323	185
UP2NO	"	50,840	216	164
UP2GF	"	44,954	234	133
UP2BDO	"	44,084	212	103
UP2PCE	"	36,915	158	115
UP2BDX	"	23,016	135	84
UP2BBF	"	15,120	115	84
UP2DM	**28**	**439,300**	**786**	**191**
UP2PAQ	**28**	**355,936**	**564**	**224**
UP2PBI	"	59,426	151	93
UP2OM	**21**	**622,045**	**960**	**235**
UP2PAP	**21**	**312,550**	**504**	**235**
UP2PAD	"	294,960	532	240
UP2AV	"	39,508	176	119
UP2BCD	"	28,847	133	91
UP2BAO	**14**	**439,544**	**774**	**329**
UP2BV	"	16,300	130	100
UP2NK	**7**	**497,014**	**704**	**271**
UP2OU	**3.5**	**153,888**	**414**	**168**

MOLDAVIA

UO5OGX	**28**	**18,000**	**101**	**75**

UKRAINE

UB5WE	**A**	**3,922,864**	**2838**	**496**
UB5MDI	**A**	**1,741,008**	**1874**	**456**
UB5AAF	"	89,033	271	161
UB5HDX	"	45,924	184	129
RY5AO	"	25,300	127	110
UY5YB	"	23,166	120	99
UB5UCH	"	17,430	102	83
UY5OO	"	1,456	28	26
UB5MCS	**28**	**1,941,819**	**1954**	**361**
UB5LAN	**28**	**883,183**	**1171**	**281**
UB5VAZ	"	872,154	1173	279
UB5OCQ	"	210,512	453	236
UB5CDF	"	207,613	393	223
UB5QAY	"	196,525	487	175
UB5VCD	"	174,990	351	190
UB5KAN	"	70,848	186	144
RB5IWF	"	36,472	155	97
UB5GES	"	32,600	128	100
UB5HBT	"	16,428	83	74
UB5MDP	"	7,440	73	60
UB5QFJ	"	468	13	13
UB5ABK	**21**	**883,460**	**1102**	**326**
UB5VAA	"	59,584	220	152
U5ARTEK	**14**	**144,837**	**425**	**209**
UY5TE	**14**	**73,920**	**360**	**168**
UB5SJ	"	69,764	230	163
UB5QBG	"	34,036	215	127
UT5HP	"	3,240	45	40
UB5VBY	**3.5**	**62,194**	**244**	**121**
UB5EGB	**3.5**	**53,286**	**222**	**107**
RZ5UWG	"	44,304	211	104
RB5IOV	**1.8**	**768**	**18**	**15**

OCEANIA

AUSTRALIA

VK6UL	**A**	**1,135,772**	**1217**	**332**
VK6NBU	**A**	**630,660**	**789**	**276**
VK6FS	"	302,500	477	220
VK6BE	**A**	**40,020**	**145**	**92**
VK5MX	"	432	12	12
VK6NE	**28**	**151,330**	**283**	**185**
VK2DCW	**28**	**38,263**	**162**	**83**
VK4NBP	"	192	8	8
VK4QK	**21**	**2,592,216**	**2198**	**396**
VK4VU	**21**	**2,576,646**	**2235**	**387**
VK5OU	**14**	**228,552**	**375**	**214**
VK3SM	**14**	**102,718**	**230**	**154**

GUAM

KG6DX	**21**	**2,340,184**	**3008**	**262**
KH6JSG/KH2	**7**	**277,398**	**483**	**99**

HAWAII

KH6GMP	**A**	**155,776**	**289**	**134**
KH6LW	**28**	**1,243,000**	**1567**	**275**

INDONESIA

YB8ACL	**28**	**544,152**	**783**	**246**
YC1BZ	**21**	**707,256**	**1260**	**188**

MARSHALL IS.

KX6PP	**A**	**525,050**	**841**	**210**
		(OPR: W4WDR)		

NEW ZEALAND

ZL3AAX	**A**	**371,028**	**664**	**196**
ZL1AGO	"	126,204	277	156
ZL4BO	**21**	**1,811,114**	**1571**	**397**

PHILIPPINES

W7LPF/DU2	**28**	**303,830**	**899**	**115**

WESTERN SAMOA

5W1BZ	**A**	**21,420**	**111**	**68**

STATION OPERATORS

Multi-Operator, Single-Transmitter

N4WW & K4HGM, KC4BH. **AG8W** & K8LF, AC8Y, AI8D, K8TK, K8MJZ, WD8DSV. **KD8B** & AA8U, N8AW, KA8AEE, WD8BDK, WD8BWN, WD8DTH, WD8SBJ. **WB8JBM:** AA8S, AI8M, K8US, KA8CSN, KA8HXC, N8AHK, N8ARA, N8DH, N8VT, W8MUA, WB8DQP, WB8LSN, WD8LEN, WD8OFP. **AI9F** & K9GS, W9OFV, W9PK, WD9IIC. **AK0A** & K0RWL, K0VBU, KA0BKT, KB0U, W0VWW, WA0ZHY, WB0LFY, WB0WAS. **W4PRO** & K4HZG, KB4LX, N4ABZ, W4HBK, WA4LMG, WB4RRA, WB4ZHQ. **AA2Z** & AB2E. **N6AV** & N6AW. **AD6R** & AJ8K, KA8EIB, N8BJL, WA8TBQ, WD8AXZ. **KB7KE** & N7ALS, N7AZM, W7DOQ. **AA4M** & KC4B, WB2ROJ. **K2VV** & NET Gp. **N4UF** & K4LK, WD4ITK. **N4NX** & NET Gp. **W6GNS:** N6AFZ, WB6RXW. **W6AB:** N6MB, W2KVA/6. **KT4U** & AA4FF. **AJ9Q** & N9ABU, KA9BTT, KA9ETO, KB9KN, WD9DTT, WD9HOZ, WD9ILG, W0HJ, WD0AQS. **K2AOE/8** & N8AK. **WA0CGV:** AI9G, KA0ACF, KA0ACI, KA0ETF, KA0GRH, KB0HL, N0AJ, WB0AJG, WB0OEE, WD0FSJ, WD0GML, WD0HBN. **WB3CZK** & WB3JRU. **KD2T** & WD2OOL. **W3CCH:** K3CXR, K3EUH, K3WUN, KA3ARQ, KA3AXE, KA3AXN, KA3BHQ, KA3BMO, N3AQL, N3ARI, WA3KBH, WA3ZGL, WB3DSV, WB3EPW, WB3FYL. **WD8SBM** & KA8DWL. **VP2E:** K8ND/VP2EEV & WD8ALG/VP2EEW. **HP1XRK** & HP1XKZ, HP1XOG, HP1XUL, HP1XAT, HP1XVY, HP1XDS, HP2XSG. **VE7CC** & VE7AAR, VE7CMN, VE7CYJ. **VE1DXA:** VE1AIH, VE1AVX, VE1FH. **VE7UBC:** VE7CNY, VE7CXC, VE7CMK, VE7DES, VE7COR, VE7CKK, VE7CKU, VE7BYK. **KP4VA:** KP4EFZ, KP4EMY, KP4FBT, KP4FMD. **HI6XQL:** W6KG & W6QL. **VE7SK** & VE7AV, VE7ENF, VE7ENI. **4U1UN:** DJ6LV & OZ7DX. **VQ9CI:** VQ9TT & CLUB Gp. **JH7YJF:** JA7DWU, JH7LRS, JH7NHE, JR7AUT. **JH1YJH:** JH1KRC, JL1AFF, + 3 Ops. **JH1YDT:** JA0VSH, JE1ARA, JE1QMV, JF1EAL, JF1EPK, JF1ODO, JK1DLQ, JK1RJU. **JA8YXI:** JA8ERG, JA8JCR, JA8OYC. **JA3ZRT:** JH3AIU, JH3FVR, JH3KWQ. **9A1ONU:** M1C, I6PLN, I4ADS, I4BFY, I4IND, I4LCK, I4LEC, I4RYC, I4USC, I4VEQ, I4VOS, I4ZSQ. **GB4DAA:** G3FXB, G3MXJ, G3ZQW. **F8OP** & F6CTT, F6EMT. **I3MAU** & I3BYT, I3EVK, I3FIY, I3GNX, I3ON, IN3DYG. **SL2ZZU:** SM2CEW, SM2EKM, SM2EZE, SM2EUO, SM2FYZ, SM2GET, SM2GXN + LENA. **SM0AQD/OH0** & SM0AJU, SM0GMZ, SM0GNU. **Y21YK** & Y23EK, Y24TK, Y24UK. **SK4NI:** SM4AIQ, SM4DVF, SM4MI, SM6CJK, SM6EOI, SM7DLZ. **PA2TMS** & PE1DTU, PA-2161. **DL0JK:** DF3AO, DF6ZH, DG6ZH, DK1DU, DK6FT, DK8ZL, DL8UI. **OK1KSO:** OK1AEZ, OK1AMF, OK1JCW, OK1WT. **HG6V:** 6 Ops. **EA6CE** & EA6BW, EA6CP, EA6ET, EA6EU. **G6UW:** G3ZAY, G3ZHL, G4FAM, G3YMH, BRS-32525. **G3RRS:** G3SJK, G3UKS, G3VPW, G4CEB. **SK7HW:** SM7BUR, SM7EKU, SM7IFK, SM7KCO, SM7MO. **Y23DL** & Y23CL, Y26DL. **I2PK** & I2CBM, I2CZ, I2RVW, I2SLA, I2YCF, I2JIP, I2YTG. **IY4FGM:** I1YUM, I4JMY, I4YNO. **TF3IRA:** TF3CW, TF3JB, TF3YH. **HA5KFL:** 6 Ops. **F6KAW:** F6AOJ, F6AUO, F6GBY, F6GDK. **G6CW:** G3TVY, G3YUT. **G8JC:** G3DEF, G3TQD, G3TQZ, G4FAT, G4FWR, G4JGD, G8ASO, G8NSL, G8NWR, G8TIC, G8TMG, G8TUP, G8TZE. **DL0WW:** DA1UY, DF1ZE, DF5ZF, DF7ZP, DK8WD, DL5FAV, DL6OE, DL8EZ, DC3ZM, DD9FB. **EG2TV** & EA1QF, EA1TH, EA2JG, EA2OP, EA2QU. **HB9H:** HB9AGC, HB9AIB, HB9CAT, HB9LG. **AN5AQX:** EA5ADI, EA5AMW, EA5AQX. **DL0UE:** DF3AV, DL3LU, DL7BI, DL8RL. **Y35ZM:** Y35LM, Y35NM, Y35VM. **SV0AE** & SV0YL. **DL0RCA:** DF3KJ, DF7KR, DJ1GX, DL2QB, DL4KE. **Y44ZI** & Y24RK, Y44VI. **HB9ALM** & HB9BAL, HB9BLQ. **HA5KKC/7:** HA5GQ, HA5KP, HA5LV, HA5MA, HA5MO. **HA7KSV:** 6 Ops. **HA0KLE:** HA0MJ + 5 Ops. **SR9PDF:** SP9BMQ, SP9FIH, SP9-2712. **OK3VSZ:** CLUB Gp. **HA3KNA:** HA3NU, HA3NS + 3 Ops. **PI1IRC:** PA0HNB, DL9BB/PA, G3XHK/PA. **PI1MHN:** PA3ADJ, PA3AIR, PA0INE, PA0JWR, PA0KHS, PA0TP, PA0VVH. **LZ1KDP:** 3 Ops. **HA4KYH:** HA4XX, HA4YK, HA4YO, HA4YQ. **DA2BS:** DA1FN, DA1MH, DA1QR, DA2WC, DF3GN. **DK7ZT** & DF3DE, SWL T. Bernitt. **IT9WPO** & 4 Ops. **HA5KKB:** HA5NK + 4 Ops. **Y32ZK:** Y24XA, Y32OK, Y32YG. **HA3KHC:** 5 Ops. **OK1KUR:** OK1AET, OK1AYE, OK1DRY, OK3CLD, OK3CWG. **OH2OT** & OH3CV. **SR1PBW:** SP1AMU, SP1JPQ. **SP5KMB:** SP5BHY, SP5GIQ, SP5IXI. **OH3AA:** OH3KS & OH3TQ. **SR9PRO:** SP9EWO, SP9LJD, SP9-3021, SP9-3367. **DL0BBS:** DF1PY, DF6PK, DF7PE. **OK3KII:** OK3CEI + Gp. **HA8KWG:** 3 Ops. **HA2KRZ:** 6 Ops. **LZ2KPB:** 3 Ops. **HA6KVC:** 4 Ops. **Y31ZJ:** Y31TJ, Y31WJ, Y47XJ. **SR9KRT:** SP9FKQ, SP9HMF. **YO9KAG:** YO9HP & YO9HT. **HA0KLF:** 4 Ops. **OK2KET:** OK2BHX + Gp. **OK2KMR:** OK2BQZ + Gp. **SP0PCZ:** SP9DKW, SP9DUV, SP9GPW, SP9IJX. **SP5KOH:** SP5GNG, SP5IXE, SP5IVU, SP5JSZ. **OK1KIR:** CLUB Gp. **OH5AB:** OH5BB, OH5KH, OH5ZN. **SP9KCB:** SP-0112 + Gp. **SP8PFI:** SP8LBO, SP8LBP, SP-0069/ZA, SP-0076/ZA. **I0OAY/0** & I0NLK, I0VUQ, IW0BCU, I0-59469. **Y64ZH:** Y64SH, Y64TH, Y64YH. **SP5KRD:** 3 Ops. **Y48ZN:** 7 Ops. **OK1KTW:** OK1AAE + Gp. **YO6KNI:** YO6XR, YO6AZL. **SR6PCL:** SP6BGL + Gp. **OK1KYS:** OK1FRF, OK1FVA. **HA3KHB:** HA3HU + 2 Ops. **SP7ZCO:** SP7-0001/PT + 2 Ops. **SR7KTE:** SP7IFM & Gp. **HG1KZC:** 2 Ops. **HA5KHS:** 3 Ops. **OK1KCF:** CLUB Gp. **OK1KZE:** CLUB Gp. **YO6KED:** YO6BTY, YO6UG. **Y62ZG** & Y62AG, Y62XG, Y2-9278/G. **ZL2AH:** 2 Ops. **HK4LRM:** HK4BKB, HK4DKR, HK4DUM, HK4FZ. **CE6EZ** & CE3NR. **ZV5JD:** PY3FJ & PP5JD. **UK9AAN:** UA9ACZ, UA9AEN, UA9AIS, UA9AJD, UW9BY, UA9AGR, UA9AKI, UA9165-1288, UA9165-930, UA9165-1382, EZ9AAA. **UK7LAH:** RL7LAH, UL7LEZ, UL7026133. **UK9CAE:** UA9CKC, UA9CPB, UA9154-365, UA9154-97, UA9154-1230. **UK9WBR:** 5 Ops. **UK9SAD:** 6 Ops. **UK7LAF:** 4 Ops. **UK7GAA:** UL7001899, UL7018136, UL7018252.**UK9UAA:** UA9UFR, UA9UKT, UA9130-190. **UK8MAA:** UM8MCY, UM8003672, UM8036124. **UK9CCC:** UA9CFP, UA9154-309, UA9154-841, UA9154-1057, UA9154-1403. **UK0SAR:** UA0124-121, UA0124-179, UA0124-340. **UK9ACP:** UA9165-942, UA9165-943. **UK0SAW:** 3 Ops. **UK9HAP:** UA9HBA, UA9158-366. **UK9CDI:** 3 Ops. **UK0AAQ:** UA0AAE, UA0103-285, UA0103-560. **UK0AAB:** UA0AGI, UA0103-114, UA0103-551. **UK0AAA:** 2 Ops. **UK2BBB:** UP2BAS, UP2BAW, UP2BBB, UP2BBF, UP2MB, UP2PX, UP2038517, UP2038597. **UK2PCR:** UP2BBT, UP2BBX, UP2BCR, UP2BCT, UP2BDF, UP2BEG, UP2BFI, UP2BFL, UP2BFN, UP2BGF, UP2PAV, UP2PCI, UP2038728, UP2038794, UP2081524. **UK5IAZ:** UB5IDZ, UB5IHO, UB5073342, UB5073837, UB5073151, UB5731619, UB5732077, UB5733137. **UK5MAF:** RB5MUV, UB5MDC, UB5MNM, UB5MNX, UB5MOA, UY5LK. **UK2BAS:** UP2BAA, UP2PAJ, UP2038609. **UK2PAP:** UP2BCI, UP2PAX, UP2OX. **UK2RDX:** UR2REZ, UR2RRJ + 3 Ops. **UK4WAB:** 7 Ops. **UK3SAB:** UA3SAQ, UA315128, UA315137. **RK3AAC:** UA3AGX, UA3AMR, UL7031151/UA3. **UK3QAE:** UA3QJW, UA3QKX, UA31211534. **UK6AAF:** UA6ABB, UA6AUN, UA6AZA. **RK3ACW:** UA3ABD, UA3ADY, UA3AEZ, UA3AFQ, RA3AGN, UA3170198. **UK5DAA:** UB5DBC, UB5VK, UT5DL. **UK5UDX:** UA4LAR, UB5CCP, UB5UAL, UB5065862. **UK5DAS:** UB5DAG, UT5DK. **RK2RAQ:** 3 Ops. **UK3DAH:** 3 Ops. **UK3ABF:** 4 Ops. **UK4ABZ:** UA4156646, UA4156732, UA4156676. **UK2OAA:** 2 Ops. **UK2FAD:** UA2FCN + 3 Ops. **UK4NBM:** 3 Ops. **UK3WAC:** CLUB Gp. **UK1OAZ/U1P:** 4 Ops. **RK2AAW:** UC2ACF, UC2009494. **UK3MAA:** 4 Ops. **UK3DBV:** UA3DFO & Gp. **UK2WAR:** 2 Ops. **UK1TAV:** CLUB Gp. **UK5EAQ:** 6 Ops. **UK5UBF:** 3 Ops. **UK6HBK:** UA6100574, UA6100575. UA6100588. **UK6LWA:** UA6150622, UA6150647. **RK2AAP:** 3 Ops. **UK2FAA:** 3 Ops. **UK5ICD:** 3 Ops. **RK5UAC:** CLUB Gp. **UK3TAY:** UA3TEW, UA3122862, UA3122060. **UK3DBF:** 3 Ops. **UK1AAF:** 2 Ops. **UK5QAD:** 2 Ops. **UK5GAC:** CLUB Gp. **RK2AAA:** UC2ABP, UC2ACK, UC2009473. **UK5AAO:** 2 Ops. **UK5QBE:** CLUB Gp. **UK5QBL:** UB5064335, UB5064445, UB5064446. **UK5FAB:** UB5FDP & UB5070436. **K3EST** & N3TR, WB4SGV, K3RV.

Multi-Operator Multi-Transmitter

VE7WJ & VE7AZG, VE7CSX, VE7ZZ/N7ZZ, K7SS, K7TU, N7AEM, W7EJ, W7WA, W7ZR. **KL7IRT** & AL7Z, AL7AK, KL7R, KL7AY, KL7BA, KL7GL, KL7AZJ, KL7ENY, KL7JHN, KL7JIZ, WL7AGG, WD0FIR & 2 Comp. Tech. **AL7H** & KL7HDS, KL7D, KL7Y, KL7M, KL7ITG, KL7JAR, KL7JCF, KL7JHD, KL7ET, KL7IB, WB6FZN, WB0UKN. **ZZ5CA:** PY5EG, PY5OW, PY5ZBU, PY2BW, PY5GA, PY5CA, PY5PS, PY5OGG, PY5EX, PY5OE. **GB4ANT:** G3JOC, G3LDI, G3MPN, G3VZT, G4BTY, G4GVW, G8HWD, G8LBS, G3XLL. **VK2BXQ** & VK2DDD, VK2DDQ, VK2APJ, VK2VAG, VK2YHA/NDK, VK2DHR, VK2BLC, VK2YRO, VK2BJI. **K3WW** & K3WJV, KB3GJ, W3BGN, N2ATX, KA3BLP. **W9ZRX** & N9MM, K9FN, W9ZTD. **JA4YFH:** JH4DIT, JA4XKL, JA4UDP, JH4BXA, JH4NFL, JH4MVB, JH4FMI. **JA7AA:** JA7UQA, JH7AEF, JH7CUO, JH7CUU, JH7IMN, JH7RVD, JH7UJN, JH7WTC, JR7OMD, JA9PPC. **K3ZJ** & 2 Ops. **VE7BFO** & VE7BYS, VE7CUP. **PP5CIT:** PP5MQ, PP5AIM, PP5DT, PP5AJ, PP5CFG, PP5WAL, PP5JA, PP5WAS, PP5WAQ, PP5HF, PP5CAX, PP5WAI. **VK3ANR:** VK3NOR, VK3YUB, + 12 Ops. **LA2Y:** LA3GX, LA3FX, LA1HZ, LA4MY, LA7MY, LA3IX, LA3HX. **JA0ZNA:** JH0GWO & CLUB Gp. **K5NA** & WB5SFS. **JA0ZGA:** 2 Ops.

SOUTH AMERICA

ARGENTINA				
LU5HDJ	A	**528,517**	**701**	**253**
LU8CW	"	151,776	363	204
LU8DO	**28**	**4,111,562**	**2792**	**494**
		(OPR: LU6EF)		
LU5FGG	**28**	**1,066,142**	**1258**	**301**
BOLIVIA				
CP6EL	A	**1,368,276**	**1268**	**364**
BRAZIL				
PY1NEZ	A	**823,140**	**913**	**306**
PY1ZBJ/PY8	A	**652,620**	**729**	**292**
ZZ4DD	"	242,520	365	235
PY2DJC	"	240,870	427	185
PP5EO	"	27,887	121	79
PY2FND	"	3,008	35	32
PQ4SA	**28**	**1,128,716**	**1056**	**362**
PT7LD	**14**	**8,950**	**63**	**50**
ZV1YCW	**3.5**	**6,256**	**41**	**34**
ECUADOR				
HD8E	**21**	**5,221,619**	**3124**	**559**
		(OPR: K7CA)		
HC1HC	**7**	**427,428**	**417**	**186**
GUYANA				
K9EF/8R1	A	**336,420**	**491**	**178**
NETH. ANTILLES				
PJ2CC	A	**6,521,098**	**4064**	**538**
		(OPR: N4RV)		
W1BIH/PJ2	**14**	**344,646**	**471**	**246**
PERU				
OA4AWD	A	**1,548,783**	**1374**	**333**
W7KEU/OA8	A	**833,368**	**1320**	**213**
TRINIDAD & TOBAGO				
9Y4VU	A	**4,430,544**	**2984**	**482**
URUGUAY				
CX9CO	A	**1,871,280**	**1530**	**414**
VENEZUELA				
YV2IF	A	**1,168,150**	**1050**	**383**
YV5GGE	A	**1,100,050**	**1013**	**350**
YX2AMM	**14**	**2,532,702**	**1913**	**447**
		(OPR: YV2AMM)		
4M3OS	"	238,368	426	208
4M4AA	**7**	**1,056,094**	**676**	**269**
		(OPR: YV4YC)		
4M3AGT	"	346,260	369	174
YV4CMF	"	27,528	81	62
4M3AZC	**3.5**	**852,548**	**589**	**262**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES			
N4WW	**4,087,675**	**2715**	**575**
K3EST	**3,781,888**	**2170**	**632**
AG8W	3,766,400	2752	550
KD8B	3,626,000	2480	592
WB8JBM	2,664,044	2077	529
AI9F	**2,202,704**	**2006**	**497**
AK8A	**1,916,728**	**1681**	**506**
W4PRO	1,766,535	1404	465
AA2Z	**1,762,992**	**1477**	**477**
N6AV	**1,686,300**	**1542**	**385**
AD8R	1,684,825	1523	475
KB7KE	**1,428,610**	**1493**	**365**
AA4M	1,326,346	1284	422
K2VV	1,263,555	1155	387
N4UF	1,018,080	969	420
N4NX	949,580	915	395
W6GNS	630,604	949	268
W6AB	577,570	813	259
KT4U	419,553	883	369
AJ9Q	181,630	886	205
K2AOE/8	150,480	410	176
WA8CGV	127,281	319	203
WB3CZK	**125,036**	**273**	**202**
KD2T	109,045	349	193
W3CCH	69,722	192	142
WD8SBM	14,938	92	77
NORTH AMERICA			
VP2E	**9,183,480**	**6031**	**618**
HP1XRK	**6,472,102**	**3895**	**602**
VE7CC	**5,283,124**	**4106**	**476**
VE1DXA	**4,946,670**	**2944**	**591**
VE7UBC	4,690,800	3597	450
KP4VA	**4,468,464**	**4020**	**496**
HI6XQL	**4,424,332**	**3121**	**521**
VE7SK	3,027,973	2736	437
4U1UN	**1,298,125**	**1364**	**335**
AFRICA			
VQ9CI	**988,500**	**1105**	**300**
ASIA			
JH7YJF	**2,676,079**	**2207**	**431**
JH1YJH	494,208	712	297
JH1YDT	281,064	436	239
JA8YXI	268,863	467	217
JA3ZRT	190,570	395	170
EUROPE			
9A1ONU	**13,362,486**	**6585**	**723**
GB4DAA	**7,621,888**	**4460**	**608**
F8OP	**7,426,120**	**4939**	**520**
I3MAU	**7,014,545**	**4462**	**555**
SL2ZZU	**6,491,169**	**4310**	**579**
SM8AQD/OH8	**6,003,580**	**3979**	**580**
Y21YK	**5,806,032**	**4052**	**516**
SK4NI	5,224,500	3610	516
PA2TMS	**5,121,450**	**3159**	**599**
DL8JK	**4,479,572**	**3092**	**529**
OK1KSO	**4,423,727**	**3053**	**511**
HG6V	**4,263,408**	**2951**	**556**
EA6CE	**4,153,990**	**3013**	**515**
G6UW	4,012,650	2685	555
G3RRS	3,926,048	2870	476
SK7HW	3,916,374	2845	519
Y23DL	3,854,286	3005	466
I2PK	3,419,400	2842	417
IY4FGM	3,390,240	2717	480
TF3IRA	**3,183,487**	**2888**	**503**
HA5KFL	3,181,380	2548	510
F6KAW	3,178,500	2658	489
G6CW	2,956,577	2467	467
G8JC	2,889,007	2249	437
DL8WW	2,836,875	2332	425
EG2TV	**2,716,056**	**2202**	**504**
HB9H	**2,610,335**	**2198**	**455**
AN5AQX	2,468,277	2393	441
DL8UE	2,446,178	2078	458
Y35ZM	2,422,578	2250	438
SV8AE	**2,270,830**	**2166**	**430**
DL8RCA	2,042,538	1742	437
Y44ZI	1,967,496	1848	438
HB9ALM	1,919,456	1828	451
HA5KKC/7	1,880,848	1747	437
HA7KSV	1,825,824	1753	429
HA8KLE	1,786,230	1603	446
SR9PDF	**1,757,547**	**1700**	**433**
OK3VSZ	1,702,260	1612	420
HA3KNA	1,698,120	1627	424
PI1IRC	1,582,715	1617	349
PI1MHN	1,436,376	1408	388
LZ1KDP	**1,217,223**	**1414**	**417**
HA4KYH	998,298	1092	378
DA2BS	**995,704**	**1252**	**284**
DK7ZT	890,280	947	360
IT9WPO	**830,367**	**1192**	**359**
HA5KKB	736,320	1003	354
Y32ZK	665,720	1024	340
HA3KHC	648,640	915	320
OK1KUR	644,457	783	331
OH2OT	**557,175**	**764**	**345**
SR1PBW	542,512	762	328
SP5KMB	504,038	695	302
OH3AA	495,496	739	241
SR9PRO	493,776	802	324
DL8BBS	472,250	737	250
OK3KII	431,475	682	275
HA8KWG	418,876	792	314
HA2KRZ	395,064	629	279
LZ2KPB	355,080	858	264
HA6KVC	330,624	613	288
Y31ZJ	243,120	548	240
SR9KRT	236,313	565	231
YO9KAG	**223,790**	**529**	**230**
HA8KLF	207,348	450	222
OK2KET	200,250	457	225
OK2KMR	175,236	402	204
SP8PCZ	167,535	426	219
SP5KOH	166,164	528	227
OK1KIR	165,648	365	204
OH5AB	151,920	332	240
SP9KCB	121,213	334	179
SP8PFI	96,624	361	183
I8OAY/8	62,040	282	165
Y64ZH	61,238	240	137
SP5KRD	48,180	208	132
Y48ZN	41,856	202	128
OK1KTW	31,031	147	91
YO6KNI	28,416	141	96
SR6PCL	24,970	165	110
OK1KYS	20,328	102	88
HA3KHB	17,578	147	94
SP7ZCO	16,368	150	93
SR7KTE	11,328	88	64
HG1KZC	10,348	71	52
HA5KHS	6,206	86	58
OK1KCF	5,130	55	45
OK1KZE	1,560	30	24
YO6KED	1,176	30	21
YU3DRM	1080	33	15
Y62ZG	100	10	10
OCEANIA			
ZL2AH	**1,339,800**	**1517**	**308**
SOUTH AMERICA			
HK4LRM	**5,194,682**	**3015**	**541**
CE6EZ	**3,959,805**	**3040**	**435**
ZV5JD	**3,334,080**	**2428**	**460**
U.S.S.R. CLUB STATIONS			
ASIA			
UK9AAN	**11,152,020**	**5091**	**560**
UK7LAH	**4,005,428**	**2910**	**532**
UK9CAE	3,067,361	2126	517
UK9WBR	1,673,802	1347	414
UK9SAD	1,200,745	1163	377
UK7LAF	1,157,057	1204	359
UK7GAA	1,013,828	1951	382
UK9UAA	979,455	1279	348
UK8MAA	**662,490**	**1005**	**306**
UK9CCC	652,482	1035	258
UK8SAR	**459,780**	**905**	**316**
UK9ACP	405,965	579	245
UK8SAW	297,642	641	226
UK9HAP	203,481	420	207
UK9CDI	102,269	336	137
UK8AAQ	60,456	216	132
UK8AAB	53,664	204	129
UK8AAA	47,092	180	122
EUROPE			
UK2BSB	**9,414,474**	**5231**	**659**
UK2PCR	7,107,358	4379	619
UK5IAZ	**5,666,185**	**3733**	**623**
UK5MAF	5,618,880	3847	576
UK2BAS	5,022,602	3823	481
UK2PAP	3,651,056	2708	496
UK2RDX	**2,950,587**	**2504**	**499**
UK4WAB	**2,484,460**	**2335**	**460**
UK3SAB	2,446,321	2114	457
RK3AAC	2,340,444	1975	492
UK3QAE	2,095,983	1837	521
UK6AAF	2,034,221	2007	497
RK3ACW	1,799,532	1845	444
UK5DAA	1,528,189	1433	437
UK5UDX	908,389	1151	409
UK5DAS	732,020	1071	340
RK2RAQ	600,568	892	328
UK3DAH	589,600	963	268
UK3ABF	572,814	976	363
UK4ABZ	465,617	954	281
UK2QAA	**395,641**	**803**	**289**
UK2FAD	**344,865**	**740**	**277**
UK4NBM	282,274	623	226
UK3WAC	221,440	390	220
UK10AZ/U1P	207,648	555	288
RK2AAW	203,580	409	290
UK3MAA	192,672	510	223
UK3DBV	177,100	440	230
UK2WAR	159,850	379	230
UK1TAV	129,920	470	203
UK5EAQ	125,244	343	196
UK5UBF	124,218	318	201
RK2RAN	122,320	330	176
UK6HBK	108,624	328	219
UK6LWA	107,352	405	189
RK2AAP	81,216	370	188
UK2FAA	78,939	265	147
UK5ICD	39,508	191	119
RK5UAC	38,622	239	123
UK3TAY	31,005	217	117
UK3DBF	28,126	137	98
UK1AAF	18,720	115	78
UK5QAD	15,257	85	73
UK5GAC	10,064	82	68
RK2AAA	8,500	107	68
UK5AAO	7,353	65	57
UK5QBE	6,844	70	59
UK5QBL	2,301	46	39
UK5FAB	1,539	29	27

MULTI-OPERATOR MULTI-TRANSMITTER WORLD WIDE

VE7WJ	**16,505,881**	**9043**	**653**
KL7IRT	**14,592,120**	**7842**	**680**
AL7H	13,539,202	7392	641
ZZ5CA	**12,545,616**	**6411**	**664**
GB4ANT	**7,945,168**	**4632**	**616**
VK2BXO	**7,885,176**	**5214**	**508**
K3WW	**6,385,880**	**3620**	**680**
W9ZRX	**5,417,178**	**3340**	**597**
JA4YFH	**4,960,614**	**3710**	**514**
JA7YAA	2,129,820	1737	420
K3ZJ	1,622,440	1301	470
VE7BFO	1,235,012	1570	283
PP5CIT	**1,157,244**	**1215**	**363**
VK3ANR	**1,116,882**	**1087**	**333**
LA2Y	**667,116**	**1917**	**348**
JA8ZNA	329,360	498	230
K5NA	**233,220**	**396**	**230**
JA8ZGA	25,564	127	77

CHECK LOGS: The following station logs were used for cross-checking. Check logs & SWL logs are appreciated. Thank You ... DL1AM/A, JM1FHD, JR1ZSG, JH3BJN, JA8BHA, LA4VP, LA5YV, LA6PS, LA8CJ, LA9ML, LA9PW, OK1DDS, OZ1CCB, PI1PT, RZ3ACL, SM7GCP, SP6ANY, SP6PZV, SR6PBB, UB5DAG, UF6HK, UK3AAI, UK3R, UK4CBL, UK4HBB, UK4YYY, UK5WAA, UT5DK, UW4NH, W8AD, W8BI, Y21DH, Y23PF, and SWL Stations: GERMANY (FRG)-DL-H33-170327I, GERMANY (GDR)-Y2-7684/E, KAZAKH (SSR)-UL7@1899

WORLD WIDE TOP SCORES
SINGLE OPERATOR

ALL BAND

PJ2CC	**6,521,098**	**K1AR**	**3,703,194**
H31LR	**5,391,396**	OL7RZ	3,632,040
YT2D	5,291,218	EA2IA	3,628,661
RU2QD	4,595,472	EL2AV	3,444,666
C6ACY	4,516,893	I6FLD	3,300,804
9Y4VU	**4,430,544**	OH1VR	3,242,103
UB5WE	3,922,864	AI7B	3,117,435

SINGLE BAND

28 MHz		21 MHz	
LU8DQ	**4,111,562**	**HD0E**	**5,221,619**
YU3MY	**3,530,016**	**VE7CML**	**2,973,955**
FG0DYM/FS7	3,304,752	VE6KW	2,960,091
SP3DOI	3,097,000	VP2MGQ	2,943,574
VE3BMV	2,796,225	RW3FW	2,918,564
4X4UH	2,718,760	VK4QK	2,592,216
OK1TA	2,647,546	VK4VU	2,576,646
14 MHz		**7 MHz**	
YX2AMM	2,532,702	I5NPH	1,619,706
YU4FRS	2,091,740	4M4AA	1,056,094
IV3HSN	2,091,012	UP2NK	497,014
OH0AM	1,595,552	VE2FU	478,848
I5FCK	1,308,622	HC1HC	427,428
K8NA	**1,229,436**	VE3EEW	413,324
HA4XH	1,109,250	4M3AGT	346,260
3.5 MHz		**1.8 MHz**	
4M3AZC	852,548	VE3JAY	72,696
OR6JG	440,818	VE3ABG	67,928
KP4WI	364,994	VE3BBN	25,376
YU3FK	229,548	DK3FB	16,560
YU4VBR	217,752	W8LRL	6,956
CT3BD	181,412	K6SE	3,410
SR5ALP	168,388	AE6U	3,360

QRPp

TG9GI	**A/B**	**855,336**	**OR8KD**	**A/B**	**365,928**
N2AA	"	808,080	JH4UTP	28	168,260
W4DR	"	492,002	WB4BBH	21	59,882

MULTI OPERATOR

Single Transmitter

9A1ONU	**13,362,486**	I3MAU	7,014,645
UK9AAN	11,152,020	SL2ZZU	6,491,169
UK2BBB	9,414,474	HP1XRK	6,472,102
VP2E	**9,183,480**	SM0AQD/OH0	6,003,580
GB4DAA	7,621,888	Y21YK	5,806,032
F8OP	7,426,120	UK5IAZ	5,666,185
UK2PCR	7,107,358	UK5MAF	5,618,880

Multi Transmitter

VE7WJ	**16,505,881**	GB4ANT	7,945,168
KL7IRT	**14,592,120**	VK2BXQ	7,885,176
AL7H	13,539,202	K3WW	6,385,880
ZZ5CA	12,545,616	W9ZRX	5,417,178

TROPHY WINNERS

Single Operator—All Band

WORLD - North Florida DX Assn. Trophy. Won by: **Station PJ2CC: Opr: Jack Reichert, N4RV.**

U.S.A. - Bob Epstein, K8IA Trophy. Won by: **John H. Dorr, K1AR.**

CANADA - Garth Hamilton, VE2VY Trophy. Won by: **Rick Burke, VO2CW.**

CARIB./C.A. - Ray Alea, KB8JF/KC4OV Trophy. Won by: **Station H31LR: Opr: Obie J. E. Johnson, HP1XOJ.**

JAPAN - Palm Garden Radio Club Trophy. Won by: **Masashi Tanaka, JR1WHW.**

S. AMERICA - Ron Moorefield, W8ILC Trophy. Won by: **Franklyn Brooker, 9Y4VU.**

WORLD - QRPp - Dayton Amateur Radio Assn. Trophy. Won by: **Germano Bezzina, TG9GI.**

Single Operator Single Band

WORLD - John N. Reichert, N4RV Trophy. Won by: **Station LU8DQ: Opr: Raul Diaz, LU6EF.** (28 MHz)

U.S.A. - Richardson Wireless Klub Trophy, Joe Johnson, W5QBM Memorial. Won by: **Station N2RM: Opr: Mark E. Millman, N2ME.** (28 MHz)

U.S.A. - 14 MHz - Bernie Welch, W8IMZ Trophy. Won by: **Theodore "Ted" Pauck, Jr., K8NA.**

CANADA - Gene Krehbiel, VE7KB Trophy. Won by: **Greg Dubord, VE7CML.** (21 MHz)

EUROPE - Myron E. Crofoot, WB4VQO Trophy. Won by: **Station YU3MY: Opr: Drago Turin, Jr., YU3ZV.** (28 MHz)

WORLD - 21 MHz - Lee Wical, KH6BZF Trophy. Won by: **Station HD0E: Opr: Alan Van Buren, K7CA.**

Multi-Operator Single Transmitter

WORLD - Mike Badolato, W5MYA Trophy. Won by: **Station 9A1ONU: Oprs: M1C, I6PLN** & Bologna DX Gang: **I4ADS, I4BFY, I4IND, I4LCK, I4LEC, I4RYC, I4USC, I4VEQ, I4VOS, I4ZSQ.**

Multi-Operator Multi-Transmitter

WORLD - Henry Thel, VE7WJ Trophy. Won by: **Station KL7IRT: Oprs: AL7Z, AL7AK, KL7R, KL7AY, KL7BA, KL7GL, KL7AZJ, KL7ENY, KL7IRT, KL7JHN, KL7JIZ, WL7AGG, WD0FIR, & 2 Comp. Tech.**

Contest Expedition

WORLD - Northern Ohio DX Assn. Trophy. Won by: **Station VP2E: Oprs: Jeff Maass, K8ND/VP2EEV & Jeff Clarke, WD8ALG/VP2EEW.**

SPECIAL CQ AWARDS - N2AA: U.S.A. QRPp Champion & **VE7WJ:** World High Score.

(NOTE: The WORLD-Club Competition Trophy is a combined S.S.B. & C.W. award. Winner will be announced with the C.W. results.)

prefixes—lacking common ones like K2, W1, WA3, etc...WB6MBF. As usual, *CQ* has the best tests...WA6KTZ. Thrills—working 175 JA's in an hour and being called by JT1KAN...AI7B. A fun contest but mobile home limits antenna...W7RIR. Biggest turn off was the number of jerks that kept calling the station when he was talking...WD8KXN. Spent first 2½ hrs. replacing the rear two sections of the band switch in SB-401...W8LKG. W8 QSL Bureau look out! I worked 273 JA's...N8II. Happy to work 6 new countries and many new prefixes...WB9TDR. Most courteous amateurs for a welcome change...N9BEM. 9A1ONU came back on my first call...KA9AUS. Thrill working 4U1UN on 80 meters ...KN0KCW. Traps got water logged—I made a big mistake when I assembled the antenna...K0TLM.

Completed 5B-DXCC...K0CS. My second contest in 30 years—really enjoyed...C6ANR. Strange condx—all contacts made with quad bearing NE @ 105 degrees...VE1CCC. 36 new prefixes—that's great...VE3GCO. I had to lay out the long wire with snowshoes on...VE3JAY. 10 meters had long skip conditions here, what a quiet band, hi...VE5AAD. Worked my first JA on 40 M...VE7BSM. The best contest in the world, I enjoyed it very much...HI8LC. My 3rd WPX Contest. 1978=9.5 K points; 1979=774 K points; 1980=1.9 Megapoints!!...6H1MEX. Propagation excellent. Only 8 duplicates in 1130 contacts...6E1J. Worked W0EEE, W6EE & N1EE in that order...VP2MGQ Op. N4MO. Finally worked KL7 good for 5BWAS, 5BDXCC, 5BWAZ, etc., on 80 meters ...KP4WI. Lost power for 3 hrs. Saturday afternoon...FG0DYM/FS7 Op. W4GSM.

I had to interrupt contest for QSY to CE0 (Easter) and FO8 (Tahiti)...LU8CW. I work-

U.S.A. TOP SCORES

SINGLE OPERATOR
ALL BAND

K1AR	**3,703,194**	N7DF	2,414,398
AI7B	3,117,435	N1GL	2,338,182
K2SS	3,109,825	K6HNZ	2,151,507
W2YV	2,928,254	WB3DNL	1,941,100
W1CF	2,624,460	W3FA	1,904,984

SINGLE BAND

28 MHz		21 MHz	
N2RM	**2,311,156**	WA6EKL	2,109,104
K6OYE	2,029,131	N2WT	1,921,266
AI6V	1,957,020	N8JW	1,761,563
K5JA	1,737,042	N5AU	1,660,917
KT4W	1,636,540	WB8IFP	865,865
14 MHz		**7 MHz**	
K8NA	**1,229,436**	N4KE	172,912
W5FO	1,007,678	KA4DSL	110,176
W5WMU	892,296	WA6KTZ	81,360
W7ISX	727,947	KB5QO	26,322
WA6DBC	564,760	W8SQ	18,468
3.8 MHz		**1.8 MHz**	
K5UR	136,686	W8LRL	6,956
KG4W	101,386	K6SE	3,410
AG0U	64,372	AE6U	3,360
K0CS	59,584	WD9DCL	2,200
WB9TIY	53,200	W2XQ	1,476

QRPp

N2AA	**A/B**	**808,080**	AB0X	A/B	156,950
W4DR	"	492,002	N0BNY	28	167,232

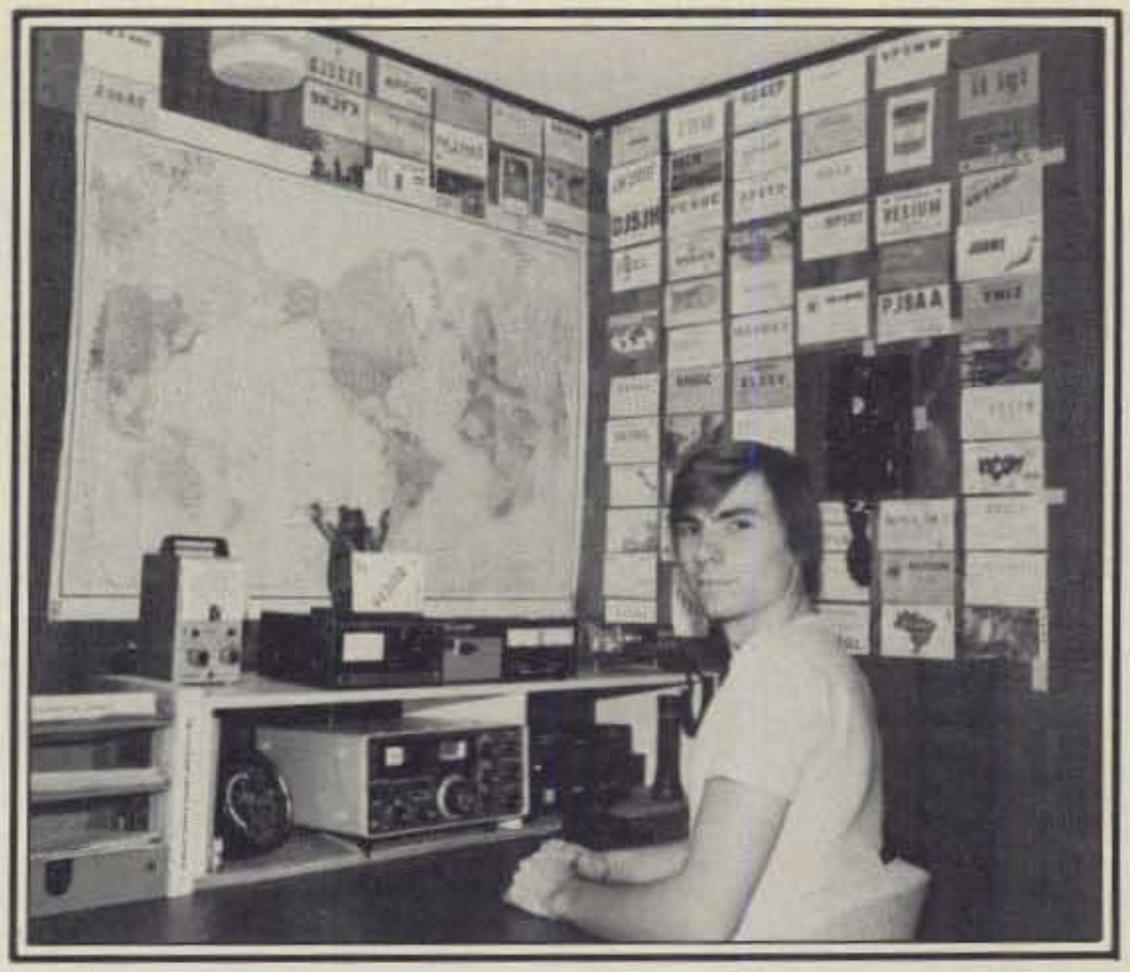
MULTI OPERATOR

Single Transmitter

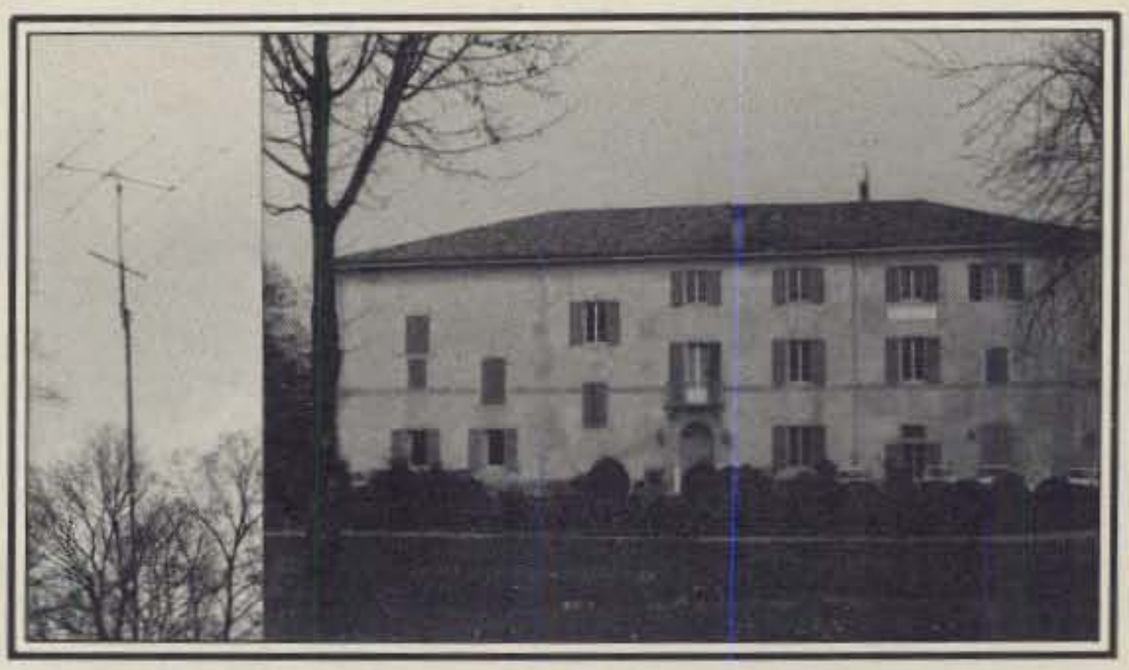
N4WW	4,087,675	KD8B	3,626,000
K3EST	3,781,888	WB8JBM	2,664,044
AG8W	3,766,400	AI9F	2,202,704

Multi Transmitter

K3WW	6,385,880	K3ZJ	1,622,440
W9ZRX	5,417,178	K5NA	233,220



Mike, VE3JTQ credits his UB5 background for his first certificate award winning effort in the WPX contest.



The famous Marconi Memorial and QTH of the unique prefix station IY4FGM, located near Bologna, Italy, was operated by I1YUM, I4JMY and I4YNO. The antennas are behind the building.

ed with special WPX, PQ4SA...PY4SA. A lot of QRM and QRN on 3.5...ZV1YCW. 15 meters open 24 hours a day and rare multipliers keep calling and calling... HD0E Op. K7CA. I found this contest much more interesting in respect to the DX contests...K9EF/8R1. Rig battery operated with a charger...W7KEU/OA8. From my home QTH with special PX, YX2AMM...YV2AMM. I wish I could persuade more guys down here to become involved, as it is, there does seem to be an increasing interest in contest...VK4VU. How come common prefixes will pull me in at S3 and rare ones I copy S9 + 40 can't even hear me?? Hi ...VK5OU. I had to work Calif. to get my own prefix (KG6)...KG6DX.

10 meters is alive and well...KH6LW. W's & JA's are excellent and courteous operators...ZL4BO. Biggest thrill—pile-up from east coast USA...JH1EAQ. Fantastic conditions into the east coast... JA7BSK. For this contest, I camped at the top of a mountain...JE3EPK/0. It seems to get bigger and better every year. Keep up the fantastic work for I for one certainly appreciate it...KL9KE. Great to work W2's over North Pole at 0500 GMT on 10 meters...HS1ABD. I hope to work full time next year...EA9EO. No problem deciding when to take time off. I just waited for a power outage...EL2AV. Pure 10 meter conditions...OE3KTA. Called by TZ4AQS...OZ3SK. My biggest thrill—CX9CO, D4CBC, PJ2CC.

Rotator stopped showing directions aerial was at—had to use torch out of bedroom window to check it...G3VAO. 12 new countries to take me to 201...G3XBY. Age 15 years, first WPX contest...OH1CQ. Nice to have one of the major DX contests in Springtime...OH2VZ. Could not operate too well on Sunday, the wind kept rotating the antenna...OH7XY. I had to babysit during the day—despite this, my best score ever made in WPX...DK5AD. Very enjoyable contest...GU3YIZ. Very frustrating for the single op, very difficult to "lose" 18 hours...EI1AA Op. EI2BB. New antenna system on 10 meters did a good job...IV3PRK.

Worked VK2VUQ/Mobile on his way to work in NSW...9H3BA. I hope the *CQ* contests will continue for a great number of years...PA3AWB. Some people still operate without call sign!...SP3DOI. VFB Contest...YO6MD. Thanks for the eyeball QSO in Dayton—really enjoyed the hamvention...SM0GMG. Storm force winds broke gear in rotor on Friday, beam stuck to S-W, tower cranked to third normal height—what a shambles!!!...GW4BLE. Bernie, glad you're back into WPX work again...YU7BCD Op. YU7OQI. This contest is really the big one...YU4FRS."

CQ World-Wide WPX/SSB Contest All-Time Records

By BERNIE WELCH, W8IMZ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be up-dated and published annually. The method of computing final scores changed several times since 1957. Data following the calls below are: year of operation, total score and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	VE3JAY('80)	72,696	78	AB	PJ2CC('80)	6,521,098	538
3.5	4M3AZC('80)	852,548	262				
7.0	I5NPH('80)	1,619,706	363		**Multi-Operator Single Xmtr**		
14	VR3AH('79)	3,526,153	437		9A1ONU('80)	13,362,486	723
21	HD0E('80)	5,221,619	559		**Multi-Operator Multi-Xmtr**		
28	LU8DQ('80)	4,111,562	494		CK7WJ('79)	16,545,370	590

AFRICA

1.8	No Entrant		
3.5	CT3BD('80)	181,412	133
7.0	ZD8CS('72)	40,230	45
14	CQ6LF('73)	1,138,047	309
21	9L1CA('79)	3,245,088	462
28	EL2AV('79)	1,874,140	415
AB	EL2AV('80)	3,444,666	498

ASIA

1.8	No Entrant		
3.5	4X4DK('71)	478,950	155
7.0	JA2BAY('78)	238,700	154
14	UK9ABA('71)	1,740,020	361
21	JH1BFF('79)	1,454,520	391
28	4X4UH('80)	2,718,760	440
AB	UA9ACN('78)	3,319,488	459

EUROPE

1.8	YU3EF('79)	17,136	56
3.5	DM2DUK('76)	526,750	245
7.0	I5NPH('80)	1,619,706	363
14	ON4UN('78)	2,122,999	433
21	YU3ZV('79)	3,225,380	415
28	YU3MY('80)	3,530,016	412
AB	YT2D('80)	5,291,218	587

Multi-Op Single Xmtr

AF	CT3/OH2BC('78)	4,377,450	385
AS	UK9AAN('80)	11,152,020	660
EU	9A1ONU('80)	13,362,486	723
NA	VP2E('80)	9,183,480	618
O	5W1AZ('76)	3,114,315	295
SA	HK4LRM('80)	5,194,682	541

NORTH AMERICA

1.8	VE3JAY('80)	72,696	78
3.5	W1CF('77)	460,908	186
7.0	W4BRB/C6A('76)	911,302	213
14	KZ5FR('78)	2,039,456	391
21	VE7CML('80)	2,973,955	395
28	FG0DYM/FS7('80)	3,304,752	484
AB	H31LR('80)	5,391,396	558

OCEANIA

1.8	No Entrant		
3.5	KH6XX('78)	305,080	115
7.0	KH6JSG/KH2('80)	277,398	99
14	VR3AH('79)	3,526,153	437
21	VK4QK('80)	2,592,216	396
28	KH6XX('79)	4,020,646	343
AB	KH6WF('79)	2,612,602	302

SOUTH AMERICA

1.8	No Entrant		
3.5	4M3AZC('80)	852,548	262
7.0	4M4AA('80)	1,056,094	269
14	YY2AMM('79)	2,751,776	452
21	HD0E('80)	5,221,619	559
28	LU8DQ('80)	4,111,562	494
AB	PJ2CC('80)	6,521,098	538

Multi-Op Multi-Xmtr

AF	9E3USA('69)	2,398,192	296
AS	UK9AAN('78)	10,702,776	532
EU	DF0DX('79)	14,145,000	690
NA	CK7WJ('79)	16,545,370	590
O	VK2BXQ('80)	7,885,176	508
SA	ZZ5CA('80)	12,545,616	664

CLUB RECORD

WESTERN WASHINGTON DX CLUB('79) 28,113,837

WPX (Prefix) RECORD

9A1ONU('80) 723

QRPp RECORD

TG9GI('80) 855,336

CQ WORLD-WIDE WPX/SSB CONTEST ALL-TIME U.S.A. RECORD HOLDERS

Single Operator

1.8	W8LRL('80)	6,956	74	14	K8NA('80)	1,229,436	444
3.5	W1CF('77)	460,908	186	21	N7XX('79)	2,862,488	376
7.0	K6JAN('75)	270,972	117	28	N2RM('80)	2,311,156	521
AB	K1AR('80)	3,703,194	513	QRPp	N2AA('80)	808,080	370

Multi-Op Single Xmtr

K4VX ('79) 4,344,340 572

Multi-Op Multi-Xmtr

K5JA ('79) 7,966,305 633

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Speed Range (WPM)	2-99	1-99	1-99	1-99	2-99	8-50	5-50+	?	8-50
Memory Capacity (Total Characters)	500			500		400	100/400	400	
Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
Real-Time Memory Loading Mode	Yes			Yes		Yes	Yes	No	
Automatic Word Space Memory Load	Yes			Yes		No	No	Yes	
Instant Start From Memory	Yes			Yes		No	No	Yes	
Message Editing	Yes			Yes		No	No	No	
Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
Five Letter or Random Word Length	Yes	Yes	Yes						No
Test Mode With Answers	Yes	Yes	Yes						No
Random Practice Mode	Yes	Yes	Yes						Yes
Standard Letters, Numbers, Punctuation	Yes	Yes	Yes						Yes
All Morse Characters	Yes	Yes	Yes						No
Advertised Price	**$199.95**	**$129.95**	**$99.95**	**$129.95**	**$79.95**	**$139.95**	**$ 99.50/ $139.50**	**$229.00**	**$129.95**

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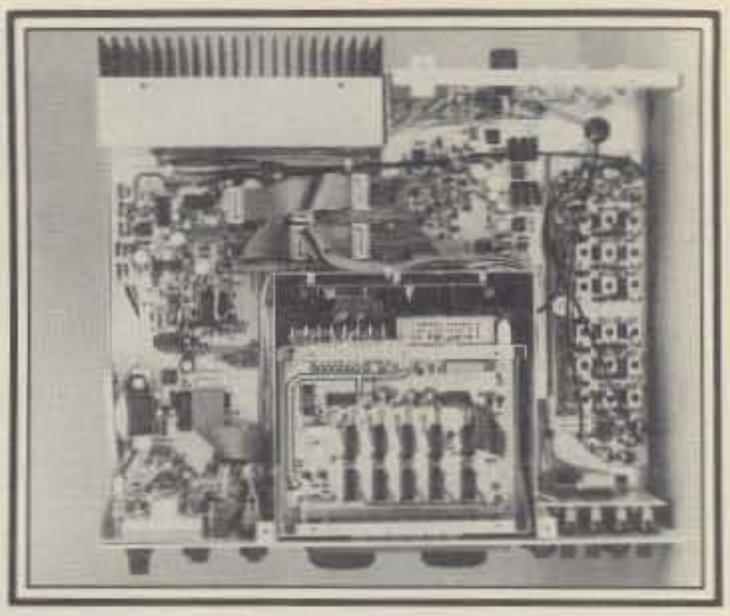
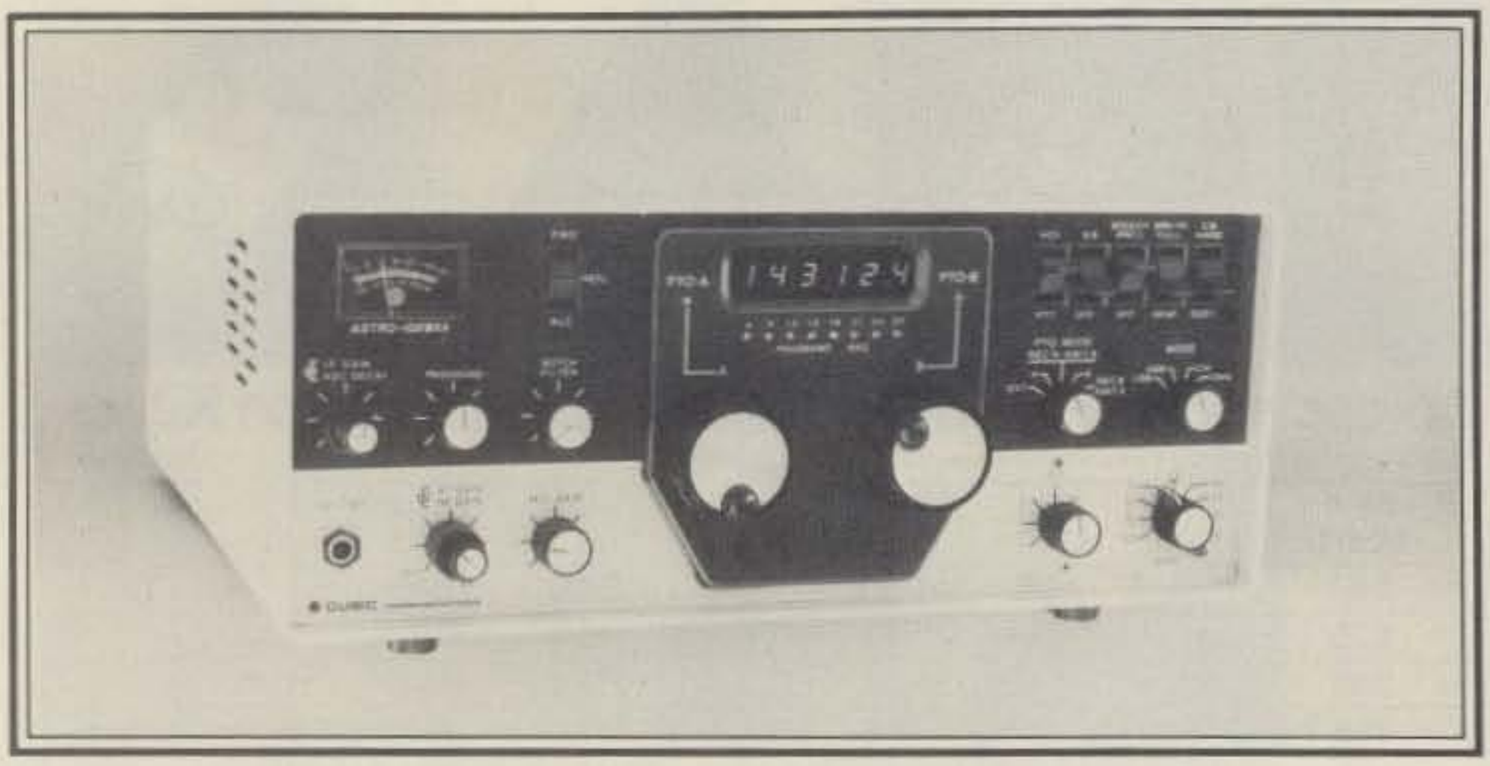
CIRCLE 75 ON READER SERVICE CARD

CQ Reviews: The Cubic Astro-102BXA H.F. Transceiver

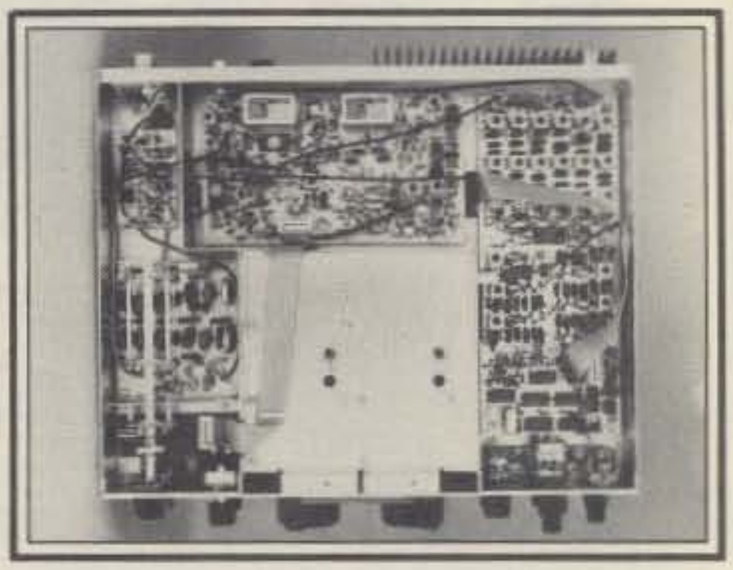
BY BOB MARGOLIN*, K1BM



The top view of the Astro-102BXA transceiver. Note the uncluttered layout and quality of workmanship.



The front view of the Astro-102BXA transceiver. You can follow the passband tuning by the little readouts below the main tuning dial.



Bottom view of the Astro-102BXA transceiver.

The first thing you notice about the 225 watt PEP, s.s.b. and c.w. 160 through 10 meter Astro-102BXA is the tuning arrangement. Located in the upper center of the front panel is a 6-digit LED readout. About half-way down the panel from the readout are two uncalibrated spin knobs labeled A and B, which control two independent PTOs. You can operate transceive off of either the A or B PTO, or split with the A PTO controlling either the receive or transmit function, and the B PTO controlling the other. The active PTO is indicated by LEDs located just above each of the knobs. Drift from a cold start runs a few hundred Hertz during the first 30 minutes or so, but the rig seems stable after that.

Whether you'll ever need the flexibility provided by this dual-PTO arrangement is hard to say, but it's nice to have if you should want to work split. And it's ideal if you regularly check into a net or want to monitor a specific frequency. Just set one PTO to that frequency and use the other as your working v.f.o. Of course, if you need still more flexibility, you can also use an external v.f.o.

*c/o CQ Magazine

When the 102 is operating transceive, the digital readout displays the operating frequency to the nearest 100 Hz. In the split mode, the readout displays the receive frequency during standby, and the transmit frequency when transmitting.

Another thing you'll notice is the lack of grid, plate, and antenna tuning controls. They're missing because the 102 is an all solid-state rig with a broad band output circuit. Because of the broad band circuit, you can use the twin PTOs to skip from band to band with nothing more than the flip of a switch, assuming, of course, you have a multiband antenna.

As mentioned before, the 102 covers 160 through 10. Each band is included in a 600 to 700 kHz switch-selectable segment, with 10 meters covered in four segments. Unfortunately, the Astro-102BXA doesn't receive WWV, which is a shame.

The tuning rate is about 25 kHz per revolution, so it takes about 20 revolutions to cover the 80 meter band. This is nc problem on the 102 because the tuning knobs and drives are as smooth as any I've come across, and can be "whipped" around at a good clip. Unlike some spin knobs, these are equipped with dimples that rotate inside the knob. Since the dimple maintains its relationship with your finger tip as you spin the tuning knob, there's no drag to slow you down. This may not seem like much, but it's the kind of nice touch that makes a rig more enjoyable to operate.

The 102 is equipped with receiver incremental tuning (RIT) that lets you shift the receiver frequency over a ±1 kHz range without affecting the transmitter frequency. When the RIT is used, the digital readout indicates where the receiver is tuned during standby, and the transmitter frequency when transmitting.

A push-on, push-off switch built into the RIT control engages the RIT. Although it is certainly a matter of personal preference, I found the switch spring a little too stiff. Cubic may have designed it this way, however, to prevent accidental engagement of the RIT. An LED located just above the control is on when the RIT is engaged.

The Astro-102BXA comes with two 8-pole crystal filters providing a 6 to 100 dB shape factor of 1.4 and a 2.4 kHz passband. If you're a c.w. op, you'll want to order the special c.w. filter—it's a 300 Hz bandwidth crystal filter that replaces one of the s.s.b. filters. The c.w. filter is cut in and out with the front-panel mode switch.

On some rigs, the passband tuning control adjusts the bandwidth somewhat like a peaking filter. Not so on the

102. As the passband control knob is adjusted from its center position, a continuously variable 8-pole filter narrows one side or the other of the passband. The result is a low or high pass filtering action that I found quite effective. Using it to best advantage, I could reduce side splatter from adjacent stations enough to pull through some weak ones that would otherwise have been unworkable. When the special c.w. filter is used, the passband control continuously shifts its center frequency over a 300 to 3000 Hz range. Just under the frequency readout is a string of eight LEDs labeled from .6 to 2.7 in .3 increments. These LEDs indicate the receiver's passband in kHz, and are another one of those "nice touches" you'll find on the 102.

The 102 also has a tunable notch filter that can be used to null out carriers or close-by c.w. stations. By itself, however, the notch isn't deep enough to totally eliminate very strong signals. But when used in conjunction with the passband tuning, most carriers can be reduced to a level at which they are not longer a problem. The notch is always active, so there's no need to spend time looking for a switch. Just turn the notch control until you hear the offending signal drop in strength.

A noise blanker is built into the i.f. immediately following the first mixer. Since I don't operate mobile in the low bands any longer, I can't testify to its effectiveness in a car. However, it did a good job on the ignition pulses of electrically noisy cars that occasionally passed by the shack. It didn't seem to have any ill effects on the quality of the received audio, but again, there's a big difference between running a noise blanker on the bench and in an automobile. A front-panel lever switch lets you cut it in and out of the circuit.

The other active receiver controls include a.f., i.f., and r.f. gain controls as well as a continuously variable a.g.c. decay-time control. All seem to work well. Because of the 102's broad band design, there is no preselector or antenna tuner. It's hard to say if they are really needed or not. When trying to copy a weak signal, especially in the presence of a stronger signal, a tunable front end can be very handy. Even so, I found the receiver's performance to be the equal of any I've come across.

On the transmit side of the 102's operation, a front-panel lever switch provides a choice of PTT or VOX operation; the ability to disable the VOX is a definite plus if your shack is on the noisy side. The VOX gain, anti-trip, and both the VOX and c.w. delay controls are inside the 102, but can be adjusted from the outside through holes in the cabinet, as can the mic gain setting. The VOX and c.w. delay controls can both be set for any time period between zero and about 2 seconds, which should be more than enough to satisfy any operator's needs.

The c.w. delay control adjusts the time the 102 remains in its transmit mode after you stop sending c.w. characters when operating semi break-in. However, the 102 will also operate with full break-in; the choice is provided by a front panel lever switch. If you've never operated QSK, you've got quite a treat in store, although hearing other nearby stations during the key-up periods can be a little unnerving until you get used to it.

In addition to a choice between semi and full break-in, the 102 also provided a choice of a fast-rise-time (hard) or a slower, rounded (soft) c.w. output envelope. As with the break-in, the choice between hard and soft c.w. is made by a front-panel lever switch. Although I could detect no overshoot on my monitor scope, the square corners of the hard c.w. envelope contain the harmonics that produce key clicks, so its use should be restricted to those "must have" contacts.

Although the c.w. operation is quite good, I'm unhappy with the built-in sidetone. Its frequency is fine, but the amplitude is too great. To adjust the sidetone volume, you have to go inside the cabinet and adjust a trim pot. The problem is that the range of useful adjustment is only the first few degrees

Test Report
Astro-102BXA

The Astro-102BXA received on loan from Cubic Communications, Inc. was evaluated and tested in accordance with their published specifications. The following results were found:

Intercept point + 6 dBm sensitivity, input voltage for 10 dB S + N/N

160m	.4μV
80m	.35μV
40m	.32μV
20m	.35μV
15m	.37μV
10m	.275μV

S meter calibration tracking above S9 for S9 = 50 μV. Notch filter 60 dB depth synthesizer noise sideband 125 dB/Hz 20 kHz off the carrier.

Transmitter

160m	105W
80m	104W
40m	103W
20m	100W
15m	99W
10m	99W

Two tone test at 15m IMD 27 dB per carrier.

Comment: Output power extremely sensitive to s.w.r.; s.w.r. 1.5 reduces output power to 70W. AGC overshot free −7 dB audio variation.

—DJ2LR

of rotation. After that, the sidetone is much too loud—it's downright uncomfortable when using cans! You can always modify the volume control circuit, I suppose, but it shouldn't be necessary in a rig of this caliber.

There doesn't seem to be any problem with the s.s.b. operation. A logarithmic-amplifier speech processor is built into the audio chain between the mic and buffer amplifiers ahead of the double balanced mixer. The amount of processing is adjusted by the internal mic gain control mentioned before. On-the-air tests with the processor in and out proved it to be effective in increasing the "punch" of the signal without introducing excessive distortion.

The front-panel mic level control adjusts the modulation percentage. I found the proper setting with the mic I was using to be about 11 o'clock, so there's plenty of reserve available to handle the less-sensitive mics around. This control also serves to set the c.w. key-down output power.

The 102 comes with a combination S-meter and s.w.r. bridge. Although the S-meter and forward power scales are calibrated, the s.w.r. is not. But the truth of the matter is that you probably don't need to know what your s.w.r. is; if the indication is more than a few degrees or so from zero, it's too high. If you're using a vertical, beam, or other "50 ohm"antenna, you've got a problem. If you're using an antenna tuner and a wire of some sort, the reflected-power indication is more than adequate for finding the null that indicates you've matched impedances.

The meter functions as an S-meter during standby, but when the transmitter operates, the meter automatically switches to one of its transmit functions. The transmit function is selected by a 3-position lever switch that lets you choose between forward or reflected power, or the a.l.c. voltage. I found the switch to be a little confusing. The panel cutout and lettering appear to be designed for a switch with 45-degree indexing, but the lever only moves about 15 degrees; at first glance, to me anyway, it always seems to be in its center position. A small point, to be sure, but one I found a little annoying.

The Astro-102BXA's c.w. output power rating is 100W into a 50 ohm load. The output circuit has a built-in v.s.w.r. shutdown protection circuit that limits the power to safe levels for all load impedances. With an s.w.r. between 1 and 1.7:1, full power is delivered to the load. This is reduced to 80% at 2:1, 60% at 3:1, and 25% with an open or shorted load.

As with most all solid-state rigs, the Astro-102BXA is designed to operate on 13.6 v.d.c. If you're going to run it in your shack, you'll need the Model PSU-6A a.c./d.c. power supply or some other source of 13.6 V at about 20 amps. If you do use a PSU-6A, you'll also get an on-off switch, which surprisingly is not built into the 102 itself, and a communications speaker that outperforms the small speaker in the 102. The front-panel phone jack on the PSU-6A is also more convenient than the 102's rear-panel jack.

Although the Astro-102BXA does suffer from a few minor shortcomings, it is overall a first-class rig that will meet the needs of most hams with room to spare. As a cliff dweller, I'm forced to run barefoot into a long wire up an average of 10 feet. Even so, the 102 has performed well. Being an inveterate county hunter, I've used it to work mobile stations running 100W into Hustlers barely 6 feet long with excellent signal reports both ways. Although operators with stacked monobanders and kw linears may prefer something more sexy, the 102 is about all the rig I can use, and I think that's about the most that should be said of any rig.

There is currently a model 103BXA on the market. This might infer that the 102BXA is about to be phased out, but that is not the case. The 103 (for a higher price) includes the three new WARC bands, an RTTY position on the mode switch, and a few other niceties. Cubic feels that you should only pay for what you can use at the moment, hence the 102. When the new bands come into being, you can get a modification kit which will update your 102 to a 103. The basic specs are the same for both units. The 102 sells for $1195.00, the optional 300 Hz filter is $82.50, and the PSU-6A power supply is priced at $189.95. These prices are amateur net.

For more information write to Cubic Communications, 305 Airport Road, Oceanside, CA 92054 or circle number 102 on the reader service coupon.

Acknowledgement

The data represented in the Test Report box was gathered by Dr. Ulrich L. Rohde, Ph.D., DJ2LR. Dr. Rohde is President of Rohde & Schwarz Sales Co., U.S.A. Inc., manufacturers of very fine, precision test equipment. He is also President of Communications Consulting Corp. and the designer of their HF-1030 communications receiver. We are fortunate in availing ourselves of his experience and well equipped laboratory.

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KA1FCB reports on one amateur's efforts to provide much needed information during the first crucial hours of the Italian earthquake.

Tuning up his rig, Uby gets ready to go on the air. (Photo by Bruce Kelly)

American Amateurs Provide Vital Link To Italian Quake Victims

BY MARC STERN*, KA1FCB

It struck without warning! Rumbling through southern Italy on a quiet Sunday morning in November, an earthquake ravaged the area with deadly effects.

Caught unaware, many Italian citizens were still in their homes when the buildings began to sway. Many doubtless wondered if the quake would subside. But this one wouldn't. In the short time it rocked the southern part of the Italian peninsula, the quake leveled many things in its path. Buildings swayed, then tumbled and fell in on themselves. Whole villages, which once dotted the map of Italy, were no more. Such was the devastation of this massive earthquake. In the few moments of its savage grip, the quake left its indelible mark on Italy.

The inevitable happened after the quake. Phone lines were torn asunder, power in the area was gone, and, in fact, all forms of communication with this area came to an abrupt halt. The first news of the quake that Sunday came to the United States in the early evening. First reports indicated it was a moderate tremor and the Italian government expected some casualties. But the real extent of the devastation was only known to the people in the quake's path. It wasn't until a full day later that the true extent of the destruction became apparent to the rest of the world.

Slowly, the dazed Italian citizenry realized the extent of the damage the quake had wrought on their country. The numbed survivors fled the ruins of what once were their homes. They were living in fear of another quake catching them inside.

Slowly, the relief effort began to get organized. The government began the grim search for the victims of the devastation. Searchers hurried to begin finding the living victims of the quake who were still buried under the rubble. As in every disaster, this is the first imperative—find the living quickly. At the same time, they also began the grim task of finding the dead.

There was another side of the relief picture, too. Thousands of dazed survivors were living, sleeping, and eating in the streets. They feared a new quake would bury them, too. They were without shelter as secondary shocks continued to rumble through the devastated area. The government had to find shelter for them quickly.

Back in the United States, the news still came haltingly. At first, it didn't seem the quake was too severe. But then more news began to come in, and the reports painted a grimmer and grimmer picture. But, there was another problem. The reports were conflicting. One report said 5,000 killed, while another said 10,000. There was really no reliable information. And, the news of the quake had another effect. With sketchy and conflicting reports in the background, many people in the large Italian communities in this country began to fear for their loved ones. Many people traced their roots to the devastated area and were very worried. But the information was still unreliable, and communication to the quake-ravaged area was all but nonexistent. Those lines of communication that were still open were taken over by the Italian government for official and relief work.

This was the situation in Boston, which has a large Italian population. And into this breach stepped the amateur radio community. Within hours of the quake some amateurs had established RTTY links with Italian counterparts, but there was still no organized communications effort, and there were many conflicting reports coming from Italy.

Realizing this, Ubaldo DiBenedetto, WA1TJW, of Cohasset, Massachusetts, went on the air in search of some friends on the Italian peninsula after hearing from a friend who is also an amateur. Some people in his amateur friend's neighborhood were concerned about their relatives in the quake-ravaged area. He asked "Uby" (pronounced "Oobee") as he is known by his friends to see if he could find out any information from that area.

Uby went on the air, but found 15 meters dead when he tried to contact the amateurs he knew in Italy. This was early Tuesday morning, roughly 36 hours after the quake. Even this far into the disaster situation the information coming from Italy was still sketchy and unclear.

But those neighbors weren't the only people concerned with accurate information on the quake. Since the information coming out of stricken part of Italy was still conflicting, a Boston newspaper also contacted Uby to see if he could find out any accurate information. Since Uby speaks fluent Ital-

*555 Worcester Rd., Framingham, MA 01701

ian, he was asked to help in the information effort.

So he kept at it and finally contacted Italian amateurs later on Tuesday. Working on 15, four amateurs established their own earthquake news reporting net. The Italian amateurs who joined this effort were IS0LMN, I6ZAJ, and I6OZP. For three days straight this amateur network provided accurate information to a community that was desperately in need of accurate reporting. The effort was rewarded with newspapers and a radio station using the information. It helped calm many fears, and gave the Italian community in Boston a link with the land of their roots.

Accurate information was "what was needed," Uby said in an interview. "The people here were anxious. Most of them (at one time or another) were immigrants from that area." "It seems," Uby said frankly, "that many people who came to the United States from the Naples area settled in the Boston, New York, Philadelphia area. A tremendous number of people needed news. The wires were out and not working and there were no reporters. The Italian government took over those lines which were left."

Conflicting reports added to the anxiety of the Italian community. "We tried to get a feel for the actual situation," he said. So, he asked two of the Italian amateurs, one of whom was from Northern Italy and the other who was from closer to the quake area, to monitor official government bulletins and listen to the 80 and 40 meter bands to hear news from other Italian amateurs. "At this time some papers told of 10,000 or 11,000 dead," Uby said, "and we discredited some of those stories. We brought the news that the people wanted and needed."

With his setup of two stations monitoring and one (in Sardinia) transmitting back to WA1TJW, Uby and his fellow amateurs brought accurate information to the United States. "We had updates every six hours. And we were able to combine a list of towns and the percentage of destruction in each. By Friday morning (five days after the quake's rumbling stopped) we had a good idea of what had happened," Uby said enthusiastically. This was the contribution of amateur radio to the earthquake information effort. "People here wanted ways to communicate," Uby said, "and amateur radio provided another way."

Another valuable contribution from this makeshift earthquake net was a list of nine phone numbers in Italy that concerned people could call to find out information on various towns. And, this impromptu net also passed health and welfare traffic. If a family feared for a relative, all the family had to do was give Uby the name and he asked his Italian contacts to find out. He brought relief to many families this way. (Uby's wasn't the only effort at communicating with Italy, by any means. Another group of Boston-area amateurs set up a health and welfare message net and passed traffic to an RTTY station that had established a link with an Italian RTTY station. They also received a list of the victims when the official count was released.)

But this is the story of one amateur's efforts and the rewards those efforts brought. It renewed his faith in the ability of the amateur community to pull together and provide emergency communications. "It was a beautiful experience" which provided Uby with a great deal of personal satisfaction "despite the background" against which it was set.

"It was very rewarding and reassuring," Uby said, "that once we were on the air, we played a part. . . . It demonstrated to me that this (amateur radio) is not just a hobby, but an institution that people should know. We are an organization that's worldwide" which ". . . serves the world."

Uby spent some long stretches at the microphone during his operations. He was at the mic seven or eight hours straight, with only relatively brief pauses for rest in between those stints. But, if you think he did yeoman work, his Italian contacts stayed with it nearly around the clock, providing their four daily updates and monitoring official broadcasts and the amateur bands.

The results literally amazed some people in the general news media. Uby said that thanks to his contacts' careful checking, the amateur community gave the people concerned about the quake an accurate picture of the destruction and injury the quake had wrought. The casualty figures the Italian amateurs compiled were so accurate that they agreed with the Italian government's own estimates. Those estimates weren't exaggerated, Uby said, because these amateurs "didn't exaggerate."

They showed a professionalism in communications that's hard to match. "Of all the services available for telecommunications, this is the only one that knows how to get on the air, handle traffic, and get on the scene of an emergency with mobiles and then relay that information," Uby said emphatically.

Uby was critical of some official communications networks but had high praise for the amateur community of which he is a proud member. "It's something when the papers have to come here to get their information," he said.

Uby DiBenedetto is a five-year veteran of the amateur radio service. An author who has published award-winning literary criticism, he has been involved in the communication of ideas for many years. Formerly a school teacher, he also taught at Harvard. He is now in the throes of writing his first novel.

Uby was well equipped to handle the emergency communication duty. His shack consists of a Yaesu FR-101, an SL 2100-D linear amplifier, a Murch electronic transmatch, a three-element Classic 33 beam antenna, an Astatic D104 mic, a Yaesu monitor scope, a Swan WM300 wattmeter, an Infotech M200E, a Ball video of RTTY, and "filters and other goodies."

Uby is a giving man, and also typifies the selfless spirit of the amateur fraternity. He has always spent his time trying to help improve the lives of others, and with his efforts in the Italian earthquake he has carried on his good work. But this story isn't about Uby only. It's also about the many amateurs who volunteered their time to help in the Italian quake's aftermath. They have proved once again the amateur community's willingness to help and to give freely of themselves. CQ

The OSCAR satellite program is destined to play a strategic role in the future of amateur radio communications, and the time to get in on the ground floor is right now!

Amateur Radio Frontiers— OSCAR Satellites

BY DAVE INGRAM*, K4TWJ

Many years ago, a very special era known as the Golden Age of Radio created excitement and memories that continue to pass through the annals of time. Those were the days of hearty techniques and amateurs with gusto, when almost any challenge was met and tried for its worthiness in our new frontier of radio communication. Although we've progressed greatly since those early days of wireless, the true spirit of the Golden Age still exists in a number of specialized communications frontiers. These frontiers include such unique modes as OSCAR satellite communications, Slow Scan TV, 10 meter f.m., EME, radio astronomy, QRP, etc. Each of these frontiers is, in a manner of speaking, in the prime of its development. The radio amateur considering new avenues of enjoyment and expanded horizons will surely find today's frontiers a refreshing return of the true Golden Age.

The information presented in this article will relate to one of these exciting frontiers: OSCAR satellite communications. In addition to discussing "general orientation" information, some basic techniques and concepts for successful OSCAR satellite operations which can be applied to both present and future spacecrafts will also be outlined.

History of OSCAR

The OSCAR amateur satellite program began during late 1961, when a small group of amateurs working at the Jet Propulsion Labs in southern California constructed a simple 2 meter c.w. transmitter, packaged it in an appropriate enclosure and secured a "piggy back" ride into space. A vast amount of planning and effort was described in that single statement; however, we will condense matters by emphasizing that that was the initial development of the "piggy back" launch and subsequent OSCAR spacecrafts. The approximate two-week lifetime of OSCAR 1 served to introduce amateurs around the world to satellite operations. Enthusiastic followers encouraged further developments, and additional OSCARs followed.

One of the most popular and successful amateur satellites to date was the first Phase II spacecraft, OSCAR 6. We were at the bottom of a sunspot cycle when OSCAR 6 began relaying 2 meter—uplinked signals into the then "dead" 10 meter band—and relay it did. The translator aboard OSCAR 6 performed magnificently for several years, proving any amateur could enjoy satellite communications almost as easily as low-band operating. Prolific satellite operators became accustomed to the relatively short time periods of passes, and the syndrome of blindly chasing a satellite across the evening skies was rapidly converted into a working concept. Then as the OSCAR 6 lifespan closed, OSCAR 7 was placed into a similar sun-synchronous low-altitude orbit.

Present OSCARs

Two amateur satellites, OSCAR 7 and OSCAR 8, are operational at the present time. Both crafts are setting extremely impressive "track records," although the older OSCAR 7 is beginning to show its age as this article is being written. If you would like to get involved with what can only be classified as the last of a Golden Age era in satellite communications, now's your chance. The challenge and meritorious credits associated with contest-style operations for low orbiting satellites will become cherished and respected memories once we've moved into the era of OSCAR 9 and subsequent Phase III satellites.

The benefits of OSCAR 7 and/or OSCAR 8 operations, namely precisely timed activities that can fit in with today's busy lifestyles, are particularly appealing to many amateurs. Orbital information initially is acquired from one of the monthly amateur magazines, and times of desirable passes are noted (remember these passes are given in UCT, and evening passes over the eastern U.S. thus will be listed as early morning passes on the following day). An OSCAR locator or Sattellabe Chart is then used to visualize the craft's flight during that specifically determined orbit and to sketch an antenna positioning chart for each two minutes of the pass. If this is one's first endeavor with OSCAR communications, a quick reference-frequency relation chart containing uplink/downlink correlations for each 5 or 10 kHz of the satellite's bandpass is also sketched and placed in direct view at the operating position. Armed with these two aids, the amateur is now ready to enjoy relatively hassle-free space communications.

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Communication Via OSCAR

The suitably equipped and duly informed OSCAR operator can run into his shack only one or two minutes before a selected pass begins, switch on the gear and operate like crazy for 15 to 18 minutes, switch off the gear and return to other activities. (Isn't broadbanded, solid state gear grand?) The operator's actions are governed by the previously mentioned pass plan and frequency relation chart, leaving only sheer communicating to be enjoyed. Assuming the satellite-returned signals become weak or lost, the operator instinctively continues following his charts to rapidly re-establish communications when that opportunity reappears. Remember to move along between QSO's at a steady pace when you're "into the satellite" for a maximum number of QSOs. Consistent use of this operating concept will soon place you high on the satellite achievement award listing and also multiply the pleasures of satellite work.

The amateur bands an OSCAR satellite operates are listed as modes. A summary of these modes is shown in fig. 1. While modes B and J are especially appealing from the standpoint of compact gear and small antennas, the satellite newcomer unfamiliar with u.h.f. techniques is urged to begin his operations with mode A. There are two main reasons for this suggestion: 1) since 2 and 10 meter frequencies are employed, the amateur can use existing or borrowed gear for this "introduction to satellite communications," and 2) a thorough knowledge of u.h.f. techniques isn't mandatory for mode "A". A semi-informed amateur could, for example, begin satellite operations with mode J, only to soon realize he wasn't hearing his strong downlink signal due to a lousy transmission line and poor connections between his expensive 70 cm antenna and receiver. This same amateur, however, will probably be familiar (or can easily and rapidly become familiar) with r.f. techniques utilized at 2 meter and 10 meter frequencies. One's existing amateur gear can also be used for mode A operations, thus providing OSCAR capabilities with minimal investments of personal time and effort. In other words, a relatively sensitive 29 MHz c.w. receiver, a 145 MHz c.w. transmitter and a couple of antennas are the only basic items you'll need to begin enjoying OSCAR communications during the next few days.

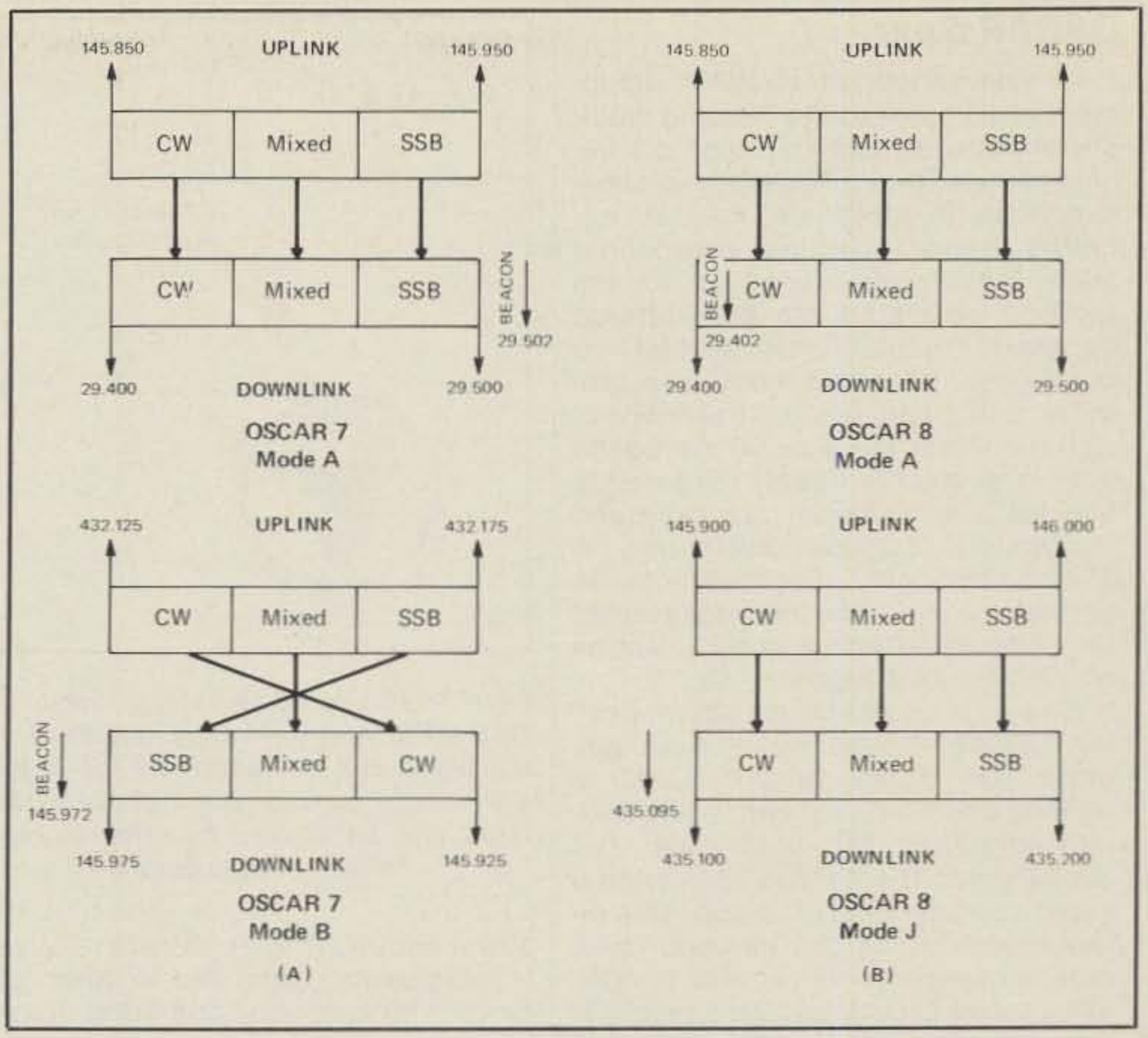


Fig. 1- (A) Modes of operation for OSCAR 7. Mixed areas can be used for c.w. or s.s.b. (B) Modes of operation for OSCAR 8. Again, mixed areas can be used for c.w. or s.s.b.

Fig. 2- A simple method of tilting the satellite antenna's mast to sidestep elevation rotor requirements. At the beginning and end of a pass the antenna is exactly horizontal, while the antenna is elevated approximately 40 degrees during mid-pass.

The situation of r.f. power is measured in satellite work as Effective Radiated Power, or ERP. Operational use of low orbit crafts such as OSCAR 8 center around maximum power levels of 100 watts ERP, which means transmitter *and* antenna gain are both considered when calculating one's uplink signal. A transmitter producing 10 watts output into an antenna with a gain of 10, for example, thus produces the maximum acceptable level of 100 watts ERP (assuming negligible transmission line losses). Uplink signals in excess of 100 watts ERP cause limiting of OSCAR 8's AGC, and prevent weaker signals from accessing the spacecraft. Running excessive uplink power is thus considered taboo, selfish and poor satellite-operating tactics.

OSCAR Gear

A wide variety of amateur equipment is available to the budding satellite enthusiast, and the cost of this gear ranges from modest to relatively expensive. In addition to hamfest acquired items boasting reasonable price tags, transverters for 70 cm and/or 2 meters are presently offered by several manufacturers. At least two companies, KLM and Icom, also produce c.w. and s.s.b. transceivers which operate the 2 or 70 cm bands (f.m. is absolutely taboo for satellite use due to its stringent duty cycle and consequent satellite-power use). A glance through advertisements in several recent amateur magazines thus should provide a good selection of OSCAR-capable gear.

One of the most personally appealing OSCAR setups we've seen employs the "Icom twins," IC202 (2 meters) and IC402 (70 cm), small mating amplifiers for each unit and similarly small antennas to provide a super compact OSCAR setup. This arrangement, which can be used fixed, mobile or portable, is capable of operating mode B or J, and also prepares one for the forthcoming OSCAR 9 spacecrafts. The Icom IC202 and IC402 ar 2 watt c.w./s.s.b. transceivers which can be powered from either internal batteries or an external 12 volt power supply. These units are relatively inexpensive, compared to other "all mode" transceivers operating these bands, yet they perform very well in satellite services. The advantage of transceivers **over** transverters is primarily their stand-alone use rather than requiring a "driving" transceiver.

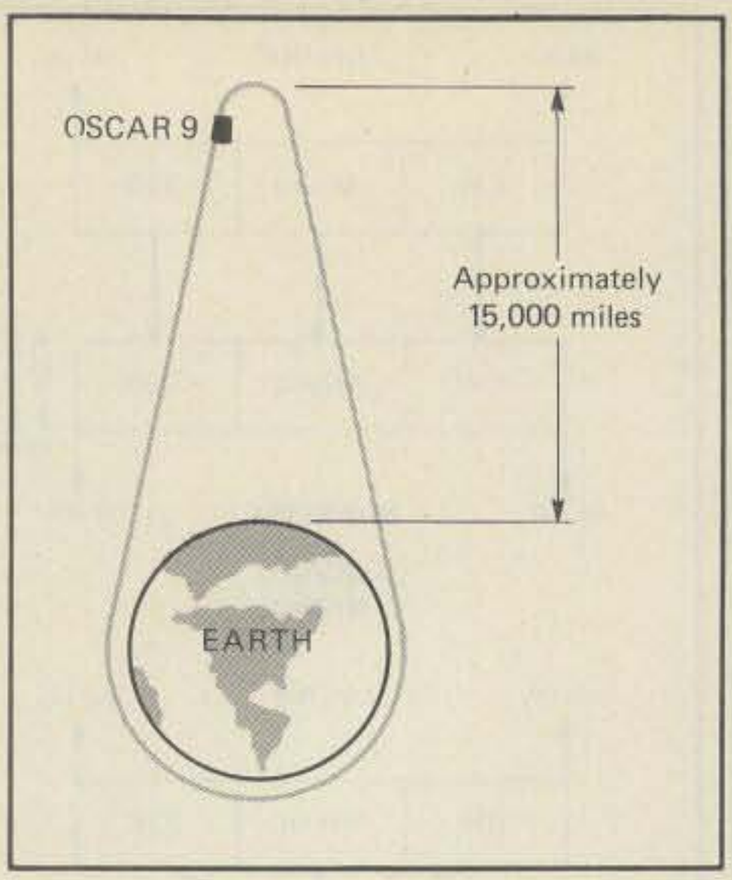


Fig. 3- Projected elliptical orbit of OSCAR 9. Approximately one-third of the world can be "seen" by the satellite from its vantage point above earth. Orbit can be altered by internal kick motor on spacecraft.

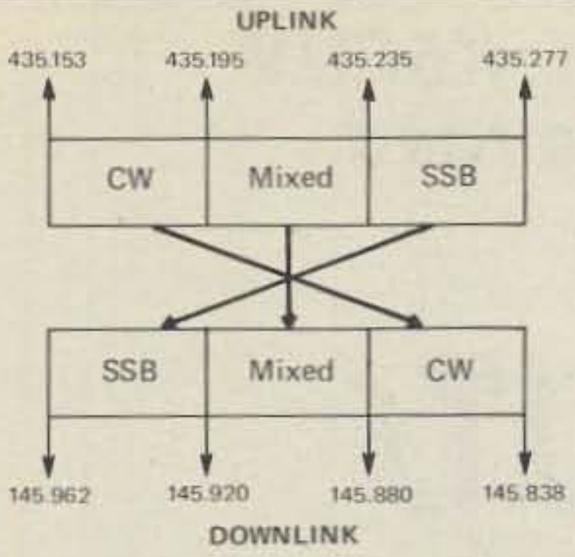
The most popular antennas used in satellite operations are circularly polarized beams of the 5, 7 or 10 element variety. Such antennas, and their associated phasing harnesses, are distributed by Spectrum International, KLM, etc. The antenna should be located in a place affording a clear view of the skies in general directions or satellite use, as trees and similar foilage "soak up" u.h.f. energy like a sponge. The satellite antennas also should be placed near the satellite equipment to minimize transmission losses at these high frequencies (notice the satellite setup is beginning to describe its own arrangement and place of location). A clever means of bypassing excessive rotor entanglements involves tilting the antenna mast from the ground at a 20 or 30 degree angle. This will eliminate elevation tracking and provide only azimuth rotor installations. An example of this arrangement is shown in fig. 2.

OSCAR 9— The Beginning of Phase III

As most amateurs are now aware, our initial move into long-range Phase III spacecrafts met with watery fate during May of 1980. This largest and most sophisticated satellite to date was to be carried aloft aboard a European Space Agency rocket which grossly misfired and fell into the ocean. Within 24 hours of the tragedy, encouraging support from around the world began pouring into AMSAT Headquarters. Memberships were renewed, donations were pledged and numerous new life memberships were announced. Obviously, we are on the road to recovery and to creating another Phase III satellite which will be named OSCAR 9 after reaching successful orbit. This means the knowledge, system planning and basic Phase III groundwork remains basically intact, with major losses confined primarily to hardware that can be replaced within an approximate 1 or 2 year period (barring, of course, unforseen circumstances).

The next two years will be an important era in amateur radio satellites. While OSCAR 8 will continue providing "Golden Age" communications for true satellite enthusiasts, additional support from these users and other amateurs anticipating OSCAR 9 will be vital for future efforts. Meanwhile, we can enjoy OSCAR 8 and someday reflect on these unique memories.

OSCAR 9 will create a situation truly unique in amateur radio communications. The craft's projected elliptical orbit will provide complete Northern Hemisphere communications and broadcast capabilities for up to 12 hours each day (see fig. 3). Visualize,



OSCAR 9 Projected band plan

Fig. 4- Projected frequency assignments for amateur 2-way communications via the next satellite, OSCAR 9.

also, a band that will permit a roundtable between two amateurs in adjacent U.S. states, England, Japan and India, and you have working idea of OSCAR 9's purpose. OSCAR 9 will employ approximately 125 kHz in the 70 cm band for uplinking signals. The downlink signals will appear in the 145 MHz region of 2 meters. A chart of the projected frequency assignments is shown in fig. 4.

OSCAR 9 operations will be slightly more sophisticated than previous satellites. Tracking of the elliptical orbit will require a different type of OSCAR locator or new calculator/computer programs. Once specific evening satellite operations begin, however, only minute antenna movements each 30 or 40 minutes will be necessary to maintain reliable communications. This "new ball game" will not be a serious entanglement, particularly for old-time satellite users.

Existing equipment used for OSCAR 7 and OSCAR 8 (mode B and mode J) should serve the amateur's needs for OSCAR 9. An additional r.f. amplifier and/or larger antenna probably will be required to supplement that setup, increasing ERP to the approximate 1000 watt level. Power levels in excess of 1000 watts ERP with OSCAR 9 are absolutely discouraged, as such "muscle flexing" will cause AGC clamping and loss of weaker uplink signals. Plans are underway to include a microprocessor-controlled frequency-seeking notch filter in OSCAR 9. This notch would automatically take care of power ursurpers in a very effective manner.

OSCAR 9 will provide many amateurs with their first chance at satellite-achieved DXCC, plus truly reliable long-distance communications. It will be a completely new dimension in amateur radio that will reflect space-age technology and shades of things to come. Few seriously enthusiastic amateurs will care to miss this experience.

UOSAT—A Merge of OSCAR and SSTV

A particularly unique and interesting amateur satellite presently is being developed at the University of Surrey in Guildford Surrey, England. This spacecraft will represent a definite departure from traditional OSCARs in several respects, one of which will be the capability of transmitting SSTV views from space (approximately 530 km above earth; 97.5 degrees inclination; sun synchronous orbit). The satellite's projected SSTV camera will consist of a two-dimensional CCD array with a format of 256 by 256 pixels by 4 shades of gray. The digitalized form of these pictures will be transmitted back to Earth on approximately 145.900 MHz, and should prove extremely beneficial during unusual weather conditions. Only minor modifications on existing SSTV gear will be required to receive these unique pictures.

Presently, a special AMSAT team at the University of Surrey is constructing the UOSAT craft. Substantial progress has been made and a successful finished product is now eminent. NASA has agreed to carry UOSAT aloft aboard a Delta 2310 rocket with the Solar Mesosphere Explorer (SME) mission which is scheduled for launch during September 1981. What greater means could one ask for an initiation into two exciting amateur frontiers at one time!

Summary

The OSCAR satellite program reflects a challenging and exciting communications frontier that is open to all radio amateurs. This mode is destined to play a strategic role in future amateur radio communications, and the optimum time to get in on the ground floor of this innovation is right now. There's a definite merit in moving away from the crowded conditions on 20 meters and enjoying the open conditions on OSCAR's frequencies. A wealth of additional information on OSCAR satellites can be found in my full length book, *OSCAR—The Ham Radio Satellites,* published by TAB Books, Blue Ridge Summit, Pennsylvania 17214. *(Additional books on Amateur Radio frontiers also published by Dave Ingram include* The Complete Handbook of Slow Scan TV *[TAB #859], and* 10 Meter FM for the Radio Amateur *[TAB #1189].)*

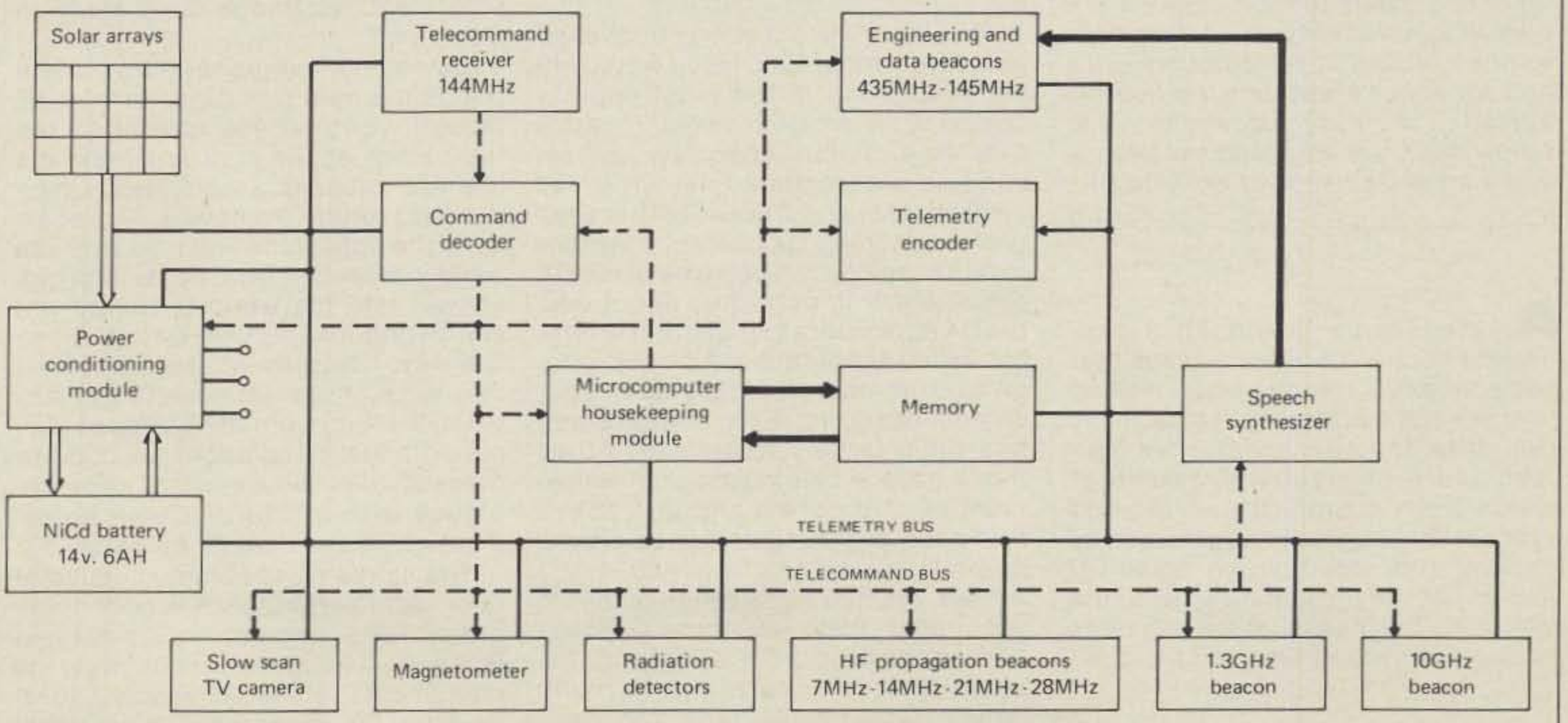


Fig. 5- U.K. amateur scientific spacecraft—UOSAT system diagram.

Every Big Gun had to start someplace. Bill, K5FUV gets us started, in painless fashion, on the road to DXing.

THE INS AND OUTS OF WORKING DX

An ongoing series designed to teach good and sound operating techniques.

BY BILL KENNAMER*, K5FUV

DX and DXing can be many miles apart, from simply working foreign and exotic places on the globe as they pop up from time to time, to the all-consuming almost professional amateur who would rather work DX on a 24 hour a day basis than step outside to see the light of day. Most of the amateur world fits somewhere in between. In DX and DXing, like in anything else, exist a set of unwritten rules of the road, tricks of the trade and subtleties that most people have to learn the hard way. Some would view this as character building or paying your dues. Maybe so, but it does take a long time and does encourage a lot of bad habits to form early on in a pursuit in which they could have been easily avoided. After twisting Bill's arm for about 4 seconds, he heartily agreed to share with us, and those to follow, his knowledge and experience in the art and science of working DX.
—K2EEK

Amateur radio is indeed a captivating hobby. It's like a disease that lies dormant within the body, waking to strike again after many years. In my own case, the attack was after fourteen years of inactivity, twelve of which were spent with an expired license. This inactivity was caused by college and establishing myself (I thought at the time) in a career in the insurance business. But the bug bites harder the second time, and I found myself not only up to my neck in the hobby, but also in the full-time pursuit of amateur radio.

The story above has little to do with our subject, except to point out the obvious gap in my amateur radio career, and also my total involvement with the hobby. This gap created a bit of a culture shock when I was exposed to new equipment and operating techniques. Bridging the gap from my past and into the present, and my daily involvement with other amateurs, plus the rekindled interest from the past in DX and basic high-performance radio techniques has led me through some experiences which may be worth sharing.

Results of the *CQ* survey published in the November 1980 issue would imply that DXing is the most popular specialty in amateur radio. It ranks first as a primary specialty, and second as a secondary interest. In my opinion, a serious DXer will of necessity also become a DX contester in order to more rapidly pursue some of his DX goals. Much is published about who the DX is, or where to find it, but little is published about techniques of DXing, or, for that matter, simple tips about contest operating. Even station setup has been largely neglected. All of these have a bearing on your enjoyment of your hobby, and it is hoped that a few suggestions can be provided which will be helpful to you.

Also, another observation is that in years past, there was more courtesy and consideration in operating, especially in DX operating. In many cases, lack of courtesy and poor operating techniques have driven many DX stations from the bands, or have restricted them to the DX phone bands. This needn't be and can be avoided. There will be more on this subject later.

There is a latent DXer in every amateur. The 2-meter operator who tries to get the last mile out of the repeater, or lines up to work Tulsa on .52 direct is exhibiting his DX tendencies. But, let a fairly new amateur call a CQ on a quiet band and have a DX station respond, and he's usually hooked for life. Then comes the need to work a few more, and so it snowballs. This brings up the need for more equipment, and sometimes disappointment, as things don't work as they seem.

Obviously, everyone learns some things the hard way. Once in a while, though, you find you turn up in the right place at the right time, and the learning process accelerates. I happened to return to amateur radio at exactly the right place and time and was rapidly propelled from confirmed ragchewer into the world of multi-multi contesting and serious DXing. Along the way, I learned what works, what may work, and what doesn't seem to work. Starting from the basics of simple antenna installation, we hope to present ideas about stations and techniques that will further your enjoyment of DX and contest operating.

The single most common cause of poor radio performance is poor or improper installation of equipment and lack of knowledge about operating the equipment. This is commonly known as *operator malfunction* (hereinafter referred to as OM). Nowhere is this

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more prevalent than in the installation of antennas. Many times we see people taking "defective" radios back to dealers that "won't load up," when in reality it's the antenna that won't load, not the transmitter. Without resorting to the handbook formulas, here are some tips on the installation of simple antennas. Simple antennas such as this will produce results if properly installed. Without proper installation, one might have just as much luck with a Cantenna.

Let's take a short look at grounding. Of course an earth ground is desirable from an electrical standpoint, but an earth ground is not necessarily an r.f. ground. In fact, if longer than a quarter wave, an earth ground can cause TVI problems. The solution? Cut a quarter wavelength of insulated wire, put a lug on one end, and tape the other. Then attach it to the back of the transmitter. Run it around the baseboard as needed to get it out of the way. One for each band where the ground wire is a quarter wavelength or longer will be sufficient. Remember, solving grounding problems now may help TVI problems later, and no one likes to see the neighborhood lynch mob coming up the sidewalk.

The next area to consider is the antenna. Within limits, the type of antenna is not as important as the height and installation. A properly installed dipole in the hands of a good operator could do better than a poorly installed beam. For a dipole, proper installation has as much to do with height as anything. The higher the better, up to a point. What height? Of course one wavelength would be best. On 20 meters, this would be between 60 and 70 feet above ground and in the clear. Obviously, this would be difficult for most of us to attain with two supports. The alternative solution would be to suspend one end of the antenna as high as possible, and bring the other end down to ground at an angle as near to 45 degrees as possible. This is the sloper antenna. It may be fed with 50 ohm coax. Special tip to the contesters: Have you ever had someone call you off the back or side of your beam and wished you didn't have to rotate around to hear them? Why not try three slopers pointed in various favored directions so that you can switch between them? It works much better than listening off the back of the beam, and it's lots cheaper than a sidemounted beam.

In spite of the rumor that a vertical radiates poorly in all directions, proper installation will provide a very effective DX antenna, especially on 80 and 40 meters. The key here is proper grounding. It seems as if most vertical users either don't know or forget that the ground is half of the antennas, and they make little or no effort to provide proper grounding. Antenna manufacturers don't help in this regard, as most specify from one to six ground rods at the base as being sufficient. Actually, they can't be blamed totally for this, as few would buy a vertical antenna if they knew they had to bury 120 half-wave radials at 3 degree intervals for maximum performance. However, any radial system is better than only one or two ground rods and can take your vertical from the also-ran class into an adequate performance class.

The radial system need not be elaborate nor even cut to exact dimensions. The important thing is to have wire in the ground, especially at the base of the antenna. An acceptable radial system would consist of 36 radials about one-eighth wave long. It isn't necessary that all of the radials be the same length, or even close. For example, in my particular installation, the area in which the antenna is installed is 8 feet wide by 50 feet long. The vertical sits 20 feet from the back of the area, so radials in that direction are up to 20 feet long. The radials in the other direction are a maximum 30 feet long and 4 feet long on each side. The installation of twelve radials of varying length in this configuration took my signal from 4 × 4 in Europe to many 5 × 8 reports. I have also worked South Africa on s.s.b. with exciter only. All this on 80 meters. Forty meter results have also been good, with the ability to work Europe to Texas on s.s.b. during late afternoon hours before darkness.

No matter how efficient your antenna system is, it won't help you at all if r.f. doesn't get there. Trying to circumvent the expense by buying cheap feedline will waste the dollars spent on good equipment and antennas. Buy only good quality coax, such as RG213. If possible, remove about an inch of the jacket and look at the shield. If you can easily see the dielectric through it, it's no good. Acceptable coax should be about 95% shield, with non-contaminating jacket.

One other antenna tip: Sealing against the weather is very important, as water inside the connectors can lead to problems. Many have used tape and silicone seal to prevent this. Upon inspection of many of these connections, water was found to have worked its way inside the connectors. The following method is used on v.h.f. antennas on oil platforms in the Gulf of Mexico, and it seems to work well. Simply wrap the connection tightly with 3M Scotch 33 electrical tape. Then apply 3M Scotchkote (available at most large electrical-supply stores) liberally. This effectively prevents moisture from entering the joint. ▣

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

Multiband Antennas: The Trap Dipole, Part II

This month we conclude our discussion of trap dipoles with installation and radiation consideration. W8FX also delves into reader mail and really picks an interesting winner for Antenna Of The Month; unfortunately it's not one you can pick up easily from your local distributor. —K2EEK

Installation Considerations

High, free and clear trap antenna installation is even more important than with simple, singleband dipoles. This is because trap resonances can be upset if not installed in the clear, and metal objects in close proximity to the flattop can affect trap operation as well.

A few rules-of-thumb should be useful. The trap dipole should be installed at least a full wavelength from buildings or other large obstructions, especially power or telephone lines, if possible. It should be mounted as high as possible; 30 feet is a good minimum to shoot for. Rope or heavy-duty plastic clotheslines or wire (with resonances broken up with strain insulators) can be used to support the ends. The transmission line should be brought away from the antenna at right angles for as long a stretch as possible. It's especially important not to bend the ends of the antenna either vertically or horizontally to squeeze it into a limited space. Doing so may detune the traps and upset their operation, as well as distort the radiation pattern in an unpredictable fashion.

If you can't fit the antenna in without a bend of some kind, consider the inverted-Vee arrangement. This requires only one high center support, the ends being sloped down and tied to lower supports. A number of commercial baluns and center insulator assemblies sport a convenient hang-up hook that is just right for the Vee. Many DXers prefer this configuration even if space isn't at a premium, since there is some gain on the higher bands and the antenna's angle of radiation (good for DX) is lowered.

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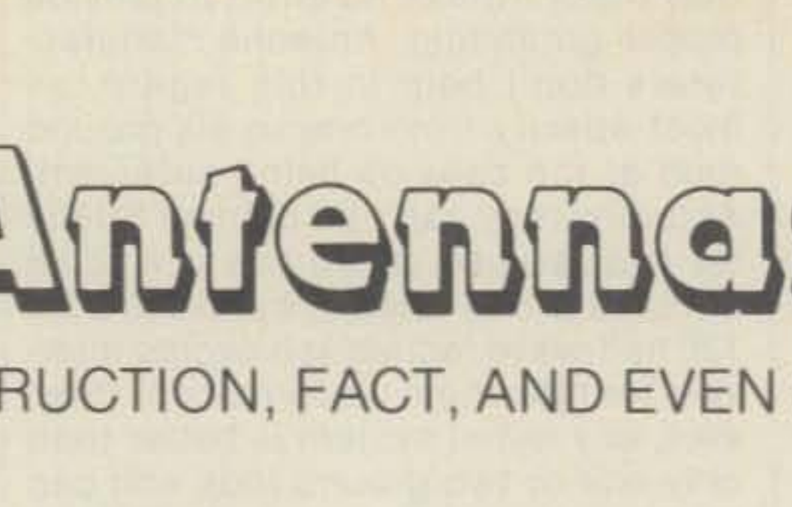


Trap antennas are great for enabling operation on several bands with a single antenna, although there's no assurance that low s.w.r. and proper transmitter loading can be maintained on all bands. Use of a coax-to-coax antenna coupler helps ease the line match to the transmitter. In addition, trap antennas—like most all multiband radiators—are notorious harmonic generators. The tuner will add a great deal of selectivity to the antenna system, which will normally reduce harmonics to an acceptable level. Representative wide-range MFJ high-power capability tuner is shown here. (Photo courtesy MFJ Enterprises)

What About Radiation Pattern?

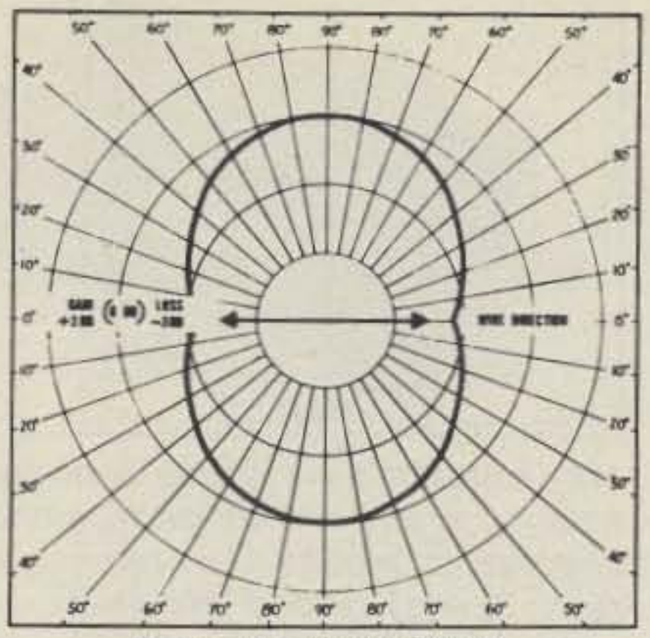
Like other horizontal antennas, *vertical* radiation angle depends on antenna height above ground; the higher the antenna, the lower the angle of radiation. For most practical antenna heights, maximum radiation will be about 30-35 degrees from the horizontal. This assumes an antenna height of one-half wavelength. If less, as on the lower h.f. bands, radiation angle will be higher. If more, as on the higher bands, it will be lower.

The trap's horizontal radiation pattern is essentially that of the basic dipole: bi-directional, doughnut or figure-8 shaped, with maximum radiation occurring at right angles (90 degrees) to the axis of the wire.

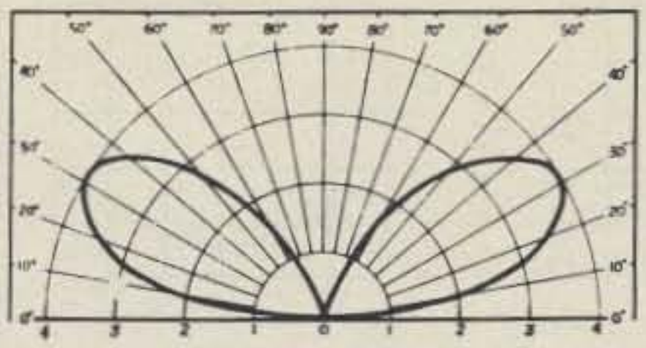
The classic figure-8 pattern assumes that the antenna is operated in a true half-wavelength mode on each band, that is, that multiple traps are installed. However, the simple bi-directional pattern tends to the cloverleaf on the higher bands where the single-trap antenna takes on the characteristics of the longwire. As the antenna becomes longer and operates on harmonic modes (3/2-, 5/2-, 7/2-wavelengths, etc.), the number of lobes formed as well as directivity increases. However, at practical heights above ground, the nulls in the pattern aren't too sharp, and the pattern tends to fill in so that directivity becomes pronounced primarily on the higher bands. If installed as an inverted-Vee, the antenna becomes more sharply directional. Fig. 1 shows basic antenna patterns.

Trap Adjustment

Trap adjustment is a subject unto itself. Since most commercial traps are factory tuned and sealed, it's the wire section lengths that are adjusted to whip the antenna resonance points and resultant s.w.r. into shape. An s.w.r. bridge can be used for adjustment, although more precise results can be obtained using a grid-dip oscillator or antenna noise bridge. Typically (but following the trap manufacturer's adjustment instructions, of course), one starts with the highest frequency band covered by the antenna, noting s.w.r., resonance or impedance characteristics, depending on the measuring instrument being used. The center wire sections are then adjusted—either lengthened or shortened—until the antenna is resonant to the desired frequency. The procedure is repeated on the next lower frequency band, working down until you have adjusted the lowest-frequency sections. Using the one-pair-of-traps configuration, you go through this procedure for the two lowest bands only; the s.w.r. on the

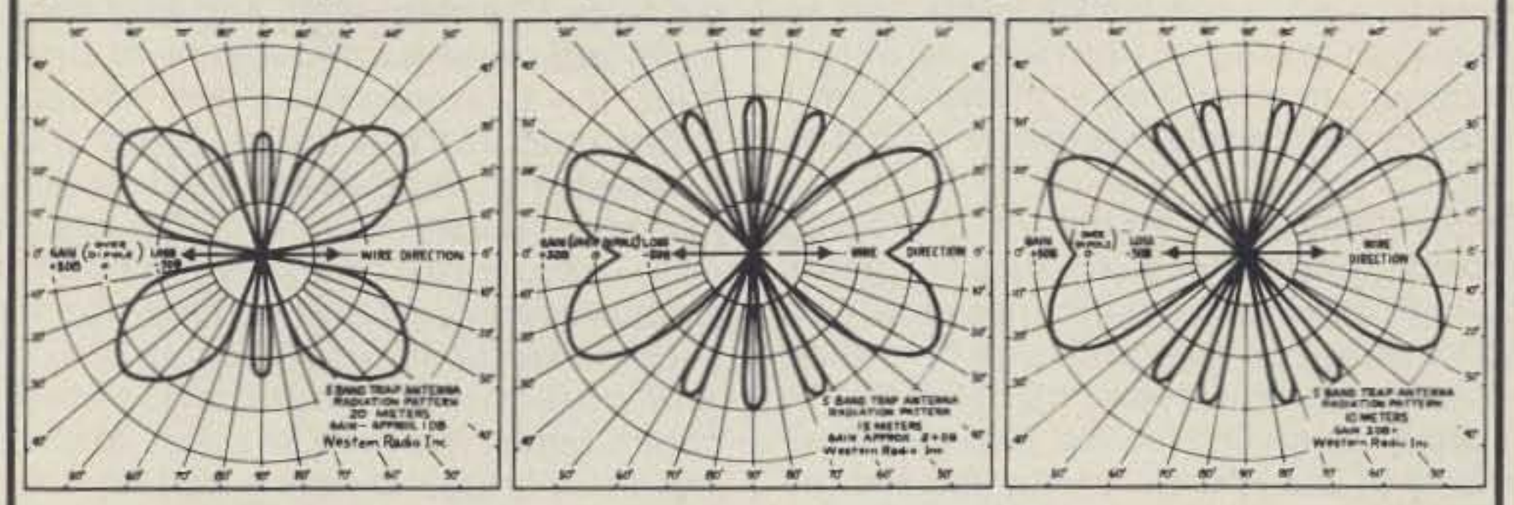


Horizontal Radiation Pattern
of Horizontal Dipole ½ Wave Length High



Vertical Radiation Pattern of
Horizontal Dipole ½ Wave Length High

Shown above, at left, is the typical horizontal radiation pattern for a half-wavelength dipole at a height of one-half wavelength above ground. This pattern holds as long as the trap dipole has a pair of traps for each band. At right, expected vertical pattern of a dipole one-half wavelength high.



Above, typical trap dipole patterns for single-trap-pair antennas on the higher bands. As can be seen, the familiar doughnut-shaped pattern shifts to the cloverleaf as the antennas are operated in harmonic modes, directivity sharpens, and some gain develops. (Source: Western Radio product literature.)

Fig. 1–Trap dipole radiation patterns.

higher bands (20, 15 and 10) is not adjustable, though you may experiment with various antenna feedline lengths if transmitter loading is a problem to coax the rig into pumping power into the system. With antennas that have separate traps for each band, you go through the whole procedure for all bands. Adjustment may take quite some time, and there may be considerable interaction in making the adjustments. But, with perseverance, the result should be a very low s.w.r. antenna on all bands.

Fig. 2 shows typical multiband trap antenna s.w.r. curves.

Reader Reports

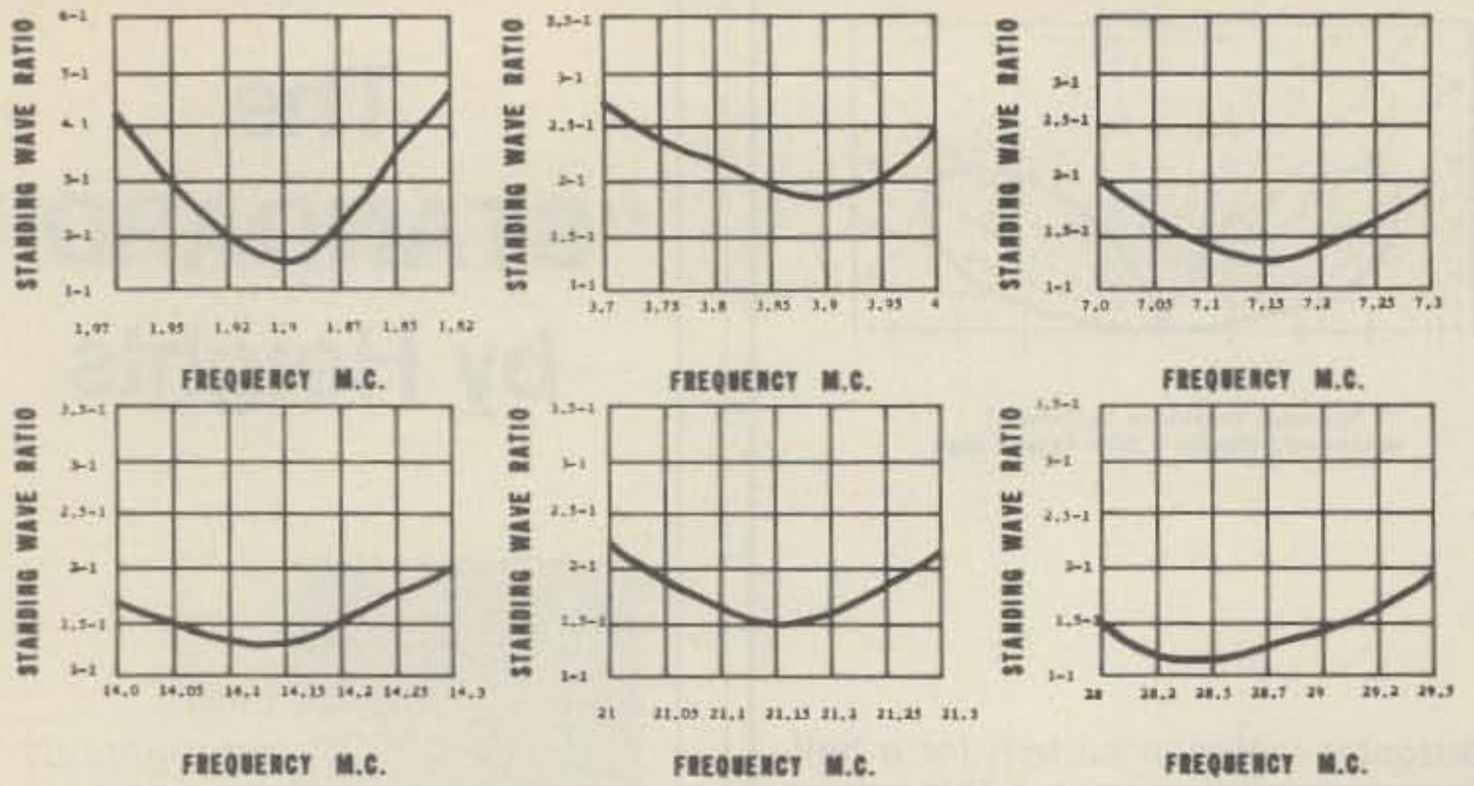
A Connecticut reader who has been corresponding with me about his antenna problems wrote requesting my views on a two-band indoor (attic) trap-loaded antenna he was considering for 80- and 40-meter use, one that would have to be bent to fit his attic's 37-foot width. (Very little room was available outdoors to run a dipole of even modest dimensions.)

Though I am a believer in loaded dipoles, I had to reply that antennas always seem to work better outdoors, in the clear, even if bent and electrically loaded to resonance. The indoor antenna will undoubtedly pass near electrical wiring, heating ducts and water piping, which will have an adverse and unpredictable effect on performance. Also, one runs the risk of r.f. getting into everything from the telephones to TVs to stereos.

In fact, I once ran high power into a full-size 40-meter dipole strung in the attic of a quadplex apartment and was surprised the very first night to receive a knock on the door from an irate and confused neighbor. Seems he had retired for the evening, turning out his lights, but woke up to pulsations of his bedroom ceiling light glowing in step with my s.s.b. modulation! Apparently, sufficient r.f. was rectified by his wiring to light the lamp even though his a.c. wall switch was turned off. (I never ran high power into that antenna again, and shortly thereafter took it down.)

Some suggestions I conveyed to my W1 correspondent as alternatives to his indoor designs included the following:

1. A loaded inverted-Vee off the top of his beam tower.



Charts above show one manufacturer's typical trap curves for the six present h.f. bands, 160 meters included.

Any multiband antenna system represents a compromise of some sort to allow convenient use of the antenna on more than one band. With the trap antenna, the tradeoffs result in slightly higher minimum s.w.r. and somewhat lower operating bandwidth, especially on the lower bands relative to the dipole at comparable heights above ground.

The Western Radio s.w.r. curves show worst-case s.w.r., for their multiple-trap antenna, of less than 2.5:1 on all bands except the two lowest, where s.w.r. at the band edges of 160 and 80 meters runs as high as 4:1. This is not necessarily a problem, since the traps can be adjusted to center on one's favorite operating range and the antenna can be fed with low-loss versions of RG-11/U or RG-8/U, or the new, lightweight RG-8X to minimize transmission line losses. And an antenna tuner can be used at the transmitter end of the line to "clean up" the impedance presented to the rig. (Source: Western Radio product literature.)

Fig. 2– Trap dipole s.w.r. What's it like?

Trap antennas are normally pruned to frequency and overall performance is checked by means of a standing wave ratio (s.w.r.) bridge. However, traps and trap antennas may be fine-tuned to resonance using an antenna noise bridge such as the Palomar Engineers unit shown here. The bridge will give a null on each band that the trap dipole resonates on, resistance and reactance can be measured, and wire sections adjusted as necessary to produce the desired resonance points. Other uses for the bridge arond the hamshack include beam antenna adjustment, determination of the resonant frequency of tuned circuits, measurement of the velocity factor of solid-dielectric cables (such as coax), and determining inductance and capacitance. It's even possible to use the noise bridge to tune a transmatch without applying r.f. from the transmitter! (Photo courtesy Palomar Engineers)

2. A trap- or base-loaded vertical in the backyard, on the roof, or on top of the tower used for his 10- and 20-meter monobanders.

3. A gamma-match to the beam tower, tuning *it* up on 80 and 40.

4. An inverted-L or "T" singlewire antenna fed against ground, supported in part by the tower or mast.

Incidentally, the ARRL *Antenna Book* has a whole chapter (No. 10) devoted exclusively to information on restricted space and indoor antennas. The same book has some excellent suggestions for space-saving 160-meter antennas that can be scaled down for 80 and 40 meters with little more than the help of a pocket calculator.

The Trap: Parting Comments

That does it for this month's column. We featured the trap dipole, pointing clearly to the fact that it can be an excellent choice for the space-limited amateur who wants to operate on several bands with but one coax-fed antenna. We highlighted the "why's" behind the trap, described how it works, hit some important installation considerations. There's no question but that the trap dipole can be made to perform a maxi-job in a mini-space. And its automatic band-switching is made to order for modern solid-state rigs.

See you next month.

73, Karl, W8FX

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Some pertinent source materials and an extended discussion of the trap antenna topics covered in this month's column can be found in the references listed below. These are all in addition to the standard amateur radio and antenna texts.

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11. "Useful Information on Multi-Band 'Trap' Antennas," an advertising booklet published by Western Radio Electronics, P.O. Box 400, Kearney, NE 68847. (Contains a wealth of trap antenna information written at the practical level.)
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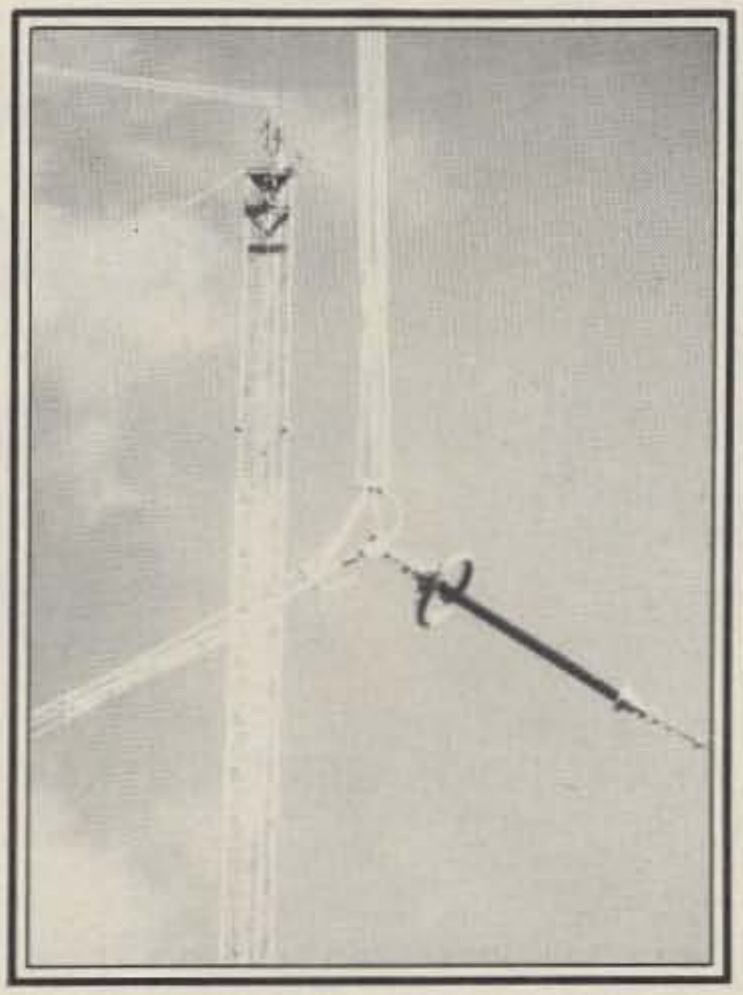
Antenna Of The Month

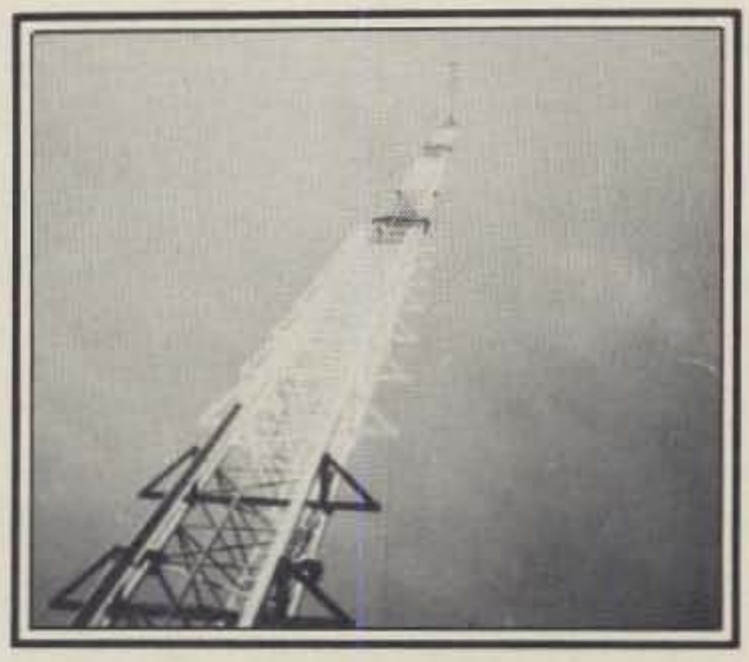
This time we depart from our practice of highlighting a popular commercial antenna. Instead we take a look at the low-frequency (l.f.) antennas at the National Bureau of Standards (NBS) site near Fort Collins, Colorado, home of familiar time-ticker WWV. These antennas, however, belong to the l.f. stations WWVL, which though now deactivated, operated on 20 kHz, and sister station WWVB, holding forth with special-purpose time and frequency information on 60 kHz.

As can be seen from the photos, the 400-foot top-loaded towers are something to behold. The antennas themselves are free-floating and completely insulated from the towers. Electrically speaking, the antennas act as high-Q capacitors which are tuned to the extremely low operating frequencies with large coils. The 13 kw, 60 kHz WWVB puts in a good signal to most parts of the continental U.S.A., day and night—at least 100 microvolts/meter to most areas, according to the NBS.

Interestingly, a number of l.f. and v.l.f. time-and-frequency stations presently operate around the world. They are rapidly replacing their h.f. counterparts for ultra-accurate applications that minimize atmospheric distortion of the transmitted signal. Some of the other major low-band stations are as listed in Table 1. Many of them can be received in the United States.



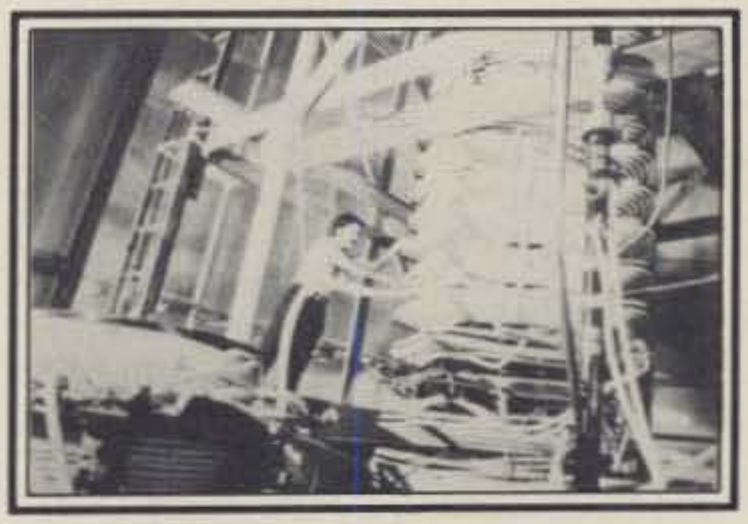
View of one corner of the WWVB/WWVL antenna spans. The systems, identical though used on very different frequencies, are made of four huskily-guyed steel towers which are arranged into a diamond shape, 1900 feet in length and 750 feet in width. Counterbalances are used on the inside and base of each tower to help maintain proper tension at the tops of the towers—neccessary because of the high winds whipping out of the nearby Rocky Mountains. Note the free-floating characteristic. The WWVL antenna has a "Q" factor of about 1,000, while the WWVB radiator's is much lower, around 100. Interestingly, WWVB began experimental broadcasts in 1956 using the callsign KK2XEI and is still operating today, with an ERP (effective radiated power) of 13 kw. WWVL first went on the air in 1960 but ceased broadcasts in 1972 except on a very limited basis.



Shown here is one of the 400-foot WWVB and WWVL antenna towers; the antennas are identical, and are top-loaded. Both stations are sister installations to the familiar h.f. time-ticker, WWV, though the 20 kHz WWVL transmitter has not been on the air regularly since 1972. The 60 kHz WWVB station is extensively used, however, to provide good coverage of the entire continental U.S.A. with precise time and frequency data much in the same way that WWV provides consumer-type calibration information on popular h.f. frequencies (5, 10, 15 MHz, etc.). The bandwidth of the WWVB antenna is about 600 Hz, while the bandwidth of the WWVL antenna is but 20 Hz! Not surprisingly, efficiencies are low; 35% for the 60 kHz WWVB antenna and 5% for the 20 kHz WWVL antenna. Shades of 75-meter mobile operation!

Callsign	Location	Frequency (kHz)
RTZ	Irkutsk, USSR	50
RBU	Moscow, USSR	66.67
GBR	Rugby, England	16
HBG	Prangins, Switzerland	75
JJF-2	Chiba, Japan	40
DCF77	Mainflingen, Germany	77.5
WWVB	Colorado (USA)	60
MSF	Rugby, England	60
OMA	Prague, Czechoslovakia	50

Table 1–Major low-band stations.



R.f. hardware at v.l.f. frequencies is Texas-size, to say the least. Photo of the antenna coils in the "helix house" at WWVL dwarfs the worker in the center of the photo. WWVL's transmissions were curtailed in 1972, although the station and the antennas are still in place at last report, and they are occasionally tested and used by various government agencies on a subscription basis. Crystal-controlled oscillators were used in the transmitter to generate the carrier wave. One, two, or three operating frequencies could be chosen: 19.9, 20.0 or 20.9 kHz; or all three could be transmitted simultaneously. Sister station WWVB is still on the air on 60 kHz, carrying high-precision, low-frequency time and frequency data.

The Kantronics Field Day 2 Morse/RTTY Reader

BY ARTHUR H. WERTZ*, N5AEN

Normally we don't accept nor print unsolicited product reviews. This is due to the fact that the review is either incomplete or non-informative as a rule and is a rehash of the product literature. N5AEN apparently has done his homework, and I'm happy to say is an exception to the rule. —*K2EEK*

There I was, pouring over catalogs, amateur magazines, and brochures trying to figure out what hardware I needed to put together to get in the RTTY business. I looked at Model 15, 19, and 28 printers (noisy, need mechanical adjustments, most one-speed, use Baudot code). I looked at Model 33, 35, and 37 printers (same problems but they did use ASCII). I looked at video displays (need TV set or video monitor, need RTTY terminal unit). I looked at home computers (need software, have too much wasted capability to devote to RTTY). Then I came across the ad for the Kantronics Field Day Morse/RTTY reader. Here was a *portable* device that copies RTTY (Baudot at 60, 67, 75, and 100 w.p.m. and ASCII at 150 and 300 baud), and in addition, reads out Morse from 3 to 80 w.p.m. The Field Day has a built-in demodulator for c.w. and RTTY and requires only one connection to the receiver speaker terminals or phone jack. Here was the answer to my whole RTTY receive problem, and I got the Morse readout to boot!

After receiving the unit, giving the manual its usual 5-second glance to see how to turn it on, I plugged it into my Icom 701 and fired it up. I had been using a surplus CV-89 boat-anchor demod, with its various switches, knobs, and scope display. It was a real treat to pick up an RTTY signal, tune the Field Day until the little pilot light flashed, and the RTTY came marching in (literally). The display is a set of horizontal 14-segment alphanumeric LED units with a character display that moves from right to left like the old Times Square news display. Ten characters are displayed at a time, with the characters moving off the left side of the screen. I found a couple of stations using ASCII (including W1AW). Changing speeds in Baudot or ASCII requires pushing a button on the front panel! Changing from Baudot or ASCII to Morse is just a matter of button-pushing. The microcomputer constantly computes and analyzes the code speed and tracks the received code. In the C.W./SPEED mode, the first two characters on the left display the code speed being received. The code speed is determined by ignoring pauses and measuring the dot and dash lengths, and provides an accurate speed readout. The Field Day has an internal code edit program which analyzes and edits poorly sent code. The unit also has a built-in 24-hour clock which can be displayed by pushing a button (of course). The unit also has a built-in "test pattern" which will sequentially display all the characters, numbers, and symbols, and verify that all the LED units and circuits are operating correctly.

The Field Day has a built-in loudspeaker, so the unit can be plugged in in place of an auxiliary speaker, and does not have to be removed for voice operation. A headphone jack is also available on the rear of the unit. As originally wired, the headphone jack is in parallel with the internal speaker and does not cut out the speaker. It is a simple matter to rewire the jacks (both miniature and regular ¼ inch jacks are provided) in series with the speaker to cut it off when the headphones are used. Headphones with 8

*8019 Riata Drive, San Antonio, TX 78227

ohms impedance must be used to provide the proper loading for the receiver output.

The demodulator output (at TTL levels) is wired to a jack on the rear of the unit. This output can be used to operate an external keyer for a Baudot or ASCII serial code printer. The internal code conversion is in the microcomputer following the keyer, so printers connected to the demod output can only operate in their normal mode. The TTL serial output of a separate terminal unit, keyboard, or transmitter-distributor can also be connected to this jack to operate the Field Day computer and display. This will permit checking terminals or keyboards, and will read and display tapes.

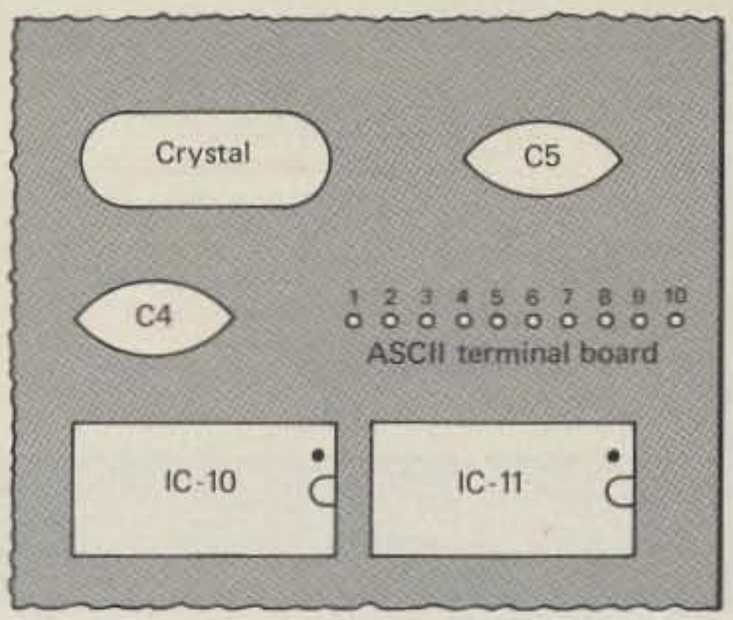
After using the Field Day for a couple of days, I finally got around to reading the technical manual seriously. The schematic diagrams and PC board layouts are accurate and very complete. I did notice, though, that there were two hex inverter chips that terminated at an undesignated terminal board which wasn't connected to anything! Eight of the inverters are connected, through latches, to the outputs of the Intel 8035 microprocessor. Another inverter is connected to an output (PROG) of the 8035. Since virtually all micros work in ASCII, could the eight inverters be the ASCII data output, and the other inverter the receive strobe? I wrote to Kantronics who advised that this was an unadvertised feature which had been built in but was not being implemented in the present model. The receive strobe is a positive-going pulse 2 or 3 microseconds long. I connected a ten-wire cable (eight data, one strobe, one ground) to the Field Day as shown in fig. 1 and connected it to my Control Data Corporation printer, as shown in fig. 2. The CDC required a negative-going strobe, so I rigged in an inverter. This was later replaced with a spare inverter in the Field Day unit. I now had hard copy of Morse from 3 to 80 w.p.m., Baudot from 60 to 100 w.p.m., and ASCII 110 and 300 baud. Since the incoming characters are displayed on the Field Day unit itself, there is no necessity to hover over the printer to see how the copy is coming out. Tuning and operating can be done at the receiver and Field Day while the printer sits back in the corner making a permanent record.

The portability and ease of connection of the Field Day allow me to unplug it, take it downstairs, plug it into an auxiliary receiver, and keep up to date on W1AW bulletins, monitor news services, and monitor MARS and amateur signals. All this while sitting in the living room and not bothering the XYL's TV watching! One of the local military bases had a carnival several weeks ago, and the South Texas Amateur Radio Society (STARS) had an amateur radio booth set up. I plugged in the Field Day, and the spectators were intrigued by the translation of c.w. "beeps" into readable characters and words. It was far simpler than hauling around TV monitors or page printers!

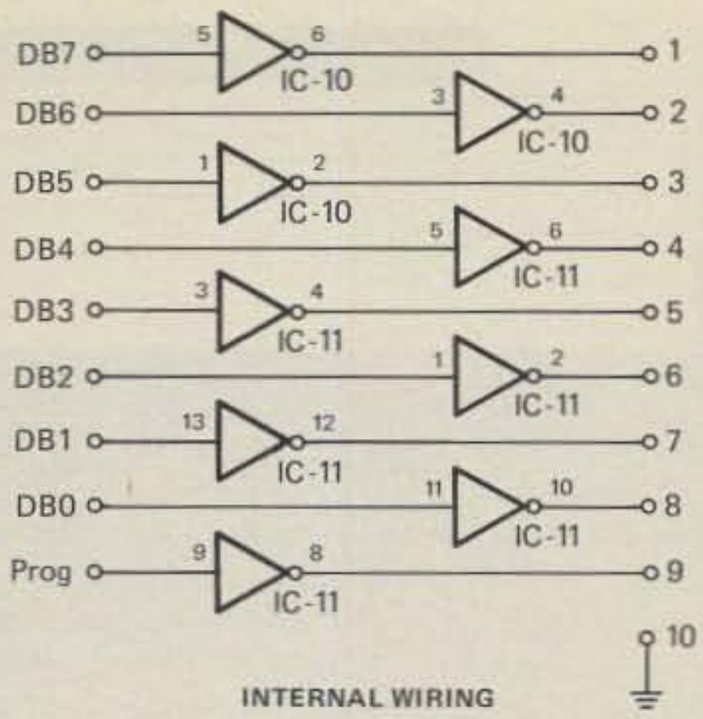
The Field Day is ideal for code-training classes, since a keyer or handkey can be plugged in and the Field Day will display the characters sent. The display is delayed by the time it takes the processor to recognize the character, decode it, convert it to the display format, and activate the display. This gives the student a chance to hear the code, make a judgment on what the character was, and then have the Field Day verify or correct it. Several tests have indicated that the rapid visual recognition and correlation of the character and its associated code sound is much more effective than announcing that "That was an A" or waiting until a group or several groups have been sent, and then comparing the copy with the original text. The display of ten sequential characters seems to encourage the students to think in terms of groups of characters, rather than individual characters. Operation of the Field Day with a handkey or keyer also provides an evaluation of proper timing and spacing of characters when sending code.

All in all, the Field Day is a handy and welcome addition to any amateur shack for RTTY operation, code practice, or for monitoring amateur or commercial RTTY. The unit is small, portable, easy to hook up and easy to operate.

The Kantronics Field Day 2 Morse/RTTY Reader measures 10" × 9" × 3½". *It sells for $449.95. For more information on the unit write to Kantronics, 1202 E. 23rd St., Lawrence, Kansas 66044 or circle number 100 on the reader service coupon.* CQ



COMPUTER PC BOARD



INTERNAL WIRING

Fig. 1–Connections for the ten-wire cable to the Field Day 2 reader.

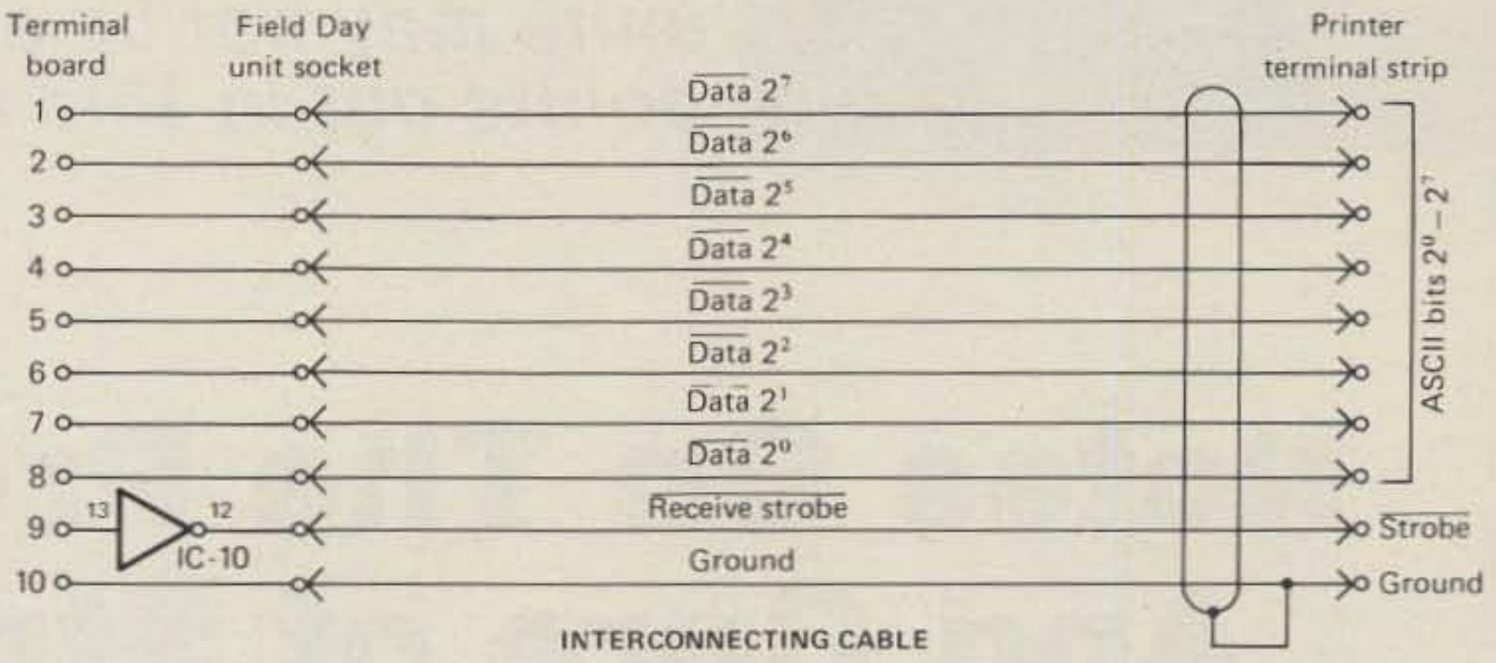


Fig. 2–Interconnecting cable between the Field Day 2 reader and the author's Control Data Corporation printer.

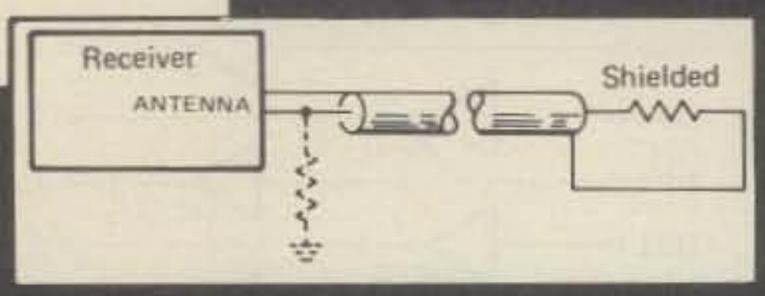


Fig. 1- Using a receiver to check shielding effectiveness of a cable. The receiver is first set to base noise level using a terminating resistor only across its antenna terminals and with its a.g.c. off. The cable, terminated in its characteristic impedance by a resistor, is then connected. The increase in noise level is then a measure of effectiveness of the cable shielding.

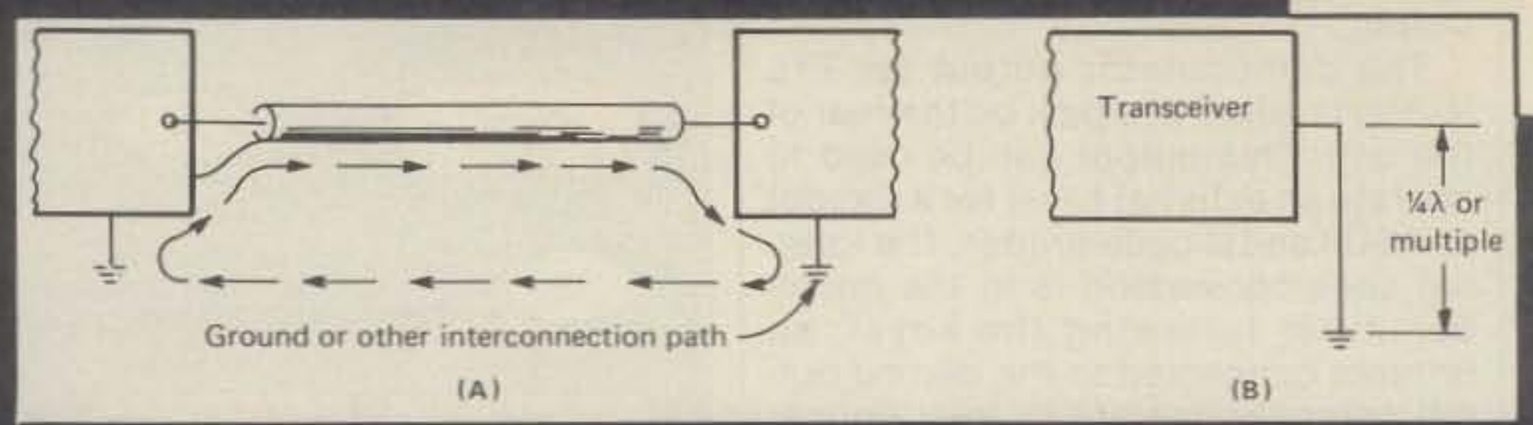


Fig. 2- The ground loop or other loop-type formation at (A). A "ground," which may not be a ground when a resonant length of wire is used, is shown at (B).

Almost every amateur experiences the frustration of trying to solve r.f. problems in the shack. Grounding units may not be a solution, as W4FA points out in this article.

Notes On The Prevention And Cure of Stray R.F. In The Amateur Station

BY JOHN SCHULTZ*, W4FA

The fun of radiating r.f. quickly turns into a sour experience when some of the r.f. feeds back into accessory items that one is using with a transceiver. The cost of the audio compressors, for instance, that amateurs have discarded because they couldn't solve r.f. feedback problems would probably pay for several ham shacks with deluxe equipment. Audio compressors aren't, of course, the only equipment subject to r.f. problems. Practically all solid-state accessory items used in any shack can experience r.f. interference problems, and the number of such accessory items is, in general, on the increase.

This article explores some of the steps that can be taken to eliminate r.f. feedback (in audio equipment) and r.f. interference problems (in other accessory equipment). Part of the material is a review of measures that have already been developed over the years to prevent such problems, while other parts of the article present some new ideas on the subject that may not be familiar to many amateurs. The article deals mainly with r.f. problems one experiences in the shack, but some ideas are applicable also, of course, to curing local hi-fi interference problems.

Two basic conditions must be present for r.f. problems to arise:

1. The r.f. must enter the unit that is being affected.
2. The r.f. must interact with some component in the unit.

The foregoing may sound like a complex way to state a thing that everyone knows, but it highlights the *two* levels at which r.f. problems can be tackled. The first, of course, is to prevent the r.f. from entering a unit at all. But, if that is not possible, one has no choice but to tackle the second area of preventing the r.f. from affecting some component in a unit.

If one had the opportunity to construct the ideal shack, the thing to do would be to enclose it in a metal

c/o CQ Magazine.

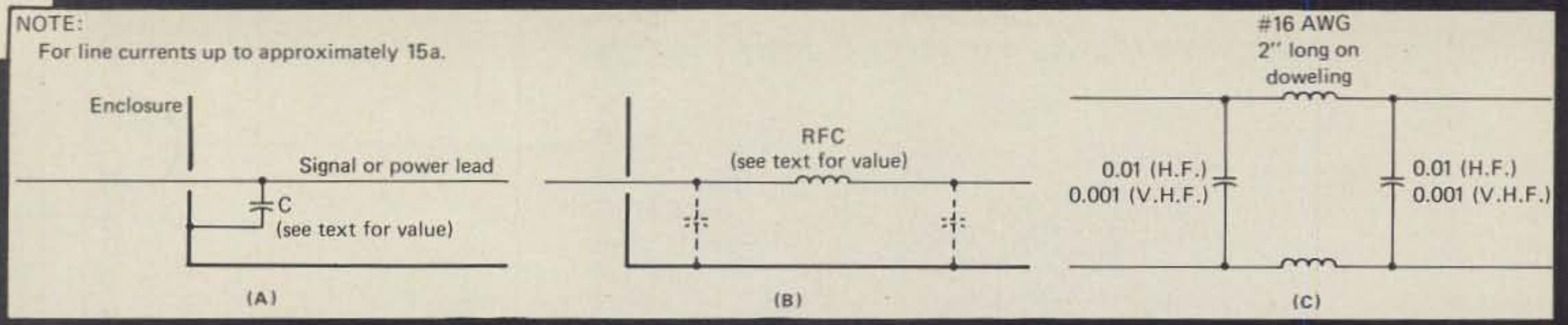


Fig. 3- Illustrations of simple bypassing and filtering for low level signal leads, power leads or control leads are shown at (A) and (B). A typical brute-force a.c. line filter is diagrammed at (C).

screen as a shield against external r.f. This is actually done in the case of the construction of some radio station studios and control rooms where such facilities must be co-located with a high-powered a.m. or f.m. transmitter. Although this is impractical for most amateurs to consider, the concept of the total enclosure should be kept in mind and carried down to the level of the equipment itself and the wiring between units. Accessory unit enclosures should provide good shielding. Enclosures that have wooden side panels instead of metal ones, for instance, may look great, but as far as r.f. is concerned, it is just like having a circuit on an open breadboard. If one suspects that inadequate shielding may be the cause of a problem with a unit, one test that can be made is to wrap up tightly the entire unit with several layers of ordinary household aluminum foil. This test, of course, does not allow for the use of any control knobs while testing, and one has to be careful that the aluminum foil does not short out any connections. Nonetheless, it is a very good method to check the adequacy of the shielding on any small accessory unit.

If the shielding test cures the problem, then one must find out why the present enclosure, if it is a metal one, does not shield adequately or provide a unit with a properly shielded enclosure. In the case of a metal enclosure, just because it is screwed together doesn't mean all the sides are making good electrical contact. One should make a careful visual check to see that all the sides have snug fits against each other and that paint, etc., does not prevent a good metal-to-metal contact. If one is using a snap-together metal enclosure without screws, the obvious thing to try is screwing it together. Many enclosures even when screwed together still have gaps between some edges due to manufacturing tolerances. These gaps can be closed in a variety of ways depending on their size and the aesthetics one wants to preserve. Thin copper sheeting, folded over once, can be inserted between some gaps in a force-fit fashion. There are also a number of metallic tapes that are excellent to cover gaps. One tape made by 3M (3M type 24) from tinned copper is designed specifically as a shielding tape. Various electronic supply houses carry it, although it is not inexpensive (about $4.00 per 15-foot roll). Various chrome and stainless tapes sold for automotive repair or decorative work are also usable.

In the case of partially metallic or non-metallic enclosures where one wants to preserve the outer enclosure because of its appearance, but where shielding of the internal electronics is needed, some form of internal shield can be tried. Shielding tape is a possibility or very fine metallic screening can be used. The metallic screening should be electrically connected to form as much of a total screening surface around the internal electronics as possible.

The aluminum foil test described for small enclosures also applies to audio or control leads that might be picking up r.f. Cut a narrow, long piece of aluminum foil and wrap it around a cable in partially overlapping turns. It should be connected to ground at one or both ends of the cable run. A point that sometimes is missed is that audio cable, like coaxial cable, has varying percentages of shield cover. The amount of shield cover on an audio lead that is necessary to prevent casual hum pickup may be inadequate to prevent some r.f. pickup. Unfortunately, the audio cable that one is likely to pick up at the local emporium will not contain any specifications as to shield coverage. The best thing to do if inadequate cable shielding is indicated is to replace the cable with the best quality shielded wire one can obtain made by a major manufacturer (Belden, Alpha, Dearborn, etc.). One can also try replacing shielded audio cable with miniature coaxial cable such as RG-174U. If one would like to go a step further and even investigate the relative shielding effectiveness of various shielded wires, the simple test setup of fig. 1 can be used.

Although one normally would not run a separate ground lead to a small accessory unit to cure an r.f. problem, there may be other ground leads used in a station. These ground leads may work fine when a transceiver is used alone but may cause problems when an accessory unit is added. So, some investigation into the nature of the grounding system is useful. The ground loop problem shown in fig. 2(A) is normally associated with hum pick-up problems in audio equipment. But, it also can produce problems at r.f. frequencies if the loop formed resonates at the wrong frequencies. The cure is the same as in the audio case. That is, one must break the loop somehow, usually by grounding the shielded cable at only one end instead of at both ends. Another interesting point to watch is the basic ground lead used in a station. As shown in fig. 2(B), the ground lead, if it is of certain lengths in relation to the operating frequency, can act as an antenna. The transceiver supposedly grounded is then really at one end of the antenna feeding r.f. back into it and to other units connected to it. This possible case of an r.f. problem should be readily apparent if the problems cease when the ground lead is disconnected. The cure is not to do away with the ground lead, but to change its length or to shield it. In the latter case, one can use coaxial cable as the ground lead with the center conductor as the ground lead and the shield connected to earth ground *only*. The shield is left disconnected at the equipment end.

Progressing a bit further along the path of trying to keep r.f. out of units, there is the usual brute-force approach of r.f. chokes, bypass capacitors, filters, etc. These can be applied to audio signal leads, control leads and power leads. Some of the simple filter techniques are illustrated in fig. 3. The key to making these simple techniques effective lies in choosing the proper value components for the frequency involved and/or careful placement of the components in a unit. For instance, for simple capacitor bypassing of a low impedance circuit one might progress from a .05

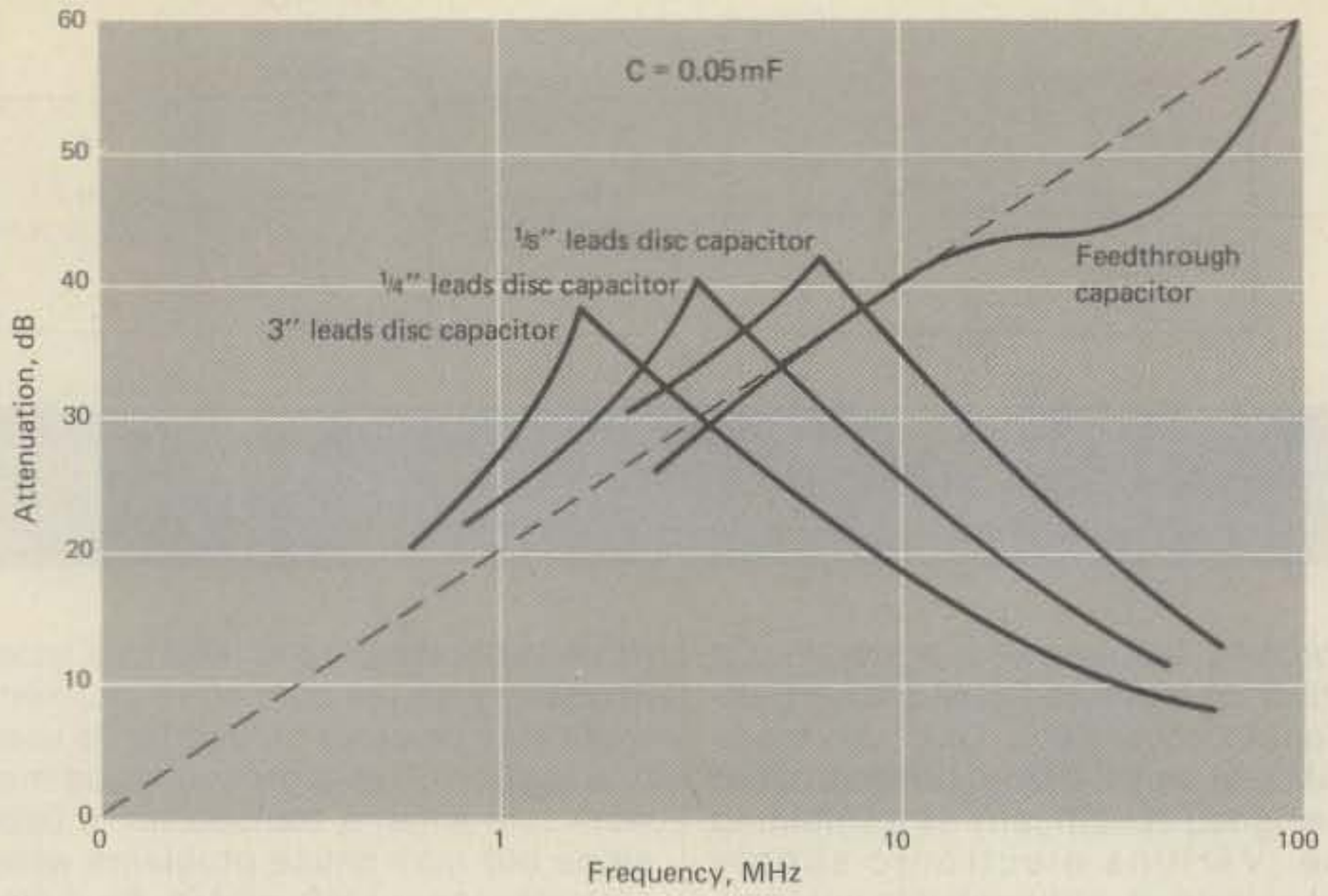


Fig. 4– The real effectiveness of capacitor bypassing is shown by this graph. The dotted line would be a perfect capacitor. Note that a feedthrough-type capacitor comes closest to the ideal bypass.

μF ceramic disc capacitor in the 80 meter band to a .001 μf capacitor on 2 meters. As shown in fig. 4, however, the effectiveness of capacitor bypassing is greatly influenced by lead length. This effect is often a disadvantage if one wants to have effective r.f. bypassing over a wide frequency range, but it can be turned into a slight advantage sometimes when only a single band is involved. One can then tailor the lead length for maximum effectiveness on one band. There is no way to calculate the exact lead length to use in the latter case; it is just a tedious matter of cut and try. Note also from fig. 4 the advantage of feedthrough capacitors over disc ceramics for bypassing. Especially at v.h.f. frequencies, it is well worthwhile to expend the effort to find feedthrough capacitors and to use them instead of ordinary capacitors.

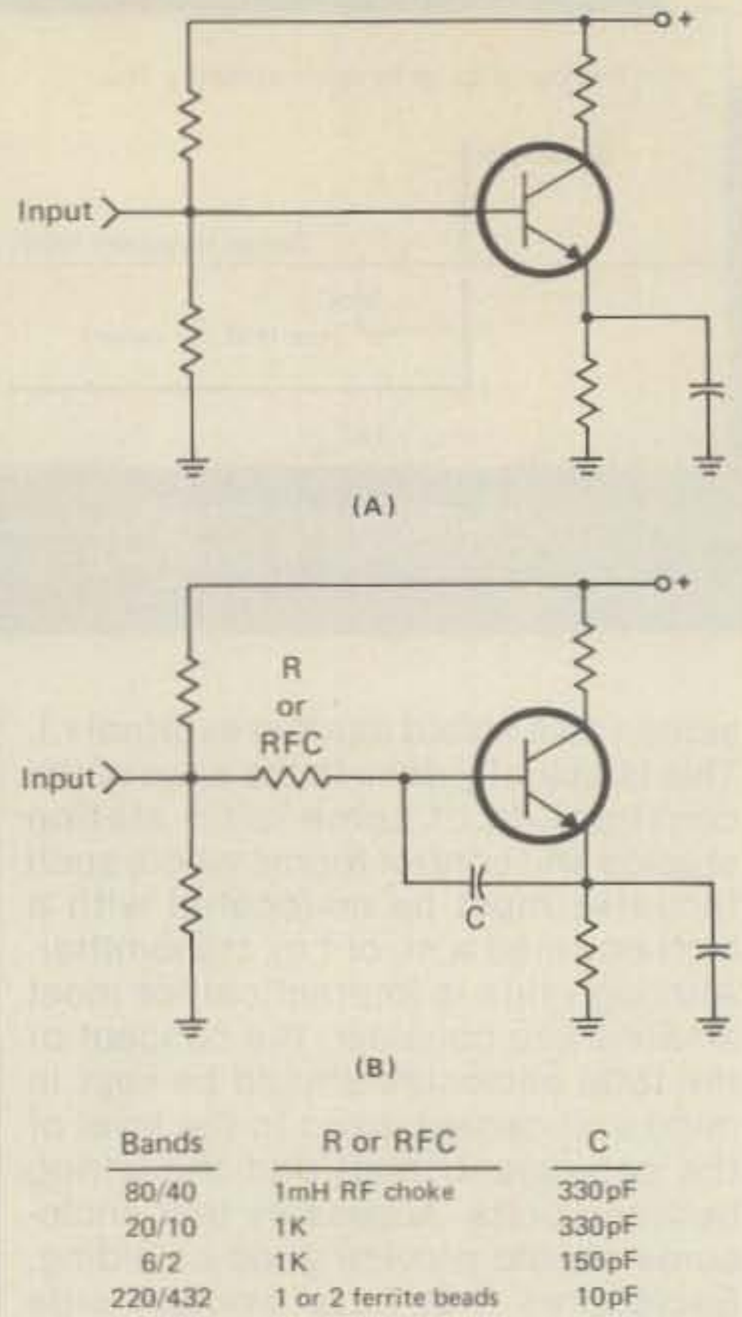
When using r.f. chokes, either alone or in conjunction with a bypass capacitor, one must also choose the choke inductance value for the frequency range it is desired to cover. It is best to follow the manufacturer's recommendation in this regard. For instance, the following is a listing for the commonly available J.W. Miller line of chokes:

Type	Frequency Range (MHz)	MicroHenries
RFC-14	7-20	84
RFC-21	15-30	38
RFC-50	30-90	8.2
RFC-144	75-180	1.7

One can also home-brew chokes by winding a ferrite core and then checking the self-resonant frequency of the choke using a grid-dip meter. In this case, the choke should be wound so the self-resonant frequency is slightly higher than the desired operating frequency. This is to account for capacity-to-ground effects when the choke is installed, which will tend to lower its resonant frequency. A choke for 2 meters, for instance, might be initially wound to resonate at 160 MHz.

If one cannot prevent r.f. from getting into a unit, then there is no choice but to cure the problem at the point where the r.f. interacts with some component in the unit. Invariably, for solid-state audio equipment, this will be rectification taking place at the base-emitter junction of a transistor. Usually, it will be the transistor in an input stage, but r.f. could be affecting more than one state. Sometimes with the help of an oscilloscope it is possible to isolate the state that is being affected. The cure is bypassing *directly* around the base-emitter junction of the state. The bypassing should *not* be to ground, since the emitter capacitor may not present a low reactance at r.f. frequencies. Bypassing is the most effective measure, although placing a resistor or r.f. choke in series with the base lead may also be helpful. Fig. 5 gives a typical application with some suggested component values for various bands.

The same technique can be applied to IC stages. If, for instance, the input signal goes to the non-inverting (+) in-



Bands	R or RFC	C
80/40	1mH RF choke	330pF
20/10	1K	330pF
6/2	1K	150pF
220/432	1 or 2 ferrite beads	10pF

Fig. 5– A normal input stage is illustrated at (A). In (B) note where components R (or RFC) and C have been added. The accompanying table shows some suggested values for different bands. The values can be adjusted for best results once it is found that the filtering is effective.

put of an IC operational amplifier, one can place a resistor or choke in series with this lead and a suitable capacitor directly from the non-inverting (+) pin to the inverting (–) input pin. There is also another interesting cure for transistor input stages that one might keep in mind. Germanium-type transistors have generally much poorer high frequency gain than silicon types. So, by changing an input stage to old generation germanium transistor, which has adequate a.f. gain but poor h.f. gain, one can often prevent r.f. problems in low-level audio states.

This article has tried to present a more or less orderly approach to getting rid of undesired r.f., starting with overall shielding measures and then working down finally to individual stages. In reality, of course, one tends to try the easiest possible cures first. And often after elaborate shielding measures have been taken, one finds that a simple bypass capacitor in the right place was all that was needed. There is no doubt that curing r.f. problems can be very frustrating. But, it is also equally true that with a combination of imagination and persistence 90% plus of undesired r.f. problems can be solved.

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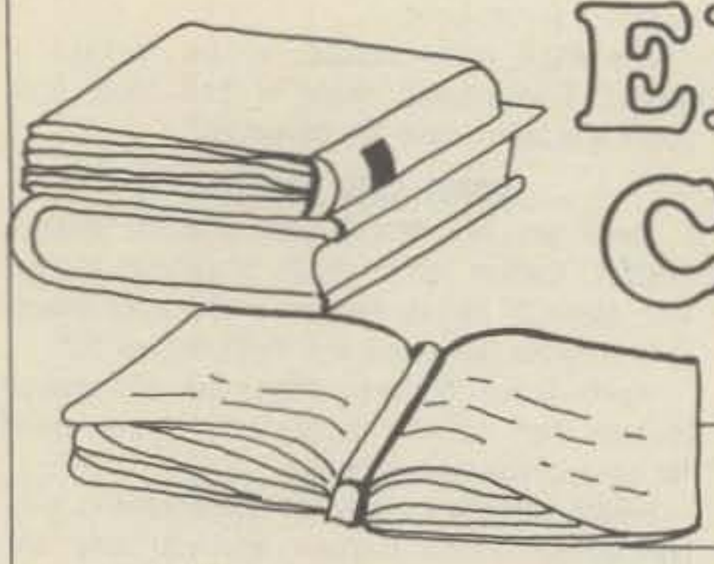


EXAM CORNER

Impedance

BY DICK BASH*, KL7IHP

This time we will consider an area that seems to bother a lot of people: **Impedance**. Impedance is one of the areas the FCC expects you to understand, and you'll find questions on it on the General/Technician, Advanced, and Extra Class written exams.

In radio circuits, there are things other than simple, pure resistance that oppose the flow of current. In circuits containing coils, we find that there is a phenomena called "inductive reactance" which resists the flow of alternating current (a.c.), and the presence of capacitors causes "capacitive reactance" to oppose the flow of a.c. So, now we have three things in an a.c. circuit that act to reduce the current flow: pure resistance, inductive reactance, and capacitive reactance.

In a radio circuit, the effects of the resistances and reactances combine in a special way to form a special kind of resistance, so to speak, that is only found in a.c. circuits. This is termed "impedance." Will we find impedance in a d.c. circuit? No! Impedance is found only in a.c. circuits and requires the presence of a reactance (capacitive or inductive or both) in addition to the resistance.

How do we measure this thing called "impedance"? Well, regrettably, we do not use an impedance meter! Impedance is a mathematically derived value and can be found by using the Pythagorean theorem. On page 103 of *Electronic Communication* (4th edition) by Robert L. Shrader (1980, McGraw Hill Book Company), Bob, W6BNB shows that impedance is designated by the letter **Z** and is found by doing this:

Impedance is equal to the square root of the sum of the squares of the resistance and reactances in the circuit.

$$Z = \sqrt{R^2 + X^2}$$

The *reactance* is designated by the letter **X** in the above formula.

*P.O. Box 382, San Leandron, CA 94577

If we replace the value of R with Z for impedance in our Ohm's Law formula that we're so used to dealing with (E = IR), we then are able to derive the various equations for finding the voltage, current, or impedance of circuits that contain both resistive and reactive components. What we end up with looks like this:

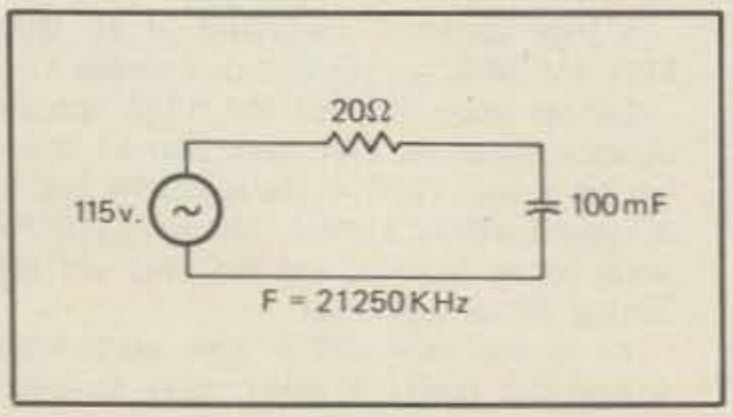
Ohm's Law	Modification For Impedance
E = IR	E = IZ
I = E/R	I = E/Z
R = E/I	Z = E/I

If we take a circuit that is made up of an a.c. signal, a resistor, and a capacitor, then we have all of the elements necessary to determine the impedance. We first examine the circuit and see that we need the reactance of the capacitor. This is determined by using the formula:

$$\text{Capacitive reactance } (X_C) = \frac{1{,}000{,}000}{2\pi fC}$$

where $\pi = 3.14$
f = frequency in megaHertz
C = Capacitance in micro-Farads
X_C = Capacitive reactance in ohms

Once you have found the reactance value, you can then use it with the impedance formula mentioned earlier. Simply multiply it by itself to obtain the square of the reactance, and then add that number to the square of the resistance (in ohms) in the circuit (in this case, it's the value of the resistor). Here's the circuit and let's see what we get from it.



If you use the formula for the reactance, then you get a capacitive reactance of 74.9344323716 ohms, which we'll round off to 75 ohms.

Let's now implement the Pythagorean theorem to get the impedance. First we substitute in the values for the resistance and reactance, square each of them, add them together, and, finally, take the square root of the sum to obtain the impedance in ohms.. Here's what the math looks like:

$$Z = \sqrt{R^2 + X^2}$$
$$Z = \sqrt{20^2 + 75^2}$$
$$Z = \sqrt{400 + 5625}$$
$$Z = \sqrt{6025}$$
$$Z = 77.620873482$$
$$Z = 78 \text{ ohms}$$

We can now find the voltage drop across each component by first finding the current using our modification of Ohm's Law (I = E/Z). If we divide our 115 volts by the 78 ohms of impedance, we get a current of 1.47435897435 amps, which we'll call 1.5 amps. In a series circuit, this current is the same throughout the circuit, so we'll simply use Ohm's Law to find the voltage drop across the resistor:

$$E = IR$$
$$E = 1.5 \times 20$$
$$E = 30 \text{ volts}$$

This means that the difference between this value (30 volts) and the total voltage (115 volts) is the voltage across the capacitor. So, the voltage across the capacitor is 115 minus the 30 volts, or 85 volts!

By the way, I should point out that the reactance value in the impedance formula (X) is the *net* reactance. It is found by assigning a positive value to any inductive reactance (from coils) and a negative value to any capacitive reactance. Thus, a circuit that has a 25 ohm coil and a 15 ohm capacitor would have a net reactance of 10 ohms. When the capacitive reactance is greater than the inductive, you'll get a negative value for X. However, this will disappear when you square it.

Well, we've pretty well covered the impedance in the depth the average applicant for a General/Technician or Advanced Class license should know it. The Extra Class applicant may wish to delve into it more, and I suggest he/she read Shrader's. You can purchase this excellent book at your local bookstore or at the bookstore of a junior college or university. If you can't find it, give me a call at 415-352-5420 and maybe I can help you find it. Good luck and I'll see you next month! ▣

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		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
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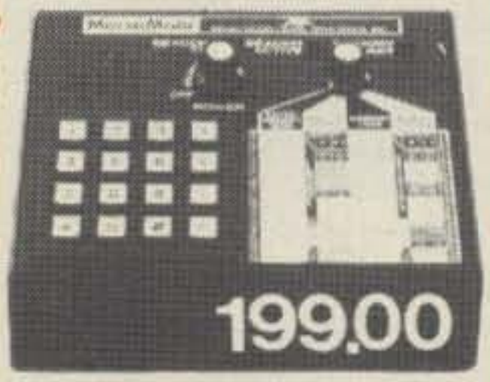

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Here's a makeshift logic probe that's a cinch to make and use.

Junk Box Logic Probe

BY MARTIN BRADLEY WEINSTEIN*, WB8LBV

Damned those digital demons anyway! There you are, trying your damnedest to read the highs and lows with a scope and a meter just because the circuit decided to poop out on you before you got around to buying a real logic probe, like one of those sweet little Global Specialties goodies. Who ever thought you'd need one this soon anyway?!

Well, no reason to stay stuck for long. Reach into your junk box for this handful of parts and you can make yourself a dandy little logic probe—good enough to get you through some simple logic level checking, anyway.

The heart of the circuit is a 555 timer used as a monostable multivibrator, which permits some stretching of brief pulses to make them more visible. The trimpot sets the trigger threshold level, and the 100K resistor limits current into the trigger. The 10 microFarad capacitor across the power leads (the probe is powered by the circuit under test) helps alleviate the effects of pull-down switching by the probe itself from triggering logic inputs in the circuit under test.

The output of the 555 drives one of the two LEDs on, depending on the logic level at the probe. Using different color or different size LEDs makes reading different levels a little easier.

It doesn't quite do everything a "real" logic probe does, but this handy junk box probe sure comes in handy.

*c/o CQ Magazine

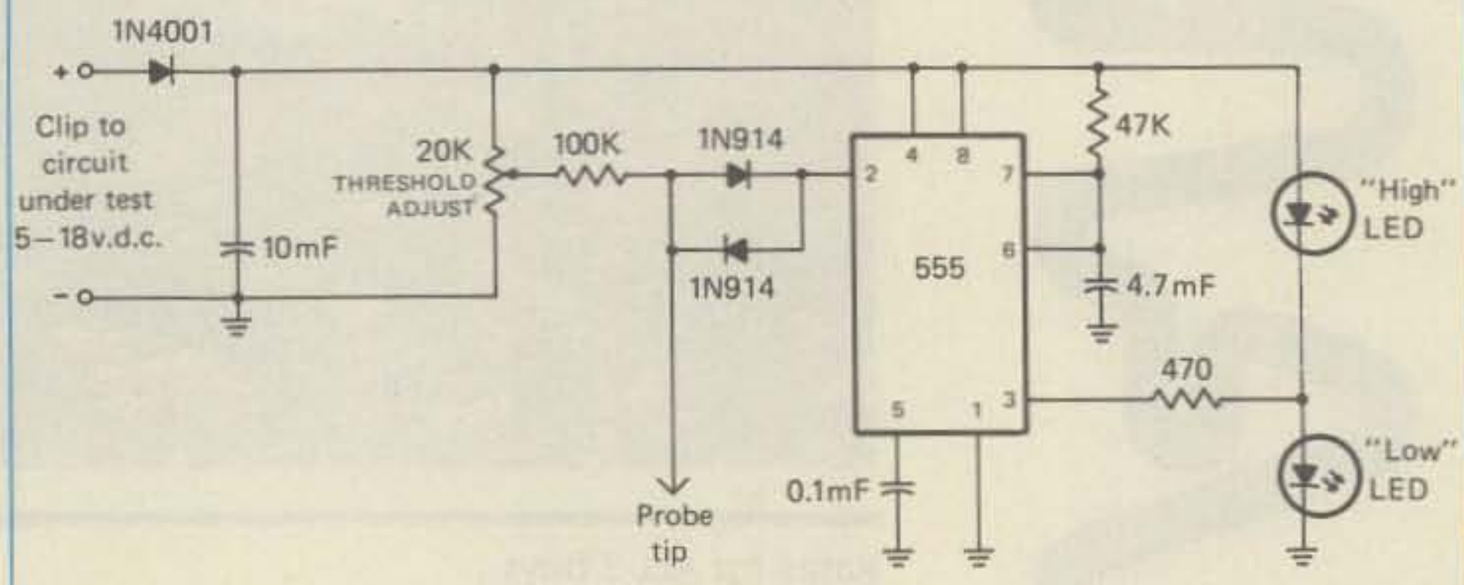

Fig. 1- A 555 timer IC creates an ideal makeshift logic probe.

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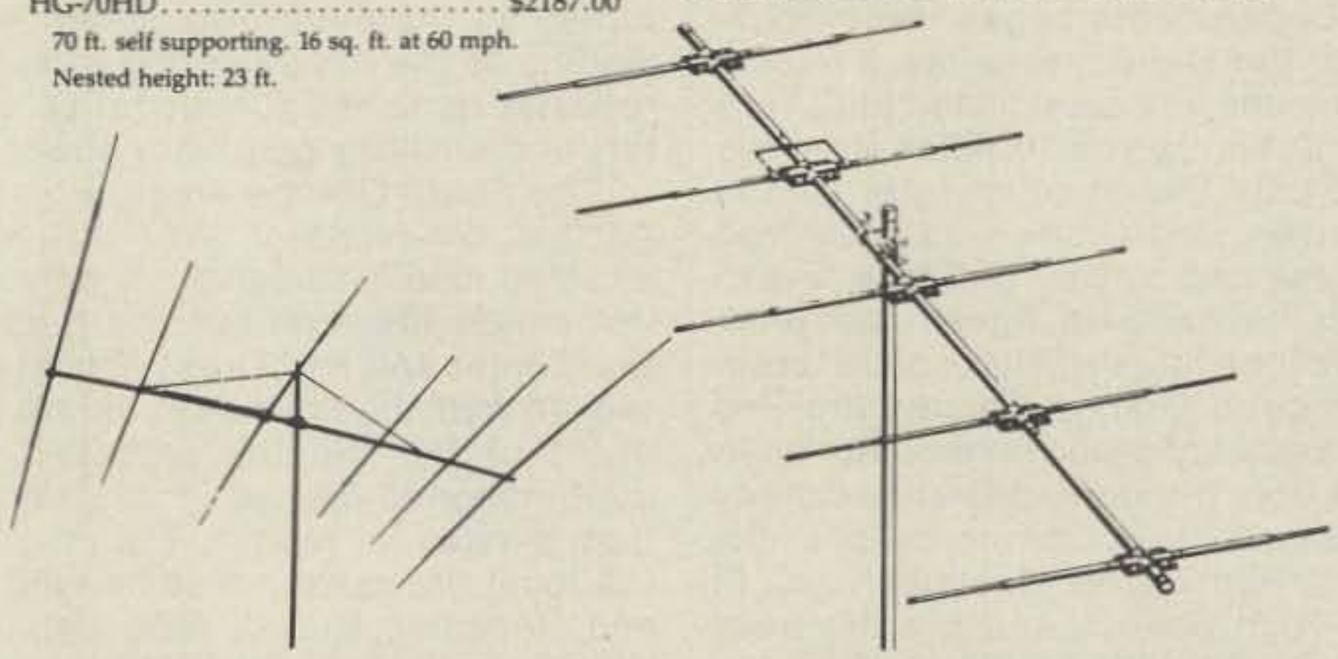

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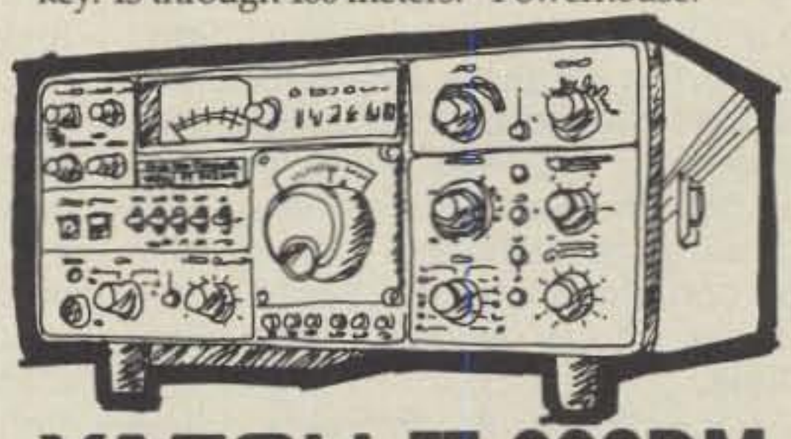

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CIRCLE 1 ON READER SERVICE CARD

Amateurs have helped out in hot spots before both figuratively and literally. Here's another fine example of amateurs coming to the aid of their community.

California Amateurs Tested Under Fire

BY JERRY BOYD*, WA6CUP

Monday, November 24, 1980 marked the beginning of nine days of wildland fires in the southern California area. The loss in acres of watershed was staggering. Six lives were lost and over 350 homes were destroyed with dozens more damaged. Damage figures combined with the costs of fire fighting efforts exceeds 75 million dollars.

At one time during this period fires raged uncontrollably in San Diego, Riverside, San Bernardino, Orange, Los Angeles, Ventura, and Santa Barbara Counties. Untold numbers of dedicated amateur radio operators provided communications in support of police, fire, local government, and Red Cross efforts on almost every fire front.

Orange County experienced the longest fire siege, and was the scene of the most destructive of the fires in terms of total acreage destroyed. A fire which began in adjacent Riverside County in close proximity to last winter's flood ravaged Lake Elsinore area was quickly whipped by Santa Ana wind conditions exceeding 75 miles per hour into the rugged canyons of southeast Orange County. Much of this area hadn't burned in decades, and in a high wind, low humidity environment the fire quickly spread into Indian, Holy Jim, Trabuco, and Silverado Canyons. A number of structures on ranch land in the mountainous area were quickly destroyed. A juvenile detention camp located in the foothills halfway up Santiago Peak was threatened, and a full evacuation was required within 24 hours after the fire's onset. The exclusive community of Cota de Caza was nearly overrun by the fire, and only the last ditch, valiant efforts of weary fire fighters prevented the destruction of numerous million-dollar homes. Cota de Caza, like the Joplin Boys Ranch, required evacuation, as did several hundred residents of nearby Modjeska and Silverado Canyons.

As the Orange County Sheriff and Fire Departments began the evacuation of threatened residents, a relocation center was established at El Toro High School some 10 miles from the fire front. The local chapter of the American Red Cross was mobilized from the nearby City of Santa Ana to assist the evacuees. Based upon practiced procedures and prior disaster experience in Orange County, the Red Cross quickly called on amateur operators from throughout Orange County to coordinate communications between Red Cross Headquarters, El Toro High School, and the fire base camp at O'Neil Park. Members of the Amateur Radio Emergency Services from both North and South County responded under the capable leadership of Emergency Coordinators Ed Ireland, WA6TLE, and Ralph, WB6JBI. Reliable communications in support of the Red Cross effort were quickly established. Early in the nine day fight against this raging inferno, the Orange County Fire Department, which had relied on amateur radio assistance in past major fires, joined in a request for communications assistance for fire fighting related logistical support. The efforts of county hams quickly became a 24 hour per day proposition for the duration of the disaster.

It should be noted that E.C. Ed, WA6TLE, had, based upon last year's fires and flooding, installed an A.R.E.S. dedicated 2 meter repeater (WR6AUM) on Santiago Peak directly above this year's fire-filled canyons. When commercial power was disrupted as fire destroyed power lines leading to the mountain top site, the repeater remained functional on battery and auxiliary generator power.

The South Orange Amateur Radio Assocation repeater W6TIO/R was situated ideally to serve not only the immediate fire area but the evacuation center and Red Cross Headquarters as well. Just two days before the onset of the fire the repeater had malfunctioned, requiring its removal from service for repairs. Even though the local fire season was nearing an end, repeater trustee Bob Sackett, W6TIO, Ernie Schultz, WA6QCA, and Huntington Beach R.A.C.E.S. Officer Tim Sawyer, WD6AWP, realized that the South County area should have a repeater in service in the event of a disaster. Thus, the aforementioned amateurs patched together a makeshift repeater using two 10 watt transceivers. Less than 48 hours later, their

*25881 Treetop Road, Laguna Hills, CA 92653

decision to expend the extra effort paid off when the fire broke out. For nine days the makeshift repeater functioned flawlessly even though pressed into almost continuous service.

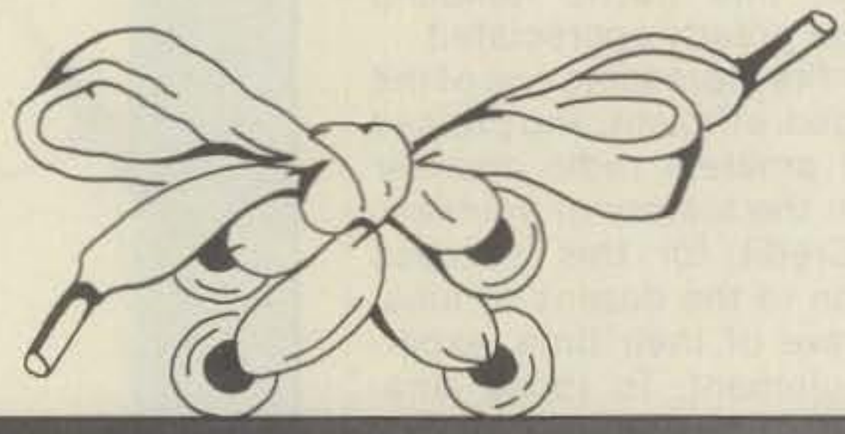
In addition to handling priority, fire-related traffic, Orange County amateurs utilized existing traffic handling nets to enable fire fighters from eight different states to send messages home during brief breaks from their duties. In view of the fact that fire fighting continued over the Thanksgiving weekend, this traffic handling capability was greatly appreciated.

This major fire represents one of the most prolonged, efficient, and praised instances of amateur radio disaster assistance in the history of southern California. Credit for this success must be given to the dozens of amateurs who gave of their time, expertise, and equipment. To those amateurs, men and women, young and old, the amateur radio fraternity, thousands of fire fighters, and dozens of public officials say a sincere thank you. Perhaps the most meaningful expression of thanks came from one Cota de Casa resident whose home was saved due to the valiant efforts described in this article. That homeowner, like many of his fellow residents, posted a hand-painted sign along the road leading from the fire base camp. It read "Thank God for the best firemen in the whole world, and the ham operators too!"

It is regretted that not all of the amateurs who participated in this activity are known. Credit must be given to the following whose identities are known: Ed, WA6TLE; Celia, WB6SZN; Hal, WA6ACB; Del, WB6JCH; Don, N6ARZ; Rich, WD6EPD; Tim, WD6AWP, Gray, WA6BJY; Lee, W6IFW; Ernie, WA6QCA; Frances, WB6QBZ; Jim, K6AIP; Dick, WA6CUE; Jim, N6BET; Bill, KA6DNU; Will, N6CRH; Betty, KA6IIT; Keith, WA6GRE; Mark, N6DNY; Walt, WA6TMN; Louis, KA6BJO; Muriel, KA6BJP; Bill, WB6CQT; Keith, N6CKT; Clayton, KH6AHM; Carrol, KA6JXM; Bruce, N6DEF; Carl, W6JYS; Patrick, WD6EDP; Ernie, KA6DVH; Rich, N6CIJ; Dave, KA6IAH; Jim, KA6G; Gordon, WB6NOA; John, W6FQX; Merrill, WA6DOR; WB6FJR; Ed, KA6DTB; Barbara, N6AUA; Bob, KB6TD; Ralph, WB6JBI; Archie, WD6CSL; Clancy, WA6HNQ; Jim, WB6BZW; Chuck, WA6IWS; Forma, WA6IWT; Erin, WA6FOW; Kathy, WA6FAH; Glenn, N6AFZ; Gordon, WB6GUC; Del, K6RTR; Roger, WB6ARK; Al, W6IBR; Len, WB6NHV; Alex, W6RE; Freid, WA6WZO; Winn, W6MBA; George, W6LJK; Frank, W6SAE; Bill, WB6JJS; John, KA6HRK; Margaret, WA6PZO; Robbie, KA6HNY; Dick, W6SUL; and Judy, KA6FBI. CQ

Are you bored with Baud? KI2U presents some straight off the cuff suggestions for getting on RTTY.

RTTY On A Shoestring



BY JOHN EDWARDS*, KI2U

Misconceptions—how do they get started? For instance, there is the notion prevalent among the general public that ham radio is a "rich man's hobby." Then, there's the bizarre concept, held by many, that antenna towers are ugly. Nonsense, hogwash and balderdash!

Of course, on the other side of the coin, amateurs can come up with some pretty strange thoughts about segments of their own hobby. The idea that radio teletype *has* to be expensive is a good example. Sure, you can sink quite a few kilobucks into RTTY, but there's a wide price range between h.f. rigs, too. (Ever compare price tags between a Collins KWM 380 and a Heathkit HW 101?) In other words, you don't have to purchase top-of-the-line equipment to get started in RTTY. Indeed, there are few other specialized operating modes that can be as downright affordable as RTTY for the newcomer on a budget.

Own a microcomputer? Then you're eligible for "silent" shoestring RTTY. Shown here is the Macrotronics S80 wider perspective computer and radio.

The Choices

When talking about "shoestring" RTTY, the most obvious question is, "How much does a shoestring cost?" Unfortunately, like everything else, shoestrings cost a lot more these days. For our purposes, however, we'll define bargain-basement RTTY as a complete system costing under $250. Not exactly cheap, but affordable to most with a real interest in radioteletype.

Now that we've determined the price range, the next step is to look at the two general systems available to low-budget RTTYers. System 1 is a mechanical setup, a "traditional" RTTY system that will put someone on F1 who owns nothing more sophisticated than a transceiver and an antenna. System 2 requires a little more from the prospective RTTY operator (a microcomputer system), but will provide a more state-of-the-art RTTY station for about the same price as System 1.

System 1

The first of the two major elements in this system is the teleprinter. With many active RTTY enthusiasts now unloading their old mechanical gear in favor of new microcomputer-based equipment, the time has never been better to pick up a well-maintained mechanical unit for a song.

Unless you live in a *very* remote area of the country, finding a good, used teleprinter should pose no problem. Ask around at your local radio club, talk about your need on some area 2-meter repeaters or try putting up notes in electronics stores. If you do a good job of spreading the word around, someone is bound to come forward with what you're looking for.

Once you've located one or two amateurs willing to part with their teleprinters, get ready to *bargain*! This is definitely a buyer's market, and you shouldn't pay more than $50 for, say, a Model 15 in absolutely pristine condition. As a matter of fact, make an in-

*78-56 86th Street, Glendale, NY 11385

itial offer of about 10 or 15 bucks. If the seller is trying to rid himself of an unused printer, he'll probably be elated at the prospect of losing his machine without doing any heavy lifting. By the way, more modern teleprinters such as the Models 28 and 32 will go for a good deal more, but $150 is still tops for just about any mechanical TTY.

The other element in System 1 is a terminal unit. This rather ominous sounding device interfaces the printer to your transceiver and vice versa. On receive, the TU converts the audio signals from your receiver's speaker jack into the electrical pulses that activate your printer. On transmit, the reverse is true, as it works to convert the printer's pulses into the audio tones that feed into your rig's mike jack. Also included in the TU is a DC loop power supply that is used to run the printer.

Depending on the exact model, the TU may also feature a number of other goodies. Autostart, CRT display and offbeat shifts are just a few of the accessories found on many higher-priced units. But since we're concentrating on saving bucks here, you'll just need an ordinary TU with the standard 170 Hz shift capability and a tuning meter. One model favored by many RTTY buffs seems to be the Flesher Corporation (P.O. Box 976, Topeka, KS 66601) TU-170. Price for this unit is $149.95 in kit form, $219.95 wired and tested. Hal Communications Corporation (P.O. Box 365, Urbana, IL 61801) also has a fairly low-budget TU with many of the features mentioned above, but sells in a wired and tested form for $249, which puts in on the upper-end of the shoestring RTTY spectrum. If you're handy with a soldering iron, you might want to test your homebrewing skills by building your own TU. The ARRL Handbook has plans for a unit you can construct yourself for under $50.

At this point, it might be appropriate to mention the availability of a couple of RTTY books to help you make some sense out of all the equipment you're looking at. Both the *New RTTY Handbook*, published by *73 Magazine*, and *CQ's RTTY From A to Z*, by Durward J. Tucker, W5VU, offer a no-nonsense, nuts and bolts approach to radioteletype. Both books are available at most larger radio stores and through several amateur radio mail-order houses.

Incidentally, if you have access to back copies of *QST*, you might want to peruse the January through October 1965 issues for the Irvin Hoff, W6FFC, series on RTTY. He does a fine job of explaining the idiosyncrasies of the vintage teleprinters we've been discussing. Also, if you're buying a printer from an individual, be sure to ask him for some pointers. Nothing like a little personalized help!

System 2

Are you aware that a microcomputer can also serve as the heart of an RTTY station? If you are, do you know how to accomplish this? Well, adapting a micro to radioteletype is really quite simple. And even better, it's ridiculously cheap when compared to dedicated electronic RTTY systems that can cost $1,000 and up.

Whether you own a TRS-80, Apple, Pet or any one of the other popular microcomputers currently on the market, chances are you're 90 percent on the way to getting on the "green keys." The only prerequisite is that you have a functioning h.f. transceiver and a computer with at least 16K of memory.

For a total outlay of about $150 you can add not only RTTY to your station, but automatic Morse and ASCII capabilities as well. The device that will transform your ordinary computer into a complete visual communications system is known as an RTTY interface. What this amazing little unit does is to turn your transceiver into a set of eyes and ears for your micro. No longer will your computer be tied down to just its tape drive or disk system; new ideas will flow into its memory from other computers around the world.

The best part of all this is that once you've made your initial investment, you'll have an RTTY system that's actually superior to any dedicated unit. After all, a regular RTTY keyboard and display can't do your logging, compute beam headings or play games with you. Your micro, however, can do all that plus a whole lot more.

One of the leading manufacturers of RTTY interfaces seems to be Macrotronics, Inc. (1125 N. Golden State Blvd., Suite G, Turlock, CA 95380). Their M80 systems will link just about any popular micro to any modern transceiver. Merely plug the cable leading from the interface board into your micro's interface port, link another cable to your rig, run the system's program cassette or disc and you're in business.

For a few extra bucks, Macrotronics also offers a line of micro-RTTY accesories ranging from split-screen viewing to a mailbox system that will allow friends to drop a transmitted message into your computer's memory at any time—day or night. All in all, some very state-of-the-art gear should help put an end to the vile, amateur-originated misconception stating that RTTY *has* to be expensive. Whether you own a microcomputer or not, it's one concept that just isn't true. Green keys, here we come! ▣

Interested in a no-holes modification that takes less than one hour to do and improves the selectivity of your TS-820? Read on.

Tighter Skirts For The TS-820

BY ROGER F. ZARUBA*, K2RZ

In the almost four years that I've had my TS-820, I've found it to be a most satisfactory piece of equipment and generally a delight to operate. However, I have found that the receiver could use some more selectivity, especially on 20 meters on a Saturday evening. A quick glance at the manual shows that the factory installed s.s.b. filter in the '820 specs out at 2.4 kHz at 6 dB, and 4.4 kHz at 60 dB, or a shape factor of 1.83. This is about what one would expect from an eight pole filter.

I recall that I had done some less than successful experiments with cascading filters for my Swan 350 about twelve years ago, so when I saw the ads for the TS-180 with its optional filter for 16 pole i.f. filtering, I knew that I had to do some experiments with my TS-820 to see if anything like that could be done with my rig. What I have come up with is a no-holes modification that improves performance on both transmit and receive. Even better, it costs less than $60 and takes less than an hour to install.

The Fox-Tango Corporation[1] has come out with some very nice and reasonably priced filters that are designed for the '820, and it is around these filters that I have built my modification. The filters have insertion losses of less than 6 dB, which means that you will not have to install another stage of amplification to make up for the filter insertion loss in the signal path, as the '820 has more than enough gain available to handle it. There are two filters available which I've tried in this modification. Filter #2808 has specs of 1.8 kHz at 6 dB and 3.1 kHz at 60 dB, and when cascaded with the s.s.b. filter in the '820, gives a 60 dB bandwidth of about 2.5 kHz. This gives a very tight transmitted signal and really restricts the audio range to the point where it is not at all possible to get natural sounding speech, even if you move the carrier points closer into the passband. Some DX stations have told me that the signal might be great for getting through a pile-up, but that the audio was too tinny for comfort. I felt the same way about the receive audio, so I traded in the filter for F-T filter #2809. The 2809 has specs of 2.1 kHz at 6 dB, and 3.6 kHz at 60dB, and when cascaded with the '820 filter, gives a 60 dB passband of about 3 kHz. I highly recommend this filter for the modification unless you're not bothered by less than natural sounding audio. At the same time you order your filter, pick up a .01 uF disc and about a foot of RG-174/U or other thin-type coax.

When I did some thinking about the modification, I decided that I wanted the benefits of the additional filtering on both transmit and receive. In this way, I would benefit from eighteen poles of filtering on receive (don't forget the two poles in the noise blanker filter) and sixteen on transmit. On receive, there should be some improvement in S/N ratio due to the narrower passband, as well as reduced QRM. On transmit, the carrier points will be further down the slope of the passband, and the carrier and opposite sideband suppression will be improved. The desired sideband will take up less space, and if you like processed speech, you can use more of it than you can with only eight poles of filtering. Ah, that sounded like the mailman dropping your filter in the mailbox now (F-T ships very quickly).

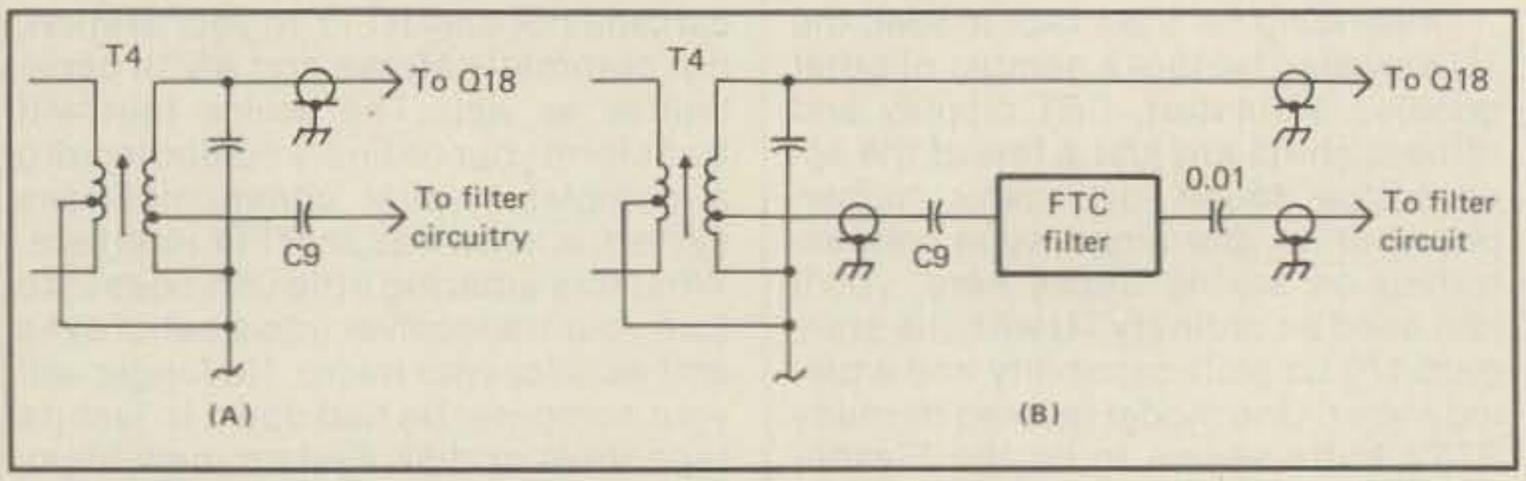


Fig. 1– (A) Original TS-820 circuit, (B) modified circuit.

Well, now that the parts are all together, start the job by removing the top and bottom covers on the '820. For reference purposes, turn on the '820 and tune in and peak the marker signal at 14.2 MHz and note the S-meter reading.

All the work involved in this modification will be performed on the upper left side of the i.f. board (viewed from the component side), so it will not be necessary to remove the board from the transceiver, even if you have the frequency counter installed. Before digging in, let's get our bearings.

On receive, the signal is injected into the i.f. board, passing through a two pole filter where some of it is sampled for the noise blanker at T2. The rest passes through T3 and goes through

*Six Cottage Place, Allendale, NJ 07401

[1] *Fox-Tango Corporation, P.O. Box 15944, West Palm Beach, Florida. The filters are $55.00 each, postpaid.*

the noise blanker switch, D1-D4, and then on through T4, being coupled into the filter circuit by C9. The transmit signal path is from the buffer, Q18, where the signal is introduced into the i.f. at the secondary of T4. It then passes into the filter circuit through C9. Since C9 is part of the common signal path, it is at this point that I decided to insert the new filter.

When you look at the i.f. board from the component side, you will note that T4 is the upper most i.f. transformer on the left side of the board. You will see C9 immediately above T4. Now look at the reverse side of the board and you can easily see the points on the foil where C9 is connected. Now that we know where everything is, let's heat up the soldering iron (40 watts or less) and get to work.

First, cut the coax into two pieces and prepare one end of each piece so that the shield is neatly wrapped and tinned. Keep the amount of center conductor that is exposed as short as possible to minimize signal leakage around the filter. Next, carefully remove C9 from the i.f. board and put it aside, as it will be needed in a few minutes. Take one of the prepared ends of a piece of the coax and dress the coax downward from T4. Connect the center conductor to the center tap of the transformer from which C9 was removed, and connect the shield to the ground foil which runs underneath the transformer, being careful to avoid shorts. Take the other piece of coax and connect the center conductor to the top end of the foil to which the other end of C9 was connected, dressing the coax upward from the board. Ground the shield to the ground foil and check for shorts. This completes all the work on the i.f. board.

Take your new filter and connect C9 to one of the feedthrough lugs and the other .01 disc to the other feedthrough lug, and keep the leads short to minimize leakage. Also be sure that you don't accidentally connect the capacitors to the ground lugs. Mount the filter atop C23 and C24, the two black electrolytics just behind the i.f. board, with the lugs facing upward, using double sided tape or the like.Next take the two pieces of coax and cut them to lengths that will allow them to reach their appropriate ends of the filter, but don't leave them excessively long. Connect one center conductor to the free end of C9 and the shield to the ground lug, keeping the amount of center conductor exposed to a minimum. Do the same with the other piece of coax and the other capacitor and ground lug, and the work is completed. Go back and check your work once more to be sure.

Now for the smoke test. Turn the transceiver on and tune in the marker

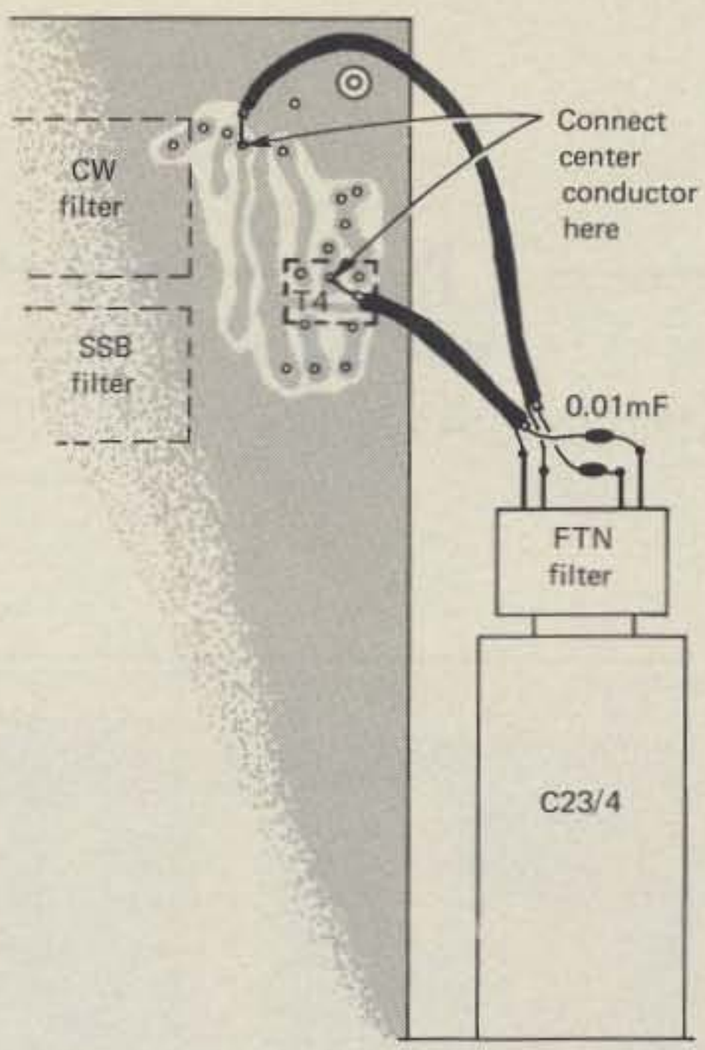


Fig. 2- Location of the pc board connections on the TS-820 i.f. board as seen from the foil side.

at 14.2 MHz. Peak the S-meter reading with the preselector and adjust the slug of T4 for maximum reading. If you noted what the reading was before the installation of the filter, you will see that it is a few dB less with the additional filter installed. Not to worry; you can use VR2 at the top of the i.f. board to bring it up to what it used to be. I don't really depend on S-meters anyway, so I just set mine to S-9. Now put the set together and you're ready to go!

When you first operate with 16 poles of filtering, you will find that the passband has become much tighter. On transmit you will have to set your mike gain just a hair higher than before to make up for the insertion loss of the filter. Tune through the marker signal and you will see just how sharp the skirts have become. If you recall, you used to be able to hear the beat note on the other side of zero beat with only eight poles, but you may not be able to hear it now. The *I.F. Shift* control will be much more effective than it was before and will really do its job now. QRM should be less of a problem now, but don't expect the filters to do much good if your QRM problems are due to cross-mod from your next-door neighbor who runs 2 kw; for run of the mill QRM, the filters do a good job. I estimate the 6 dB bandwidth to be about 2 kHz and the 60 dB bandwidth to be about 3 kHz, a substantial improvement over what it used to be. Without making any adjustments to the carrier points from the way the factory set them up, I find that the audio is clean and natural sounding, and the reports I get indicate that this is also true on transmit. Delightful results for so little time, money, and work.

This month by
ROD LINKOUS, W7OM

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

If there is anything that chills a DXer, it is being the DX club activities or program chairman. Next to DX news, most of my correspondence from readers is about DX club programs. They usually inquire about tips on how to get through a year in that awesome job. It is really not all that bad.

The DX Club Forum—Programs

In many of our previous DX columns we have given a tip or two on where and how programs can be generated that appeal to most. This month I will try to summarize some past tips and give you some new leads. To condense this item, I will assume the audience contains non-DXers as well.

The obvious choice of subject matter is the DXpedition. It has that far away appeal and intrigue. Some of the world's finest amateurs can make a DXpedition hum with success. Many excel in entertaining an audience. They are often good amateur photographers, too. Yet when it comes to giving a program or documenting a DXpedition on film with audio cassette, a few miss the boat. Or, for example, one DXpedition 35mm slide and tape documentary excelled in footage on the boat and had darn little about the destination.

The biggest key to success of DX programs is their length. They should normally be around 25 to 30 minutes in duration. So if you have a program speaker, set the time limit up front. This will save you cutting him off before the end of the program. With live programs the question and answer period can burn up more time than a hot pileup. The best way to handle this is with a tough moderator who is time sensitive. It isn't all that hard to imitate some of W7PHO's firmness.

The 35mm slide and tape cassette program offers the best protection against live program cancellations. Movies also are excellent insurance. But the non-professionally prepared ones have a risk. Simple solution—take time to preview them.

Kent Svensson, SM4CAN, (left) receives 5BWAZ plaque number 3 from John Attaway, K4IIF. John toured the Scandanavian countries, which provided the opportunity to present the plaque to Kent. This was a major feat in working/confirming 5BWAZ and the local DX crew turned out for the event. (Photo via K4IIF)

Now for some timely sources for programs for those who need them. Two quick tips—recent DXpeditions and recent conventions or hamfests. For the price of postage, a multitude of possibilities are there for the asking. For example, David Shoen, N2KK, of 80 meter DXpedition fame is a professional photographer, too. Write to him about his trip and ask him for some help. If David can't come to you, maybe a program can come to you via the mail.

Our local club underwrote the cost of documenting a DXpedition on 35mm and tape. Maybe your club would be interested in such a project. This way you solve the DXpeditioner's problem, your program needs and provide a travelling program for others. It may cost you some stamps, maybe some slides and tape, but it is probably cheaper than dinner for the speaker.

I used David only as an example. He is harder than most to write to as he spends most of his time travelling. Thank goodness, for he has given many of us a new one on the low bands. But there are a lot more like David in the hobby.

I have had the pleasure of hearing Bill Poellmitz, K1MM, give a program. He handles an audience as well as he handles the pileups. He is an excellent showman, too. Marty Laine, OH2BH, is another who excels in this arena. Although his program on Annobon, 3C0AN, is a few years old, it is excellent once you get past the first slide. It shows the extremes that a few have gone through to give us another new one. He has excellent command of English and his programs are well worth the postage. The Colvins (W6KG and W6QL) are a show team. This just starts the list.

You will find DXpeditions to be excellent. The story of where they went appeals to all. The how (problem *et al*) of the trip will amaze and amuse you, too.

By writing to recent conventions or hamfests you can obtain a copy of the program. BINGO! Now you have a program shopping list. Programs of this type are proven products, some quality and some marginal. A comment from the events chairman will steer you in the right direction.

A few more ideas. Try local companies. The telephone company, for example, in most areas has a speakers' bureau. The list of technological subjects gives excellent choices. They can speak to all levels, from the general public to the engineering audience. They will give you another perspective of the communications world.

If you are fortunate enough to have a local college or military installation nearby, invite the paid professionals. The military is especially keen on telling the public how their tax dollars are spent. They are developing and using the most advanced technology and equipment. The military speakers are not only eager to tell their story but are also eager to interact with their neighbors. Just ask them; try the military public affairs office.

Finally, and probably the easiest bunch of people to work with, is your local fire department. Fire prevention and safety are their business. Best of all, they are very good at it. Like the

*5632 47th Ave. SW, Seattle, Washington 98136

George Wagner, K5KG, of Houston, Texas, looks right at home on the ferry headed to Aland Island. He operated as K5KG/OH0 at the QTH of OH0NA. In six days he made 3,050 QSOs with 54% on c.w. which covered WAS and 112 countries. Kee, OH0NA, was a great host and devoted a week off from work to keeping George on the air. OH2BDA was also operating from Aland at the same time, giving all takers a chance to work both in one swing of the band.

military, they work for you. A yearly program in many clubs is CPR (Coronary Pulmonary Resuscitation). Electrical shock is always a possibility in our hobby, so be prepared. It is better than hoping you never need it. Bring the family out to this one.

The firemen are pros in the area of aerial safety, too. So why not get them to tell you the right way to handle the safety aspects of that tower work.

Finding a DX program is a detective job, tough at first, sometimes challenging. But in one evening you can lay out a year's calendar. Then join the rest of the club in the pileup. Good luck in the quest.

5 Band WAZ

Standings as of December 1, 1980

Plaques have been won by the following stations:

Plaque No. 1, ON4UN, John Devoldere (Belgium)
Plaque No. 2, K4MQG, Gary Dixon (U.S.A.)
Plaque No. 3, SM4CAN, Kent Svensson (Sweden)

The top contenders for WAZ:

1. AA6AA, 199 zones
2. N6DX, 191 zones
3. W8GT, 189 zones
4. SM0AJU, 189 zones
5. N4WW, 186 zones
6. K5UR, 183 zones
7. WA4JTI, 180 zones
8. DL3RK, 180 zones
9. W1NG, 178 zones
10. VK6HD, 177 zones

CQ DX Awards Checkpoint

Two new checkpoints have been added for your convenience. Use them to check your QSL cards. Fred Farley, AA4FF, in Lynchburg, Virginia and TF3KX in Iceland are authorized to verify applications for DX awards offered by *CQ*.

5BWAZ Number 3

The call to the most challenging DX project, 5BWAZ, was answered by many. This project has a common leveler—location is *not* the key to success. Unlike 5BWAS and 5BDXCC, where you are is not as important as dedication to the project.

Recently the *CQ* plaque for 5BWAZ number 3 was personally presented to

Not often a group of DXers gets together on the street corner in Stockholm. (L to r) Rio, JR1JRK; SM0GMZ; SM0AQD; George, K5KG; SM0GMG; SM0CMP; and SM0AGD. Not shown is the photographer, JH1ARJ.

Kent Svensson, SM4CAN. Those who have spent any time on 80 know the call. Now the background on the 5BWAZ project from Kent's point of view.

First, Kent lives in a small village (Laxa) about 200 miles west of Stockholm with his wife and two children. He runs the electrical service and construction department of a particle board factory. His wife, Berit, works in personnel administration for a company making mineral-wool. He has been DXing since first licensed in 1963.

The station contains a Drake TR4-C, Collins S-line and a homebuilt linear. Output power to the homebrew antenna farm is 1 kw pep. The antennas will interest those with the inclination to build. On 80, the antenna is a shunt-fed grounded tower with an electrical height of 110 feet. On 40, four verticals are used in a switched array. Each vertical has 70 radials and can be switched for gain in eight different directions (7 dB forward gain; with about 20 dB front to back). On 20, 15 and 10, the love for quads prevails. The quad is a four element one on a 30 foot boom at 60 feet.

Kent started the 5BWAZ quest on 1 January 1979 along with the multitude. By May 1979, he had 180 zones. The top bands went very well. The 80 meter antenna didn't get into service until March, so he missed the first season. The most difficult zones turned out to be on 80 (zones 1, 2, 6, 12, 19, 22 and 31).

Thanks to Rich, KL7RA, and the 79 *CQ* Worldwide C.W. contest, Zone 1 on 80 fell. After skeds with VE2ACP in Zone 2, a QSO with VO2CW was easy. *(Ed.—Seems after you do it the hard way, they get easy.)* For Zone 6, XE1MBG was moved from 20 down to 80 for an easy contact. Zone 12 was a real challenge. Thanks to CE3OE, Daniel, CE3DZ, kept that important schedule on 80. It took a lot of time on 20 to set this one up.

Mike, UW0MF, helped with Zone 19. Mike was also instrumental in obtaining the QSL for Zone 23. Zone 22 came via schedules set up by VU2RAK. Both VU2DPK and VU2BX came up on special skeds to give Kent the zone and another brand new one on 80. Central Pacific was absolutely the toughest one to work. Kent had a number of skeds with Lee, KH6BZF, but no propagation. Then through Norman, KH6PI, several more tries. The sked on 1 February 1980 on "gray line" made it. Three weeks later, Randy, KH6XX, was

The WAZ Program

10 Meter Phone

80	N6AW	88	K5UR
81	KØQMU	89	WØNZA
82	I8MPO	90	WA4LOF
83	JR2RAV	91	KØCD
84	JE1LZZ	92	KB6CO
85	N4NX	93	W5TKV
86	K4CKS	94	W7FP
87	W4UNP	95	JA1EF

15 Meter Phone

67	N4NX	69	NL7H
68	JR2XJO	70	N9AFY

20 Meter Phone

336	KØZZ	339	N6AW
337	YU2RNC	340	JAØCOR
338	I8WES		

10 Meter C.W.

11	N4MM	13	JA7GLB
12	JG1FJT		

15 Meter C.W.

41	JR4IV	42	W8UVZ

20 Meter C.W.

124	WB6SHL	127	WØRJU
125	KØZZ	128	K4GXH
126	WB2KXD		

All Band WAZ
S.S.B.

2064	WA7OBH	2074	SM5HYL
2065	DJ7EV	2075	W9OKL
2066	JA1HEE	2076	K3STM
2067	JA7LBX	2077	KBØA
2068	EA5BA	2078	KB9IS
2069	JH1OJU	2079	KB8IZ
2070	JA4GXS	2080	WA2VEE
2071	WD8JYR	2081	K2OLG
2072	FR7ZN	2082	N4AYO
2073	W7FOF	2083	KØQQ

C.W. and Phone

4961	DL9TD	4976	DL3BD
4962	DJ4SO	4977	VE1BLX
4963	K4WGW	4978	N2ATD
4964	W6MPG	4979	DF2ED
4965	N8BJQ	4980	JH2JUK
4966	EA2HW	4981	F8DU
4967	JA4AO	4982	ZE1CR
4968	W3GOH	4983	ON7WW
4969	JA3MPT	4984	WD9HAW
4970	KB8LT	4985	OZ1FRR
4971	N5CB	4986	SM6DUA
4972	F6EVS	4987	W3ESU
4973	F6CXB	4988	K8MPF
4974	K9WA	4989	N6PV
4975	YU1NYE		

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the W A Z manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all C.Q. awards is $4.00 for subscribers and $10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application.

in the log and the KH6 card was on the wall.

The QSLing went very well. The last QSL arrived on June 27th from UA1UBS. That was for Zone 16 on 15. Like many, the first 199 QSLs were in hand in April.

Our congratulations to Kent on the outstanding accomplishment. With 305 countries and over 40,000 QSOs, he is now turning his interest to a new project—5BWAS. So for those who need Sweden or Zone 14, there will be a lot of SM4CAN activity on the low bands.

IDXF Slide Presentation

The International DX Foundation (IDXF) is working on a slide presentation which will cover most, if not all, IDXF DXpedition operations. We would be glad to present this show at your convention/hamfest, etc. Please keep posted in future IDXF newsletters for further information. A slide presentation on the recent 9M6MU DXpedition is available now. Direct inquiries go to Box 117, Manahawkin, NJ 08050 U.S.A.

From The Pileups

The new U.S. call assignment system is giving many a challenge just to keep them straight. KH3AA should be on Johnston Island, but he has moved to Hawaii. Only WH3AAA, WH3AAB and KH3AA are currently on the island. Look for KH3AB on 7240 at 0800 regularly. **(KH3AB)** Arthur, G3JKI/5A, showed again during late October and said he would be active. He was again working to lists prepared by F6CY1 on 10, 15 and 20, but this time he was asking for QSLs to go to his home address. Arthur also said he has written permission dating back to his previous operation. **(Long Skip)** I changed my QSL manager to my sister-in-law who is just getting started in amateur radio. She likes lots of mail and the VQ9JW cards do part of the job. **(VQ9JW)** Ian, VK4NIC/3X, still working the needy. Mostly with manager W4FRU around 1630 on 28735 and later with W7PHO on 15

CQ DX Awards Program

S.S.B.

944	G3XTT	948	KA9I
945	N8BJQ	949	KA6WW
946	XF4MDX	950	WB5PBA
947	WB9VJN		

C.W.

467	G3XTT	469	KA3BOD
468	N8BJQ		

S.S.B. Endorsements

310	K9LKA/315	150	JH4PRU/169
310	YV5AIP/311	150	KB0C/156
310	W8ILC/310	150	N8BJQ/154
310	N4MM/310	28MHz	KB5DN
300	VK4VC/302	28MHz	WB4UBD
300	W2SUA/302	28MHz	G3XTT
		28MHz	JH4PRU

C.W. Endorsements

275	N4MM/295	150	G3XTT/152

The total number of active countries as of deadline was 318. The basic award fee is now $4 for CQ subscribers and $10 for non-subscribers. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement fee for stickers is $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, 911 Rio St. Johns Dr., Jacksonville, Fla. 32211 USA.

The Milano DX team. Sitting, from left to right, are I2JML, I2RR, I2XNC, I2NDH, and I2PKF. Standing are I2IMI and I2MQP. They reported that conditions for the last CQ Worldwide DX S.S.B. Contest were very good, and in one day they worked 121 countries and qualified for WAZ.

meters about 2100. Ian will most likely be there until either April or June. He has a contract. He has had some discussions about future employment of a similar nature in Canada, but such employment would not come until after his Guinea job has ended. Hopefully, by the time you read this, his certification will be made by the DXCC desk. The paper work is a big chore with many complications. **(QRZ DX)**

The Northern California DX Club keeps drawing the DX visitors. SM5CIK and DL1QK joined them recently for a meeting in San Leandro. If you are in the area you can get info on the club WR6ACZ repeater (147.96 in/147.36 out). **(The DXer)** VK9ZG, Graem, closed down on 3 December. Fortunately, Willis Island will continue on the air as the replacement is Dave Shaw, VK9ZD. Dave was first licensed on 25 November 1980, so we should show him every courtesy and as much encouragement as possible. Dave is using a Collins KWM-2A with the same TH3 Jr that was used by VK9ZG. The antenna donated by VK3OT remained and all he had to do was plug up and take on the pileup. He will be active 10 through 80. Some tentative skeds you might watch are 0500 on 21202 with VK3PA; 0630, Tuesdays and Fridays on the 14265 Pacific DX Net; 0700 with the P29JS group on 14265; and 1000 around 14175 with VK9CP. Dave work c.w. and hopes to frequent those bands not patronized by VK9ZG. **(QRZ DX)**

Felix Yaoch, KC6BS, shown here at the controls, puts Korror, Palau in the Western Carolines on the air for the deserving. Len Kaufer, KH0AC, visits Felix on his trips through the islands and provided the photo.

VK9CCT showed from Cocos Keeling recently. The appearance of Alex, VK9CCT, was a welcome surprise. Unfortunately, it is difficult to give any real advance warning of his visits because of the nature of the job that takes him there. **(Long Skip)** N4CNL, ex K4MPI, has the logs for BV1US operation from September 1960 to 1962, c.w. only. **(QRM)** You don't have to read Japanese to use the QSL Report published by JH1HWN. This fine report is mailed monthly and supplements those available from other sources. **(Totem Tabloid)** Jack Bock, K7ZR, the editor of the Western Washington DX Club's *Totem Tabloid*, was elected to a three year term as a club trustee. Jack's editorials on c.w. have made excellent reading. **(ed)** Peter, OX3PT, expects to be on 40 meters as often as possible around 0100. He plans to operate around 7085 and will listen around 7160. **(QRZ DX)** The Youth Palace is performing important tasks for the young people of the Sudan in many educational areas, including physics, chemistry, sports, music and the arts. The Physics department takes great pride in having trained amateur radio operators at

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Okino Tori Shima was deleted effective November 23, 1980, leaving 318 valid countries possible as of deadline. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsements involving the issuance of a sticker is $1.00. The basic award fee is now $4 for *CQ* subscribers and $10.00 for non-subscribers. Please attach your latest *CQ* mailing label to qualify for the $4.00 rate.

C.W.

W6PT	318	W3GRS	314	K9MM	309	N4MM	295	JA1GTF	285
ON4QX	317	N6AV	312	W4BQY	307	W1NG	293	SM3EVR	284
K6EC	315	K4CEB	311	W2GT	304	W4OEL	292	K3FN	283
W9DWQ	315	K6JG	309	DL3RK	299	WA8DXA	289	W1WLW	276
N4PN	315	N6CW	309	N6FX	298	DJ7CX	287	JH1VRQ	275
W6ID	314								
DL7AA	314								

S.S.B.

WA2RAU	318	W3AZD	316	F2MO	313	YV5DFI	304	LA7JO	291
W6EUF	318	W3CWG	316	W4DPS	312	N6AW	304	IØMBX	289
W9DWQ	317	W4UG	316	W6YMV	312	W2SUA	304	G4CHP	289
DL9OH	317	K6EC	316	OE2EGL	312	DL6KG	303	AI8S	287
K8DYZ	317	IØZV	315	I5WT	312	N2SS	302	N5FG	284
W3NKM	317	F9RM	315	W3GG	312	K8PYD	302	K9HQM	284
W6REH	317	K6YRA	315	ZL1AGO	312	VK4VC	302	JA5PUL	284
XE1AE	317	W4SSU	315	DK2BL	312	W6FET	301	I8LEL	283
W4EEE	317	K6JG	315	WØSD	311	WØSR	300	K1UO	282
W2TP	317	K9LKA	315	YV5AIP	311	W2CC	300	W6DN	281
IØAMU	317	VE2WY	315	W6RKP	310	HP1JC	300	N3RL	281
K6WR	317	ZL3NS	314	K6XP	310	WA4WTG	300	WD8MGQ	278
K2FL	317	VE3GMT	314	K5OVC	310	OE3WWB	300	K3MWV	277
W9JT	317	K4MQG	314	W8ILC	309	OK1MP	300	W4BQY	277
WA2EOQ	317	SM6CWK	314	N4MM	309	XE1J	299	WA4LOF	277
W9QLD	317	I8YRK	314	K8LJG	309	WA4JTI	296	WA6TOO	276
ZS6LW	317	DJ9ZB	314	K9RF	309	I6PLN	295	YU2RTW	276
VE3MR	316	I4ZSQ	314	I3LLD	309	DJ7CX	294	XE1CI	276
TI2HP	316	SM6CKS	313	W9SS	308	VE3FJE	293	WA4TLI	276
W3GRS	316	OZ3SK	313	N6AV	308	K5DUT	293	ZL1BIL	275
VE3MJ	316	EA4LH	313	WØSFU	307	K9BWQ	293	W8ILC/QRPp	275
I8AA	316	N4WF	313	WØYDB	306	W1NG	292	WAØTKJ	275
W9KRU	316	YV1KZ	313	XE1KS	305	JH1VRQ	291	K9UAA	275
I8KDB	316	K9MM	313	LU1BAR/W3	305	W7OM	291	WA4DAN	275

their newly established club station 6T1YP. The Yugoslav (SRJ), German (DARC) and Finnish (SRAL) national societies as well as the Northern California DX Foundation deserve recognition for their contributions. As invited guests for training and lecturing, we managed to open the station 6T1YP for international friendship between the Sudan and the rest of the world. Some 10,000 QSOs were logged during four nights of operating. **(OH2BH)**

Many have not been receiving a QSL reply from LX2BQ when their cards are sent via the bureau. Willy advises he is not a member of the bureau and does not reply to the cards he doesn't receive. He does QSL 100% for all cards received direct. **(LX2BQ)** Frank, DL7FT, of ZA2RPS fame, expects to try again sometime around mid April from Albania. He will have to make two trips—the first to get permission in black and white and the second for the actual operation. Due to a new flight schedule into Albania, April is the earliest time that arrangements for all necessary transportation could be made. Planned are c.w. and s.s.b. operation on 10, 15 and 20. Crystal control is mandatory and the low bands are not possible. **(QRZ DX)** Len, KH0AC, Saipan in the Marianas lost all of his antennas in a recent typhoon. The winds came up so fast that they couldn't secure the antennas. The big Wilson 9 element 20 and 15 meter interlaced beam at Dan's, KG6RL, QTH is in such bad shape that he will be lucky to make a small 10 meter beam out of it. Len is back on the air with his trapped vertical. A new TA33 is on the way. **(K7ZA)**

DX Nets

A quick way to a new country is provided by the DX news of *Long Skip* and *QRZ DX*. Hopefully the following will aid you:

Day	Freq.	Time	Net
Sat;Sun	3795	0630	80M DX Net
Sunday	7080/ 7180	0200	40M DX Net
Daily	7240	0800	XX DX Net
Daily	14220	0630	P29JS Net
Daily	14225	2300	Family Hour
Daily	14250	1500	Family Hour
Friday	14250	0500	Arabian Knights Net
Tue/Sat	14265	0500	Pacific DX Net
Daily	21345	2330	Family Hour
Daily	21355	1700	Afrikkaner
Daily	28510	*	10M DX Net

*Unfortunately we did not get the time confirmed.

There is another good DX net on 10 meters on Monday, Wednesday and Friday, meeting around 28750 at 1200 UTC with DK2OC. Known as the DX to DX Net, they have a gathering of DX for those with propagation at that time.

73, Rod, W7OM

QSL Information

A4XIH to G4GIR
A9XDD to K7DVK
A9XDE to N4BPP
C31HV to G4GIG
CN8AD to F8JL
CR9B to WA3HUP
DJ1US/ST3 to DF2RG
DJ7UX/EA6 to DARC
DX82P to DU1JB
EL2AM to WD4NBX
EL2AV to N6FL
FG0DYM/FS to W3HNK
FG0GBL/FS to K8BPX
FG0FIS/FS to K6LPL
FH8CL to I1KFB
FK8DH to DJ9ZB
FM7BW to WB4IWW
FO0ALN to K4II
FO0DX to K1MM
FP8AA to K2RW
FP0FSZ to VO1FB
FP0FXP to K8BTH
FP0GAP to W8NR
FP0GAQ to K8CJQ
FP0GBG to W8AH
FY7YE to W5JLU
GU5DQR to DK5SF
GU5DQT to DJ5PA
H5AA to ZS4MG
H5ADX to ZS6GH
H44SH to AD1S
HB0NL to HB9NL
HS5AID to AG6D
HV1CN to DL1KK
HV2VO to I0GPY
HZ1TA to I8YCP
I2DMK/IC8 to I2DMK
I2IZC/IA5 to I2USR
IS0FGM to I4BFY
IY4FGM to I4FGM
J3AJ to W7LLC
J6LIR WB6FCR
J28AZ to I8JN
K5LBU/ST0 to WA4ZQQ
KA4EIN/TI4 to N5ANA
KA6ISE/CX to W6KBD
KC6DC to AD1S
KC6YC to W7EJ
KC6ZR to W7ZR
KH3AB to KB7MO
LA5YJ to WB1DQC
N4ADJ/KH2 to WB4CCT
OH2UY/OH0 to OH2UY
OH0AL to OH2AL
OH0AM to OH2BBM
OX3CO to WB3KGY
OY5NS to W3HNK
OY9R to K2IJL
P29NBF to K6UJV
PY0OD to WA4MDS
PY0ZDX to WA4VDE
SV0AO to KA2FRP
T2AAD to W9GW
T3AC to WB6FBN
TJ1CK to DL1HH
TN8AJ to WB9TTM
TR8CR to F6AQO
TU2JJ to KN0KCW
VE1KG/CO2 to VE1KG
VE2FMD/5U7 to VE2AUF
KV4NIC/3X to W4FRU
VK9CCT to WA9WWT (US)
VK9CCT to VK5QX (DX)
VK0GW to VK5GW
VK0WW to VK5XX
VP2AJ to WB2TSL
VP2EA to KB4QB
VP2VGS to SM0CMM
VP5B to N4KE
VP5WW to N4KE
VP8SB to G3ZMF
VP9AD to W3HNK
VP9CB to VE3MPZ
VP9JM to K4BR
VQ9JW to KA3EDN
VQ9RS to N6BLN
VQ9TT to KB5MZ
VS6DD to N6ADD
VS6JR to WA4QMQ
VU2UH to SP9AJT
W6KG/SV to YASME
W7EJ/KX6 to W7EJ
W7LPF/DU2 to N2CW
WA7JRL/SU to W8LZV
WA7JRL/4X to W8LZV
WB1GDQ/9K2 to K1LOM
WB4ZNH/5X to K4PHE
WD4KMD/DU2 to N2CW
WD4MDM/VP9 to WD8IRE
WN4FVU/5X to N4NX
XT2AT to OE8ENK
YS9RVE to WA0JYJ
YX2AMM to YV2AMM
ZE1DK to WA8WFF
ZF2BN to W4HET
ZK2AXE to PA0GMM
ZK1BD to ZL1SZ
ZK2BM to PA0GMM
ZS1DM to WA4JQS
3B6CD to 3B8CF
3B8DB to K5BDX
3B8RS to 3B8AD
3D2FJ to JA7SGV
4S7KK to K2FV
4U35UN to W2MZV
5B4CX to OE8GMK
5B4HF to KC5I
5B4JP to SK2AU
5N0DOG to W4FRU
5T5NC to G3TXF
5W1CY to ZL1AMO
5Z4NQ to WD9CIV
5Z4YV to JA2AJA
6O0DX to I2YAE
6W8HL to KB4GQ
6Y5MD to VE3IPR
8R1K to K1RH
9G1RT to KB7HB
9K2EW to WA3SWH
9K2KX to W4KA

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1900 MHz to 2500 MHz DOWN CONVERTER
This receiver is tunable a range of 1900 to 2500 mc and is intended for amateur radio use. The local oscillator is voltage controlled (i.e) making the i-f range approximately 54 to 88 mc (Channels 2 to 7).

PC BOARD WITH DATA	$19.99
PC BOARD WITH CHIP CAPACITORS 13	$44.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY	$69.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY PLUS 2N6603	$89.99
PC BOARD ASSEMBLED AND TESTED	$99.99
PC BOARD WITH ALL PARTS FOR ASSEMBLY, POWER SUPPLY AND ANTENNA	$159.99
POWER SUPPLY ASSEMBLED AND TESTED	$49.99
YAGI ANTENNA 4' LONG APPROX. 20 TO 23 dB GAIN	$59.99
YAGI ANTENNA 4' WITH TYPE (N, BNC, SMA Connector)	$64.99
2300 MHz DOWN CONVERTER	
Includes converter mounted in antenna, power supply, Plus 90 DAY WARRANTY	$259.99
OPTION #1 MRF902 in front end. (7 dB noise figure)	$299.99
OPTION #2 2N6603 in front end. (5 dB noise figure)	$359.99
2300 MHz DOWN CONVERTER ONLY	
10 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output	$149.99
7 dB Noise Figure 23 dB gain in box with N conn. Input F conn. Output	$169.99
5 dB Noise Figure 23 dB gain in box with SMA conn. Input F conn. Output	$189.99
PC BOARD FOR 5 dB UNIT WITH DATA	$35.00
PC BOARD FOR 5 dB UNIT WITH ALL PARTS FOR ASSEMBLY	$139.99
DATA IS INCLUDED WITH KITS OR MAY BE PURCHASED SEPARATELY	$15.00

Shipping and Handling Cost:
Receiver Kits and $1.50, Power Supply add $2.00, Antenna add $5.00, Option 1/2 add $3.00, For complete system add $7.50.

HOWARD/COLEMAN TVRO CIRCUIT BOARDS

DUAL CONVERSION BOARD $25.00
This board provides conversion from the 3.7-4.2 band first to 900 MHz where gain and bandpass filtering are provided and, second, to 70 MHz. The board contains both local oscillators, one fixed and the other variable, and the second mixer. Construction is greatly simplified by the use of Hybrid IC amplifiers for the gain stages. Bare boards cost $25 and it is estimated that parts for construction will cost $270. (Note: The two Avantek VTO's account for $225 of this cost.)

47 pF CHIP CAPACITORS $6.00
For use with dual conversion board. Consists of 6-47 pF.

70 MHz IF BOARD $25.00
This circuit provides about 43 dB gain with 50 ohm input and output impedance. It is designed to drive the HOWARD/COLEMAN TVRO Demodulator. The on-board band pass filter can be tuned for bandwidths between 20 and 35 MHz with a passband ripple of less than ½ dB. Hybrid ICs are used for the gain stages. Bare boards cost $25. It is estimated that parts for construction will cost less than $40.

.01 pF CHIP CAPACITORS $7.00
For use with 70 MHz IF Board. Consists of 7-.01 pF.

DEMODULATOR BOARD $40.00
This circuit takes the 70 MHz center frequency satellite TV signals in the 10 to 200 millivolt range, detects them using a phase locked loop, deemphasizes and filters the result and amplifies the result to produce standard NTSC video. Other outputs include the audio subcarrier, a DC voltage proportional to the strength of the 70 MHz signal, and AFC voltage centered at about 2 volts DC. The bare board cost $40 and total parts cost less than $30.

SINGLE AUDIO $15.00
This circuit recovers the audio signals from the 6.8 MHz frequency. The Miller 9051 coils are tuned to pass the 6.8 MHz subcarrier and the Miller 9052 coil tunes for recovery of the audio.

DUAL AUDIO $25.00
Duplicate of the single audio but also covers the 6.2 range.

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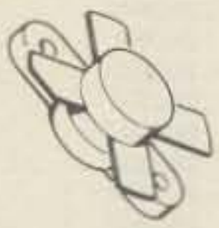

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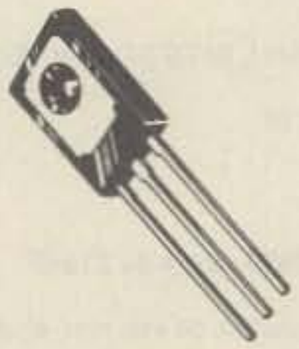

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- Common Collector Characterization

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CIRCLE 83 ON READER SERVICE CARD

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

If you were looking for YU 80 meter c.w. contest activity on January 10/11 and found none, you may be wondering what happened. The problem was that the SRJ has changed this one to a new 40/80 meter c.w. contest on February 14/15. Unfortunately, it was a late decision and the announcement was not received in time to make the February issue.

However, just in case you did get involved, here is a brief explanation of the scoring. QSOs with YUs were worth 5 points on 7 MHz and 10 points on 3.5 MHz. Other DX contacts were worth 2 points on 7 and 5 points on 3.5, but only 1 point on 7 and 2 points on 3.5 if station was in your own continent. The multiplier was the sum of DXCC countries and YU prefixes worked on each band.

Logs go to: SAVEZ Radio Amatera Jugoslavije, P.O. Box 48, 11001 Beograd, Yugoslavia.

The new PACC contest manager is PA0INA, and logs for the PACC Contest on February 14/15 now go to: F. T. Oosthoek, PA0INA, P.O. Box 521, 4330 Am Middelburg, The Netherlands. However, I am sure that if you have already sent them to PA0DIN he will forward them to the proper address.

I question the wisdom of the YL ISSBers scheduling their QSO Party on the same weekend as our World Wide WPX SSB Contest. Our WPX contest has been scheduled on the last weekend in March for many, many years and is a well established fact. There is no QRM problem since the ISSBer's affair is c.w., but we do have a very large following and possibly some of their DX-minded members may find our contest more attractive. It would seem to me that a change in their dates would be advisable.

And a final reminder. The deadline for material for the July issue is April 10th. Announcements received after that date will not make the July Calendar.

73 for now, Frank, W1WY

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

*	**Fb/Mr 27-1**	**CQ WW 160 Mtr. Phone**
*	Fb/Mr 28-1	French Phone Contest
*	Fb/Mr 28-1	RSGB 7 MHz C.W.
*	Fb/Mr 28-1	YL-OM C.W. Contest
*	Fb/Mr 28-1	G-QRP C.W. Activity
*	Mar. 7-8	ARRL Phone Contest
	Mar. 14	"Corona" 10 Mtr. RTTY
	Mar. 14-15	Virginia QSO Party
*	Mar. 14-15	QCWA Phone Party
	Mar. 14-15	So. Carolina QSO Party
	Mar. 21-22	Bermuda Contest
	Mar. 21-22	Commonwealth Phone
	Mar. 21-22	BARTG RTTY Contest
	Mar. 21-22	Tennessee QSO Party
	Mar. 28-29	**CQ WW WPX SSB**
	Mar. 28-29	YL ISSB CW QSO Party
	Apr. 4-5	ARRL Open CD Phone
	Apr. 4-5	Polish C.W. Contest
	Apr. 5-6	Wisconsin QSO Party
	Apr. 8-9	DX-YL to N.A.-YL C.W.
	Apr. 11-12	ARRL Open CD C.W.
	Apr. 15-16	DX-YL to NA-YL Phone
	Apr. 18-19	Polish Phone Contest
	Apr. 18-19	YL ISSB Phone Party
	Apr. 18-20	ARCI QRP QSO Party
	Apr. 25-26	Swiss H-26 Contest
	Apr. 25-26	King of Spain Contest
	May 30-31	**CQ WW WPX C.W.**

*Covered last month.

CQ WW WPX Contest

S.S.B.: March 28-29 C.W. May 30-31
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

Complete rules were published in last month's issue. Do not become alarmed by the "Important Rule Changes" indicated in the announcement. Basically, the format is exactly the same as in previous years with only a couple of modifications and clarifications as follows:

1. Part IV—Definition of a multi-operator, single transmitter station has been clarified as follows: Only one transmitter and one band may be used during the same 10 minute time period. (Picking up new multipliers on another band during the 10 minute time period is *not* permitted.)

The physical boundaries of a multi-multi station are now defined as within a 500 meter diameter.

2. Part XI—The eligibility clause for Trophy and Plaque winners has been reduced to *two* years from the previous three years. This does not apply to QRPp, Expeditions, Club or *CQ* Special Awards.

Stations that are World winners will not be considered for a sub-area award; that award goes to the runner-up for that area.

3. Part XIII—A Prefix multiplier check list is now a definite requirement and must be included with each log entry.

Everything else—the exchange, the scoring, etc.—remains exactly the same. And keep in mind that a Prefix multiplier is counted *once only*, not once on each band.

This year you have a choice of two addresses to send your logs to. Be sure to indicate S.S.B. or C.W. Contest on the envelope. Deadline for S.S.B. is May 10 and for C.W., July 10. The addresses are as follows (please mark the envelopes S.S.B. or C.W.):

CQ Magazine, WPX Contest, 76 N. Broadway, Hicksville, N.Y. 11801.

Contest Director, Bernie Welch, W8IMZ, 7735 Redbank Lane, Dayton, Ohio 45424.

This is OH2BH's home lay-out. This is the station John operated as K4IIF/-OH2 during the phone weekend of the Scandinavian Activity Contest. John reports that one of the most gratifying aspects of traveling is the willingness of overseas hams to make their stations available when he is out of the country during contest weekends.

"Corona" 10 Meter RTTY

Saturday, March 14, 1100-1700 UTC

This RTTY contest is organized by the DARC to increase RTTY activity on the 10 meter band. This is the first of a series of four tests to be held this year. The other three will take place on May 10th, September 26th, and November 8th.

Activity of course is on 10 meters only, in that portion of the band normally used for RTTY operation.

Exchange: RST, QSO no., and your name.

Points: One point for each completed QSO.

Multiplier: Each country as determined by the DXCC and WAE country lists, and each call area for W/K, VE/VO and VK. (The last WAE country list appeared in the August Calendar.)

Final Score: Total QSO points times the total multiplier as indicated above.

Awards: Plaques to the leading stations in each of three classes: single operator, multi-operator, and s.w.l.

Mailing deadline for all entries is within 30 days after each test and entries go to: Klaus K. Zielski, DF7FB, P.O. Box 1147, D-6455, Erlensee, West Germany.

Virginia QSO Party

Starts: 1800Z Saturday, March 14
Ends: 0200Z Monday, March 16

This party is again being sponsored by the Sterling Park A.R.C.

The same station may be worked on each band and mode, and Virginia stations may work in-state stations for QSO and multiplier credit.

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

Scoring: One point per QSO. Virginia stations multiply total QSOs by sum of states, provinces, DX countries, and Virginia counties worked. Out of state stations multiply number of Virginia QSOs by total number of Virginia counties worked (maximum of 96).

Frequencies: C.W.—60 kHz from low end of each band, and Novice bands. Phone—3930, 7230, 14285, 21375, 28575.

Awards: To high scorers in each state, province, DX country, and Virginia county.

Indicate each new multiplier as worked. Include a summary sheet with your log and an s.a.s.e. for copy of the results.

Logs must be received by April 15th and go to: Virginia QSO Party, P.O. Box 599, Sterling, VA 22170.

Martti Laine, OH2BH has reason to be smiling, having just been awarded three plaques for his activity from CT3BZ in the 1978 CQ World Wide DX Contest. The presentation was made by our DX Editor, John Attaway, K4IIF at a special meeting of the Helsinki DX Group during his visit to Finland last September. The three plaques, all World Awards, are the John Knight, W6YY Phone/CW; the Stu Meyers, W2GHK Phone Contest Expedition; and the Al Kahn, K4FW Memorial for Larry LeKashman, W2AB on C.W. Taking in the proceedings is Ville Hiilesmaa, OH2MM himself a plaque winner, the W4BVV Operators' European Phone Award, in which he set a new European record.

South Carolina QSO Party

Two Periods GMT
1700 Sat. Mar. 14 to 0500 Sun. Mar. 15
1500 to 2400 Sunday, March 15

This party is again being sponsored by the Colleton County Contesters.

The same station may be worked on each band and each mode, and S.C. stations may also work in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for S.C.; state, province, or DX country for all others.

Scoring: *For S.C.*—Two points per QSO, 5 points if it's an S.C. Novice or Tech.

All Others—Two points for each S.C. contact, 5 points if it's with a Novice or Tech. (Novice and Techs must sign /N or /T for identification.)

Final Score: *For S.C.*—Total QSO points times the sum of (S.C. counties + states + provinces + DX countries) worked.

All others—Total QSO points times the sum of S.C. counties worked (max. of 46).

Frequencies: C.W.—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110. S.S.B.—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, simplex.

Awards: Certificates to top scoring stations in each S.C. county and each state, province, and DX country. Also to the top scoring Novice and Tech. in each S.C. county and each state.

Include a summary sheet with your entry showing the scoring and other useful information.

Mailing deadline is April 18th to: Colleton County Contesters, c/o Elliot Farrell, WA4YUU, P.O. Box 994, Walterboro, S.C. 29488. Include a large s.a.s.e. for a copy of the results.

Bermuda Contest

Starts: 0001Z Saturday, March 21
Ends: 2400Z Sunday, March 22

Rules remain the same as last year, and the five year eligibility for Trophy remains in effect.

You are limited to 36 hours out of the 48 hour contest period. Off times must be no less than 3 consecutive hours and each period must be indicated.

The same station may be worked once per band, either phone or c.w., but not both. Cross band or cross mode also not permitted. On 40 meters phone contacts are not permitted between the U.S. and the United Kingdom or West Germany.

Stations in the U.S. and Canada may work the United Kingdom, West Germany, and Bermuda. The U.K. and DL stations may work W/K, VE and VP9s.

Participation is for single operator stations only and operation must be from their own residence.

Exchange: RS(T) and QTH. State for W/K, province for VE, country for U.K., DOC for DL, parishes for VP9s.

Scoring: Each completed QSO, phone or c.w., is worth 5 points. Multiply total QSO points by the number of different VP9 stations worked on each band, 3.5 through 28 MHz for your final score. (Note: It's each different VP9 station on each band, not parishes.)

Awards: The top station in each U.S. state, VE province, U.K. county, and DL DOK will receive a printed award. The overall winner in each of the above areas, however, will receive something more substantial: a Trophy to be presented at the Society's Annual Dinner held in Bermuda in October. Round trip transportation and hotel accommodations will be provided for the winners. (Note: Trophy winners for '77, '78, '79, '80 are not eligible.)

Use a separate log sheet for each band, and a dupe sheet if 200 or more contacts are logged. A penalty of 3 contacts will be deducted for each duplicate contact for which points are claimed. Duplicates in excess of 1.5% of total contacts made may mean disqualification. Therefore, check your log carefully and include a signed de-

claration that all rules and regulations have been observed.

Entries must be received before May 31st by the Radio Society of Bermuda, P.O. Box 275, Hamilton 5, Bermuda.

CARF Commonwealth SSB Contest

Starts: 1200Z Saturday, March 21
Ends: 1200Z Sunday, March 22

This one was organized by the Canadian Amateur Radio Federation and is not to be confused with the RSGB Commonwealth c.w. contest, usually also scheduled for March. (I have not heard from them this year.)

Eligibility is limited to amateurs licensed to operate within the Commonwealth or British Mandate Territories, s.s.b. only.

The same station may be worked once per band. Contacts between stations in own call area are not permitted. (All of the U.K. considered same area.)

Exchange: RS plus 3 figure serial number starting with 001.

Scoring: Each completed QSO is worth 5 points. In addition, a bonus of 20 points may be claimed for the 1st, 2nd, and 3rd contact with each Commonwealth call area on each band. Add total from each band for your final multi-band score.

Entries may be single or multi-band, single operator only. Separate log sheets are required for each band. Multi-band entries are not eligible for single band awards, but you may request that one single band be judged for competition. (No s.w.l. category was mentioned.)

Frequencies: Plus or minus 20 kHz of 3600, 3780, 7080, 14180, 21200, and 28480.

Awards: Certificates to the top scoring entry in each Commonwealth call area in each category, and the CARF Commonwealth Trophy to the overall winner in the multi-band class.

Penalty points may be deducted for taking credit for duplicate contacts or bonus points. Include a summary sheet, dupe sheet, and the usual signed declaration with your entry to be received before June 1st.

Mail to: CARF Contest Committee, P.O. Box 2172, Station D, Ottawa, Ontario K1P 5W4, Canada.

B.A.R.T.G. Spring RTTY Contest

Starts: 0200 GMT Sat., March 21
Ends: 0200 GMT Mon., March 23

Sponsored by the British Amateur Radio Teleprinter Group, this contest is open to all amateurs and s.w.l. There are three categories: single operator, multi-operator, and s.w.l.

Use all bands, 3.5 through 28 MHz. Operation is limited to 30 hours out of the 48 hour contest period. The 18 hours off may be taken any time but not in less than 3 hour periods.

Exchange: RST plus a three figure contact number, and time in GMT (full 4 figures).

Points: Contacts with stations within own country 2 points. With stations in other countries 10 points. A bonus of 200 points for each country worked on each band including own. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total number of countries worked on each band, and number of continents worked (counted once only).

Final Score: (a) Total QSO points × country multiplier. (b) Country multiplier × bonus points × continents worked. Add sum of (a) and (b) for your final score.

Awards: Certificates to the top stations in each of the three classes, in each continent, and each W/K, VE/VO, and VK call area.

Final position will be valid for entry in the World RTTY Championship. There are also awards for working 25 DXCC countries and also for working all six continents. (Get additional info from G8CDW.)

Indicate on/off times in your log and include a summary sheet showing the scoring, etc. Log forms are available from G8CDW by sending a large s.a.s.e. and 2 IRCs.

Logs must be received by May 31st and go to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

Tennessee QSO Party

2100Z Sat. to 0500Z Sun. Mar. 21/22
1400Z to 2200Z Sun. March 22

The Tenn. Council of Amateur Radio Clubs is again sponsoring this one.

The same station may be worked on each band and mode, and mobiles in each county change. No county line operation, however. Tenn. stations may contact in-state stations for QSO and multiplier credit.

Exchange: Signal report and QTH. County for Tenn., state, province, or country for others.

Scoring: Phone—One point per QSO. C.W.—2 points on 80, 1½ points on other bands.

Tenn. stations multiply total QSO points by sum of (states + VE provinces + Tenn. counties) worked. Out-of-state stations multiply QSO points by Tenn. counties worked (max. of 95).

Phone and c.w. same contest.

Following bonus points may be added to your final score: A power multiplier of 1.5 for stations using 200 watts or less input. And a 200 point bonus for

mobile and portables for each county change outside own county (min of 10 QSOs per county).

Frequencies: C.W.—50 kHz up from bottom of each band. Phone—3980, 7280, 14280, 21380, 28580. Novice in their authorized bands.

Awards: Certificates to each station submitting a log with 15 or more contacts. Plaques to top Tenn. scorer and out of state winner, as well as Tenn. mobile and portable winners. Only single operator stations eligible.

Use a separate log sheet for each band with 50 or more contacts, and a check sheet if you have over 200 contacts.

Mailing deadline is May 1st to: Dave Goggio, W4OGG, 1419 Favell Drive, Memphis, Tenn. 38116. Include a large s.a.s.e. with your entry.

YL Int'l SSBers QSO Party

C.W.: March 28-29 S.S.B.: April 18-19
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

Rules are designed for membership participation and are rather lengthy and complicated. I would suggest you write to the party chairman, Lyle Shaw, KC4LF, for details. Essentially they are as follows:

All bands may be used and the same station may be worked on each band for QSO credit but only once for a multiplier. Two meter simplex contacts are also permitted.

You are required to take two 6 hour rest periods in each section.

Exchange: Name, RS(T), S.S.B.er number, country, state, and partner's call if any. Non-members send "no number" and QTH.

Points: On C.W. contacts with members are worth 8 points, with non-members 1 point.

On S.S.B. 5 points with members and 1 point with non-members.

Multiplier: Only contacts with members count as a multiplier. One for each of the following: Each state, country, VE province, YL/OM team or DX/WK team, and for DX/WK partners working each other.

Frequencies: C.W.—3665, 7070, 14070, 21070. S.S.B.—3925, 7290, 14332, 21373, 28673. DX on 3765 and 7090. VKs on 3690.

Awards: Certificates to the winners in each category as listed under multiplier.

Members desiring to enter as DX/WK teams should send their request to KC4LF as soon as possible.

Non-members can enter the single operator category only.

Again, I strongly advise that you write for more details.

Mailing deadline for all entries is May 15th and they go to the party chairman, Lyle F. Shaw, KC4LF, 6329 Fairway Blvd., Apollo Beach, FL 33570.

You can exceed the total memory capability of your computer by using a disk based system. No, the bytes don't fall on the floor; they are all used and explained in this month's installment.

INTRODUCTION TO BASIC

A Computer Programming Language

Part XV—A Disk Based System

BY BUZZ GORSKY*, K8BG

Anyone who has written a program that requires extensive data input and output has realized the disadvantages of a tape based system. The data transfer is slow and all of the data must fit into the machine in order to be able to work with it, search through it, or sort it. With a disk based system, however, it is possible to have a body of data which is larger than the total memory capability of the computer, yet work with that data in many different ways. The random access capability of the machine makes this possible, and in effect makes the computer's memory almost limitless (that is, limited to the storage space on the number of disks available at any one time). On the other hand, using random access files requires that the programmer do some of the work that the computer would do for tape based or disk based sequential access files.

Let's consider an example to make this clearer. Suppose that we have a file of contacts which includes call letters, name, and QTH. If we save this file on tape we might do so with a statement like:

```
100 PRINT# – 1, C(I), N(I),Q(I)
```

and the computer would be able to get the list into and out of memory without the programmer thinking much about it. The same could be done in a sequential access file, except that specific delimiters would be used to indicate the end of each piece of data. Again, the programmer would not be concerned with the length of any of the calls, names, or QTHs, or exactly where they were in a given disk record.

For a random access file this is not the case. Before actually programming the task, we have to consider just how the data will go into the **Disk Records**. Each *record* can hold 256 characters of data. We must apportion this exactly to enter and retrieve data. We could allow each disk record to equal one QSO record, but that would be wasteful of disk space, since it is unlikely that a single call, name, and QTH combination would be 256 characters long. Therefore, we will include several sub-records in each single record. Suppose we decide to allow 6 characters for each call, 7 for each name, and 10 for each QTH. In that case there would be 23 characters in each QSO sub-record. We would then have 10 sub-records in each record. I get that number because 23 times 10 is 230 (which is smaller than 256), while 23 times 11 is 261 (which is larger than 256). So if we want 23 characters per sub-record, we can put 10 sub-records into each record. That leaves 26 blank, wasted spaces in each record. If our data absolutely has to have 23 characters, then that is the best we can do, and that's all there is to it. However, in this case the choice has been somewhat arbitrary, so let's reconsider our needs. Let's try 6 characters for the call, 7 for the name, and 7 for the QTH; that is 20 characters for each sub-record. We can now include 12 sub-records in each record, and we will have 16 characters left over. That's better, but with 12 sub-records, and 16 extra characters, we can obviously put one more character into each and still be under 256 total. So let's add one more to the QTH. Our final plan then is to use 6 characters for each call, 7 for each name, and 8 for each QTH. This is 21 characters per sub-record, and with 12 per record we will be using 252 characters with a waste of only 4 per record. Fig. 1 shows a diagram of what each record will look like.

Now that we have made this plan, how do we implement it? We will use a series of basic commands to establish the files as we wish. The **OPEN** and **FIELD** statements will set things up for us. You know that when you power up in disk basic the machine asks you how many files you will use. It then sets aside a 256 character

*712 Hillside Drive, Carlisle, PA 17013

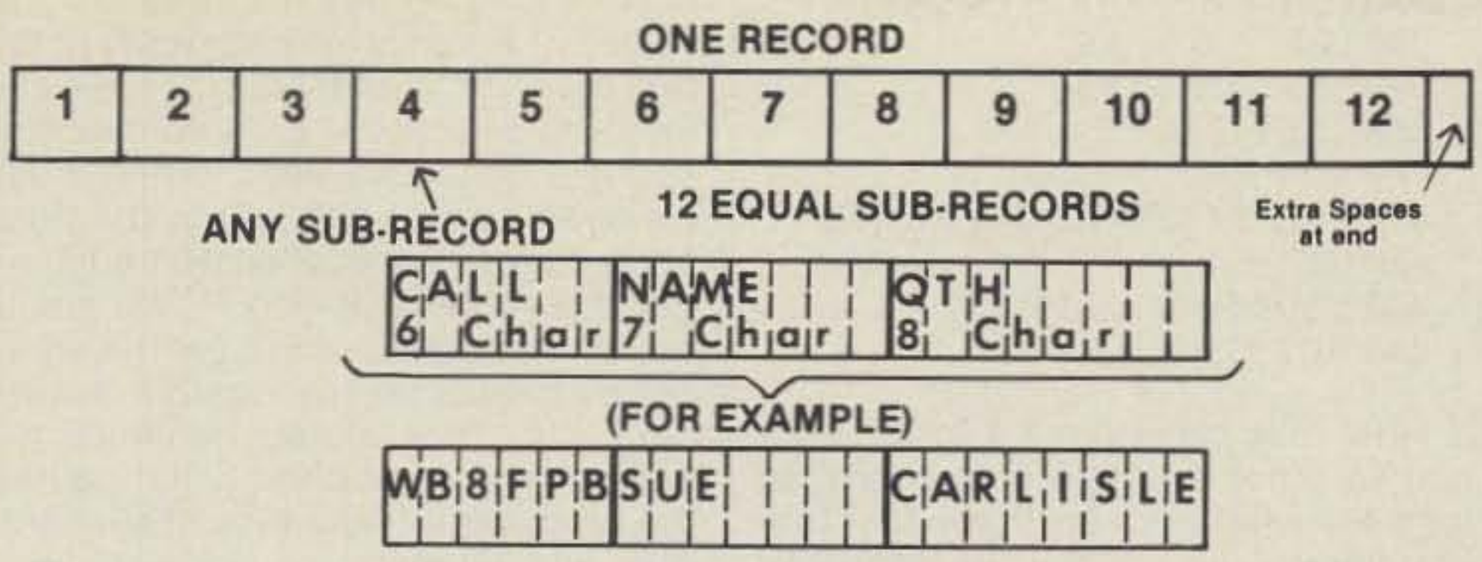


Fig. 1– One complete record and its component breakdown.

space in memory for each file. It will use this space to hold data that will be written to disk or to place data that is read from disk. Each of these disk **BUFFER** areas is assigned a number and that number is associated with a particular disk file by the open statement. For example:

```
10 OPEN "R",1,"QSOFIL/TXT"
```

tells the machine that we wish to use a random-access file, and that we will use buffer number one for data to and from the file named QSOFIL/TXT. The TXT suffix is often used to show that the file contains text material rather than any sort of program.

The **FIELD** statement is somewhat more complicated. This statement apportions that 256 character buffer space among the variables that we plan to use. Everything is treated as strings.

Let's say that we will use C$ for calls, N$ for names, and Q$ for QTH. We might write:

```
20 FIELD 1, 6 AS C$, 7 AS N$, 8 AS Q$
```

This tells the machine that whatever is in the first 6 spaces of buffer number one will be assigned to the variable C$, whatever is in the next 7 spaces is assigned to N$, while Q$ gets whatever is in the next 8. Well that is fine for our first sub-record, but how will we get to the remaining 11 sub-records? The answer is that we can re-field a buffer as often as we wish without upsetting the data that resides in the buffer. That is, the field statement apportions the data, but it does not modify the data. Thus, when we want to get the next record we could write:

```
30 FIELD 1, 21 AS J$, 6 AS C$,
7 AS N$, 8 AS Q$
```

What is J$, you ask? J$ stands for junk! While looking for the second sub-record we don't care what is in the first one, so we assign a variable to include all of the characters in that first sub-record, and we never intend to use that variable for anything. C$, N$, and Q$ now get the data in the second sub-record.

Notice that in these two field statements, we begin counting characters right from the first one in the 256 character record, but we don't care if we account for all 256. That is, any characters after the end of our field are unavailable, but we don't have to worry about them. On the other hand, we must keep track of things that occur before the data we wish to access, and those characters must be assigned to some variable. It would obviously be inconvenient to have to write all of these field statements every time we want to get another sub-record, and we will take a look at some tricks to take care of that a bit later.

After we have opened a file and set up the buffer field, how do we actually get data from disk into the buffer? We tell the computer to get the data with a GET statement such as:

```
40 GET 1,R
```

The one says that we want to get data for buffer number one. Recall that the open statement will have assigned that buffer to a particular disk file with a specific name. The R is the record number of that file. As the records are stored on disk, the first is assigned record number 1, the next is 2, and so forth up to the last record in the file. The number of the last file can be obtained with the LOF(I) function, where I is the number of the buffer in question. Let's consider an example to see how this all works. Suppose we have our QSO file and we are in a program that uses the file. We now want to search our file for a particular call. We have just entered the call we want with an input statement that has assigned that call to the variable X$. How would we get the program to search the disk file for that call and give us the operator's name and QTH?

First, of course, we need to get the file open. We will use a sub-routine to take care of the fielding. Here's what we might write:

```
100 OPEN "R",1,"QSOFIL/TXT"
110 R = 1:S = 0
120 GOSUB 1000
130 IF X$<>C$ THEN 120
```

Our subroutine might look like this:

```
1000 S = S + 1
1010 IF S>12 THEN S = 1:R =
   R+ 1
1020 IF R>LOF(1) THEN  RETURN
1030 FIELD 1, 21 * (S – 1) AS J$, 6 AS
   C$, 7 AS N$, 8 AS Q$
1040 IF S = 1 THEN GET 1,R
1050 RETURN
```

Our program would continue as follows:

```
140 IF R>LOF(1) THEN PRINT
   "CALL NOT IN FILE"
150 PRINT "CALL----";C$
160 PRINT "NAME----";N$
170 PRINT "QTH-----";Q$
```

How does this all work? Beginning at line 100, we open the file and set some values for S and R. S will be the number of the sub-record we are looking at, while R will be the record number. The subroutine will assign C$, N$, and Q$ to the data for one of the sub-records. We then look to see if C$ equals (or does not equal) the particular call we have entered as X$. If they are not equal, we go back to the subroutine. Clearly then the subroutine is the heart of the matter, so let's see what happens there.

In line 1000 we increase S. Note then that the first time through, S will be set equal to 1, so that it will indicate the first sub-record. R would also be 1, indicating the first record. We next look to see if S is now greater than 12. Recall that there are 12 sub-records in each record, so a sub-record 13 would be meaningless. If S is greater than 12, we set S equal to 1 and increment R. In this way we would now be looking at the first sub-record in the next record. Next in line 1020 we look to see whether R is now greater than the value for the last file in the record, LOF(1). If so we are obviously out of data so we will return. If not we go ahead with the field statement. Here J$ is our junk or "ignore it" variable. We assign 21 = (S – 1) characters to this variable. The first time through for any record, S would be 1 and so we would assign zero characters to J$. The next time through we assign 21 characters to J$, and so forth. The next 6 characters go to C$, the next 7 to N$, and the next 8 to Q$. After the buffer is fielded we go to line 1040 and see if S is 1. If so we are considering the first sub-record in a record, so we get the record from disk. We then go back to the program. There we print a message if R exceeds LOF(1), otherwise we display the given call, name, and QTH.

This obviously takes more programming than would be required if the file had been a sequential one, but with the random file we might have 80K of data and still be able to search it for

the call we want. Besides the required programming, there would be one other "cost" for this system...time. It will obviously take longer to find a call this way than if all the calls were in memory. How long will depend on how much data is in the file. We'll take a look at how to beat this time problem a bit later. First let's consider how we can get data into this file.

Our first theoretical problem is to find out which sub-record is the "next" one so that when we want to add a call to the file, we can put the new call into the sub-record, just after the last sub-record we have used. There are several ways to keep track of how many records and sub-records are in use. Since we have 4 characters left over at the end of each record, we might use the 4 spaces in the first record to store S. LOF would give us the value for the last record number. Then we would just look there to see what sub-record was used last in record number LOF, the last record. An alternative would be to search through the sub-records with a subroutine like the one shown above and look for a blank call. When that occurs, S would be pointing to the first blank sub-record. If there were no blank calls, then the entire record would be full and we would begin with the next one.

Let's consider an example for call entry. Let's assume that we have just input a call as X$, a name as Y$, and a QTH as Z$. We now want to save these in the disk file. We are using the system of keeping S in the last four spaces of the first record. Here's what we might write.

```
200 OPEN "R", 1, "QSOFIL/TXT"
210 FIELD 1, 252 AS J$, 4 AS SR$
220 GET 1,1
230 S = CVI(SR$):R = LOF(1)
240 S = S + 1
250 IF S > 12 THEN S = 1:R =
    LOF(1) + 1
260 FIELD 1, 21 * (S – 1) AS J$, 6 AS
    C$, 7 AS N$, 8 AS Q$
270 GET 1,R
280 LSET C$ = X$
290 LSET N$ = Y$
300 LSET Q = Z$
400 PUT 1,R
410 FIELD 1, 252 AS J, 4 AS SR$
420 GET 1,1
430 LSET SR$ = MKI$(S)
440 PUT 1,1
```

Now that seems like a lot of work just to enter a single sub-record, so let's see what went on. In the first four statements we got the file open and fielded to find SR, the sub-record number, and we get the first record. CVI is a function which converts the string representation stored in SR$ to an integer. We also let R = LOF(1). Now we increment S, and if it is greater than 12 we set S = 1 and increase R. We then get the record indicated and field it for entry of the next sub-record. The LSET statements put the string data in X$, Y$, and Z$ into their proper places in the sub-record. LSET puts the data in at the "left" of each data space. That is, if we have a 4 letter call it would go in as the four characters followed by two blanks, since the space for calls has room for 6 characters. If we used the RSET command, then the four letter call would go in as two blanks followed by the four characters of the call. What happens if the call is 9 characters long? Simple! The first 6 characters are entered and the next 3 are *lost*. Thus, planning is important in setting things up in the first place. With our system it is obvious that we may lose some name and QTH information, but I would expect these sub-record sizes to be adequate for most cases. Once the actual data is in, we refield the buffer and then get in the first record and store S. The MKI$ function will store the integer S as a string which can be obtained and returned to integer form by CVI.

One comment: Whenever a series of disk operations is completed, the close statement should be used to close the disk file. At this point the computer does some very important housekeeping for the file. If this is not done, some data may be lost. I said above that I would consider how the time for accessing a particular sub-record can be minimized when there is a lot of data to search. So let's consider that problem.

Suppose that we have a very extensive call letter file that includes name, QTH, mailing address, date of last QSO, frequency, signal reports, and QSL status—in other words, a rather complete log entry. We might not be able to fit this entire file into the computer memory, but if we can get the entire list of calls in we might set things up with a random access file for the data itself, and a separate sequential access file that has the calls and the values of S and R for each entry in the real data file. With this system we can load the sequential file into memory, and then when we want to find a call we search for a call within the computer memory, and when we find it, we get the value of S and R. We would then use those values to get the entire set of data from the random access data file. That would minimize the search time considerably. Of course, the price would be a loss of available disk space, since we would have to use room to store the second file. We would also be using memory in the computer for holding the data from the sequential file during the entire program run. If time were more important to us than memory and disk use, then this option would be best. In a situation where file space is the most important consideration, we would not use this type of system. This is just another example which shows that there are various ways to accomplish a task; each has its advantages and disadvantages.

There is one more way in which a disk system can make the computer seem to have more memory that it has, and this involves program space rather than data space. Suppose you have a program with several options in it for various operation. Further, suppose that the program is quite long. You might break the program up into parts. One part would be for each of the available options, and an additional part would be a very short program to give the user a chance to indicate which part of the program is desired. Suppose that program QSO3/BAS, the third part of this program, is used to edit the data file. In program QSO/BAS, the program part that lets the user pick which part he wants to use, we would have an input statement that lets the user enter a value to show which part is to be used. We might then have:

```
100 IF N = 3 THEN RUN"QSO3/BAS"
```

This line would cause the computer to load the QSO3/BAS program and run it. In this way we can use disk space to store each part of the program and then use these run statements to get from one part of the program to another. Again, we lose in time while each program is loaded, but we can manage a huge program in a limited amount of space. This little trick and the use of random access files can make the computer seem to have limitless storage capacity.

While I have not shown any complete programs in this installment, I hope that these ideas and examples will help you to use the disk capabilities for maximum efficiency.

To Be Continued

Here's a way to increase the versatility of your Tempo S-1.

External Power For The Tempo S-1

BY ROY DUFFUS*, W2SEN

Many hams lament the inability to operate the Tempo S-1 from an external power supply, particularly when the internal batteries are very low or dead, or, while you're waiting for a new set of the special-size nicads from Henry Radio. A popular solution presented in several New York area repeater club newsletters is to install a SPDT slide switch which will disconnect the negative side of the battery. Then, the existing charging jack can be fed with 10.3 v.d.c. from an external source, with the internal diode in series with the charger input dropping the voltage to the nominal 9.6 v.d.c. required. The circuit uses an 8-volt regulator which is biased by bleeder resistors (which get hot and waste power, not incidentally).

My solution, with thanks to Andy Woerner, K2ETN, is to install a normally closed miniature jack instead of the slide switch across the battery circuit. There is room to locate it above and behind the PTT switch, to the left of the frequency control thumb switches. In this case, the power required is 9.6 v.d.c. because the internal diode is bypassed. The following circuit provides this and offers these advantages: the jack installs in a round hole—no messy filing to fit a rectangular slide switch; three inexpensive silicon diodes can be used in series to bias the 8-volt regulator (and they're cool!); and several 5-volt, 5-watt zener diodes are easier to find and a lot less expensive than one 10-watt diode for over-voltage protection. True, there are even less expensive crowbar circuit alternatives, but I settled for simplicity.

*27 Dogwood Hill, Upper Saddle River, NJ 07458

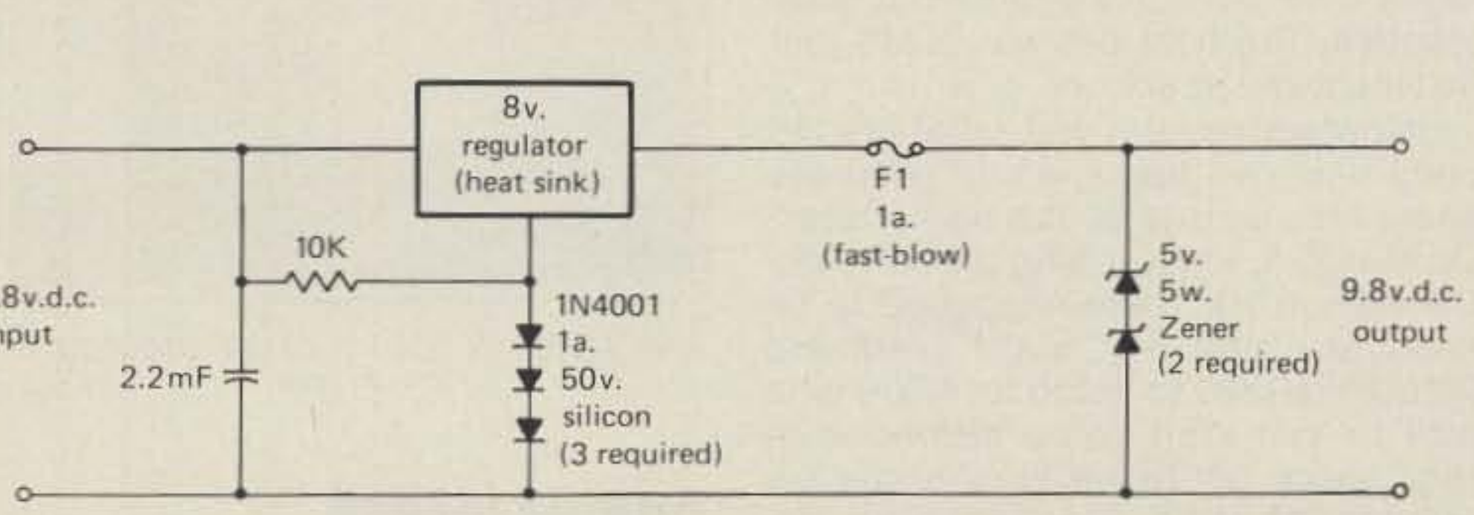


Fig. 1– The voltage regulator circuit needed to power your Tempo S-1. The 8 volt regulator is a Motorola MC7808.

a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

The March "Story of The Month" as told by Leonard is:

Leonard C. Pray, W1ORV
All Counties #272 3-17-80

"I was licensed in 1946. In 1947 I started my career in broadcasting at WBEC in Pittsfield, Mass., then to TV in 1953 at WBZ-TV. Since 1957 I have been a technician at Channel 5 in Boston and will probably retire from there in another 7 years. I have been a videa tape editor for 20 years and still enjoy it.

"As a ham I have enjoyed many different phases of the hobby. For 12 years I was an avid DXer and didn't do too badly with about 310 credited countries before I quit. I was active in *CQ* magazine's programs, such as the *CQ* DX tests, WPX, SSB, etc. My greatest achievement was earning WAZ award #96 all S.S.B. (I see they now have a 5 Band Award for that; wish I could have a beam again—Hi.)

"Finally I got disgusted with the goings on in DX, such as "New" countries at low tide, Don Miller antics, etc., so on November 4, 1970 I was introduced to County Hunting by my buddy, W1UOP. After that date, any DX I worked was incidental, probably a County Hunter himself. Roger and I had some of our most enjoyable times in amateur radio making county-hopping trips in his Winnebago, giving out counties wherever we could find a county line sign that we could park beside. We made two trips a year until we both went off the air about the end of 1974. At that time I still needed 313 counties. After two moves I came back on the air in June 1977, living in an apartment building, running a coax out the window to the mobile antenna on my car in the parking lot.

"Two years later on June 30, 1979, W7NXZ drove half way across Montana to get me my last two counties. I was very happy on July 4th when I drove to Atlanta for the Convention,

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

Boo, SM5HPD with his TR7, RV7, TR-4C, RV-4C L4B.

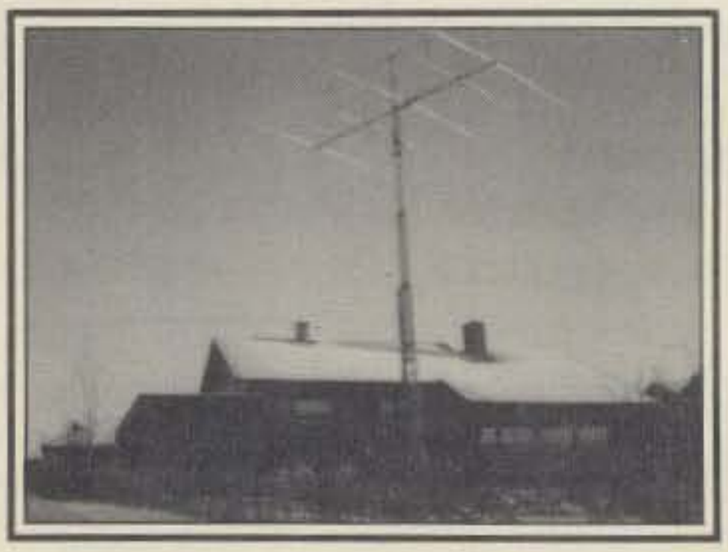
then to Florida for visits and a stop at Cocoa to pick up a record book from K4RQX. I had been waiting about 6 months for the book from *CQ*. So finally in August, after vacation, I started filling out the book. Quite a task finding each card and entering it, but to my surprise I discovered that I was missing about 50 counties. My logs and filing cards indicated that they had been received, but the QSLs were not to be found. Thinking back to the moves I had made, I remembered a file box that was missing and those cards must have been in it. Well back to the radio and the mails. I got a lot replaced, but had to rework many of them because either I couldn't find the correct QTH or in a few cases they were deceased. By the first of the year I needed just one more; that was Dewey, SD. I believe that most of this is an Indian reservation. I called the hams who were there but most were inactive. The best bet was N0JS, but he was away at school.

"Now with all but one, what are the odds that two hams would need the same last county at the same time? On March 3, I had the rig tuned to the CH Net on 20. There happened to be short skip that day, and I overheard W3LDD tell NC to listen for N0JS who was to call Walt some afternoon in that week while he was home on school vacation. I called Walt immediately to tell him my situation, and we agreed to call each other if either of us heard N0JS. The next morning Walt called to say that he was going to call N0JS and get him on the Net. He came right on, and we both worked him for last counties for USA-CA.

"Now that that project is finished, what next? I don't think I will try second time around with my present conditions. I have already started to finish 5BDXCC for which I only need the 40 and 75 part. I think I have a chance to do this because it can be done with a dipole. It might take a while because summer conditions wipe you out with static. Then there is 5BWAS.

"However, there will always be the County Hunters. I know of no other group of hams who are so helpful and cooperative with one another. I shall always be involved with them. I shall try to finish all 20M and all Mobile, and I probably have 1000 on 75, although activity on that band has diminished greatly. Of course the cost of mobiling will probably cut back on that phase quite a bit. When I think of how my 1978 car gets almost three times the mileage of my 1973 car, it takes the curse off it.

"Incidentally, I have decided to renew my acquaintance with *CQ* magazine. I feel that the new group will get the magazine back to its former status."



The TH6DXX and sloped dipoles at SM5HPB.

Awards Issued

Ray Teeter, N2RT (ex W2NCI) added All Counties, Mixed, and USA-CA-3000 endorsed All A-1, to his nice collection.

Special Honor Roll
All Counties

#303 Raymond E. Teeter, N2RT 11-6-80.
#304 Vivian K. Scott, WD0EMS 11-6-80.
#305 Steadman Lidell, W2MEI 11-10-80.
#306 Brenton G. Sorlien, WB0WPU 11-21-80.
#307 Robert N. MacIntyre, VE4ZX 11-25-80.
#308 David C. Allen, WA2JFL 11-28-80.

That "Early Morning Sunshine" Lady, Vivian Scott, WD0EMS was elated to win All Counties endorsed, Mixed.

"Steady" Lidell, W2MEI was pleased to be #2 All Counties endorsed All 2X-C.W.

Brenton Sorlien, WB0WPU found time to do his paper work and got USA-CA-500 through USA-CA-2500 endorsed All S.S.B., All 20; USA-CA-3000 endorsed All S.S.B.; and All Counties endorsed Mixed.

After waiting 10 years, Bob MacIntyre, VE4ZX sent in the paper work to add to his collection USA-CA-1000 through All Counties endorsed Mixed.

David C. Allen, WA2JFL was pleased to catch USA-CA-3000 endorsed All S.S.B., All 14 and All Counties endorsed All S.S.B.

Al Armitage, WD4HVZ picked up USA-CA-2500 and 3000 endorsed Mixed.

Inge Ekfeldt, SM6CVX acquired USA-CA-2500 endorsed Mixed.

Keith Turner, WA2TJL obtained USA-CA-500 through USA-CA-2500 endorsed Mixed.

John Sebastian, N8BGF claimed USA-CA-500, 1000 and 1500 endorsed All S.S.B., All Mobiles, All 20.

"Addy" Hoogenraad, WB0RAF applied for USA-CA-500 and 1000 endorsed All S.S.B.

Frank Cassidy, G4HBI (no relation to our DX Editor, Hi) qualified for USA-CA-500 and 1000 endorsed All S.S.B.

James Grandinetti, WA2SRM also qualified for USA-CA-1000 endorsed All S.S.B.

"Ace" Burdett, KA9AHH gained USA-CA-1000 endorsed Mixed.

USA-CA-500 certificates endorsed Mixed go to:

Werner F. Brill, DL9YC.
The Mexico DX Club, XF4MDX #4 Award to Mexico.
Martin Raab, DL3HC.

USA-CA-500 certificates endorsed All A-1 go to:

Wesley E. Wade, Sr., KA3BHZ.
Jiri Havel, OK1ABP.
Bob Cawley, WD0AVG.
Bob Daut, Jr., WB3KRV (most as a Novice).

Merlin Anderson, K8EFS got #13 USA-CA-500 endorsed All 50 MHz.

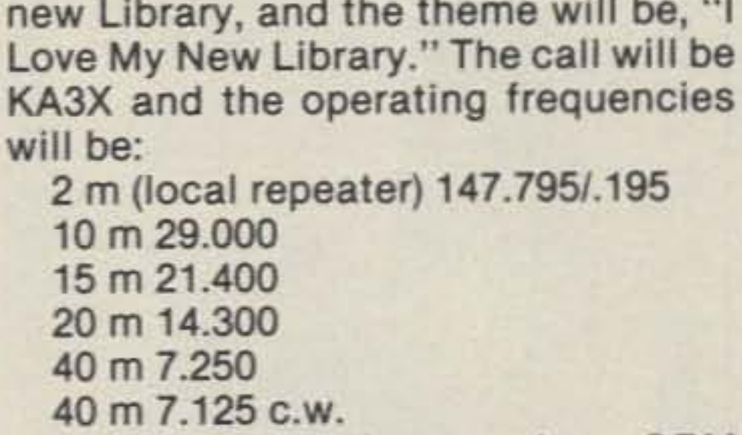
Charlie E. Jacobsson, SM0CHA had me send him USA-CA-500 endorsed All S.S.B.

Awards

I Love My Library—Valentine's Day Award: The Lawrence County Amateur Association (PA) is sponsoring a two day special event from their new Library in downtown New Castle on Valentine's Day, February 13 & 14, 1981. They will be operating from the new Library, and the theme will be, "I Love My New Library." The call will be KA3X and the operating frequencies will be:

2 m (local repeater) 147.795/.195
10 m 29.000
15 m 21.400
20 m 14.300
40 m 7.250
40 m 7.125 c.w.

All frequencies plus or minus QRM (except 2 meters). Operating times: 0900-1700 EST which is 1400-2200 GMT. Your QSL and $1.00 will bring you the certificate. For any additional data or to apply write to: John Hudak, KA3X, 422 Galbreth Avenue, or Zach Allerton, KB3MC, 124 Richelieu Ave., New Castle, PA 16101.


MICRO-80™ INC.
PRESENTS
COMPU-WARD

Compu-ward's.

Compu-ward's: Sponsored by MICRO-80 Incorporated, the award is available to licensed amateurs and shortwave listeners worldwide. Emphasis of these award programs is focused on the advancement of both the amateur radio and computer hobbies through demonstrated excellence in the art of computerized communications. Stations applyng for these awards may or may not have a computerized stations. However, all stations contacted must be computerized, meaning the contacted station must have a transmitter interfaced with a computer such as the well-known TRS-80, Apple II, Commodore PET, Heathkit, Atari, etc. To be valid, all contacts must be made on or after January 1, 1980. There are two awards being offered: (1) h.f. bands—29.7 and below; (2) v.h.f./u.h.f.—50.0 MHz and above.

All contacts must be made on one or any combination of the following modes (including any modes authorized by the FCC since the release of this announcement): RTTY, SSTV, C.W. and ASCII. Crossmode communications will not be recognized for these awards.

Single Band and Mixed Band endorsements will be given with each band segment (h.f., v.h.f., u.h.f., etc.). Cross-band operation will only be accepted for OSCAR contacts. All OSCAR contacts will be considered only for v.h.f./u.h.f. accomplishments even though some of the OSCAR satellites have receive frequencies on 10 meters. Contacts via repeater are acceptable.

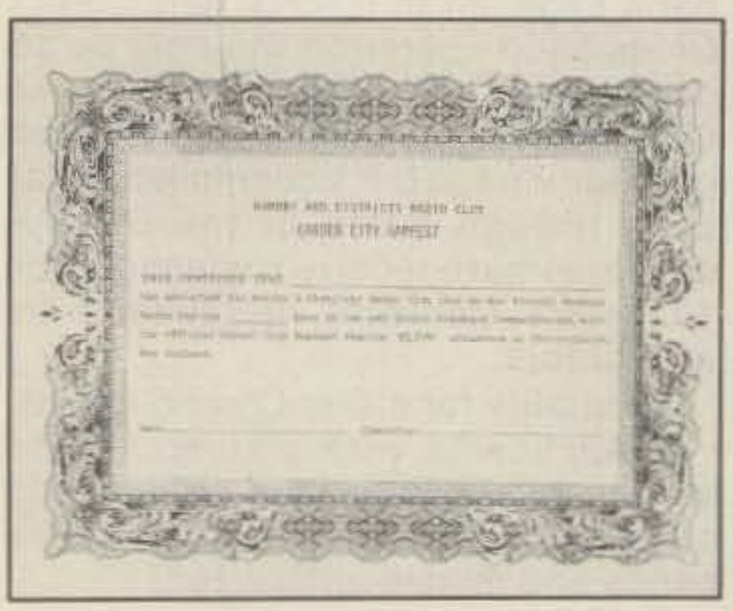
To qualify for either Compu-award:

1. Applicants *with* a computerized station must contact a *minimum* of 15 other computerized stations on the bands and modes authorized.

2. Applicants *without* a computerized station must contact a *minimum* of 25 computerized stations on the bands and modes authorized.

To apply, prepare a list of contacts for each award. In prefix order, list each call worked, mode utilized, frequency or band of operation, and date and time of each contact made. ***Do not send QSL cards!*** Have your list of con-

tacts and supporting QSL cards verified by two other amateurs or a local radio club official. The services of a Notary may be sought if the applicant desires. Forward the verified list/application with $4.00 for each award to: MICRO-80, 2665 North Busby Road, Oak Harbor, Washington 98277. Foreign stations may substitute 10 IRCs for each award sought.



Garden City Hamfest Award.

Garden City Hamfest Award: The Hornby and Districts Radio Club Branch 56 of the New Zealand Association of Radio Transmitters is to hold a Hamfest in Christchurch on Saturday March 7, 1981. An award will be available to any station that makes a two-way contact with the Hamfest Station ZL3VV (Victor Victor). The operating frequencies and times (*GMT*) are:

10 meters	28.585 MHz
15 meters	21.285 MHz
20 meters	14.285 MHz
Thursday, March 5th	0500-0700GMT
Friday, March 6th	0500-0700 GMT
	2000-2400 GMT
Saturday, March 7th	0000-0300 GMT

Propagation permitting, all three frequencies will be used simultaneously.

Stations who make a two-way contact should send their QSL card and U.S. $1.00 or 4 IRCs to Hamfest Award, P. O. Box 31095, Christchurch, New Zealand. (Thanks to ZL3GI for this data.)

Cologne-Diploma.

Cologne-Diploma: This is available to all licensed amateurs and SWLs (on heard basis). Only QSOs after June 1, 1980 are valid. The diploma can be issued for h.f. or u.h.f. or for mixed bands.

u.h.f.:

1. Stations of the Koln-Aachen district must work at least 30 stations of the 5 Cologne DOKs. Two club stations must be included.

2. Stations outside Koln-Aachen district must work at least 15 stations in at least 3 Cologne DOKs. Club stations count double. (15 QSOs.)

3. Stations outside Germany must work 6 stations in at least 2 Cologne DOKs. Club stations count double. (6 QSOs.)

h.f.:

1. German radio amateurs must work at least 15 stations in at least 3 different Cologne DOKs. Two club stations must be included. (15 QSOs.)

2. European radio amateurs must work at least 8 stations in at least 2 different Cologne DOKs. Club stations count double. (8 QSOs.)

3. DX stations must work at least 6 stations of Cologne DOKs. Club stations count double.

DOKs that count for the Cologne-Diploma are: G 10, G 12, G 24, G 35, G 39, and Z 12. Send GCR list which would show data on all the QSOs and be certified by two other amateurs or a club official. Also include DM 5, or $3.00, or 10 IRCs to: Benna Reinarz, DB6KL, Kurt-Schumacher-Str. 1, 5000 Koln 90, Federal Republic of Germany. (Thanks to DK9KD for this data.)

USA-CA Honor Roll

3000		1500		500	
N2RT	329	WB0WPU	501	WB0RAF	1529
WB0WPU	330	VE4ZX	502	DL9YC	1530
VE4ZX	331	WA2TJL	503	KA3BHZ	1531
WA2JFL	332	N8BGF	504	G4HBI	1532
WD4HVZ	333			K8EFS	1533
		1000		OK1ABP	1534
2500		WB0RAF	631	WB0WPU	1535
WB0WPU	387	G4HBI	632	WD0AVG	1536
SM6CVX	388	WB0WPU	633	WB3KRV	1537
VE4ZX	389	WB2SRM	634	XF4MDX	1538
WA2TJL	390	KA9AHH	635	WA2TJL	1539
WD4HVZ	391	VE4ZX	636	DL3HC	1540
		WA2TJL	637	SM0CHA	1541
2000		N8BGF	638	N8BGF	1542
WB0WPU	443				
VE4ZX	444				
WA2TJL	445				

Notes

Our good friend and fellow County Hunter, Garry, VE3GCO has come out with something we've all been looking for—*The Radio Amateur Awards Directory Of The World*. It contains all kinds of good information, rules, checklists, maps, and application forms for more than 150 of the most popular awards. The postage-paid cost is $7.00. Please send cash, check, money order, 30 IRCs or equivalent to: Garry V. Hammond, VE3GCO, 5 McLaren Avenue, Listowel, Ontario, Canada N4W 3K1.

As mentioned in a previous column, the Radio Society of Great Britain puts out an *Amateur Radio Awards Edition*, and it can be purchased through Ham Radio's Bookstore, Greenville, NH 03048 for $6.95. (Thanks to Nathan Rosen, W2-6893 for this data.)

As previously mentioned, on March 1, 1981 the cost of all *CQ* Awards will be changed. For non-subscribers the cost will be $10.00 and for subscribers to *CQ* the cost will be $4.00. Subscribers will be required to enclose with their applications a mailing tab (or a copy) from their *CQ* magazine.

Also as previously mentioned, but it needs repeating, there is no longer a POD 26. The U.S. Government Printing office combined it with the POD 65, and it is now called the National Zip Code and Directory of Post Offices and costs $7.50. Stock # 039-000-00261-2, it can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, or it can be ordered from most U.S. Post Offices.

I'm sure I forgot some important things—had another grandchild, this time a boy, David Dehardt. What excitement when he arrived early. How was your month?

73, Ed, W2GT

The 2K Classic represents the culmination of fifteen years experience in developing, manufacturing and improving the 2K series. It remains as always a "workhorse", engineered and built to loaf along at full legal power for days or weeks without rest. A look inside shows why! No expense has been spared to make the 2K a truly "Classic" Amateur amplifier. Heavy duty, top quality components along with its rugged construction assures you of trouble free operation. The 2K Classic offers engineering and features second to none. It will put your signal on the air with greater strength and clarity than you ever dreamed possible. The 2K Classic operates on all amateur bands, 80 through 15 meters (export models include 10 meters).

Features:

- Two rugged Eimac 3-500Z grounded grid triodes
- Pi-L plate circuit with silver plated tank coil
- Resonant cathode pi input circuit
- Maximum legal input on all modes
- Price: $1195.00

The 1KD-5 ...Another fine member of the famous Henry Radio family of superior amplifiers. And we're still convinced that it's the world's finest linear in its class. The 1KD-5 was designed for the amateur who wants the quality and dependability of the 2KD-5 and 2K-4, who may prefer the smaller size, lighter weight and lower price and who will settle for a little less power. But make no mistake, the 1KD-5 is no slouch. Its 1200 watt PEP input (700 watt PEP nominal output) along with its superb operating characteristics will still punch out clean powerful signals...signals you'll be proud of. Compare its specifications, its features and its fine components and we're sure you will agree that the 1KD-5 is a superb value at only $695.

The 2KD-5 We have been suggesting that you look inside any amplifier before you buy it. We hope that you will. If you "lift the lid" on a 2KD-5 you will see only the highest quality, heavy duty components and careful workmanship...attributes that promise a long life of continous operation in any mode at full legal power. The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20, and 15 meter amateur bands. It operates with two Eimac 3-500Z glass envelope triodes and a Pi-L plate circuit with a rotary silver plated tank coil. Price $945.

And don't forget the rest of the Henry family of amateur amplifiers...the Tempo 2002 high power VHF amplifier and the broad line of top quality solid state amplifiers. Henry Radio also offers the 3K-A and 4K-Ultra superb high power H.F. amplifiers and a broad line of commercial FCC type accepted amplifiers for two way FM communications covering the range to 500 MHz.

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

Announcing!

A brand new "super" linear...the 3K Classic! Designed for the most critical Amateur Radio operator...the individual who wants and appreciates owning the finest. Available in spring 1981. *F.C.C. approval pending*

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

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Henry Radio

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CQ SHOWCASE

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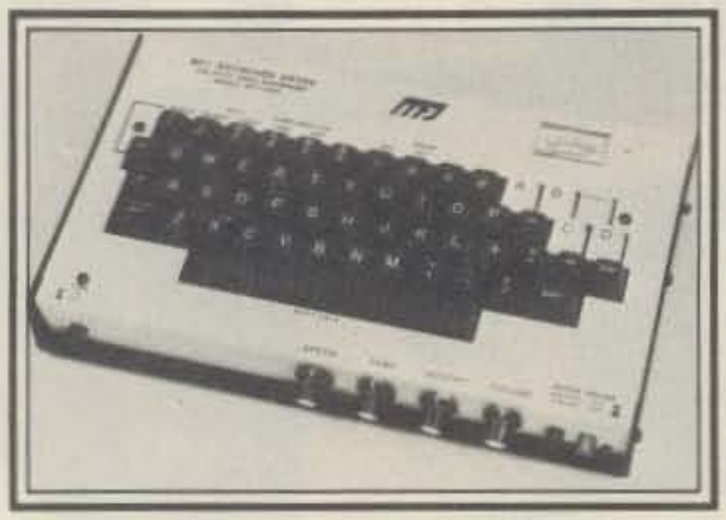
Graphiglass Etching is now offering high-quality sand-etched plates in either dark or clear glass. They measure 6″ × 2″ × 2⅝″ and are a way to make your letters permanent. Each comes set in a handsome stand made of hand-oiled solid oak with felt pads. Up to six one-inch characters will stand out sharply on the rich dark glass or classic clear glass.

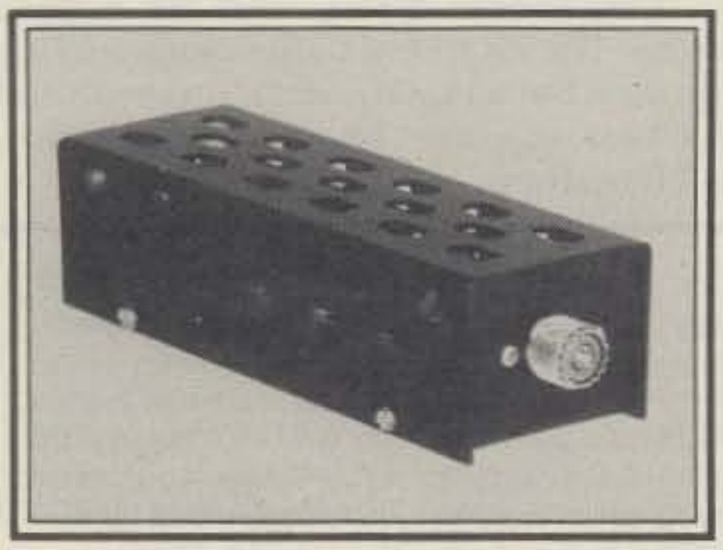
They are priced at $12.95 postpaid with your choice of glass. For more information, contact Graphiglass Etching, P.O. Box 27326, Escondido, CA 92027, or circle number 121 on the reader service coupon.



MFJ Super Keyboard

The MFJ Super Keyboard features c.w., Baudot, ASCII, buffer, programmable and automatic messages, Morse code practice, and a full-feature keyboard. You press only a one or two key sequence to execute any command. All keys and controls are positioned logically and labelled clearly. A meter gives continuous readout of buffer memory and speed. Two characters before full, the meter lights up red and the sidetone changes pitch.

Four automatic messages and two programmable message memories (A and B) are provided. The 50 character text buffer sends smooth, perfect code even if you "hunt and peck." Five level Baudot is transmitted at 60 wpm; RTTY and c.w. ID are provided via message A. There are two Morse code practice modes, and there is a plug-in paddle available to use it as a full-feature keyer. The MFJ-494 Super Keyboard sells for $279.95, and there are additional modules and options available. For more information, contact MFJ Enterprises, Inc., Box 494, Mississippi State, MS 39762, or circle number 110 on the reader service coupon.



Ten-Tec Dummy Load

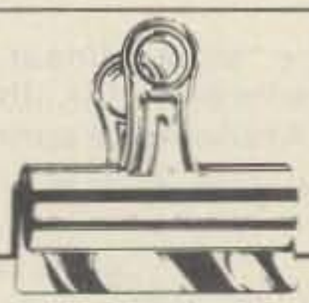
The new Model 209 dummy load from Ten-Tec is air cooled for clean, easy use around the shack in testing and alignment. Rated at 300 watts for 30 seconds, the Model 209 will make quick checks of equipment without disturbing other amateurs on the air. A derating curve is included for using the dummy load over longer periods of time up to a 5 minute maximum. V.s.w.r. is 1.1:1 maximum from 0-30 MHz and 1.5:1 maximum from 30-150 MHz.

The dummy load is housed in an aluminum enclosure that is perforated with wide slots for free air flow, and dark painted for heat dissipation. An SO-239 coax connector is built-in. Size is 1¾″H × 2¼″W × 6¾″D, and weight is ½ lb. Amateur net price is $26. For more information, contact Ten-Tec, Inc., Highway 411 East, Sevierville, TN 37862, or circle number 106 on the reader service coupon.

Hamtronics Receiving Converters

The new line of Hamtronics receiving converters are housed in attractive wood-grain aluminum cases and feature a low noise figure, less than 2 dB, for applications requiring exceptional sensitivity, such as OSCAR satellites and conventional terrestrial activity. Called the "CA" series, these converters are available in a wide range of v.h.f. and u.h.f. bands and in several popular output ranges. V.h.f. models use protected dual-gate mosfets in the front end and mixer. U.h.f. models use two of the MRF-901 bipolar transistors in the r.f. amplifier and a doubly balanced Schottkey diode mixer for broadband response.

Converters include s.s.b., c.w., f.m., and ATV. Converters are available in either kit or wired form starting at $34.95. A new line of receiver preamps has also been produced, available in either a drawn metal enclosure with mounting tabs, or as a pc board module. Preamps come in kit or wired form starting at $12.95. For more information, contact Hamtronics, Inc., 65F Moul Rd., Hilton, NY 14468, or circle number 107 on the reader service coupon.



a regular feature by
THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

AMRAD Requests STA For Spread-Spectrum Experiments

The Amateur Radio Research and Development Corporation (AMRAD) has requested a Special Temporary Authorization (STA) which would permit its members to experiment with spread-spectrum modulation techniques in bands allocated to the amateur service. The STA is required because the existing rules do not permit such operations. Specifically, the use of spread-spectrum techniques appears to be at variance with three sections of the Rules:

§ 97.61 Authorized frequencies and emissions. Spread-spectrum emissions are not specifically authorized in this section.

§ 97.117 Code and ciphers prohibited. Spread spectrum uses a code sequence to distribute energy throughout the frequency band used. Thus, AMRAD proposes to furnish the code sequences it will use to the FCC prior to the series of tests its members will conduct.

§ 97.123 Unidentified communications. The spread-spectrum signals would probably not be demodulated by either the FCC's monitors or by amateurs. Thus, in addition to identification in the spread-spectrum mode being used, AMRAD members will identify their communications using c.w. or conventional voice modulation (whichever is appropriate) on the center frequency within the specific band occupied by the spread-spectrum transmission.

At least three spread-spectrum experiments are planned:

1. H.F. Frequency Hopping Experiment—Skywave and groundwave paths will be investigated in the 3.5, 7.0, and 14.0 MHz bands.

2. 10-Meter Frequency Hopping Experiment—The intent here is to modify several CB, s.s.b. transceivers for frequency hopping operations in the 28-29.7 band. Also to be investigated is the frequency hopping capability of the Inoue Communication Equipment Corporation (ICOM) IC-701 h.f. transceiver, one of the few transceivers available capable of external digital control.

3. U.H.F. Direct Sequence Experiment—The use of direct-sequence (DS) modulation will be examined in the 420-450 MHz band. Specifically to be examined is the area of mutual interference between DS and amateur TV operations.

Amateurs who desire additional information on AMRAD's proposed spread-spectrum experiments are urged to contact that organization's president, Paul L. Rinaldo, W4RI, at (703) 356-8918. Correspondence may be sent to:

Mr. Paul L. Rinaldo, W4RI
AMRAD
1524 Springvale Avenue
McLean, VA 22101

**8603 Conover Place, Alexandria, VA 22308*

Amateur's License Revoked For Out-Of-Band Operation

In November 1980, the Commission revoked the station license of Bernard J. Winner, WD8CMB, and suspended his Amateur Technician Class Operator License for the remainder of this license's term, because of Winner's unauthorized use of 27.440 MHz. This frequency is in a band allocated to the Industrial Radio service. In taking these actions, the Commission maintained that the unauthorized operation of radio transmitting equipment on Industrial Radio service frequencies is a most serious matter, since it disrupts the Commission's program of spectrum allocation, and it interferes with the operations of the rightful users of the allocated frequencies.

FCC Continues Actions Against Illegal CB Amplifier Manufacturers

Two Charlotte, NC, businessmen were convicted and fined in Federal District Court in Charlotte for the attempted sale of illegal amplifiers intended for use with CB transceivers. Both men were sentenced to one year in jail, and each was fined several hundreds of dollars. The jail sentences were suspended on the conditions that both men remain gainfully employed, and that they do not violate any federal, state, or local laws over the next two years. The court action was the result of an effort by the FCC Norfolk Office and the United States Attorney for the Western District of North Carolina, and it is the first action of its type where the mere offer for sale of illegal equipment was the basis for prosecution.

Frank Rose Becomes Convenor Of CCIR Study Group 8E (Amateur; Terrestrial)

Frank L. Rose, FCC, recently became the Convenor of CCIR U.S.

Study Group 8E. The CCIR is the technical arm of the ITU, and it provides the technical guidance needed by the parent organization in its deliberations regarding, among other things, frequency allocations.

In his first message to USSG 8E participants, Rose stated that he will seek a balanced presentation in the CCIR of amateur concerns and advancements. Further, while he acknowledged that amateurs must strive to inform the telecommunications community of their activities, Rose stated that we must, at the same time, take care to prevent the imposition of unnecessary constraints on the amateur service which would work to prevent our continued exploration of technical matters and operational techniques.

Amateurs who want to participate in the work of USSG 8E are encouraged to write to:

Mr. Frank L. Rose
CCIR Study Group 8E
FCC
Washington, D.C. 20554

Amateurs Question Susceptibility Of Home TV Recorders

Several amateurs have recently expressed concern regarding the susceptibility of home TV recorders to signals radiated in the 40-meter band. While it is not known at this time whether the models tested exhibit a design deficiency which renders them interference prone to signals radiated only in the 7 MHz band, or whether signals at other frequencies will also be intercepted, amateurs who do experience such problems are urged to file complaints with the FCC. Write to:

Chief, Investigations Branch
Field Operations Bureau, FCC
Washington, D.C. 20554

Be sure to include detailed information on both the transmitter and its antenna system, and on the TV recorder involved. Copies of complaints to the FCC should be forwarded to the ARRL RFI Task Group, 225 Main Street, Newington, CT 06111.

FCC Reports 11% Jump In R.F.I. Complaints During FY80

Jeffrey Young, Chief, Investigations Branch (Field Operations Bureau, FCC) reported in December 1980 that r.f.i. complaints to the Commission during FY80 totaled 80,244. This number represents an 11% increase over the number of complaints reported during FY79 (72,069), and it may indicate that r.f.i. problems are again about to increase on a long-term basis.

Of the 80,244 r.f.i. cases reported, 63,640 involved alleged interference to television receivers (so-called "TVI"). Put another way, almost 80% of all r.f.i. cases involved television receivers! Fortunately, amateurs were cited in only 2,618 TVI complaints, while CB operations accounted for 51,100 such cases.

Of the 80,244 r.f.i. complaints reported to the FCC during FY80, it is interesting to note that amateurs were cited only about 5% of the time (4,203 amateur-related complaints). Unfortunately, 35% of these complaints (1,466 cases) involved alleged interference by one amateur to the operations of another amateur. Such amateur-to-amateur interference is a source of increasing concern to both the amateur community and the Commission, and it suggests that the amateur service must address the question of interference in our bands with the utmost urgency. ■

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Thirty years ago this month, in the March 1951 edition of *CQ*, my byline appeared on this column for the first time.

CQ pioneered propagation forecasts specifically tailored to the needs of radio amateurs. The first *Monthly DX Predictions* column appeared in the June 1946 issue, when *CQ* was little more than a year old. Edited by my good friend Perry Ferrell, the column appeared monthly until November 1949. Between December 1949 and February 1951, while *CQ* featured several outstanding articles dealing with radio propagation, there was no regular column devoted to this subject. Since March 1951 the column has appeared continuously, month after month, under my byline.

In the field of shortwave radio propagation elapsed time is often measured in terms of sunspot cycles rather than in months or years. By this system of reckoning, I have shared with *CQ* readers the last years of Cycle 18, all of Cycles 19 and 20, and now through the peak years of Cycle 21. I hope that this column will continue to serve as a reliable source of propagation information throughout the remaining life of Cycle 21 and into Cycle 22 and beyond!

March Propagation

One of the questions that I have been asked the most during my 30 years as Editor of this column is "What season of the year is best for DX propagation on the shortwave bands?"

This isn't an easy question to answer, since there are so many variables involved, and the answer could be different for different sets of conditions and for the various bands. In a general way, however, taking into account the overall number of hours that each band between *10* and *160* meters can be expected to open for DX, and the number of different areas of the world to which each band may open, I believe that the *spring* and *fall* months are optimum for DX propagation.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for March 1981

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 1, 7-8, 27, 29	A	A	B	C
High Normal: 2-3, 6, 24, 26, 28, 30-31	A	B	C	C-D
Low Normal: 4-5, 9-10, 14-16, 20-23, 25	A-B	B-C	C-D	D-E
Below Normal: 11,13, 17, 19	B-C	C-D	D-E	E
Disturbed: 12, 18	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9 + 30 dB.

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be excellent (A) on March 1st, good (B) on the 2nd and 3rd, good-to-fair (B-C) on the 4th and 5th, etc.

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

There is a solar-ionospheric relationship which helps to explain this. Spring and fall are the *equinoctial* seasons. These are the times when the sun is most nearly overhead at the equator, making night and day of almost equal length in all parts of the world. On March 21st and September 22nd of each year the sun is directly over the equator, and the length of night and day is exactly equal everywhere.

The vernal, or spring equinoctial period in the northern hemisphere, has a noticeable influence on shortwave propagation conditions for a period of several weeks lasting from late February through late April. The effects of the autumnal, or fall, equinoctial period are felt from early September through late October.

During equinoctial periods, it is always spring in one hemisphere and fall in the other. This tends to create an ionosphere of similar characteristics throughout more of the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere. It is this "ionospheric equalization" which takes place during the equinoctial periods that is responsible for optimum DX conditions.

This improvement is most noticeable on long circuits between the northern and southern hemispheres, for example, from the United States to Australia, to South America, to southern Africa, to southern Asia, to Antarctica, etc.

During these seasons, conditions are also optimum for long-path as well as short-path openings, and during grey-line twilight periods associated with sunrise and sunset.

Look for these optimum conditions during March on the shortwave bands.

During March, it should be a toss-up between *10* and *15* meters for the best DX band during the daylight hours from sunrise to sunset, with *20* meters not far behind. Some DX openings are also expected on the *6* meter band during the daylight hours. From sundown to midnight, DX honors will likely be shared between *20* and *40* meters, with some good openings towards the

west and the south also possible on *15* meters. On days when conditions are High Normal or better, even the *10* meter band may remain open for DX towards the west and the south well past sundown. Also check both *80* and *160* meters during this time frame for some good DX possibilities. In other words, between sundown and midnight DX should be possible on all shortwave bands between *10* and *160* meters!

Between midnight and sunrise, the best DX bands should be *40* and *80* meters, with openings to many areas of the world also possible on *20* meters. The *160* meter band should also open for DX to many parts of the world during this time period.

March looks like a great month for world-wide DX propagation conditions on all the amateur shortwave bands. For more detailed information concerning band openings, refer to the *DX Propagation Charts* for March which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* which are valid for both March and April 1981. These charts, which include data for Hawaii and Alaska, contain band opening predictions for predominantly one-hop paths, ranging in distance from 50 to 2300 miles. For day-to-day changes in shortwave propagation conditions expected during March, see the *Last Minute Forecast* which appears at the beginning of this column.

V.h.f. Ionospheric Openings

Many of the solar-ionospheric relationships which can produce ionospheric openings on the v.h.f. bands tend to maximize during equinoctial periods.

There is a good chance for an increase in widespread auroral activity during March, accompanied by auroral-scatter-type openings on the v.h.f. bands and sporadic-E-type short-skip openings, up to distances of approximately 1200 miles on *6* and *2* meters. Check the *Last Minute Forecast* at the beginning of this column for those days during March that are expected to be Below Normal or Disturbed. These are the days on which auroral activity is most likely to occur.

Conditions should be optimum during March for *trans-equatorial scatter propagation* between the southern tier states and countries deep in South America. TE openings must cross the magnetic equator at or near a right angle, and signals are usually very weak, often with severe flutter fading. The best time for TE openings should be between 8 and 11 p.m., local time. TE openings are most likely to occur on *6* meters, but some may also be possible on *2* meters.

Solar activity is expected to be high enough during March to permit some regular F-layer DX openings on the *6* meter band to many parts of the world, particularly when conditions are High Normal or better. Signals arriving in the quadrant between northeast and southeast should peak by mid-morning. Noontime should be best for openings towards the Caribbean, Central America and the northern countries of South America, although *6* meters may open in this direction as early as an hour or two after sunrise. During the afternoon hours expect the skip to extend deeper into South America and to shift towards the west and northwest. Trans-continental openings on *6* meters should be possible from about noontime through the late afternoon hours.

Not much meteor activity is expected during March, although some meteor-scatter-type openings may be possible on the *6* and *2* meter bands

during minor meteor showers expected March 13-14 and March 23-24.

Solar Cycle Activity

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 146.5 for November 1980. This results in a provisional 12-month running smoothed sunspot number of 156.7 centered on May 1980. This is a drop of 2.5 points in a month as the present cycle continues its slow decline from last December's maximum value of 165. A smoothed sunspot number of 135 is forecast for March 1981.

73, George, W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

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

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

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

3). Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

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

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

CQ Short-Skip Propagation Chart
March & April, 1981
Local Standard Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	09-18 (0-1)	07-09 (1) 09-12 (1-2) 12-13 (1-3) 13-16 (1-3) 16-18 (1-2) 18-21 (0-1)	07-08 (1) 08-09 (1-2) 09-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-21 (1)
15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-14 (0-3) 14-16 (0-2) 16-20 (0-1)	07-09 (1-2) 09-13 (2-4) 13-14 (3-4) 14-16 (2-4) 16-19 (1-3) 19-20 (1-2) 20-21 (0-2) 21-23 (0-1)	07-08 (2) 08-09 (2-3) 09-16 (4) 16-19 (3) 19-21 (2-3) 21-23 (1-2) 23-01 (0-1)
20	11-13 (0-1) 13-16 (0-2) 16-21 (0-1)	08-09 (0-3) 09-11 (0-4) 11-13 (1-4) 13-16 (2-4) 16-18 (1-4) 18-21 (1-3) 21-02 (0-2) 02-08 (0-1)	06-07 (1-2) 07-08 (3) 08-09 (3-4) 09-18 (4) 18-22 (3-4) 22-00 (2-3) 00-02 (2) 02-06 (1)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-22 (4) 22-23 (3-4) 23-00 (3) 00-02 (2) 02-04 (1-2) 04-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-20 (4) 20-22 (3-4) 22-00 (2-4) 00-03 (1-3) 03-06 (1-2)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-00 (4) 00-03 (3-4) 03-06 (2-3)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-03 (4) 03-04 (3-4) 04-06 (3)
80	07-11 (4) 11-18 (4-3) 18-22 (4) 22-00 (3-4) 00-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-00 (4) 00-05 (3-4) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-03 (4) 03-05 (4-3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

HAWAII
March & April, 1981
Openings Given in Hawaiian Standard Time

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	08-09 (1) 09-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	12-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 21-22 (1)* 22-01 (2)* 01-02 (1)*
Central USA	08-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-19 (3) 19-23 (4) 23-03 (3) 03-06 (2) 06-08 (3) 08-09 (2)	19-20 (1) 20-22 (2) 22-02 (3) 02-04 (4) 04-05 (2) 05-06 (1) 22-23 (1)* 23-02 (2)* 02-03 (3)* 03-04 (2)* 04-05 (1)*
Western USA	08-09 (1) 09-11 (2) 11-12 (3) 12-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (4) 11-15 (3) 15-18 (4) 18-20 (3) 19-22 (2) 22-00 (1)	15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3) 10-15 (2)	18-19 (1) 19-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (1)* 21-22 (1)* 22-23 (2)* 23-04 (3)* 04-05 (2)* 05-06 (1)*

ALASKA
March & April, 1981
Openings Given In GMT

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	18-20 (1) 20-00 (2) 00-01)1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	13-15 (1) 20-22 (1) 22-01 (2) 01-03 (3) 03-05 (2) 05-06 (1)	06-13 (1) 07-12 (1)*
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	14-16 (1) 20-23 (1) 23-02 (2) 02-04 (3) 04-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)*
Western USA	20-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

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

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

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

Barry Electronics Corp.

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No - 89-90

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Tidbits

Queen Mary Novice Band Operation

A few of my friends have promised to give Novices plenty of chances to contact the Queen Mary during 1981. They will operate on the Novice 10, 15, and 40 meter bands four hours the second Saturday of each month. Listen for W6RO 30 kilohertz (plus-or-minus 5) above the low end of these Novice bands at 1, 2, 3, and 4 p.m. Pacific, Mountain, Central, and Eastern times, respectively. Whenever conditions are suitable, W6RO operation will start on the 10 meter band and later be shifted to the 15 and 40 meter Novice bands. There will be many times when two or three of these Novice bands will be operated simultaneously from W6RO.

Listen for W6RO on 7.125 to 7.135, 21.125 to 21.135, and 28.125 and 28.135 megahertz. W6RO operators will answer Novice type callsigns in preference to all others while operating in these Novice bands. The remaining 1981 dates are 14 March, 11 April, 9 May, 13 June, 11 July, 8 August, 12 September, 10 October, 14 November, and 12 December.

As is true in all operations of this type, the contacts should be kept as brief as possible to let the W6RO operators make more contacts. Just send the signal report (RST), your name, and your location (QTH). Do not repeat this information more than one time. Do not send information about your rig, antenna, or weather, and do not chat. Do not waste time saying you want a QSL because that is understood to be the situation. If you understand the proper use of the break sign (BK), use it to minimize time lost in identifying stations.

The Queen Mary (W6RO) QSL is a unique one that will be a welcome addition to your card collection, and it will probably end up posted prominently on your radio shack wall. The W6RO QSL includes a color photo-

QSL card from W6RO aboard the R.M.S. Queen Mary.

graph of the Queen Mary, plus a wealth of related information. This is an oversize (4 by 9 inches) card that you will be glad to receive and display. There is no requirement to enclose a self-addressed and stamped envelope (s.a.s.e.), International Reply Coupons (IRC's), or payment in any form to obtain a W6RO QSL confirming your two-way radio contact with the Queen Mary. Simply send your completed QSL to Amateur Radio Station W6RO, Queen Mary, P. O. Box 7493, Long Beach, California 90807. You will be given a QSO number by the W6RO operator, and it is important to show this number on your QSL to make it easier for them to locate your contact in their station log. If you do not have printed cards, just provide the contact facts in a note to enable W6RO amateurs to quickly find your contact in their log.

If your vacation plans include a visit to Southern California, it would be greatly appreciated if you visit this tourist attraction and say hello to the W6RO operators. I particularly urge you to drop by on the second Saturday of a month when you can greet Bill Botko, WB6WYX, Bob Creiman, AB6V, and Glen Skagerberg, N6AVC in the W6RO shack. Another group of my friends operates W6RO the second Friday of each month and they give top priority to Novices. Bill Diaper, WB6JDY, Roy Harrison, AA6W, and Val West, WB6VVZ will be trying to work you on 10, 15, and 40 meters. Please let them know that you appreciate their special consideration of Novices. The world's largest airplane will soon provide an additional attraction at the same location, although it is not presently available for public viewing. The Spruce Goose and the Queen Mary represent aviation and marine history at their glorious best.

Canadian Contact Available

Clarence Angst, VE3LBU has provided the first VE (Canadian) contact for many American Novices. He operates in the 10 and 40 meter American Novice bands most of the time, and he sends at any desired speed between one and 15 words per minute (wpm).

Clarence has been licensed with an Advanced ticket since November of 1978. He teaches electronic theory. He is a member of the American Radio Relay League (ARRL) and the Canadian Amateur Radio Federation (CARF).

Listen for VE3LBU if you want a good contact with a fine citizen of Prescott, Ontario in Canada. I know he is active on the Novice bands, because that is where I worked him. Clarence enjoys rag chewing, so be prepared for a nice chat when you contact him. He enjoys the articles in *CQ* and suggests listing the Novice col-

2814 Empire Ave., Burbank, CA 91520

Buzz Ewing, KA8BRV of Otsego, Michigan, started as a Novice in July 1978 and he upgraded to General in April 1980. He likes rag chewing instead of chasing DX (long distance contacts), and he has already received more than 500 QSL (confirmation) cards, including a few expressing the wish that his QTH (location) was West Virginia instead of Michigan. His station includes a Tempo One Transceiver, a Heath HW-8 QRP (low power) Transceiver, a 40-meter dipole, and a Wilson 4 band vertical. Buzz reports that the Novice articles have helped him, and he continues to read them even though he is no longer a Novice. His age is the highway speed limit of 55.

umn with the other departments to make it easier to find each month.

Personalized Help

A recent Novice column included a short list of amateurs who are willing to help people just getting started in amateur radio. That brief listing has been expanded as offers of help have been received. If you need help, send your request to W6DDB and enclose a self-addressed, stamped envelope for the reply. If there is a volunteer in your area, you will receive information about that person. If not, you will receive that information. The present list shows 41 people in 33 states; it needs to show about ten times that amount of amateurs to be really useful. If you are an experienced amateur who is willing to help newcomers, please send a note letting me know your name, callsign, address, and telephone number. If you know someone who provides this important service, please tell that person that it would be appreciated if he/she would agree to be included in this list of experienced advisors.

I have taught licensing courses more than three decades, and I am aware that new amateurs need more than classroom instruction. It is satisfying to help new amateurs select and install the equipment and accessories of their initial stations. It is even more satisfying to stay with them as they work their first few contacts on the air. I have found that a few simulated (across the table) contacts provide excellent training in calling procedures, operating procedures, Q-signals, and the use of phonetic abbreviations (modified Phillip's Code). This is essential personalized training that can make the difference between good and bad operating results, which usually determines whether new amateurs progress in amateur radio or become discouraged and quit.

Experienced amateurs can perform a useful service by helping new amateurs get a good start. It is not enough to help license people; that is just the first step in producing an efficient amateur who will be an asset to all.

If you need help by mail, write to Paula Franke, WB9TBU, P. O. Box 873, Beecher, Illinois 60401.

New All-Band Communication Receiver

Radio Shack is marketing a new receiver that provides code, s.s.b., and a.m. reception from 10 kilohertz to 30 megahertz. This 6-band receiver features a digital readout (number display), and it is powered by common house power (120 vac) or battery power (12 vdc).

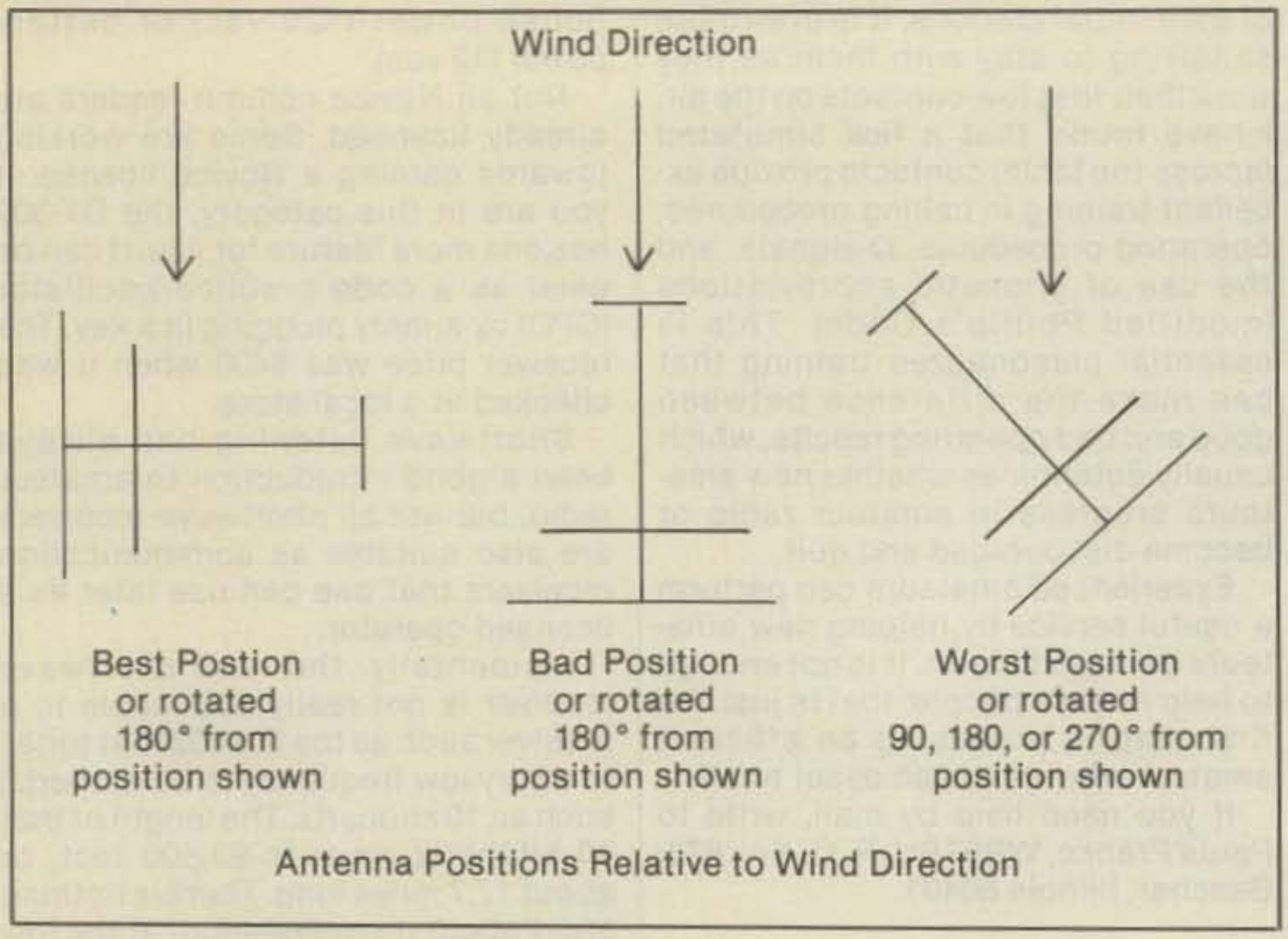
Not all Novice column readers are already licensed. Some are working towards earning a Novice license. If you are in this category, the DX-302 has one more feature for you: It can be used as a code practice oscillator (CPO) by simply plugging in a key. The receiver price was $400 when it was checked at a local store.

Shortwave listening has always been a good introduction to amateur radio, but not all shortwave receivers are also suitable as communication receivers that one can use later as a licensed operator.

Incidentally, the term *shortwave receiver* is not really applicable to a receiver such as the DX-302 that tunes to a very low frequency (3-30 kilohertz) such as 10 kilohertz. The length of that 10 kilohertz wave is 93,600 feet, or about 17.7 miles long. There is nothing short about the wavelength at the low end of this receiver's tuning range.

Junkbox Danger

John Ritch of the Environmental Protection Agency (EPA) is involved in a study about polychlorinated biphenyls (PCB) used as a coolant in capacitors and transformers manufactured between about 1935 and



Antenna Positions Relative to Wind Direction

Fig. 1– The worst antenna position is kitty-corner. The resultant air turbulence in these positions places a severe strain on the antenna.

Phil Marty, KAØGIS does a good job of keeping Cherokee, Iowa easy to contact on the Novice bands. During his first 4 months on the air, he has contacted amateurs in 47 states and 13 countries. His most memorable foreign contact so far was with the Canary Islands. His station includes a Tempo 2020 Transceiver and a Wilson 4-band trap vertical antenna. Phil is the Editor of the Cherokee Daily Times.

1978. PCB has been identified as a toxic environmental pollutant that could cause bone, liver, and skin diseases, plus cancer and reproduction failures in humans; it has been proven to cause these problems in animals during laboratory tests.

PCB is an oily synthetic chemical that is not readily biodegradable in our environment. The maximum allowable proportion of PCB in a food product is three parts per million, but up to 50 times that amount have been detected so far, due to contamination occurring in food processing plants.

If you are working on equipment, be careful to avoid coming in contact with any oily substance oozing out of capacitors and transformers, because it could be PCB. Similarly, do not take apart capacitors or transformers that may contain PCB.

If you have components that may be leaking PCB, the EPA would appreciate receiving your call to their toll-free telephone number, 800-424-9065. They want all the facts you can supply.

Yagi Positions in High Winds

Hy-Gain advises amateurs to minimize wind turbulence and strain on Yagi-Uda beam antennas during high velocity wind conditions. While the antenna is not in use, it is best to position it with the elements in line with the wind and the boom broadside to the wind. In this position, the wind blows over and under the boom but the resultant turbulent air does not strike the antenna elements. If the antenna is facing toward or directly away from the wind, the turbulent air flowing past forward elements strikes elements farther back, which is undesirable. The worst antenna position is kitty-corner (45, 135, 225, or 315 degrees) with the wind hitting the boom and elements. The resultant air turbulence in these positions places a severe strain on the antenna. (See fig. 1.)

Dial-A-Chip

Most of us have taken advantage of at least one of the many services that are available at no cost by telephone, even if it was just to dial to get the weather or the correct time. Amateur radio operators may want to Dial-A-Chip and listen to a silicon chip that synthesizes human speech. The Southern California telephone number to call for this unique experience is 408-737-3939, which is a National Semiconductor Corporation number. The Digitalker is unique, and it is worth the cost of a call to hear it.

Written Help

Many of the letters I receive are from newcomers to amateur radio. These people usually request information that has been printed in previous Novice columns. I recommend that aspiring amateurs read the following

Novice columns in the listed sequence:

"Advantages of Starting as a Novice," June 1978

"How to Get Started in Amateur Radio," July-August 1978

"Sources of Aid for Prospective Amateurs," December 1978

"Getting Technical Help from Experts," October 1977

"Code," June-August 1979

"Worldwide Sources of Code Practice," October-November 1980

"Amateur Radio Station Installation Tips,"November 1977-March 1978

"Amateur Radio Station Grounding," September-November 1978

"Amateur Radio Callsigns," April-May 1979

"Worldwide Amateur Radio Callsigns," January 1980

"Operating Tips," May 1978

"Phillips Code," November-December 1979

"Q-Signals for Amateur Radio Use," February 1980

"QSL Cards," January-March 1979

"HF Radio Wave Propagation Predictions," March-April 1980

"Worldwide Codes," December 1980

This is Manny Espinole, KA6FOC of Pleasant Hill, California. Manny is 67 and he has been retired 6 years. He obtained his Novice license in April of 1979, but it took him until June to get up his nerve and an antenna to actually get on the air and talk with other amateurs. He must have overcome his early fears, because I recently issued a TAD (Ten American Districts) award to him and he has contacted at least five countries. He operates a Yaesu FT-101-B with a homebrew 4-element 15-meter Yagi-Uda that he made using old pieces of tubing.

If you are unable to locate the preceding issues in local libraries of clubs or from amateur friends, you could try purchasing them (for $2 each) from *CQ* Magazine, 76 North Broadway, Hicksville, New York 11801. Most issues are also available at fifty cents each (including U.S.A. shipping) from W6LS, 2814 Empire Avenue, Burbank, California 91504.

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

Some of the stations I've recently worked on the Novice bands are: Bob, KA1BAX, Westerly, R.I.; Madeline, KA2ILI, Frankfort, N.Y.; Joe, KA3DQD, Newark, Delaware; Kathy, KA4CVC, Cocoa Beach, Fla.; John, KA5KDK, Temple, Texas; Polly, KA6KKN, Apple Valley, Calif.; Joe, WB7TUI, Coos Bay, Oregon; Farrell, WD8JPZ, Milford, Mich.; Howard, KA9BYE, Mt. Vernon, Indiana; David, KA0JIT, Raymore, Missouri.

73, Bill, W6DDB

CQ BOOK SHOP

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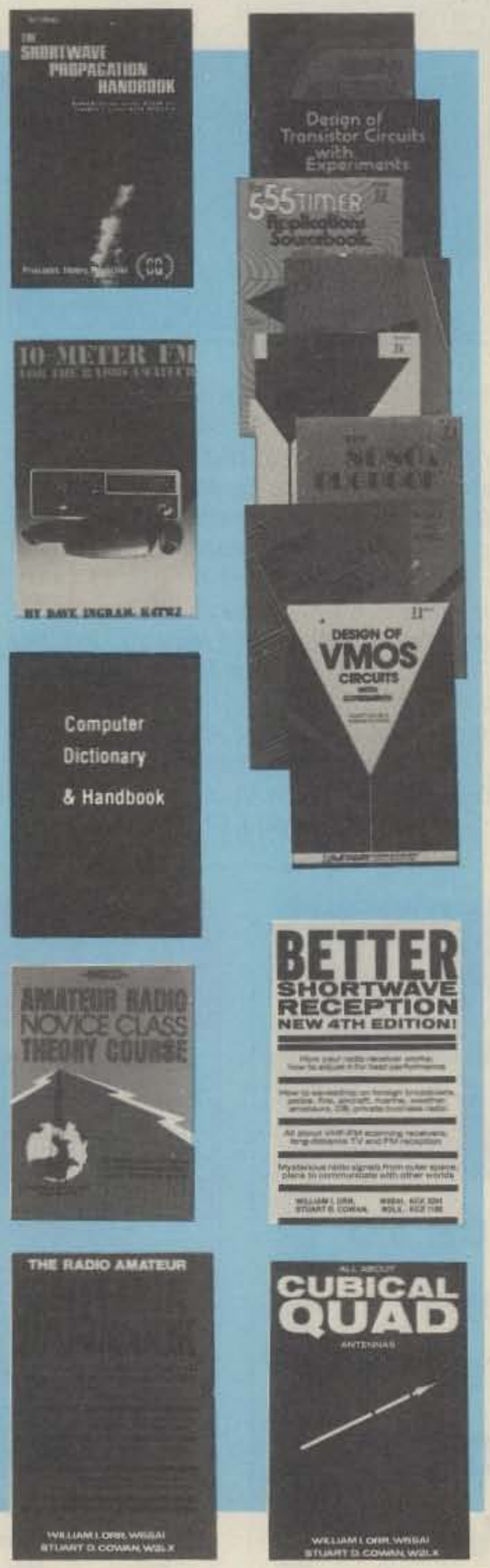

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Zero Bias *(from page 8)*

for they all offer alternatives, sometimes to each other.

If you are heavily into DX, Contesting and the like, then perhaps you might not see the simple economy and subtleties of QRPp operation the way Ade Weiss does. Both have their point and place, just as if you were a computer enthusiast and read all of the specialty magazines on computers, you might pass by Buzz Gorsky's series on Basic, while someone trying to find out or get a taste of programming might hang on every word. So, I think a great part of our role is like a department store. We invite you in and hopefully display our various wares in all degrees of complexity and price and invite you to shop, browse, ask questions and certainly return a satisfied customer and friend.

What's New

We've got some great material coming up in the months to come. We're preparing some interesting RTTY pieces, some state of the art material in non-engineering (you won't have to be a whiz in calculus) language, antenna projects for the warmer months, building projects and equipment modifications to get some workbench time in and many other areas of interest. Bill Kennamer, K5FUV, will be doing a regular piece on how to work DX. This will be a teaching series aimed at the amateur who would like to give it a try. Bill's an avid DXer who has the knack of explaining just what it takes to give DXing a whirl without spinning your wheels. We're also preparing material on how to work Contests which will give the neophite Contester or curious amateur enough background to get his feet wet without drowning or getting shot down completely by the big guns. I can't promise you the biggest department store in town, but you'll certainly have plenty of "merchandise" to choose from.

73, Alan, K2EEK

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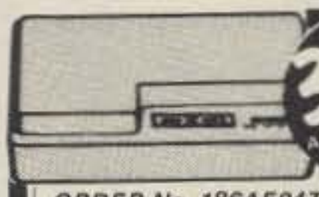

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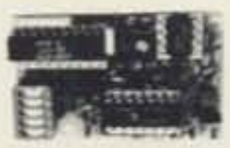

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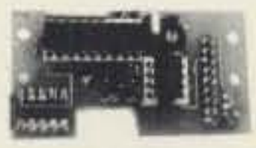

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