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Amateur Radio

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CQ

Results of the 1986 CQ WW DX CW Contest

. . . page 13

THE RADIO AMATEUR'S JOURNAL

KENWOOD

...pacesetter in Amateur Radio

#1 Rated HF

"DX-cellence!"

TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT- 940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Interface IF-232C/IF-10B

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL- 922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.

More TS-940S information is available from authorized Kenwood dealers.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

KENWOOD

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2201E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

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All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)

- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**

Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-5/6/7 headphones
- SP-40/50B mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2S extra DC cable.

Kenwood takes you from HF to OSCAR!

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

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NOW! 70 cm

All Mode Mobility!

TR-751A/851A

Compact all mode transceivers

It's the "New Sound" on the 2 meter band—Kenwood's TR-751A! Automatic mode selection, versatile scanning functions, illuminated multi-function LCD and status lights all contribute to the rig's ease-of-operation. All this and more in a compact package for VHF stations on-the-go!

- Automatic mode selection, plus LSB

144.0 144.1 144.5 145.8 146.0 148.0 MHz

CW	USB	FM	USB	FM

- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option
- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter

- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone and microphone hook included
- Frequency lock, offset, reverse switches
- Digital Channel Link (DCL) option

Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2 m antenna tuner
- **SWT-2** 70 cm antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50B** mobile speakers
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-43S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.
- **MA-4000** dual band antenna with duplexer

Actual size front panel

TR-851A

70 cm SSB/CW/FM transceiver

The same winning features are yours on 70 cm with the TR-851A!

- Covers 430-439.999 MHz
- 25 W high power/5 W adjustable low
- MC-43S UP/DWN mic. and mic. hook included

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The Radio Amateur's Journal

ON THE COVER: These are the flying fingers of Steve McElroy, K4JPD of Douglasville, GA. Photo by Larry Mulvehill, WB2ZPI.

OCTOBER 1987 **VOL. 43, NO. 10**

FEATURES

DEPARTMENTS

Zero Bias

AN EDITORIAL

It occurred to me the other day that the original crew who started the *CQ* World-Wide DX Contest way back when had some pretty devious motives in setting the dates. Maybe it wasn't so devious the first year or so, but in subsequent years the wonderful planning became obvious. I know that Frank, W1WY, will say that it was a choice made after analyzing contest activity, open dates, geopolitical considerations, and the opportunity for global amateur friendships. George, W3ASK, would add some esoteric information on critical sunspot activity favoring a particular window of time.

The interest starts to build in the *CQ* WW DX Contest about the time the high-claimed scores are published. Who did what and who beat whom and who was even listed at all becomes very important. Then September comes and tension heightens as the phone scores are published and the all important rules for the next one are printed. Now it starts getting down to the wire and people see just whom they beat and who beat them (and by how much). They can also see who has been gaining on them and on whom they are gaining. In October we have the CW results plus the All-Time Records, another hurdle to overcome and new levels of aspiration. Everyone is now up for a challenge. October is also the time of the Phone contest, and so a month is spent getting everything in shape, fine-tuned, and honed, with back-up gear in place and an all-out concentration of effort. November arrives and it is a repeat of October, adrenalin flowing freely, DXpeditions all over the place, and amateur activity from countries, island rocks, sandbars possibly populated by one shepherd and three goats . . . it's the ultimate amateur high. It's contest fever.

Now comes the uncertainty. The contest is over and you're not quite sure how you did. If only you had put up another beam, tried a new mike or keyer, bought that new super-duper transceiver, or even went for the whole nine yards and ordered the latest King Kong "Super Mega Blaster" all band amplifier, you could have edged out so-and-so or at least given him cause to cringe at your signal. It's at this point that our fantasy life (amateur radio fantasy, that is) blossoms. If only we had had this and that, we could have done better. Even the top guys and groups want to be so top that there's plenty of space between them and the next guy. Who wouldn't be proud to be listed in the All-Time Records and have that record stand for a long time?

Plaque presented to CQ by the ORARI.

Now you'll see the logic of timing, for timing is everything. Following on the heels of the *CQ* WW DX Contest is Christmas with its wonderful tradition of exchanging gifts. What better time to ask for all the things you'll need, want, have to have, can't do without for next year's outing. So you see how sneaky it can be. As close as I can figure and piece together from remaining records, the original contest committee was infiltrated by certain members of the gift-wrapping industry posing as amateurs. They arranged in very subtle ways this bit of timing. I mean after all, none of us really wanted all of these new and wonderful transceivers, antennas, amplifiers, and the myriad of accessory items. Before that we were all happy with our one-tube oscillators. The bigger the gift, the more wrapping paper it takes. Simple, yet insidious. So if your family complains about the price of the King Kong "Super Mega Blaster," tell them it's not your fault, and they can get even by not wrapping it.

CQ Receives Award

After years of presenting awards for amateur radio achievement, *CQ* was on the receiving end recently. ORARI (Organisasi Amatir Radio Indonesia) in celebrating the 19th anniversary of their QSL and Awards Bureau has awarded a plaque to the *CQ* Award Directors on behalf of all ORARI members who have participated in *CQ* Awards Programs and *CQ* DX Contests. The plaque was presented by Ben S. Samsu, YB0EBS/W6.

On behalf of the *CQ* Award and Contest Directors, I thank the members of ORARI.

Travels With CQ

Huntsville does attract a lot of amateurs. I can't attest to the actual numbers, but in absolute terms it ranks extremely high in amateur turnout. I'd say that we saw more people there than at most hamfests we attend. There were also more young people there than at most hamfests.

What's the secret? Well, it's absolutely free; there is no admission charge. How do they pay for all that space in the Von Braun Civic Center? Again it seems to be a simple idea—raffle tickets. Instead of attaching a prize ticket to an admission ticket, this group sells the prize tickets (both amateur and nonamateur prize drawings) to any and all who attend. They found out that they could sell enough prize tickets to pay for the event. It also allows anyone who is interested in the event to attend even though they may not have money. Another good idea that works is their mailing for the hamfest. If you've attended the previous event and registered at the door, your name will be added to the mailing list for the current hamfest. You will receive a card letting you know about the event coming up. That card is also a raffle ticket. Shortly before the event you will receive another reminder card, also a raffle ticket. These two tickets are for Saturday and Sunday drawings. Each of these drawings is held for prior-attendees and the prize for each is a $100 bill. That's quite an inducement to keep coming back each year.

Dick and I were quite impressed with the organization and how efficient everything was run. Of course the food concession needs quite a bit of work to get it out of a double *yech* rating. Dave and Sandy Ingram drove up for the event, and Karl and Millie Thurber showed up, too. The fleamarket had a lot to offer, and both Dick and I availed ourselves of several goodies to bring home. The weather was good and the price was certainly right, so any of you out in that area who decided not to go, shame on you.

73, Alan, K2EEK

New PK-232 Breakthrough

Six Digital Modes - Including Weather FAX

A new software enhancement makes the AEA PK-232 the only amateur data controller to offer six transmit/receive modes in a single unit.

* **Morse Code**
* **Baudot (RTTY)**
* **ASCII**
* **AMTOR**
* **Packet**
* **Weather FAX**

$319.95 AMATEUR NET
$379.95 AEA RETAIL

Your home computer (or even a simple terminal) can be used for radio data communication in six different modes. Any RS-232 compatible computer or terminal can be connected directly to the PK-232, which interfaces with your transceiver. The only program needed is a simple terminal program, like those used with telephone modems, allowing the computer to be used as a data terminal. All signal processing, protocol, and decoding software is in ROM in the PK-232.

The PK-232 also includes a no compromise VHF/HF/CW modem with an eight pole bandpass filter, four pole discriminator, and 5 pole post detection low pass filter. Experienced HF Packeteers are reporting the PK-232 to have the best Packet modem available.

Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant status and mode indication. The 240 page manual includes a "quick start" section for easy connection and complete documentation including schematics. Two identical back panel radio ports mean either your VHF or HF radio can be selected with a front panel switch. Other back panel connections include external modem disconnect, FSK and Scope Outputs, CW keying jacks, and RS-232 terminal interface.

The RS-232 connector is also used for attaching any Epson graphics compatible parallel printer for printing Weather Fax. Weather maps and satellite photos, like the one in this ad, can be printed in your shack.

Contact your local AEA dealer today for more information about the one unit that gives you six modes for one low price, the PK-232.

Brings you the Breakthrough

2006-196th St. SW
Lynnwood, WA 98036
(206) 775-7373

You're face to face

Meet America's Newest, the Ten-Tec Paragon, Model 585

PARAGON HF TRANSCEIVER, Model 585 . . . $1995

The Paragon Model 585 is a full featured, synthesized transceiver. General coverage all mode receiver tunes from 100 kHz to 29.999.99 MHz. Transmit at 100 watts output on all authorized frequencies from 1.8 to 29.999.99 MHz. SSB, CW, FSK and optional FM. Noise blanker and speech processor are standard equipment. Dual VFOs, RX offset, TX offset, QSK with a changeover time of less than 30 ms, five i-f filters (standard 6 kHz AM and 2.4 kHz SSB, optional 1.8 kHz, 500 Hz and 250 Hz) that are front panel selectable independent of mode, selectable tuning rates with automatic speed-up at rapid tuning knob rotation, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more!

Sixty-two programmable memories that include frequency, mode, filter selected, channel number and a 7 character alpha-numeric tag for entering a net name, call sign or I.D. of your choice. As the memory channels are scanned, all of the information is displayed (what a light show!) and the receiver automatically sets up mode, filters, tag and frequency as stored in each channel. Channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset.

The construction is impressive too. All circuit boards are glass epoxy (G-10) and all of them can be removed without desoldering. The front panel is hinged to provide access to all sections of the chassis. All aluminum construction keeps the weight of the rig reasonable too. And of course, the front panel is a spacious arrangement which makes the critical controls easy to use.

Frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift one MHz or to the next ham band. Frequency readout is selectable to display to 100 Hz or 10 Hz. Front panel clock is in 24 hour format. Rear panel input and output provisions keep the all-mode operator in mind too. Fixed level audio out and FSK keying (170 Hz shift), auxiliary dc jack, amplifier control circuits plus all the other connections that you could possibly need, including RS-232 computer interface option.

The Paragon is the end result of a three year engineering effort. Much of that effort was invested in improving the receiver performance and controlling the phase noise inherent in a PLL oscillator. We are proud of the performance of the Paragon and we think it has set new standards of excellence in synthesized rigs. All we ask is that you take the time to check it out. We think that you will share our pride in the Paragon.

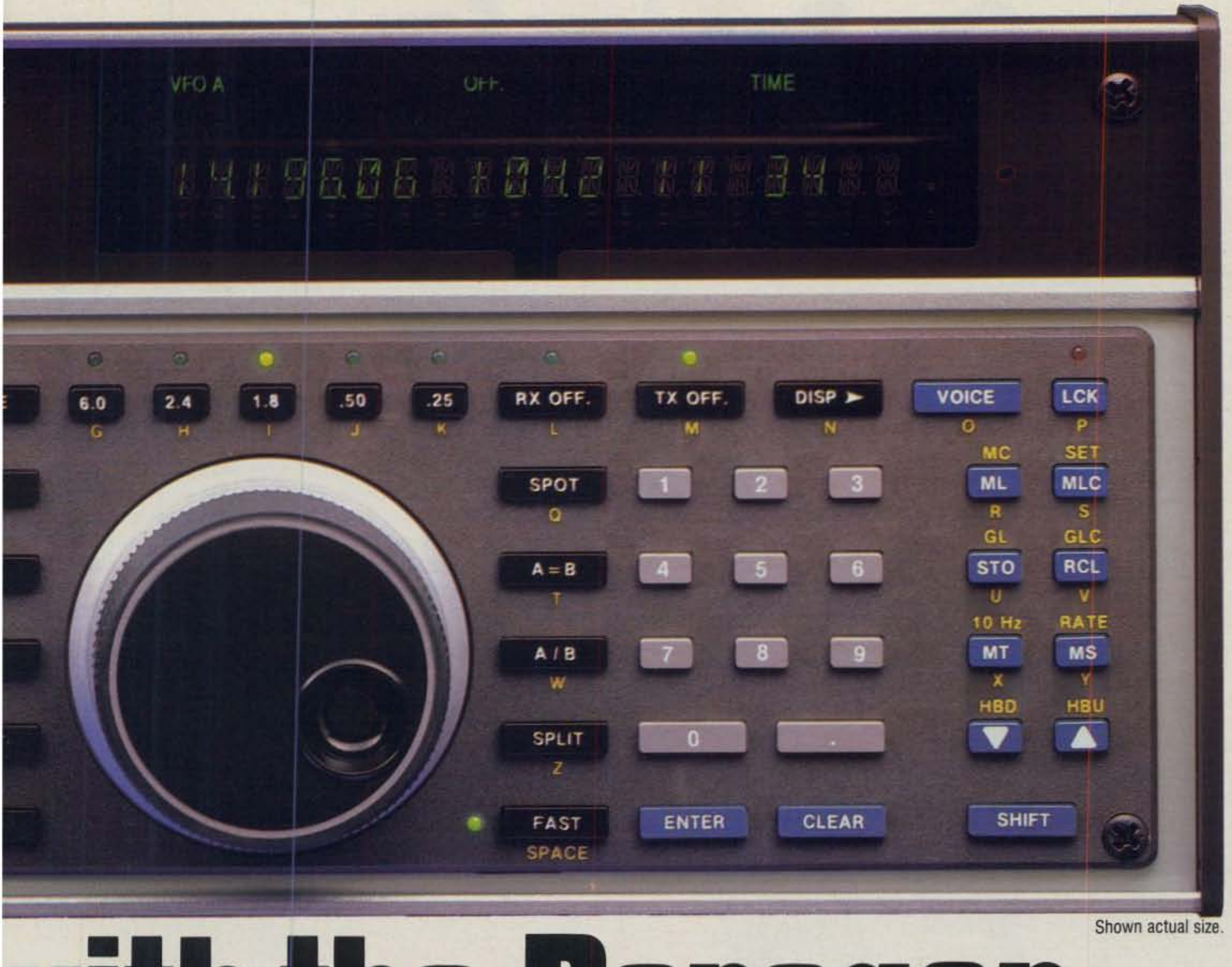
GENERAL SPECIFICATIONS

Frequency Range: Receive: 100 kHz to 29.9999 MHz. Transmit: 1.8 to 29.9999 MHz.
Frequency Control and Readout: Microprocessor controlled digital PLL synthesizer. 10 Hz resolution.
Frequency Stability: Worst case, 1 PPM per degree C. at 29.999 MHz.
Frequency Accuracy: ± 100 Hz @ 25 degrees C.
Tuning Rate:

	Normal	Normal Shifted
CW/USB/LSB/FSK	10 Hz 4.8 kHz per turn	20 Hz 9.6 kHz per turn
AM/FM	50 Hz 24 kHz per turn	100 Hz 48 kHz per turn
	Fast	**Fast Shifted**
CW/USB/LSB/FSK	20 Hz 9.6 kHz per turn	50 Hz 24 kHz per turn
AM/FM	100 Hz 49 kHz per turn	500 Hz 240 kHz per turn

Antenna Impedance: 50 ohm unbalanced.
PC Boards: 14 double-sided, 9 single-sided .062" glass-epoxy.
Power Required: Receive = 1.5A. Transmit = 20A. 12 - 14 VDC.
Dimensions: HWD 5¼" x 14¾" x 14¼". 13 x 37 x 36 cm.
Net Weight: 16 lbs. 7.25 kg.

Paragon Station with Model 960 Matching Power Supply ($229), and the Mighty Titan Amplifier ($2685).



Shown actual size.

with the Paragon.

TRANSMITTER

Modes: USB & LSB (J3E), CW (A1A), FSK (F1A); FM (F3E) optional (Model 256).
DC Power Input: Typical 200 watts.
RF Power Output: ALC stabilized, adjustable, 10 to 100 watts (into 50 ohms) with front panel RF OUT control.
Microphone Input: Low impedance, bias voltage for electret provided.
CW Sidetone: Internally generated, adjustable tone and volume independent of AF GAIN control.
SSB Generation: 9 MHz, 8-pole crystal ladder filter. Balanced modulator.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Spurious Output: Greater than 50 dB below peak power output.
Third Order Intermod Products: -30 dB from two-tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 750 Hz automatic.
FSK Shift: 170 Hz.
Transmit Offset Tuning Range: ±99.9 kHz.

RECEIVER

Modes: USB, LSB, CW, FSK, AM, (FM optional).
Sensitivity:

	.1 - 1.6 MHz	1.6 - 29.999 MHz	
SSB/CW/RTTY	.5 uV	.15 uV	10 db S/N @ 2.4 kHz
AM	3.5 uV	1.0 uV	10 dB S/N @ 6.0 kHz
FM	1.0 uV	.3 uV	12 dB SINAD @ 15 kHz

Selectivity:

	-6 dB BW	-60 dB BW	Shape Factor
Standard AM	6.0 kHz	11.25 kHz	1.875:1
Standard SSB	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz SSB (Model 288)	1.8 kHz	2.9 kHz	1.60:1
Opt. 500 Hz CW (Model 285)	500 Hz	1.4 kHz	2.80:1
Opt. 250 Hz CW (Model 282)	250 Hz	.85 kHz	3.40:1
Standard FM	15 kHz	30 kHz	2.00:1

Attenuator: -20 dB for 1.6 to 29.999 MHz, -10 dB for .1 to 1.6 MHz.
I-F Frequencies: 1st = 75 MHz, 2nd = 9.0 MHz, 3rd = 6.3 MHz (FM 3rd = 455 kHz).
Image Rejection: Greater than 80 dB.
I-F Rejection: Greater than 70 dB.
Noise Blanker: Switchable on/off with adjustable width.
Dynamic Range: 100 dB.
Blocking Dynamic Range: +16 dBm for 1 dB compression of an S9 signal, frequency offset = 50 kHz. -2 dBm for 1 dB compression of an S3 signal, frequency offset = 50 kHz.
Third Order Intercept: +18 dBm.
Noise Floor: -132 dBm @ 2.4 kHz BW.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 27 ms.
Receiver Offset Tuning Range: ±99.9 kHz.
Pass Band Tuning I-F Shift: ±1.2 kHz.
Audio Output: 1.5 watts @ 8 ohms. 5% distortion max.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.
Audio Bandpass Filter: 4 pole, variable center frequency 220 to 1.7 kHz, 35% bandwidth @ -6 dB.
Tone Control: Variable 15 dB rolloff @ 5 kHz.

...America's Best Kept Secret!

TEN-TEC

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Write for our new 10-page full-line catalog.

MADE IN USA

Our Readers Say:

Having A Ball On 6

Editor, *CQ*:

I really loved your article on 6 meters in July by Dave Ingram. Matter of fact, I liked it so much I tried it, and you know what? He was 110% correct. I have found a home on 6 meters and am having a ball! This band has something for everyone, and running 20 watts PEP does not bother anyone's TV in my neighborhood, as I was told it would, not even channel 2. I have worked stations from Alaska to Hawaii QRP with no trouble at all with a 3-element beam. Cheap thrills!

One other thing I would like to say is that I have read a lot about the DXpeditions in your magazine, and I would like to know if they are all alcoholics. Every line seems to be filled with the "hard stuff." Come on, guys! We have young impressionable hams reading this stuff! They should be told that drinking and hamming do not have to go together!

Mitchell W. Cox, KB4WTS
Ridgeway, VA

Banjo Lessons Over The Air?

Editor, *CQ*:

I always enjoy KR7L's writing, and his recent article "What Do You Do After You Say 'Hello'?" was no exception (June 1987 issue). I also like to tell people about my interests and hear about theirs. The results are sometimes surprising.

One of the best examples of this is a QSO I had with a retired phone-company worker raising trees in Oregon. When he found out I teach banjo, he told me he'd always wanted to learn to play one but didn't know where to begin. It was tricky giving a banjo lesson over the air without playing one, but we managed. We signed off two hours later, very pleased with our conversation.

Since then, I've discussed chiropractic techniques with a retired chiropractor who'd been a jazz musician since the 30's, heard about an author's latest book on public speaking, and compared work experiences with other freelance technical writers and consultants.

Tell people about yourself. You have no idea who you'll meet.

John V. Hedtke, KD7WS
Seattle, WA

Hi Hi—Low Low

Editor, *CQ*:

Bradley Wells should get a special award for his June '87 article "What Do You Say After Hello?

After being an SWL only for 40-plus years, I've learned more about radio, geography, and weather than any hundred or so people could ever possibly want to know in several lifetimes. But the hams remain my favorite, if for no other reason than the fact that sooner or later patience is always rewarded with something that is informative or amusing or otherwise worth hearing. That is, if one isn't first too irked by the one thing that is more unimaginative than all of the too-often repeated, mundane talk that Bradley referred to.

I'm referring to the absolutely mindless and meaningless prattle that sometimes comes into vogue, is picked up by nearly everyone, and is then parroted by too many for no reason other than the fact that every other parrot is saying it—e.g., fortunately the society has almost completely given up "Sorry about that." I wish the hams would do the same with "Hi Hi." It means nothing, does nothing, is nothing. Please, people. Pull the plug on Hi Hi. On any scale for rating anything that's worth saying or hearing, Hi Hi has long since passed the ultimate pits of being low, low.

Russell G. Sheley
Phoenix, AZ

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Announcing

• **Marfa, Texas** - The Big Bend ARC will operate K5FD on October 2, 3, 4 from the Marfa Lights Festival from 1500–0000Z on suggested frequencies phone 3.920, 7.250, 14.250, 21.400, and 28.400. For certificate send QSL and SASE to Stewart Billingsley, N5HXZ, P.O. Box 1458, Marfa, TX 79843.

• **Clovis, California** - The Fresno ARC emergency communications van will operate Diamond Jubilee Special Event station W6TO in the City of Clovis for their Octoberfest Crafts Fair Pioneers' Day. For a certificate, QSL 8½" × 11" SASE to W6TO FARC, P.O. Box 783, Fresno, CA 93712-0783. Operating time 1500Z Oct. 3 to 0100Z Oct. 4. Suggested frequencies: lower portions of General 80, 40, 20, and 15 meter bands, Novice phone 28.450, CW 7.130, and 2 meter repeater 146.82/22 or 146.94/34.

• **Dearborn, Michigan** - The Ford Amateur Radio League, the Tin Lizzie Club, will operate K8UTT and member stations October 3 and 4 from 1200–2200Z to commemorate the first Model T Ford built October 1, 1908. Operations will be in the General portions of the 80, 40, and 20 meter bands. For 8½" × 11" certificate, send SASE and QSL to member station or to K8UTT, Ford Amateur Radio League, Box 2112, Dearborn, MI 48123-2112.

• **Topeka, Kansas** - The Kaw Valley ARC will operate Special Event station WØCET on October 3 and 4 from 1500–2300Z in celebration of John Amis's callsign, 9CET. Suggested frequencies: 10 meter ±28.400, 20 meter ±14.275, 40 meter ±7.275. For certificate send QSL and SASE to Terry Hoss, KAØBHO, 2931 Tutbury Tn. Rd., Topeka, KS 66614.

• **Fullerton, California** - The Rehab Radio program at St. Jude Hospital in Fullerton, California will mark its tenth anniversary with a Special Event operation. Special QSLs, will be sent to hams confirming QSOs with WD6BPT. Operation will be on 10 meters (28.3 to 28.6 MHz) and 15 meters (21.3 to 21.4 MHz). In case of poor band conditions, there may be operation on 20 meters (14.2 to 14.3 MHz), plus some 2 meter FM operation on local repeaters. WD6BPT operation will commence on October 4 from 2000–2400Z. Operating times Monday through Friday, October 5 to 9, will be scheduled in one hour sessions scattered between 1500Z and 0030Z. Send QSLs to WD6BPT, St. Jude Hospital, P.O. Box 4138, Fullerton, CA 92635.

• **Hodgenville, Kentucky** - The Kentucky ARS will operate WE4K from Hodgenville, Kentucky, birthplace of President Abraham Lincoln, on October 10. Operation will be on SSB from 1500–2000 UTC in the lower 25 kHz of the General class phone bands on 40 and 20 meters. Operation will also take place on 28.325 MHz if conditions are favorable. For a special certificate, send SASE (business-size envelope) to WE4K, 128 Meadow Lane, Bardstown, KY 40004 or Callbook address.

• **Clarksburg, West Virginia** - The Stonewall Jackson ARA will sponsor Special Event station WB8ZVS in conjunction with Local 89 of The International Firefighters Union October 10 and 11 to promote National Fire Prevention Week. Operation will be 7235 kHz from 1700–2200 UTC and 3860 kHz from 2200–0300 UTC. A certificate will be available for SASE to J.R. Chaido, 289 Magnolia Ave., Clarksburg, WV 26301.

• **Hot Springs National Park, Garland County, Arkansas** - The Hot Springs ARC, WA5BRF, in recognition of the opening of its radio station at the Mid America Museum, will operate 10 kHz from the bottom of the General portion of the phone bands and on the Novice 10 meter band from 0001 UTC October 10 to 2400 UTC October 11. For special QSL send your QSL and SASE to WA5BRF, 117 Camellia Drive, Hot Springs, AR 71901.

• **Dalton, Georgia** - The Dalton ARC will operate Special Events station KI4IG on October 10 and 11 from 1400–2000Z at the Prater's Mill Country Fair. Suggested frequencies: ±7.250, 14.250, and for Novice 28.400. For special QSL card, send your QSL & SASE c/o Dalton ARC, POB 143, Dalton, GA 30722-0143.

• **Carthage, Missouri** - The Carthage ARS will operate WØLF on October 12–16 from 2100–0200Z, and October 17 from 1300–2000Z in conjunction with The Carthage Annual Fall Maple Leaf Festival. Suggested frequencies: CW—3.600, 7.050, 14.050, 21.050 ±QRM. Phone—3.860, 7.230, 14.260, 21.375; and Novice phone—28.350 MHz ±QRM. For special QSL and certificate send your QSL and 9" × 12" SASE for unfolded (39¢ postage) or a business #10 SASE for folded certificate, to CARS, WØLF, c/o Civil Defense, 407 S. Garrison St., Carthage, MO 64836.

• **Edmond, Oklahoma** - The Edmond ARS will operate

W5ERY from 1700Z October 17 to 1700Z October 18 in celebration of the Edmond ARS's 30th anniversary. Suggested frequencies include 3.870, 7.270, 14,100 (CW), 14,270, and 147.135. For unfolded certificate send an SASE 9" × 12" envelope (39 cents postage); folded certificate for business-size SASE (22 cents postage) to: Edith Vaughn, KA5YPX, 1020 Juno Circle, Edmond, OK 73034.

• **Poteau, Oklahoma** - The Fort Smith (Arkansas) Area ARC will operate Special Event station W5ANR in conjunction with the first annual Green Country Sorghum Festival. Operation will be from 1500–0300Z October 17 and 1500–2300Z October 18 in the lower 30 kHz of the General phone bands, 28.435 in Novice phone, and 145.01 on packet. For certificate send QSL and SASE to FSAARC-W5ANR, Box 32, Ft. Smith, AR 72902-0032.

• **Scout Jamboree On The Air** - The Boy Scouts of America sponsors this annual event, which includes Boy and Girl Scouts, former members, amateur ops, etc. It will take place on October 17 from 0001 local time to October 18 at 2400 local time on Phone 3940, 7290, 14290, 21360, 28990; CW 3590, 7030, 14070, 21140, 28190; Packet, RTTY, SSTV, ATV on usual frequencies. Exchange name, QTH, Scout rank, etc. Send brief reports (logs not necessary) to JOTA Coordinator, International Div., S221, BSA, 1325 Walnut Hill Lane, Irving, TX 75038-3096, no later than November 15, 1987. Postcard-size certificates are free and available to all participants. Temporary patches for the Scout uniform are available for $1.50 each from the above address. For more information, also contact the above address.

• **Lexington, North Carolina** - The Healing Springs Mountain VHF Society will operate K4HOG for the 4th Annual Lexington Barbecue Festival on October 24 from 1300–2100Z on 7.250 MHz, 14.250 MHz, 21.325 MHz 28.325 MHz, Novice frequencies. Also area 2M repeaters. Special BAR-B-QSL for SASE only. Mail to: Healing Springs Mtn. VHF Society, Inc., P.O. Box 41, Lexington, NC 27293-0041.

• **The following hamfests, etc., are slated for October:**

Oct. 3, **Tri-State ARA Hamfest,** Huntington Civic Center, Huntington, WV. Contact Paul Patton, NT8M, P.O. Box 652, Huntington, WV 25711.

Oct. 3, **Cochise ARA Swapmeet,** Sierra Vista, AZ. Contact Jacquie Kelly, KD7DZ, 602-458-4107, or write to CARA, P.O. Box 1855, Sierra Vista, AZ 85636.

Oct. 3–4, **ARRL Virginia State Convention & Hamfest/ Computer Fair,** Virginia Beach Pavilion, Virginia Beach, VA. Contact Manny Steiner, K4DOR, 3512 Olympia Lane, Virginia Beach, VA 23452 (804-340-6105).

Oct. 4, **Yonkers Electronics Fair & Fleamarket,** Yonkers Municipal Parking Garage, Yonkers, NY. Contact Yonkers ARC, 914-969-1053.

Oct. 4, **Springfield Hamfest & Computer Expo,** Springfield, OH. Contact Springfield Independent Radio Association, P.O. Box 523, Springfield, OH 45501 (SASE).

Oct. 4, **Rome, Georgia Hamfest,** Rome Civic Center, Rome, GA. Contact Bobbie Carol Waller, KA4DXU, 24 Wellington Way, SE, Rome, GA 30161 (404-235-5417).

Oct. 4, **Salt Plains ARC Eyeball QSO Party,** south side of Salt Plains Lake, north central Oklahoma. Contact Gary Gerber, KBØHH, 316-842-5079, or 842-5155.

Oct. 10, **New England DXCC Assn. 35th Anniversary Banquet,** Masonic Lodge, Concord, MA. Contact New England DXCC, Joe Poges, W1EED, 144 Broadway, Wakefield, MA 01880.

Oct. 10, **11th Annual Mid-Atlantic VHF Conference,** Warrington Motor Lodge, Warrington, PA. Contact Pat Cawthorne, WB3DNI, 215-672-5289.

Oct. 10–11, **1987 Kansas State ARRL Convention & Hamfest,** Broadview Ramada Hotel, Wichita, KS. Contact Wichita ARC, 707 N. Main, Wichita, KS 67203; or call Verne Heinsohn, WAØZWW, 316-264-2796.

Oct. 10–11, **Greater Memphis Hamfest 87,** National Guard Armory, Memphis, TN. Contact Tommy Holbrook, W4WBQ, 4780 Bowen Ave., Memphis, TN 38122 (901-685-1796).

Oct. 11, **NOARC Allen County Hamfest,** Allen County Fairgrounds, Lima, OH. Contact NOARC, Box 211, Lima, OH 45802 (license exams will be given; contact W8TY at above address).

Oct. 17, **Tri-Cities Hamfest,** Appalachian Fairgrounds, Gray, TN. Contact Tri-Cities Hamfest, P.O. Box 3682 CRS, Johnson City, TN 37602.

Oct. 17, **Radio Amateurs of Greater Syracuse Hamfest,** Arts and Home Center, New York State Fairgrounds, Route 690. Contact Ed Swiatlowski, WA2URK, 315-487-3417, or write to RAGS, P.O. Box 88, Liverpool, NY 13088.

Oct. 18, (raindate Oct. 25), **Hall of Science ARC Hamfest,** New York Hall of Science parking lot, Flushing Meadow Park, Queens, NY. Contact Steve Greenbaum, WB2KDG, 718-898-5599 (evenings) or Arnie Schiffman, WB2YXB, 718-343-0172 (evenings).

Oct. 24–25, **Texoma Hamarama 87,** Lake Texoma Lodge, east of Kingston, OK. Contact Texoma Hamarama Assn., P.O. Box 610892, DFW Airport, TX 75261.

Oct. 24–25, **9th Annual Hamfest Chattanooga Amateur Radio & Computer Convention,** Chattanooga Choo-Choo complex, Chattanooga, TN. Contact Hamfest Chattanooga, P.O. Box 3377, Chattanooga, TN 37404.

Oct. 25, **Kettle Moraine RAC Ham, Computer, Video Fest,** Waukesha County Exposition Center, Waukesha, WI. Contact KMRA Club, 313 Hillview Circle, Waukesha, WI 53188 (SASE).

Oct. 25, **Kalamazoo Hamfest,** Kalamazoo Central High School, Kalamazoo, MI. Contact Jim Hastings, Kalamazoo Hamfest, 1813 Greenbriar Dr., Kalamazoo, MI 49008.

Oct. 25, **Heart of Ohio Ham Fiesta,** Marion County Fairgrounds Coliseum, Marion, OH. Contact Ed Margraff, KD8OC, 1989 Weiss Ave., Marion, OH 43302 (614-382-2608).

Oct. 31, **Tri-City ARC Auction,** St. James Parish Hall, Poquetanuck, CT. Contact WA2RYV, 203-464-6555.

Oct. 31, **Hamfest Minnesota & Computer Expo,** Hennepin Technical Center/North Campus, Brooklyn Park, Minneapolis, MN. Contact Hamfest Minnesota & Computer Expo, Box 726, St. Louis Park, MN 55426 (SASE).

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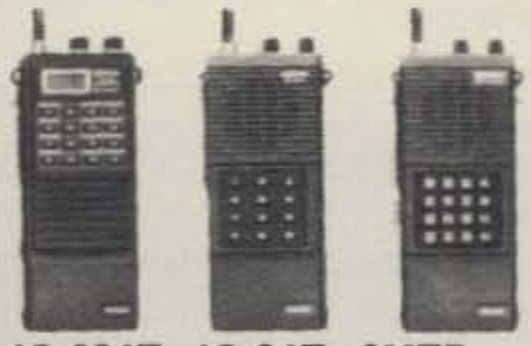

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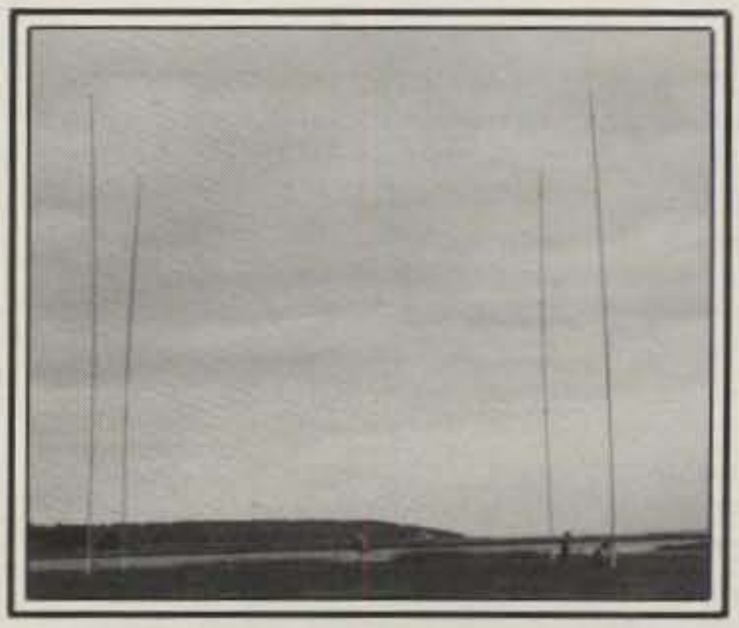
Paul, K1XM, and his XYL Charlotte, KQ1F, helped staff this year's HC8A effort, third in the world in Multi-Single.

Here's the team at world high Multi-Multi KP2N. Top row, from left, N7BG, W6MSG, KA6S, WB6NRO; second row, K5VT, W6OUL, KC7V, AA6AA; and bottom row, WA2UZA, N6DX, W7CB, N6ZV, N6VI.



W1KM used this four-element phased array of verticals on 80 meters to amass 524 QSOs while winning the All Band Single Op category for the USA.

1986 CQ World-Wide DX Contest CW Results

BY LARRY BROCKMAN*, N6AR/4, AND BOB COX, K3EST**

Suppose you could experience the DX Contester's dream. What would it be? Possibly you would like to win the contest from some far-off place, or perhaps field the ultimate super-station in the USA, one where you could work everything on the first call. Many have had one of these dreams. Buzz Reeves, K2GL, not only had the second dream, but he lived it. Buzz put together a super-station whose N2AA operating team utilized it to the fullest in becoming the perennial Multi-Multi winner for the USA. A look at this year's results is a case in point—67 countries on 160; 95 on 80; well over 100 on 40, 20, and 15; and almost 50 on a quiet 10 meters. Not bad for one weekend. Close to 6 band DXCC in 2 days!

But it's the experience on the air with N2AA that convinces one of the real mysticism of K2GL's station. For example, as you tune across the band you're likely to hear a zone 23 station give N2AA an answer to a QRZ, helpless to get in on a piece of that action yourself. Or, how about the long string of answers they would get on a dead or dying band? Then there's the stuff you can't even hear that they are working. In the end we all shake our heads in amazement at the final score as well.

There's a video tape that tells the story of K2GL's station. It's a real eye-opener, too. An arsenal of big antenna arrays are being built and erected right before your eyes, not to mention the battery of gear and the intensity of the operation that follows. Of course, the commitment it takes to field such a station is incredible—the work, the pain, the time, the space, the expense of it all. Not many could afford to do it, but Buzz could and did. Yet if money were the answer, that would be one thing. But money is not the answer. There's something intangible in what it takes to put a super-station together and keep it together for any length of time. Those who have tried it know what we mean. Just think about the problems in keeping your own station in top condition—the wind, rain, snow, cold, heat, normal wear and tear, the unexpected. Just one rotor can be an incredible thing to keep running, with some subtle problem areas to solve. Multiply your maintenance by 10 or more, and it's clear what kind of a challenge it is to keep a super-station running. Not to mention the challenge of keeping a top-notch operating team motivated year after year.

It is with regret that we report that K2GL died this year, and his super-station passes on along with him. For most of us K2GL served as an example of how some things could be done. It was actually possible to put that kind of a super-station together; the band was really open at that time; all that DX really was available. In recent years several super-stations have met the same fate—K2GL, W2PV, and W6AM to mention a few. We might all do well to reflect on what those guys really meant to us as DX contesters. "Nothing," you might say. Well, "nothing" is not an honest answer. If you were active at all in the past 10 years, you know that even if you never met any of those three guys, they affected you. And not just the "Yeah, I remember all the times I had to wait for those bruisers in the pile-up" type of effect either. Those super-stations and the operators who manned them provided us all with some real inspiration and drive. They gave us some good, old-fashioned determination, a goal to strive for; they built confidence that it could be done because someone else had done it. To many their example also provided training for all of us in technique. Lastly, their big signals were like magnets that attracted DX, DX that we would otherwise not have worked because they wouldn't even have known the band was open. Yes, Buzz Reeves, K2GL, will be missed.

The All Band Results

Despite generally poor conditions and low sunspots, the 1986 CW Contest produced some truly amazing scores around the world.

* *12041 Walker Pond Rd., Winter Garden, FL 32787*

** *3039 Campbell Place, Davis, CA 95616*

QRP enthusiast CX8DT set up portable 100 feet above the Atlantic Ocean at Punta Negra, Uruguay.

Dick Norton, N6AA, set a new world and South American continental record at 9Y4VT with a fantastic 8.2 million points. Dick amassed over 5000 QSOs, 146 zones, and 396 countries in besting his own 1983 World record mark from the same location by 1 M points. But alas, we are saddened to report the passing of Cyril Balwah, 9Y4VT, Dick's host, and an end to an era of contest records at 9Y4VT. Dick had lots of competition. Finishing second with a new North American record was Chip, K7JA, at Pedro, NP4A's super-station with a fine 7.04 M. Then in third and fourth place were a pair of visiting operators in PJ land. Dean Fredriksen, W8ZF at PJ2FR, and John Corvelli, W2GD at P40GD, finished in that order. Not far behind in fifth place was Jim Neiger, N6TJ, with 6.8 M at D44BC. Jim returned for the second year in a row, this time setting a new African continental record. Jorma, OH2KI, took top honors for Europe as ZB2X, with a fine 3.8 M points, enough for a new European continental mark and tenth in the World.

Things were tough in 1986 Stateside, with absolutely no records set in any category of the contest. Yet Greg, W1KM, broke 3 M in capturing USA Single Operator all band high for the USA. Greg's 80 meter effort is absolutely incredible for an all band entry, with 524 QSOs on that band, and that proved to be the real difference. He was followed by Scot, K0DQ, guest operator at W3GRF, and a string of W1, 2, and 3 stations. Yes, the northeast swept all ten top spots in the USA this year.

This year's Multi-Operator efforts had the interesting distinction of not setting any records in the contest. Yet the Multi-Single category continues to enjoy enthusiastic participation and growth. Worldwide, it was the teams at KP4BZ (7.9 M), VP9AD (7.8 M), and HC8A (4.6 M) in that order for a Western Hemispheric sweep of the top three spots. Europeans LZ7A, UZ2FWA, and EA3VY took the second three slots in that order, and all were closely packed at about the 4.5 M mark. In the USA, Austin Regal's N4WW team won with an impressive 4.2 M effort, 700 K above the pack, led by W5WMU and N3RS at 3.6 M and 3.4 M, respectively.

The boys at KP2N sent us photos of the panoramic view from their Virgin Island location, but we couldn't figure out how to do it justice in the magazine. The unobstructed shot they had helped them scoop up the world high Multi-Multi honors with a fine 17.5 M, just shy of the North American record. The teams at EA9CE (16.5 M) and J6DX (14.7 M) finished second and third, welcome multipliers for us all.

As mentioned in our introduction, the top USA spotlight went to N2AA (at the K2GL super-station) for the last time due to Buzz's death. That's twice in a row for N2AA. Congratulations on the fine 7.6 M effort, guys. In second place was Frank Donovan's W3LPL team. Following our two year rule, that makes W3LPL the trophy winner. Well, it is the rule, I guess. The guys at NR5M finished third with a fine 5.5 M despite the significant disadvantage in location.

In the QRP category, a tough game in any year, but even tougher in the sunspot minimum, it was Stancho, LZ1BB, who walked away with a great 868 K effort, almost double the runner-up 4X6IF at 424 K. The list of QRPers submitting entries continues to grow longer and longer, indicating that the real thrill of the contest is the skill and challenge of it all. Congratulations to all the hard-working QRPers for a job well done.

This year's combined SSB/CW all band winner was Olli Rissanen, OH0XX, who posted an impressive 12 M points from FY5YE. Olli also contributed to the CW mode winning Finlandia Contest Team, which sent representatives to 4 continents and amassed over 21 M points. Four of the entrants (EA9AM, PT7BZ, FY5YE, and ZB2X) finished in the top 10 worldwide. Let's see some more competition in the team arena in future years. It's a good way to drum up some friendly rivalry, and team contesting does not affect the club competition, which is separate.

Speaking of the club competition, the Frankford Radio Club recaptured its top USA spot from the Yankee Clipper Contest Club this year with an impressive 120 M points compared to 95 M points for the Clipper Club. In third place was the Southern California Contest Club, narrowly edging out the Potomac Valley Radio Club by .5 M out of 50 M. In the DX Club competition the Rhein/Ruhr DX Club narrowly edged out the Bavarian Contest Club at the 25 M level for first place. The Northern Lithuania Contest Club (21 M) bested rival Lithuanian Contest Club (17 M) for third place. Just a note on club scoring. It is important that your club name appear on the log submission. It is not sufficient that the list of entries sent by the club show all the calls and scores. That's the most common reason most club scores are lower than club officials feel they should be. We've had some complaints on this, but the only way we can be sure an entrant means for his score to be counted for a club is by looking at the actual log. This year, for example, one club claimed credit for HS0A, but the HS0A log clearly specified a club on it different than the other club's list. So the logs themselves will be the final guide.

Single Band Categories

The lower bands continued to dominate the competition in this year of the sunspot low. Although no 160 M records were set this year, the low band enjoyed new levels of activity from around the world. The Europeans led by HB9AMO (87 K), IO2UIY (82 K), and SP3BQD (70 K) ran away with the top 3 worldwide spots. In the USA, W1CF challenged K5UR's 2-year-old record with a fine 43 K, but failed to top it. The defender, K5UR, finished second, complaining that the lack of a JA opening kept him from achieving a repeat of his record.

TOP SCORES

WORLD Single Op All Band		USA Single Op All Band	
9Y4VT	8,191,246	W1KM	3,029,832
NP4A	7,040,400	W3GRF	2,933,507
PJ2FR	7,028,688	K1ZM	2,779,014
P40GD	6,991,947	K1EA	2,631,084
D44BC	6,815,001	K5ZD/1	2,469,159
EA9AM	6,367,956	N2LT	2,446,688
FY5YE	5,836,215	K1TO	2,311,680
PT7BZ	5,242,977	K1CC	2,253,421
5T5XX	3,929,844	W3BGN	2,209,006
ZB2XX	3,796,480	K3WW	2,166,300

Single Op Single Band 28 MHz		Single Op Single Band 28 MHz	
4M7A	312,092	N6BFM/4	11,600
LU4FDM	120,528	KB3A	6,644
LU1DCB	105,225	WA3CGE	6,380
VK6HD	80,448	AC8W	5,700
VK6SM	74,472	KD1U/4	4,059
LU5UL	66,990	WA6FGV	4,068
21 MHz		**21 MHz**	
PY5CA	1,102,486	K3RV/4	258,888
CX7BY	747,604	K1ZX/4	238,518
ZS6BCR	673,068	WB4TDH	197,714
UB5IJG	447,984	K5GO	192,584
LU1AF/D	338,520	N4BP	134,244
YW5X	290,996	K5TSQ	126,120
14 MHz		**14 MHz**	
P40N	1,477,905	W2YV	573,990
KP4FI	1,218,928	K2VV	534,576
YW1A	829,280	K1RU	468,402
CX5AO	828,933	K2RD	394,236
DK3GI	822,024	WB8JBM	337,220
HK1HHX	772,376	N5CR	327,740
7 MHz		**7 MHz**	
UP3BA/UF	696,134	N6QR	336,980
I4IND	553,632	W7EJ	270,592
I5MPN	496,546	AA4LU	269,800
CX8BBH	448,723	W6YA	263,451
4N1C	395,388	K0RF	263,296
LZ1KDP	368,368	W6PU	208,611
3.8 MHz		**3.8 MHz**	
P40R	576,725	W1FV	195,804
EA8RCT	441,350	W6RJ	106,600
UP2BJK/UF	339,158	W8UVZ	34,700
CT5AT	295,464	K9DX/6	34,650
SP3GEM	266,376	WE5P	32,908
YX3A	205,300	W3QM	25,382
1.8 MHz		**1.8 MHz**	
HB9AMO	87,204	W1CF	43,460
IO2UIY	82,377	K5UR	28,815
SP3BQD	70,468	N4IN	22,200
DK8NG	69,012	K4TEA	18,870
OZ1LO	63,770	W0ZV	13,330
UL7MAN	52,938	WB3AVN	10,915

Multi-Op Single Transmitter		Multi-Op Single Transmitter	
KP4BZ	7,922,868	N4WW	4,176,612
VP9AD	7,830,495	W5WMU	3,589,872
HC8A	4,641,780	N3RS	3,434,920
LZ7A	4,532,352	K3KG	3,308,125
UZ2FWA	4,436,100	K4JPD	2,814,714
EA3VY	4,417,268	K3OO	2,582,118
Multi-Op Multi-Transmitter		**Multi-Op Multi-Transmitter**	
KP2N	17,480,855	N2AA	7,558,965
EA9CE	16,497,312	W3LPL	7,016,880
J6DX	14,710,800	NR5M	5,542,537
VP2MU	10,725,081	N4ZC	4,164,714
UP9A	8,208,608	W3GM	3,862,982
N2AA	7,558,965	NF2L	3,752,720

Yaesu's mini HTs. The smallest, smartest, toughest radios. Anywhere.

Whether you're a Novice or Extra class operator, you're sure to appreciate the high power, durability and size of Yaesu's FT-23R Series mini-HTs.

To begin with, you'll find a model that's right on your wavelength. The 2-meter FT-23R. The 220-MHz FT-33R. Or the 440-MHz FT-73R.

Whichever you choose, you benefit from incredibly small packaging. (Take a look at the actual size photo.) Aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. And moisture-resistant seals that really help keep the rain out.

But perhaps best of all, each radio blends sophisticated, microprocessor-controlled performance with surprisingly simple operation. In fact, it takes only minutes to master all these features:

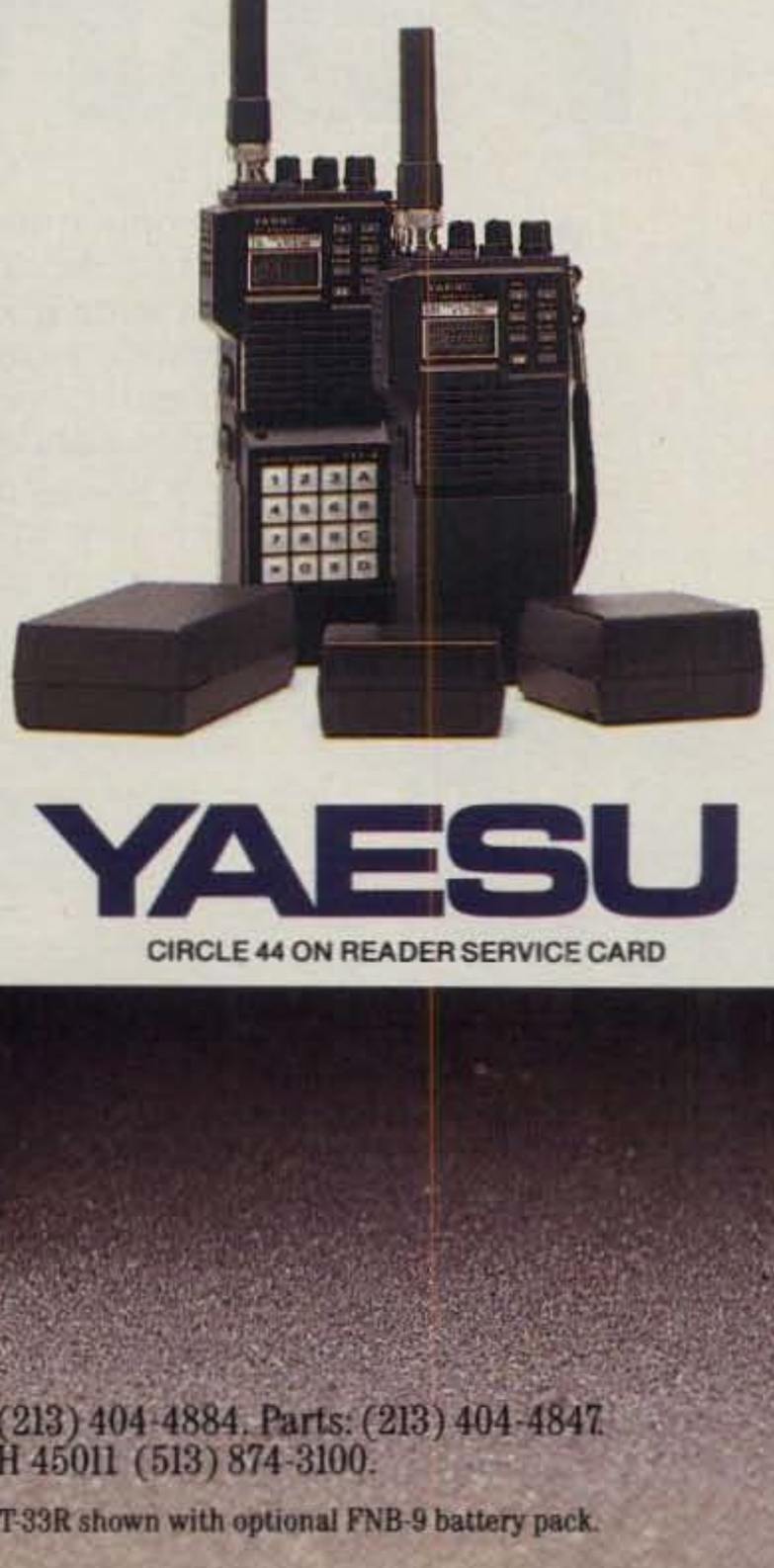
Ten memories that store frequency, offset and PL tone. Memory scan at 2 frequencies per second. Tx offset storage. Priority channel scan. Channel selection via tuning knob or up/down buttons. PL tone board (optional). PL display. Independent PL memory per channel. PL encode and decode. LCD power output and "S"-meter display. Battery-saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch.

The FT-23R comes with a 7.2-volt, 2.5-watt battery pack. The FT-73R with a 7.2-volt, 2-watt pack. And the FT-33R with a powerful 12-volt, 5-watt pack.

You can choose the miniature 7.2-volt, 2-watt pack shown in the photo below. And all battery packs are interchangeable, too.

And consider these options: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And more.

Check out the FT-23R Series at your Yaesu dealer today. Because although we can tell you about their incredible performance, toughness and small size, seeing is really believing.



YAESU

CIRCLE 44 ON READER SERVICE CARD

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ICOM has a commitment to high performance 220MHz gear. That's why we're the only manufacturer who can offer you a full line of 220MHz equipment...whether it's a mobile, handheld, base station transceiver, or fiber optic multi-bander.

Handhelds. Choose the full-featured five-watt **IC-03AT** with 10 full function memories capable of storing odd offsets and subaudible tones, scanning and DTMF direct keyboard entry. Or select the **IC-3AT** easy-to-operate handheld featuring thumbwheel switch frequency selection.

Mobiles. ICOM offers the **IC-38A**, which sports a large LCD readout, 21 memories, scanning, and memory lock-out. The slim-line **IC-37A** features an LED readout, nine memories capable of storing offset and subaudible tones and both memory and band scan.

Base Station. The **IC-375A** is a 220MHz all mode operator's dream...25 watts output, an internal power supply, 99 memories, scanning, and all subaudible tones built-in.

Multi-Bander. The newest addition to ICOM's 220MHz family...the **IC-900** fiber optic controlled six-band mobile, which has a 220MHz optional band unit.

Quality. High Performance. That's ICOM 220MHz.

CIRCLE 57 ON READER SERVICE CARD

IC-3AT Handheld

IC-03AT Handheld

NEW! IC-375A Transceiver

IC-37A Mobile

IC-38A Mobile

ICOM 220MHz

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CW TROPHY WINNERS AND DONORS

SINGLE OPERATOR, ALL BAND
World
9Y4VT (Opr. Dick Norton, N6AA)
Donor: W2AB Memorial (Albert Kahn, K4FW)
World QRPp
Stancho Stanchev, LZ1BB
Donor: Gene Walsh, N2AA
World—Most Contacts (5108)
P40GD (Opr. John M. Crovelli, W2GD)
Donor: KV4AA Memorial (14270 kHz Group)
USA
Gregory M. Cronin, W1KM
Donor: Frankford Radio Club
Canada
James William Roberts, VE3IY
Donor: Canadian DX Association
Caribbean/Central America
NP4A (Opr. Chip Margelli, K7JA)
Donor: Peter Monroe, WB1DQC
Europe
ZB2X (Opr. Jorma Saloranta, OH2KI)
Donor: Edward Bissell, W3AU
Africa
D44BC (Opr. James B. Neiger, N6TJ)
Donor: Gordon Marshall, W6RR
Asia
VS6DO (Opr. Akito Nagi, JA5DQH)
Donor: Japan CQ Magazine
Japan
Toshirou Ogino, JI1QPU
Donor: Japan Crazy Contesters Club
Oceania
Philip David, YB0ARA
Donor: Maui Amateur Radio Club
South America
PJ2FR: (Opr. Richard J. Smith, N6KT)
Donor: YV5AAZ Memorial (Venezuela DX Club)

SINGLE OPERATOR, SINGLE BAND
World (14 MHz)
P40N (Opr. Paul Newberry, N4PN)
Donor: W2JT Memorial (NJ DX Association)
World—21 MHz
PY5CA (Opr. Jim Hoffman, K5FA)
Donor: South Jersey DX Assn. (N2CW Memorial)
World—3.5 MHz
P40R (Opr. Bob Allphin, K4UEE)
Donor: Fred Caposella, K6SSS
World—1.8 MHz
Pierre Petry, HB9AMO
Donor: KP4ES Memorial (Chip Margelli, K7JA)
USA (14 MHz)
David J. Horbachuk, W2YV
Donor: Northern Illinois DX Association
Canada (14 MHz)
Ron Vander Kraats, VE3AT
Donor: Canadian Amateur Radio Federation
Caribbean/Central America (3.5 MHz)
Luis Caamano, HI8LC
Donor: DX Club of Puerto Rico
Europe (14 MHz)
Jukka Keskiaho, OH8PF
Donor: Southern New England DX Club
Australia—14 MHz
K. E. Hamlon, VK4TT
Donor: Jay Carr, W6FAY
Japan—21 MHz
Yoshihito Takahashi, JA1YYE
Donor: DX Family Foundation

MULTI-OPERATOR
SINGLE TRANSMITTER
World
KP4BZ (Opr. KP4BZ, NP4Z, WP4I, WP4D, WP4K)
Donor: Anthony Susen, W3AOH
USA
N4WW (Opr. N4WW, K0LUZ, KU4J, WY4A)
Donor: Doug Zwiebel, KR2Q
Europe
LZ7A (Opr. LZ2PO, LZ2HE, LZ2DF, LZ2CC, LZ2-E-44)
Donor: K3AO Memorial (Friends of K3AO)

MULTI-OPERATOR
MULTI-TRANSMITTER
World
KP2N (Opr. KP2N, AA6AA, K5HK, K5VT, KA6S, KC7V, N6DX, N6VI, N6ZV, N7BG, W6MSG, W6OUL, W7CB, WB6NRO, WT6T)
Donor: Hazard Reeves, K2GL
USA
W3LPL (Opr. AI3M, K3DI, K3RA, KT3Y, N8II, W3XY, WB3JRU, WD4AXM)
Donor: Jim Rafferty, N6RJ
Europe
UP9A (Opr. UP2BAW, UP2BCO, UP2BCT, UP2BCW, UP2BIG, UP2BUJ, UP2BIL, UP2BN, UP2BNZ, UP2BRF, UP2CY, UP2PAJ, UP2QA, UP3BF)
Donor: OH DX Ring

CONTEST DXPEDITIONS
World Single Operator
EA9AM (Opr. Martti Laine, OH2BH)
Donor: Yankee Clipper Contest Club
World Multi-Operator
J6DX (Opr. K6GXO, N9AG, NC8G, W8ILC, W8OK, W8PR, WB8ENR, WD8IXE)
Donor: Bill Schneider, K2TT

SPECIAL SINGLE OPERATOR
COMBINED SSB/CW
World—All Band
FY5YE (Opr. Olli Rissanen,OH0XX)
Donor: John Knight, W6YY
World—Single Band
Jukka Kreskiaho, OH8PF
Donor: Yuri Blanarovich, VE3BMV

CLUB
World—SSB/CW
Frankford Radio Club
Donor: CQ Magazine

John, W2GD, managed to make more contacts, 5106 in all, than anyone else this year, but that was only good enough for third in the world in the all band category at P40GD.

On 80 meters new world and four new continental marks were set as Bob Allphin, K4UEE, operating P40R, demolished the old 1983 record of 333 K set by VP2KAC. Bob's 577 K included almost 1700 QSOs, 25 zones, and 90 countries. Number 2 was EA8RCT at 441 K (a new African continental record); number 3 was UP2BJK/UF at 339 K (a new Asian continental record); and number 4 was CT5AT at 295 K (a new European record). Eighty was open an incredible 15 or 16 hours a day, providing fertile ground for such blockbuster scores.

In the States, W1FV took the top spot on 80 for the second year in a row with 196 K, just shy of his own record from the year before. He was followed by Bob, W6RJ, at 107 K. For anyone who has ever operated 80 meters from California, that's an unbelievable score!

Meanwhile, the 7 MHz band continued to provide the 20+ hours of opening reported in 1985. Making the most of it was UP3BA/UF, who set a new Asian continental record with 715 K points, topping his own 1984 standard of 574 K points. A pair of Italians battled it out for second place, with the winner I4IND, followed closely by I5MPN.

Forty meters represented the only area the West Coast dominated in the USA competition for 1986. Five of the top 6 slots went to stations in Colorado or west, with Adam, N6QR, grabbing the prize with a fine 337 K. Jim, W7EJ, was second with 270 K, followed by AA4LU, W6YA, K0RF, and W6PU. A special congratulations to N6QR and W6YA, both of whom broke 100 countries on 40 meters from W6 land, a monumental task, indeed.

Paul Newberry, N4PN, operating at P40N, beat the old world high 14 MHz mark of VP2KAA with a fantastic 1.48 M for a new record worldwide and in South America, and the highest single band score ever achieved on CW in the contest. KP4FI finished second at 1.28 M, just under the old record, followed by YW1A and CX5AO. DK3GI's 822 K was good enough for tops ever from Europe (as he bested his own old 1985 record), and he finished 4th worldwide.

USA high 14 MHz went to W2YV (operated by KQ2M) with 574 K, with John, K2VV, close behind at 534 K. John managed to hold on to his old record by a hair. Third and fourth place also went to the northeast, K1RU and K2RD in that order.

The charm that seems to smile on the CQ WW Phone Contest propagation for the high bands just didn't stick around for late November. Hence, our high band scores suffered the same this year as they did in 1985, with no new records anywhere. In fact "southern expo-

sure" dominated the world competition this year with all six of the high scores on 10 and 15 meters located in either South America, southern Africa, or Australia (with one exception). On 15 meters Jim Hoffman, guest operating at PY5CA, broke 1 M to capture world high at 1.1 M. He was trailed by CX7BY (750 K) and ZS6BCR (673 K). The lone exception to the dominance of the "southern exposure" was UB5IJG, whose 448 K put him fourth in the world on 15 meters. On 10 meters 4M7A managed a cool 312 K, amazing considering conditions, and almost three times the nearest competition from LU4FDM with 120 K and LU1DCB with 105 K. Two VK6's battled it out for 4th place, with VK6HD narrowly besting VK6SM.

The USA troops were led on 15 meters by K3RV/4 (259 K) in a tight battle with K1ZX/4 (238 K). On 10 meters N6BFM/4 led the pack with 11.6 K, but that was nearly double KB3A's second-place score of 6.6 K. Yes, it definitely helped to be further south on 10 and 15 this year.

The combined SSB/CW single band winner this year was Jukka, OH8PF, who topped 2 M on 20 meters on combined modes. Congratulations, Jukka, and from a tough location in the sunspot minimum, too.

Some Special Comments

The variability of conditions from one location to the other bears some special comment this year, especially since it's the bottom of the sunspot cycle. One of the reasons we started our "zone winners" table a few years ago was to give recognition to those who have a QTH disadvantage. Note that activity in zones 3 and 4 is just as high as ever, but the scores are way down compared to those posted from zone 5. Also, the faithful in zones 1 and 2, and those in the northern Arctic regions of Europe, are suffering during the sunspot minimum. Our thanks to those who have continued to brave the bottom of the cycle with lots of activity. Our new cycle is on its way, and 1987 should show some slight signs of improvement.

As indicated in last month's phone results, the Contest Committee has put together a data base of active stations in the contest. In CW we are concentrating on 40 meters. The calls of all stations worked by a number of key entrants have been entered into the computer. This does take some time, but it is proving to be well worth it. For example, we have found that there is a predictable level of performance by most of the top entrants in terms of the percentage of "unique" calls in their logs. "Unique" calls are those which don't appear in any of the other logs contributing to the data base. Presumably the percentage of unique calls will be bounded for a large enough data base. Large percentages indicate possible call copying problems. Indeed, the percentages of unique calls for top operators appear to be consistent even for multi-multi entrants, who work many more stations than the average entrant. If an entrant shows an unusually large percentage of "unique" calls, then his log gets some special attention. Specifically, it is examined for "busted" calls. Our point is that contesters usually enjoy the heat of the competition and the high rates that come with it. But rate is not the distinguishing characteristic of the best operators. The really top operators must sustain a high rate without errors and without duplication. Now the committee believes it has found a way to screen logs to identify possible accuracy problems for further study—the database check mentioned above.

If you are concerned about your performance in accuracy, we have a suggestion for you. Try tape-recording your contest, or at least part of it. Then go back after the contest and re-log the contest without referring to the original log. A comparison of the two logs will provide some real insight. If your percentage of error runs in excess of a couple of percent, you have a problem that needs attention. The best operators aren't just fast; they are both fast and accurate.

We would like to remind all of you about several areas where some additional cooperation is in order. Please use duplicate checking sheets and include them with your entry. You should be aware of the fact that we penalize at the rate of 10 contacts for every duplicate we find in the log. Second, please pay attention to the mailing deadlines and the address for posting your entries. Some of you are still sending your logs to the old Vanderventer address. *CQ* has not been there for years, and those logs will be returned to you. If you elect to send your log directly to one of the Directors, please make sure you send it to the right Director. Use the addresses given at the beginning of these results. For the 1987 contest N6AR will be handling the SSB Contest, while K3EST will handle the CW Contest. If you send a log directly to a Director, do not send it Certified or Registered. That usually results in a special trip to the post office, and our XYLs don't appreciate that at all. A simple self-addressed postcard enclosed with the log is a better way to go. The logs sent to *CQ* headquarters are held **unopened** until a quantity arrive, and then are sent in bulk to the Director. Consequently, we rarely get those self-addressed postcards out until we do our sorting and mailing to the committee members.

Parting Comments

Our hard-working committee—Frank, W1WY; John, K1AR; Dave, K2SS; John, K2VV; Doug, KR2Q; Gene, N2AA; Ed, N3ED; Fred, AD6C; Glenn, K6NA; Rick, N6ND; John, KE7V; and Mike, W9RE wish to extend to each and every one of you a special invitation to participate in the 1987 CQ WW DX Contest. As you read these pages, the Phone Contest will be just days away. Have fun!

73, Larry, N6AR, and Bob, K3EST

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

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

WORLD TOP SINGLE OPERATOR—ALL BAND

Station	160	80	40	20	15	10
9Y4VT	310/17/51	563/21/69	1114/25/72	1137/32/80	1395/30/81	580/21/43
NP4A	340/18/53	487/26/77	959/28/72	1104/32/88	1310/27/86	417/24/69
PJ2FR	217/12/39	615/22/67	1079/27/78	1277/29/75	1059/26/74	414/18/41
P40GD	263/13/27	719/20/63	1031/22/69	1270/23/65	1025/24/74	800/17/42
D44BC	200/13/44	583/19/61	980/22/65	1100/32/80	1230/25/72	395/19/57
EA9AM	260/13/45	666/20/63	936/20/68	1184/28/80	1067/26/79	224/12/38
FY5YE	125/11/31	473/17/54	510/24/63	882/23/73	1386/23/79	675/22/70
PT7BZ	61/9/16	288/16/46	925/20/56	916/31/71	1338/29/73	481/17/55
5T5XX	66/9/18	328/15/44	1067/20/70	556/23/66	770/25/77	313/19/58
ZB2X	201/14/47	463/17/62	722/23/68	858/29/77	1027/24/69	236/19/63

USA TOP SINGLE OPERATOR—ALL BAND

Station	160	80	40	20	15	10
W1KM	45/13/35	524/23/76	365/31/81	761/30/95	336/24/76	18/10/13
W3GRF	28/10/21	222/20/75	585/35/98	742/32/93	341/23/79	43/12/25
K1ZM	85/15/48	287/24/77	380/28/80	739/34/91	324/22/67	29/13/22
K1EA	81/15/41	213/21/66	307/32/84	794/34/93	366/22/71	36/14/23
K5ZD/1	71/14/37	220/22/74	360/31/84	753/32/95	237/21/66	35/10/23
N2LT	40/13/30	132/17/55	437/35/96	776/31/89	315/23/65	33/12/21
K1TO	56/13/36	198/18/68	192/28/77	956/29/98	241/23/62	25/11/17
K1CC	47/12/30	192/20/63	344/30/86	699/30/77	358/21/63	35/11/20
W3BGN	63/16/39	194/21/62	264/27/75	720/31/81	326/22/68	40/14/26
K3WW	31/12/22	262/23/78	407/30/76	677/26/73	264/19/60	24/12/29

WORLD TOP MULTI-OPERATOR SINGLE TRANSMITTER

KP4BZ	164/11/34	603/19/68	1597/29/78	1648/32/93	1322/26/92	305/22/61
VP9AD	110/9/22	850/20/77	1622/31/101	1566/33/99	1441/29/94	31/15/25
HC8A	91/8/15	409/20/49	736/24/57	1138/33/84	971/26/68	334/17/30
LZ7A	236/13/50	626/23/80	1155/32/97	1227/36/103	436/32/101	76/19/52
UZ2FWA	518/18/59	1047/26/86	512/35/102	902/35/92	411/35/103	100/24/66
EA3VY	195/14/54	578/19/72	1072/31/93	1195/33/88	565/27/80	105/22/53

USA TOP MULTI-OPERATOR SINGLE TRANSMITTER

N4WW	61/17/58	338/23/80	597/35/102	729/35/105	548/28/95	50/19/39
W5WMU	47/16/43	300/28/80	742/36/103	456/34/105	442/29/99	45/16/35
N3RS	56/15/45	286/26/87	487/36/101	755/37/120	286/25/89	43/16/35
K3KG/4	45/15/37	169/22/73	561/37/117	847/38/112	231/29/90	52/17/38
K4JPD	50/16/38	71/21/56	611/34/91	665/34/92	480/27/79	42/16/30
K4VX/0	48/18/37	148/27/70	233/35/93	841/36/103	186/26/82	51/17/35

WORLD TOP MULTI-OPERATOR MULTI-TRANSMITTER

KP2N	478/16/50	1206/25/89	2447/33/103	2843/38/118	2340/28/93	840/22/62
EA9CE	551/13/51	1310/17/73	1629/25/80	2649/38/111	2137/32/91	570/22/71
J6DX	612/19/57	1215/18/64	2229/29/91	2692/31/96	2121/23/83	1439/21/66
VP2MU	333/13/37	1522/22/90	1214/22/77	2412/34/97	1327/26/79	827/17/55
UP9A	982/21/74	1264/30/93	1502/36/119	1833/36/106	718/33/111	200/22/54
N2AA	181/20/67	544/28/95	861/38/118	1358/37/127	592/28/103	101/19/43

USA TOP MULTI-OPERATOR MULTI-TRANSMITTER

N2AA	181/20/67	544/28/95	861/38/118	1358/37/127	592/28/103	101/19/43
W3LPL	126/18/60	671/27/91	962/37/104	1100/36/115	531/29/103	104/19/53
NR5M	84/20/45	325/26/80	863/34/101	1033/34/108	643/30/100	102/18/41
N4ZC	68/16/41	321/23/74	681/36/107	700/32/90	585/27/87	82/19/42
W3GM	87/17/54	350/23/84	351/35/90	822/37/109	402/27/94	98/19/42
NF2L	122/16/56	270/22/80	440/35/94	808/35/100	438/27/91	65/16/35

USA QRM

Blew up two receivers, two amps, and one antenna switch, cut one ops leg, propagation was awful, but this contest is the best of the best. Always fun whatever happens . . . *NR5M*. Power failure, high winds, cold weather, low power, low antennas, plus good food, good conditions, and good friends = Fun Contest . . . *NG6W*. Working 24 countries on 160 from Florida! . . . *K8UNP/4*. Incredible absorption made our antennas work like underground dipoles; only the determination of the operators made this difference . . . *K7LXC*. My two-element quad became a one-element quad halfway through the contest . . . *W7HS*. I found a black hole—over my house . . . *KT7G*. A real thrill working my son, K8GL, on 5 bands at VP2MU . . . *WA8IGG*. Due to an injury, couldn't write my log, so I taped the contest and then transcribed it 3 weeks later when I could write . . . *W8VSK*. Where were the JA's? . . . *K9QVB*. Where were the sunspots? . . . *NJ9Z*. Took time out from the contest to get married this weekend, but worked a few QSOs anyway . . . *K9BG*. All the hot summer's antenna work paid off . . . *W0JLC*. The holiday weekend kills me . . . *KM0L*. Lost 4 hours to snow static . . . *K0RF*. I learned a lot; I'll be out for blood next year—QRP all the way . . . *WB1ESN*. First QRP Contest. How to be humble . . . *WB6JMS*.

Working 5T5XX in a huge pileup . . . *KA1SR/QRP*. 32 countries with 2.9 watts on 80 . . . *AA2U*. Power failed at 1140Z Saturday. Murphy has found my new QTH . . . *K1DG*. Forty and 80 just don't cut it from western Pennsylvania . . . *K3TUP (opr. K3UA)*. Couldn't believe how 80 meters opened up . . . *WA2CNF*. 33 countries on 160 with under a hundred watts for an ex-W6 is like dying and going to heaven . . . *N6AR/4*. First entry. Not much of a score but lots of fun . . . *KR1B*. Great fun with only a multiband dipole . . . *W1WAI*. Sunspots wanted . . . *K2UR*. Missed my 80 meter record of last year by just over 1000 points . . . *W1FV*. Only CQ on 40 meters was answered by FO5BI . . . *W2DW*. I found out you need great stamina and sharp hearing to make it through in one piece . . . *NT2S*. Sat back, relaxed, and worked only what sounded interesting . . . *K4PI*. A ground plane on the East Coast is just like a tribander at 60 ft. in the Midwest . . . *W9LT/4*. Quite a difference compared to being at HH2VP. Still a lot of fun . . . *N4XR*. Worked an HZ first call in a pileup even though I forgot to turn on the amplifier or retune the transmitter . . . *K4BAM*. If the "tuner uppers" ever got tuned up, it would help a lot . . . *W4BAA*. Worked ZB2X for country number 100 on "top band"—makes 6 band DXCC . . . *W8CNL/4*. Worked 2 BY's for a new country . . . *N6OM*. D44BC standing out among the crowd with a big signal and answering the first time . . . *K6ZUR*. Thanks to all the Soviet and African stations that showed up on 40 meters . . . *K5MK*. No JA opening really hurt the score on 160 . . . *K5UR*.

DX QRM

Being called by HS0A on 80 meters! . . . *8P9AG*. First contest in our new clubhouse . . . *PI4RTZ*. High winds both days—couldn't always rotate antennas . . . *XE2SI*. This contest was a kind of a Dutch meeting (20 PA's) . . . *PA6DX*. Aurora really affected conditions a couple of hours into the contest . . . *NL7G*. Many of the old timers came back to the University to operate in the contest . . . *JA2YKA*. Mountains to the west blocked the Pacific. Thanks to VP2MAI, VP2MIX, and VP2MO for their efforts in trying to move it . . . *VP2MU*. This is my first year of taking part in your contest . . . *VU2UR*. What happened to the 20 dB power factor you are supposed to have with a BY prefix—not one USA station . . . *K5IID (BY1QH opr.)*. Had two power failures but worked a few new ones anyway . . . *YB3ATB*. Though visually disabled, I enjoyed participating in the contest . . . *VU2TTC*. I guess the 1825 to 1830 window has gone by the boards . . . *VE7BS*. Why is it so lonely up here when there is actually propagation on 10? . . . *YC6LD*. Is this the sunspot null? . . . *ZS6BCR*. Keep up the great magazine; it makes magic reading . . . *VK3NI*. Next year I return to my home call, CT1ADP . . . *CT3ET*. Tough on 10—did not work or hear local zones 30, 31, or 32 . . . *VK6HD*. My first DX on 3.5 MHz—F5IN . . . *VE3OMU*. My last contest from the Philippines; next year I'll be on from AH2 . . . *KD6TB/DU2*.

Difficult to find Europeans when I'm only running barefoot on 7 MHz . . . *YC4FRX*. 80 meters is a tough band to operate when the closest station is 1500 miles away . . . *KG6DX*. Won't be so intimidated by 20 meters the next time . . . *VE7GFA*. 28 MHz made up for the disappointing conditions on 160 . . . *VE3IY*. Island power shut down Sunday. 500 feet of drop cords got me back on the air using resort's standby power . . . *W7TB (ZK1TB opr.)*. Always noisy in Hong Kong—too many lights . . . *JA5DQH (VS6DO opr.)*. What would contesters do it if the Finns and the Americans didn't go on contest expeditions? . . . *VE3XN*. Thanks for the contest . . . *UA9LDF*. Hope to meet you next year . . . *UA9CBO*. Had to take a rest period for 14 hours—AC power problems . . . *UP3BA/UF*. Very poor conditions . . . *UC2AA*. Good conditions on 3.5 MHz . . . *UW3AA*. Worked in class C power, 2.25 watts . . . *UA1ANP*. Worked only a few hours because I operated at U3KM . . . *UV3ACX*. Sorry, but I was very busy . . . *UA1OT*. Glad to take part in the contest . . . *UQ2GGP*. New location, new antennas, new power amp, FB conditions on 160 and 80, wonderful PJ2FR operation . . . *UP3BO*. Last dipole installed just 5 hours before the contest and had infinite SWR; had to operate in the contest without a linear—never again . . . *UP2PAQ*. Sorry, but aurora hurt conditions to the USA . . . *UP2BZ*.

A new world opened up to me on 40 meters with a rotatable antenna just put up a week before the contest . . . *UB5WE*. This is our first entry into a CW contest ever; those contest-minded and skilled *CQ* WW operators were a joy for us newcomers . . . *OZ1FYM*. First heard "22," then "MM," then 9N1MM for the first time on 40 meters . . . *HB9BOU*. I hope that the 40 meter quad will stay in the air long enough so that I can enter another *CQ* contest . . . *G4NCY*. Biggest thrill was BY0AA coming back to a CQ call . . . *G3LNS*. Roll on cycle 22 . . . *EI1DH*. Nice to work HS0A for a new zone for my WAZ on 160 . . . *HB9AMO*. A real experience to work USA by aurora on 15 and 10 meters . . . *SM5AOE*. Age 19 and I'm becoming too old for operating the entire 48 hours . . . *DL6FBL*. Part of the bandswitch on the amp broke. To switch to 80 and 160 we had to go in with the needle-nose pliers . . . *HC8A*. It was so cold at night we couldn't pound on the paddle . . . *JA1YWX*. We used the big 5-element Yagi on 14 MHz for the first time and it helped us greatly to get new Caribbean multipliers . . . *JA7YAA*. We could hear the stations in the Caribbean, but couldn't work them . . . *JA9YAV*. We suffered from snow static noise (S9 + 20 dB) for 20 hours or more . . . *JH7YJF*.

Two-element 40 meter Yagi broke in a windstorm two days before the contest . . . *K5KG/LU*. Biggest problem was operators falling asleep on the key . . . *VE1CIT*. Biggest thrill was the first hour of sleep after the contest . . . *VE3WAA*. Had a lot of fun despite the S9+ noise; just wish we heard more DX . . . *XE2NQ*. First multi-op experience; we got the know how now . . . *ZY4OD*. It was our honeymoon for me and my wife; after 3 weeks and 19000 QSOs she still loves me . . . *DF4ZL/5B4*. Lost a few JAs while assisting a passing motorist . . . *IK5AFR*. Your contests are fascinating world feasts without political boarders . . . *IO0KHP*. The *CQ* WW CW is the funniest game of the year . . . *I0UZF*. My first contest on 160 meters single op. What fun being called by 5T5 and ZB2!! . . . *I2UIY*. First *CQ* WW Contest after 9 years; how nice that all the bands were open at some time or another . . . *OH2BDP*. The 48 hours is too much for my strength (62 years old) . . . *OH3NM*. Two QSOs with a question mark—not sure the reports were for me . . . *OH5MX (It's good to see others with a "definite maybe" QSO—ed)*. I joined the test only to pick up a few new countries . . . *OH2BNS*. I didn't hear any JA stations on 80 meters . . . *OH2BCI*. Conditions were down from SSB part. Winds were up and knocked off half of my first director on Saturday night . . . *OH1ZAA*.

I wonder what the power limit is in some countries . . . *OH3RF*. The color TV next door and my fatigue allowed me only about 6.5 hours in the contest—looking for a remote QTH . . . *OK1HBT*. CW is a great joy . . . *SP9PRH*. This is my 28th *CQ* WW CW . . . *YU7SF*. I had TVI problems during the best contest time . . . *YU2TW*. I heard VP2MU calling like in a dream, but when I turned the antenna, nothing! . . . *SV1RP*. Unbelievable! I got one report of 579 out of 57 QSOs on 160 meters with a maximum of 100 watts . . . *SV0AA*. My swan song from ZC4; back to a humble G4 next year . . . *ZC4CZ*. Thank you for the competition. The first major contest the club has entered . . . *ZC4EPI/ZC4AP*. Fifteen was so bad I ran outside to see if a moose had eaten my antenna . . . *KL7UR*. A lot of fellows missed a good multiplier when I couldn't break their memory keyers! *N4RP/C6A*. Imagine my surprise when that chirpy European on 40 turned to to be 9N1MM . . . *NP4A (opr. K7JA)*.

OK, enough fooling around. Next year I'm going to get serious . . . *PJ2FR (opr. W8ZF)*. BY4AA, VS6DO, HS0A on 2 bands, all called me! . . . *ZP5XDW*. Our last WW from Venezuela . . . *4M4A (opr. K3UOC)*. Bad conditions, but a nice contest . . . *LU5UL*. Best operator was D44BC . . . *LU2DGZ*. My first CW Contest; thanks to everyone who worked me at 12 wpm . . . *CE3BFZ*. His Majesty, *CQ* WW DX Contest, seems to be the contest that shows who is who! We love it . . . *UZ9AYA*. Three-element 80 meter beam was wrecked with a wild wind . . . *UZ0AXX*. It was hard work this year . . . *OK7AA*. Had to QRT at 1930Z Sunday due to video interference . . . *GB4DX*. Really appreciated the low-band openings . . . *F5IN*. Good conditions on 80; great opening on 10 . . . *DL7ON*. Sixth straight year in the Channel Islands for the WW CW. Tremendous fun. See you next year . . . *GJ0AAA*. Spent over an hour calling PJ7A and 9M2MM. In the end they gave me a call when I had a pileup! . . . *LX9BV*. Our best score, and on the sunspot minimum. Wow! . . . *EA3VY*. Worked every QSO—took a week off work to recover . . . *G4ELZ/QRP*. Biggest thrill was worked JA's on 40 meters . . . *DL9YX/QRP*. My neighbor loved it. I worked QRP and there was no TVI . . . *SM0DJZ*. Little score, Big Big Fun . . . *CX8DT*. A big battle with QRP . . . *G3LHJ*.

U.S.A. CLUB SCORES

Frankford Radio Club	120,387,511
Yankee Clipper Contest Club	95,170,987
Southern California Contest Club	50,472,160
Potomac Valley Radio Club	50,145,348
Dixie DXers	45,006,050
Northern California Contest Club	40,310,657
Northern Texas Contest Club	33,013,007
Mad River Radio Club	23,991,050
Over the Hill Club	18,205,059
San Diego DX Club	14,164,402
Texas DX Society	12,896,700
Central Florida DX Association	11,452,535
Orange County DX and Contest Group	10,788,482
Williamette Valley DX Club	10,634,354
Southeastern DX Club	9,907,855
Society of Midwest Contesters	8,316,767
South Florida DX Association	7,813,564
Kansas City DX Club	6,494,168
Carolina DX Association	6,176,541
Western Washington DX Club	5,776,352
Rubber Circle Contest Club	5,108,701
Hoosier Contest Club	4,766,623
Northern Ohio DX Association	4,611,459
Grand Mesa Contesters	3,758,052
Greater Milwaukee DX Association	3,387,299
Southern California DX Club	3,320,494
Central Arizona DX Association	3,221,155
Northern Florida DX Association	2,887,314
The Other Club	2,872,984
Albany Amateur Radio Club	2,312,691
Mississippi Valley DX and Contest Club	2,233,502
Northern California DX Club	1,955,157
Eastern Iowa DX Association	1,501,122
Boiled Owls of New York	1,427,342
Northern Illinois DX Association	1,012,447
Long Island DX Association	828,705
Salt Lake City DX Association	722,174
Delta DX Association	626,817
South Jersey Radio Association	539,462
Contest Association of South Texas	515,313
Redwood Empire DX Association	493,686
Rochester DX Association	486,460
Woodbridge Wireless Association	465,481
Florida West Coast DX Ring	445,010
West Jersey DX Group	434,470
Utica Amateur Radio Club	403,821
Arrowhead Amateur Radio Club	382,492
Northern New Mexico Amateur Radio Club	333,193
Alamo DX Amigos	283,724
Eastern Michigan Amateur Radio Club	206,635
Murphy's Marauders	184,365
West Texas DX Association	184,011
Central Virginia Contest Club	143,368
Rip Van Winkle Amateur Radio Society	116,190
Rockford (IL) Amateur Radio Association	87,819
Inland Empire DX Association	80,148
Central California DX Club	75,505
Western Pennsylvania DX Association	50,714
Madison DX Association	18,788

DX CLUB SCORES

Rhein Ruhr DX Association	25,866,042
Bavarian Contest Club	24,844,798
Northern Lithuanian Contest Group	21,308,595
Lithuanian Contest Group	12,137,163
Uruguay DX Club	12,008,789
Kaunas Polytechnic Institute	9,576,245
South German DX Group	8,530,344
Riga Radio Club	8,308,116
Radio Club of the GDR	7,831,676
Radio Amateur Society of Thailand	5,468,537
YU DX Club	4,602,878
DX Club of Saar/Pfalz	4,081,185
Communications Ham Club	3,688,357
Kumamoto University Ham Club	3,657,233
SP DX Club	3,460,581
Osaka Communications Electronics ARC	3,136,600
Lvov Radio Club	2,817,624
Alaska DX Association	2,380,197
Mid 80's Contest Association	2,200,722
The Bullmertz	1,693,226
Kiev Central Club	1,518,573
ARBA	1,426,335
Chiba University Amateur Radio Club	1,184,248
Shanghai Amateur Radio Society	1,147,506
Minsk Amateur Radio Club	1,146,059
Voroshilovgrad Radio Club	988,758
Hokaido University Amateur Radio Club	890,309
Gaucho Amigos CW (GACW)	735,714
Tallinn Radio Club	452,157
Venezuelen DX Club	384,223
PZK	96,993
Krakowski Klub Krotkofaloocow	92,266

Station Operators
Multi-Operator Single Transmitter

AI6V & W6SZN. **AG6D** & N1EE, N6AUV, W6NWS. **AK1L** & KA1X. **BY1PK:** & Tung Xiao-Yong, Yan Pi-Dong, Yuan-Bo, Wang Guo-Xiang, Gong Ke-Lu. **BY4AA:** Xuru, Zhou Yu-Hong, Hu Song-Qing, Gao Min, Gu Humin. **DF4ZL/5B4:** DF4ZL, DF8ZH, DL1RK. **DF8BV:** DJ0ND, DL6MAO, DL1MAJ. **DF8RN:** DF3EX, DL3YCJ. **DJ1OJ** & DJ0IP, DL5MAE. **DJ8EK:** DK6Q1, DJ0EA, DL8GAR, DF8UG, DL1GS. **DK8MM:** DL4FJ, DJ7IK. **DK8OI:** DJ3WM, DJ3XD, DJ7MG, DK1GF, DK1II, DL5OAP. **DL7ON &** DL7SI. **DL8NBJ &** DL4NAC. **DL8DK:** DL1FBQ, DL8FBP, DJ0GN, DL2ZAE. **EA3VY:** EA3's AIR, AVV, DXD, FER, FHC, KV, LL. **EA6URP:** EA6DO, EA6EJ. **F5IN** & F6ARC, F6BEE. **F6EID** & F6GNC, F6EMT. **F6ENO** & F6DKV. **F6GOE** & F6QF, F5WB, F6DZS, FI1AUB. **FF6KPQ:** F6DZD, F6IFI, F6ETI. **FH/W5KG:** W6KG, W6QL. **GB4DX:** G4's DRS, EOF, GIR, JGL, G5LP. **GJ8AAA:** G3SXW, G3TXF, G3WVQ. **HA1KRR:** HA1's ZZ, DRR, XO, XU, ZN, HG1ZV. **HA3KMR:** Kiss, Jrau, Horrath, Kiss, Kunkli. **HA3KHL:** Kaiser, Majer, Manya, Pasztor, Vass, Turjanxi. **HA3KNA:** HA3's OV, OU, NS, NU. **HA5KAG:** HA5's ABC, OG, CE, AEX. **A5KFL:** Gabor, Laszlo, Zoltan, Pal, Zoltan, Jozsef. **HA6KNC:** HA6's OI, OA, NG, OO, IOB. **HB9AJ:** HB9's OL, UH, AQF, BWN, CCT, XJJ, CJR, COB, COC, CTU, CZF, DEO. **HB9Z:** HB9CSA, HB9RE. **HC8A:** K1XM, KQ1F, KD2HE. **HG1S:** Gelber, Muller, Finta, Pozsgai, Pittmann, Nimeth. **HG1Z:** HA1's XY, ZE, XR, RS, RT, DRD. **HG5A:** HA5's WE, QF, UA, LN, OM, MK, ML, FM, HA7's RY, SU, HA8RG. **HG6N:** HA6's ND, NY, ON, OQ, NF, NN, YG. **HG6V:** Simon, Bocsi, Dienes, Vingender, Peto, Suszter. **HG7B:** HA2EEO, HA5's WA, PP, DW, HA6DU, HA7's UL, JAO, UG, UO, HA8IE. **HG9R:** HA9's OA, PP, RP, RU, RX, SU.

HS8A: DL7MAE, G4UAV, HS1AMH, JA8JCJ, K2BA, ON5OS. **IK2BHX &** I2VXJ, IK2EGL, IK2GSN. **JA1YAG:** JH8SPE, JN1BAD, JP1NWZ, JR4EJW, JR4EAR. **JA1YCL:** JK1SST, JL1LNC, JL1QOC, JN1GPR, JO1GAD, JS1AFY. **JA1YFG:** JN1IZK, JO1RUR, JP1OGL. **JA1YWX:** JE6MII, JF2IWL, JG1IMM, JH5DXO, JH7PKU, JH8USD, JI2GUT, JJ1HJR, JJ2DIM, JM1CAX, JM1LPN, JM1MCF, JN3PYQ, JO1BMV, JR4NIV. **JA1YXP:** JH9CAU, JH8RRR, JI2DLF, JN1OTG, JO1JOY, JR4HCV, JR8ALC, JR8GUM. **JA3YBF:** JA9UXW, JE6BXJ, JF4BME, JG3LZG, JH9GRM, JH9JFH, JJ2ICA, JJ3KGS, JN1APL, JO1IAP, JR4AGT, JR4IZK. **JA4YJA:** JF4BNH, JJ3LJU. **JA6YAI:** JA6PPI, JE6MQW, JF6AEC, JF6CIC, JF6DEA, JF6EOZ, JF6MND, JF6PPQ, JG6CVD, JG6EAP, JG6OZC, JN1LLA, JR6GKT, JR6QFV, T. Higashi, Y. Moriyama, T. Nagasaki. **JA7YAA:** JE7HLZ, JE7QCQ, JG3JRM, JH8MRP, JH8ORW, JN1UYN, JR7PGL, JR8BMW. **JA8YFB:** JE7JNB, JE7MOY, JF7AAD, JF7GQK, JF7LEI, JF7TDN, JH8QNT, JN1RON, JO1NBV, JR7GYC, JR7JLU, JR7JVU, JR7OEF, JR7RLB, JR7WFH, JR8NUB. **JA8YBY:** JH8PNE, JO1DFG, JR8DQB. **JA9YAV:** JA9VMD, JA9XZD, JH9AEV, JH9ETC, JH9KZQ. **JE1YRD:** JA2EZD, JA4XHF, JE1JKL, JH1DTC, JI2KVW, JR2SCJ, JR4WKV, K8HVT. **JH7YJF:** JA7DWU, JA7RHJ, JA7SN, JR7XKN.

K1AR: & Packet. **K1IU** & KA1GQW. **K1KI** & Packet. **K1RQ** & KB1W, KB1KE, WA1ZAM, WB1EYL, NB1Y. **K1SA** & KY1K, K1MZB. **K3KG** & K4BAI, K4FJ, W4NL. **K3OO** & K3NZ, K3ZUF. **K4JPD** & N4ZZ. **KAVX/8** & AH2U, K98GL, K9FD, K9ZO, KM9P, NS8Z. **K5KG/LU:** K5KG, K5TU. **K5RR** & K5KJ, KC5NK, N5TP, NR5K, W5AH, WD5JYF, WD5K. **K6HIH** & K6AUC. **K7LXC** & K7HBN, K7WA, KR7G, VQ9GB. **K8AZ** & K8NZ, KQ8M, K8MR, N8ATR, W8HSK, W8KIC. **KA1KPH** & KM1P, NC1B. **KB3MM** & N3ARK, K3IE, WB3LFZ. **KB8G** & AB8W, K8FPC, K8RWL, K8UAA, K8VBU, KB8U, KD8IW, NT8P. **KC5DX** & WD5J. **KD3H** & Net. **KD4OM** & Net. **KJ4NS** & AA4SB, NU4O. **KM1C** & W1PH, WB8BTH, KB1T. **KP4BZ** & NP4Z, WP4C, WP4D, WP4K. **KY3M** & W3LR. **KZ2S** & KA2AEV. **LX9BV:** LX1WW, LX1JP. **LZ1KEZ:** Iwan, Encro, Kolvo. **LZ1KKR:** Mitko, Club. **LZ1KNP:** Ilia, Mitko. **LZ1KRC:** Victor, Asen, George. **LZ1KVZ:** Gosho, Todor. **LZ2KRU:** Ivelin, Wasil, Ilko. **LZ2KVA:** Willi, Dilian, Emil. **LZ7A:** LZ2's PO, HE, DF, CC, -E-44. **N1AU** & NB1H, K1FWE. **N3BB/5 &** WN4KKN. **N3BNA** & N3DTM, ND3Y. **N3RS** & K3JJG, KM3T. **N4EJW** & N4EJV. **N4WW** & K8LUZ, KU4J, WY4A. **N6AW** & N6AV, W6KP, K7EG. **N6ND** & KZ6E, N6CW, W6UQF, WU6N. **NG1W** & Guido, K1MZB, K1SA, KN1M, KY1K. **OH1AF:** OH1's EH, JS, KA, NOA, -100. **OH1VR** & OH1NOR, OH2BUQ. **OH9AB:** OH9NV, OH9SS. **OH8AM:** OH2's BAZ, BQS, BMD, BVI, BNN, VY, OH1JT, OH6UM. **OK1KCF:** OK1KZ, Pavel. **OK1KHK:** Club. **OK1KLV:** OK1DVE, Club. **OK1KQJ:** OK1's BY, AYP, IMP, DXS, DC, DLE, AZG. **OK1KSO:** OK1's AEZ, CF, WT, AAU, AII, JJB. **OK1OAZ:** OK1DDG, Club. **OK1OPT:** Club. **OK2KDS:** OK2UF, Club. **OK2KMS:** OK2's JS, FD, PZW, PTW. **OK2KPS:** Club. **OK2OSN:** OK2BFN, Club.

OK3KAG: Club. **OK3KGQ:** OK3CLL, OK3ZCD,OK3-2351. **OK3RJB:** OK3's, CQD, CQR, CSQ, CSB, CKW, TRJ, CPG, TCL. **OK3RKA:** OK3TDP, OK3CPC. **OK5R:** OK1's ADM, ADS, ALW, AWZ, DIM, RI. **OK5SSM:** OK1's AYE, FRI, DRI. **OZ4HAM:** OZ1BJF, OZ1FYW, OZ2JZ. **PI4GAZ:** PA3AFH, PA3BTH, PA8SOL, PA8WRS. **SK5EU:** SM5ODQ, Club. **SK5SM:** SM5's NZY, PHU, IXE, CAK, SM6MYF, SM6KNE, SM7PMY. **SK6RR:** SM6CVT, SM6LRR. **SK6TW:** SM6's AOU, CKU, CPY, DER, DOI, DQO. **SL8CB:** SM3LGO, SM7ORL, SM5LRM. **SP1PEA:** SP1's CU, MHZ, NQF. **SP3KRF:** Club. **SM3PKK:** SP3's MIZ, MIW, RAZ, LWP, DAH. **SP5PBE:** SP5's ANJ, ELA, FKW, GIQ, JTF, JTM. **SP6PDT:** SP6's RCU, OUG, IKS, OJE. **SP8PLU:** Club. **SP9ZAS:** Piotrowski, Zawislak. **U3KM:** UV3ACX, UA3-170-481, UA3-170-793. **U3TT:** Club. **UB3QZZ:** Alex, Oleg, Slaw. **UB4CXU:** UB5's CBU, CDX, ITK. **UB4CYT:** RB5CB, RB5CQ, RB5CW, UB5CCN. **UB4DXX:** UB5DCW, Club. **UB4EWG:** Alex, Serge, Serge. **UB4EXU:** UB5's EJB, EOD, 060-1894. **UB4EYJ:** RB5ECV, RB5EEU, UB5EFW, UB5EPU, UB5EQX. **UB4FWC:** Club. **UB4GWC:** George, Vasily, Victor. **UB4IWN:** UB4IRI, UB4ITR, UT5SI. **UB4IWI:** UB4IUK, UB5IOV, UB5IQW. **UB4IWR:** Club. **UB4IXZ:** RB4IDY, UB5INO, UY5EG, UB5-073-3867. **UB4IYK:** Gerg, Serg, Vlad. **UB4LZA:** UB4LEP, UB5LEE, UY5DV. **UB4MWA:** UB5's MDA, MMR,MOJ. **UB4MWU:** UB4MWU, UB5MBM. **UB4MZK:** UB4MVE, UB5MHO, UB5MJS. **UB4QWV:** Club. **UB4SWB:** R82SB, RB5SJ, UB5SDE. **UB4VWA:** Club. **UB4WZA:** UB5's WBY, WCX, 068-453. **UB4XWB:** UT5QG, UB5-062's -56, -240, -647.

UC1AWB: UC2AAX, UC2ADX, UC2-188-188, UC2-188-190. **UC1AWC:** Club. **UC1AWZ:** RC2AP, UC2-188's -40, -73, -123, -148. **UC1WWD:** Igor, Ivan. **UC1WWF:** UC2's WBI, WBP, XW, AI. **UC1WXD:** UC2's WCC, WCP, 006-43. **UL8CWW:** Alex, Serv, Serv. **UL8GWW:** RL7GH, RL7GN, UL7GBN, UL7GDJ,

UL7-018-99. **UO4OWR:** Igor, Oleg, Serge. **UP1BWW:** UP2's BAS, BKW, BLA, BMW, PAX, PX, 038-892, 038-1268. **UP1BXF:** UP2BAI, UP2-03801142. **UP1BYC:** Andrius, Vita. **UP1BYK:** UP2BJV, UP2-038-1091. **UP1BZA:** UP2's, BHN, BIM, BLR, BNY, OX, -038-1732. **UP1BZM:** UP2-038-1744, UP2-038-1787. **UP1BZO:** RP2BIH, RP2BIT, UC2AIP, UP2BFN, UP2BMT, UP2BQF, UP2-038-8346, UP2-038-1751. **UP1BZQ:** UP2BAT, UP2BQF, UP2-038-1682. **UQ1GWB:** UR2RDZ, UQ2-037-233. **UQ1GWE:** Club. **UQ1GWW:** RQ2GG, UQ2's GAG, GLK, -037-83, -037-116. **UQ1GWX:** George, Vladimir. **UQ1GXY:** UQ2LL, UQ2-037-374. **UR1RWX:** UR2's RJ, RDJ, RHF, RL, RNA, RRR, -083-165, -083-167. **UR1RXL:** UR2's ED, HY, RW. **UR1RXX:** Club. **UR1RYY:** UR2's RAT, RDO, RE, RMR. **UT4IWB:** RT5JA, UB5-067-2492, UT5-187-054. **UT4UWL:** Club. **UT4UXW:** UL7LEN, UT4UZ, UT5UGR, UY5JW. **UZ1AWO:** UA1AIL, UA1-169-880, UA1-169-2412. **UZ1AWX:** Club. **UZ1OWJ:** UA1OAA,UA1-113-31, UA1-113-490. **UZ1OWZ:** Club. **UZ1TWB:** UA1TAE, UA1-144-380, UA1-144-386. **UZ1ZZZ:** UA1's ZA, ZEO, ZX, UW1ZM, UA1-143-3, UA1-143-5.

UZ2FWA: RA2FA, UA2's FF, FJ, FM, FX. **UZ2FWN:** UA2FBC, UA2-125-902, UA2-125-908. **UZ3AXX:** RA3DUU, UA3's AQW, AQX, DHW, -170-79, UB5-067-866. **UZ3DXW:** UA3's DDB, DFO, -142-1944, -142-1945, -142-1949. **UZ3QWM:** UA3QLJ, UA3QPA, UA3-121-3104. **UZ3QYA:** Alex, Alex, Serge. **UZ3TYE:** Club. **UZ3XWA:** UA3-127-56, UA3-127-95, UI8-047-012. **UZ4AWT:** Eugene, Nick, Vladimir. **UZ4CYL:** UA4CCG, UW4CO, UW4CT. **UZ4FWO:** RA4FBG, UA4FAO, UA4-148-677, UA4-148-669, UA4-148-679. **UZ4HWS:** Al, Ven, Vasily. **UZ4WWB:** Club. **U4WWO:** UA4-095's -682, -684, -685. **UZ4YWW:** UA4's YBN, YDZ, -097-33, -097-403. **UZ6LWZ:** RA6LRT, UA6-150-1104, UA6-150-1336. **UZ6LXX:** RA6LVA, UA6LMW, UV6LX. **UZ6YWB:** Club. **UZ9AYA:** UA9's AM, AO, OG, UM8MR, UL7LT, UW9's AG, AN, AR, UA9-165-983. **UZ9CYP:** UA9's CUA, -154-2105, -054-2106. **UZ9JWF:** RA9's JB, JG, UA9's JEO, JCU, -162-180. **UZ9SWW:** UA9's SA, SBD, SDR, SEX, SJZ, SJY. **UZ9SWY:** RA9SVT, UA9's SHO, SIF, SGW, TS, Igor, Serge. **UZ9UWK:** RA9UNK, UA9UEG, UA9UTG. **UZ9XWA:** UA9XDG, UA9-090-200, UA9-090-745. **UA9XXM:** UA9XF, UW9XA, UA9-090-744. **UZ0AXX:** Club. **UZ0JWA:** UA0's JAB, JB, JO. **UZ0QWA:** UA0's, QAS, QDL, QEW. **UZ0SWA:** UA0-124's-143, -237, -576. **UZ0UWE:** UA0US, HA0VF, UW0UQ. **UZ0ZWD:** UA0's ZBP, ZCJ, ZDD.

VE1CIT & VE1BIG, VE1BII. **VE2LJ** & VE1BHA, VE2BTW. **VE3RFX:** VE3DAP, VE3INQ. **VE3WAA:** VE3DTR, VE3IIN, VE3IJE, VE3LFA, VE3OEO, VE3OEQ, VE3OEY, VE3PCT, VE3PJC. **VO2WL:** K3TM, NB3O. **VP5X:** K6ANP, KK6X, WW6F. **VP9AD:** N3RD, W3XU. **VU2TEC:** VU2FOY, VU2HRN, VU2MVX, VU2TER. **W1BK** & N1BHI. **W2JT:** K2GHV, Net. **W2UI** & N3KR. **W3GG** & K3RT. W3NX & K8NA. **W4FX** & W2GW, KJ4X, N4SZ, W4JZ. **W5ASP** & N5EA, W5VAH, W5VWN. **W5WMU** & K5GA, K5LZO, N5AN, N5IVF. **W6BIP** & WA6AUE. **W8IMZ:** N8BJQ, WB8MRU. **W8JGU** & KZ8Y, N8ABD, N8DCJ, W8CZN, WA8BIN, WA8DXB, WA8DXG. **W0XK** & K0MAT. **WA4QQV** & WA4QMQ. **WA7NIN** & W6OAT. **WB0NAA/YN:** K3ZO, WB0NAA. **WK6V** & N6NW, N7AHN. **WR6R** & AK6T, NB6L, KI6EZ, NP4WI. **XE2NQ** & AA5B, K5TA. **Y44ZL** & Y33VL, Y41RM, Y66GL, Y66IL, Y26WL. **Y42ZB** & Y42WB. **Y45ZM** & Y45YM, Y45WM. **YT3M:** YU3's ZV, EW, ZO, GO, RJ, IX. **YT3T:** YU3's BQ, EW, HR, EIJ, YU2YW. **YU1ATA:** YU1ZC, YU1TT. **YU4BAB:** YU4RS's -1600, -1555, -1570. **YU4CBC:** YU4GB, Club. **YU5GBC:** YU5's GB, UC, JA, Kire, Kriste, Toni. **YZ1U:** YU1XA, Club. **ZY4OD:** PY1DFF, PY1URQ, PY4DD, PY4OD, PY4WG. **4N1F:** YU1FQ, YU1HA, YU1GQ, YU1EFG. **4N2M:** YU2WM, YU2RO, YU2SVA, YU2ECO. **4N4T:** Trkulja, Blagic, Cehic.

Station Operators Multi-Operator Multi-Transmitter

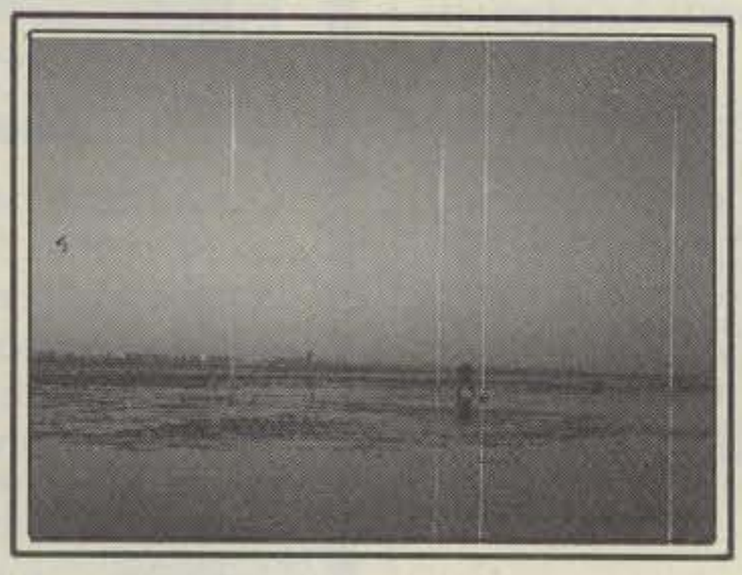
DK3BJ: DF3OC, DJ1FC, DJ4AX, DJ4PT, DJ9IE, DK2YI, DK4TP, DL9GS. **DL0KF:** DF3LP, DF3LZ, DF6LH, DJ2BV, DJ3UL, DJ4FZ, DJ5AV, DJ5AZ, DJ6TK, DJ7SW, DK9AV, DL2LAK, DL2ZT, DL3HAA, DL4BAN, DL5LC, DL7OY, DL8PY, DL8VR. **EA9CE:** EA5BRA, EA7ALG, EA7CFW, EA7DS, EA7TH, EA7TL, EA9EO, EA9EU, EA9GK. **J6DX:** K6GXO, N9AG, NC8Q, W8ILC, W8OK, W8PR, WB8ENR, WD8IXE. **JA2YKA:** JA4UDP, JA9SSY, JA9XXS, JE2JCV, JE2SRB, JE2VBZ, JE2VYM, JE7BIZ, JF2DQJ, JF2UTL, JG2AGD, JG2BVO, JG2MTC, JG2VTD, JH2QXG, JH4VBQ, JI1NPL, JI2UHH, JI2WYI, JJ1BTC, JJ1MVV, JJ2FAU, JJ2NJF, JK2CZL, JR7OMD, K. Saito. **JA3YKC:** JE3MAS, JE6LPM, JG3BJG, JG3CPF, JG3HLV, JG3MRT, JG3WDN, JI3ERV, JK3HYA, JR3WLA, JR4IMK, JR4PMX, JR5ARQ, JR6NWN. **JA9YBA:** JA9BEX, JA9LNJ, JA9NFO, JA9OTX, JA9OWJ, JA9VDA, JH9KIF, JI9VSH, JH0CAZ, JH7UJR, JJ3URK, JA9-10148. **KP2N &** AA6AA, K5HK, K5VT, KA6S, KC7V, N6DX, N6VI, N6ZV, N7BG, W6MSG, W6OUL, W7CB, WB6NRO, WT6T. **KS8S &** AD8P, KU8E, W8FN, WA6OGX, WA8SAE, WM4T. **LZ1KRB:** LZ1QD, LZ1XS, LZ1ZL, LZ1ZM, LZ1M-280, LZ1M-290, LZ1M-310, Vasil Camilarov, Stoycho Ganevsky. **N2AA &** K2GL, K2NG, K2SS, K2TT, K2TW, K2UR, K3EST, K5NA, KC2X, KR2Q, KU2M, KU2Q, KT3M, KY2P, N2WT, NT2X, WB2MAE, WB2BHC, WB2KMY. **N4ZC &** KZ5D, PA3ABA, N9CC, W4NUS, WD4BTF, WA8MAZ. **N6TU &** AA6T, KA6LAF, N6ITV, N6RZ, W6NV, WA6OCV, WB6SHD. **NF2L &** AG2S, K2YY, K3JLT, N3RG, WA2HGM, WB2YOF. **NL7G &** KL7PJ, KL7Y, KL7U, NL7GP, WL7E. **NR5M &** K2TNO, K5GN, KE5IV, KG5U, KN5H, N5RP, NM5M, NT5D, NZ5I, W9AGH, WB5N, WM5K, WI5P. **OK7AA:** OK3CAP, OK3CBU, OK3CEI, OK3CEM, OK3CLA, OK3CQW, OK3CUM, OK3EA, OK3JW, OK3LU, OK3LZ, OK3TJI, OK3WM, OK3YEC, OK3YX, OK3ZAF. **PA6DX:** PA0CLN, PA0COR, PA0ERA, PA0JMH, PA0VAI, PA3BAS, PA3BFM, PA3BUD, PA3OCF, PA3CEE, PA3CEF, PA3CTM, PA3CWM, PA3DEM, PA3DFT, PA3DKC, PA3DMH, PA3DQW, PA3DWD. **PI4RTZ:** PA3ACA, PA3ALP, PA3BBL, PA3BFB, PA3BWD, PA3CAL, PA3ELX, PE1ALC, PD0MCL. **UP9A:** UP2BAW, UP2BCO, UP2BCT, UP2BCW, UP2BIG, UP2BIJ, UP2BIL, UP2BN, UP2BNZ, UP2BRF,UP2CY, UP2PAJ, UP2QA, UP3BF. **VP2MU:** K8GL, KD2SX, KA2CIW, N2MG, VP2MAI, VP2MIX. **W3LPL &** AI3M, K3DI, K3RA, KT3Y, N8II, W3XY, WB3JRU, WD4AXM. **XE2SI &** AA6RX, AB6R, AE6E, K6JYO, KV6O, N6ADI, N6CCE, N6DLU, NC6U, NI6W, NN6U, W2KVA, W6HAL, WA6OTU. **4UI1TU:** DF3CB, DF4RD, DJ1US, DL6RAI. **8P9AG:** K6ZM, K4UVT.

SINGLE OP ZONE WINNERS

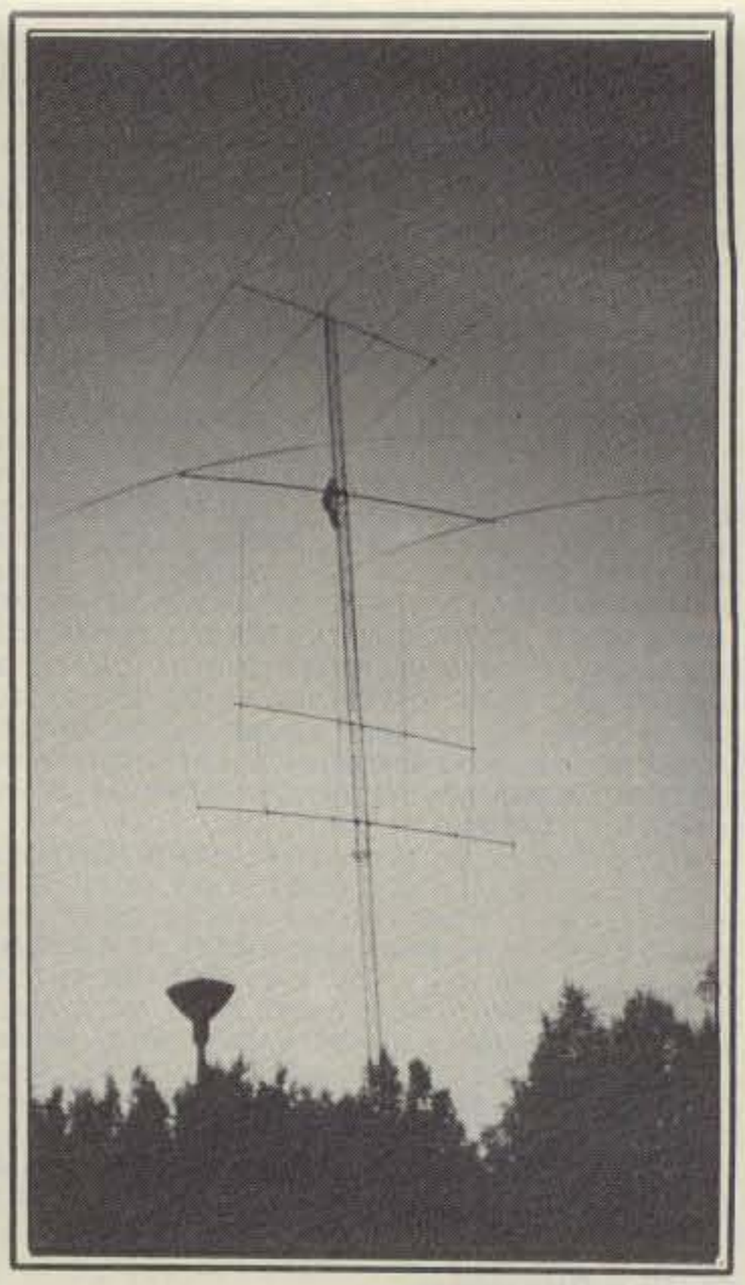
Zone	Call	Score	Zone	Call	Score
1	KL7RA	296,868	21	UF6FFF	3,068,568
2	VO2AC	40,326	22	9N1MM	839,105
3	N6RO	2,142,918	23	OK1XC/JT	256,370
4	W9RE	2,113,370	24	VS6DO	2,063,338
5	W1KM	3,029,832	25	JI1QPU	1,287,069
6	XF0L	549,822	26	No Entry	
7	TE4T	808,500	27	NY6M/KH2	971,919
8	NP4A	7,040,400	28	YB0ARA	1,664,208
9	9Y4VT	8,191,246	29	VK8AV	192,468
10	OA4ZV	1,447,040	30	VK2BQQ	505,377
11	PT7BZ	5,242,977	31	AH6AZ	1,025,759
12	3G1B	280,044	32	VK9NL	1,124,161
13	CX5AO	828,933	33	EA9AM	6,367,956
14	ZB2X	3,796,480	34	No Entry	
15	OK3CSC	2,214,216	35	D44BC	6,815,001
16	UW3AA	1,390,260	36	TR8JLD	1,974,548
17	UH8DC	1,308,200	37	No Entry	
18	UA0ABL	373,404	38	ZS6BSZ	903,681
19	UW0LT	695,611	39	No Entry	
20	ZC4CZ	1,000,160	40	UV1OO	616,764

Jorma, OH2KI, shows us how ZB2X managed to be the success it was (number 1 Single Op All Band Europe). Here Jorma is shown scaling the tower just six hours before the contest.

IO2UIY, shown here hard at work, finished second this year on 160, making an incredible 800 contacts.



FV6NDX uses this four-element phased array positioned in a salted lake in southern France. (Photo courtesy of Jackie, F6BBJ)



OH8PF won the combined SSB/CW single band trophy this year using this super array of antennas. Jukka says he's an acrobat on the tower, and we believe it.

WORLD TOP 10 QRPp
(5w input)
All Band

1. LZ1BB 868,137
2. 4X6IF 424,928
3. UB5IJA 350,880
4. G4ELZ 244,860
5. RB5IJ 227,981
6. OK3CGP 227,539
7. DL9YX 186,780
8. K1CGJ 167,562
9. G3KDB 155,112
10. DL8CM 151,341

Team Contesting

1. Team Finlandia (EA9AM by OH2BH, PT7BZ by OH2MM, FY5YE by OH2BBM, ZB2X by OH2KI and XF0L by OH2BQL) 21,693,423

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

CW RESULTS
SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

W1KM	**A**	**3,029,832**	**2049**	**131**	**376**
K1ZM	"	**2,779,014**	**1842**	**136**	**385**
K1EA	"	**2,631,084**	**1797**	**138**	**378**
K5ZD/1	"	2,469,159	1676	130	379
K1TO	"	2,311,680	1668	122	358
K1CC	"	2,253,421	1675	124	339
KC1F	"	1,600,131	1217	127	334
K1XA	"	1,455,220	1284	106	280
K1DG	"	1,322,558	1027	122	335
W1BIH	"	881,995	754	121	300
W1FJ	"	866,013	776	97	284
AK1A	"	788,522	750	102	271
K1VR	"	633,065	702	97	232
W1WAI	"	517,390	608	82	228
KG1D	"	484,036	588	81	212
KA1DWX	"	417,984	454	100	236
K1YR	"	306,000	444	67	183
WA2CNF /1	"	269,598	394	79	183
AI3E/1	"	214,020	319	75	171
W1CWU	"	183,736	300	75	163
W1IHN	"	179,630	267	80	173
K1RX	"	105,600	229	51	114
WB1CNM	"	89,199	151	58	129
KR1B	"	81,310	174	51	122
N1DC	"	29,682	119	34	63
KZ1M	"	27,216	96	43	69
W1OPJ	"	7,168	50	17	39
W1PLJ	"	5,685	44	13	33
KX1F	"	2,040	24	14	20
WA1FCN	**21**	**49,364**	**201**	**20**	**66**
K1EFI	"	35,460	142	21	69
W1WEF/M	"	1,424	36	6	10
K1RU	**14**	**468,402**	**1142**	**37**	**104**
W1YN	"	49,725	200	20	65
W1XN	"	12,932	74	17	44
W1END	"	3,360	35	12	33
K1ZZ	**7**	**135,001**	**385**	**31**	**96**
K8PO/1	"	85,878	260	30	87
W1FV	**3.5**	**195,804**	**616**	**23**	**88**
W1CF	**1.8**	**43,460**	**234**	**19**	**63**
			(Opr. WA2SPL)		
N2LT	**A**	**2,446,688**	**1733**	**131**	**356**
N2MM	"	**1,671,705**	**1342**	**125**	**310**
W2VJN	"	**1,511,619**	**1143**	**130**	**331**
K2LE	"	1,313,722	1078	116	317
N2RM	"	877,914	1011	85	217
K2NJ	"	521,640	648	79	201
N2UN	"	399,645	464	89	232
K2FL	"	338,436	405	96	220
KA2ZPD	"	258,318	388	82	172
K2QIL	"	257,740	367	65	198
KQ2K	"	224,924	284	81	196
WA2ASQ	"	204,288	328	72	156
W2NS	"	195,432	338	50	154
W2FTY	"	185,861	306	71	150
K2JLA	"	185,502	273	79	179
K2BK	"	130,170	228	62	135
W2TZ	"	125,672	250	61	123
W2KHQ	"	108,744	202	65	132
N2AIF	"	105,271	198	63	136
KY2O	"	98,326	175	63	148
KU2C	"	97,440	310	47	95
N2AIR	"	92,630	208	45	112
N2MR	"	91,390	190	67	123
K2QF	"	90,139	213	51	112
NA2Q	"	88,136	188	56	128
KW2J	"	69,776	166	62	116
NQ2O	"	67,116	144	56	148
W2DW	"	57,670	153	48	98
W2GGE	"	54,720	88	54	106
W2FOI	"	53,579	147	38	93
K2PF	"	41,952	112	46	92
W2PHT	"	41,500	128	43	82
W2GKZ	"	36,708	107	43	90
W2FR	"	33,048	94	52	84
WA2VYA	"	22,673	104	24	55
KT2D	"	22,624	87	36	65
WB2HJW	"	18,662	75	31	55
W2KTF	"	10,934	54	30	47
K2HVN/M	"	6,726	41	20	39
NR2I	"	247	10	5	8
KE2N	**28**	**1,300**	**24**	**10**	**16**
K2SG	**21**	**113,420**	**369**	**24**	**83**
K2UR	"	112,597	355	23	86
KA2HMS	"	46,191	191	20	69
K2MFY	"	34,263	155	21	60
W2YV	**14**	**573,990**	**1245**	**38**	**121**
			(Opr. KQ2M)		
K2VV	"	534,576	1236	35	113
K2RD	"	394,236	948	33	108
K2WK	"	306,636	755	34	104
NG2X	"	116,164	373	29	84
W2AYJ	"	55,900	175	25	75
K2UU	**7**	**102,544**	**307**	**32**	**84**
NT2S	"	16,200	103	17	43
KB2HZ	**3.5**	**22,338**	**118**	**19**	**54**
W2HG	"	20,350	107	19	55
K2LP	"	4,250	8	4	7
NA2M	**1.8**	**2,640**	**40**	**11**	**19**
N2KA	"	198	8	4	7
W3GRF	**A**	**2,933,507**	**1961**	**132**	**391**
			(Opr. KØDQ)		
W3BGN	"	**2,209,006**	**1587**	**131**	**351**
K3WW	"	**2,166,300**	**1665**	**122**	**328**
K3TUP	"	**2,103,150**	**1413**	**135**	**390**
			(Opr. K3UA)		
K3LR	"	2,007,208	1378	141	370
AA1K/3	"	1,967,471	1491	124	343
KC8C/3	"	1,917,448	1614	111	301
N3AD	"	1,854,855	1529	113	310
K3NA	"	1,590,246	1292	120	321
N3CXV	"	917,280	950	104	260
K3VW	"	799,686	790	101	253
W3UM	"	714,058	705	108	253
K3WJV	"	644,206	613	106	277
W3OV	"	581,231	681	88	213
K3IPK	"	536,400	654	85	215
W3UJ	"	322,252	467	67	171
W3AZ	"	291,500	396	80	185
KW3F	"	221,308	307	76	168
W3GN	"	199,184	300	74	162
W3EVW	"	164,589	252	77	172
N3EQF	"	80,850	188	59	116
N3HW	"	80,136	190	54	105
AA3B	"	79,872	183	48	108
W3CV	"	78,752	173	63	121
W3QIR	"	60,024	136	50	124
W3HXI	"	28,728	123	35	49
W3EAN	"	23,316	114	24	63
W3YFV	"	18,130	75	35	63
W3HVM	"	13,706	68	28	49
KB3A	**28**	**6,644**	**86**	**13**	**31**
WA3CGE	"	6,380	57	13	31
W3TB	21	8,640	73	17	37
K3RR	**14**	**253,750**	**694**	**30**	**95**
N3RR	"	172,596	525	28	86
K3BSY	"	125,430	372	31	82
N3DQI	"	7,122	19	8	14
W8FJ/3	**7**	**154,014**	**411**	**35**	**98**
W3QM	**3.5**	**25,382**	**130**	**20**	**54**
K3LZ	"	24,893	128	19	54
K4JLD/3	"	7,436	55	16	36
WB3AVN	**1.8**	**10,915**	**77**	**16**	**43**
N6AR/4	**A**	**1,985,760**	**1381**	**139**	**365**
WX4G	"	**1,982,464**	**1370**	**143**	**369**
W4RX	"	**1,878,566**	**1479**	**139**	**352**
NQ4I	"	1,640,672	1232	138	334
W3VT/4	"	1,616,220	1163	130	362
N4KG	"	1,498,791	1085	130	349
K4PQL	"	1,494,420	1226	115	308
KE9A/4	"	877,735	892	107	242
W3YY/4	"	622,755	714	100	215
K4AMC	"	574,182	592	100	243
K4PI	"	554,414	506	115	283
W9LT/4	"	364,785	459	79	214
AB4H	"	349,758	425	98	208
W1UA/4	"	316,470	427	97	177
K4PB	"	312,602	394	91	207
K2PEQ/4	"	281,162	352	96	206
K4OD	"	254,079	357	76	183
K4CEB	"	234,650	345	83	164
K4LQ	"	227,970	322	78	177
W4YE	"	192,907	323	53	156
N4TG	"	172,235	266	81	164
N4XM	"	167,466	264	83	164
N4XR	"	167,440	270	74	186
K4GKD	"	158,970	276	60	150
W4BTZ	"	149,017	274	74	135
WZ4F	"	139,531	246	66	151
K4FPF	"	135,200	255	65	135
K4BAM	"	131,700	258	55	130
N4MM	"	122,808	217	63	141
KF4CI	"	109,025	235	55	120
WB4AKE	"	108,238	222	56	125
KN4B	"	102,235	227	53	108
AA4S	"	98,235	202	62	123
WB4GNT	"	96,576	198	69	123
KV4AM	"	92,880	196	56	116
W4BFR	"	85,956	198	56	118
W4WKQ	"	83,721	201	61	116
K4PR	"	74,900	194	61	114
WS4G	"	69,888	161	61	107
WB4FOT	"	64,080	161	47	97
W4YN	"	52,736	150	44	84
N4LJS	"	46,011	125	58	89
KB4JS	"	45,743	125	58	91
WA4VDE	"	33,087	103	42	81
K6ETM/4	"	20,056	84	34	58
NN7A/4	"	7,755	53	20	35
W4GTS	"	7,020	50	23	37
KK3Q/4	"	1,258	60	20	17
N6BFM/4	**28**	**11,600**	**92**	**18**	**40**
KD1U/4	"	4,059	39	16	25
K3RV/4	**21**	**258,888**	**649**	**31**	**107**

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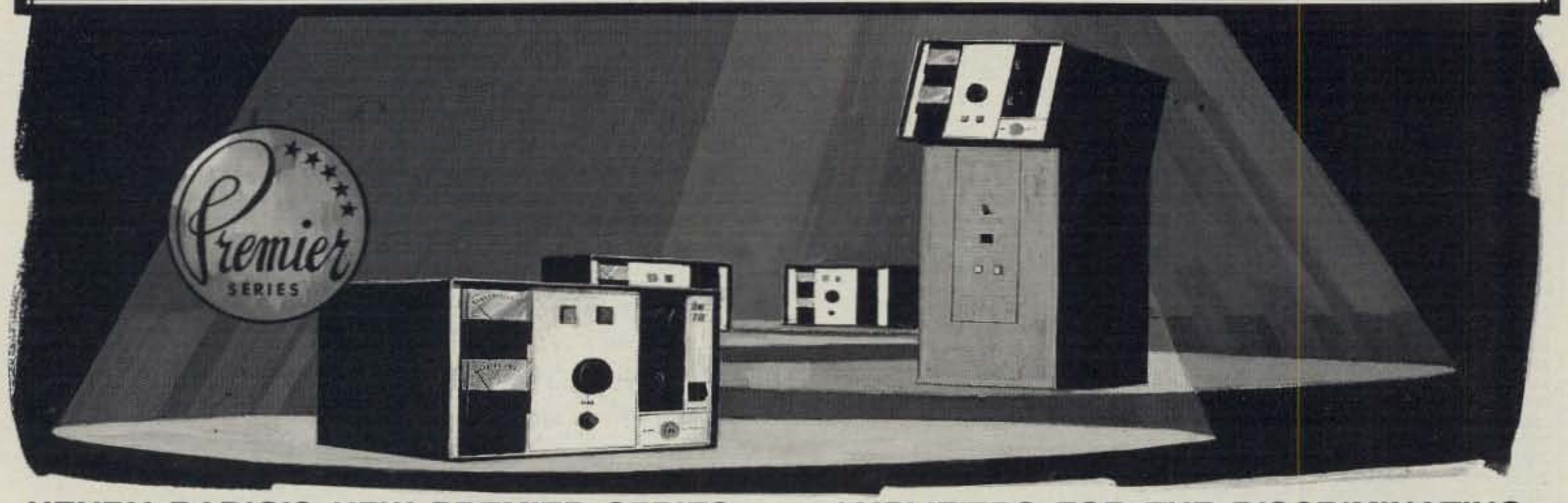

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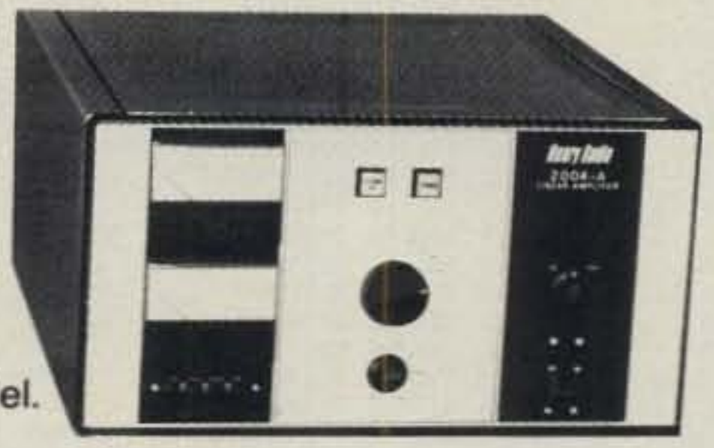

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K1ZX/4	"	238,518	666	28	98
WB4TDH	"	197,714	567	29	92
N4BP	"	134,244	471	25	74
K4TKM	"	119,560	345	28	94
W4XJ	**14**	**322,308**	**884**	**34**	**92**
N4VZ	"	298,080	744	35	109
WC4E	"	292,999	754	33	100
N4MO	"	147,516	449	28	86
AA4LU	**7**	**269,800**	**660**	**37**	**105**
WA4CTA	"	141,379	375	34	99
W5VUX/4	"	28,044	120	25	57
W4KMS	"	2,691	30	13	24
W4MGX	**3.5**	**10,584**	**72**	**16**	**40**
N4IN	**1.8**	**22,200**	**118**	**17**	**58**
K4TEA	"	18,870	102	18	56
W4BAA	"	9,686	68	15	43
W8CNL/4	"	9,240	70	15	40
N4SU	"	8,748	66	16	38
N4KE	"	3,780	33	13	32
K4XO	"	448	12	4	12
K5KLA	**A**	**693,720**	**671**	**115**	**254**
KA5W	**"**	**568,416**	**556**	**116**	**256**
N5RM	"	556,556	564	111	253
N5JB	"	423,489	499	106	207
N5AW	"	342,392	390	101	236
K5LP	"	338,670	405	102	216
NA5R	"	267,698	386	99	175
N5UA	"	135,568	227	86	143
AI9X/5	"	126,801	226	81	138
NI5M	"	114,268	223	75	121
W5OB	"	109,282	202	67	135
WA5HOD	"	95,760	183	60	130
W5LW	"	83,636	147	103	103
W5JC	"	59,565	145	67	98
KT5D	"	30,912	100	38	74
W5HRF	"	29,440	98	47	68
W5EJT	"	18,693	88	26	46
K5DB	"	18,288	88	26	46
K5LM	"	15,023	69	29	54
WB5SSD	"	12,118	65	32	51
N5HB	"	11,392	63	25	39
WK5P	"	6,283	82	28	33
N5EPA	"	6,213	40	26	31
W5EIJ	"	1,922	25	11	20
NN5E	**28**	**3,333**	**45**	**12**	**21**
K5GO	**21**	**192,584**	**516**	**33**	**100**
K5TSQ	"	126,120	370	29	91
W5VX	"	125,114	365	30	91
K5BDX	"	30,189	127	24	63
N5CR	**14**	**327,740**	**813**	**35**	**105**
W5FO	"	234,060	601	37	104
W5BOS	"	118,364	327	35	92
WF5E	"	50,496	194	28	68
W5KCR	"	20,148	100	21	52
K5MK	**7**	**65,550**	**208**	**31**	**83**
NT5G	"	46,460	167	29	72
AF5M	"	44,064	168	30	72
W5PWG	"	22,594	110	24	55
NX5H	"	11,940	79	21	39
WE5P	**3.5**	**32,908**	**169**	**20**	**56**
K9MK/5	"	2,888	30	13	25
K5UR	**1.8**	**28,476**	**139**	**22**	**62**
N5JJ	"	7,920	57	15	40
N6RO	**A**	**2,142,918**	**1794**	**134**	**289**
			(Opr. WA6VEF)		
K6NA	**"**	**1,684,469**	**1280**	**146**	**321**
W6MKB	**"**	**953,200**	**853**	**133**	**267**
W6GO	**"**	**721,980**	**723**	**134**	**248**
NE6I	"	474,579	586	97	182
N6BT	"	441,500	634	89	161
W6JTI	"	393,300	526	103	173
W6ISQ	"	378,738	433	107	211
W6REC	"	364,752	496	95	177
N6EK	"	318,591	433	99	174
W6FSJ	"	301,938	414	103	170
K6DR	"	267,152	406	87	149
KI6T	"	219,438	368	80	139
W6WB	"	183,429	308	81	148
N6IC	"	167,900	275	89	141
W6BA	"	112,725	242	57	110
W6ABW	"	101,080	272	64	88
N6AN	"	91,680	215	63	97
K6PU	"	83,985	197	64	101
ND6G	"	81,200	166	68	107
K6ZUR	"	78,732	188	62	100
K6YK	"	74,936	201	46	90
N6NF	"	68,502	172	56	91
WE6G	"	63,310	184	55	75
K6LRN	"	58,420	167	51	76
K9RN/6	"	53,244	174	43	65
K6JG	"	52,767	131	59	84
N6IBP	"	52,200	151	57	88
K2ITG/6	"	52,130	150	50	80
W6BYH	"	42,545	127	45	82
KG6AO	"	41,140	137	49	72
AJ6V	"	38,962	133	47	74
W6LC	"	36,565	136	47	56
N6OM	"	35,000	124	38	62
N6JM	"	27,930	106	43	55
KD6GC	"	25,550	188	35	38
AA6EE	"	25,252	99	45	62
K6EID	"	17,496	80	33	48
W6NNV	"	17,072	74	33	55
W6SX	"	13,630	88	28	30
K6WS	"	11,022	71	32	34
K6ICS	"	1,224	22	13	11
WA6FGV	**28**	**4,068**	**46**	**11**	**25**
N6OU	"	112	6	4	4
AA4M/6	**21**	**43,416**	**231**	**25**	**42**
W6BSY	"	27,302	132	25	48
W6QHS	**14**	**243,810**	**655**	**36**	**93**
WC6I	"	152,853	492	34	81
N6GG	"	121,844	587	36	97
WA6TLA	"	64,500	224	30	70
W6DN	"	52,400	185	32	68
W6HJ	"	12,032	69	24	40
W6VG	"	4,192	44	14	18
N6QR	**7**	**336,980**	**864**	**37**	**103**
W6YA	"	263,451	656	37	100
W6PU	"	208,611	656	34	83
K5KT/6	"	85,749	302	30	71
N6OC	"	46,041	160	33	70
N6VR	"	40,050	157	33	57
N7CW/6	"	35,108	98	37	94
W6RJ	**3.5**	**106,600**	**399**	**32**	**68**
K9DX/6	"	34,650	199	22	41
K6XT	"	14,592	94	19	38
WB6EGE	**1.8**	**1,950**	**42**	**10**	**16**
N6PE	"	425	14	8	9
K5MM/7	**A**	**1,177,686**	**1213**	**112**	**227**
KY7M	**"**	**743,422**	**870**	**114**	**223**
KS7T	"	168,844	365	66	125
KØFX/7	"	145,926	270	73	125
NN7L	"	141,192	325	59	100
W7IIT	"	128,947	271	65	104
W7HS	"	114,072	218	78	116
K7ABV	"	88,677	203	60	107
WA7HHX	"	82,885	218	56	81
NQ7M	"	58,424	159	57	77
NT7E	"	57,456	164	52	81
KX7J	"	50,094	139	55	83
W7QN	"	50,050	150	56	74
N7HJM	"	37,835	124	46	69
WA7KLK	"	36,270	119	48	69
W7MCU	"	19,968	74	43	61
W7IEU	"	16,632	90	27	39
W7GUR	"	15,975	78	32	43
KA7FEF	"	11,730	73	34	35
N7EPO	"	5,550	47	27	23
K7UU	"	5,406	40	26	27
K7EFB	"	4,455	41	26	29
W7TVL	"	798	14	10	11
N7JB	"	735	14	10	11
W7VIH	"	130	7	5	5
K7QQ	**28**	**2,484**	**62**	**13**	**23**
WB7RFA	"	1,182	28	10	13
WB7FDQ	**21**	**70,380**	**256**	**30**	**72**
N7RT	"	61,886	229	25	72
KE7C	"	30,260	167	30	48
N7RO	"	25,500	156	20	40
KT7G	"	23,850	164	17	33
N7TT	**14**	**156,633**	**513**	**33**	**76**
WA7BPI	"	79,808	244	34	82
W7EKM	"	45,370	244	23	42
KN7K	"	10,700	80	19	31
KC7MM	"	344	15	4	4
W7EJ	**7**	**270,592**	**725**	**34**	**94**
K7NO	"	54,696	194	31	75
K7UR	"	19,350	93	26	49
W7AYY	"	14,224	96	22	34
K7XX	"	13,650	72	36	93
W7TSQ	"	3,060	41	15	15
KA7T	**3.5**	**16,974**	**160**	**18**	**28**
W7ZI	"	6,006	58	15	27
W7TJ	"	3,296	53	14	18
W7KKR	"	860	24	9	11
K8CC	**A**	**1,115,480**	**1013**	**113**	**282**
N8CXX	**"**	**755,550**	**724**	**108**	**257**
			(Opr. K8JM)		
W8LNO	"	669,641	697	117	236
KE8M	"	323,032	426	80	191
N8BC	"	232,376	343	74	174
W8GOC	"	197,087	290	78	175
W7IJ/8	"	171,114	272	79	158
KA8JZR	"	125,210	254	61	129
KB8FJ	"	105,932	276	45	97
N8CQA	"	84,196	172	58	159
K8CV	"	81,951	165	51	126
K8OOL	"	75,947	168	58	115
K8OT	"	50,320	156	48	100
WA8YTM	"	48,133	136	39	88
WA8IGG	"	31,719	111	37	72
W8UPH	"	31,160	125	32	63
W8WVU	"	26,565	99	44	61
W8JRK	"	18,468	79	32	49
K8EF	"	10,336	50	26	50
NK8Q	"	6,732	50	26	40
KB8TT	"	2,982	29	16	26
AC8W	**28**	**5,700**	**61**	**11**	**27**
NE8T	"	1,708	25	10	18
K8MNG	"	1,008	19	7	14
W8QID	**21**	**42,044**	**164**	**23**	**69**
WB8JBM	**14**	**337,220**	**900**	**32**	**98**
			(Opr. WD8AUB)		
WD8LDD	"	280,448	786	34	94
W8LU	**7**	**58,995**	**188**	**31**	**84**
W8UVZ	**3.5**	**34,700**	**132**	**27**	**73**
KV8Q	"	23,680	128	18	56
K8VIX	"	20,907	117	14	55
W8TWA	"	18,834	103	19	54
K8DD	"	10,384	70	17	42
N8EA	**1.8**	**9,632**	**71**	**15**	**41**
K8NW	"	3,876	43	13	25
W9RE	**A**	**2,113,370**	**1504**	**136**	**354**
			(Opr. WA8YVR)		
KA9OKH	**"**	**647,472**	**733**	**108**	**221**
KV9S	"	564,140	637	101	234
K9CAN	"	545,896	549	104	258
W9OP	"	288,511	409	82	181
K9UIY	"	278,748	407	76	185
N9ER	"	158,232	263	76	152
NA9J	"	156,750	289	68	141
K9MMS	"	112,307	251	43	120
W9NA	"	109,536	241	52	111
WB9HRO	"	99,912	217	61	123
W9KTP	"	68,242	168	44	105
W9HE	"	42,827	140	40	73
K9DFK	"	35,754	114	36	82
W9GXR	"	34,596	111	51	73
KK9A	"	30,300	109	31	69
NJ9Z	"	20,330	87	43	64
K9UQN	"	18,720	88	27	51
W9TNZ	"	14,352	67	23	55
NG9L	"	11,550	66	26	49
W9LNQ	"	10,448	60	21	48
K9IFO	"	9,591	57	22	47
KA9IMX	"	1,131	25	16	13
K9QVB	**21**	**76,255**	**272**	**23**	**78**
W9YSX	"	72,653	242	25	82
W9WAQ	"	39,560	158	23	69
W9SC	"	38,340	155	22	68
WB9JKI	**14**	**299,720**	**829**	**32**	**95**
N9AW	"	87,575	276	31	82
W9GIL	"	77,110	247	29	81
N9RD	"	57,909	220	27	70
N9AEJ	"	53,037	222	21	62
K9WYI	"	8,526	57	19	39
K9BG	"	5,712	47	16	35
N4RR/9	**7**	**41,877**	**154**	**28**	**71**
K9EL	"	40,339	136	33	74
WA9MAG	"	29,568	114	32	65
KS9O	"	28,336	124	27	61
W9RN	**3.5**	**22,572**	**119**	**19**	**57**
KE9U	"	14,760	80	19	53
W9YYG	**1.8**	**2,754**	**40**	**11**	**23**
WØJLC	**A**	**1,576,539**	**1043**	**149**	**382**
WØKEA	**"**	**585,648**	**631**	**118**	**218**
KJØH	"	381,234	453	99	214
NQØI	"	169,510	277	73	157
WØRXL	"	160,860	298	75	135
KØSCM	"	120,640	272	52	108
KØIYF	"	120,080	232	65	125
KMØR	"	73,272	163	62	110
WAØCFZ	"	72,224	180	50	98
WØVX	"	67,450	180	49	93
KCØFJ	"	61,056	163	61	83
NSØB	"	56,100	132	64	101
KØRW	"	31,115	95	51	76
WØUY	"	20,029	116	33	58
KSØT	"	18,718	83	39	59
WØNGB	"	12,580	79	31	43
KØMZV	"	8,190	51	27	43
KMØL	"	6,900	53	20	30
WW6D/Ø	"	4,698	37	22	32
WØYK	**21**	**45,810**	**214**	**25**	**65**
KØUK	"	28,240	121	26	54
WØIZV	14	6,336	50	17	27
WØHBH	"	950	20	8	11
KØRF	**7**	**263,296**	**671**	**36**	**100**
K9AY/Ø	"	20,235	104	24	47
WØUO	**3.5**	**19,110**	**111**	**20**	**50**
WØZV	**1.8**	**13,330**	**101**	**19**	**43**
NØXA	"	7,560	66	18	36

ALASKA

KL7RA	**A**	**296,868**	**747**	**59**	**97**
KL7UR	21	3,720	67	11	13
AL7CQ	**3.5**	**5,720**	**116**	**12**	**13**

ANTIGUA

V2ACW	**A**	**925,184**	**1646**	**81**	**175**
			(Opr. KA2DIV)		

BAHAMAS

N4RP /C6A	**A**	**381,140**	**936**	**65**	**125**

CANADA

VO1MP	**A**	**1,110,525**	**1256**	**85**	**250**
VO1QU	**14**	**320,572**	**1177**	**27**	**80**
VO2AC	**A**	**40,326**	**301**	**29**	**37**
VE1AI	**A**	**916,175**	**1121**	**89**	**236**
VE1ASJ	"	564,021	900	83	261
VO1AW	"	35,508	100	38	94
VE1CGV	"	13,524	93	33	36
VE1AIH	"	1,386	24	12	12
VE2AYU	**A**	**584,835**	**804**	**83**	**224**
VE2WA	"	17,640	120	18	45
VE2FFE	"	9,291	70	21	36
VE3IY	**A**	**1,226,232**	**1456**	**113**	**265**
VE3XN	"	688,101	876	98	249
VE3KP	"	551,134	999	72	167
VE3ST	"	207,064	326	73	175
VE3MVV	"	37,454	115	44	78
VE3OMU	"	10,730	85	27	31
VE3MCL	"	8,554	71	14	33
VE3EZU	"	6,882	104	12	19
VE2AEJ/3	**28**	**7,560**	**88**	**12**	**28**
VE3NBE	**21**	**17,346**	**116**	**18**	**41**
VE3AT	**14**	**170,280**	**642**	**27**	**83**
VE3OZB	**7**	**128,760**	**493**	**34**	**82**
VE3PN	**1.8**	**12,390**	**141**	**12**	**30**
VE5AAD	A	9,360	150	17	13
VE6APN	**A**	**30,328**	**210**	**26**	**42**
VE6DZ	"	25,542	178	33	33
VE7GEA	A	17,316	95	35	39
VE7CXN	"	1,890	49	9	9
VE7CXR	**14**	**40,426**	**541**	**14**	**20**
VE7AV	"	2,516	30	15	19
W7DRA /VE7	3.5	1,010	50	5	5
VE7BS	**1.8**	**4,607**	**136**	**9**	**8**

COSTA RICA

TE4T	**A**	**808,500**	**1552**	**77**	**168**
			(Opr. TI4SU)		
TI2OY	"	124,960	533	48	62

CUBA

CO2JA	**7**	**13,494**	**158**	**14**	**25**

DOMINICA

J73O	**1.8**	**3,074**	**51**	**8**	**21**

DOMINICAN REPUBLIC

HI8JR	**A**	**1,788,917**	**2585**	**87**	**212**
			(Opr. HI3JEI)		
HI8WA	7	5,975	109	10	15
HI8LC	**3.5**	**26,233**	**336**	**8**	**29**

GUANTANAMO BAY

KG4XO	**1.8**	**39,702**	**497**	**11**	**28**

HONDURAS

HR1AT	**14**	**25,122**	**224**	**18**	**35**

JAMAICA

6Y5J	**A**	**2,007,616**	**2868**	**89**	**215**
			(Opr. K6RR)		

MEXICO

XF8L	**A**	**549,822**	**1438**	**70**	**112**
			(Opr. XE1OH)		
XE2MX	"	125,100	587	45	55
XE2PPT	7	3,180	79	9	11
XE2PQ	**3.5**	**8,094**	**216**	**10**	**9**

NICARAGUA

YN3EO	**A**	**574,253**	**1875**	**44**	**107**
			(Opr. Y25OE)		

PANAMA

HP1AC	**A**	**425,035**	**869**	**57**	**112**

PUERTO RICO

NP4A	**A**	**7,040,400**	**4617**	**155**	**445**
KP4FI	**14**	**1,218,928**	**3273**	**36**	**112**

ST. KITTS

V42A	**A**	**852,715**	**1993**	**65**	**134**
			(Opr. WA2HZR)		

ST. MAARTEN

PJ7A	**A**	**3,729,490**	**3214**	**112**	**349**
			(Opr. N2GC)		

AFRICA

CANARY ISLANDS

EA8ABR	**A**	**310,288**	**591**	**51**	**125**
EA8AGF	"	23,430	148	25	30
EA8BCJ	**14**	**36,076**	**208**	**15**	**43**
EA8BLC	**7**	**161,694**	**694**	**18**	**60**
EA8ABG	"	96,360	536	17	43
EA8RCT	**3.5**	**441,350**	**1524**	**22**	**75**
			(Opr. OH5XT)		
EA8AVT	**1.8**	**1,998**	**40**	**7**	**11**

Cape Verde

D44BC	**A**	**6,815,001**	**4488**	**130**	**379**
			(Opr. N6TJ)		

CEUTA & MELILLA

EA9AM	**A**	**6,367,956**	**4337**	**119**	**373**
			(Opr. OH2BH)		

GABON

TR8JLD	**A**	**1,974,548**	**2230**	**82**	**216**

MADEIRAS ISLANDS

CT3ET	**A**	**840,114**	**1428**	**48**	**150**

MAURITANIA

5T5XX	**A**	**3,929,844**	**3097**	**111**	**333**
			(Opr. DL1VJ)		

REP. OF SOUTH AFRICA

ZS6BSZ	**A**	**903,681**	**1089**	**93**	**186**
ZS2U	"	17,010	105	34	47
ZS4WD	"	8,346	72	17	22
ZS6BCR	**21**	**673,068**	**1711**	**33**	**99**

ZAMBIA

9J2EZ	**A**	**643,746**	**1161**	**53**	**133**

ZIMBABWE

Z23JO	7	5,061	81	8	13

ASIA

BRITISH SOVEREIGN AREA OF CYPRUS

ZC4CZ	**A**	**1,000,160**	**1155**	**79**	**225**

HONG KONG

VS6DO	**A**	**2,063,338**	**2422**	**140**	**288**

INDIA

VU2TTC	**A**	**254,025**	**465**	**80**	**145**
VU2LAM	"	150,052	356	57	106
			(Opr. UB5LGM)		
VU2UR	**21**	**33,768**	**200**	**24**	**48**
VU2RJA	"	3,503	42	13	18

ISRAEL

4X6NM	**21**	**166,066**	**692**	**23**	**63**
4Z9AAC	"	165,144	754	26	58

JAPAN

JI1QPU	**A**	**1,287,069**	**1331**	**127**	**240**
JF1EQA	**"**	**1,004,564**	**1147**	**108**	**208**
JH1OGC	"	604,112	808	107	166
JA1JQY	"	152,607	341	70	99
JH1MTR	"	104,544	240	74	102
JA1BNW	"	98,854	232	61	100
JF1SEK	"	93,636	218	69	93
JE1AER	"	82,818	234	51	78
JA1DFQ	"	70,560	185	58	89
JH1AWN	"	58,786	187	54	56
JR1ZTT	"	47,912	182	43	63
JA1QJZ	"	31,160	118	44	51
JA1JGP	"	28,884	136	36	47
JS1OSP	"	15,057	91	29	34
JM1AQU	"	14,135	97	26	29
JH1NHY	"	11,736	74	34	38
JF1JAX	"	6,716	58	19	23
JH1XTV	"	374	12	8	9
JH9HXF/1	**28**	**6,771**	**68**	**14**	**23**
JO1CRA	"	6,426	60	16	26
JR1IJV	"	5,814	59	15	23
JM1SMY	"	4,763	49	14	23
JL1OYU	"	3,815	42	13	22
JE1SLP	"	3,080	43	15	25
JE1SLP	"	1,950	28	10	15
JA1AAT	"	273	8	6	7
JL1DBI	"	144	9	4	4
JA1YYE	**21**	**166,757**	**616**	**34**	**69**
JE1AYU	**"**	**164,220**	**592**	**31**	**74**
JR1RCQ	"	52,202	230	31	55
JS1UMQ	"	33,892	181	26	48
JG1NBD	"	33,522	180	25	49
JE1CKA	"	24,700	147	24	41
JE1DXC	"	24,353	132	24	47
JM1LRQ	"	23,912	156	21	35
JA1BFN	"	22,980	141	22	38
JA1WYQ	"	22,230	134	25	40
JM1CMA	"	4,756	56	13	16
JP1TRJ	"	4,070	41	17	20
JS1GHA	"	2,926	33	14	24
JH1BUB	"	2,880	34	13	19
JL1ROT	"	684	14	8	11
JR1XFS	**14**	**122,645**	**473**	**29**	**66**
JK1KRS	"	29,625	136	29	50
JF1MYI	"	13,916	120	18	31
JA1VBW	"	8,281	60	16	33
JA1EMQ	"	6,204	59	20	24
JO1QZI	"	3,600	38	17	23
JA2SAP/1	"	240	10	5	5
JN1AIF	**7**	**36,579**	**162**	**30**	**59**
JA1JIO	"	30,640	148	29	51
JA1YWG	"	17,298	108	27	35
JF1NCT	"	1,050	16	12	13
JA1NYV	"	828	18	10	8
JA1KZP	"	294	15	4	3
JA1OND	**3.5**	**14,094**	**98**	**22**	**36**
JA1GO	"	3,838	40	15	23
JF1RPK	"	1,780	42	10	10
JE1SPY	**1.8**	**1,275**	**30**	**11**	**11**
JH1BIN	"	416	18	8	8
JA2EU	**A**	**267,712**	**585**	**73**	**105**
JA2YDC	"	238,764	472	82	115
			(Opr. JI2RIQ)		
JH2FFR	"	157,437	323	82	107
JA2UOT	"	121,968	305	68	86
JF2UOP	"	91,060	222	60	97
JA2MYA	"	57,456	186	59	67
JA2WZ	"	18,792	133	33	39
JA2BUN	"	17,688	77	37	51
JR2RAV	**28**	**8,700**	**92**	**20**	**30**
JF2VDY	"	3,838	42	16	22
JE2QYZ	21	7,550	57	19	31
JJ2FJM	"	6,068	64	16	21
JI2LCE	"	510	14	7	8
JK2CKB	"	224	12	7	7
JA2HLX	**14**	**297,000**	**887**	**36**	**84**
JF2EZA	"	135,408	387	36	88
JA2KVD	"	26,712	146	25	47

HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	**2149**
SP-20 Ext. speaker w/audio filter	149.00	**134.95**
FL-101 250 Hz CW filter	69.95	
FL-102 6 kHz AM filter	56.00	
CI-V Computer interface adapter	TBA	
EX-310 Voice synthesizer	46.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	
IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	**899.95**
PS-35 Internal power supply	199.00	**179.95**
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-44A SSB filter (2nd IF)	178.00	**159.95**

IC-735 HF transceiver/SW rcvr/mic	999.00	**799.95**
PS-55 External power supply	199.00	**179.95**
AT-150 Automatic antenna tuner	445.00	**349.95**
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	169.00	**154.95**
PS-30 Systems p/s w/cord, 6-pin plug	299.00	**269.95**
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	**149.95**
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	559.00	**489.95**
AH-2 8-band tuner w/mount & whip	625.00	**549.95**
AH-2A Antenna tuner system, only	495.00	**429.95**

ICOM

Other Accessories - continued:	Regular	SALE
GC-5 World clock	91.95	**89.95**

VHF/UHF base multi-modes	Regular	SALE
IC-271A* 25W 2 meters ... **CLOSEOUT**	859.00	**699.95**
AG-20* Internal preamplifier	64.00	
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	**1049**
IC-275H 100W 2m FM/SSB/CW	1389.00	**1229**
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1249**

IC-471A* 25W 430-450....	**CLOSEOUT**	979.00	**769.95**
AG-1* Mast mounted preamplifier		99.50	
IC-471H* 75W 430-450 ...	**CLOSEOUT**	1399.00	**999.95**
AG-35* Mast mounted preamplifier		95.00	

***Preamp $9.95 with 271A/471A/471H Purchase**

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	115.00	**104.95**
PS-35 Internal power supply for (H)	199.00	**179.95**
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM **CLOSEOUT**	639.00	**569.95**
IC-490A 10W 430-440..... **CLOSEOUT**	699.00	**499.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**369.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**479.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	**399.95**
IC-28H 45W 2m FM, TTP mic	489.00	**429.95**
IC-38A 25W 220 FM, TTP mic	489.00	**429.95**
IC-48A 25W 440-450 FM, TTP mic	489.00	**429.95**
HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-900 Transceiver controller	589.00	**529.95**
UX-29A 2m 25W unit	295.00	**269.95**
IC-3200A 25W 2m/440 FM w/TTP	599.00	**529.95**
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	**1089**
IC-1200A 10W 1.2 GHz FM Mobile	699.00	**629.95**
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	**1069**
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	**104.95**
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	**119.95**
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00	**1289**

Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	**249.95**
IC-2AT with TTP	299.00	**259.95**
IC-3AT 220 MHz, TTP	339.00	**299.95**
IC-4AT 440 MHz, TTP	339.00	**299.95**
IC-02AT 2-meters	365.00	**299.95**
IC-02AT/High Power	399.00	**339.95**
IC-03AT for 220 MHz	449.00	**399.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2A 2-meters	299.00	**269.95**
IC-u2AT with TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**329.95**
Accessories for micros - CALL $		
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	**399.95**
A-2 5W PEP synth. aircraft HT	499.00	**449.95**
A-20 Synth. aircraft HT w/VOR	599.00	**529.95**

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	**SALE 99.95**
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$949.00	**799.95**
RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	**159.95**
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25 MHz-2 GHz rcvr.. **SPECIAL**	1099.00	**899.95**
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	**119.95**
AH-7000 Radiating antenna	89.95	

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JR2CFD	"	25,632	140	28	44
JA2BJC	"	22,100	117	24	44
JH2XMO	"	19,647	132	21	38
JA2EC	"	15,768	110	22	32
JA2KPV	"	13,515	105	19	32
JR2ASX	"	5,880	58	17	25
JE2LQX	7	18,626	109	24	43
JG2LGM	"	3,051	45	14	13
JA2IVK	3.5	7,144	86	16	22
JA2EJI	"	2,666	34	12	19
JF3CCN	**A**	**296,616**	**555**	**83**	**121**
JG3NKP	"	32,936	124	39	53
JH3JYS	"	26,600	117	49	51
JR3XEX	"	21,670	106	40	54
JA3UWB	"	20,331	101	38	43
JH3TXP	"	19,125	101	29	46
JA3ARM	"	16,660	115	31	37
JG3EHD	"	4,116	53	14	14
JI3BFC	28	1,408	22	10	12
JA3QJL	**21**	**103,700**	**448**	**30**	**55**
JR3NZC	"	84,992	378	29	54
JK3GAD	"	22,243	148	22	37
JR3WXA	"	16,359	112	20	37
JR3YYJ	"	11,016	81	22	29
JI3KDH	"	7,920	65	17	28
JA3YDS	**14**	**44,622**	**232**	**26**	**48**
JA3DM	"	22,348	111	28	46
JH3DEJ	"	234	8	7	6
JI3XZA	**7**	**34,190**	**205**	**25**	**40**
JA3BRB	"	5,964	50	17	25
JI3OIP	"	2,496	41	14	10
JH3BGG	**3.5**	**39,960**	**204**	**28**	**46**
JA3BCT	"	1,040	24	9	11
JH3CYZ	**1.8**	**1,378**	**32**	**10**	**16**
JR4IVR	**A**	**275,761**	**401**	**103**	**154**
JH4UYB	"	252,805	469	86	131
JA4ESR	"	195,000	383	86	114
JR4VGD	"	42,069	147	49	62
JA4FMS	"	27,690	138	36	42
JA4ATV	"	11,020	66	21	37
JR4ISK	"	7,809	58	25	32
JE4VVM	**21**	**56,560**	**252**	**29**	**51**
JE4DNO/4	"	12,744	90	21	33
JA4FWM	**14**	**143,162**	**530**	**30**	**54**
JH4IFF	**7**	**49,432**	**243**	**25**	**49**
JA4QZH	"	2,368	64	16	21
JA4YPE	1.8	266	14	6	8
JA5AF	A	17,925	101	31	44
JR5JAQ	21	7,098	66	18	24
JA5FDJ	**14**	**26,064**	**149**	**27**	**45**
JA5JGV	"	6,750	53	19	26
JA5BJC	**3.5**	**92,365**	**395**	**27**	**64**
JA5IU	"	4,360	51	18	22
JH6TYD	**A**	**97,755**	**279**	**65**	**82**
JE6JVJ	"	41,292	149	53	58
JA6AKV	"	31,212	122	45	63
JF6KAC	"	22,113	94	39	52
JF6JQM	"	21,538	95	38	51
JA6RHH	"	7,434	49	25	34
JA6BWH	"	1,260	24	12	9
JR6IQI	**28**	**4,810**	**59**	**15**	**22**
JH6WHN	"	680	15	8	9
JE6JRY	**21**	**100,293**	**364**	**31**	**70**
JA6YCU	"	24,034	151	25	36
JA6YCL	**14**	**40,080**	**187**	**27**	**53**
JA6BXA	**7**	**100,266**	**368**	**34**	**68**
JE6QMV	"	69,600	303	29	58
JI6DMN	"	1,245	31	8	7
JA6GGD	1.8	98	8	4	3
JH7LVK	**A**	**592,140**	**793**	**107**	**177**
JA7KM	"	67,488	191	65	83
JA7BE	"	29,952	111	44	60
JA7JHT	"	22,784	99	41	48
JA7PCH	"	17,028	100	31	35
JA7ASD	"	15,862	84	36	41
JE7IVP	"	15,622	82	33	40
JH7BMF	"	10,653	91	26	27
JA7AXP	"	8,232	57	26	30
JA7YTM	"	6,532	60	22	24
JH7WKQ	**21**	**69,552**	**329**	**30**	**54**
JA7HTO	"	15,847	113	23	30
JA7FTR	**14**	**195,138**	**644**	**35**	**76**
JA7SSB	"	140,798	458	36	77
JH7IAV	"	48,484	306	25	37
JH7BRG	"	43,788	186	28	54
JH7XGN	"	39,072	199	27	47
JH7MEX	"	37,130	181	27	52
JA7HMZ	**7**	**248,520**	**733**	**35**	**85**
JA7OOQ	3.5	2,660	46	13	15
JA7NI	**1.8**	**5,168**	**64**	**12**	**22**
JA8RWU	**A**	**293,888**	**472**	**125**	**131**
JA8UBV	"	218,655	384	90	125
JA8SW	"	16,093	88	40	37
JA8AJE	"	6,042	50	29	24
JA8AQ	**28**	**1,794**	**26**	**12**	**14**
JH8WJY	**21**	**58,680**	**274**	**31**	**59**
JA8FFM	**14**	**71,246**	**280**	**33**	**65**
JA8EAT	**7**	**84,530**	**298**	**33**	**74**
JA8EJO	"	8,688	81	22	26
JR8JTO	"	4,672	59	16	16
JA8KSD	**3.5**	**17,325**	**140**	**22**	**33**
JA9JFO	**A**	**311,742**	**491**	**102**	**149**
JA9RPU	"	210,900	412	79	111
JA9CWJ	"	29,498	119	45	53
JA9PBZ	"	8,496	59	23	25
JA9LSZ	**21**	**71,915**	**288**	**30**	**65**
JA9CGJ	**A**	**93,970**	**230**	**61**	**99**
JA0BR	"	5,782	54	25	24
JH0XUP	21	1,380	24	10	13
JH0HON	"	828	18	8	10
JA0QNJ	**14**	**70,300**	**282**	**30**	**65**
JA0UMV	**7**	**60,816**	**278**	**31**	**53**
JA0KAZ	"	22,440	104	31	54
JA0UQI	"	1,853	41	10	7
JA0DAI	**3.5**	**14,518**	**114**	**23**	**38**

JORDAN

JY9RL	**A**	**257,244**	**468**	**52**	**142**
JY5DP	14	8,976	93	10	23

KOREA

HL5AP	A	14,396	93	25	36

MONGOLIA

OK1XC/JT	**A**	**256,370**	**831**	**449**	**106**
JT5AA	14	5,440	100	11	18

NEPAL

9N1MM	**A**	**839,105**	**1321**	**78**	**179**

(Opr. K3TW)

PEOPLE'S REP. OF CHINA

BY1QH	**21**	**100,730**	**773**	**21**	**49**

(Opr. K5IID)

SAUDI ARABIA

HZ1HZ	**A**	**1,627,659**	**1554**	**100**	**269**

WEST MALAYSIA

9M2AX	**1.8**	**1,914**	**39**	**9**	**20**

U.S.S.R. (Asiatic)

ASIATIC RUSSIA

RA9FA	**A**	**262,728**	**557**	**47**	**131**
UA9CE	"	228,030	494	46	119
UA9XS	"	190,734	447	41	125
UA9MR	"	153,504	274	84	150
UV9WN	"	93,052	205	51	121
UA9SG	"	41,138	228	16	51
UA9QBT	"	38,232	127	29	79
UA9YAB	"	36,427	189	21	52
UA9AU	"	12,546	64	31	51
UA9CUA	"	4,847	45	10	27
RW9WA	**28**	**13,200**	**112**	**12**	**28**
UA9XHT	**21**	**45,406**	**220**	**22**	**51**
UA9XAB	"	16,308	115	16	38
RA9SUV	"	12,628	109	11	30
RA9XBL	"	3,108	37	8	20
RA9JM	**14**	**249,688**	**835**	**34**	**84**
UA9XR	"	224,927	795	25	76
UA9ACV	"	136,245	565	23	70
UA9LDF	"	124,560	601	24	56
UA9UDN	"	111,945	535	25	60
UA9FAR	**7**	**118,776**	**537**	**21**	**63**
UA9QA	"	58,292	287	23	53
UA9FGJ	"	50,388	269	16	52
UA9CAQ	"	20,108	174	12	32
UA9CBM	**3.5**	**141,232**	**567**	**19**	**72**
UA9SGN	"	89,100	476	12	54
UA9WGT	"	78,263	454	10	51
UA9HFC	"	39,672	258	12	45
UA9SBM	"	30,200	216	9	41
UV9FM	**1.8**	**45,227**	**339**	**10**	**39**
UA9UR	"	34,998	255	16	41
UA9CBO	"	30,753	224	11	40
UA9MS	"	20,923	186	12	37
UA9QDA	"	20,007	190	9	31
UA9CI	"	3,456	108	6	26
UW0LT	**A**	**695,611**	**1133**	**103**	**193**
UA0ABL	"	373,404	960	55	119
UA0QO	"	153,940	525	73	106
UA0FDX	"	80,210	399	62	68
UA0ZZ	"	18,600	229	25	25
UA0SBQ	"	16,653	170	24	37
UA0CM	"	12,480	169	24	28
UA0LGK	"	7,200	222	16	14
UA0JGY	"	6,828	85	23	35
UA0SGJ	"	4,386	61	20	23
UA0CS	"	2,750	99	14	11
UA0BCK	**14**	**79,380**	**376**	**25**	**89**
UA0QGX	"	66,934	285	22	76
UA0JDQ	"	26,944	254	23	41
UZ0AB	"	22,680	170	20	43
UA0LH	**7**	**47,586**	**432**	**26**	**40**
UW0LO	"	16,728	180	21	30
UA0ZDE	"	12,495	176	17	18
UA0SR	"	8,840	123	10	24
UA0QD	**3.5**	**65,331**	**485**	**16**	**45**
UA0ABB	"	38,488	236	17	51
UA0WCL	"	28,080	237	11	37
RA0JD	"	1,207	73	9	8

AZERBAIJAN

UD6DKW	**A**	**120,156**	**374**	**29**	**85**
UD6GF	**21**	**67,320**	**475**	**14**	**41**
RD6DJ	"	17,914	180	14	39
UD6DFF	**14**	**75,568**	**416**	**17**	**51**
UD6DZ	7	231	7	4	7
RD6DAB	**3.5**	**9,152**	**142**	**7**	**19**

GEORGIA

UF6FFF	**A**	**3,068,568**	**2567**	**107**	**329**
UF6FHK	"	38,100	206	21	54
UP3BQ/UF	**21**	**211,120**	**815**	**22**	**69**
UP2BBM /UF	**14**	**213,850**	**819**	**25**	**66**
UP3BA/UF	**7**	**696,134**	**1875**	**32**	**92**
UP2BJK /UF	**3.5**	**339,158**	**1194**	**25**	**76**
UF6VBC	**1.8**	**46,195**	**425**	**7**	**34**
UP2BNA /UF	"	13,913	161	6	25

KAZAKH

UL7TCU	**A**	**264,492**	**564**	**67**	**119**
UL7CEP	"	48,375	185	39	86
RL7LCT	"	6,680	75	11	29
RL7JA	**21**	**46,498**	**272**	**19**	**48**
UL7BBW	"	35,504	216	13	33
UL7BY	**14**	**243,400**	**828**	**29**	**71**
UL7EDR	"	86,100	393	24	58
UL7FCI	"	75,660	442	13	47
UL7CAC	"	33,065	149	30	55
UL7JW	**7**	**156,768**	**702**	**29**	**67**
UL7LDR	"	69,292	395	20	48
UL7BN	"	10,222	90	14	24
RL7GE	"	2,640	53	4	18
UL7BB	**3.5**	**88,726**	**523**	**17**	**57**
RL7QA	"	44,573	353	12	41
RL7ABK	"	5,616	85	7	17
UL7MAN	**1.8**	**52,938**	**393**	**10**	**41**

KIRGHIZ

UM8MBI	21	4,424	68	8	20
UM8BX	**14**	**135,564**	**640**	**24**	**54**
UM8MGO	"	37,114	218	25	52
UM8MIZ	**3.5**	**64,680**	**401**	**15**	**51**
UM8MBA	"	35,729	268	15	42

TADZIK

UJ8JA	**21**	**195,275**	**690**	**26**	**81**
UJ8AQ	**3.5**	**15,662**	**168**	**11**	**30**

TURKOMAN

UH8DC	**A**	**1,308,200**	**1716**	**81**	**229**
RH8AD	"	15,067	92	19	42
UH8EAN	**21**	**23,177**	**199**	**14**	**35**
UH8BO	"	900	20	7	11

UZBEK

UI8IAJ	A	18,972	73	42	61
UI8CAM	"	18,700	190	15	53
UI8CAJ	**21**	**26,542**	**243**	**12**	**34**
UI8IAO	"	14,257	117	19	34
UI8ADR	**14**	**23,550**	**131**	**14**	**36**
UI8AFA	**3.5**	**170,970**	**827**	**21**	**61**

EUROPE

AUSTRIA

OE5KE	**A**	**431,576**	**547**	**73**	**219**
OE3RE	"	158,790	370	48	189
OE3DSA	**3.5**	**128,650**	**1072**	**17**	**66**

BALEARIC ISLANDS

EA6GP	**A**	**86,564**	**442**	**36**	**98**
G6ZY/EA6	**21**	**280,340**	**1362**	**30**	**77**
EA6WX	"	21,492	232	13	41

BELGIUM

ON4GO	**A**	**172,600**	**434**	**56**	**144**
ON6LO	"	16,560	188	14	32
ON4WR	**14**	**144,786**	**598**	**32**	**86**

(Opr. ON5SQ)

ON4XG	"	37,944	304	17	45
ON4ABW	**3.5**	**41,036**	**604**	**11**	**47**

BULGARIA

LZ1KTM	**A**	**319,232**	**855**	**68**	**188**
LZ6KST	"	197,820	732	58	152
LZ1KVF	"	173,989	352	82	175
LZ1BJ	"	169,090	555	50	135
LZ1DD	"	99,821	311	46	137
LZ6BR	"	75,820	305	44	126
LZ2KSU	"	59,072	273	48	94
LZ1WL	"	55,500	244	42	108
LZ6FJ	"	23,688	238	20	74
LZ1BG	"	4,500	39	20	25
LZ2ZA	**28**	**4,662**	**62**	**13**	**29**
LZ1DX	**21**	**62,605**	**377**	**25**	**70**
LZ2RS	"	43,616	273	26	68
LZ2SL	"	6,856	69	14	34
LZ1YJ	**14**	**41,280**	**426**	**16**	**44**
LZ1KDP	**7**	**368,368**	**1652**	**34**	**109**
LZ1VA	"	29,645	227	20	57
LZ6DQ	**3.8**	**82,836**	**886**	**15**	**63**
LZ2AX	"	76,670	749	15	67
LZ2KAC	"	45,375	527	14	61
LZ1IF	"	22,302	485	9	33
LZ1NM	"	6,061	176	7	22

CZECHOSLOVAKIA

OK3CSC	**A**	**2,214,216**	**2261**	**131**	**355**
OK1VD	**"**	**707,168**	**1168**	**90**	**262**
OK2RU	**"**	**619,515**	**978**	**91**	**262**
OK1AMF	**"**	**427,818**	**643**	**97**	**242**
OK1DKW	"	306,504	805	63	195
OK3PQ	"	262,056	554	72	172
OK2EC	"	232,596	443	76	176
OK1BB	"	152,262	340	58	140
OK1EP	"	138,866	311	56	127
OK1MKU	"	129,960	340	56	134
OK3IF	"	123,543	386	40	119
OK2PO	"	122,304	422	51	141
OK3CGI	"	107,670	365	43	142
OK2ABU	"	106,032	527	54	134
OK3CDZ	"	96,640	302	46	114
OK3CEL	"	95,524	477	39	104
OK3FON	"	93,279	262	54	123
OK2AG	"	76,288	203	41	108
OK1MZO	"	75,900	377	34	116
OK1MHI	"	73,216	339	33	110
OK2BTP	"	55,224	291	32	86
OK2BSG	"	52,537	174	42	65
OK3MB	"	51,570	213	43	92
OK1FTW	"	51,546	148	57	85
OK1ALQ	"	50,020	206	43	122
OK1DXW	"	40,400	234	32	93
OK2OVZ	"	39,006	197	21	45
OK2BCZ	"	38,870	266	30	100
OK3CWF	"	35,052	381	22	70
OK1DZJ	"	29,767	109	42	61
OK3THM	"	29,000	103	41	59
OK1DVK	"	28,574	121	39	118
OK1FCA	"	24,948	171	48	51
OK2BCI	"	24,514	82	44	75
OK1ATX	"	20,856	89	36	52
OK3CMZ	"	20,273	83	38	59
OK1AWC	"	15,745	96	26	41
OK3KJJ	"	14,694	147	13	43
OK1DGN	"	14,564	144	22	45
OK3ZAB	"	14,272	195	32	32
OK3TRJ	"	13,857	56	41	52
OK1DZL	"	13,680	121	23	34
OK3TUM	"	12,642	258	9	40
OK2KHD	"	10,998	59	31	47
OK2KNJ	"	8,694	111	20	43
OK3CTX	"	6,384	105	15	41
OK3ZWX	"	5,841	37	25	34
OK1DIS	"	5,661	104	14	37
OK3CEG	"	4,452	40	23	30
OK1AOU	"	2,852	40	12	19
OK3CSQ	"	2,442	20	17	20
OK1AEH	"	2,211	42	13	28
OK1AIA	"	1,836	49	8	28
OK1XW	**28**	**10,106**	**96**	**18**	**44**
OK1AJN	"	2,700	38	12	24
OK3IR	**21**	**37,980**	**185**	**28**	**62**
OK2QX	"	13,266	94	20	47
OK2BHQ	"	11,438	100	15	28
OK1AIR	"	6,380	70	16	28
OK2BHV	**14**	**280,028**	**1061**	**34**	**137**
OK2PFQ	"	114,885	520	31	84
OK1FV	"	97,236	403	31	80
OK2BGR	"	88,992	431	24	72
OK2BNX	"	84,048	377	31	71
OK1AYQ	"	35,535	260	20	49
OK1MNV	"	21,100	217	13	37
OK2PAU	"	19,580	177	16	28
OK3CAB	"	15,394	212	11	32
OK3CAE	"	15,150	180	14	36
OK3CPY	"	6,776	109	13	31
OK1DXK	"	4,826	63	12	26
OK1MIZ	"	2,100	78	8	13
OK1XM	"	175	9	4	3
OK1MNW	**7**	**57,133**	**378**	**21**	**76**
OK1MAW	"	54,600	323	28	77
OK2PCF	"	40,000	335	18	62
OK3CAL	"	26,569	197	13	50
OK1FBH	"	14,272	149	16	48
OK2PFP	"	4,832	137	12	20
OK1PFM	"	3,652	41	11	33
OK1AOR	"	1,305	23	11	18
OK3ZBU	**3.5**	**79,475**	**798**	**11**	**76**
OK3CPW	"	40,330	414	14	60
OK1FKM	"	39,675	433	13	56
OK1XJ	"	31,030	389	14	44
OK1ABP	"	26,254	311	14	53
OK1FKW	"	21,460	326	12	46
OK1DQT	"	20,382	106	18	68
OK2HI	"	19,975	202	12	45
OK2PFX	"	17,094	156	13	53
OK2PKY	"	16,254	83	7	27
OK3CDN	"	13,908	201	12	45
OK1JST	"	13,000	230	10	42
OK1AWF	"	12,250	238	9	41
OK2PKL	"	2,490	77	6	24
OK1DTO	"	900	32	6	19
OK2SMO	"	416	27	5	11
OK1KOP	"	378	27	4	10
OK3CWQ	**1.8**	**32,391**	**452**	**11**	**48**
OK1KPU	**"**	**22,200**	**304**	**15**	**45**
OK3TPV	**"**	**18,582**	**277**	**11**	**46**
OK1DRU/P	"	18,207	302	9	42
OK2BVG	"	17,248	248	11	45
OK2BWM	"	14,999	230	11	42
OL7BLO	"	12,328	234	8	38
OK1DFF	"	10,800	228	10	38
OK2PAY	"	10,793	254	7	36
OK2PGG	"	9,034	186	8	31
OL5BPH	"	9,009	223	6	33
OK1FZM	"	8,342	173	7	36
OL8CTA	"	6,273	143	7	34
OK1HBT	"	5,371	119	8	33
OK2PZZ	"	4,788	122	8	28
OL9CRF	"	4,000	125	6	26
OK3CSQ	"	3,740	57	11	33
OL6BNB	"	3,616	112	5	27
OK3TEW	"	3,335	119	5	24
OL9CSN	"	2,550	116	5	20
OK1MNI	"	2,378	84	5	24
OL6BNW	"	2,079	76	5	22
OK1AIJ	"	1,392	59	4	20
OL8CSQ	"	1,248	23	9	17
OK1HCG	"	1,104	45	4	20
OK1KZD/P	"	768	33	4	20
OK1MSB	"	720	43	3	17
OL5BOP	"	420	30	2	13
OK1JIK	"	378	27	2	12
OL9CQW	"	374	36	3	14
OL5VGP	"	294	29	2	12
OK3YFM	"	154	14	3	8

DENMARK

OZ7YY	**A**	**1,219,056**	**1511**	**111**	**325**
OZ8CT	"	258,216	820	49	154
OZ1FAO	"	191,505	438	65	190
OZ1DPW	"	40,320	165	39	89
OZ5WQ	"	20,868	140	21	53
OZ1NF	"	16,147	152	17	50
OZ4CG	"	16,048	140	21	47
OZ4OC	"	8,034	57	29	49
OZ9MM	"	7,480	97	19	36
OZ2RH	"	5,014	40	16	30
OZ1DKG	"	960	38	4	20
OZ1DTF	**14**	**67,940**	**334**	**23**	**63**
OZ1IOC	"	5,379	88	10	23
OZ1TL	**7**	**101,985**	**281**	**57**	**138**
OZ7BG	"	18,018	135	17	60
OZ1FTE	**3.5**	**43,334**	**270**	**23**	**71**
OZ3QN	"	32,955	417	13	52
OZ2E	"	16,112	101	15	61
OZ1LO	**1.8**	**63,770**	**692**	**13**	**57**
OZ7JZ	"	10,500	178	10	40

ENGLAND

G3MXJ	**A**	**1,641,150**	**1624**	**123**	**327**
G4BUO	"	1,521,674	1540	114	337
G4OBK	"	755,425	1275	78	257
G3UFY	"	527,672	890	77	207
G3NKS	"	344,148	802	60	181
G3ESF	"	298,410	695	61	184
G3GRS	"	200,152	694	55	142
GB8WR	"	152,092	450	50	138
G3SJX	"	115,364	294	63	128
G4ZFE	"	105,696	392	41	103
G3PFL	"	94,608	517	44	100
G4OKN	"	78,225	359	41	108
G3GGS	"	57,000	197	39	86
G4ZME	"	6,476	120	24	47
G8AEV	**28**	**3,150**	**34**	**15**	**27**
G3UFY	"	910	14	12	14
G3HCT	**21**	**205,288**	**685**	**31**	**103**
G3LNS	"	188,622	666	32	94
G4RKK	"	73,332	355	24	73
G6QQ	"	19,110	169	13	36
G4CP	**14**	**204,972**	**812**	**33**	**91**
G3RZP	**"**	**203,118**	**1000**	**26**	**71**
G3FXB	**7**	**320,688**	**1197**	**31**	**105**
G4CNY	"	222,138	930	31	98
G3YDV	"	52,564	584	26	42
G4RFE	"	19,256	332	11	47
G4MPK	"	6,720	119	8	34
G4FAM	**3.5**	**142,310**	**910**	**23**	**84**
G4WVG	"	30,336	400	13	51
G4ARI	"	9,844	188	8	38
GB2RIP	"	1,813	40	7	30
G3XTT	**1.8**	**39,270**	**403**	**12**	**54**
G4VGO	"	29,280	355	12	48
G3BDQ	"	6,380	96	10	34

FAROES ISLANDS

OY2J	**A**	**778,533**	**1892**	**73**	**210**

FEDERAL REP. OF GERMANY

DL6FBL	**A**	**2,600,955**	**2427**	**129**	**354**
DL4BBO	**"**	**1,182,564**	**1802**	**82**	**239**
DK2OY	**"**	**590,605**	**1037**	**88**	**247**
DJ1XP	"	542,031	701	87	284
DK6NP	"	457,548	581	100	264
DJ6QT	"	451,328	729	84	260
DJ2YA	"	434,334	563	104	278
DL3LU	"	385,250	578	93	242
DL1JF	"	307,506	466	87	231
DL8KJ	"	304,038	525	72	191
DL1TH	"	233,085	580	61	144
DK9IP	"	219,962	504	56	149
DL9EY	"	201,160	496	59	129
DK5QK	"	188,520	512	63	151
DF1LX	"	178,529	488	49	148
DL5ZBA	"	164,000	533	56	144

(Opr. DK7ZT)

DJ1YH	"	161,229	341	68	173
DF3OG	"	144,760	305	66	154
DF5BM/P	"	141,778	422	47	135
DL3NAA/A	"	133,284	516	46	128
DL1ZQ	"	124,740	343	40	122
DL6QW	"	111,600	252	60	140
DF4EX/A	"	106,175	340	46	109
DL1SBR	"	98,252	372	45	109
DL2JX	"	78,000	266	40	90
DJ2TI	"	77,605	252	60	127
DF1SD	"	49,815	192	44	91
DL1ES	"	42,262	179	34	79

DL1HBT	"	35,695	158	34	87
DJ0CP	"	35,316	164	30	73
DJ0KE	"	33,756	196	30	86
DJ9TQ	"	33,561	106	41	72
DL2AW	"	31,863	112	44	85
DJ2UU	"	29,960	186	31	76
DF3QN	"	27,548	177	28	69
DJ9MH	"	25,397	159	31	78
DF2HL	"	15,170	100	27	55
DL4YAO	"	8,450	121	12	38
DL4NEV	"	7,897	90	17	36
DL8IG	"	7,600	65	20	30
DL7YS	"	4,720	61	20	39
DL8AK	"	1,290	23	13	17
DJ7CY	"	384	8	8	8
DL4NAC	"	323	9	8	9
DJ7XG	**28**	**3,950**	**36**	**13**	**37**
DJ1ZU	"	2,139	30	10	21
DK4JN	**21**	**103,168**	**413**	**28**	**96**
DL1RB	"	69,722	316	26	81
DK3GI	**14**	**822,024**	**2006**	**39**	**129**
DJ8FR	"	153,341	670	29	84
DL0LR	"	74,700	423	25	65
DL3ZBJ	"	71,712	432	24	59
DL8NU	"	51,704	267	25	67
DJ0YI	"	24,885	200	17	46
DL9MBZ	"	19,888	231	12	32
DF4QW	"	10,725	125	14	25
DL1JC	"	3,164	46	11	17
DJ5AV	"	414	13	7	11
DL2HBX	**7**	**124,875**	**643**	**30**	**95**
DL6SN	"	47,190	200	29	76
DL3NCI	"	23,904	174	18	65
DL1MCD	"	15,960	250	13	43
DL2ZA	"	1,830	58	7	23
DJ5KX	"	1,824	62	6	26
DJ5JH	**3.5**	**52,955**	**395**	**19**	**70**
DL3HAH	"	44,631	461	15	66
DL3DD	"	13,949	251	9	44
DK3FD	"	12,374	245	11	35
DF3OL	"	10,432	97	13	51
DJ5GG	"	5,980	83	12	40
DJ3TF	"	5,356	64	14	38
DK8NG	**1.8**	**69,012**	**626**	**16**	**65**
DF2UU	"	23,817	409	10	41
DJ2YE	"	667	28	4	19

FINLAND

OH6YF	**A**	**928,050**	**1471**	**89**	**256**
OH2PM	**"**	**722,420**	**1112**	**99**	**291**
OH2BDP	"	492,733	692	99	274
OH7EU	"	276,100	526	79	196
OH2LU	"	195,890	475	59	131
OH6NIO	"	172,956	479	58	145
OH6MM	"	128,000	435	48	152
OH2BKF	"	118,585	281	56	129
OH2ZAR	"	114,444	420	43	110
OH6AK	"	96,195	583	45	120
			(Opr. OH6RC)		
OH3NM	"	92,964	294	45	138
OH5PT	"	85,629	222	68	151
OH2EJ	"	57,377	164	57	130
OH2BZD	"	54,981	191	42	107
OH6XL	"	43,750	211	35	90
OH7NW	"	41,097	212	33	100
OH7YN	"	37,100	257	29	71
OH2BPA	"	26,400	160	32	88
OH7QR	"	21,182	123	26	63
OH9TD	"	16,400	149	18	62
OH5MX	"	13,916	120	21	77
OH3WS	"	11,979	72	33	66
OH1PY	"	5,280	45	19	41
OH3MC	"	4,933	100	30	52
OH3MC	"	4,933	100	30	52
OH9PN	"	2,438	34	15	31
OH2BNS	"	792	15	9	15
OH3TY	**28**	**10,660**	**97**	**18**	**47**
OH1ZAA	"	2,992	74	9	25
OH2AV	**21**	**113,918**	**518**	**28**	**75**
OH2BCI	"	69,324	288	29	80
OH2BUU	"	11,032	103	17	39
OH8LC	"	7,181	107	10	33
OH8PF	**14**	**616,864**	**1847**	**37**	**111**
OH3BU	"	67,158	400	25	66
OH6NEX	"	32,513	402	14	47
OH2BCD	"	28,083	210	20	49
OH6NEQ	"	26,220	262	15	42
OH7NM	"	16,936	142	19	54
OH3RO	"	13,888	151	15	41
OH3MP	"	11,600	160	17	41
OH8OB	"	10,017	109	14	39
OH2DE	"	3,560	49	13	27
OH3AC	"	12	2	2	2
OH7AA	**7**	**206,720**	**856**	**34**	**102**
			(Opr. OH7JR)		
OH2HE	"	152,096	889	30	82
OH1HD	"	14,734	240	12	41
OH8TU	"	14,304	252	12	36
OH3TQ	"	13,578	96	22	51
OH1UR	"	120	8	5	7
OH3RF	**3.5**	**62,122**	**528**	**20**	**69**
OH6UC	"	5,668	76	11	41
OH2BBF	**1.8**	**15,550**	**250**	**9**	**41**

FRANCE

F6FYA	**A**	**1,477,264**	**1561**	**69**	**185**
FD1JCB	A	557,331	1111	74	205
F6HWM	"	136,095	265	66	145
F6DYX	"	126,270	525	47	106
FE5AH	"	117,390	510	32	98
FD1LCY	"	105,264	312	47	106
F9BB	"	100,812	272	51	135
F6IJA	"	87,373	300	47	96
F6GYU	"	51,212	330	31	93
F6CXL	"	23,987	190	19	38
FD1JDG	"	5,355	85	17	46
F6CCI	"	3,434	50	10	24
FD1LBG	"	494	15	7	12
F6EPQ	**21**	**27,719**	**238**	**21**	**38**
F9DK	**14**	**39,424**	**311**	**21**	**43**
FV6NDX	**7**	**214,760**	**983**	**30**	**88**
			(Opr. F6BBJ)		
F3JL	**3.5**	**51,353**	**539**	**12**	**44**
F6ENV	"	17,212	196	15	57
F6EPO	**1.8**	**3,604**	**97**	**5**	**29**
F3AT	"	1,953	54	5	26
F2VO	"	1,850	69	4	21
F8TQ	"	665	35	2	17

GERMAN DEMOCRATIC REP.

Y24UK	**A**	**2,459,772**	**2691**	**116**	**338**
Y78UL	**"**	**402,840**	**907**	**61**	**209**
Y44UI	**"**	**191,490**	**566**	**52**	**143**
Y39SH	"	183,150	633	66	143
Y54UE	"	183,048	704	51	123
Y25FF/A	"	180,804	657	41	142
Y53YN/P	"	149,547	320	68	169
Y28XL/A	"	141,600	568	45	132
Y49RF	"	125,640	455	52	128
Y39UL	"	106,080	503	45	111
Y22DK/A	"	86,040	304	53	127
Y53XN/P	"	81,613	313	51	80
Y36YM	"	81,585	310	47	100
Y56VM	"	81,400	307	41	107
Y55TJ	"	71,568	276	39	103
Y53ED	"	68,400	205	44	107
Y23CM	"	63,036	218	36	117
Y22WF	"	62,016	214	40	96
Y24SK/A	"	60,840	231	44	112
Y51XH	"	59,220	275	41	100
Y25XG/A	"	57,921	190	41	88
Y42HA	"	57,078	266	34	92
Y48YN	"	52,650	198	39	96
Y25TG	"	51,660	206	30	93
Y21RO	"	48,708	214	40	68
Y23UL	"	46,599	186	39	108
Y22UB	"	42,000	188	44	96
Y55VJ	"	41,952	154	42	96
Y43VL	"	40,690	209	33	97
Y33ON	"	40,641	407	23	46
Y21UL	"	34,013	194	32	81
Y32VN	"	33,165	196	31	68
Y58ZA					
/Y31SC	"	32,896	125	42	96
Y52TE	"	32,258	123	41	86
Y26WL/A	"	30,988	138	37	85
Y24YH	"	27,946	134	29	60
Y31NJ	"	27,405	133	35	70
Y22GC	"	26,967	110	35	66
Y26WM	"	26,544	115	41	71
Y43VA	"	25,764	114	41	72
Y22HF	"	25,410	149	40	70
Y27BN	"	23,735	181	26	75
Y67UL	"	23,288	171	27	55
Y37ZK	"	21,252	157	65	127
Y25TM/A	"	19,000	89	32	68
Y24HB	"	15,960	163	22	62
Y37WB	"	15,912	88	27	51
Y24GB/A	"	15,834	74	34	54
Y21GO	"	14,694	103	22	40
Y25JA/A	"	10,720	100	23	45
Y37WK	"	10,586	112	21	58
Y31TM	"	10,320	69	24	56
Y31ON	"	9,792	61	27	45
Y36SG	"	9,570	51	28	38
Y22YE	"	9,240	71	27	50
Y59ZF	"	8,905	106	20	45
Y38ZM	"	8,384	58	22	42
Y33TB	"	8,268	117	14	39
Y27AL/A	"	8,211	78	23	46
Y26LG	"	7,906	51	22	37
Y53XM	"	6,600	117	12	43
Y66RL	"	4,727	55	12	17
Y24SG	"	4,600	40	16	30
Y37RG	"	3,910	52	19	27
Y23VB	"	3,760	30	19	28
Y22LE	"	2,666	38	16	27
Y72VL	"	2,436	45	13	29
Y51TO	"	2,145	29	14	19
Y23WO	"	1,530	36	10	20
Y54WM/P	"	1,500	34	12	18
Y73XH	"	1,400	26	12	13
Y24VF	"	1,178	30	8	23
Y48ZF	"	792	21	12	12
Y31SJ	"	588	11	10	11
Y37ZE	**21**	**47,658**	**210**	**25**	**69**
Y23JA	"	11,316	108	14	32
Y87VL	"	8,690	67	16	39
Y38ZB	"	6,392	72	16	31
Y82ML	"	3,944	60	8	21
Y57ZA/P	"	3,120	34	16	24
Y21EA	"	2,106	30	11	16
Y32KE	**14**	**155,880**	**629**	**31**	**89**
Y23RJ	"	23,744	188	20	44
Y51XE	"	22,338	177	18	33
Y42VG	"	21,229	141	22	49
Y21FC/A	"	20,865	176	18	47
Y23ZF	"	11,760	108	18	42
Y27GL	"	6,650	80	10	25
Y66YF	"	5,425	80	10	21
Y21FL	"	3,605	67	9	26
Y23JN	"	1,344	30	9	16
Y23BF	"	1,248	18	10	16
Y24UA	"	798	31	6	15
Y23CJ	"	648	26	5	4
Y92ZL	"	594	27	7	11
Y35SA	"	110	11	3	7
Y26SO	**7**	**18,410**	**207**	**16**	**54**
Y31PA	"	5,822	128	9	32
Y32EE	"	3,815	59	10	25
Y37XO	"	2,975	80	8	27
Y25SA/A	"	2,448	52	7	27
Y24DG	"	1,710	37	9	29
Y24OL	"	1,540	51	6	22
Y36VM	"	1,280	28	9	23
Y21CL	"	378	26	6	8
Y33UB	"	266	9	6	8
Y49ZL	"	15	3	2	3

GIBRALTAR

ZB2X	**A**	**3,796,480**	**3507**	**126**	**386**
			(Opr. OH2KI)		
ZB2EO	**7**	**70,073**	**419**	**20**	**59**

GREECE

SV1RP /SV7	**3.5**	**77,832**	**930**	**15**	**57**
SV8AA	**1.8**	**1,475**	**57**	**4**	**21**

HUNGARY

HA8MM	**A**	**1,771,889**	**2057**	**130**	**379**
HA7UI	"	459,020	939	80	196
HA8LKC	"	310,942	701	74	200
HA5KF	"	240,679	592	62	167
HA7KLJ	"	149,039	539	51	136
HA4XX	"	123,710	445	46	132
HA8HG	"	99,180	368	52	122
HA6IAM	"	81,315	445	34	105
HA8HH	"	64,713	407	36	75
HA9TT	"	57,344	286	38	90
HA3IS	"	19,110	137	34	64
HA3GJ	**28**	**5,734**	**72**	**13**	**34**
HA3GQ	"	1,836	27	12	22
HA3IU	"	587	15	7	10
HA8DV	**21**	**75,500**	**326**	**27**	**79**
HA4YO	"	26,465	157	23	44
HA8CH	"	15,340	139	16	36
HA1SE	"	14,994	92	22	41
HA3FL	"	13,140	103	18	42
HA4YG	"	8,316	80	14	28
HA8VK	**14**	**117,660**	**558**	**28**	**78**
HA5HH	"	75,690	403	22	68
HA2UD	"	63,341	346	30	67
HA8AT	"	15,827	174	15	34
HA2MC	"	4,194	100	6	30
HA9RE	**7**	**277,350**	**1335**	**33**	**96**
HA0DD	"	40,836	316	17	65
HA7WJ	"	38,970	202	25	65
HA8KWG	**3.5**	**99,544**	**863**	**19**	**73**
HA6NL	**"**	**93,544**	**859**	**15**	**73**
HA8ES	"	27,782	416	12	46
HA1RR	"	26,040	414	11	44
HA6VA	"	25,901	288	12	47
HA3OD	"	16,072	292	9	40
HA8CQ	"	7,740	143	9	36
HA8UB	**1.8**	**20,531**	**382**	**9**	**40**

ICELAND

TF3SD	**A**	**33,570**	**154**	**24**	**66**
TF1PS	"	27,783	178	22	41

IRELAND

EI4DW	**A**	**320,724**	**834**	**61**	**175**
EI3DP	**21**	**94,164**	**607**	**20**	**64**
EI1DH	"	85,624	544	26	66

ISLE OF MAN

GD8AVF	**A**	**49,816**	**224**	**31**	**73**

ITALY

I8UZF	**A**	**244,114**	**539**	**64**	**165**
IK0FEC	"	51,388	208	32	84
IK6ASR	"	45,120	159	43	77
IK1ICC	**28**	**6,930**	**78**	**18**	**37**
IO3JSS	**21**	**279,524**	**930**	**34**	**100**
IK2DVG	"	278,640	931	34	101
I1KN	"	99,636	401	28	86
			(Opr. IK5AFR)		
I1ZEU	**14**	**281,988**	**1240**	**29**	**79**
I7PXV	"	106,820	671	25	73
I1JDP	"	51,887	322	23	66
I4IND	**7**	**553,632**	**1845**	**34**	**113**
I5MPN	"	496,546	1637	37	109
I1XSG	"	121,128	868	21	82
IO7LMR	"	67,947	668	18	53
IO2UIY	**1.8**	**82,377**	**796**	**15**	**66**
IY4FGM	"	46,565	608	13	54
			(Opr. I4IKW)		
IO0KHP	"	3,920	94	8	32

NETHERLANDS

PA8XPQ	**A**	**350,238**	**778**	**70**	**199**
PA3CWL	"	175,908	609	56	158
PA3CXC	"	125,952	394	49	115
PA0GT	"	104,705	240	54	151
PA0UV	"	97,446	343	45	104
PA3ACC	"	11,673	150	29	66
PA3BNH	"	5,313	100	8	25
PA3AMA	"	5,866	150	23	50
PA3DKX	**14**	**29,749**	**192**	**18**	**53**
PA0PLN	"	6,630	90	13	26
PA3BNT	**3.5**	**12,000**	**137**	**14**	**46**

NORTHERN IRELAND

GI4BBV	**7**	**43,946**	**331**	**18**	**68**

NORWAY

LA9VDA	**A**	**38,412**	**220**	**40**	**92**
LA2HFA	"	11,700	101	23	55
LA8LA	"	7,614	56	20	34
LA7SI	"	5,500	42	18	37
LA8CJ	"	4,902	40	19	24
LA2OG	"	847	27	4	7
LA7MFA	**14**	**50,224**	**335**	**24**	**62**
LA1HCA	"	5,053	72	12	19
LA8XM	**7**	**66,056**	**718**	**22**	**70**
LA8WG	"	13,113	236	11	36

POLAND

SP9DWT	**A**	**268,814**	**701**	**66**	**167**
SP3HC	"	182,320	597	52	160
SP9DBA	"	148,452	540	55	123
SP9HWN	"	136,151	450	48	123
SP3BEJ	"	114,975	363	44	131
SP9AKD	"	112,077	411	47	142
SP3LPR	"	111,132	402	51	145
SP9BBH	"	107,070	381	41	125
SP6DVP	"	75,012	321	39	102
SP8AG	"	75,120	272	36	104
SP9KUZ	"	25,186	215	25	73
SP9EQS	"	24,402	217	21	62
SP6KYA	"	13,260	206	15	45
SP9ZD	"	12,406	77	30	44
SP3CDQ	"	10,545	63	23	34
SP5LM	"	9,130	66	21	34
SP9DAE	"	8,804	62	29	42
SP3XR	"	8,493	79	22	35
SP4AWE	"	5,465	170	15	24
SP6BFK	"	3,480	43	14	26
SP6CIK	**28**	**3,145**	**47**	**12**	**25**
SP5DIR	**21**	**39,060**	**179**	**25**	**65**
SP2BMX	"	22,420	149	22	54
SP9KZ	"	21,303	107	22	59
SP7NJX	"	14,457	93	18	43
SP9ENV	"	11,285	90	17	44
SP4EEZ	"	7,650	70	16	34
SP3IBS	"	740	16	9	11
SP3RBI	**14**	**232,596**	**793**	**34**	**92**
SP3HYK	"	44,712	259	24	57
SP3BGD	"	32,368	226	20	48
SP9PRH	"	35,960	235	17	45
SP2HBP	"	15,533	172	13	36
SP5GBJ	"	14,760	129	17	28
SP4JCQ	"	8,505	106	10	25
SP7MGD	"	4,785	79	8	21
SP3AZO	"	2,050	42	9	16
SP2ZFJ	**7**	**133,027**	**537**	**33**	**104**
SP5BWO	"	85,260	432	29	87
SP3CCT	"	73,185	469	26	79
SP5JTR	"	68,565	422	25	80
SP9CTW	"	53,636	300	27	79
SP4DGN	"	34,580	239	23	68
SP8LBK/8	"	32,844	233	20	64
SP8TQ	"	22,470	226	14	56
SP3GVX	"	9,588	157	10	41
SP6AUI	"	6,109	125	8	33
SP9BPF	"	3,552	38	12	35
SP3IOE	"	2,610	32	12	18
SP3GEM	**3.5**	**266,376**	**1201**	**34**	**98**
SP5CTY	"	100,980	736	21	78
SP6CZ/6	"	86,490	724	18	72
SP8MJ	"	25,251	283	10	47
SP9NSV	"	12,985	135	10	39
SP9IGY	"	11,115	226	10	35
SP7NMW	"	6,172	195	5	27
SP5SA	"	5,016	92	12	32
SP6KJO	"	2,552	88	5	24
SP9KUE	"	2,278	61	7	27
SP3DVF	"	1,728	72	4	20
SP3BQD	**1.8**	**70,468**	**629**	**17**	**62**
SP9GDB	"	22,660	371	11	44
SP9DH	"	19,950	366	8	42
SP5INQ	"	16,800	274	10	40
SP5GH	"	8,364	67	9	42
SP9AOA	"	4,810	99	8	32
SP5GRU	"	714	35	3	18

PORTUGAL

CT1CHU	A	17,911	147	30	51
CT1QF	"	10,224	89	17	31
CT1CWT	**21**	**16,456**	**182**	**12**	**32**
CT1YH	**7**	**41,096**	**262**	**19**	**69**
CT1BQH	"	1,989	55	5	8
CT5AT	**3.5**	**295,464**	**1500**	**24**	**80**

ROMANIA

YO9CIB	**A**	**247,572**	**779**	**46**	**160**
YO2BP	"	233,928	616	63	165
YO3NL	"	188,694	711	55	143
YO3AAQ	"	66,967	228	50	117
YO2GZ	"	61,362	283	31	95
YO6EZ	"	60,114	369	20	109
YO7BGA	"	20,330	88	39	56
YO2BEA	"	15,275	109	23	42
YO6BQT	"	8,215	125	20	43
YO7DEO	"	4,576	40	19	33
YO8CEZ	21	10,320	99	19	41
YO5ALI	14	10,863	100	13	38
YO9AHX	"	10,065	147	13	42
YO8DOH	**7**	**45,765**	**426**	**17**	**64**
YO9YE	"	31,284	330	15	51
YO8CDQ	"	30,240	299	17	55
YO4BBH	"	7,038	120	11	35
YO6AAD	"	1,593	31	8	19
YO2DFA	**3.5**	**6,355**	**200**	**7**	**24**
YO8BDA	"	5,960	131	8	40
YO6BTY	"	224	28	3	5

SARDINIA

IS0GMH	**A**	**34,128**	**255**	**22**	**57**

SCOTLAND

GM3CFS	**A**	**140,139**	**469**	**48**	**159**
GM4MFL	"	70,325	325	42	103
GM8SQ	"	26,598	171	22	56
GM3RAO	**14**	**38,772**	**432**	**14**	**40**
GM3ITN	**1.8**	**10,260**	**127**	**11**	**45**

SPAIN

EH2IA	**A**	**2,137,959**	**2540**	**110**	**307**
EA3FAA	"	678,194	1276	87	232
ED1CI	"	613,991	1110	63	176
			(Opr. EA1CIM)		
EA5CF	"	511,791	835	89	264
EA7AAW	"	262,010	742	55	142
EA7AZA	"	165,615	419	53	130
EA3DBO	"	122,112	347	47	145
EA7XC	"	91,350	279	50	100
EA5CKP	"	62,073	205	42	79
EA5FMJ	"	48,361	177	45	92
EA3BOW	"	45,990	249	33	93
EA1EVZ	"	32,118	189	28	73
EA2CR	"	13,157	128	29	54
EC5BXX	"	5,796	100	15	27
EA3BU	"	5,181	75	10	23
EA7FDW	**28**	**5,110**	**64**	**14**	**21**
EA1BGT	"	2,328	68	7	17
EA1SQ	"	1,824	27	10	22
EA7FVI	"	234	7	6	7
EA4CPI	**21**	**22,400**	**149**	**15**	**49**
EA4CQJ	"	13,806	95	15	44
ED5EXI	**14**	**128,644**	**669**	**30**	**86**
EA4AYX	"	8,532	70	18	36
EA2BLH	**7**	**22,620**	**171**	**14**	**51**
EA2AX	"	13,260	182	12	39
EA7DMF	**1.8**	**10,648**	**211**	**9**	**35**

SWEDEN

SM8AJU	**A**	**567,360**	**809**	**93**	**267**
SM5AOE	**"**	**451,513**	**858**	**81**	**212**
SL0FRO	"	431,824	1090	67	207
			(Opr. SM0CCE)		
SM7WT	"	251,828	353	90	224
SM0BDS	"	174,246	427	61	165
SM2CDF	"	58,658	220	27	184
SM0COP	"	41,778	172	35	64
SM5BAX	"	40,080	177	40	80
SM3CVM	"	34,574	155	31	87
SM5RE	"	31,395	198	31	74
SM5APS	"	17,300	60	41	59
SM0CGO	"	10,934	100	24	53
SM5CSS	"	10,368	52	31	41
SM7CNA	"	8,493	64	36	57
SM7LAZ	"	3,360	50	16	24
SM7FHJ	"	2,294	24	14	23
SM5CAK	"	1,798	24	12	17
SM3RAB	"	1,008	22	9	9
SM8KV/8	**21**	**77,140**	**368**	**31**	**85**
SM6LWH	"	12,240	105	20	40
SM6PVB	"	1,920	43	11	19
SM4GNU	**14**	**241,808**	**926**	**33**	**94**
SK0HB	"	132,800	731	27	73
			(Opr. SM0NBC)		
SM6BJI	"	105,455	492	31	84
SM0TW	"	85,749	463	27	74
SM5CLE	"	73,429	400	28	69
SM2DQS	"	69,642	418	21	52
SM0LPC	"	29,792	157	25	51
SM7TV	"	15,052	182	14	39
SM6JY	"	13,884	172	15	37
SM0NVQ	"	5,461	96	14	29
SM0BTS	"	441	21	4	3
SM7OEL	**7**	**41,472**	**339**	**20**	**61**
SM4CMG	"	6,250	125	15	35
SM6DYK	**3.5**	**63,518**	**540**	**24**	**64**
SM6BGG	"	30,793	163	20	63
SM6BGA	"	7,238	62	13	34

SWITZERLAND

HB9AGA	**A**	**653,338**	**1173**	**86**	**236**
HB9CXR	"	200,064	506	64	128
HB9CRV	"	123,150	393	46	104
HB9DDZ	"	116,021	345	50	131
HB9CVO	"	69,662	259	40	82
HB9DFY	"	60,900	200	31	109
HB9CJG	**21**	**75,840**	**365**	**27**	**69**

HB9DX	"	15,732	70	25	67
HB9AGH	**7**	**41,606**	**291**	**17**	**54**
HB9APJ	"	32,040	231	18	54
HB9BOU	"	26,700	278	16	44
HB9AMO	**1.8**	**87,204**	**748**	**16**	**62**

WALES

GW3JI	**A**	**219,596**	**651**	**48**	**158**
GW4RHW	"	101,830	317	35	135
GW3KYA	**21**	**23,816**	**340**	**12**	**40**

YUGOSLAVIA

YU3AI	**A**	**1,638,887**	**1959**	**80**	**321**
YU3EA	"	1,308,801	1419	123	358
YT2O	"	909,924	1199	101	296
			(Opr. YU2OB)		
YU3MA	"	752,246	1110	97	244
YU7BW	"	387,236	819	66	196
YT7KW	"	282,500	655	65	185
YU7SF	"	261,426	670	63	170
YU7MGU	"	55,200	213	49	101
YU7ORQ	"	49,446	227	41	93
YU7NH	"	47,238	202	35	101
YU4TR	"	36,058	203	40	81
YU7NH	"	13,797	134	20	53
YU3ER	**28**	**16,590**	**105**	**23**	**56**
YU3BO	**21**	**266,000**	**859**	**36**	**104**
4N4A	**"**	**189,428**	**568**	**34**	**108**
			(Opr. YU4EU)		
4N3E	"	157,316	485	33	101
			(Opr. YT3NA)		
YU2AYZ	"	116,640	513	26	82
YU2FB	"	35,673	194	27	64
YT3AA	14	644,171	1767	39	118
4N2E	"	563,536	1619	38	120
			(Opr. YU2RA)		
YT3L	"	526,864	1529	37	112
			(Opr. YU3BC)		
4N7N	"	313,398	1123	36	102
			(Opr. YT7WW)		
YU2ACF	"	75,952	423	26	75
4N1C	**7**	**395,388**	**1993**	**29**	**97**
			(Opr. YU1SA)		
YU7GMN	"	150,529	923	27	82
			(Opr. YU7RS606)		
4N7ZZ	"	58,218	364	23	70
YU3QI	"	41,990	442	21	74
YU7XX	"	33,345	265	19	54
YU7FN	**3.5**	**31,125**	**309**	**15**	**45**
YU3WZ	"	23,814	502	11	38
YU2UX	"	7,600	187	7	33
YU3MM	**1.8**	**39,329**	**483**	**13**	**54**
YU2TW	"	34,472	422	12	50

U.S.S.R. (EUROPEAN)

BYELO-RUSSIA

UC2OT	**A**	**189,196**	**489**	**70**	**163**
UC2AIU	"	180,385	532	55	160
UC2ACZ	"	134,321	378	61	158
UC2ADM	"	93,922	211	43	99
RC2AR	"	77,715	347	42	115
UC2AS	"	77,634	295	46	125
UC2ACT	"	24,528	168	23	61
UC2SKC	**21**	**62,424**	**285**	**26**	**82**
UC2AA	**14**	**374,688**	**1264**	**34**	**110**
UC2WAO	**7**	**16,794**	**266**	**9**	**45**
UC2CAS	"	8,379	92	15	42
UC2WG	"	6,806	141	9	32
UC2OAR	**3.5**	**67,752**	**778**	**14**	**58**
RC2AB	"	63,640	635	15	59
UC2SM	"	41,986	516	12	57
UC2OBB	"	29,733	472	10	43
UC2WAZ	**1.8**	**27,840**	**345**	**12**	**48**
UA3LEO /UC	"	24,360	371	10	46
UC2WO	"	23,688	345	11	45
UC2AAD	"	8,890	215	7	20
UC2LB	"	3,916	63	9	35

ESTONIA

UR2QD	**A**	**163,392**	**301**	**81**	**195**
UR2RIY	"	142,500	655	37	113
UR2RCU	"	133,350	244	85	169
UR2RER	"	122,760	335	61	187
RR2RW	"	38,038	104	55	88
UR2RND	"	25,215	83	47	76
RR2RU	"	17,784	63	44	57
UR2RKQ	"	17,750	214	16	55
UR2RBQ	"	8,778	93	18	39
UR2RDB	"	1,240	20	13	18
UR2FU	**7**	**43,242**	**441**	**17**	**62**
RR2RT	**3.5**	**20,440**	**185**	**15**	**55**
UR2RBM	"	1,875	75	5	20
UR2AO	**1.8**	**14,040**	**297**	**8**	**32**

EUROPEAN RUSSIA

UW3AA	**A**	**1,390,260**	**1785**	**122**	**348**
UA4LCR	**"**	**512,544**	**1117**	**80**	**224**
UA6HRZ	**"**	**445,067**	**1039**	**75**	**218**
RA3RN	"	187,487	308	84	229
RA3QW	"	180,336	535	56	112
RA4HX	"	171,508	454	61	151
UA3DVS	"	145,888	538	47	141
UA1AFM	"	134,588	593	39	139
UA6YAH	"	100,893	359	47	122
UV6AY	"	97,300	443	36	103
RA4HW	"	92,340	383	42	120
UA6BPU	"	91,632	563	35	103
UA4CH	"	85,228	389	46	103
RA3DN	"	78,374	372	42	107
UA6LIG	"	66,435	351	32	97
UA3GO	"	52,055	250	40	105
UA4ANZ	"	49,500	215	37	93
UA6VY	"	48,863	249	40	91
RA3GW	"	44,034	294	36	87
UA4CMF	"	43,149	323	25	66
UW3AO	"	41,325	316	27	68
UZ4PZL	"	39,440	305	22	58
UV4CD	"	34,480	246	29	75
UV3DN	"	32,640	372	18	50
RA3QR	"	28,391	175	29	60
UA3UCD	"	25,410	160	34	87
UA1ANA	"	23,358	125	29	73
UA6AG	"	20,570	152	21	64
UA3XN	"	20,007	125	25	56
UA3TCJ	"	19,200	110	28	56
RZ3DM	"	16,463	103	27	74
RW3DC	"	13,356	118	26	58
RV6AF	"	12,510	93	30	60
UA4CJF	"	11,583	109	23	58
UA4CGW	"	11,573	113	20	51
UA4LAF	"	10,812	112	21	47
UA4CDY	"	9,776	132	16	36
UA4WE	"	6,700	48	25	42
RA3GD	"	6,148	66	15	38
UA1OGU	"	5,940	76	17	37
RV6AB	"	2,940	37	10	18
UA4CK	"	1,568	19	13	19
UA3TDO	"	1,170	35	9	21
UA6LQ	**28**	**40,848**	**294**	**26**	**66**
RA3LB	"	180	5	5	5
UA3RAR	**21**	**159,275**	**715**	**32**	**83**
UA6LAM	"	112,600	616	26	74
UA4HN	"	84,693	509	27	84
UA3WU	"	23,600	175	17	42
UA3YAO	"	15,424	136	18	46
UA3TAM	"	11,040	138	14	46
UA4WDU	"	8,700	106	15	35
UA4CRA	"	8,240	118	16	24
RA6LE	"	6,250	69	15	35
RV6AB	"	2,940	37	10	18
UA1ZD	**14**	**143,598**	**811**	**24**	**67**
UA3QJE	"	131,700	803	27	73
UA3RFV	"	124,209	664	29	82
UA4YA	"	118,692	628	28	80
UA6PAM	"	88,645	471	30	75
UA6BPM	"	71,852	449	25	67
UV3HY	"	64,410	381	25	70
UA6LCW	"	61,364	382	28	64
OK3IA /UA3	"	48,598	276	23	71
UA6AUT	"	46,082	299	23	59
UV1AS	"	35,309	350	15	52
UA6HSV	"	25,465	285	14	41
UA4QK	"	16,983	251	13	38
UA3QBV	"	12,120	141	16	44
RA3NA	"	10,519	79	17	50
UA1OB	"	6,426	121	11	31
UA6LTI	**7**	**124,868**	**615**	**29**	**77**
UA6HPW	"	37,030	362	14	56
UA1QQ	"	36,114	335	32	57
UV3WT	"	30,552	262	16	60
UA3XAW	"	18,250	182	18	65
UA3GGF	"	16,531	153	17	44
UT5UGN /UT5X	"	2,640	77	6	24
UA3TDR	"	900	25	7	13
UA1DZ	**3.5**	**159,890**	**981**	**29**	**89**
RW3AX	"	36,725	407	11	54
UA3QBX	"	36,160	453	12	52
UA1AKC	"	14,734	213	7	41
UA6AQV	"	14,352	242	9	39
UV6LDR	"	11,891	220	8	39
UA4AO	"	11,880	154	10	45
UA4WFA	"	11,248	125	8	29
UA1ANP	"	11,200	256	7	33
UA3BK	"	9,578	150	8	34
UA3TGC	"	7,296	156	9	29
UA3PFW	"	4,018	103	8	33
UA1ZFC	"	1,080	55	5	13
UA3XAG	"	682	34	6	15
RA3DX	**1.8**	**32,913**	**370**	**12**	**57**
RA3DOX	"	24,780	338	13	46
RA6AOS	"	18,036	260	11	43
UA3LES	"	15,120	268	3	37
UW6OE	"	8,282	156	8	33
UA4CLV	"	6,588	142	7	29
UA3DHP	"	6,045	179	6	25
UV3ACX	"	6,118	148	7	31
UV1AS	"	5,577	147	6	27
UV6HFK	"	4,185	117	6	21
UA3DJG	"	2,716	63	8	20
UV6AGF	"	1,988	62	7	21

FRANZ JOZEF LAND

UV100	**A**	**616,764**	**1381**	**57**	**149**
UA1OT	14	708	23	5	7

KALININGRAD DISTRICT

UA2EC	**A**	**205,128**	**502**	**62**	**202**
UA2FFA	"	8,601	65	22	39

KARELIA

RA1NA	**3.5**	**63,648**	**683**	**15**	**63**

LATVIA

UQ2GD	**A**	**881,625**	**1412**	**104**	**271**
UQ2PQ	"	617,337	1123	99	270
UQ2GT	"	219,876	735	57	162
UQ2NN	"	155,585	598	46	139
UQ2GFU	"	87,514	464	35	98
UQ2GHG	"	16,617	142	26	61
UQ2HK	"	8,792	137	11	45
UQ2GW	"	2,600	29	14	26
UQ2GKA	**28**	**1,150**	**28**	**8**	**17**
UQ2GLQ	**21**	**11,174**	**66**	**22**	**52**
UQ2GJV	**14**	**39,075**	**299**	**21**	**54**
UQ2GMC	"	30,774	224	19	50
UQ2GP	**7**	**18,144**	**130**	**25**	**56**
UQ2GIP	**3.5**	**45,866**	**533**	**13**	**58**
UQ2GKL	"	36,932	326	18	58
UQ2GGP	"	36,288	500	14	50
UQ2GBJ	"	14,455	185	11	48
UQ2GGE	"	14,442	207	10	43
UQ2GHB	"	13,832	232	9	44
UQ2GQQ	"	10,374	227	8	30
UQ2PZ	**1.8**	**18,290**	**228**	**14**	**48**
UQ2GMB	"	15,087	275	9	38
UQ2GNL	"	7,056	185	6	30
UQ2GA	"	2,573	68	7	24

LITHUANIA

UP3BP	**A**	**602,718**	**1161**	**81**	**242**
UP3BO	**"**	**348,670**	**750**	**72**	**221**
UP3BU	"	346,983	910	62	211
UP2BR	"	325,152	591	74	214
UP2BIF	"	283,984	932	54	170
UP2BBI	"	235,936	840	46	156
UP2DM	"	168,434	447	64	163
UP2PAQ	"	134,640	595	38	127
UP2DV	"	83,600	393	37	115
UP2DT	"	66,120	328	40	105
UP2BNC	"	54,849	293	38	103
UP2BIP	"	54,570	161	70	100
UP2BDO	"	24,768	201	27	69
UP2BHK	"	17,108	257	14	38
UP2PCX	"	15,456	144	18	66
UP2BBF	"	13,333	142	24	43
UP1BXA	"	11,600	103	18	32
UP2ND	"	6,832	89	15	41
UP2OM	"	3,888	129	16	46
UP2BZ	**21**	**57,114**	**267**	**28**	**86**
UP2AV	"	6,139	70	14	33
UP2NK	**14**	**302,868**	**1070**	**37**	**104**
UP2PCI	"	248,436	1018	35	99
UP2OU	"	68,400	485	24	59
UP3BX	"	66,600	408	24	66
UP2FF	"	14,535	189	11	34
UP2BDO	"	12,290	156	14	37
UP2BIW	**7**	**49,896**	**344**	**24**	**75**
UP2OO	"	44,936	434	19	63
UP2BEJ	"	32,224	330	18	58
UP2BLQ	**3.5**	**88,720**	**833**	**16**	**64**
UP2BOA	**"**	**88,128**	**699**	**19**	**77**
UP2BIC	"	71,402	692	13	69
UP2OQ	"	56,240	508	17	59
UP2SA	"	37,488	415	13	58
UP2BRJ	"	34,832	533	10	46
UP2BEL	"	30,016	363	13	51
UP2BOC	"	27,633	397	11	50
UP2BKT	"	17,702	303	10	43
UP2BPI	"	14,063	251	9	40
UP2BB	"	10,464	193	8	40
UP2BGR	"	8,474	213	7	31
UP2BOS	"	7,216	154	6	35

MOLDAVIA

UO5OLW	**A**	**197,000**	**602**	**50**	**150**
UO4OWN	"	61,800	456	31	89
UO5OCI	**21**	**17,834**	**241**	**22**	**52**
UO5OAL	"	16,640	260	22	42
UO5WU	**14**	**59,072**	**568**	**28**	**76**
RO4OA	**3.5**	**82,025**	**776**	**17**	**68**
UO5GR	"	5,764	90	10	34

UKRAINE

RB5MF	**A**	**1,003,023**	**1439**	**109**	**318**
UT4UX	**"**	**864,155**	**1279**	**97**	**304**
UB5QKQ	**"**	**728,460**	**1148**	**94**	**286**
RB5IA	"	530,610	975	86	259
UT5UIW	"	318,795	758	72	193
UY5TE	"	270,216	776	60	183
UB5QJI	"	231,716	690	54	158
UB5IAN	"	193,112	655	54	148
UB5LIE	"	189,056	520	58	153
UB5MFC	"	177,316	533	53	141
UB5VKO	"	154,315	391	63	154
UT5LF	"	145,317	435	46	131
UB5MMP	"	141,750	548	42	133
UB5JS	"	123,282	515	38	124
UB5FCE	"	108,675	409	44	131
UB5IBV	"	104,041	409	41	126
UB5MTM	"	97,280	261	52	100
UB5CAL	"	88,128	406	44	118
UB5EPV	"	83,160	242	35	185
RB5AE	"	71,394	307	39	107
UB5VK	"	53,845	307	30	91
RB5MU	"	48,870	169	48	87
UB5DW	"	47,813	204	37	100
UB4IM	"	42,875	204	32	93
UB5IPH	"	41,128	263	26	80
UB5VCS	"	39,794	211	31	70
UN5EIT	"	38,622	201	35	88
UB5WDD	"	34,875	201	34	91
UB5VBN	"	32,786	228	25	72
RB5MP	"	25,830	123	34	71
RB5JS	"	25,602	186	29	73
UB5EPA	"	24,096	161	30	66
UT5UIA	"	19,412	146	26	66
RB5IF	"	19,332	101	31	77
RB5ML	"	18,887	117	28	73
UB5AEO	"	18,160	110	23	57
UB5SBF	"	15,680	80	21	59
UB5EEP	"	15,337	259	8	41
UB5IDA	"	14,181	91	31	56
RB5AT	"	13,896	145	19	54
UT5HP	"	6,656	52	25	39
UB5CDF	**28**	**8,736**	**100**	**18**	**39**
RT5UO	"	2,380	37	13	22
RB5WW	"	1,984	38	11	20
UB5ZEL	"	345	22	4	11
UB5IJG	**21**	**447,984**	**1309**	**36**	**108**
UB5IUH	"	128,544	631	28	75
UB5WF	"	86,229	336	27	90
UB5VAS	"	67,932	312	27	84
UB5BZ	"	64,365	315	26	79
RB5LM	"	53,184	277	26	70
UB5IOM	"	52,164	343	25	56
RB5VW	"	19,350	130	21	54
RT5UY	"	18,924	108	24	59
UB5VY	"	12,852	103	20	34
RT4UN	"	8,532	81	16	38
UB4EM	"	7,497	68	20	43
UB5CN	"	5,270	75	12	22
UB5EFA	"	714	18	7	14
UB5EC	**14**	**304,075**	**1193**	**33**	**102**
UB5IAL	"	115,825	576	32	81
UB5AKA	"	74,387	692	23	50
RB5JX	"	52,126	477	24	43
UB5JNW	"	42,504	373	17	99
RB5WR	"	32,550	291	16	46
UY5WA	"	26,712	243	18	45
UB5JAM	"	21,384	167	22	50
UY5XN	"	16,136	90	21	36
RB5WG	"	1,200	57	5	15
UB5WE	**7**	**299,013**	**1102**	**35**	**103**
RB5MA	"	202,520	952	29	93
RB5QW	"	17,898	240	12	45
RB5HB	"	9,072	168	12	42
UB5MQF	"	4,640	60	12	28
RT4UF	**3.5**	**73,997**	**719**	**15**	**62**
RB5LO	"	70,604	707	14	62
UB5VKW	"	61,620	610	17	62
UB4IZZ	"	57,507	417	21	66
UB5ISX	"	57,290	507	16	69
UB5FAN	"	40,870	575	11	50
RB5AL	"	25,160	285	13	55
UB5MLP	"	24,750	266	14	52
UB5SBN	"	24,602	298	9	40
UY5VA	"	17,850	312	8	43
UB5QEB	"	11,568	193	11	37
UB5HAW	"	11,284	344	9	53
UB5FDG	"	11,221	202	8	41
UB5REN	"	10,504	176	10	42
RB5AQ	"	7,938	132	10	39
UB5KEG	"	3,429	113	6	21
UB5SBR	"	1,200	40	7	18
UB4MPC	**1.8**	**30,090**	**332**	**10**	**49**
UB5WAL	"	13,847	278	8	35
UT4UN	"	8,484	153	8	34
RB5CU	"	7,486	170	7	31
UT4UW	"	7,385	180	6	29
UB5ES	"	3,876	94	8	26
UB5RFT	"	2,860	130	5	17
UB4IUK	"	2,415	85	6	15

OCEANIA

AUSTRALIA

VK2BQQ	**A**	**505,377**	**755**	**88**	**145**
VK8AV	"	192,468	403	64	108
VK3NI	"	179,928	520	46	73
VI5AGX	"	35,030	200	25	37
VK6HD	**28**	**80,448**	**427**	**16**	**48**
VK6SM	**"**	**74,472**	**428**	**15**	**43**
VK4SF	"	1,947	61	5	6
VK4XA	**21**	**185,674**	**787**	**27**	**59**
VK2APK	**14**	**329,278**	**927**	**31**	**91**
VK4TT	"	101,136	350	32	65
VK3AHQ	"	67,080	220	32	72
VK2EKY	**7**	**96,560**	**484**	**23**	**45**
VK3BEE	**1.8**	**1,534**	**41**	**8**	**5**

EASTERN CAROLINE ISLANDS

KC6TO	**A**	**179,015**	**537**	**59**	**56**

FRENCH OCEANIA

FO5JP	**21**	**166,936**	**1000**	**20**	**36**

GUAM

NY6M /KH2	**A**	**971,919**	**1558**	**83**	**130**
KG6DX	**3.5**	**94,733**	**531**	**25**	**36**

HAWAII

AH6AZ	**A**	**1,025,759**	**1719**	**93**	**110**
N5CT /KH6	**7**	**136,604**	**881**	**20**	**32**

INDONESIA

YB0ARA	**A**	**1,664,208**	**1675**	**110**	**226**
YB0TK	"	804,479	1120	91	156
YB3ATB	"	278,265	491	72	123
YC6LD	**28**	**22,776**	**150**	**20**	**32**
YC8VCE	**21**	**233,280**	**892**	**32**	**58**
YB0ZAA	"	114,226	478	26	56
			(Opr. YC0ECT)		
YB2FEA	"	85,272	323	27	61
YC4GAP	"	82,480	354	28	52
YC3HCM	"	50,172	460	31	80
YB3EP	14	460	23	8	12
YC4FRX	7	9,386	87	17	21

MINAMI TORISHIMA

7J1ACH	**A**	**424,159**	**948**	**72**	**79**

NEW ZEALAND

ZL2SQ	**A**	**470,400**	**1089**	**60**	**87**
ZL1AIZ	"	145,965	281	76	109
ZL1ANJ	"	11,022	112	17	16
ZL1BEK	**14**	**99,947**	**390**	**27**	**62**
ZL3AGI	"	21,456	140	21	27

NORFOLK ISLAND

VK9NL	**A**	**1,124,161**	**1704**	**93**	**136**

OGASAWARA ISLAND

JA4GXS /JD1	**A**	**67,584**	**502**	**42**	**54**

PHILIPPINES

K4YT /DU1	**A**	**71,148**	**180**	**59**	**88**
KD6TB /DU2	**14**	**80,700**	**369**	**26**	**49**
W3JEH /DU7	"	675	43	9	6

SAIPAN

JA1BK /KH0	**A**	**146,430**	**557**	**43**	**47**
NH6X /NH0	7	4,580	229	11	9

SOUTHERN COOK ISLANDS

ZK1TB	**A**	**340,168**	**608**	**82**	**120**

SOUTH AMERICA

ARGENTINA

LU1EWL	**A**	**341,982**	**742**	**63**	**99**
LU1HUC	"	91,728	291	47	65
LU7JI	"	54,912	192	61	82
LU4FDM	**28**	**120,528**	**508**	**21**	**60**
LU1DCB	"	105,225	589	20	41
LU5UL	"	66,990	546	16	26
LU2DGZ	"	45,429	386	20	37
LU1AF/D	**21**	**338,520**	**938**	**29**	**95**
LU2E	**1.8**	**4,440**	**78**	**8**	**12**

BRAZIL

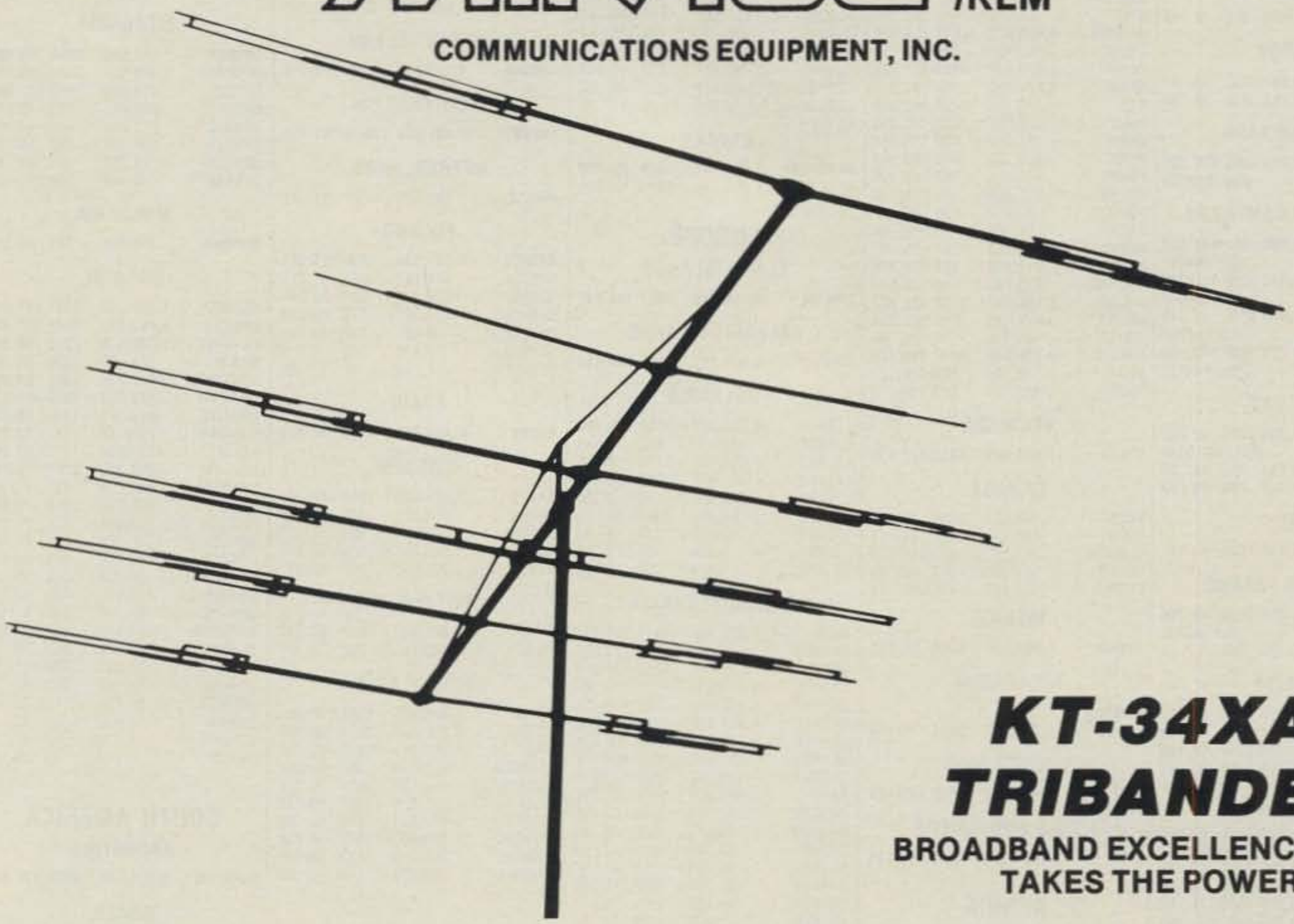
PT7BZ	**A**	**5,242,977**	**4009**	**122**	**317**
			(Opr. OH2MM)		
PY2BTR	"	653,276	1023	67	154
PT7AQ	"	414,960	843	54	113
PP1RR	"	165,186	400	58	103
PY2KP	"	159,900	377	60	90
PY1AJK	"	79,110	243	55	79
PY1QN	"	63,656	310	22	51
PY5MR	"	51,840	196	46	74
PY2MT	"	22,010	115	29	42
PT2CW	"	18,216	90	30	42
PY5CFE	"	16,302	94	27	39
PT2DMS	"	13,832	93	20	36
PY2LPI	"	12,095	66	20	21
PY2MM	"	10,200	72	22	28
PY4WS	"	6,996	41	30	36
PY6BZ	"	4,030	47	14	17
PY5CA	**21**	**1,102,486**	**2408**	**34**	**120**
			(Opr. N5FA)		
ZY7ZZ	"	254,016	803	31	77
ZY5AKW	"	12,322	70	22	39
PY4AST	"	3,004	29	20	26
PY2FK	"	2,496	22	17	22
PY2RLQ	**14**	**76,250**	**426**	**16**	**45**
PY2LMA	"	27,522	156	15	61
ZV2BW	"	11,956	75	22	39
PY2SLS	"	7,731	182	15	21
PT7CG	"	4,158	72	12	30
PY1ZFO	**7**	**135,540**	**509**	**25**	**65**
PY5CA	"	90,929	392	23	56
PY2DP	**3.5**	**22,048**	**149**	**16**	**37**

CHILE

3G1B	**A**	**280,044**	**795**	**45**	**63**
			(Opr. XQ1ADG)		
CE3BFZ	"	46,230	229	26	43
CE3ZW	21	6,016	72	13	19
CE4IDY	**14**	**145,992**	**586**	**29**	**59**
CE2BFR	"	70,336	379	22	42

MIRAGE /KLM

COMMUNICATIONS EQUIPMENT, INC.



KT-34XA TRIBANDER

BROADBAND EXCELLENCE THAT TAKES THE POWER

KLM's KT-34XA TRIBANDER is the 2nd generation of a unique new series of antennas designed to provide superior **broadband** coverage on 20, 15, and 10 meters. The combination of lossless linear loading and hi-Q air capacitors enables the KT-34XA to outperform **all** commercial available tribanders and meet or exceed the performance of a conventional stacked monoband system. The lower weight and windload of a single antenna mean reduced tower and rotator requirements. Thus, overall system costs can be kept to a minimum while enjoying the best of monobander-type performance.

KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one tri-resonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart shows the remarkable performance qualities of the KT-34XA.

The KT-34XA's design represents the first major advancement in tribander technology in over 20 years! The conventional traps, coils, and capacitors have been discarded in favor of integral linear loading and hi-Q air capacitors, all composed of aluminum tubing. These give the KT-34XA a conservative power handling capability of 4 KW PEP and an unusually high level of operating **efficiency**. Linear loading also makes full ¼-wave elements possible on 15 and 10 meters, and brings 20 meters much closer to the desirable ¼-wave than any conventional tribander.

BANDWIDTHS:	14.0-14.350 MHz 21.0-21.50 MHz 28-29 MHz	**GAIN:**	8.5-9dB 9-9.5dB 11-11.3dB
VSWR:	1.5:1	**BOOM LENGTH:**	32 ft. × 3" O.D.
FB/FS:	20dB/40dB	**TURN RADIUS:**	21.5 ft.
FEED IMP.:	50 ohms w/balun	**WINDLOAD:**	9 sq. ft.
BALUN:	3-60-4:1 5KW PEP	**WT. (LBS.):**	75 lbs.
ELEMENT LENGTH:	24 ft.	**MAST:**	2" O.D. (standard)

Mechanically, the KT-34XA has been built to survive the toughest weather conditions. All aluminum, including the boom, is strong 6063-T832 alloy. All electrical hardware is stainless steel. Virtually indestructible "Lexan" insulators, just like those on KLM's 40 meter "Big Sticker," are used for mounting the elements and insulating them from the boom. KLM's 3-60 MHz 4:1 balun is supplied for direct connection to any 50 ohm feedline.

Turn your KT-34A into an XA.
Call your local dealer for price.
Hank Scott

MIRAGE /KLM

COMMUNICATIONS EQUIPMENT, INC.

P.O. Box 1000 • Morgan Hill, CA 95037
(408) 779-7363

CIRCLE 159 ON READER SERVICE CARD

COLOMBIA

HK1AMW	**A**	**1,404,004**	**1740**	**86**	**201**
HK3MAE/7	28	1,798	23	13	16
HK1HHX	**14**	**772,376**	**1997**	**35**	**96**

EASTER ISLAND

CE0ZIG	**7**	**47,532**	**312**	**18**	**33**

ECUADOR

HC1BI	**A**	**92,807**	**233**	**56**	**87**
HC7SK	**3.5**	**113,152**	**556**	**18**	**50**

FRENCH GUYANA

FY5YE	**A**	**5,836,215**	**4051**	**120**	**369**
		(Opr. OH0XX)			

NETHERLANDS ANTILLES

PJ2FR	**A**	**7,028,688**	**4661**	**134**	**374**
		(Opr. W8ZF)			
P40GD	**"**	**6,991,947**	**5108**	**119**	**340**
		(Opr. W2GD)			
P40N	**14**	**1,477,905**	**3138**	**37**	**122**
		(Opr. N4PN)			
P40R	**3.5**	**576,725**	**1682**	**25**	**90**
		(Opr. K4UEE)			

PARAGUAY

ZP5XDW	**A**	**2,014,200**	**2265**	**92**	**208**
		(Opr. WB4OSN)			
ZP5LDY	**21**	**50,784**	**372**	**16**	**30**
ZP5JAL	**14**	**34,357**	**248**	**15**	**32**

PERU

OA4ZV	**A**	**1,447,040**	**1825**	**85**	**187**

TRINIDAD & TOBAGO

9Y4VT	**A**	**8,191,246**	**5099**	**146**	**396**
		(Opr. N6AA)			
J6LAD/9Y	"	72,280	247	43	61

URUGUAY

CX9AK	**28**	**5,225**	**96**	**9**	**10**
CX7BY	**21**	**747,604**	**1772**	**34**	**109**
CX5AO	**14**	**828,933**	**1914**	**38**	**109**
CX8BBH	**7**	**448,723**	**1375**	**31**	**82**

VENEZUELA

4M4A	**A**	**2,795,538**	**3175**	**90**	**208**
		(Opr. K3UOC)			
4M7A	**28**	**312,092**	**1297**	**23**	**59**
		(Opr. YV7QP)			
YW1X	**21**	**290,996**	**1065**	**24**	**68**
YW1A	**14**	**829,280**	**1963**	**37**	**105**
		(Opr. YV1DIG)			
YX3A	**3.5**	**205,300**	**695**	**23**	**67**
YV5IWT	"	62,593	402	14	39
YV10B	**1.8**	**17,115**	**165**	**13**	**22**

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

K1AR	**1,821,261**	**1196**	**141**	**392**
K1RO	1,698,300	1315	120	330
KM1C	1,637,715	1139	130	375
K1IU	1,577,840	1136	130	325
N1AU	1,460,767	1177	107	320
W1PH	456,015	537	83	220
AK1L	429,248	499	84	220
K1SA	404,633	495	90	203
W1GG	380,100	456	80	220
W1RR	379,845	411	96	249
KA1KPH	196,350	317	72	166
NG1W	124,542	236	60	138
K1KI	71,070	138	69	137
W1BK	36,180	109	48	87
KZ2S	**1,354,640**	**1136**	**104**	**306**
K2TD	423,400	492	83	209
W2UI	150,936	366	72	180
W2JT	12,474	79	15	48
N3RS	**3,434,920**	**1913**	**155**	**477**
K3OO	2,582,118	1526	151	443
W3GG	1,816,479	1447	116	325
W3NX	852,663	768	111	288
KY3N	664,340	791	95	200
KB3MM	560,190	567	98	257
W3AP	518,880	541	102	243
K3UEI	450,802	479	102	239
N3BNA	447,204	507	95	237
WB3CAC	376,247	562	75	154
KS3F	272,244	353	92	202
K3SO	145,368	259	64	152
KD3H	72,842	174	55	99
N4WW	**4,176,612**	**2323**	**157**	**479**
K3KG/4	**3,308,125**	**1905**	**158**	**467**
K4JPD	2,814,714	1919	148	386
W4FX	996,930	878	116	302
K8UNP/4	903,860	761	121	309
N4EJW	771,864	800	100	248
WZ4Z	484,900	579	97	228
K4MF	462,678	474	103	251
WA4QQV	441,159	547	95	212
W4OO	345,900	425	96	204
WS4E	226,848	311	84	188
K0HLB/4	213,300	500	82	158
WA4CTC	150,347	273	65	128
KD4OM	121,747	215	68	143
WB4BBH	117,834	187	89	157
WI4R	67,512	159	66	108
W5WMU	**3,589,872**	**2032**	**159**	**465**
KC5DX	266,936	405	86	158
N6ND	**2,376,696**	**1654**	**151**	**365**
N6AW	**1,880,555**	**1435**	**147**	**310**
AI6V	1,793,176	1432	140	311
AG6D	913,297	1093	116	203
W6BIP	763,752	770	115	248
WR6R	509,282	648	105	193
K6HIH	222,605	397	85	126
W6LEN	131,688	275	75	102
K6BWX	47,854	138	60	82
W6OAT	38,198	95	60	82
W6NNV	17,460	74	33	57
K7LXC	**811,521**	**868**	**115**	**218**
WA7NIN	623,784	694	109	207
W8JGU	**1,789,630**	**1257**	**135**	**367**
W8IMZ	489,435	546	101	234
W8YGR	40,870	119	46	88
K4VX/8	**2,466,540**	**1507**	**159**	**420**
KB0G	1,118,894	886	130	328
W0XK	465,450	523	104	217

BERMUDA

VP9AD	**7,830,495**	**5618**	**137**	**418**

CANADA

VE2LJ	**1,168,533**	**1749**	**75**	**205**
VO2WL	489,533	1179	64	127
VE3WAA	243,533	625	65	113
VE1CIT	162,400	505	50	95
VE3RFX	26,826	410	10	24

MEXICO

XE2NQ	**1,866,106**	**3262**	**90**	**181**

NICARAGUA

WB8NAA /YN1	**1,350,008**	**2632**	**72**	**160**

PUERTO RICO

KP4BZ	**7,922,868**	**5635**	**139**	**426**

TURKS AND CAICOS

VP5X	**2,364,880**	**3177**	**91**	**235**

AFRICA

MAYOTTE

FH/W6KG	**1,557,612**	**1790**	**84**	**210**

ASIA

BRITISH SOVEREIGN AREA OF CYPRUS

ZC4EPI	**419,472**	**805**	**64**	**152**

CYPRUS

DF4ZL /5B4	**2,628,438**	**2584**	**86**	**267**

INDIA

VU2TEC	**344,248**	**908**	**46**	**102**

JAPAN

JA1YWX	**1,720,400**	**1615**	**133**	**258**
JA1YCL	943,074	984	125	238
JA1YFG	916,200	1185	113	187
JA1YXP	500,405	935	84	121
JA1YAD	433,704	796	75	129
JA1YAG	107,091	270	70	93
JE2YRD	**1,631,718**	**1468**	**140**	**282**
JA3YBF	**1,931,155**	**1822**	**131**	**264**
JA4YJA	42,952	143	51	67
JA6YAI	**1,306,875**	**1306**	**129**	**246**
JA7YAA	**1,097,772**	**1177**	**132**	**240**
JH7YJF	978,380	1346	96	169
JA7YFB	564,975	872	95	148
JA8YBY	**360,890**	**573**	**87**	**152**
JA9YAV	121,776	281	74	103

PEOPLE'S REPUBLIC OF CHINA

BY1PK	**682,992**	**1841**	**69**	**125**
BY4AA	228,750	967	64	86
BY8AA	215,338	633	40	94

THAILAND

HS8A	**3,117,645**	**3297**	**128**	**307**

U.S.S.R.

ASIATIC RUSSIA

UZ9AYA	**4,220,864**	**2795**	**136**	**404**
UZ9SWY	2,458,950	1843	135	372
UZ9SWW	2,143,944	1930	104	292
UZ8AXX	**1,937,925**	**1763**	**137**	**298**
UZ8JWA	798,000	1365	84	152
UZ9XXM	644,354	1113	51	163
UZ9CYP	627,396	993	56	175
UZ9XWA	533,952	931	51	155
UZ8QWA	521,163	1144	89	148
UZ8SWA	250,740	825	46	94
UZ8UWE	196,560	910	49	77
UZ9JWK	88,601	800	41	105
UZ9UWK	19,623	209	35	69
UZ8ZWD	3,190	73	11	11

KAZAKH

UL8GWW	**1,954,368**	**2336**	**93**	**258**
UL8CWW	1,488,277	1686	94	249

EUROPE

ALAND ISLANDS

OH8AM	**3,746,940**	**3887**	**146**	**445**

BALEARIC ISLANDS

EA6URP	**519,777**	**1292**	**60**	**219**

BULGARIA

LZ7A	**4,532,352**	**3756**	**155**	**483**
LZ1KEZ	348,096	859	78	181
LZ1KVZ	317,310	1190	58	152
LZ1KNP	304,896	753	68	188
LZ2KRU	209,699	659	53	150
LZ1KRC	64,704	389	24	72
LZ2KVA	61,952	543	17	47
LZ2KSB	6,864	129	10	38
LZ1KKR	825	23	10	15

CZECHOSLOVAKIA

OK5R	**4,222,434**	**3171**	**161**	**481**
OK1KSO	2,529,360	2202	135	405
OK2KMI	2,058,680	1811	139	381
OK3KAG	1,842,630	2185	121	389
OK1OAZ	1,687,944	2351	109	315
OK3RJB	1,614,892	1749	121	366
OK2OSN	1,331,424	1605	106	326
OK1KQJ	1,191,200	1625	103	297
OK3RKA	434,238	781	75	219
OK1OPT	395,200	1070	61	186
OK5SSM	340,280	665	80	155
OK3KGQ	86,640	577	27	87
OK2KPS	83,584	401	31	97
OK2KDS	38,784	268	34	67
OK1KHK	28,050	382	15	60
OK1KCF	11,680	95	25	48
OK1KLV	5,130	74	15	42

DENMARK

OZ4HAM	12,090	150	17	61

ENGLAND

GB4DX	**2,130,624**	**2434**	**111**	**321**

FEDERAL REP. OF GERMANY

DL7ON	**1,161,546**	**1338**	**116**	**327**
DF0BV	1,091,664	1368	104	295
DK0OI	1,066,482	1378	86	245
DK0MM	1,021,112	1288	109	327
DJ1OJ	850,720	1099	103	306
DL0DK	751,716	1010	74	240
DJ0EK	364,650	723	71	184
DL8NBJ	143,376	361	57	149
DF0RN	111,936	318	54	138

FINLAND

OH1AF	**1,971,441**	**2362**	**113**	**364**
OH1VR	1,383,195	1951	109	306
OH9PH	276,100	588	69	221
OH9AB	98,589	267	53	124

FRANCE

F5IN	**4,247,410**	**3310**	**147**	**443**
F6GOE	1,587,944	2123	86	251
F6EID	1,376,428	1747	110	294
F6ENO	54,332	643	13	55
FF6KPQ	31,635	291	21	36

GERMAN DEMOCRATIC REP.

Y33ZL	**1,255,632**	**1844**	**110**	**334**
Y45ZM	196,168	477	63	154
Y42ZB	49,200	177	46	64

HUNGARY

HG5A	**4,100,292**	**3439**	**155**	**481**
HG7B	**3,990,855**	**3399**	**151**	**476**
HG6N	3,653,562	3393	137	425
HG9R	3,600,944	3430	141	443
HG1S	2,027,733	2109	102	417
HG1Z	1,636,200	2051	117	333
HA2KMR	1,154,420	1797	102	292
HA3KNA	1,007,028	1510	100	296
HA1KRR	906,906	1843	80	206
HG6V	821,033	1298	94	265
HA6KNG	652,430	1198	78	187
HA5KFL	421,398	1117	68	178
HA5KAG	388,397	985	66	161
HA3KHL	11,984	115	17	39

ITALY

IK2BHX	**1,565,196**	**2096**	**119**	**309**

JERSEY ISLAND

GJ8AAA	**4,257,048**	**4130**	**119**	**415**

LICHTENSTEIN

LX9BV	**485,936**	**1449**	**61**	**190**

NETHERLANDS

PI4GAZ	**108,376**	**1022**	**21**	**71**

POLAND

SP5PBE	**2,045,799**	**1989**	**120**	**321**
SP1PEA	441,742	1004	67	211
SP6PDT	234,739	835	50	141
SP8PLU	144,088	377	50	116
SP3PKK	64,636	336	40	103
SP9ZAS	2,108	44	8	9
SP3KRF	1,768	42	12	22

SPAIN

EA3VY	**4,417,268**	**3710**	**146**	**440**

SWEDEN

SK6TW	**1,025,280**	**1864**	**100**	**270**
SK5EU	691,275	1431	85	240
SK5SM	363,957	923	72	197
SK6RR	276,354	829	63	171
SL0CB	201,056	502	61	145

SWITZERLAND

HB9AJ	**201,025**	**727**	**53**	**134**
HB9Z	40,850	205	27	59

YUGOSLAVIA

YZ1U	**3,568,851**	**4381**	**136**	**381**
YT3M	3,122,560	2658	145	399
YT3T	1,343,845	1858	102	295
YU2CBM	623,664	982	104	262
YU1ATA	424,109	877	79	222
4N1F	397,854	991	68	211
4N4T	369,309	975	59	198
YU5GBC	230,906	637	56	158
YU4CBC	214,024	612	59	189
YU4BAB	10,626	145	19	50

U.S.S.R.

BYELO RUSSIA

UC1AWC	**910,912**	**1730**	**115**	**229**
UC1AWB	880,320	1421	104	289
UC1WWF	778,078	1335	98	275
UC1AWZ	479,712	995	75	229
UC1WXD	7,875	153	12	33
UC1WWD	381	20	6	13

ESTONIA

UR1RWX	**1,887,480**	**2247**	**135**	**400**
UR1RYY	856,540	1594	91	288
UR1RXL	32,436	212	28	76
UR1RXX	918	47	5	13

EUROPEAN RUSSIA

UZ6LWZ	**1,580,832**	**1690**	**139**	**389**
UZ1ZZZ	**1,349,660**	**1904**	**87**	**271**
UZ4FWO	952,110	1450	117	309
UZ3AXX	703,248	1563	80	242
U2KM	694,710	1584	80	230
UZ4WWB	621,931	1326	77	236
UZ3XWA	534,688	1094	79	229
UZ4CYL	528,040	1004	83	224
UZ4AWT	493,535	1106	76	219
UZ1TWB	478,588	1092	72	220
UZ1AWX	444,660	1001	74	182
UZ3DXW	387,544	1196	63	188
UZ6LXX	377,006	999	72	181
UZ4YWW	271,946	887	58	169
UZ4HWS	271,104	990	47	147
U3TT	178,092	637	56	148
UZ3QWM	170,150	716	56	110
UZ1OWZ	117,078	595	48	110
UZ3TYE	110,112	616	36	111
UZ1AWO	62,790	379	35	80
UZ1OWJ	41,338	301	35	72
UZ4WWO	36,852	349	20	63
UZ3QYA	28,884	224	27	60
UZ6YWB	25,168	212	22	30

KALININGRAD

UZ2FWA	**4,436,100**	**3481**	**173**	**507**
UZ2FWN	8,468	140	15	43

LATVIA

UQ1GWW	**2,522,205**	**2393**	**149**	**446**
UQ1GWE	259,168	753	55	169
UQ1GWB	78,658	409	39	95
UQ1GXY	27,900	241	30	86
UQ1GWX	20,188	160	25	73

LITHUANIA

UP1BZA	**2,882,683**	**2586**	**155**	**464**
UP1BWW	2,449,501	2374	149	454
UP1BZO	1,439,258	1893	117	361
UP1BYC	385,866	665	77	214
UP1BZQ	271,062	924	44	154
UP1BYK	188,384	537	59	165
UP1BZM	24,252	120	40	89
UP1BXF	22,466	205	19	75

MOLDAVIA

UO4OWR	**155,595**	**741**	**55**	**110**

UKRAINE

UB4WZA	**1,700,040**	**2031**	**117**	**348**
UB4CYT	**1,385,511**	**1942**	**105**	**316**
UT4UXW	1,375,638	2286	106	312
UB4DXX	974,409	1496	98	281
UB4SWB	937,730	1405	91	304
UB4XWB	912,307	1163	108	313
UB4EWG	888,576	1250	96	288
UB4QWV	739,772	1341	89	264
UB4IXZ	729,664	1117	105	311
UB4CXU	590,150	1257	75	215
UB4MWA	463,218	920	71	198
UB4EYJ	427,728	854	75	191
UB3QZZ	379,340	877	71	189
UB4LZA	365,307	890	65	198
UT4JWB	153,940	658	44	128
UB4EXU	126,324	319	59	139
UB4IWN	116,130	494	43	115
UB4GWC	66,591	199	47	100
UB4MWU	66,552	302	37	104
UB4IWI	57,873	306	30	71
UB4FWC	54,695	842	11	54
UT4UWL	50,165	235	43	84
UB4MZK	11,725	115	22	45
UB4VWA	6,875	80	13	42
UB4IWR	6,216	62	21	35
UB4IYK	6,214	78	16	46

SOUTH AMERICA

ARGENTINA

K5KG/LU	**3,628,167**	**3255**	**115**	**264**

BRAZIL

ZY40D	**2,794,350**	**2921**	**98**	**227**

GALAPAGOS ISLANDS

HC8A	**4,641,780**	**3679**	**128**	**301**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

N2AA	**7,558,965**	**3637**	**170**	**553**
W3LPL	**7,016,880**	**3491**	**166**	**526**
NR5M	**5,542,537**	**3050**	**162**	**475**
N4ZC	**4,164,714**	**2437**	**153**	**441**
W3GM	3,862,982	2110	158	473
NF2L	3,752,720	2143	151	456
KS8S	**3,153,382**	**2024**	**144**	**418**
N6TU	**2,818,834**	**2078**	**154**	**372**

ALASKA

NL7G	**1,939,803**	**2358**	**116**	**205**

BARBADOS

8P9AG	**1,953,830**	**2750**	**85**	**220**

MEXICO

XE2SI	**5,093,278**	**5052**	**141**	**298**

MONTSERRAT

VP2MU	**10,725,081**	**7646**	**134**	**435**

ST. LUCIA

J6DX	**14,710,800**	**10,299**	**141**	**457**

U.S. VIRGIN ISLANDS

KP2N	**17,480,855**	**10,152**	**162**	**515**

AFRICA

CEUTA

EA9CE	**16,497,312**	**8846**	**147**	**477**

ASIA

JAPAN

JA2YKA	**3,174,688**	**2545**	**145**	**319**
JA9Y8A	**3,036,563**	**2521**	**148**	**291**
JA2YKC	2,458,746	2094	135	279

EUROPE

BULGARIA

LZ1KRB	**2,039,904**	**3003**	**117**	**315**

CZECHOSLOVAKIA

OK7AA	**7,445,390**	**5775**	**167**	**519**

GERMANY (FRG)

DK3BJ	**3,257,217**	**3191**	**138**	**411**
DLØKF	3,066,096	3452	125	403
DFØEG	31,360	320	10	60

ITU GENEVA

4U1ITU	**2,965,360**	**3797**	**120**	**385**

LITHUANIA

UP9A	**8,208,608**	**6481**	**178**	**557**

NETHERLANDS

PA6DX	**4,786,236**	**5329**	**129**	**417**
PI4RTZ	131,670	660	43	122

YUGOSLAVIA

4N4C	**709,856**	**1153**	**89**	**250**

QRP

LZ1BB	**A**	**868,137**	**1285**	**99**	**294**
4X6IF	"	**424,928**	**753**	**53**	**143**
UB5IJA	"	**350,880**	**798**	**74**	**198**
G4ELZ	"	**244,860**	**629**	**52**	**158**
RB5IJ	"	227,981	522	71	176
OK3CGP	"	**227,539**	**447**	**93**	**206**
DL9YX	"	**186,780**	**274**	**73**	**210**
K1CGP	"	**167,562**	**290**	**58**	**156**
G3KDB	"	155,112	448	49	135
DL8CM	"	151,341	460	51	132
WR4K	"	**150,588**	**297**	**56**	**132**
DL4FN	"	126,716	339	44	114
YV2BE	"	**114,062**	**368**	**39**	**68**
SMØDJZ	"	**111,936**	**362**	**51**	**141**
YU3MJ	"	**105,984**	**406**	**41**	**97**
K3WS	"	**93,366**	**211**	**58**	**113**
I4KRF	"	**85,760**	**394**	**35**	**93**
UB5ZIV	"	85,278	514	34	88
ZV8WAS	"	**78,720**	**296**	**38**	**58**
PA2REH	"	**68,412**	**410**	**34**	**109**
N1AFC	"	67,983	191	39	90
UA6ALV	"	**64,372**	**254**	**41**	**113**
KH6CP/1	"	61,650	179	42	95
WB6JMS	"	**58,930**	**170**	**58**	**84**
JA7AS	"	**55,200**	**188**	**57**	**63**
OK1DKR	"	47,754	279	32	94
ED8BIE	"	**45,441**	**188**	**26**	**55**
Y21XC	"	**44,831**	**196**	**36**	**91**
PAØPUR	"	43,056	241	27	65
CX8DT	"	**37,072**	**137**	**45**	**67**
W1SOX	"	36,330	126	35	70
GBØWKS	"	36,288	215	29	83
Y23UA	"	32,242	202	28	66
SP4GFG	"	31,209	215	29	72
YO6HQ	"	**30,903**	**278**	**18**	**51**
Y22PM	"	30,184	279	20	68
KA1SR	"	29,325	123	27	58
WB1ESN	"	28,808	113	34	70
KB4GID	"	25,410	96	37	68
JA1XDA	"	24,380	180	23	83
PAØADT	"	23,870	135	24	53
EA1KC	"	**19,923**	**147**	**23**	**64**
UAØSG	"	**19,264**	**160**	**20**	**44**
W8KR/Ø	"	19,228	82	37	55
DL6SF	"	18,963	163	22	41
OZ1JVN	"	**18,306**	**205**	**16**	**65**
EA3FQV	"	17,940	123	30	62
NU4B	"	16,560	74	33	57
OI3AI/1	"	16,254	121	19	44
Y26JD	"	16,120	235	15	47
Y24TG	"	15,252	117	25	57
OK2PAW	"	13,776	131	21	63
FB1LMS	"	9,280	98	17	47
OK2KHF	"	9,018	166	11	43
OK1DZD	"	8,910	82	19	36
DJ5QK	"	7,975	76	12	43
UQ2GCP	"	7,668	68	20	36
OK1DCP	"	6,630	73	15	50
WB9TBU	"	6,628	49	29	39
WA9FWO/5	"	5,980	49	15	31
YO5BCX	"	5,940	97	11	44
YO6DMR	"	5,850	127	9	36
OZ8E	"	3,182	44	16	27
OI3AX	"	2,175	30	6	19
W2JEK	"	450	12	6	9
VE1AGZ	"	325	32	3	2
AH6EK	**28**	**8,463**	**98**	**15**	**16**
LZ1ZH	"	**1,104**	**35**	**8**	**15**
UB4ET	"	672	28	8	13
RB5GD	**21**	**40,232**	**206**	**24**	**70**
UR2CR	"	**13,167**	**139**	**16**	**41**
UB5WAB	"	3,296	31	17	30
RB5EG	"	2,414	48	7	27
NO5W	"	1,248	20	10	16
SP8MMK	"	828	18	8	10
OH3GD	**14**	**112,991**	**661**	**26**	**77**
UAØSMM	"	**102,557**	**496**	**28**	**63**
LZ1DB	"	**69,384**	**469**	**22**	**62**
UB5FDM	"	**60,442**	**413**	**24**	**70**
JA2DN	"	**33,966**	**179**	**25**	**49**
W8VSK	"	**18,150**	**99**	**17**	**49**
N6TO	"	**12,712**	**111**	**20**	**36**
OK2BTI	"	**12,667**	**177**	**12**	**41**
G3LHJ	"	11,720	108	10	30
UT5VAK	"	7,040	162	7	37
GM4HQF	"	4,890	101	8	22
SP5CJQ	**7**	**19,430**	**223**	**13**	**54**
RB5LVV	"	**17,766**	**223**	**15**	**48**
LZ1TA	"	**7,350**	**151**	**12**	**50**
Y24KG	"	5,934	83	11	35
Y23TL	"	5,148	131	5	34
YU1LM	"	4,536	108	8	34
W8IQ	"	1,200	25	9	15
UV3DFL	"	924	34	7	15
JO1LDY	"	60	4	3	3
UQ2PM	**3.5**	**27,240**	**405**	**11**	**49**
OK1DRQ	"	**21,808**	**340**	**12**	**46**
OK3CUG	"	21,392	336	11	45
HA8IQ	"	**16,400**	**306**	**8**	**42**
YT3RM	"	**12,870**	**100**	**5**	**26**
G3VMY	"	**11,997**	**256**	**7**	**36**
Y24SB	"	**9,798**	**202**	**8**	**38**
SP9GKM	"	**6,630**	**184**	**6**	**28**
OK3YDX	"	5,538	138	6	33
OK1DNR	"	5,434	139	6	32
AA2U	"	**4,257**	**44**	**11**	**32**
Y23TI	"	4,059	124	4	29
Y25XA	"	3,485	80	7	34
OK1DLY	"	3,381	148	4	19
Y22AN	"	2,968	107	4	24
OH3GZ	"	2,460	70	7	23
Y26VG	"	2,257	53	7	30
Y23OH	"	1,875	48	4	21
Y26EH	"	1,000	37	7	18
JA1KFX	"	817	27	9	10
G3ICH	"	420	17	5	15
Y24HG	"	392	28	3	11
Y37XJ	**1.8**	**13,552**	**307**	**7**	**37**
OK1MP	"	**7,000**	**121**	**8**	**42**
OK3CVI	"	3,360	140	5	25
OL4BOR	"	684	37	3	16
Y24ZF	"	234	18	2	11
SP8BVJ	"	153	20	2	7

CHECK LOGS

Our thanks go to the following stations who sent in check logs:

DA1SK, DFØEG, DK5OS, DL3NCI, DL6HCC, DL6RAI, EA1AUS, EA1BVW/EA8, EA1CSB, EA8ZS, F11ATR, G3ICH, G4FDC, GI5TK, HA3PT, HA7KLG, HA7KNT, HA8RJ, HA8XX, HAØNAE, HK3DDD, K4FW, K6FM, K7QQ, K8CL, KE6VL, KD8M, LA1B, LA2EG, LA5PEA, LA6XI, LA8CE, LA8XM, LA9ABA, LA9OI, LA9XG, LA9ZV, LZ1IA, LZ1KCC, LZ1KHK, LZ1KKI, LZ1KSD, LZ1MC, LZ10X, LZ2AG, LZ2CF, LZ2KD, LZ2SB, LZ6CW, N5TV, N7JB, NP4A, OH1XX, OH2BAH, OH2FQ, OH2NL, OH3TQ, OH5FA, OH5OT, OH5RZ, OH6AA, OH6NH, OH6RC, OH6VR, OH6XA, OH6ZH, OH7NDX, OH8NKQ, OK1AYU, OK1DMP, OK1DWJ, OK1KIX, OK1KTA, OK1US, OK2PGG, OK2PLH, OK3CIR, OK3CGT, OK3CQD, OZ1ABA/A, OZ1BUR, OZ1CMC, OZ1EUO, OZ1HRS, OZ1IPP, OZ1JLX, OZ1JMM, OZ1JNR, OZ1PP, OZ2E, OZ2JI, OZ4RS, OZ5PA, OZ8JD, PA3AAV, PA3AFF, PA3DUA, PAØLKR, PI4GAZ, PY1OL, PY2DP, PY2FK, PY2NZP, PY3CJI, PY6BZ, RA1AI, RA1QAZ, RA1QE, RA3EA, RA3EF, RA3NB, RA3RM, RA4NBG, RAØJB, RAØSS, RB5CB, RB5ICY, RB5JJ, RB5LTZ, RB5NT, RB5UU, RB5UX, RD6DAA, RL8PYL, RT4UA, RV6AA, RV6AM, RV6AZ, RV9UV, RW6AA, RW3DM, RZ3AM, RZ3DZ, SK7UL, SM5AHX, SM5CEU, SM5FUA, SM5FUG, SM5ICV, SM5MLE, SM6AHS, SM6BWQ, SM6BZE, SM6CDN, SM6CMR, SM6LJP, SM6OEF, SM6OLL, SM6REA, SM7CZC, SM7KWE, SM7OEL, SM7RWE, SMØBFJ, SMØCMH, SMØCSX, SP1AEN, SP2BIK, SP2BLC, SP2BME, SP2BMI, SP2DKI, SP2FAV, SP2GBL, SP2GOH, SP2GUV, SP2IU, SP2HGG, SP2PMK, SP2US, SP3BYZ, SP3CDQ, SP3DAH, SP3MY, SP3ZAC/3, SP4ETO, SP4NKV, SP5CCC, SP5CWQ, SP5ILO, SP5PB, SP6CES, SP6FER, SP6HTX, SP6KSD, SP6PKQ, SP8AG, SP8BJH, SP8GSC, SP8JMA, SP8SIP, SP8ZHY, SP9PDF, SP9ZFC, SP9JPA, SP9PDF, U3ADD, UA1OAM, UA1OFT, UA1QBQ, UA1QCC, UA3AAJ, UA3ACJ, UA3AGW, UA3DAU, UA3DEV, UA3DL, UA3DMY, UA3DTT, UA3ECJ, UA3ECQ, UA3ET, UA3IAA, UA3IDT, UA3LCC, UA3MED, UA3NCJ, UA3NEM, UA3PB, UA3PDW, UA3PP, UA3QUK, UA3RAO, UA3RCG, UA3RFZ, UA3ROE, UA3TBZ, UA3TFV, UA3VGY, UA4CJO, UA4HFK, UA4HLX, UA4HML, UA4NBH, UA4NZ, UA4WAP, UA4WH, UA4YAQ, UA4YQ, UA4YZ, UA6ADN, UA6HNU, UA6HOF, UA6HU, UA6LFQ, UA6LON, UA6PCH, UA6YBU, UA6YCI, UA9AKW, UA9CES, UA9FZ, UA9JEL, UA9MDV, UA9OJ, UA9XAA, UA9YC, UAØAAB, UAØDA, UAØFFU, UAØJDD, UAØKAV, UAØKDB, UAØKLL, UAØSGN, UAØWZ, UAØZX, UB1RR, UB3IWA, UB3JWW, UB4JFJ, UB4UDN, UB5AGL, UB5AJP, UB5ENC, UB5EQV, UB5III, UB5IMZ, UB5KCA, UB5KCT, UB5KG, UB5LAL, UB5LKY, UB5MEC, UB5MQS, UB5QHU, UB5QJA, UB5QVE, UB5VAA, UB5VBI, UB5WEU, UB5ZBG, UB5ZY, UC2AIH, UC2IA, UC2IDG, UC2ODW, UC2SD, UF6VB, UJ8JF, UL7JZ, UL7PEI, UL7PFE, UL7PFH, UL8GBV, UM8MGM, UM8MTF, UM8MY, UO4OZZ, UO5ODA, UP2BGP, UP3BI, UQ1GWY, UQ1GXX, UQ2GCV, UQ2GEO, UQ2GHJ, UQ2GIU, UQ2GLW, UQ2GLY, UQ2GMR, UR2RGN, UT4UB, UT4UH, UT5BP, UT5JBG, UT5UCK, UT5UFI, UT5UII, UV3DAV, UV3HD, UW3AQ, UW3EG, UW3PN, UW3ZV, UW4CN, UW6AA, UW6HO, UW6HS, UW9CS, UWØCN, UY5GG, UZ1AWT, UZ1LWF, UZ4FWE, UZ4LWV, UZ4PZA, UZ6AXF, UZ6EWA, UZ6EWF, UZ6LXM, UZ6LZL, UZ9CZA, UZ9OWD, UZ9OXI, UZ9XXG, UZØOWB, UZØUWC, VE3PEX, VE7ACM, VK4UR, W3HVQ, W9YDP, WQ5W, Y21AE, Y21DG/A, Y21UC/A, Y21UD, Y21XH/A, Y22JD, Y22TD, Y22TO, Y22YJ, T23CO, Y23EL, Y23QD, Y23RB, Y23VH, Y24CG, Y24EA, Y24GE, Y24LN/A, Y24LO, Y24WJ/A, Y24XD, Y25BE, Y25PA, Y26BN, Y26DO, Y26GN, Y26IH, Y26IL, Y27VH, Y27YH, Y28HL, Y28TO, Y31YF, Y32PT, Y32QH, Y33UB, Y35VG, Y35WF, Y38YE, Y39XC, Y41MH, Y43XL, Y46TO, Y46XF, Y49MH, Y51YJ, Y52ZE, Y53VL, Y54ZA, Y56YF, Y56ZN, Y57ZL, Y61XM, Y62QH, Y64ZL, Y71VG, Y75YL, YO2KCB, YO2KYI, YO5TA, YO6DDF, YU3RU, YU7DR, YV5ANT, ZL1BSG, ZL2BDC, ZY6BG, ZZ2-0548, 4N2D, J6LAD/9Y.

Disqualifications: None

W4FA presents specific details on constructing an economical maximum power dummy load plus hints on building HF dummy loads for any power level.

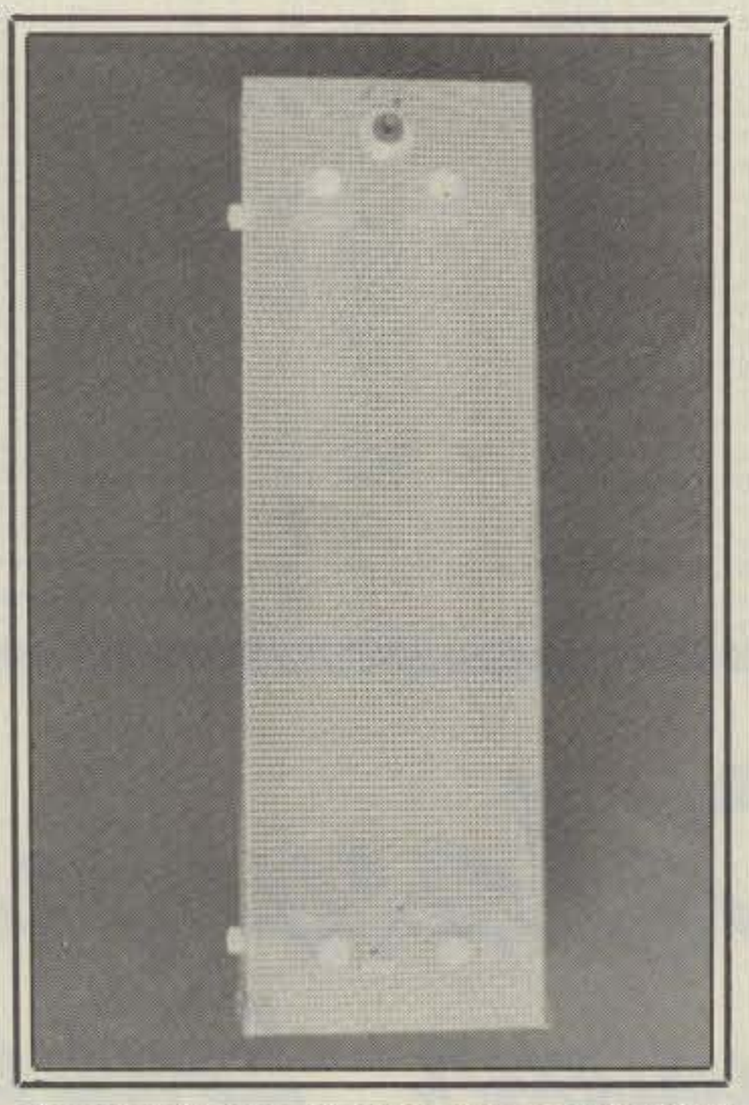
Build A Really Big Dummy Load

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The dummy load described in this article evolved after a number of years of experimenting with dummy loads. What finally convinced me to go ahead and build it is the last experience I had with a KW, oil-filled dummy load overheating and spilling oil (all of its contents) over a test bench. That dummy (of foreign manufacture) had a safety value which didn't function, and one of the end seals simply popped out of its main cylindrical frame.

Anyway, the dummy load described in this article, as the name implies, will handle more than a KW output on any HF band with a very low SWR. It uses four load resistors (air-cooled), whereas some commercial, air-cooled dummy loads on the market rated at a KW use only one such resistor! One need not duplicate the construction of the dummy exactly. One could use only one load resistor, if desired, or various combinations of lower wattage load resistors rather than the types mentioned.

This article will mainly present a few construction hints on how one can inexpensively homebrew an HF dummy load in the power range of 100 to 1,000 watts plus. But first of all, one perhaps should ask the question if a dummy load is still really necessary or useful in a station setup? The classic answer used to be that using a dummy load prevents a lot of unnecessary on-the-air QRM as one tunes up a transceiver's output tuning and loading circuits. That was partially true, although the circuits still had to be "touched up" on the air when the transceiver was connected to a real antenna. The new transceivers with solid-state finals don't require output tuning. If anything, an antenna tuner has to be adjusted, and a 50 ohm dummy load between the transceiver and the antenna tuner doesn't aid the process. An in-line noise bridge is the only really "quiet" way to pretune such a setup. But in spite of all that, my station setups, even using the latest transceivers, have always included a dummy load.



The Big Dummy is constructed in a 14" × 5" × 4" perforated sheet-metal enclosure which is tack-soldered together.

The dummy load, first of all, presents a quick means to check to see if a transceiver is putting out the proper power level and if the various ALC, speech-processing functions, etc., are performing properly as indicated by the transceiver's internal metering. I'd estimate that more than a few amateurs have encountered situations, either in a new station setup or when something has gone wrong with an antenna or grounding system, where there is so much RF feedback, VOX problems, keying problems, etc., that one couldn't tell what was going on until one could confirm that the basic transceiver was functioning properly by using a dummy load. Even if there are no problems, periodic checking of a transceiver's meter readings with a dummy load will basically confirm the transceiver's output capability, the same as making and recording periodic SWR checks on a station's antenna system will highlight a possible developing problem. Of course, for those of us who like to experiment with or test transceivers and linear amplifiers, a dummy load is an essential tool.

Circuitry

The dummy load consists of a 50 ohm load which is basically nonreactive at HF frequencies. Some stray capacitance cannot be avoided in the construction of the dummy, but the main thing to avoid is inductive effects by choosing an RF noninductive load resistor or resistors. Not to insult anyone's intelligence, but I would like to emphasize *RF* noninductive load resistors. There are various audio noninductive load resistors available, and more than one amateur has picked them up and tried to use them as RF dummy loads with, of course, complete failure. Unfortunately, they are usually just labeled "noninductive."

One could at the 100 watt power output level parallel a number of carbon-composition 2 watt resistors to form a 50 ohm dummy load. But even starting at that power level, I think it is much better to shoot for a proper noninductive load resistor. Such a resistor is of the carbon-film-deposit type and looks like the ones shown in the photograph of the "Big Dummy." They come in various ohmic values and power ratings and range in size from 3 inches long to 11 or more inches long. They have been around for years for use as terminating resistors in transmitting rhombic antennas and as parasitic suppressor resistors in the tube-type finals of high-power (1 kw to 500 kw) broadcast transmitter. They are

*c/o CQ magazine

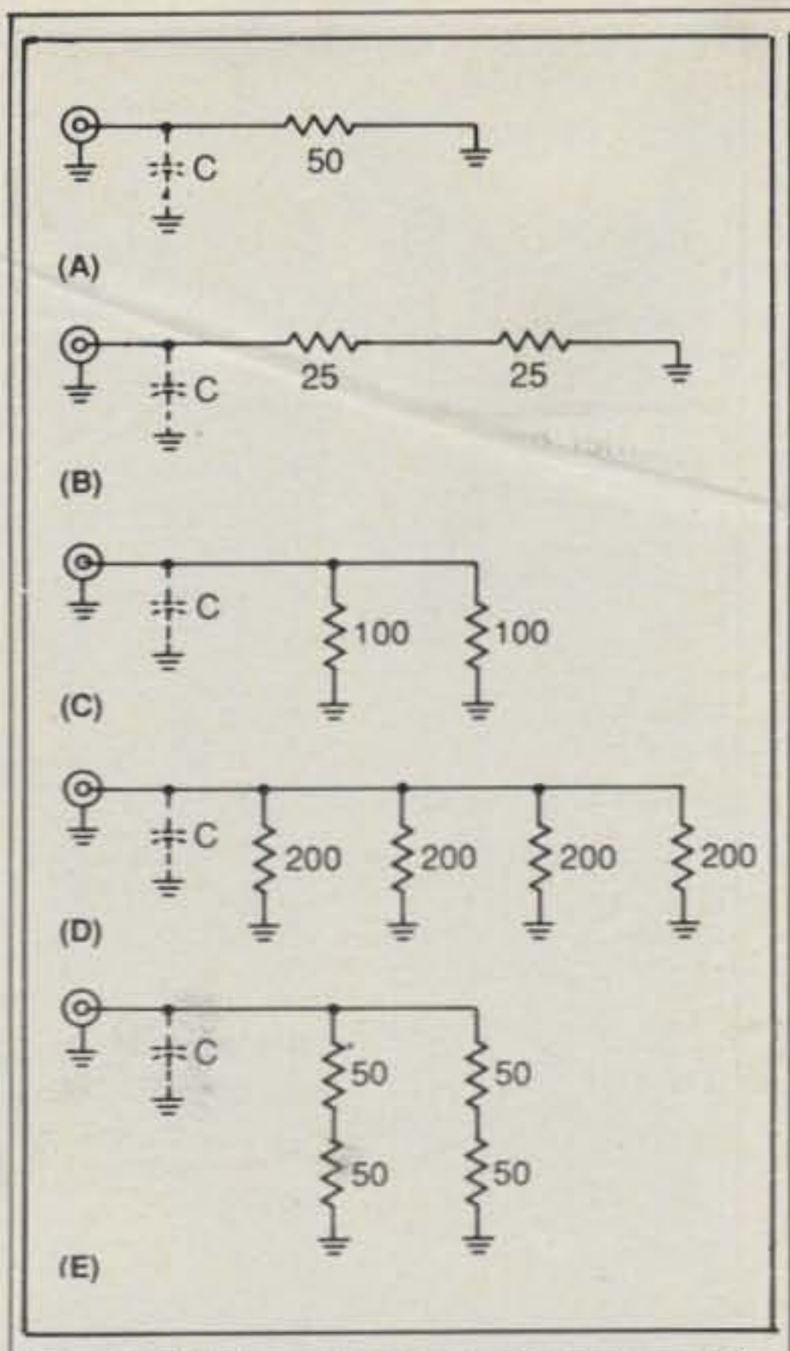


Fig. 1–(A) through (E) are various combinations of resistors that may be used to form a 50 ohm dummy load. The "Really Big Dummy" uses the arrangement at (E) with four 50 ohm resistors nominally rated at 90 watts each. The capacitor "C" is explained in the text.

still being manufactured today by a number of companies. Unfortunately, I don't know of any source from which an amateur can directly mail-order them except from surplus outlets such as Fair Radio Sales, which now and then comes across a supply of them. However, they are out there, and I can't believe that any amateur who really checks the surplus outlets, flea markets, etc., can't come across them at no more than a few dollars each. A few years back I came across one source which had some sitting around which were unused and over 30 years old. They needed a bit of cleaning up but were A-1 electrically.

Depending upon what resistor values can be found and what power level one wants to achieve for a dummy load, the resistors can be arranged in almost any manner as shown in fig. 1, ranging from the use of a single resistor to various parallel/series combinations. I've shown just a few possibilities in fig. 1 because the 25, 50, 100, and 200 ohm resistor values seem to be the most commonly available values. Fig. 1(E) is that of the "Really Big Dummy." The dashed-in capacitor shown by the coaxial input connector for each diagram is a frequency compensating capacitor which may or may not be necessary to obtain the lowest possible SWR on 10 meters depending upon the physical construction used for a dummy load. The capacitor value required usually ranges from 5–20 pF, but the capacitor itself need only be the absolute run-of-the-mill 1 kv disc ceramic type, even for a 2 kw dummy load.

The carbon-film-deposit resistors are very rugged electrically and the seemingly low wattage ratings marked on them are deceptive. If no markings are found on them, a reasonable rule of thumb is that the 3 inch long ones are rated 20–25 watts and the 8–11 inch long ones are rated at 70–90 watts. The resistors can have enough RF power dissipated in them that they glow a dull red and yet will cool off again without sustaining any damage. They have been (and are being) used in dummy loads where the rule of thumb has been applied that they can dissipate 10 times their power rating for a 20 second period if allowed to cool off between usages. Therefore, a 20–25 watt rated resistor will certainly suffice for test periods a minute or less with a 100 watt output transceiver. The "Big Dummy," which uses four 90 watt resistors, should be able to handle 3.6 kw for short periods, although I've been very happy to see it perform at the 1.5 kw output level for many one minute periods with cooling periods in-between. All of this assumes that the resistors are mounted such that air can freely circulate about them.

Construction

The "Really Big Dummy" was constructed as simply as possible using perforated sheet metal stock, as shown in the photographs. The stock was salvaged from some old, old audio amplifier chassis, but the type of decorative metal stock available in hardware outlets can also be used. Also, any type of commercial enclosure which has plenty of perforations to allow free air flow around the resistor(s) will suffice. The resistor(s) should have a clearance of ¾ inch to 1 inch to each side of the enclosure and between the resistors.

Large electrical fuse clips were used to hold the resistors and the clips insulated from the enclosure by mounting them with standard 10-32 nylon hardware (a nylon nut was used under each clip to act as a spacing insulator). The fuse clips are not necessary, however, and a perfectly suitable mounting can be fabricated from ¾ inch wide copper strapping fastened around each end of the resistor(s). The strapping material can be found in large hardware or electrical outlets or simply do it yourself by cutting up copper sheeting material.

As shown in the photograph, a standard SO-239 connector is mounted on one *side* of the enclosure rather than one *end* of the enclosure. This allows the enclosure to be stood on end during operation and seems to facilitate the air flow

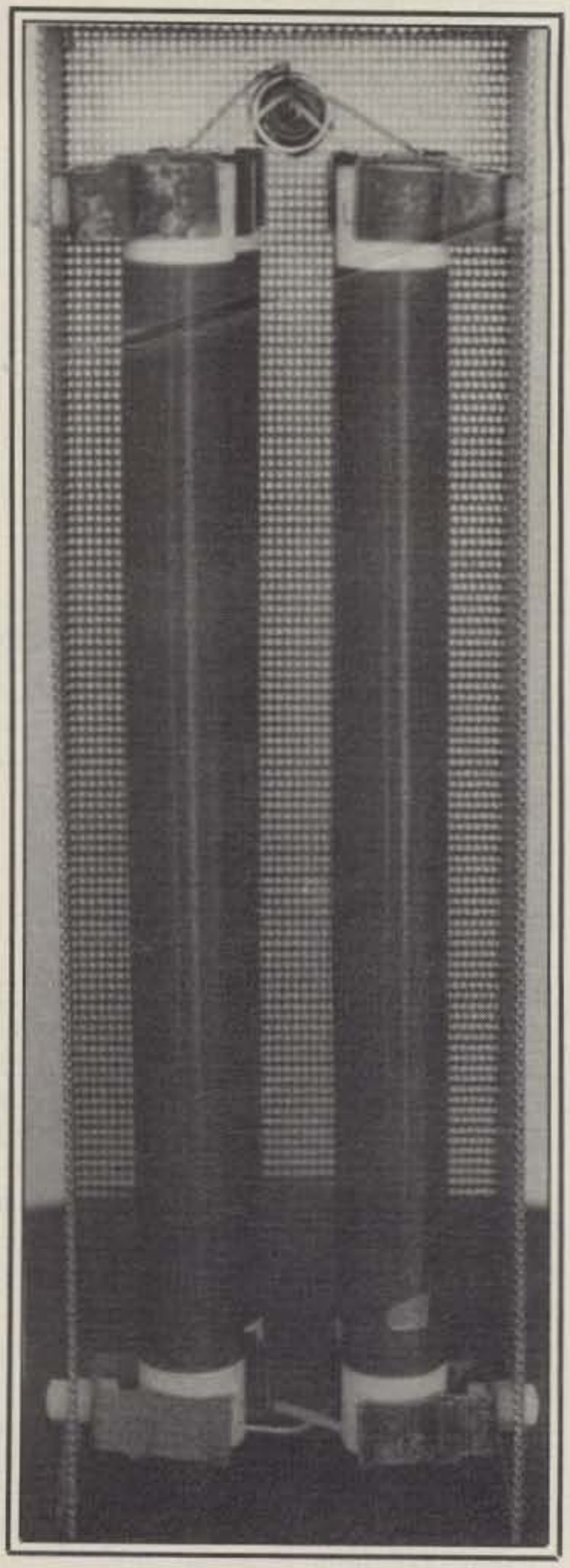
around the resistors as a convection flow develops along the length of each resistor.

Electrical Tests

Initial electrical tests of the "Really Big Dummy" weren't bad, but did show an SWR of 1:2 at the high end of 10 meters. Experimentation with compensating capacitors at the coaxial input connector did help, but not enough. Finally, the wiring at the "far" end of the resistors was changed to a crossover arrangement (explained in the caption to one photograph). That, plus a 10 pF compensating capacitor at the coaxial connector, did it. The SWR went down to 1:1.25 at 29.9 MHz and was always better below that frequency. The point is that if multiple resistors are to be used in a dummy load, you might have to experiment a bit with the wiring to get maximum cancellation of stray capacitive and inductive effects for minimum SWR, especially on 10 meters.

Summary

Dummy loads are not difficult to construct for the HF bands, and if one has enough patience to find the parts necessary (mainly the RF noninductive resistors), they can be constructed at a considerable price advantage compared to buying commercial units. Besides, it's a good, fun-type project even for a newcomer.



This photograph shows the resistor mounting with fuse clips insulated from the enclosure by nylon machine-screw hardware. Note the crossover wiring at the bottom of the resistors. The top end of the right foreground resistor is wired to ground, while its bottom lead crosses over to the bottom end of the left background resistor, the top end of which goes to the center pin of the coaxial connector. The four resistors form the network shown in fig. 1(E).

The 20 second to 1 minute test period allowed by some of the dummy loads suggested may sound short, but usually it is enough to check for proper equipment adjustment even using a continuous-carrier mode of modulation. The simplest of fans directed to force air across the dummy-load resistors should, if desired, increase the operating period by a factor of at least two or three times. CQ

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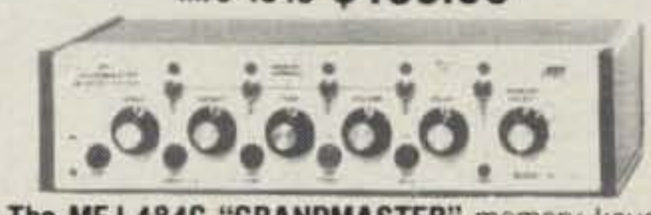

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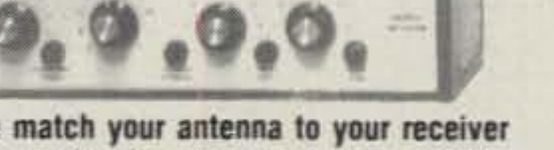

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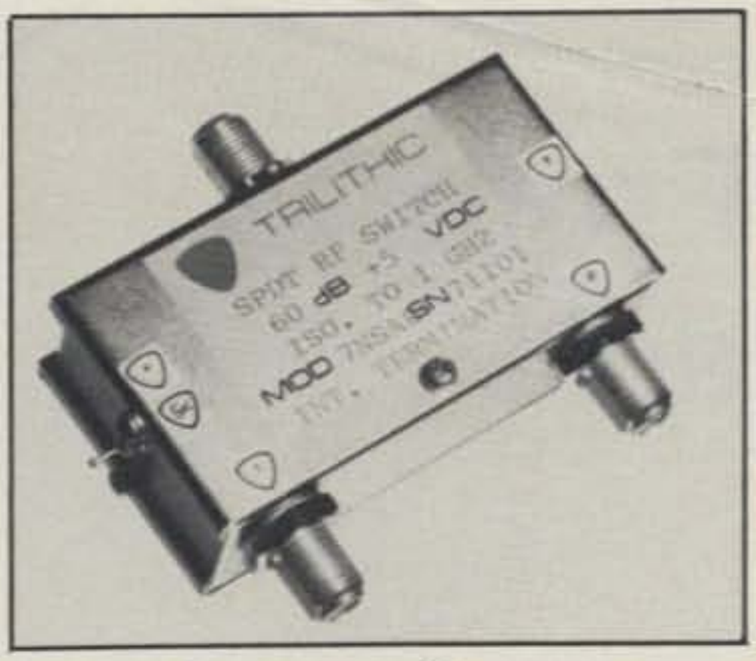
For more information about the SB-1000 Linear Amplifier and Heathkit's line of amateur radio equipment, send for the free Heathkit catalog. Write to Heath Company, Dept. 150-955, Benton Harbor, MI 49022. In Canada, write to Heath Company, 1020 Islington Ave., Dept. 3100, Toronto, Ontario, M8Z 5Z3.

Astatic Silver Eagle Plus Microphone

The Astatic Corporation is introducing a new version of the Silver Eagle. The ETS9-D104SE+ is the Silver Eagle plus a new microphone amplifier, switching system, and built-in ETS. The end of transmission signal (ETS) was originally developed for use in the NASA Space Program. The circuit produces 1 kHz tone when the microphone is unkeyed. This tone indicates the transmission is completed. The ETS tone is heard by the user of the microphone as well as the person receiving the transmission, and is generated electronically within the microphone. The ETS feature is switch selectable. The Silver Eagle Plus also features a new switching system. With its newly redesigned amplifier, the ETS9-D104SE+ retains its talk power while improving SSB operation.

Additional features include a new VOX switch which allows improved operations

on transceivers that incorporate this feature, a 20 dB pad on the audio output, and the capability of powering the microphone either from a 9 volt battery or directly from the radio. For more information, contact Astatic Corp., Harbor and Jackson Streets, Conneaut, OH 44030-0120, or circle number 103 on the card.



Trilithic Programmable A/B (SPDT) RF Switch

Trilithic has announced the Models 7LSAB and 7NSAB electronically controlled latching and non-latching A/B switches. Available in a variety of configurations, including a direct PCB mountable version, the electrical performance includes return loss of 20 dB minimum, insertion loss of 0.2 dB maximum, isolation of 60 dB minimum 70 dB typical, frequency range DC-1000 MHz, and characteristic impedance 75 ohms.

A/B switches are used for switching between dual (redundant) local area networks, between cable drops and receiver antennas, and in automated and/or remote test equipment. They may be ganged to create 1×3, 1×4, 1×5, etc., switches for other applications. Trilithic will package these in 1×N versions as well as N×M (e.g., 2×5) matrix switches in a single housing. The Model 7NSAB Non-Latching A/B Switch with Type-F connectors is priced at $49 each in quantities of 10 or more. The PCB mountable version is $34 each. Other connectors and options are slightly more. A 450 MHz version is less. For more information, contact Trilithic, 6840 Winona Drive, Indianapolis, IN 46236-9506, or circle number 102 on the reader service card.

Miracle Flux

Miracle Flux makes it possible to solder aluminum to aluminum or aluminum to dissimilar metals. All that is required, in addition to Miracle Flux, is a brush for application, ordinary solder, and a soldering iron. After ensuring that the surfaces to be soldered are free of dirt and scale, brush on Miracle Flux and then heat. Once flux reaction starts, apply solder immediately. For more information, contact Miracle Rod, P.O. Box 791, Glasgow, KY 42141, or circle number 104 on the reader service card.

How do signals get from one place to another? What do some of those strange-sounding terms mean? How can I use this information to make my station and operating more efficient? Read W1ICP's two-part series and find out.

Getting The Signal From Here To There—Part I

BY LEW MCCOY*, W1ICP

Radio-signal propagation is a fascinating subject and one not completely understood by many amateurs, particularly newcomers. There are many ways in which your transmitted or received signal can arrive at its destination. A great deal depends on the frequency, the time of day, the condition of the sun, and so on. Just how propagation takes place is the subject of this article.

Groundwave

There are many different ways a radio signal can travel, but there are only two basic methods of radio-signal propagation. These two ways are by **ground wave** or by **sky wave**. Let's deal with ground wave first. The term *ground wave* is just what the name implies—a wave of radio energy that travels along the earth until it is completely absorbed or attenuated. If it travels in contact with earth, it is also called a surface wave. Ground-wave signals have a very high attenuation factor. This is easily evidenced by signals on the broadcast band where 100 miles is just about the limit for ground-wave distance. For example, in the 80 meter band the signal loss at 100 miles is on the order of 150 dB! The range for 80 meters for ground wave is about 25 to 50 miles, of course depending on the power of the transmitted signal.

There are many conditions when the transmitting antenna and the receiving antenna are within line of sight of each other. Some portion of the transmitted signal travels this route and is called the "space wave." Of course, any signal traveling via ground wave and line of sight has some angles involved in its travel from transmit to receive point. A portion of the signal can strike the earth and then be reflected so that it actually takes a longer path to reach the destination than the direct signal. These signals combine when they reach the receiving antenna, and depending on their phase difference, because of arriving at different time intervals, they can actually add or subtract in strength from each other.

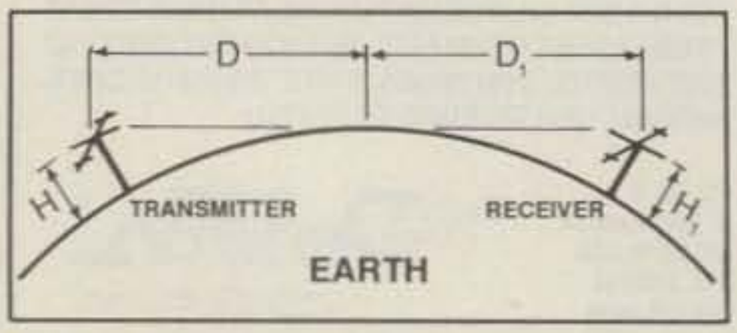


Fig. 1– This drawing shows the distances one can get from line-of-sight contacts. The formula for D or D1 (in miles) is D = 1.415 divided by the height in feet of the antenna. We have also included a simple basic program for those amateurs with computers (see text).

Line of Sight, or How High the Antenna

Normally, on VHF and UHF the distance the signal travels is "line of sight." Except for rare instances, signals above 144 MHz are not propagated via the ionosphere, so we must depend on line of sight. Repeater owners seek the highest possible location for their stations for just this reason. The higher the repeater, the greater the coverage (see fig. 1).

Many amateurs live in fringe areas of repeaters, and it is helpful to know what they can expect in distance from given heights. The distance from the transmitting antenna to the horizon can be found from the formula D = 1.41 times the square root of the antenna height. The distance from the horizon to the receiving antenna is, of course, determined by the same formula.

This information comes into play many times in amateur radio, so I have included a simple program in BASIC.

Program to determine the line-of-sight distance.

```
10 PRINT" The height of the transmitting antenna in feet is"
20 INPUT H
30 D = 1.41*SQR(H)
40 PRINT"The distance from the transmitting antenna to the horizon is";D; "miles."

50 PRINT "The height of the receiving antenna in feet is"
60 INPUT H1
70 D1 = 1.41*SQR(H1) + D
80 PRINT "The distance between the transmitting site and the receiving site is ";D1
90 end
```

While it isn't called a signal-propagation method, there is another way signals can get from here to there, so to speak. It is not unusual for a transmission to be reflected off hills, mountains, etc., at VHF and UHF, causing different signal paths than normal line of sight. This is also true when large buildings which sometimes act as reflectors are present.

Meteor Scatter

It should be mentioned that in the case of VHF-UHF signals the signals can be propagated in other ways. For example, during meteor showers (which occur much more frequently than many people believe) there are relatively long distance contacts possible on the higher bands. A meteor passing through the upper atmosphere leaves an ionized trail from which a signal can be reflected. The trail only lasts for a very short time, so contacts must of necessity be very short. However, during dense meteor showers it is

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possible for longer contacts, on 10 and 15 meters, for example.

Ducting

Still another means of transmission, particularly evident at VHF, is "ducting." Atmospheric ducts occur particularly over large bodies of water and tend to "trap" signals, and they can be carried great distances. Notable examples are contacts on VHF from the west coast of the U.S.A. to Hawaii.

Sky-Wave and the Ionosphere

Much of the fun of amateur radio would not be there if it were not for the ionosphere. This is an ionized layer that surrounds the earth and ranges in height from 20 miles up to 200 or so miles. As we go higher from the surface of the earth the atmosphere becomes less and less dense. The atmospheric pressure becomes much weaker, and free electrons and ions can move about without combining into atoms. (Note: One important point the newcomer to amateur radio should know is that radio waves travel at different speeds depending on the dielectric material they are passing through or striking. They can "bend" or "bounce" depending on this dielectric material.)

The ionization is caused by ultraviolet radiation from the sun. However, the ionosphere is by no means constant, and each layer we will discuss has many vagaries. The sun, as most of us know, is not a "constant" radiating device in that the amount of ultraviolet radiation depends on many things such as the sunspot and solar flux numbers, which go through a cycle of changes.

Sunspots and Solar Flux

As mentioned, radiation from the sun is the controlling factor of the ionosphere. Solar sunspots have been noted for well over 200 years, and it has been noted that the number of sunspots tends to rise and fall in cycles, covering approximately 11 years for each cycle. Over the last 50 years or so much more has been discovered about solar activity and the sun's relationship to radio-signal propagation. Until recently we discussed sunspot numbers when talking about propagation conditions. Those numbers are smoothed to provide a "better" average. However, for meaningful and useful information the sun's activity is measured every day at 1700 Universal Mean Time at an observatory in Ottawa. This information is compiled to provide a daily report of solar activity called the *solar flux*. Hourly bulletins from WWV give the solar-flux number or index.

A "quiet sun" has a solar-flux number of 66 (and propagation would be considered poor for the higher bands). During times of sunspot cycle peaks the solar flux numbers can go quite high. For example, in the peak month of Cycle 21 (we currently number the cycles), November 1979, a solar flux of 383 was recorded—very good conditions indeed! Anyone who has come into amateur radio in the last few years has a real treat in store. Conditions are getting better, and we are on the upswing in sunspot numbers.

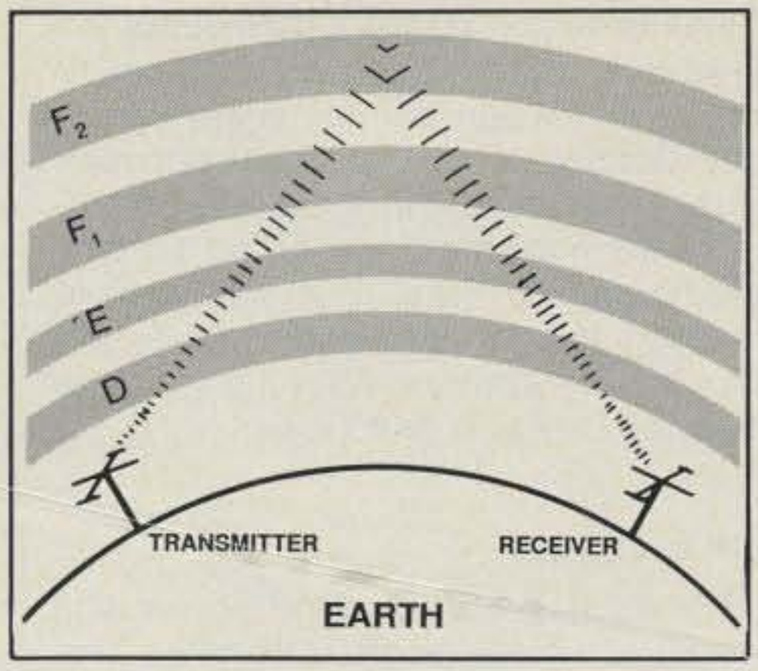

Fig. 2– This drawing shows the various layers of the ionosphere.

Radio signals leave the antenna at many angles, some going up to be refracted and reflected off ionized layers back to earth at some distant receiving antenna providing the long-distance contacts so many of us enjoy. Fig. 2 is a drawing showing these layers.

Depending on the type of antenna used, there will be many angles of radiation from the antenna. We'll discuss this subject in greater detail later on, but there are a few points that should be covered now. The ionosphere has the capability of reflecting radio signals, but only signals below a certain angle (see fig. 3). This cutoff angle is called the "critical

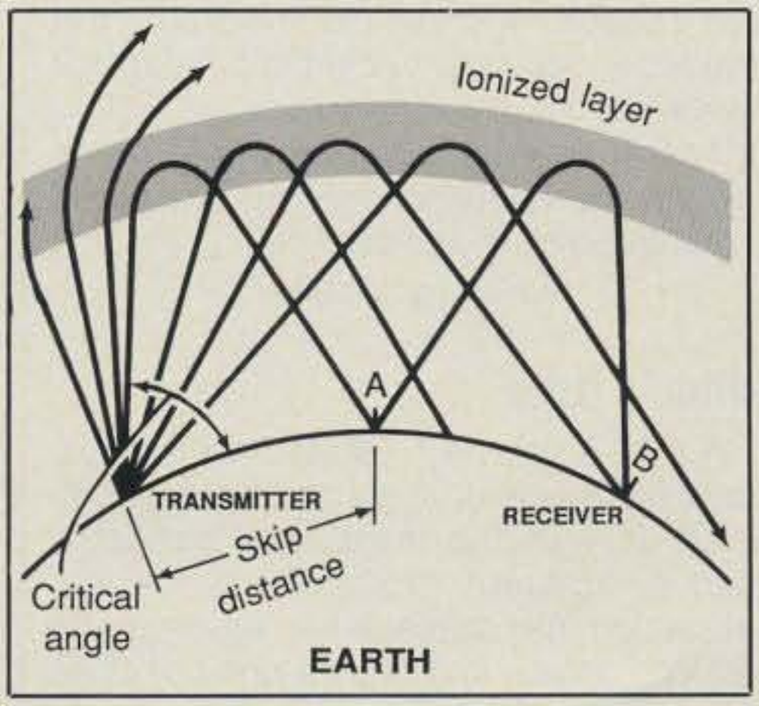

Fig. 3– As discussed in the text, any angle above the critical angle will not be returned to earth but will proceed on through the ionosphere into space. In actual practice, the signal leaving the antenna does not travel in single lines as shown, but rather travels as a broad front, with some areas of the front, or lobes of energy, stronger than others.

angle," and any signals higher than this angle will go right through the ionosphere without being returned to earth. (Which means we want to avoid antennas with the majority of their radiation straight up! Some of the popular loop antennas can be guilty of "lost" radiation.)

In addition to the ionosphere, the earth itself serves as a reflector, so signals reflected back down from the ionosphere strike the earth and are reflected back up, going up and down until they are dissipated. It should be noted that there is always some loss from the signal when it strikes the earth. The amount of loss depends on the quality of the earth where the signal strikes, and we have little or no control over that factor. The distance between the transmitter and where the signal is bounced back to earth from the ionosphere is called the **skip distance.**

Now that we have an idea about the signal skip of sky wave, let's look at the various ionosphere layers and how they can help or hinder our signal.

The D-Region

Let's discuss the layers one at a time to see how they affect our signals. As we know now, the sun is the controlling factor when it comes to ionization. During daylight hours the lowest layer or region comes into play. It is called the D-region and is about 60 miles up. This is a relatively dense layer of atoms with fewer free ions. As the sun strikes this layer, the D-region becomes a very heavy absorber of low-frequency signals, such as those in the broadcasting band and our 80 meter band. In fact, at midday absorption is so strong that we have to depend entirely on ground wave at these low bands. Low-frequency signal waves such as 160 and 80 meter signals take longer to travel through the D-region than high-frequency signals. The wave has more time to strike atoms and dissipate energy (as heat). In fact, the entire signal can be dissipated in this manner, never having a chance to be reflected back to earth. Signal loss is much less at 40 meters, and the D-region has practically no effect on any of the higher bands.

An interesting sidelight here about the D-region is that the Federal Communications Commission permits some broadcast stations to operate only between certain time limits during the day and requires them to shut down during nondaylight hours to prevent their signals from reaching too far and causing interference to other stations. After the sun goes down the D-region disappears.

The E-Layer

The next layer is called the E-layer, and it exists at a mean height of 65 miles. This layer comes into play for long-distance communications. It is the next most heavily ionized layer, again with ionization heaviest at noontime and during daylight hours, with the layer (normally) disappearing at night. And it, like the D-region, can be a heavy absorber of signals. There are occasions when a condition exists that is called **sporadic-E** (many times this occurs at night). This makes for some interesting signal paths on 15, 10, and 6 meters. For this reason one should never "give up" when these bands appear dead. Check them frequently and try a few CQs. You might be surprised. More about sporadic-E later.

The F-Layer

To most of us the really important layer in the ionosphere is the F-layer, as this is responsible for most of our long-distance contacts. The height of the F-layer is between 150 and 250 miles, and it is the most intensely ionized layer. The F-layer at times breaks up into two distinct layers, the F1- and F2-layers, the F1-layer being the closest to the earth. They usually recombine after dark into the F-layer. The degree of ionization depends on many factors—time of day, time of year (sun's position), and most important, the time of the sunspot cycles and solar flux number.

Next time we'll discuss signal paths through and via the ionosphere and some of the vagaries that exist.

(To be continued)

Editor's Note

W1ICP's two-part series on propagation is designed as a basic primer to familiarize us with the terms and concepts used in amateur radio. For a full discourse on the subject we recommend that you obtain and read a copy of *CQ*'s *The Shortwave Propagation Handbook*. The *Handbook* was written by *CQ*'s Propagation Editor George Jacobs, W3ASK, and Theodore J. Cohen, N4XX. It covers all areas of propagation in full detail and is written in easy-to-read language. The book is available from the *CQ* Book Shop for $8.95 plus $2.00 shipping and handling.

The 1988 CQ WW 160 Meter Contest

CW: January 29-31
SSB: February 26-28


ALINCO
ALD-24T
DUAL BAND FM TRANSCEIVER
145.00
ALINCO
ELH-230D
ALINCO ELECTRONICS
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ELECTRONICS INC.

ALINCO

VHF & UHF FM MOBILE TRANSCEIVERS

ALR 22T (25 WATTS)

ALR 22HT (45 WATTS)

ALR 72T (25 WATTS)

With ALINCO's advanced engineering and technology, the ALR-22T (Output: 25W) and ALR-22HT (Output: 45W) 2m FM Transceivers as well as the ALR-72T (Output: 25W) 70cm FM Transceiver are designed to be the ultimate in compact size and power. An impressive array of features gives maximum flexibility in mobile installations.

FEATURES

- **Ultra-Compact**
  5-1/2" W x 1-9/16" H x 6-1/2" D, an ideal size for installation in today's compact automobiles.
- **Large LCD**
  Highly visible front Panel LCD is designed for easy viewing.
- **21 Memory Channels**
  21 fully programmable memories. All offsets, encode and decode information and "locked out" memories can be programmed.
- **High RF Output**
  Provides a powerful 25 watts (or 45 watts with ALR-22HT), RF output power with a low power setter of approximately 5 watts.
- **Dual Digital VFOs**
  Features dual digital VFOs, with front panel selection. The two VFO's tune independently.
- **Memory Scan and Programmable Band Scan**
  - SCAN Button initiates memory scan. Skips memories in which no data is stored or are locked out.
  - UP or DOWN buttons on the microphone initiates band scan in the appropriate direction. Two selectable frequencies can be stored independently for scanning limits, if so desired.
  - In both memory and band scan, scanning stops on the busy frequency and automatically resumes 2 seconds after signal ceases.
- **Priority Function**
  With priority function selected, the unit scans back to the memory channel selected to monitor activity.
- **Easily Programmable Repeater Offsets**
  +/-600KHz: (ALR-22T and ALR-22HT) + /-5MHz: (ALR-72T) or simplex are selected by the front panel offset button.
- **16-Key Autopatch Up/Down Microphone**
  Encodes 16 DTMF tones. Up/Down switches provide step frequency change or initiate band scan.
- **Standard Tone Squelch — not an add-on option as with other manufacturers.**
- **Easily programmed Non-Standard Offset Frequency.**
- **Unit can be used for CAP or MARS operation with no modifications.**

TYPE	ALR-22T/22HT	ALR-72T
Frequency Coverage (MHz)	140-149.995	440-450
Channel Spacing (KHz)	5, 10, 15, 20 and 25	5, 10, 15, 20 and 25
Subaudible Tones-Encode/Decode	Included	Included
DTMF	Included	Included

Accessories Supplied as Standard

- Hand Microphone with DTMF Pad (Condenser Type)
- Mobile Mounting bracket
- Spare fuse
- DC Power Cable
- Washers and Screws for Mounting . . .

Ask your dealer for the product brochure which shows the specifications on this outstanding Mobile Transceiver.

ALD-24T (25 Watts on both bands) has all the features as 22T, 22HT, 72T plus Cross Band full duplex. (See page one)

24T DUAL BAND MOBILE

140-149.995MHz/440-450MHz

① ON/OFF and Volume Control
② Squelch Control
③ Main Dial
④⑤ MHz UP/DOWN Control (1MHz steps) Also memory channel selection
⑥ Scan/PRI (Scan and Priority Channel Button)
⑦ A/B/TS (VFO A or B and Tuning Spacing)
⑧ MR/CHECK (Memory Recall/Offset Frequency Check)
⑨ MW/SKIP (Memory Write/Memory Skip Button)
⑩ LOCK/DUAL Button
⑪ CALL 1/CALL 2 Button
⑫ Tone/Tone No. Button (Tone unit Activate/Tone Frequency Select)
⑬ +/−/OW (Offset select button/Offset write button)
⑭ F (Function key)
⑮ TX LED (Transmit)
⑯ F LED (Function)
⑰ RX LED (Receive)
⑱ H/L Button (Power: High/Low Select)
⑲ LCD (Display)

Ask your dealer for the product brochure which shows the specifications on this outstanding Dual Band Mobile.

ALINCO

140-149.995 MHz

ALX-2T & ALX-4T HANDHELD TRANSCEIVER

With ALINCO's advanced electronics technology, the ALX-2T and ALX-4T Ultra Compact UHF & VHF hand-held transceivers have been designed to provide maximum performance and operating convenience. Choice of standard and/or optional heavy duty batteries expands the flexibility of these units. These units give you all the advantages and performance of a larger hand-held in a package, so small, so refined, so well built that only ALINCO could build it.

FEATURES

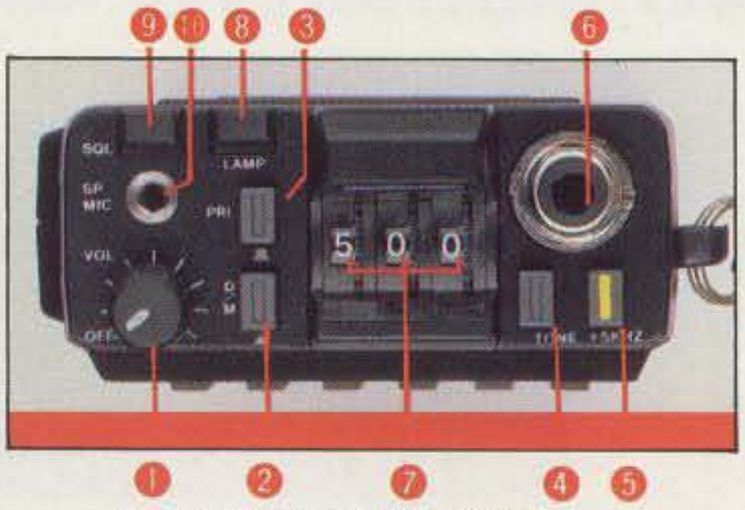
- Dimensions: With battery 160mAH
  4⅝"(H) x 2⅜"(W) x ⅞"(D)
- Output Power ALX-2T ALX-4T
  a. With Standard 450mAH Ni-Cd.....2W 1W
  b. Optional Ni-Cd packs available for increased output power
- Easy-to-operate thumbwheel frequency selection
- Battery Save Function
- LED illumination of the dial
- Detachable Slide on battery pack
- Expanded frequency coverage
- Standard Repeater Offsets
- Priority Function
- Subaudible Tone & DTMF Encoder
- Rugged, high impact molded case

ADVANCED PRIORITY FUNCTION Operator can monitor another frequency as well as the operating frequency when using the priority function. (Receives operating frequency for 1.5 second and priority frequency for 0.5 second.)

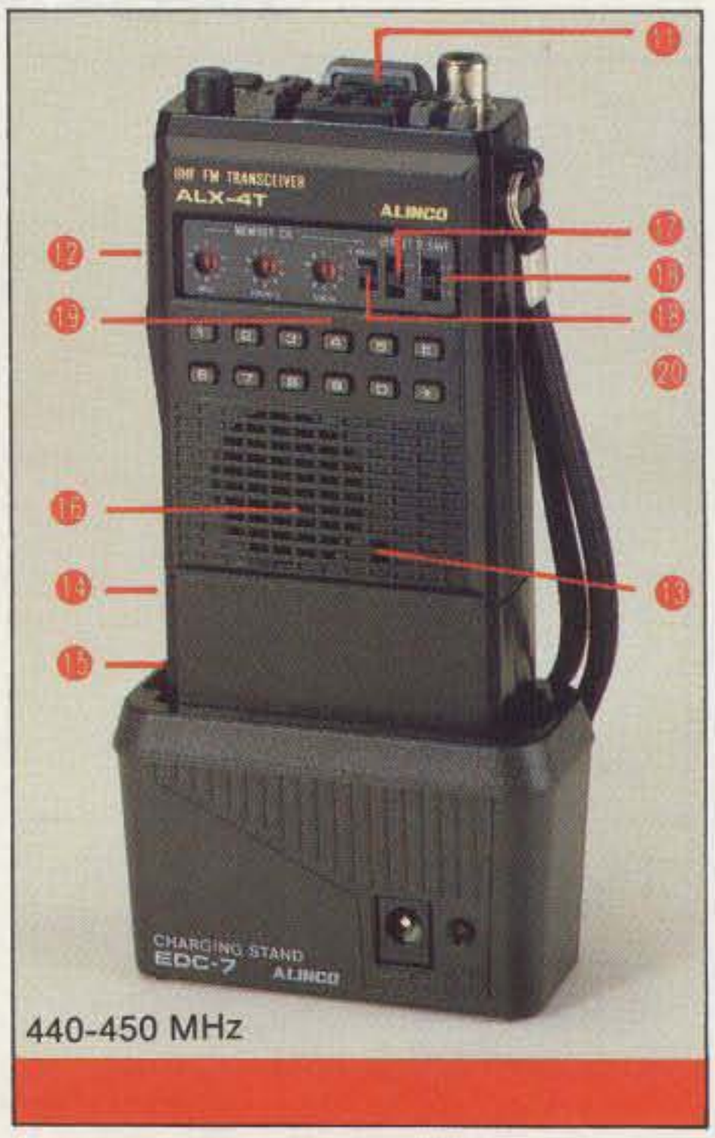
Optional Accessories

- Battery Charging Stand
  Input: 13.8V (DC12V – 17V).....EDC-7
- DC/DC Converter EDH-10
- NI-CD Battery Pack 7.2V (160mAH) EBP-2N
- NI-CD Battery Pack 7.2V (450mAH) EBP-3N
- NI-CD Battery Pack 7.2V (700mAH) EBP-4N
- NI-CD Battery Pack 9.6V (450mAH) EBP-6N
- Leatherette Case Set
  (Body Case, Battery Case & Belt Clip).....ESC-5
- Earphone Microphone EME-2

Note: All optional accessories can be used both on ALX-2T and ALX-4T.



1. Volume & Power Switch
2. M/D (Memory/Dial) Button
3. PRI (Priority) Button
4. Tone Button
5. +5KHz Switch
6. ANT connector
7. Thumbwheel
8. Lamp Button
9. Squelch Button
10. Earphone/Mic Jack
11. Lamp & TX LED
12. PTT Switch
13. MIC
14. Battery Lock Button
15. Battery Pack
16. Speaker
17. Simplex/Duplex Switch
18. Battery Save Switch
18'. +5KHz. Switch for Memory Channel
19. Memory Channel
20. Keyboard (DTMF Encoder)



440-450 MHz

Ask your dealer for the product brochure which shows the specifications on these outstanding Handheld Transceiver

ALR-206T
2m FM MOBILE TRANSCEIVER

ALINCO's Model ALR-206T 2 meter FM transceiver has been designed for maximum flexibility in mobile installations. This compact transceiver offers new concepts in design for easier operator control.

Microprocessor control offers improved receive and transmit circuitry. Features a powerful 25-watt high and 5-watt low RF output and is programmable from microphone.

Non-standard offsets, subaudible tones and 140-149.995 MHz coverage make this the ideal transceiver for today's Amateur needs.

FEATURES

- Unique Frequency Control Knob
- Compact
- 25-Watt Output with HI/LO Power Switch
- 10 Channel Memory (Back-up Lithium Battery)
- Memory Scan and Programmable Band Scan
- High Visibility LCD Display with S/RF Meter
- 16-Key Up/Down Microphone w/DTMF
- Audible "Beeper" Confirms Operations
- High Performance Receive/Transmit
- Repeater Offset Buttons and Reverse Button
- Easy-to-Install Mobile Mount
- External Speaker Jack
- Programmable Subaudible Tones
- Programmable Non-Standard Repeater Offsets
- Extended Frequency Range for MARS and CAP

TYPE	ALR-206T
Frequency Coverage (MHz)	140-149.995
Channel Spacing (KHz)	5
Tone Burst	Not Available
Subaudible Tone	Included
DTMF	Included

ALM-203T 2m FM HANDHELD TRANSCEIVER

The Model ALM-203T has been designed with special emphasis on compact size, super performance and rugged construction. Incorporating the latest in mechanical and electronic technology, including key features such as a bright LCD, 10-channel memory with memory back-up; memory scan, programmable band scan; key board frequency selection, and an easy-to-operate front panel key board layout. The ALR-203T also functions as a 150-160 MHz receiver when A/B switch is set to B position.

FEATURES

- 17-Key Function Control Panel
- 10-Channel Memory (Built-in Backup Battery)
- Indication of Function on LCD
- Memory Scanning
- Programmable Scan
- Non-Standard Repeater Offset
- Built-in "S" & "POWER" Meter
- Battery Saving Function
- Max. Output: 5W (When optional DC/DC Converter is used.)
- 2 Programmable Subaudible Tones

Standard Accessories

- Ni-Cd Battery Pack
- A.C. Wall Charger
- Rubber Flex Antenna
- Hand Strap
- Belt Clip
- Earphone

TYPE	ALM-203T
Frequency Coverage	144-147.995 150-160:RX Only
Channel Spacing (KHz)	5
Tone Burst	Not Available
Subaudible Tone	Included
DTMF	Included

Optional Accessories

- EDH-25 DC/DC Converter for 5W Output
- ESC-3 Leatherette Case & Shoulder Belt
- EDC-2 Cigarette Plug & Charger Cable
- EMS-20 Speaker/Microphone
- EBP-5N Ni-Cd Battery Pack (Supplied as Standard)

Ask your dealer for the product brochure which shows the specifications on this outstanding Handheld Transceiver.

ALINCO

144MHz and 440MHz Linear Amplifiers

The silver grey anodized chassis with the black front will complement your shack or mobile.

FEATURES

- Heavy duty heat sink for longer transmissions
- Low pass filter installed for a cleaner signal
- All units include a protection circuit
- ELH-260D and ELH-230D include a gain Rx Pre-Amp

ELH-260D
140-150MHz
All Mode (FM SSB CW)
200mw-5W Input Power
3W in = 50W Output Power
DC13.8V/10A
10dB Gain Rx Pre-Amp
50 ohms
3.58" x 1.61" x 8.50"
1.50 lbs.

ELH-730G
430-450MHz
All Mode (FM SSB CW)
200mw-5W Input Power
3W in = 30W Output Power
DC13.8V/7A
50 ohms
3.58" x 1.61" x 7.68"
1.19 lbs.

ELH-230D
140-150MHz
All Mode (FM SSB CW)
200mw-5W Input Power
3W in = 30W Output Power
DC13.8V/4.5A
15dB Gain Rx Pre-Amp
50 ohms
3.58" x 1.61" x 6.42"
1.12 lbs.

ELH-230G
140-150MHz
All Mode (FM SSB CW)
200mw-5W Input Power
3W in = 30W Output Power
DC13.8V/4.5A
50 ohms
3.58" x 1.61" x 6.42"
1.12 lbs.

Ask your dealer for the product brochure which shows the specifications on these outstanding 144MHz and 440MHz Linear Amplifiers.

IC Regulated
DC POWER SUPPLY

JAPAN'S #1 POWER SUPPLY IS NOW AVAILABLE TO THE U.S. AMATEUR

It has always been Alinco's policy to provide its customers with the most efficient and best performing power supplies at the most competitive prices possible. Alinco products are the best value for your money — recognized the world over for their high quality standards. Alinco's I.C. Regulated Power Supplies consistently out perform the competition.

FEATURES

- No Hum - Quiet Operation
- Attractive Case
- Efficient
- Reliable
- Single or Dual Meters on All Models
- Variable Voltage on All Models

EPL-322M
D.C. 13.8V (Rated) (Variable: 3-15V)
25A D.C. (Continuous) 32A D.C. (Max) (50% Duty Cycle)
Under 30mV (P-P) (Rated)
770VA (Rated)
Automatic Current Limiting Systems shuts down in excess of 20 amps
11¾" x 4" x 5¾" (W)
11 lbs.

EP-2030
About 10V-15V D.C. (With Voltage Adjuster) on front panel)
117/220 Volt Dual Transformers
15A D.C. (Continuous) 20A D.C. (Max.) (50% Duty Cycle)
Under 30mV (P-P) (Rated)
Automatic Current Limiting Systems shuts down in excess of 20 amps
10½" x 9½" x 6"
13½ lbs.

EP-3030
About 10V-15V D.C. (With Voltage Adjuster) on front panel)
117/220 Volt Dual Transformers
25A D.C. (Continuous) 30A D.C. (Max.) (50% Duty Cycle)
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CQ REVIEWS:

The Encomm Tokyo Hy-Power Lab Model HL-1K/A HF Linear Amplifier

BY JOHN J. SCHULTZ*, W4FA/SV0DX

The diminutive size of the HL-1K/A amplifier (its front panel measures only 11¼" × 5½") led me at first to imagine that it must be just another "tin-box" type of amplifier design. That was before I tried to lift the thing. After gaining due respect for the fact that the HL-1 will stay put in a hurricane, I began to look much closer at the amplifier. I'll go into details as we go along, but suffice it to say that I found the HL-1K/A to be an extremely well-constructed unit with electrical performance that matches its physical ruggedness. It was a refreshing surprise to discover the unit.

The front panel of the amplifier is dominated by the two panel meters and the plate tuning and load controls.

General

The HL-1K/A is a 1 KW input class linear amplifier that covers all of the HF bands (including the WARC bands) and 10 meters when modified by a licensed amateur. It is ideally suited for use with any HF transceiver (tube or solid state) of the 100 watt output class. It is completely self-contained to include an internal power supply and is configured to present a very small front-panel area while being about 14½ inches deep. It "weighs in" at about 40 pounds, and while such a weight does not negate portability, it does pack a lot of weight for its small size. Physically and electrically the HL-1K/A does not present any greatly innovative ideas. Rather, it is a conservative, well-disciplined design that should appeal to amateurs who are willing to invest in an amplifier that should last for many years of dependable performance. Table I presents the specifications for the HL-1K/A as supplied by the manufacturer.

Circuitry

Fig. 1 presents the overall schematic of the HL-1. The upper half of the diagram presents the RF circuitry while the lower half covers the power supply and control circuitry.

Looking at the RF circuitry first, one immediately notices that the heart of the amplifier is a pair of Eimac 4X150A tubes operated in a grounded-grid, class AB mode. Why manufacturers choose a certain tube for a linear amplifier design out of the many tube types available is always an intriguing question. At first I couldn't quite understand why Tokyo Hy-Power chose 4X150A tubes, since I haven't seen them used for some years in HF amplifier designs. But as I speculated about their choice, I realized that it was

Frequency band:	1.8 through 21 MHz all HF amateur bands (1.8, 3.5, 3.8, 7, 10, 14, 18, 21 MHz)
Mode:	SSB, CW (RTTY/SSTV/AM)
Output power:	500 watts max. (RTTY/SSTV/AM: about half of SSB and CW)
Driving power:	100 watts max.
Plate voltage:	DC 2 KV (DC 2.4 KV with no RF excitation)
Plate current:	500 mA max.
Input impedance:	50Ω (unbalanced)
Output impedance:	50Ω (unbalanced)
Vacuum tubes:	Eimac 4X150A/7034 × 2
Semiconductors:	Unijunction transistor × 1, Thyristor × 1, Diode × 31, LED × 3
Class of operation:	Class AB 1, grounded grid
AC supply voltage:	AC 100/110/117/120/200/220/234/240V, 15/8A max. (50/60 Hz)
Built-in meters:	Plate current meter IP 600 mA (full scale); Multi-meter IG 3 mA (full scale), PO 1 KW (full scale), EP 3 KV (full scale)
Input/output connector:	M type (SO-239)
Dimensions:	284 (W) × 153(H) × 375(D) mm
Weight:	approx. 18 kg
Accessories:	Control plug, fuses (8A/200V, 15A/100V)
Cooling method:	Forced-air cooling by a large sirocco fan
Power consumption:	150VA at stand-by, 1600VA at max. input

Table I–Specifications of the linear amplifier.

*c/o CQ magazine

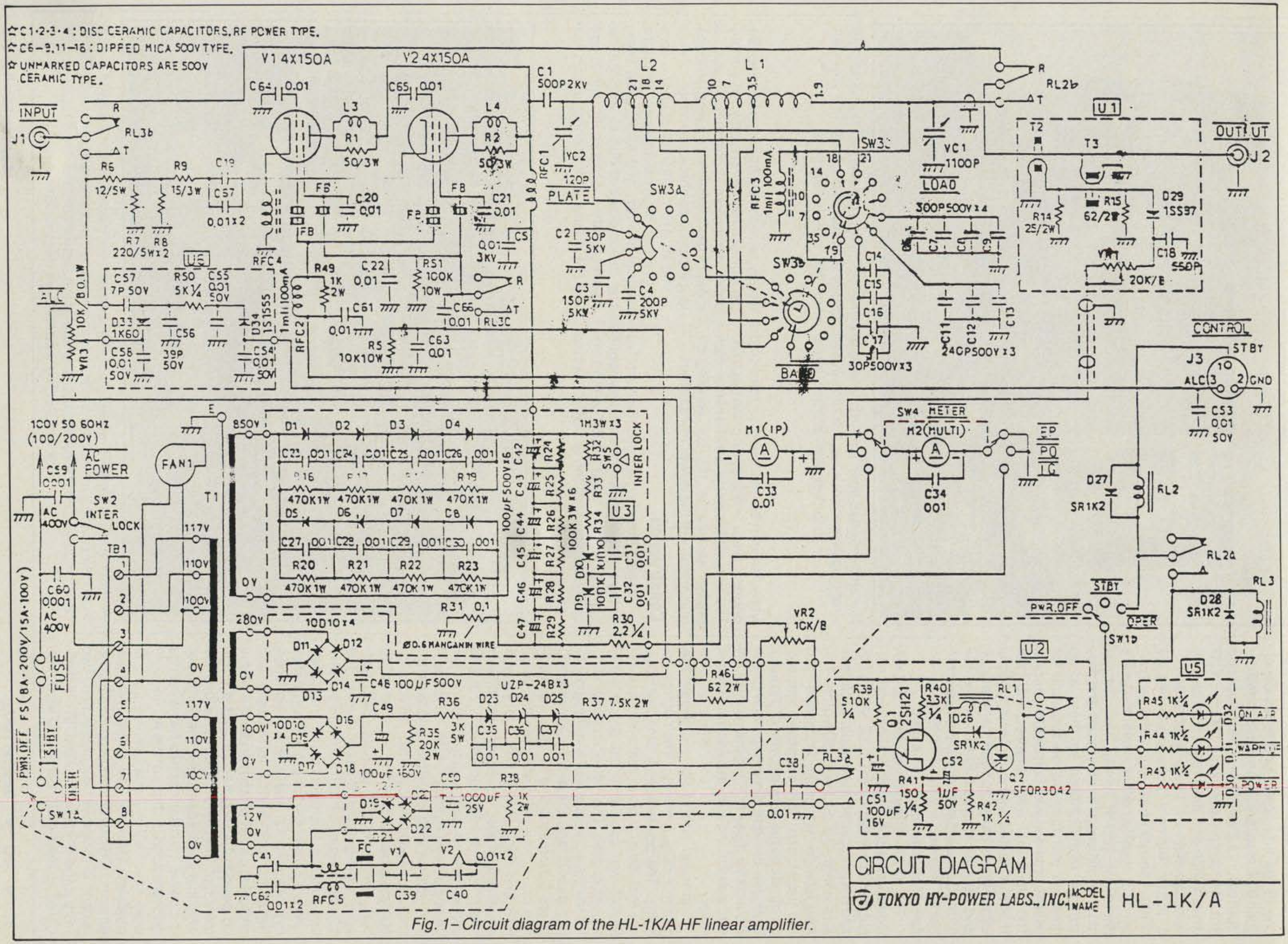
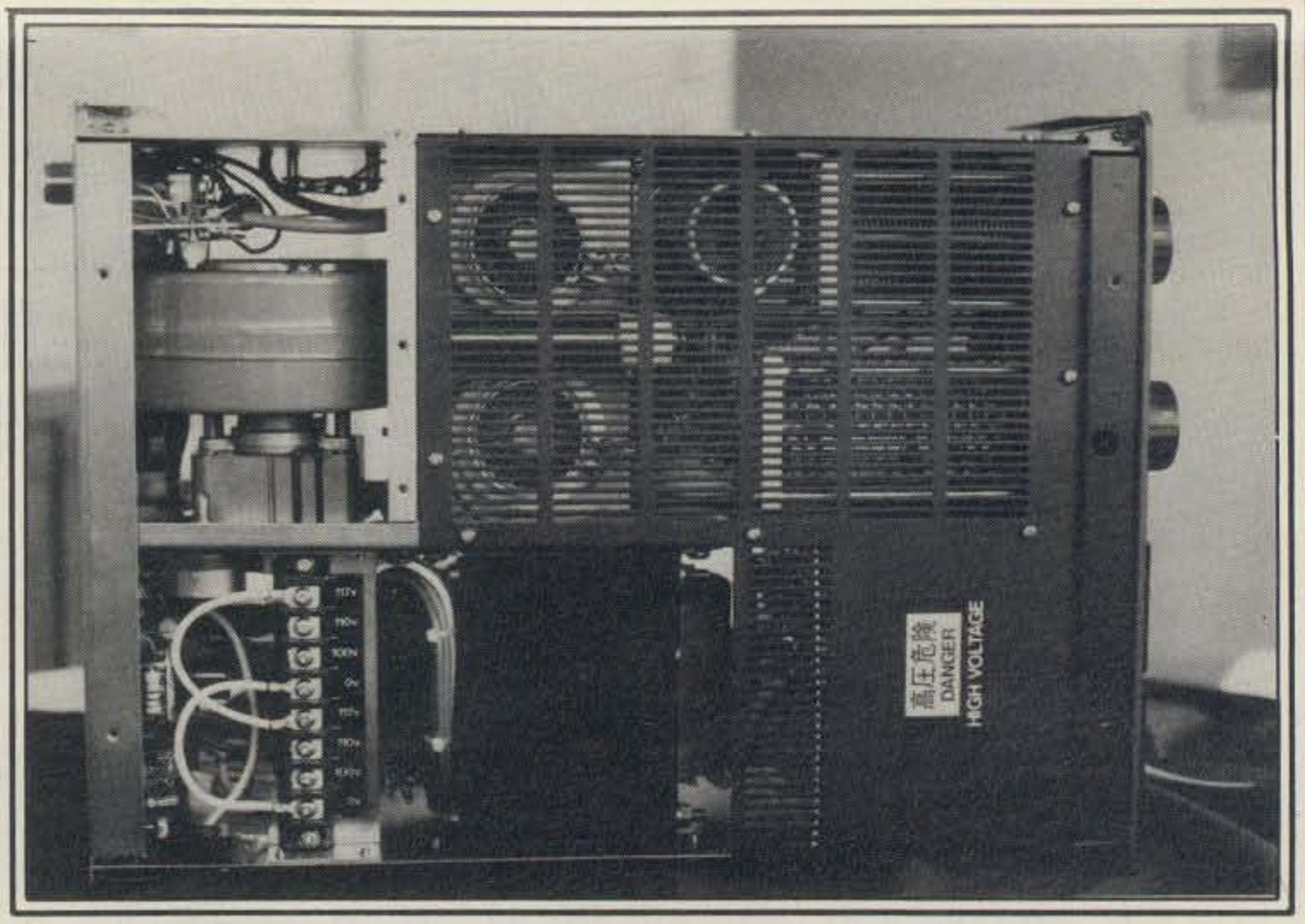


Fig. 1– Circuit diagram of the HL-1K/A HF linear amplifier.

very well thought out. The 4X150A was one of the first power grid tubes developed by Eimac, and its ceramic/metal design features a very high plate dissipation in a very compact package (4X150B/C/D types which one may see advertised by surplus outlets are the same tube but with a higher filament voltage—up to 26 volts). The tube has been used in thousands of amplifier designs over the years (more VHF than HF types). There literally must be millions of them around, and they are still manufactured so there is no question that they will be available for years to come at very competitive prices. The tubes that were supplied with the HL-1K/A tested were in their original Eimac boxes dated as 1986 manufacture and with the standard Eimac guarantee form. Subsequently, all new models are being shipped with 4CX250B's. All specifications remain the same.

The plate circuitry of the HL-1K/A works into a conventional pi-network output circuit consisting of L1, L2, VC1, VC2, and the associated fixed padding capacitors controlled by the bandswitch. The area labeled "U1" in fig. 1 contains a toroid transformer forward-power wattmeter circuit so the output power of the amplifier can be read directly on one of the front-panel meters. Transmit/receive antenna switching is done by a conventional relay.

The lower half of fig. 1 presents the power supply, metering, and control circuitry. The power-supply circuitry does not include any compromises; it is extremely well done. Only one power transformer is used. The high-voltage winding for the plate supply uses a voltage doubling circuit, and there are separate RC surge suppressor and voltage equalization networks across each rectifier (e.g., R16 and C23 across D1) and voltage equalization resistors across each filter capacitor (e.g., R29 across C47). A 280 volt winding on the power transformer develops screen voltage for the 4X150's. A 100 volt winding develops grid bias for the tubes and is switched to −55 volts for operating bias or to −140 volts for cutoff bias during receive periods. Both voltages are regulated by zener diodes. The 12 volt winding on the transformer provides filament voltage for the final tubes and is also rectified to provide an operating voltage for Q1 and Q2 (lower right corner of fig. 1). Q1 and Q2 form a timer and switching circuit which mandates a warm-up period of 45–60 seconds for the filaments of the 4X150A tubes before the amplifier can be operated. The primary of the power transformer has two windings and taps such that any of the AC line voltages specified in Table I can be accommodated (100 to 240 volts). A great amount of RF bypassing and RF filtering is used in the power supply section. Two front panel meters are used. M1 is dedicated to read plate current (0–600 ma), while M2 can be switched to read grid current, plate voltage, or power output. The cooling blower is permanently connected across the 100 volt winding on one primary of the power transformer.

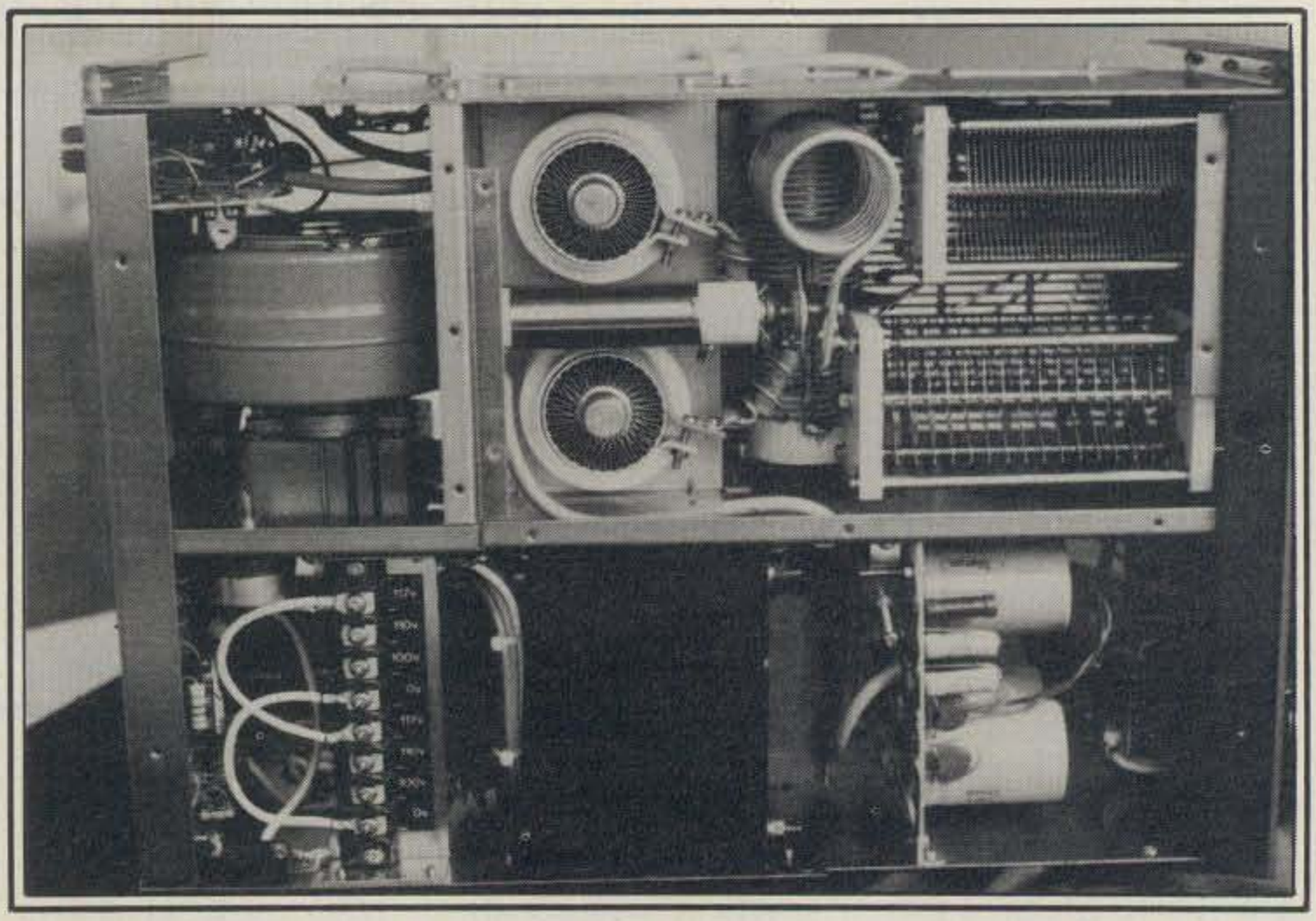


The amplifier has been set on one side and the top cover removed for this view. The strapping panel for various AC line input voltages is shown in the lower left. An interlock switch removes power when the cover is removed.

Construction

Without "beating around the bush" or trying to use evasive wording, if someone were to ask me what I think of the construction quality of the HL-1K/A, I would simply have to rate it as outstanding. Being a bit of a homebrewer myself, I appreciate equipment construction that is meant to last, especially in relation to major pieces of station equipment.

The HL-1K/A amplifier utilizes a compartmented internal chassis structure, internal shields, and rolled steel upper and lower outer shells to enclose the whole amplifier. It is a bit difficult to convey the quality of the construction fea-



Removing the internal RF shield for the RF compartment produces this view. A further interlock switch grounds the plate high voltage when this shield is removed. The PC board mounted on the back panel and above the blower contains the circuitry for the direct-reading wattmeter in the amplifier.

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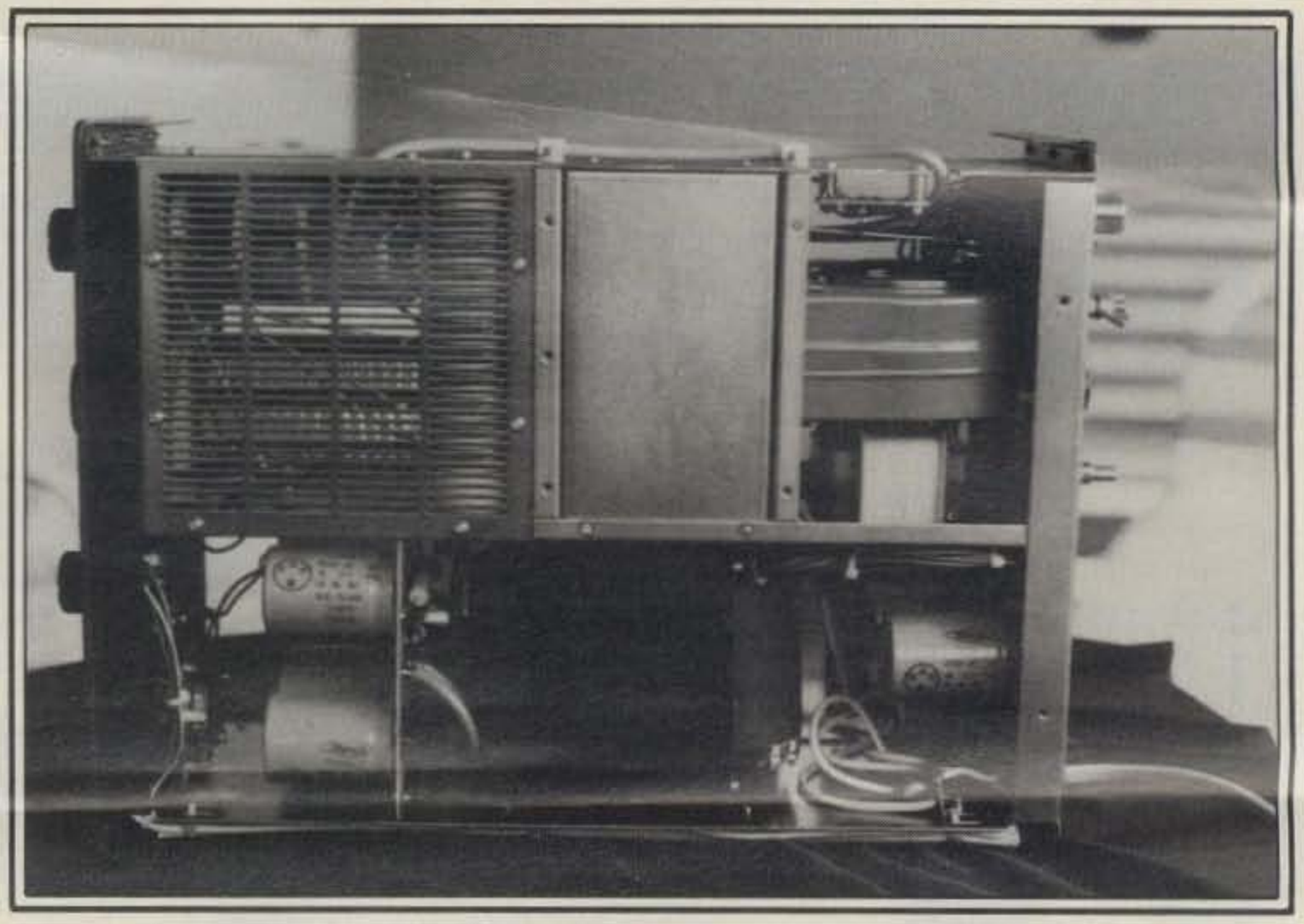
tures in writing, so I would suggest that readers take a close look at the photographs of the internal top and bottom views of the amplifier.

The internal view of the top side of the amplifier shows three main compartments—one containing the power transformer and other power-supply components, the main RF compartment, and a rear compartment for the large squirrel cage blower. Several PC boards are used to mount circuitry components, but everything is very accessible. One can see how the tubes are mounted. Then looking towards the front panel and in between the two variable capacitors, one can see the two coils associated with the plate pi-network circuit. The air-wound coil uses 4 mm diameter silver-plated wire (many 3 KW amplifier designs don't go that far), and the larger coil is wound on a ribbed ceramic form. All of the cabling is neatly held in place and well dressed.

Taking a look at the photograph showing the internal view of the bottom side of the amplifier, one sees more clearly the filter capacitors associated with the power-supply circuitry. Also, note the sealed, air-tight tube socket mounting sub-chassis to which the blower is attached (upper middle of the photograph).

The photograph of the rear panel of the amplifier shows a very clean and functional arrangement. There are two SO-239 connectors for RF in/out (each mounted with four bolts, lockwashers, and nuts), a ground terminal, a connector for both relay control and ALC output, and a potentiometer control for the ALC output. Note that the rear panel is held to the forward compartments by three bolts on each side. The whole rear panel can be detached in case it ever becomes necessary to access any of the components mounted on the inside of the panel (e.g., the antenna changeover relay).

Quite by accident, the HL-1K/A that was tested rattled around for three months in the Stateside and overseas U.S. military postal system before it got to me. Talk about a shake-table test. Of course, once I received the unit I quickly examined it and fully expected quite a few things to be loose. In reality, only two of the four screws holding the front panel in place had worked a bit loose. The power tubes, by the way, are packed separately, and one inserts them when the amplifier arrives.



In this view the amplifier is on its side and the outer bottom cover has been removed. The sealed compartment in the middle is a sub-chassis for the tube sockets.

Connecting and Operating The HL-1K/A

Setting up the amplifier involves little more than making the RF input/output connections (a coaxial jumper cable is supplied), a connection to a transceiver to key or ground the coil of the antenna changeover relay in the HL-1K/A, a ground connection, and plugging in the AC line cord. Speaking of the AC line, one should note that the HL-1K/A will operate perfectly well from the usual 110 volt, 16 ampere type of household line. A separate 220 volt line is not required as is usually the case with higher powered amplifiers. On the other hand, however, one should note that the HL-1K/A has power transformer taps for both 110 and 117 volt lines. They are there for a reason. If you use the HL-1K/A on a 110 volt line when it is set up for a 117 volt input, you will get only an RF power output of 450 watts or so rather than the full 500 watts output.

The manufacturer recommends that an ALC connection be used from the HL-1K/A back to the driving transceiver. I suppose this might be useful with some older transceivers, but I found it quite unnecessary with modern solid-state transceivers which have tight internal ALC loops.

The front-panel controls on the HL-1K/A are absolutely straightforward and easy to use. The power switch would normally immediately be set to the "operate" position. A green LED then immediately illuminates, an amber LED illuminates after the 45–60 second filament warm-up period, and a red LED illuminates when the amplifier is keyed. Tune-

A view of the back panel (the top and bottom covers have been removed). Note the absence of any pop rivets or the like. Everything is secured with solid hardware.

Band(MHz)	Input SWR	Drive(watts)	Output(watts)
1.8	1.4	65	500
3.8	1.4	60	500
7.2	1.5	65	500
10.1	1.5	60	500
14.2	1.5	75	500
18.2	1.35	65	500
21.2	1.25	70	500
24.5	1.2	80	500
28.5	1.4	85	500
29.5	1.45	80	500

Table II–Summary of test results for each band as related to the input SWR and the input power required to achieve a full 500 watts key-down output.

up is simple. The bandswitch is set to the correct band and drive slowly applied while the "plate" and "loading" controls are adjusted for maximum power output with meter M2 set to read output power. With the drive level properly adjusted, and assuming a reasonably matched antenna load is used, one will quickly see M2 read 500 watts while M1 indicates about 500 ma of plate current (1 KW input). The "plate" tuning control has a 1:6 vernier drive and is particularly easy to adjust. The "loading" control drive is direct, but that poses no problem since its tuning is relatively broad.

10 Meter Operation

The HL-1K/A will cover the entire 10 meter band. As was mentioned, conversion information will be supplied to licensed radio amateurs. Suffice it to say that no parts are required for the conversion, and a screwdriver is the only tool that is needed.

Tests/Operating Results

Table II presents a summary of test results for each band as related to the input SWR and the input power required to achieve a full 500 watts key-down output. As one can see, the input SWR never exceeded 1:1.5, so the HL-1K/A is perfectly suited for use with any solid-state transceiver. The maximum driving power required was 85 watts, but generally it was in the 60–70 watt range. Third-order IMD products were a respectable –34 dB on 20 meters.

The HL-1K/A perked along for hours and hours in actual use on SSB and non-QSK CW. The output remained rock stable, and absolutely no sign of over-heating was noticed. The blower in the HL-1K/A produces no mechanical noise whatsoever, although the faint whooshing sound of air flow is present, as with any forced-air cooled amplifier. The only way to get away from that effect would be to enclose the whole amplifier again in another outer air-tight enclosure as is done with high-power broadcast transmitters. The wattmeter in the HL-1K/A was found to be a bit conservative, although it is a minor matter—the actual power output was about 20–25 watts higher on several bands than the 500 watts indicated on the amplifier's meter.

No exact tests were made, but it seems the HL-1K/A will cover a generous frequency range both below and above each of the amateur bands, so it should be quite suitable for applications such as MARS operation.

Manual

The instruction manual supplied with the HL-1K/A is complete enough in that it supplies one with all the information needed to set up and properly use the amplifier. However, in comparison to the beautiful hardware represented by the HL-1K/A, I would have to rate the manual as only "adequate." It lacks a parts list, and one winces at some of the translations.

Summary

The HL-1K/A is not an inexpensive amplifier, but then again there is absolutely nothing inexpensive about its construction either. Having designed and built many linear amplifiers myself, I can only salute the engineers who put this one together. It is a quality product that should last for many years of enjoyable service. I would heartily endorse the HL-1K/A for anyone who wants to boost the output of their 100 watt class transceiver to the next level of competitiveness with a clean signal.

The suggested retail price for the HL-1K/A with tubes supplied is $995.00. The amplifier is available without tubes for $849.00. For additional information, contact Encomm, Inc., 1506 Capital Ave., Plano, TX 75074.

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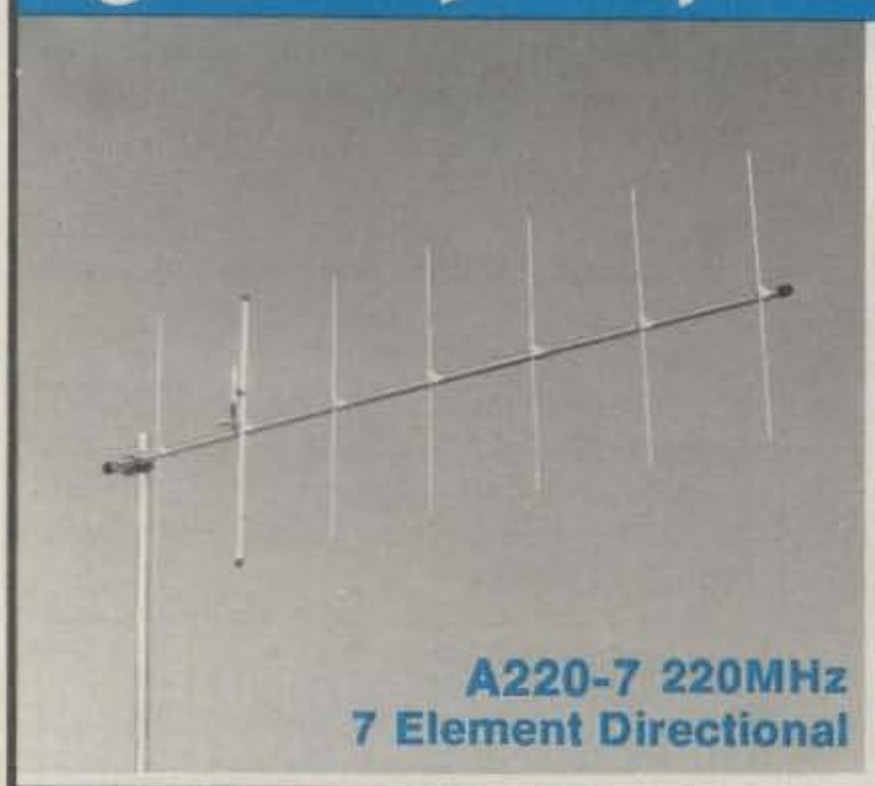

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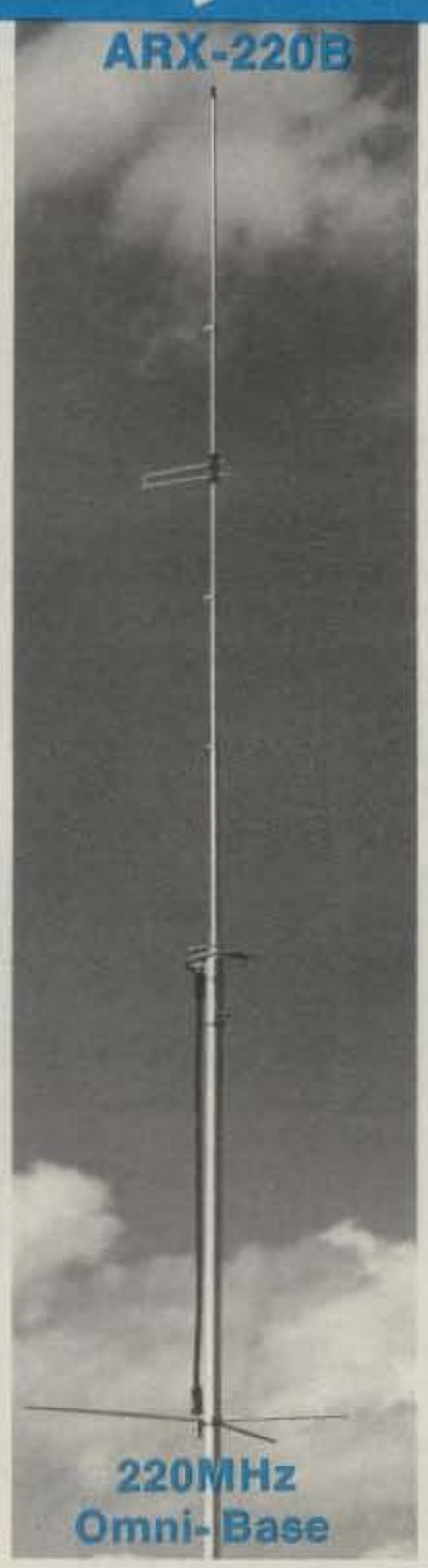

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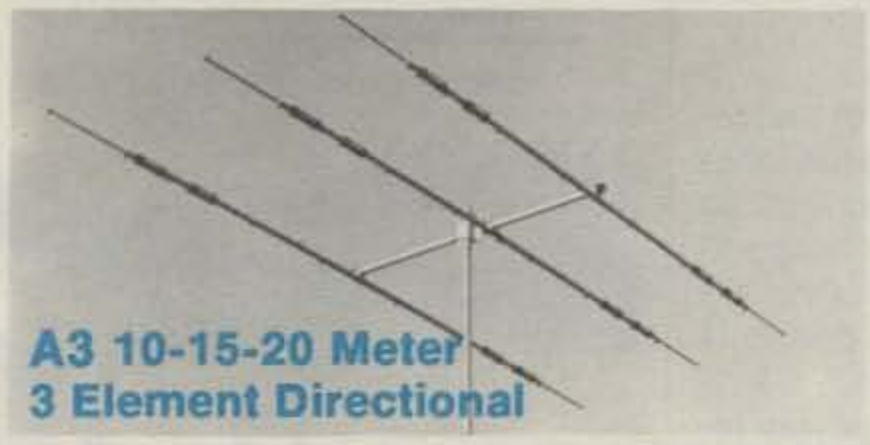

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A4 10-15-20 Meter
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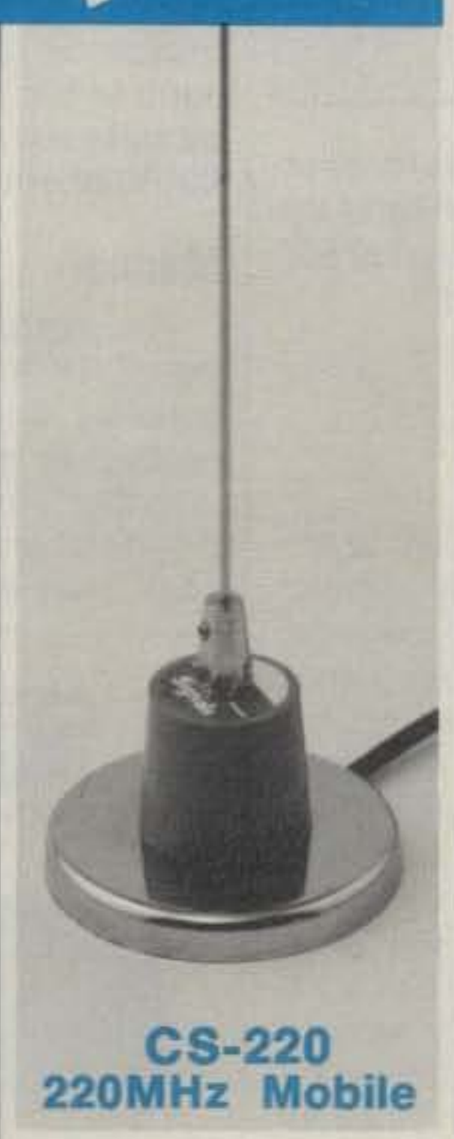

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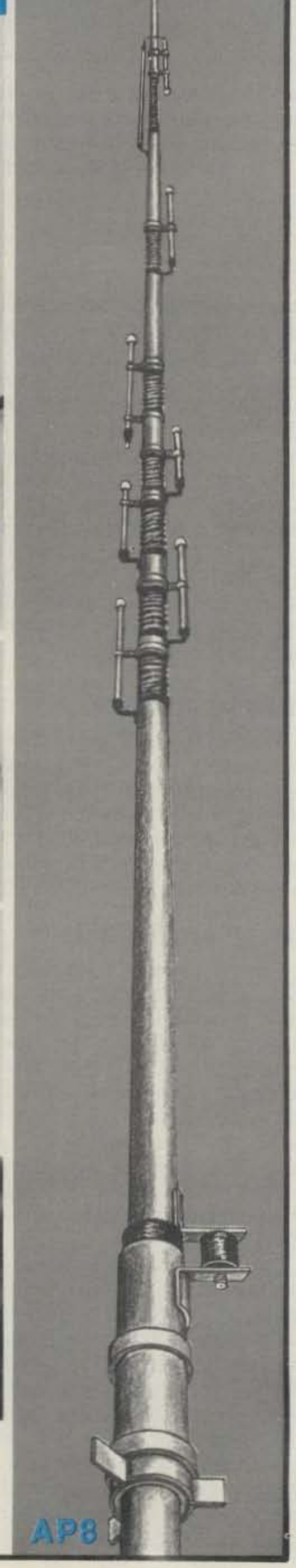

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CIRCLE 161 ON READER SERVICE CARD

Worried about destroying those expensive tubes in your amplifier when you tune up? Here's a nifty way to save your tubes and minimize QRM at the same time.

The Right Way To Tune Up Your Rig

BY MICHAEL R. MELTZER*, K2SDD

How many times have you had a nice QSO interrupted by the high-pitched whistle (heterodyne) of an inconsiderate person tuning up on the frequency? How many times have you been told to tune up only when using a dummy load? But has anyone ever told you how to properly *use* a dummy load? If you did tune up into the dummy load and then switched to your antenna, wouldn't your control settings change anyway?

After years of experimenting I have discovered a very successful way to tune up my rig. It may not be the best way, but if you do discover a better way please tell me, because I have not found it yet.

What You Need

First of all, you need the following:

1. A good dummy load of 50 ohms impedance that can handle the power you are using. Most of us get along fine with the resistors-in-oil variety that looks like a can of paint. The air-cooled types are nice but more expensive. Dummy loads must have adequate ventilation. Do not place the oil types directly on the floor, just in case a little oil leaks out of the small vent hole some day. Oil will stain.

2. A coax switch, so you can switch between your dummy load and your real antennas. Use high-quality 50 ohm coax, such as RG-213U.

3. A peak-reading wattmeter. This will allow you to tune up on voice peaks. The meter will require a voltage source such as a battery. If it does not, it is not a peak-reading meter. Beware of inferior accessories. Quality is cheaper in the long run.

To make this method work, you must cut your antennas for a 50 ohm impedance (check for a very low SWR), or you should use an antenna tuner. I am going to assume that your antenna *does* require a tuner and that you own a large linear amplifier. If your antenna is cut for proper impedance and your power is lower, it will be even easier.

What You Do

The first step is to adjust your antenna tuner in the band segment you plan to use. Do that at as low a power level as possible, because you will be putting power into your antenna and you want to minimize QRM. Five watts or less will probably do it. Set your SWR meter for *maximum* sensitivity and then tune the tuner for minimum reflected power.

Depending on the impedance of your antenna, you may be able to adjust for no reflected power at all. This will make your rig "think" that your antenna is 50 ohms, which is also the impedance of the dummy load. The rig will not be able to tell the difference between the tuner-antenna combination and your dummy load when you switch between them.

Leave the meter in the *reflected* position for the balance of tune-up. Now all rig adjustments can be made into your dummy load, which should not produce QRM. (Editor's note: At high power levels, many dummy loads do radiate some RF. Inexpensive coaxial cable, which has "holes" in the braid, will make the leakage much worse. Double-shielded coax, such as RG-213U, would be a good choice for this application. Additionally, make sure that all connectors are well soldered and tightly secured. You may want to have another amateur located within a mile or two of your station check to see that your dummy load is not radiating.) When you

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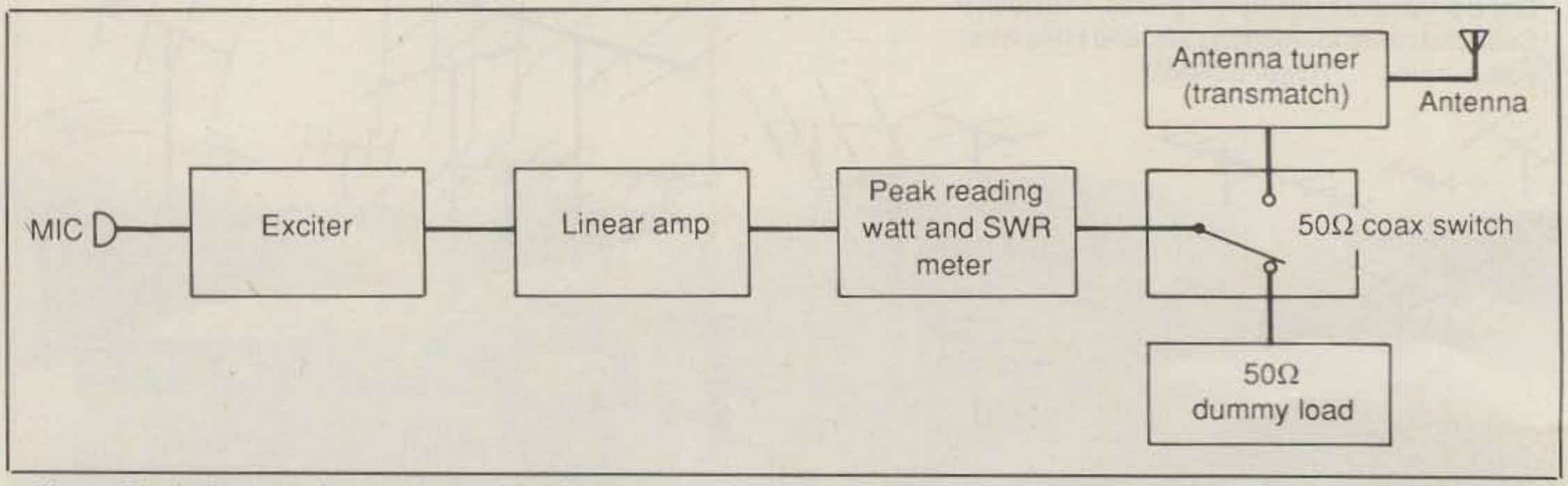

Fig. 1– Block diagram of station assembled for "safe" tuning. To minimize unwanted leakage, it is imperative that high-quality coax be used and that all connectors be properly affixed. RG-213U would be a good choice for the coax.

are finished, you may simply switch over to your tuner-antenna.

Many people tune up their linear amplifiers in such a way as to place unnecessary stress upon them. They tune them in the CW position where pressing down on the key forces the amp to transmit at full duty cycle. Do not do that.

Tune up as follows: Place your rig in the SSB position, turn on your speech processor if you have one, and speak into your mike. Watch your peak-reading wattmeter scale and tune for maximum output power. Single sideband is not full-duty cycle, so your tubes will stay much cooler during tune-up. You tune for maximum *output*, because power going *out* into your antenna system (or dummy load) will not remain behind in your rig to cook it. Maximum output will probably occur *near* resonance but not necessarily at exact resonance.

However, what if you are in the CW portion of the band? Tune up with voice peaks even if you plan to switch to CW. You are transmitting into a dummy load, so it is legal. As you speak into the microphone, there are certain syllables that make tune-up easier. Say the number 5 such as "Fiiive" or the letter "X" or, as I do, just say a nice long "AAAHHH." You may feel silly until you get used to it, but chances are no one is hearing you anyway. Also, you are producing only about one-fourth the tube killing heat as the person who uses continuous key-down until he sees the anodes glowing red. Do not whistle into the microphone, because that produces full-duty cycle, just like holding down the key.

Tuning up on voice peaks may be much safer for your amplifier, but **beware** if you start to smell hot oil from your dummy load. If the hot oil expands too much, the dummy will burst. Ask my friend K2PTH how long it takes to clean oil off of the ceiling and walls!

As you gradually increase your power, your *reflected* power will be seen to increase and your SWR will appear to grow. Do not become alarmed. Remember, you left your SWR meter at maximum sensitivity. If your forward power increases by 10 times, of course, your reflected power will increase by 10 times as well. All is normal.

When tune up is completed, you just switch back to your tuner-antenna and you are ready to go. You created a minimum of QRM and you did not stress your amplifier tubes. It is a very nice system.

I wish to thank W2ISB, N2FIT, and W2EUD for experimenting with me on this during the past three years. We all arrived at the same conclusion. This system is the best that we know of.

So next time you have a QSO interrupted by a carrier from someone tuning up his rig on the frequency, remember he may not be thoughtless, but he definitely is ignorant! CQ

CQ World-Wide DX Contest All-Time Phone Records

BY FREDERICK CAPOSSELA, K6SSS

In the records listed below, boldface listings denote world records. Number groups after calls are: year of operation, total score, contacts, zones, and countries. All-band and Multi-Operator records include a band-by- band breakdown of the world leader in each category.

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	UP2BBT/U6V('83)	203,416	1,490	8	39
3.5	VE3BMV('85)	383,040	1,629	25	89
7.0	VP2ET('85) (Opr. K5RX)	850,795	2,295	31	124
14	VP2KAA('81)	2,011,185	4,186	37	150
21	ZZ5EG('86) (Opr. N5FA)	2,184,570	4,236	36	138
28	YV2AMM('82)	1,839,004	3,700	37	130

AFRICA

1.8	EA8AK('82)	34,220	201	12	46
3.5	CT3BZ('79)	235,113	772	22	87
7.0	EA8AK('84)	776,700	1,736	35	115
14	CR6WW('74)	1,058,446	2,152	35	132
21	EL2AV('81)	1,404,936	3,087	35	117
28	OH2MM/CT3('79)	1,827,150	4,068	37	113

ASIA

1.8	UP2BBT/U6V('83)	203,416	1,490	8	39
3.5	UW9AF('83)	222,192	554	19	53
7.0	JA8IXM('86)	316,382	794	37	109
14	N2BZQ/4X('82)	1,142,964	2,347	36	135
21	4S7AAG('81) (Opr. OH2BCP)	918,925	2,897	38	137
28	4XØU('80) (Opr. 4X4UH)	1,187,200	2,555	37	123

EUROPE

1.8	LZ2CJ('84)	107,818	1,319	13	61
3.5	LX9BV('86) (Opr. DL6RAI)	185,280	1,527	19	77
7.0	I4VEQ('86)	425,799	1,435	35	118
14	YZ9A('85)	1,286,126	2,954	38	142
21	LZ2KTS('83) (Opr. LZ2CC)	1,368,897	2,821	39	152
28	9H1EL('81)	1,355,760	3,662	36	132

NORTH AMERICA

1.8	VE3BMV('86)	52,240	662	14	26
3.5	VE3BMV('85)	383,040	1,629	25	89
7.0	VP2ET('85) (Opr. K5RX)	850,795	2,295	31	124
14	VP2KAA('81)	2,011,185	4,186	37	150
21	V22A('86) (Opr. WB7RFA)	1,789,470	4,075	37	140
28	KV4FZ('79)	1,482,525	4,079	39	126

OCEANIA

1.8	KH6CC('85)	45,984	484	13	19
3.5	T32AF('85)	222,768	1,064	23	49
7.0	T32AF('84) (Opr. KH6UR)	677,844	2,045	34	80
14	ZM1BIL('83)	1,334,232	2,635	38	136
21	AHØAB('82) (Opr. JA3DOC)	1,923,840	4,509	36	108
28	AHØB'(82) (Opr. JA2VUP)	1,788,430	4,173	36	109

SOUTH AMERICA

1.8	YV2IF('84)	18,291	172	14	25
3.5	YV3AZC('84)	351,324	1,238	26	82
7.0	9Y4VU('84)	700,488	1,718	28	110
14	FY7AK('76) (Opr. F5QQ)	1,415,329	2,950	36	127
21	ZZ5EG('86) (Opr. N5FA)	2,184,570	4,236	36	138
28	YV2AMM('82)	1,839,004	3,700	37	130

Single Operator/All Band

AF	EA8AK('81)	9,974,811	5,506	152	457
AS	EX6F('84)	6,362,000	4,648	113	387
EU	YU3EY('82)	4,913,574	3,170	136	455
NA	HI8PGG('81) (Opr. N1GL)	9,009,721	7,190	131	392
O	KH6XX('81)	5,713,434	4,912	131	262
SA	9Y4VT('82) (Opr. N6AA)	11,954,696	7,082	146	422
QRP	TG9GI('82)	1,035,693	1,747	75	192

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	39	7	9
9Y4VT	3.5	404	17	57
(1982)	7.0	748	25	78
11,954,696	14.0	1,620	32	89
	21.0	1,476	34	96
	28.0	2,795	31	93
	Total	7,082	146	422

Multi-Operator/Single Xmtr.

AF	ED9CM('83)	10,157,160	5,148	152	511
AS	RG6G('82)	12,276,352	6,012	156	558
EU	I4RYC('80)	9,918,368	5,997	139	453
NA	NP4A('82)	14,953,818	8,772	174	585
O	KH6XX('85)	7,632,357	5,657	149	308
SA	9Y4W('82)	16,775,034	8,097	158	540

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	124	8	25
9Y4W	3.5	296	17	59
(1982)	7.0	594	27	86
16,775,034	14.0	1,953	35	127
	21.0	2,104	35	121
	28.0	3,026	36	122
	Total	8,097	158	540

Multi-Operator/Multi-Xmtr.

AF	EA8CR('77)	21,351,898	10,290	153	544
AS	EW6V('82)	18,746,136	10,100	142	544
EU	OHØW('82)	19,030,501	10,773	188	729
NA	VP2KC('79)	37,770,012	17,767	175	677
O	KH6XX('79)	21,990,252	10,989	184	494
SA	P41C('81)	41,957,244	17,718	173	625

WORLD RECORD

Station	Band	Contacts	Zones	Countries
	1.8	261	9	21
P41C	3.5	861	22	69
(1981)	7.0	1,752	30	98
41,957,244	14.0	4,837	38	156
	21.0	5,790	39	143
	28.0	4,813	35	138
	Total	17,718	173	625

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Build A High-Gain Portable Antenna For VHF/UHF Operation

BY EDISON FONG*, WB6IQN, AND PETER HENDLER, KE6GG

I'm going to describe a portable antenna for the VHF 2 meter, 220 MHz, and UHF region offering +9.5 dB of gain over a quarter-wave loaded antenna (rubber duck). The antenna offers an SWR of less than 1.2 to 1 at resonance. It is completely collapsible to 10 inches and is easily stored in a briefcase or large pocket. Set-up time is less than 30 seconds. This paper describes construction details of the antenna and the performance compared with other portable antennas which are presently used in the VHF region.

In disaster situations, such as earthquakes and floods, VHF and UHF remain the primary source of communications. More radios operate in these two regions than all others combined. Essentially all emergency disaster drills in metropolitan areas are performed on VHF and/or UHF. For emergency communications, what is needed is a good antenna, even with the plethora of repeaters. If local repeaters are disabled during a disaster, long-distance repeaters would be the alternative. These are typically 50–100 miles away and would be marginal through a hand-held transceiver using a loaded quarter-wave antenna. If an antenna could offer 6–10 dBs of gain, a welcome improvement would result. In addition, some directionality from the antenna would be desirable. For convenience and flexibility, the antenna should be small enough to fit into a portable first-aid kit or auto emergency kit. It must also be capable of performing on 220 MHz and 450 MHz if the need arises. The antenna must be affordable and components must already be in use or readily available. It is the author's belief that the antenna described in this paper will fulfill all of these requirements.

*74 Glover St., San Francisco, CA 94109

Antenna	Gain in dBs
3″ short duck	−2.0
3″ short duck with groundplane	−1.5
6″ standard duck*	0
6″ standard duck with groundplane	+1.5
¼-wave whip	+2.5
¼-wave whip with groundplane	+4.0
⅝-wave whip	+7.0
⅝-wave whip with groundplane	+8.5
⅝-wave whip with offset groundplane	+9.5

**Used as the reference.*

Table I– Relative gain of various antenna configurations which are practical for VHF 2 meter operation. Measurements were performed using an HP 8558a spectrum analyzer and rounded to the nearest 0.5 dB.

There is constant controversy over what antenna configuration gives the best performance on VHF and UHF frequencies. Some hold the opinion that the loaded quarter wave (rubber duck) has the best performance-to-convenience ratio. However, many prefer the unloaded ¼-wave whip since it offers about 3 dB of gain over the rubber duck. Still others will tolerate the ⅝-wave whip simply for performance, independent of the convenience. Before describing the featured antenna, let's compare the relative performance of 2 meter omnidirectional antennas which could be adapted to portable use. These include a 3 inch short duck, a 6 inch loaded duck, a ¼-wave whip, and a ⅝-wave whip.

The most popular of these antennas is the 6 inch loaded duck for 2 meters. In this report the 2 meter rubber duck will be used as the reference antenna. Table I shows the relative performance of the various configurations with and without ground plane. Similar relative perfor-

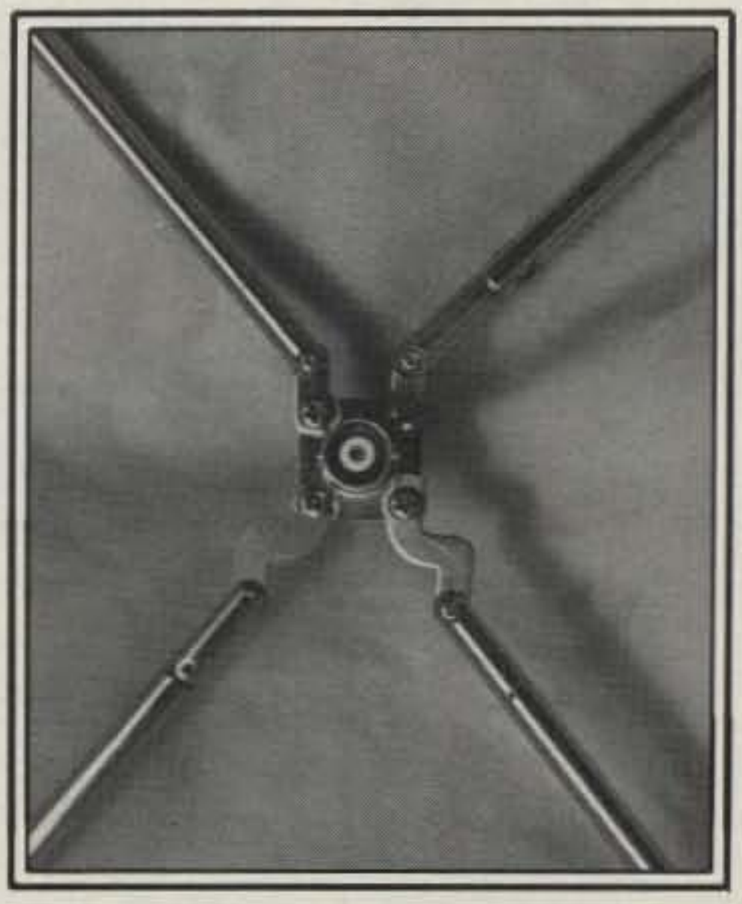

Fig. 1– Close-up view of the BNC connector with its four ground radials attached using the four holes originally intended for chassis mounting.

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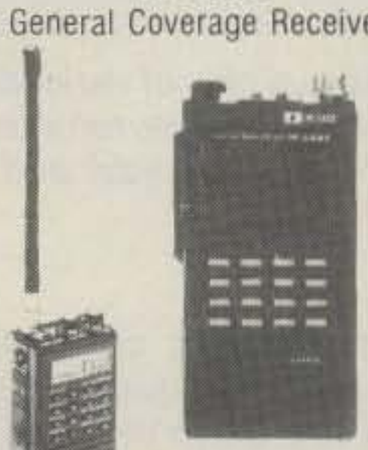

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CQ World-Wide DX Contest
All-Time U.S.A. Records

BY FREDERICK CAPOSSELA, K6SSS

Tabulated below are the record-high scores achieved by U.S. Contesters in the CQ World Wide DX Contest. Number groups following calls and bands are: year of operation, total score, contacts, zones, and countries.

PHONE

Single Operator/Single Band

1.8	AA1K/3('85)	24,633	165	19 50
3.5	K7SS('86)	217,038	828	31 91
7.0	W7RM('85) (Opr. W7WA)	243,270	813	31 71
14	K1OX('85) (Opr. KC1F)	1,131,328	2,176	36 140
21	K3RV/4('86)	925,031	1,821	35 138
28	N7DD('80)	754,536	1,730	36 113

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
	1.8	27	8	19
K1AR	3.5	168	24	80
(1985)	7.0	97	22	67
4,007,648	14.0	1,073	34	116
	21.0	1,007	28	109
	28.0	98	13	36
	Total	2,465	129	427

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	34	14	30
KX4S	3.5	208	24	80
(1985)	7.0	222	30	101
4,603,120	14.0	1,167	34	134
	21.0	769	31	118
	28.0	41	15	40
	Total	2,441	147	505

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	109	8	16
N2AA	3.5	406	24	79
(1979)	7.0	366	28	84
13,299,750	14.0	1,646	40	152
	21.0	2,198	40	144
	28.0	1,354	36	120
	Total	6,079	176	595

CW

Single Operator/Single Band

1.8	K5UR('85)	47,005	219	25 60
3.5	W1FV('85)	197,120	603	27 85
7.0	K1OX('85) (Opr. KC1F)	439,632	1,055	32 110
14	K2VV('85)	655,046	1,567	35 107
21	W1RM('82)	483,560	1,196	33 107
28	N4WW('82)	394,940	1,064	33 97

Single Operator/All Band

Station	Band	QSOs	Zones	Countries
	1.8	63	11	32
K1AR	3.5	329	19	69
(1985)	7.0	607	30	89
3,397,905	14.0	967	33	97
	21.0	428	23	72
	28.0	4	4	4
	Total	2,398	120	363

Multi-Operator/Single Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	17	9	16
N4AR	3.5	67	16	62
(1981)	7.0	461	28	92
4,564,350	14.0	755	34	110
	21.0	499	33	101
	28.0	686	32	97
	Total	2,485	152	478

Multi-Operator/Multi-Xmtr.

Station	Band	QSOs	Zones	Countries
	1.8	72	14	27
W2PV	3.5	427	18	70
(1981)	7.0	1,101	30	103
10,431,729	14.0	1,389	35	118
	21.0	1,228	35	103
	28.0	1,050	34	106
	Total	5,267	166	527

Club record: Frankford Radio Club ('79) 173,821,640

CQ World-Wide DX Contest All-Time C.W. Records

Single Operator/Single Band

WORLD RECORD HOLDERS

1.8	YV3AGT('85)	147,588	591	21	63
3.5	P40R('86) (Opr. K4UEE)	576,725	1,682	25	90
7.0	VP2KAA('83) (Opr. N4PN)	837,366	2,461	30	104
14	P40N('86) (Opr. N4PN)	1,477,905	3,138	37	122
21	LU8DQ('81)	1,359,711	2,993	37	116
28	LU8DQ('79)	1,033,399	2,775	34	93

AFRICA

1.8	EA8AK('82)	75,768	385	15	51
3.5	EA8RCT('86)	441,350	1,524	22	75
7.0	EA7TL/9('83)	354,308	1,175	21	80
14	CR6IK('74)	925,386	2,021	38	116
21	5Z4MX('83)	820,338	1,953	35	106
28	FR0MM('79)	978,012	2,590	36	90

ASIA

1.8	UP2BBT/U6V('83)	83,160	481	14	49
3.5	UP2BJK/UF('86)	339,158	1,194	25	76
7.0	UP3BA/UF('86)	696,134	1,875	32	92
14	4X0U('82)	735,504			
21	4Z4NUT('80)	519,831	1,500	34	83
28	4X4UH('80)	554,645	1,772	32	83

EUROPE

1.8	HB9AMO('85)	95,201	740	17	66
3.5	CT5AT('86)	295,464	1,500	24	80
7.0	YZ9A('85)	637,144	2,017	36	110
14	DK3GI('86)	822,024	2,006	39	129
21	YU3ZV('81)	732,096	1,957	37	107
28	DK3GI('79)	592,848	1,584	31	101

NORTH AMERICA

1.8	K5UR('85)	47,005	219	25	60
3.5	VP2KAC('83) (Opr. N4RJ)	332,880	1,302	28	86
7.0	VP2KAA('83) (Opr. N4PN)	837,366	2,461	30	104
14	VP2KAA('80) (Opr. N4PN)	1,244,782	3,111	37	117
21	VP2KAC('80) (Opr. N4RJ)	1,075,407	2,955	36	105
28	KV4FZ('79)	653,072	2,384	32	87

OCEANIA

1.8	KH6CC('85)	23,746	257	15	16
3.5	VR3AH('76)	178,560	956	24	40
7.0	KH6XX('84)	427,230	1,424	33	68
14	KH6MD('85)	610,722	1,640	37	89
21	KH6XX('78) (Opr. K7SS)	816,102	2,311	38	81
28	KG6DX('80)	801,876	2,367	35	79

SOUTH AMERICA

1.8	YV3AGT('85)	147,588	591	21	63
3.5	P40R('86) (Opr. K4UEE)	576,725	1,682	25	90
7.0	YX5A('84)	696,150	2,003	29	88
14	P40N('86) (Opr. N4PN)	1,477,905	3,138	37	122
21	LU8DQ('81)	1,359,711	2,993	37	116
28	LU8DQ('79)	1,033,399	2,775	34	93

Single Operator/All Band

AF	D44BC('86) (Opr. N6TJ)	6,815,001	4,488	130	379
AS	UF6CR('82)	4,613,680	3,982	92	312
EU	ZB2X('86) (Opr. OH2KI)	3,796,480	3,507	126	386
NA	NP4A('86) (Opr. K7JA)	7,040,400	4,617	155	445
O	N6BT/AH0('81)	4,241,746	4,083	121	228
SA	9Y4VT('86) (Opr. N6AA)	8,191,246	5,099	146	396
QRP	UP2BIM('82)	899,932	1,351	83	279

WORLD RECORD

Station	Band	Contacts	Zones	Countries
9Y4VT (1986) 8,191,246	1.8	310	17	51
	3.5	563	21	69
	7.0	1,114	25	72
	14.0	1,137	32	80
	21.0	1,395	30	81
	28.0	580	21	43
	Total	5,099	146	396

Multi-Operator/Single Xmtr.

AF	EA9EU('80)	5,077,696	3,884	116	326
AS	RG6G('82)	10,394,658	5,355	166	511
EU	YU3EY('81)	7,674,190	4,051	150	345
NA	NP4A('82)	11,648,565	6,881	168	515
O	KD7P/KH2('84)	4,487,665	3,375	159	296
SA	P41E('81)	8,059,296	5,055	148	388

WORLD RECORD

Station	Band	Contacts	Zones	Countries
NP4A (1982) 11,648,565	1.8	172	15	35
	3.5	589	23	73
	7.0	1,342	28	92
	14.0	1,270	36	108
	21.0	1,547	34	106
	28.0	1,961	32	101
	Total	6,881	168	515

Multi-Operator/Multi-Xmtr.

AF	EA8CR('78)	17,734,970	9,799	142	463
AS	EW6V('82)	14,702,688	8,001	159	504
EU	OH0W('82)	14,371,840	9,515	184	618
NA	NP4A('80)	17,627,820	10,846	171	487
O	AH0C('83)	6,877,750	5,164	149	302
SA	P42E('82)	23,295,408	12,315	161	475

WORLD RECORD

Station	Band	Contacts	Zones	Countries
P42E (1982) 23,295,408	1.8	390	12	28
	3.5	1,083	22	60
	7.0	1,995	29	81
	14.0	2,965	36	112
	21.0	3,351	32	103
	28.0	2,531	30	91
	Total	12,315	161	475

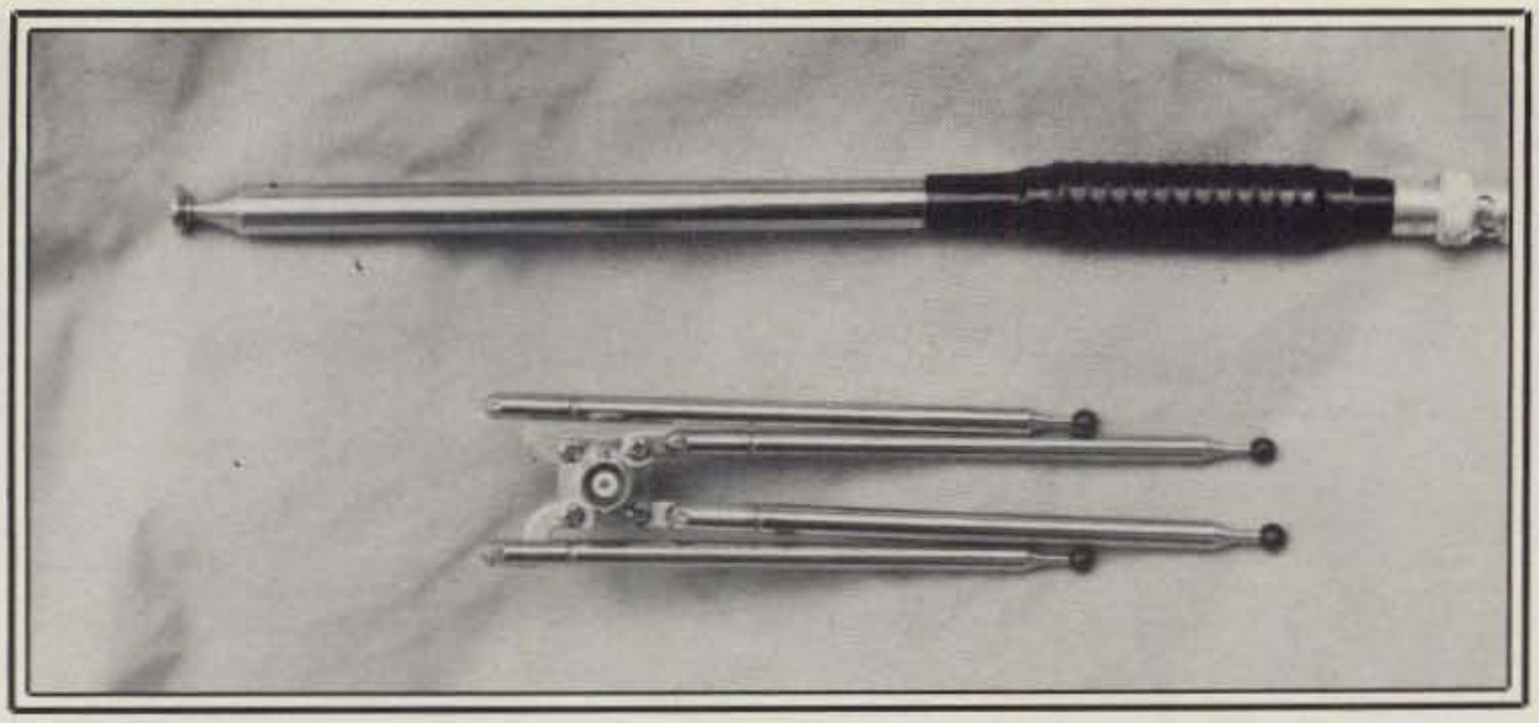

Fig. 2– Collapsed antenna which can easily fit into a large pocket or first-aid kit.

Fig. 3– Fully erected antenna which offers +9.5 dB of gain over a rubber duck.

mances were demonstrated by 220 MHz and 450 MHz. Table I demonstrates a trend which is common knowledge to most antenna enthusiasts. The larger the antenna, the greater its gain. This is a fundamental law in antenna theory.[1] The question then remains, what is the most practical configuration? The 6 inch rubber duck is clearly the most popular antenna on high-band VHF as demonstrated by its heavy usage on 2 meters and by public-safety officials. Table I indicates that the ⅝-wave whip with an offset ground plane gives the best performance. Although the physical size of a ⅝-wave antenna (about 45 inches for 2 meters) makes it impractical for day-to-day operations, during an emergency an antenna offering +9.5 dBs might be essential.

On the requirements mentioned in the first paragraph, the major obstacle was to make the antenna portable so that it could be stored in a convenient place when not in use. In addition, setup should not take more than a few minutes, since in an emergency situation time is crucial.

To solve both of the above problems, a configuration using five telescopic whip antennas was developed. Four of the telescopic whips (¼ wave) would be used as ground radials, while the remaining element would be the radiating element. The radiating element was a commercial ⅝-wave whip with a terminating male BNC connector. These are commercially available for 2 meters, 220 MHz, and 450 MHz.[2] A ⅝-wave radiating element could also be constructed from scratch as described in any antenna manual.[1] The four ¼-wave whips were portable transistor radio antennas which coincidentally were about 19 inches. These were obtained from Russell Antennas Inc. (stock #SOM-6H).[3] Since they are telescopic, they can be adjusted for optimum performance on each band. To attach the five whips together, a female-to-female BNC chassis mount connector (Amphenol 12650) was used. The four whips, with their swivel ends, are screwed to the four chassis mount holds on the BNC connector.

A close-up view of the BNC connector with it four ground radials is shown in fig. 1. Fig. 2 shows the antenna collapsed and fig. 3 shows it fully erected. With careful adjustments the SWR is easily tuned to below 1.2 to 1. This offers far better SWR compared to other configurations as shown in Table II. With the radials evenly spaced, gain relative to a rubber duck was +8.5 dB. With the radials offset to one side, an extra dB of gain was observed. Thus total measured gain was +9.5 dB. This translates to increasing effective radiated power (ERP) to nine times, equivalently converting the 2 watts from a hand-held transceiver to 18 watts of ERP. Receiving ability is also improved. The antenna could also be used

No-65-66

Antenna	Measured SWR
3″ short duck	3 to 1
3″ short duck with groundplane	2.5 to 1
6″ standard duck	3 to 1
6″ standard duck with groundplane	2.5 to 1
¼-wave whip	2.0 to 1
¼-wave whip with groundplane	1.2 to 1
⅝-wave whip	2.3 to 1
⅝-wave whip with groundplane	1.2 to 1
⅝-wave whip with offset groundplane	1.2 to 1

Table II– Measured SWR of the various antenna configurations. The rubber duck antennas offer poor SWR because they are not adjustable.

in the 220 MHz and 450 MHz band simply by changing the radiating element and adjusting the ground radials for the proper length.

The three-band antenna complete with coaxial cable easily fits into a pouch or large pocket. Setup time for any particular band is less than 30 seconds. The applications for such an antenna are endless. I found this configuration essential on backpacking trips since it gives my HT the equivalent power of a mobile rig. My alternative would be to carry a large battery to drive a high-power transceiver. Since its development I have kept one in my briefcase and use it when I access WA6EUZ/R, which is about 50 miles away. The rubber duck barely breaks squelch, while the featured antenna produces a full quieting signal (30 dB S/N).

References

1. *ARRL Antenna Handbook*, Newington, Connecticut, 1974.
2. Amateur Electronics Supply, 4828 W. Fond du Lac Ave., Milwaukee, WI 53216.
3. Russell Industries, 3069 Lawson Blvd., Oceanside, NY 11572.

CQ REVIEWS:

The Radio Amateur's Novice Voice Class

BY PETER R. O'DELL*, KB1N

Remember back when learning something new was supposed to be difficult? You know all the trite phrases that the teacher always passed along with smug self-righteousness—"Study hard." "You have to work *hard* to get anything worthwhile." You get the idea.

In recent years, academia has discovered what wise teachers have known for millennia—learning is best accomplished in a relaxed state of mind. You get that by making it fun. Humor, quick pacing, and enthusiasm play a big role.

It is nice to see that someone is finally approaching Novice theory and code in this fashion. Others following suit will have to work to reach the mark established by Fred Maia, W5YI, and Gordon West, WB6NOA, in *The Radio Amateur's Novice Voice Class*.

Maia and West have put together a package of material for the person with no background in amateur radio. Two audio cassettes provide complete training in Morse code that should carry anyone above the 5 wpm mark. West keeps the tape lively as he intersperses wise cracks and jokes in with the instruction.

About half of the second side of tape two is devoted to describing what the code test will be like. West dissects a sample QSO. Then he takes the listener through a test that could be made up from the QSO. Finally, West discusses what an applicant must do to take the test.

There is a postscript to the tape informing the potential examiners of what they must do to administer the test. With all the changes that have occurred in testing rules in the last couple of years, that is information most of us would need to be sure we are doing things right. Phone numbers and addresses for West and Maia are included for applicants or test administrators who need more information. (A "real" test comes with the package. It is sealed in an envelope clearly marked that it is to be opened only by the amateurs administering the test.)

The package contains a book covering the written portion of the Novice exam. Each of the pool questions, along with the multiple-choice answers, is listed. Maia and West indicate which answer is correct and explain why it is the correct answer. West and Maia have a lively, tongue-in-cheek writing style that should keep most prospective Novices interested enough to finish the book and pass the test.

The manual contains a short history of the Novice license, more information on what the examiners must do, and information to answer just about any question that a newcomer might have. In fact, the authors have gone so far as to include a sample 610 form properly filled out to serve as a guide.

The tapes and book are bound in a handsome plastic carrying case. West and Maia provided *CQ* with an advance copy of the course. It contained a 610 form, an HF band limit chart, and a list of international prefixes, as well as the study material. We understand that the standard package will contain additional information from manufacturers and dealers—anything and everything that it will take to get someone on the air and having fun.

West and Maia are making the package available directly or through dealers. More importantly, though, Radio Shack will be carrying a similar package in all of its 8500 stores! According to the authors, the only differences in the Radio Shack package will be cosmetic. It is in the 1988 Radio Shack Catalog as part No. 62-2402.

Let's see. What if each store sold one package every month? That would be 100,000 or so Novice courses out there. Suppose that 50% of the people go ahead and get a license. We would have 50,000 new Novices in the next year. It just might happen. After all, the trade magazines report that CB is on the upswing. Radio Shack does a wonderful job of promoting its products. Wonder why some of the other outfits that publish Novice training guides never thought of Radio Shack.

Price class is $20. For more information, write to W5YI-VEC, P.O. Box 10101, Dallas, TX 75207 (phone 817-461-6443) CQ

Everything that a newcomer needs to pass the Novice exam can be found in the two cassette tapes and the book.

*Associate Editor, CQ

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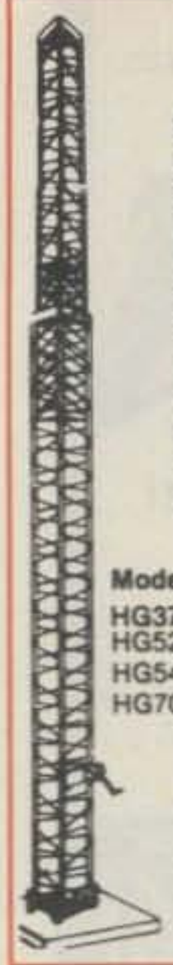

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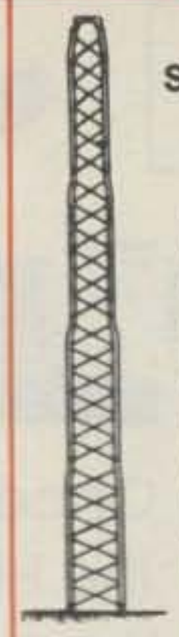

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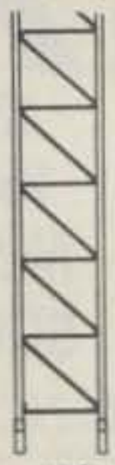

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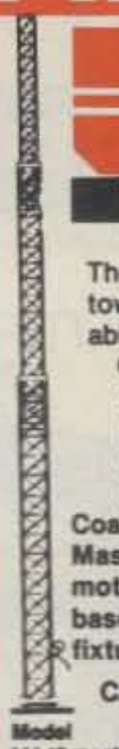

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4BTV 40-10 mtr Vert	$89	G7-144 2-mtr Base	$119
G6-144B 2-mtr Base	$89		

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
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TBR160 160m Coil Kit	$49
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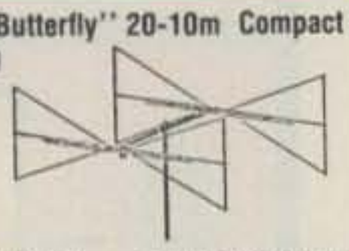

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Additional Motor Units	$89
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Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
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Model	Height	Ant. Lead*	Price
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FK2558	58 ft.	13.3 sq. ft.	1049.
FK2568	68 ft.	11.7 sq. ft.	1099.
FK4544	44 ft.	34.8 sq. ft.	1319.
FK4554	54 ft.	29.1 sq. ft.	1399.
FK4564	64 ft.	28.4 sq. ft.	1499.

25G Double Guy Kit	$249.
45G Double Guy Kit	$269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

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5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
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1/4 CCM Cable Clamp (1/4" Cable)	$.55
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- **10 memories**
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- **10 memories**
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Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	195
RS50M	37	50	229

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MIRAGE

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23A	2M	Yes	2W	30W	$129
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D1010N	440	No	10W	100W	$319

rfconcepts

rfc 2-317 2M
30W in = 170W out
LIST $299.00

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2-23	2M	2-30W	$112.00
2-217	2M	2-170W	$299.00
2-117	2M	10-170W	$299.00
3-22	220	2-20W	$112.00
3-211	220	2-110W	$299.00
3-312	220	30-120W	$264.00

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CIRCLE 37 ON READER SERVICE CARD

Awards

a monthly feature by
DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for October, narrated by Cliff, is:

Cliff & Dot Jones, K4CCW & K4BZV USA-CA All Counties #487 & #488, 11-30-84

"I'd like to give credit to W9VHD and W7HMQ, both silent keys, and to W5ZIC, Boyd, for kindling my interest in amateur radio.

"I entered the Navy in October 1941 and started learning the code as a signalman, but changed to gunner and then to electrician. Dot and I were married in Nevada in 1944, and at the end of World War II, in 1945, I was discharged from the Navy and we moved to Ontario, Canada.

"I re-enlisted in the Navy in 1947, and after going through submarine school in New London, Connecticut in 1949, we went to San Diego, California, and from there to Hawaii. In 1958 I was transferred to Tacoma, Washington and began studying and helping Dot with code and theory. Our Christmas Eve mail of 1958 brought my General class license with the call K7GUK. Care of our children and my parents delayed Dot's study, so she was unable to upgrade to General class at that time.

"The year 1960 found me back in Hawaii, operating KH6SP at the submarine base, when Hawaii became a state. Cliff Corne, K9EAB (silent key), the first ham to work all the U.S. counties, contacted me there for a new state and county. Dot, back in Washington, studied on her own and surprised me on the air one night as K7HXH. Later she and family joined me in Hawaii, bringing furniture and rigs. We operated from Hawaii with the calls KH6EGE, Dot, and KH6EGF, Cliff.

"In 1963, after 20 years of military service, I retired and we moved to Illinois and were given the calls W9HGO, Dot, and W9HFF, Cliff. At our first Illinois Hamfest, just a few days after arrival in the state, we met K9EAB for an eyeball QSO. We also met George, K9CSL, at the same hamfest. We met Jack Scroggins, W0SJE, and Ella Koons, W0AYL, among the founders and charter members of MARAC (Mobile Amateur Radio Awards Club) while operating mobile on 75 meters. That marked the beginning, in 1965, of our collecting and giving out counties.

"In 1969 we moved to Tennessee as K4CCW, Cliff, and K4BZV, Dot. Radio

333 South Lincoln Ave., Mundelein, IL 60060

Cliff and Dot Jones, K4CCW and K4BZV, out to run counties.

was sacrificed while we cut trees, cleared the land, and built our home. In 1979, when we decided to get back to county hunting in earnest, we found that over 200 of my cards had been misplaced, so I decided to go 'all mobile.' Some five years later, in November 1974, we finally completed USA-CA All Counties numbers 487 and 488.

"Now with retirement and our children grown and married, we spend our summers in Tennessee and winters in Texas and run counties in each area. We still enjoy running the counties and meeting old friends and making new ones.

"We can't begin to thank each person individually, so will just say 'thank you' to all."

Awards Issued

Ed Daigre, W5ILR, filed his qualifying application for All Counties #543, USA-CA 3000 #575, USA-CA 2500 #646, USA-CA 2000 #713, USA-CA 1500 #796, and USA-CA 1000 #973, All SSB, dated 6-4-87.

Bobby Hunter, KC5CV, made a clean sweep of it and claimed All Counties #544, USA-CA 3000 #576, USA-CA 2500 #648, USA-CA 2000 #715, USA-CA 1500 #799, USA-CA 1000 #978, and USA-CA 500 #2189, All SSB, dated 6-23-87.

Donald J. Simpson, Sr., W3EYF, claimed USA-CA 2500 #645, USA-CA 2000 #712, USA-CA 1500 #795, USA-CA 1000 #972, and USA-CA 500 #2184, Mixed, dated 6-3-87.

John G. Ditmer, W0IZV, received USA-CA 2500 #647, USA-CA 2000 #714, USA-CA 1500 #797, USA-CA 1000 #974, and USA-CA 500 #2185, Mixed, dated 6-10-87.

USA-CA Special Honor Roll

Eldred J. "Ed" Daigre, W5ILR
All Counties #543, All SSB, 6-4-87

Bobby G. Hunter, KC5CV
All Counties #544, All SSB, 6-23-87

USA-CA Honor Roll

3000		NE5Y	798
W5ILR	575	KC5CV	799
KC5CV	576		
2500		**1000**	
W3EYF	645	W3EYF	972
W5ILR	646	W5ILR	973
W0IZV	647	W0IZV	974
KC5CV	648	Y23DL	975
		NE5Y	976
2000		N7FQQ	977
G5PQ	711	KC5CV	978
W3EYF	712		
W5ILR	713	**500**	
W0IZV	714	W3EYF	2184
KC5CV	715	W0IZV	2185
		Y23DL	2186
1500		NE5Y	2187
W3EYF	795	N7FQQ	2188
W5ILR	796	KC5CV	2189
W0IZV	797	WA6MUK	2190

The total number of counties for credit for the United States of America County Award is 3076. The basic award fee for subscribers to CQ is $4.00. For non-subscribers, it is $10.00. Initial application must be submitted in the USA-CA record book which may be obtained from CQ Publishing Company, 76 North Broadway, Hicksville, NY 11801, U.S.A. for $1.25. To qualify for the special subscriber rate please send a recent CQ mailing label with your application. To be eligible for the USA-CA, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending a SASE to the USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060, U.S.A. DX stations must include extra postage for air mail reply.

D. H. "Doug" Allerston, G5PQ, updated his good record by claiming USA-CA 2000 #711, Mixed, dated 6-3-87.

Archie W. Roach, NE5Y, received USA-CA 1500 #798, USA-CA 1000 #976, and USA-CA 500 #2187, Mixed, dated 6-17-87.

Juergen Lorenz, Y23DL, qualified for USA-CA 1000 #975, and USA-CA 500 #2186, Mixed, dated 6-13-87.

Beatrice J. Wilson, N7FQQ, filed her application and received USA-CA 1000 #977, and USA-CA 500 #2188, All 20M SSB, dated 6-22-87.

Theodore E. Palmer, WA6MUK, qualified for USA-CA 500 #2190, Mixed, dated 6-29-87.

On May 29, 1987, Daniel G. Hammell, WA9EZT, submitted documentation to add a 75M endorsement to his All Counties #467 dated 2-25-84. Congratulations, Dan.

On June 1, 1987, Michael J. Eilers, K8OOK, added an All 40M CW endorse-

ment to his USA-CA 500 #1762. Mike also holds USA-CA All Counties #480 dated 7-3-84. Nice going, Mike.

USA-CA 500 certificates went to:

Donald J. Simpson, Sr., W3EYF, USA-CA 500 #2184, Mixed, 6-3-87.

John G. Ditmer, WØIZV, USA-CA 500 #2185, Mixed, 6-10-87.

Juergen Lorenz, Y23DL, USA-CA 500 #2186, Mixed, 6-13-87.

Archie W. Roach, NE5Y, USA-CA 500 #2187, Mixed, 6-17-87.

Beatrice J. Wilson, N7FQQ, USA-CA 500 #2188, All 20M SSB, 6-22-87.

Bobby G. Hunter, KC5CV, USA-CA 500 #2189, All SSB, 6-23-87.

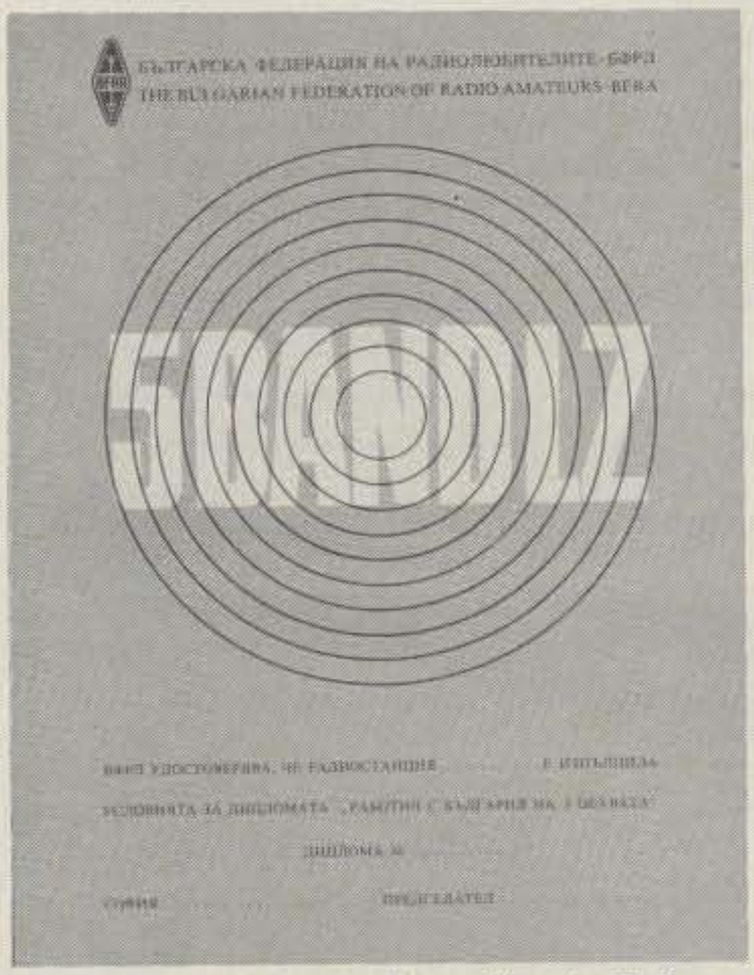
Theodore E. Palmer, WA6MUK, USA-CA 500 #2190, Mixed, 6-29-87.

Awards Available

BFRA Awards. The Bulgarian Federation of Radio Amateurs sponsors an interesting awards program which offers six attractive certificates. The awards are available to all radio amateurs and shortwave listeners throughout the world for contacts on CW, SSB/AM, or mixed modes. To apply for any one of the six awards, submit a GCR list of contacts, verified by two licensed radio amateurs or local club officials, along with 10 IRCs, to Central Radio Club, P.O. Box 830, Sofia 1000, Bulgaria. The list must show station worked, date, time, band, and mode. The six awards and requirements for each are as follows:

Peoples Republic of Bulgaria Award available to amateurs and SWLs for contacts after January 1, 1965.

People's Republic of Bulgaria Award. QSOs/SWL reports after January 1, 1965 are valid for this award. Applicants in Europe must have five contacts with LZ1 stations and five with LZ2 stations on each of the 3.5 and 7 MHz bands, for a total of 20 contacts with different Bulgarian amateur radio stations. Applicants on other continents are required to have 20 contacts with different Bulgarian amateur stations—10 with LZ1 stations and 10 with LZ2 stations, irrespective of the band.



5 Bands LZ Award offered by the Bulgarian Federation of Radio Amateurs.

5 Bands LZ Award. QSOs/SWL reports after January 1, 1979 are valid for this award. Applicants must have ten contacts, one with an LZ1 station and one with an LZ2 station on each of the 3.5, 7, 14, 21, and 28 MHz bands.

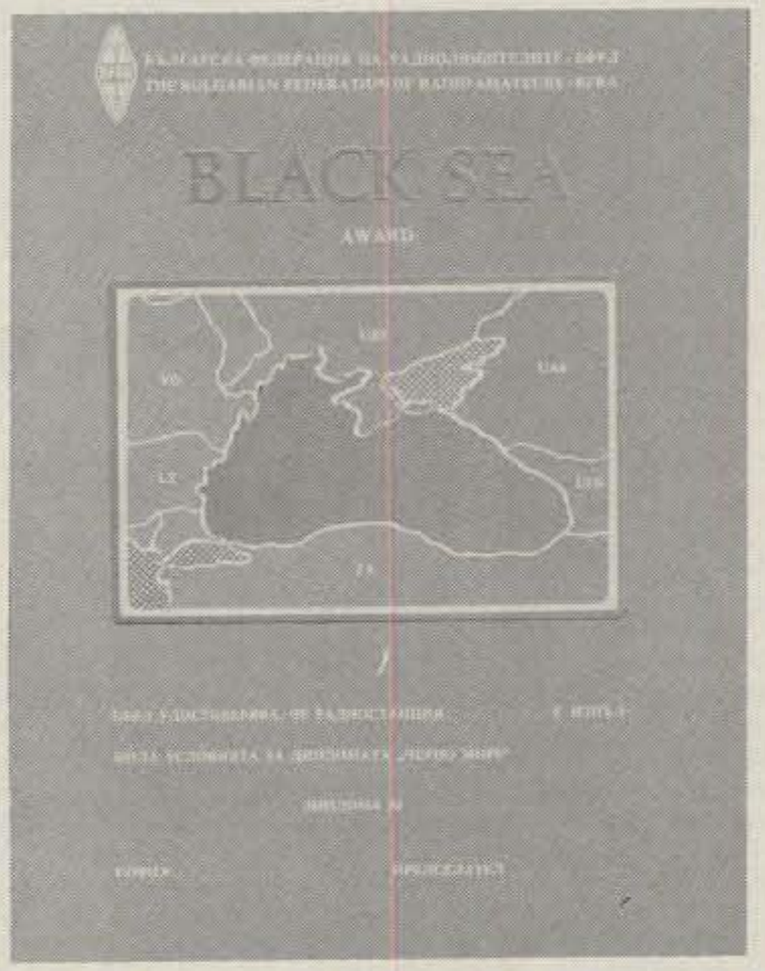
W 100 LZ Award from the Bulgarian Federation of Radio Amateurs.

W 100 LZ Award. QSOs/SWL reports after January 1, 1979 are valid for this award. Applicants must have 100 contacts with different LZ stations during one calendar year.

W 28 Z ITU Award. QSOs/SWL reports after January 1, 1979 are valid for this award. Applicants must have specified numbers of QSOs/SWL reports with the following countries of ITU Zone 28: DL, DL7/W. Berlin, FC/TK, HA, HB9, HBØ, HV, I, IS, LZ, M1, OE, OK, SP, SV, SV5, SV9, SY, YO, YU, Y2, ZA, 9H, 4U1ITU.

W 28 Z ITU Award available from the Bulgarian Federation of Radio Amateurs.

The award is issued in three classes. Contacts with five different LZ stations are required, *plus* the following additional contacts for each class: Class 1—28 contacts with different stations in 20 countries; Class 2—28 contacts with different stations in 16 countries; Class 3—28 contacts with different stations in 10 countries.



Black Sea Award for contacts with countries bordering the Black Sea.

Black Sea Award. QSOs/SWL reports after January 1, 1979 are valid for this award. Applicants must have 60 contacts with different amateur stations located in the countries bordering the Black Sea, with a minimum of one contact with each of the following countries: LZ, TA, YO, UA6, and UB5.

Sofia Award. QSOs/SWL reports after January 1, 1979 are valid for this award. Applicants must have 100 points based on contacts with amateur stations located in Sofia, the capital city of Bulgaria. The point value for each contact must be determined as indicated by the following table.

	Band (MHz)				
Applicants	**3.5**	**7**	**14**	**21**	**28**
In Europe	2	2	1	2	2
Outside Europe	15	5	1	2	3

A station may be contacted only once per band, irrespective of mode.

The more active stations in Sofia are: LZ1KAA; LZ1KAB; LZ1KDP; LZ1KPG; LZ1KSA; LZ1KSF; LZ1KVV; LZ1KWF, AB, AD, AM, AP, AQ, AU, BC, FF, FN,IA, JW, KX, LB, MS, NP, QG, QI, QP, SS, UA, UO, WV, WD, WJ, XL, XX, ZQ.

California Kilo-QSO Certificate. The California Kilo-QSO Award is sponsored by A.R.S. N6NKN to promote the exchange of QSL cards, encourage contact with all California stations, and encourage especially contacts with stations in Orange County, California. There is no fee for the award.

Rules: Starting January 1, 1988 and continuing through December 31, 1988, work enough California stations to accumulate 1000 QSO points. All bands and all modes are allowed, but each California station may be worked only once for QSO credit. All contacts must be verified by QSL cards. Contacts made from 0001Z January 3, 1988 through 2400Z January 3, 1988 are worth 5 points, and contacts made thereafter are worth one point. Contacts made with Orange County, California stations on January 3 are worth 10 points, and 2 points thereafter. (Orange County QTH must be stated in log.)

Awards: A plaque will be awarded to the first station to submit verification of 1000 QSO points, and to the first station to submit verification of 1000 QSO points by working only Orange County stations.

Numbered certificates will be awarded to all stations who accumulate 1000 QSO points within the calendar year 1988.

Special certificates will be awarded to stations who accumulate 1000 QSO points by working only Orange County stations.

Verification: Each contact must be verified by QSL, but QSLs need not accompany the application. Your logs need only be certified by yourself and two other amateur radio operators. For applications and official log, send #10 SASE to ARS N6NKN, R. J. Zolla, 3106 Ginger Apt. D, Costa Mesa, CA 92626, U.S.A.

73 and Good Hunting, Dorothy, WB9RCY

Sofia Award available for working stations in Sofia, the capital of Bulgaria.

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IC-745 Gen. Cvg Xcvr	1049.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
IC-575A 10m/6m Xcvr	TBA	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-275A All Mode Base w/PS	1199.00	Call $
IC-275H All Mode Base 100w	1389.00	Call $
IC-271A All Mode Base 25w	859.00	Call $
IC-27A FM Mobile 25w	429.00	Call $
IC-27H FM Mobile 45w	459.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
IC-38A FM Mobile 25w	459.00	Call $
IC-2AT FM HT	299.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $
IC-900 Six Band Mobile	TBA	Call $
UHF		
IC-475A All Mode 25w	1399.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-48A FM Mobile 25w	459.00	Call $
IC-4AT FM HT	339.00	Call $
IC-04AT FM HT	449.00	Call $
IC-μ4AT 440 FM HT	369.00	Call $
IC-3200A FM 2m/70cm 25w	599.00	Call $
220 MHZ		
IC-375A All-Mode, 25w, Base Sta.	TBA	Call $
IC-38A 25w FM Xcvr	459.00	Call $
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	339.00	Call $
IC-03AT Deluxe HT	449.00	Call $
1.2 GHz		
IC-1271A All Mode 10w	1229.00	Call $
IC-120 1w, FM, Xcvr	579.00	Call $
IC-12AT Deluxe 1w HT	459.00	Call $

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TS-830S Xcvr	1099.95	Call $
TS-430S Gen. Cvg Xcvr	859.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1199.95	Call $
TS-440S Gen. Cvg Xcvr	999.95	Call $
TL-922A HF Amp	1499.95	Call $
TS-670 40,15,10,6 Meter Quad	TBA	Call $
Receivers		
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VHF		
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TM-2570A FM Mobile 70w	559.95	Call $
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TM-411A FM Mobile 25w	449.95	Call $
TH-415A 2.5w 440 HT	359.95	Call $
TH-41BT FM, HT	269.95	Call $
TW-4100A, 2m/70cm FM	649.00	Call $
TR-50 1w 1.2GHz FM	549.95	Call $
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TM-321A Compact 25w Mobile	TBA	Call $
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FT-767 4 Band New	1895.00	Call $
FT-690R 6m, 10w All Mode	TBA	Call $
FL-7000 15m-160m Solid State Amp	TBA	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	699.95	Call $
FRG-9600 60-905 MHz	679.95	Call $
VHF		
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FT-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-711RH FM Mobile 35w	TBA	Call $
FT-730R 10w 440 FM	399.95	Call $
FT-770RH FM Mobile 25w	479.95	Call $
FT-73 R/TT Mini HT	314.95	Call $
FT-709RH FM HT 4w	359.95	Call $
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CIRCLE 28 ON READER SERVICE CARD

Novice

a monthly feature by
BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Third-Party and Reciprocal Operating Agreements

Per the 4 June 1987 FCC Public Notice 3500, the United States has third-party (T) and/or reciprocal (R) operating agreements with the following countries:

T	R	Country (see notes 1, 2, and 3)
*		Antigua and Barbuda (V2)
*	*	Argentina (LU)
*	*	Australia (VK)
	*	Austria (OE)
	*	the Bahamas (C6)
	*	Barbados (8P)
	*	Belgium (ON)
*	*	Belize (V3)
*	*	Bolivia (CP)
	*	Botswana (A2)
*	*	Brazil (PY)
*	*	Canada (see note 4) (VE)
*	*	Chile (CE)
*	*	Colombia (HK)
*	*	Costa Rica (TI)
*		Cuba (CO)
	*	Cyprus (5B)
	*	Denmark (OZ)
*		Dominica (J7)
*	*	Dominican Republic (HI)
*	*	Ecuador (HC)
*	*	El Salvador (YS)
	*	Fiji (3D2)
	*	Finland (OH)
	*	France (see note 5) (F)
*		the Gambia (C5)
	*	Federal Republic of Germany (DL)
*		Ghana (9G)
	*	Greece (SV)
*	*	Grenada (J3)
*	*	Guatemala (TG)
*	*	Guyana (8R)
*	*	Haiti (HH)
*	*	Honduras (HR)
	*	Iceland (TF)
	*	India (VU)
	*	Indonesia (YB)
	*	Republic of Ireland (EI)
*	*	Israel (4X)
	*	Italy (I)
*	*	Jamaica (6Y)
	*	Japan (JA)
*	*	Jordan (JY)
	*	Kiribati (T3)
	*	Kuwait (9K)
*	*	Liberia (EL)
	*	Luxembourg (LX)
*		Mexico (XE)
	*	Monaco (3A)
	*	Netherlands (PA)
	*	Netherlands Antilles (PJ)
	*	New Zealand (ZL)
*	*	Nicaragua (YN)
	*	Norway (LA)
*	*	Panama (HP)
*	*	Paraguay (ZP)
*	*	Peru (OA)
	*	Philippines (DU)
	*	Portugal (CT)
*		St. Christopher and Nevis (V4)
*	*	St. Lucia (J6)
*		St. Vincent and the Grenadines (J8)
	*	Seychelles (S7)
*	*	Sierra Leone (9L)
	*	Solomon Islands (H4)
	*	Republic of South Africa (ZS)
	*	Spain (EA)
	*	Suriname (PZ)
*		Swaziland (3D6)
	*	Sweden (SM)
*	*	Switzerland (see note 6) (HB)
*	*	Trinidad and Tobago (9Y)
	*	Tuvalu (T2)
*	*	United Kingdom (see notes 7 and 8) (G)
*	*	Uruguay (CX)
*	*	Venezuela (YV)
	*	Yugoslavia (YU)

2814 Empire Ave., Burbank, CA 91504

This is nine-year-old Ronie Weaver, KB6OLU, of Irvine, California. He got his Novice license during October 1986, and his first contact was with OE5AHL in Austria. His station includes an ICOM IC-745 transceiver, a 4-element Yagi-Uda antenna for 10 and 15 meters, and dipoles for 40 and 80 meter operation. Ronie is a fullback on his football team. He wants to be a policeman or the coach of a professional football team. His father is N6VO.

Nine-year-old Patrick Reams, KB4VYP, of Wendell, North Carolina operates the 15 and 40 meter Novice code bands. He shares this station with his Mom, KB4EXL, and Dad, WA4MJF. Patrick is a member of the Raleigh Amateur Radio Society.

Notes:

1. We have reciprocal operating agreements with 68 countries. We have third-party traffic agreements with 40 countries. We have both reciprocal operating agreements and third-party traffic agreements with 31 countries.

2. International radio communications must be in plain language. Business messages are prohibited. At the end of each exchange of international third-party traffic the FCC licensed amateur must transmit the call signs of the foreign station and of his own station.

3. Qualified foreign licensed amateurs may apply for reciprocal operating permits. The reciprocal permit is valid a maximum of one year or until the expiration date of the alien's license, depending on which date comes first. The reciprocal permit authorizes operating privileges specified by the alien operator's home regulations, but not to exceed U.S.A. Extra class operating privileges. The reciprocal licensee does not necessarily have full U.S.A. Extra class privileges. As an example, a reciprocal licensee who holds the equivalent of a U.S.A. General class license in her/his home country is restricted to no more than U.S.A. General class operating privileges in the U.S.A. FCC form 610A is used to apply for a reciprocal operating permit. A copy of the alien's license must accompany the permit application. U.S.A. citizens are not eligible to obtain reciprocal permits issued by the FCC. However, aliens are eligible to earn FCC issued U.S.A. amateur radio licenses.

4. American amateurs are allowed to operate in Canada (and vice versa) without having to obtain reciprocal operating permits.

5. Including French Guiana, French Polynesia, Gambier, Marquesas, Society and Tubai Islands, and Tuamotu Archipelago. This also includes Guadeloupe, Ile Amsterdam, Ile St. Paul, Iles Crozet, Iles Kerguelen, Martinique, New Caldeonia, Reunion, St. Pierre and Miquelon, plus Wallis and Futuna Islands.

6. Third-party traffic is only permitted with ITU stations 4U1ITU in Geneva and 4U1VIC in Vienna.

7. Third-party traffic is only permitted with special event stations having a GB call sign prefix. GB3 stations are excluded from this arrangement.

8. Including Bermuda, British Virgin Islands, Cayman Islands, Falkland Islands, Gibraltar, Hong Kong, Monterrat, St. Helena and Turks, and Caicos Islands.

Each time a combined reciprocal operating and third-party traffic agreements list is printed in this column I receive re-

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CIRCLE 40 ON READER SERVICE CARD

Nine-year-old Charles "Andy" Broome, KB4VRU, of Chattanooga, Tennessee is a fourth grader. His father is KI4HZ. Their station includes a Kenwood TS-520-SE transceiver.

quests from foreign (DX) amateurs who want to know what can be done to add their countries to either or both lists. I have told these amateurs that they should initiate action at their end, since America is receptive to such agreements. A recent letter from a DX amateur caused me to be concerned that the policy I was stating may have been changed; however, a letter to the FCC evoked a favorable response as shown in fig. 1.

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

March 3, 1987

IN REPLY REFER TO:

31220-C

Mr. William Welsh
2814 Empire Avenue
Burbank, CA 91504-3297

Dear Mr. Welsh:

This is in reply to your letter dated January 30, 1987, in which you seek information on how to add countries to the list of those for which the United States has concluded amateur reciprocal operating and third party agreements.

Agreements such as those which interest you are negotiated with foreign countries through the U.S. Department of State. Over the years it has been found that proposed agreements related to amateur radio are more readily negotiated when the proposal has the support of the foreign amateur radio community and is first initiated by the foreign country. If foreign amateur radio operators are interested in such arrangements with the United States or any other country, they should make known their desires with their home country. The United States, having a number of these agreements with other countries, is receptive to providing draft notes, which could form the basis of an agreement, to any country which makes known its interest.

If you or any amateur radio operator becomes aware of a significant interest in any particular country, you may wish to bring this to the attention of the U.S. Department of State or the Commission.

Sincerely,

Will A. McGibbon
Chief, Spectrum Engineering Division

Fig. 1– How to initiate amateur reciprocal operating and third-party agreements.

30th Pennsylvania QSO Party

The 1986 30th annual Pennsylvania QSO Party drew more than 500 entries, and this year's party promises to be bigger and better than ever. The contest section covers all such events, including this one. Look there to get complete contest details. This item simply mentions major facts.

Operating periods are 1600 UTC 10 October to 2200 UTC 12 October, with a break 12 October from 0500 to 1300 UTC. Exchange sequential contest numbers and ARRL section or county. Listen and call 10 kiloHertz up from the bottom end of the Novice code and voice segments. Novices should be very popular in this contest because each code and voice/SSB contact with a Novice counts 10 and 5 points, respectively. Novices double their own scores. Certificates are awarded to winners in each county, ARRL section, and DX country. I think you will like this one.

Vehicle Accidents Involving Hazardous Materials

It is very possible that you will encounter a highway accident involving a truck carrying hazardous materials. I have had this happen several times. In two cases I was the first one at the scene of the accidents. Luckily everything worked out satisfactorily. However, my good fortune was just a matter of luck.

The Department of Transportation (DOT) has developed a guide that enables one to make correct decisions and to take proper actions in such incidents. Their manual is the "Emergency Response Guide," which is available from several suppliers. This guide identifies hazardous materials placards, provides detailed instructions of how to handle accidents involving specific hazardous materials (plus general procedures), and states steps one should take following exposure to specific materials. One source of emergency response guides is the American Trucking Associations (ATA), Customer Services Department, 2200 Mill Road, Alexandria, Virginia 22314. The ATA order number for the guide is C0980, and one should send $6 ($5 price of book, plus $1 shipping and handling) for each guide. The pocket-size version of the guide costs $4 each (total), and it is ATA order number C0985.

Amateurs are usually extroverts who are likely to stop at accidents to offer help, including radio communications. The guide is a worthwhile addition to the glove compartment. Guides are available at reduced prices when they are purchased in quantities, such as for club groups.

Metal Dog Tags Endangered

The Army Soldier's Data Tag Task Force is developing an electronic dog tag containing a microchip. This new identification device would contain the serviceman's family, financial, medical, military, and religious-preference data. It may contain more data in its final form. When the new plastic tag is inserted into a microcomputer, an extensive computer printout is produced. This device may prompt the military to use correct blood types on these tags, whereas they appear to have preferred marking everyone as being either O-positive or O-negative in recent times. The reasoning behind this practice is obvious: Type O blood can be transfused to those who have type A, B, or AB blood without harm. However, it is better to use the matching blood type in every case.

73, Bill, W6DDB

No - 83-84

Antennas & Accessories

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

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

A Look at Shareware

This month columnist W8FX takes a close look at a novel and interesting source of computer software. That source is known as shareware. We think you'll find this month's column quite instructive and informative.

—K2EEK

Last time we got together we concluded our series on "Super Software" for the hamshack. We continued on the software track by catching up on some mail on hamshack computer topics: letters on Commodore 64 diagnostic routines and parts procurement problems, updates to the Winner's Edge contesting software, and some notes on Etron and Gardner software. We also examined some of the pesky problems associated with hamshack AC lines and their effects on operating gear and computers, and we looked at some new antenna products, including the Big Horn Delta Loops. We also saved room for pulling down a few books, catalogs, and booklets from the bookshelf.

This month we'll continue our focus on software, but switch to a different track. We'll take a close look at the shareware software marketing concept, a concept that is very popular in the software industry as a whole, but one which is only recently taking hold in hamshack software. We'll also discuss some new antenna products and bring into focus one of amateur radio's newest frontiers, that of lightwave communications.

The Shareware Phenomenon

In my opinion, some of the biggest bargains in computer software are products marketed via the shareware concept. This is try-before-buying software, which is usually freely distributed as though it were in the public domain. But shareware is usually much more sophisticated and comprehensive than most public-domain software and is often copyrighted. Its authors typically request voluntary payments from the user.

Before getting into the details of shareware, sometimes known as user-supported software, we should mention that shareware is often confused with public-domain software, which is totally free and not copyrighted. Most public-domain software is written by hobbyists and generally fills niches too small to be filled by commercial firms. Such software is distributed freely, often via electronic bulletin-board systems and user-group libraries.

These libraries often make available collections at low prices, typically $3 to $8 per disk, to cover the costs of disk duplication and handling. Such software is never guaranteed, and almost always is unsupported by the author. But because the programs are not copyrighted, there are no fees to pay. Most such programs can be listed out and altered in any way you choose, or used as a base for programs you may write yourself. Most programs in the public domain are written by the "end user," either just for fun or because someone needed a routine or program that was not available commercially. As you might expect, quality varies widely. Shareware programs, on the other hand, are usually very good. Many of them are equivalent to, or better than, expensive commercial programs. While authorization is given for you to copy and distribute the software freely, the authors request a voluntary fee from you if you like and use the program.

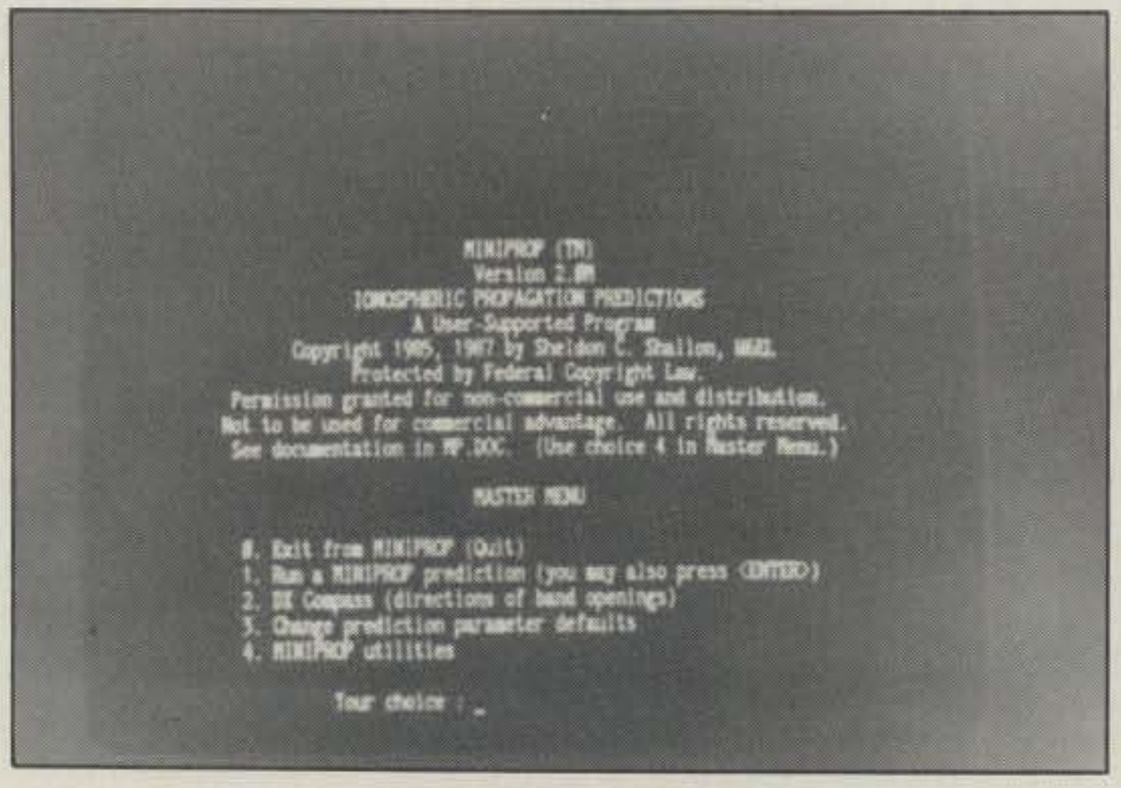
Ordinarily, this user-support fee is somewhere between $10 and $90, rarely above the latter figure to avoid bumping into the price-tags of regularly distributed commercial software. In return for the registration fee, the authors will normally update you with the latest version of the program and furnish a professionally printed manual. Some authors even provide telephone support, much in the same fashion as do commercial software houses. Often the author will throw in extras such as automatic program updates for some length of time, and even pay commissions to users whose friends register.

The term "shareware" is said to have been introduced by the author of the very impressive and highly successful IBM-PC wordprocessing program PC-WRITE, Bob Wallace; his concept involved formal registration if you use the program. A similar concept known as Freeware™ was coined and eventually trademarked by Andrew Fluegelman, the author of the popular communications program PC-TALK III. There's a fee here, too, but it is more of a donation than a registration fee.

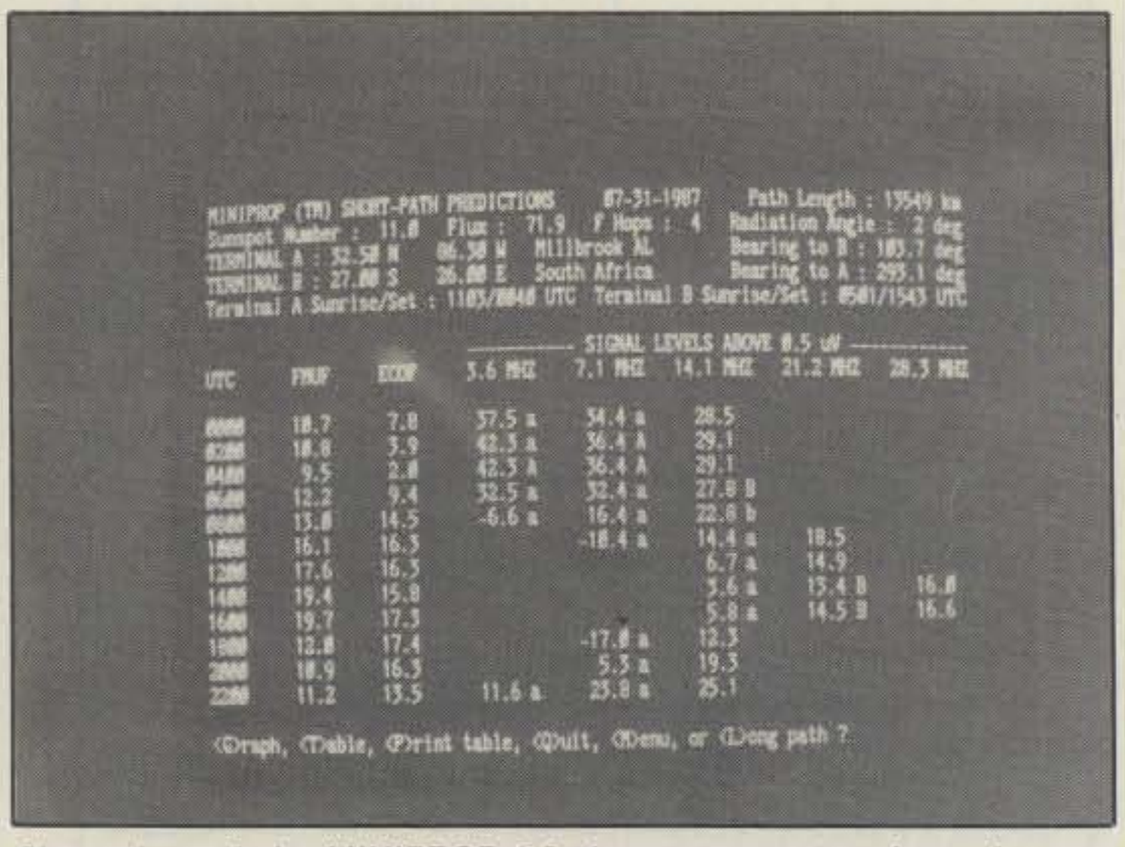
One of the big advantages of shareware and similar methods of distribution is the ability for you to directly contact the program's author for assistance. Most shareware firms are small operations, and when calling you may very well get to talk with "the man" himself rather than a customer service representative. You can easily suggest changes and improvements, directly influencing the product.

While there isn't a great deal of amateur radio software available as shareware, there is some, and all things considered, successful hamshack shareware is as good as the best commercial programs. This is probably because to be successful as shareware, a program must have a unique, identifiable niche

317 Poplar Drive, Millbrook, AL 36054



Screen photo of a MINIPROP 2.0 short-path prediction over a path from your columnist's Alabama QTH to South Africa. Note the inclusion of predicted signal levels. (W8FX photo)



Shown here is the MINIPROP 2.0 shareware program's main menu screen. (W8FX photo)

Please send all reader inquiries directly.

```
                    MINIPROP (TM)
                     Version 2.0M
          IONOSPHERIC PROPAGATION PREDICTIONS
                  A User-Supported Program
     Copyright 1985, 1987 by Sheldon C. Shallon, W6EL
              Protected by Federal Copyright Law.
   Permission granted for non-commercial use and distribution.
 Not to be used for commercial advantage.  All rights reserved.
 See documentation in MP.DOC.  (Use choice 4 in Master Menu.)

                       MASTER MENU

    0. Exit from MINIPROP (Quit)
    1. Run a MINIPROP prediction (you may also press <ENTER>)
    2. DX Compass (directions of band openings)
    3. Change prediction parameter defaults
    4. MINIPROP utilities

             Your choice :
```

Fig. 1– MINIPROP 2.0 main menu. The above screen greets the user upon loading the MINIPROP 2.0 program. Note that this "shareware" program is described as user-supported and is protected by copyright.

and be truly useful, not just flashy or "interesting."

Where and how to access this software goldmine? Your area's local bulletin-board systems (BBSs) are some of the best sources. Many hundreds of open-access BBSs across the land allow you to download software which is posted on their board. While most software found on BBSs is a "mixed bag" of sometimes useful, sometimes not public-domain material, many boards also post shareware for downloading. All you need to access this useful source is a modem and terminal software for your PC. Local hams who are "into" modem communications can usually give you a telephone listing of the BBSs in your area. Another excellent source of BBS names and numbers on a national scale is *Computer Shopper* magazine, which in each issue provides an excellent listing of public access systems that is updated monthly.

A very good source of IBM-PC software is the PC Software Interest Group (PC-SIG). This outfit is the closest thing to what you might call an official "library of record" for IBM shareware and public-domain software. While they may not have every such program on disk, they have most of them, and their disks are inexpensive (about $6). It's worth a postcard to the PC-SIG for their flyer. Write to them at 1030D East Duane Ave., Sunnyvale, CA 94086.

PC-SIG and most of the dozen or more firms who perform a similar function don't specialize in amateur radio software. However, several outfits have put together small collections of ham public-domain and shareware programs. One firm that comes to mind is Public Brand Software, P.O. Box 51315, Indianapolis, IN 46251. A recent catalog shows four amateur radio disks, including some packet programs. They also distribute a large number of communications disks which include non-ham programs that are useful in the hamshack, including Pro-Comm™, an outstanding terminal program that's becoming increasingly popular as a companion for packet controllers.

One feature I particularly like about Public Brand's catalog is that they provide subjective ratings for each disk, ranging from "trophy" (tremendous) and four stars (invaluable) down to one star (interesting). This rating system, while not perfect, at least helps you cull out the wheat from the chaff before forking out $5 for a disk of software.

Another IBM-PC software distributor that lists amateur radio disks in its 50-page catalog is People's Choice Software, P.O. Box 3061, Warner Robins, GA 31099. Their disk collections are quite inexpensive at $3.75 a crack.

Shareware seems to be focused mainly on IBM-PC type software, although there are a few Commodore and Apple suppliers out there. Too, there are numerous amateur radio shareware programs posted on the public communications utilities, such as CompuServe and QuantumLink (a Commodore-specific PC network).

We've mentioned it before, but it's worth mentioning again: Alfred Glossbrenner's book *How to Get Free Software* remains a premier source of "free software" information. It includes lists of software sources for most of the computers in hamshack use today, even the so-called orphan machines. Especially useful are the chapters on freeware/shareware, online sources of software, user-group libraries, and the little-known sources of free software. The $14.95 book is well worth the price. It's available widely in bookstores, or contact St. Martin's Press, 175 Fifth Avenue, New York, NY 10010.

Another source of information on public-domain and freeware offerings is, of course, this column. While we split our focus about 50-50 on antenna and computer topics, we try to bring to your attention new PC software that may have a hamshack application. Stan Horzepa, WA1LOU, performs a similar service in his *QST* "On Line" column, where he regularly includes a "new software" feature and also helps to maintain the ARRL's The On Line Program Exchange (PX), which serves as a storehouse and exchange facility for amateur radio public-domain software.

A Shareware Example: MINIPROP 2.0

We indicated that there was not a great deal of amateur radio shareware in the field. But Sheldon C. Shallon, W6EL, is helping to turn this situation around with one of the most comprehensive propagation prediction programs we have seen.

Shel's program, MINIPROP 2.0, is a follow-on to the earlier CP/M version which we reported on some time ago. This program, also shareware, was one of the most comprehensive PC propagation programs available to the amateur, and copies of it quickly spread worldwide. As usage expanded, Shel received an increasing number of requests for additional features. In particular, a superior F-layer model and other techniques used by the British Broadcasting Company (BBC) were included, as was an improved method for predicting E-layer cutoff frequency. These additional features and improved propagation models were combined in Version 2.0, now available for the IBM-PC as well.

This is truly a neat program. When you run a MINIPROP prediction, you are asked for the latitudes and longitudes of the terminals on either end of the path, the date, and the sunspot number or solar flux. Conveniently, the program's built-in atlas entries may be used instead of manually entering latitudes and longitudes, and your own QTH may be stored in a disk file so that you don't have to enter it each time. Predicted short- and long-path signal levels on 5 frequencies of your choice, F-layer maximum usable frequency (FMUF) and E-layer cutoff frequency (ECOF) at 2-hour increments throughout the day are displayed. Predicted band openings are flagged, and beam headings, path length, and sunrise/sunset times for the path terminals are also shown.

```
                        MINIPROP
                       07-31-1987
Sunspot Number :  28.2   Flux :  85.0   Min. Radiation Angle :  1.5 deg

     TERMINAL A : Millbrook AL          TERMINAL B : Scotland
       Latitude :  32.50 N                Latitude :  56.50 N
      Longitude :  86.30 W               Longitude :   4.10 W

        Sunrise : 1103 UTC                 Sunrise : 0423 UTC
      Gray line : 338/158 deg            Gray line : 325/145 deg

         Sunset : 0040 UTC                  Sunset : 2023 UTC
      Gray line : 22/202 deg             Gray line : 35/215 deg

   SHORT-PATH  Bearing from A to B :  39.5 deg
               Bearing from B to A : 283.5 deg
               Path Length :  6584 km    4091 mi (U.S.)

   LONG-PATH   Bearing from A to B : 219.5 deg
               Bearing from B to A : 103.5 deg
               Path Length : 33416 km   20765 mi (U.S.)

Computing short-path predictions..
```

Fig. 2– MINIPROP 2.0 initial statistical information for a given path. The computer displays the above screen while MINIPROP calculates the short-path prediction.

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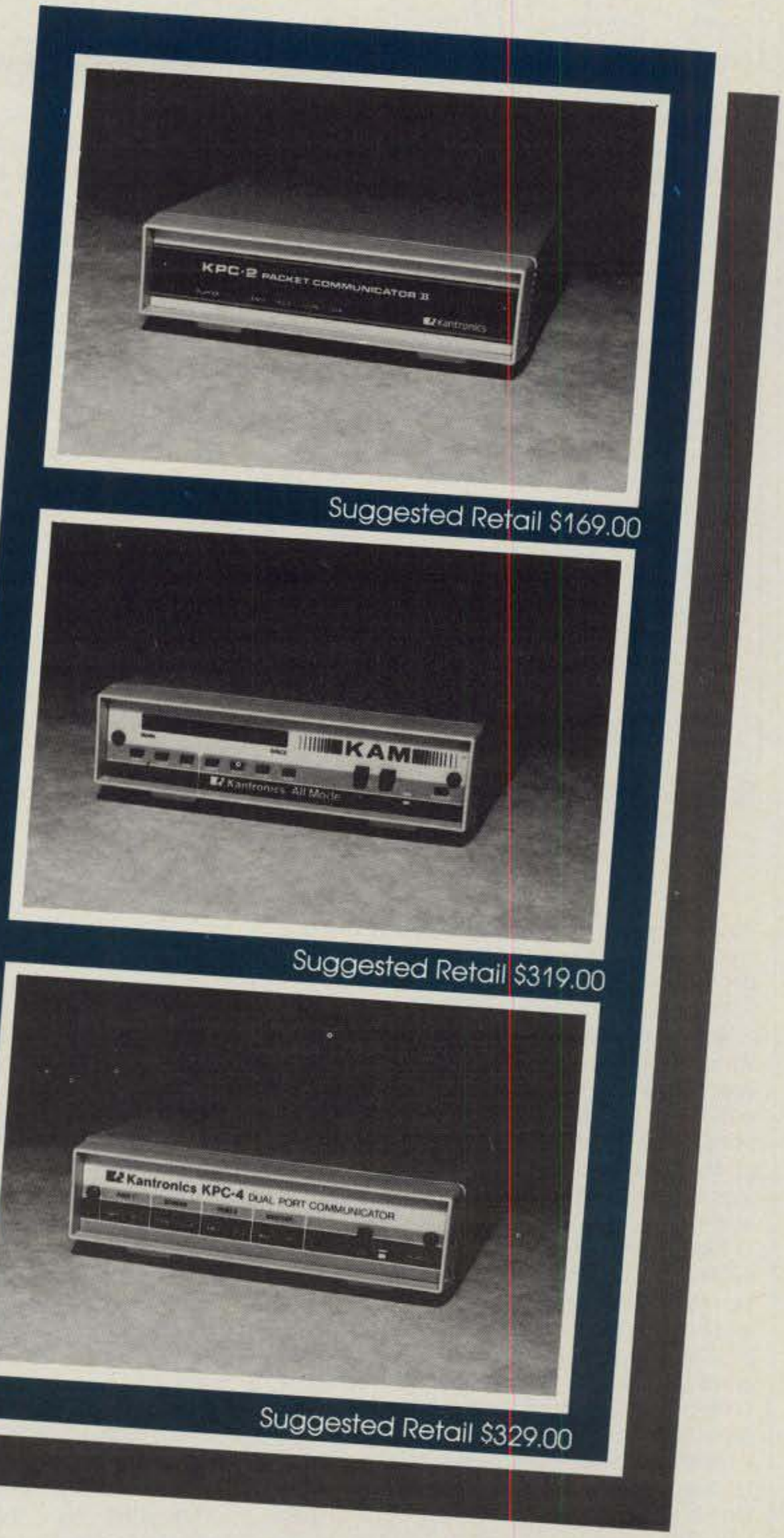

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1202 E. 23 St Lawrence, Kansas 66046 (913) 842-7745

* KAM, KPC-2, KPC-4, and KPC-2400 units shipped 7-31-87 or later.
** KPC-1 (Packet Communicator), KPC-2, KPC-4, KPC-2400

```
MINIPROP (TM) SHORT-PATH PREDICTIONS     07-31-1987     Path Length :  6584 km
Sunspot Number :  28.2   Flux :  85.0   F Hops :  2   Radiation Angle :  2 deg
TERMINAL A : 32.50 N    86.30 W   Millbrook AL          Bearing to B :  39.5 deg
TERMINAL B : 56.50 N     4.10 W   Scotland              Bearing to A : 283.5 deg
Terminal A Sunrise/Set : 1103/0040 UTC  Terminal B Sunrise/Set : 0423/2023 UTC

                          ---------- SIGNAL LEVELS ABOVE 0.5 uV ----------
UTC      FMUF     ECOF     3.6 MHZ    7.1 MHZ   14.1 MHZ   21.2 MHZ   28.3 MHZ

0000     18.7      9.2      37.7 a     41.6 a     39.9 A     37.2 B
0200     17.3      4.7      53.3 a     47.9 A     41.9 A     38.1
0400     15.4      4.5      52.0 a     47.4 A     41.7 A     38.0
0600     13.3      8.8      42.8 a     43.7 a     40.6 B
0800     14.1     12.6      25.0 a     36.4 a     38.3 B
1000     14.6     14.8      -6.5 a     23.5 a     34.2 a     34.5
1200     15.7     15.9                  8.3 a     29.4 a     32.2
1400     17.3     16.2                 -2.1 a     26.2 a     30.7
1600     18.1     17.1                 -5.3 a     25.2 a     30.2 B
1800     18.3     17.3                 -0.5 a     26.7 a     30.9 B
2000     18.4     16.4                 11.2 a     30.3 a     32.6 B
2200     18.6     14.1       1.4 a     26.7 a     35.2 a     35.0 B

<G>raph, <T>able, <P>rint table, <Q>uit, <M>enu, or <L>ong path ?
```

Fig. 3– MINIPROP 2.0 short-path tabular results. Note options available at the bottom of the display, which include displaying results in graphic form and making a long-path prediction.

```
SHORT-PATH PREDICTIONS          07-31-1987          Millbrook AL TO Scotland
Sunspot Number :  28.2   Flux :  85.0   F Hops :  2   Radiation Angle :  2 deg
          MHZ              X = FMUF        O = ECOF              MHZ
          30 ------------------------------------------------------ 30
          28                                                        28
          26                                                        26
          24                                                        24
          22                                                        22
          20 ------------------------------------------------------ 20
          18 XXXXX                        XXXXXXXXXXXXXXXXXXXX      18
          16     XXXX              XXOOXXXOOOO       OOOO           16
          14         XXXXXXXXXOOO                       OOO        14
          12               OO                             O       12
          10 O-----------OO-------------------------------OO       10
           8  O         OO                                         8
           6   OO     OO                                           6
           4     OOOOO                                            4
           2                                                       2
           0 ------------------------------------------------------ 0
             0  0  0  0  0  1  1  1  1  1  2  2  0 U
             0  2  4  6  8  0  2  4  6  8  0  2  0 T

<G>raph, <T>able, <P>rint table, <Q>uit, <M>enu, or <L>ong path ?
```

Fig. 4– MINIPROP 2.0 short-path graphic results. The above display corresponds to the tabular results shown in the previous example, fig. 3.

You're given the option of sending the program's output to your printer, but with predictions shown for each half hour instead of 2 hours.

A DX Compass feature helps you determine which bands are open in 12 directions from your QTH at any time of the day. Also, there are provisions for you to edit the atlas, view and print the rather considerable documentation, print a customized table of great-circle bearings from your QTH to all of the atlas entries, and more.

Fig. 1 shows the MINIPROP 2.0 main menu, while fig. 2 displays initial statistical information for a given path, prior to running the prediction. Fig. 3 shows short-path tabular results over the given path, while the corresponding graphic predictions are displayed in fig. 4. Long-path predictions, both in tabular and graphic form, can also be called up.

As you can see from the printouts we've selected, the program has some nice wrinkles. One is the display of sunrise/sunset and grayline data. Another is that in addition to the FMUF (highest F-layer MUF) being displayed, the E-layer cutoff frequency (ECOF) is also shown. A third is the display of antenna radiation angle calculated for the path.

A fourth, and the most impressive wrinkle, is the inclusion of predicted signal levels in the five primary HF bands. The signal levels shown are in dB with respect to 0.5 microvolt "behind" 50 ohms, and they assume a matched antenna load. As Shel explains it, if on your receiver 0.5 microvolt produces an S3 signal, then 0 dB would be S3. Assuming 5 dB per S-unit, 10 dB would be S5, 30 dB would be S9, and so on. The signal levels also assume 100 watts radiated power with free-space half-wave dipoles on both ends of the path. The predicted levels assume that a reflecting F-layer is always present and that there is no reflecting E-layer. Therefore, while the predicted signal levels can't be taken as Gospel, and they may have to be adjusted for your antenna and station power, they at least serve to give you some idea of whether signals are likely to be strong or weak over the path.

You may also note in fig. 3 that there are various letter "flags" which appear behind the program predictions. These are used to aid in interpreting the predicted signal levels in terms of the relationships between the FMUF, ECOF, and HPF (highest probable frequency), and whether propagation over the path can really be supported. This gets rather technical, but is nicely explained in the program's documentation.

A unique feature of the program is the DX Compass option. This handy feature provides a screen display showing the highest F-layer MUF (FMUF) you can expect on 12 bearings separated at intervals of 30 degrees from a specified location at any given time of day. It's easy to see how this feature is useful for planning operations during DX contests. Fig. 5 shows a representative DX Compass display.

MINIPROP 2.0 is available for 16-bit PC/MS DOS systems as well as CP/M machines. The PC/MS-DOS version will run on clones and compatibles having 128K of memory; an 80-column monochrome monitor is required. A CP/M version is also available which will run on machines using the CP/M 2.2, CP/M 3.0, and CP/M Plus operating systems, including the CP/M equipped Commodore 128.

As we've indicated, MINIPROP 2.0 is shareware, and it's copyrighted to preclude commercial sale and distribution by anyone other than the author. However, there is no restriction on noncommercial use, and Shel encourages users to give copies to their friends. In fact, the preferred method for obtaining the program is to get a friend to make a copy for you, or to find it on a BBS that has an amateur radio download section. Shel indicates that while he isn't in the disk duplication business, as a last resort you may send him a blank 5¼ inch disk and stamped return mailer, and he'll make a copy for you in either MS-DOS format or in one of several CP/M formats. If you ask Shel to make the copy for you, be sure to specify your operating system and whether you need a single- or double-sided disk. Contact Shel at 11058 Queensland St., Los Angeles, CA 90034-3029.

Remember: MINIPROP 2.0 is shareware, a user-supported program. This means that if you find it useful, you should consider sending to the author a contribution in the suggested amount of $25.

New Antenna Products

NCG Antennas and Accessories. The NCG Company is well-known for its line of imported SSB transceivers. These are manufactured by Matsushita Electric Co., the parent company of Panasonic, Quasar, and Technics, and reportedly the world's largest electronic manufacturer. NCG has recently expanded the product line to include antennas and other antenna-related accessories.

Particularly interesting is the line of dual-band, "ultra super gain" antennas. These include various base/repeater and mobile models that cover 146/446 MHz, 446 MHz/1.2 GHz, and 1260/1300 MHz; a 920 MHz vertical is also available. The antennas are rated at 30 to 200 watts, depending on the particular model and band, and range in length up to 16 feet. SO-239 or Type N connectors are available on most models, which range in price from $24.95 for a 146/446 MHz mobile antenna to about $169 for a 146/446 MHz base/repeater antenna. At least two duplexers are available, one for 145/446 MHz rated at 500 watts and another for 900-1400 Mhz that's rated at 70 watts.

NCG also imports the Japanese Creative Designs roof towers, which are designed to spread antenna weight over a broad base for maximum stability. These are manufactured of polished, high-strength aluminum to provide a structurally sound mounting fixture that is stable in the face of severe winds. These towers are available in three versions with heights of about 6, 10, and 15 feet. Ranging in price from about $150 to $350, the towers are lightweight

```
Sunrise: 1123 UTC                    FMUF          Radiation Angle:  1.5 deg
Sunset:  0008 UTC                                      Sunspot Number:  28.2
Millbrook AL                         17.4              Solar Flux:  85.0

                        17.6                  18.1

                18.6                                  19.6

                                1500 UTC
          20.1            32.50 N   86.30 W                   21.5
                             08-31-1987

                22.0                                  23.4

                        23.5                  24.5

                                24.3

DX Compass for what UTC (e.g., 0215) (or <RTN> to quit)?
```

Fig. 5– MINIPROP 2.0 DX compass display. This display shows the highest FMUF expected on 12 bearings separated at 30 degree intervals from a specified location (the author's QTH in this case) at any given time of day (1500 UTC in this example).

A practical helium neon laser setup. The power supply and battery are housed in the toolbox shown in the photo. (Photo copyright 1985 Steve J. Noll.)

(18 to 51 pounds, depending on height), and the towers' roof surface feet are rubber coated to provide protection against roof damage.

For a flyer drop a line to NCG Co., 1275 North Grove St., Anaheim, CA 92806.

Communicating by Lightwave

Today, for better or worse, we amateurs are increasingly becoming appliance operators. Seems that the technology has gotten so far ahead of us that it's all but impossible to catch up with it, much less to be on the leading edge. That's why Steve J. Noll, WA6EJO's manual, *Amateur Lightwave Communications*, caught my eye. It's on the cutting edge of technology, and it talks about the frontier stuff hams should be experimenting with.

Steve's book is a unique "how to do it" manual written for the amateur and electronic experimenter who is interested in using lasers for free-space communications. In its 119 pages, the book takes a hands-on, practical approach to this frontier activity.

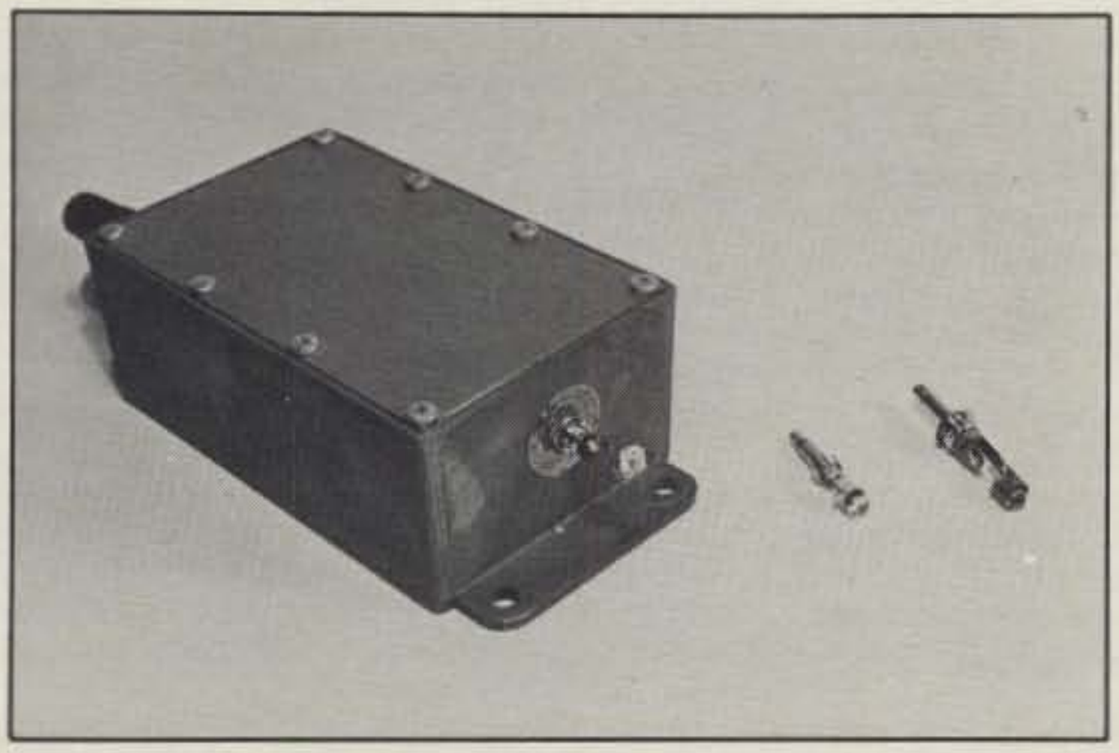
For one like me who never became involved with lightwave communications as an amateur activity, the book is an eye-opener. It discusses how light wavelengths are considered legitimate amateur bands by the FCC, and how laser "contacts" are valid in ARRL contests. It covers the nature of light in layman's terms, makes comparisons to more-familiar RF concepts, and explores laser operation and the four main types of lasers (gas, solid state, liquid, and semiconductor).

Before getting into the manual's nitty-gritty details, it would be good to digress for a moment on the nature of light itself. First, when we examine light, we see that it is in fact a part of the electromagnetic spectrum just as ordinary radio waves are. The light wavelengths in which we are most interested for communications range from 400 nanometers (violet), to 700 nanometers (red), to over 1000 nanometers (infrared). Still, light is different from RF in that it also possesses a particle nature existing only in discrete units called *photons*. The separate, tiny "photon packages" can be made to travel in a very narrow beam, which makes light excellent for point-to-point communications.

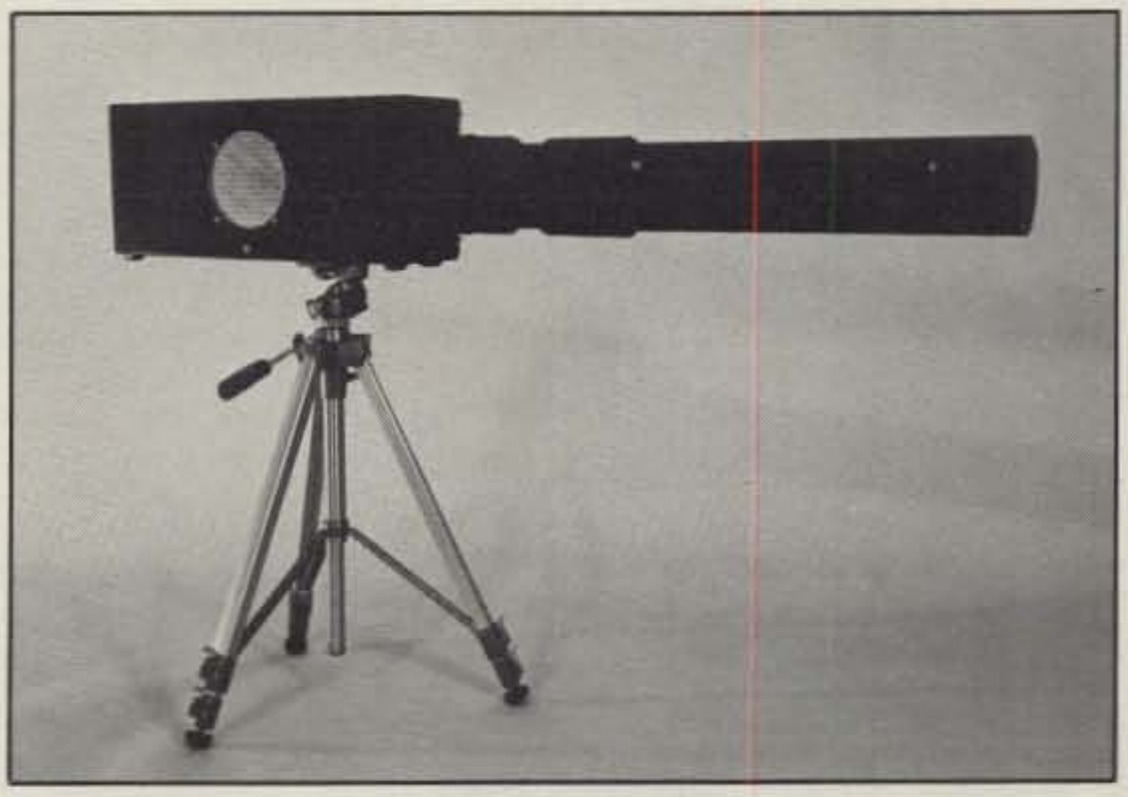
When we look at the bands and emission types available to the Amateur Radio Service under Part 97 of the FCC rules, we see that there are over three dozen entries starting with 160 meters and extending through the millimeter waves. The last FCC entry is "above 300,000 GHz," and there is no upper limit (visible light starts at about 400 TetraHertz, one THz being 10^{12} Hz, or one million megaHertz [MHz]).

The light "transmitter" in which we are interested is the laser, a device which was first conceived in 1958 and actually built in 1960. The word *laser* is an acronym for "Light Amplification by Stimulated Emission of Radiation," although its operation is not limited to producing visible light. There also are lasers (known as masers) that produce microwaves up through the infrared range, and progress is now being made on an X-ray laser. For amateur communications purposes, the most common and practical device is the helium neon laser. A laser transmitter setup is shown in fig. 6.

A "receiver" of sorts is required for two-day lightwave communications. Similar to an RF receiver, a light receiver requires an antenna to gather energy, a "front end" filter for selecting the wavelengths of interest, a detector for converting the photon energy to electrical energy, and miscellaneous circuitry for amplification and filtering of the final signal.



An electro-optic lightwave receiver. Photodetectors are mounted on phone jacks and plugged into this test box for comparisons. The schematic for this receiver is found in WA6EJO's manual, described in this month's column. (Photo copyright 1985 Steve J. Noll.)



Shown here is a photomultiplier tube lightwave communications receiver. A 3 inch diameter lens is housed inside the long PVC pipe. (Photo copyright 1985 Steve J. Noll.)

The "antenna" for the lightwave receiver is the critical area in communications; "the bigger, the better" applies here, too. The purpose of the light antenna is to gather as much light from the source as possible, concentrate this light onto the detector, and reject light coming from unwanted sources. Lenses and curved mirrors constitute the main tools of the trade and need only be mounted in a tube or holder, taking the form of a simple telescope, to make a complete antenna system. Fortunately, we only need to gather as much light as possible from the source and needn't have adjustable focus. Thus, a lightwave antenna can be much simpler and more inexpensively constructed than an optical telescope. A 3.5 inch lens light receiver setup is shown in fig. 7.

Steve's manual focuses on the practical and inexpensive helium neon laser, and he covers operation, construction, and sources. He also discusses several types of modulation schemes, optical receivers and antennas, front-end filters, and detectors. He includes schematics for laser power supplies and lightwave receivers, and examines propagation and communications-range factors as well as operating safety.

Steve also provides a long list of sources for low-cost lasers and laser-related equipment, as well as a commented bibliography and addendum of late-breaking laser and holography news. An important point is that while laser equipment usually carries with it astronomical price tags, the do-it-yourself sections of the manual deal only with materials and techniques that are within the reach of someone on a limited budget. His indexed 18,000 word manual is $13.98 postpaid and is available directly from the author at 1288 Winford Ave., Ventura, CA 93004-2504.

We'd also like to thank Steve for permission to extract liberally from his copyrighted 1985 material in our column, and for the excellent photos and sketches he made available to us.

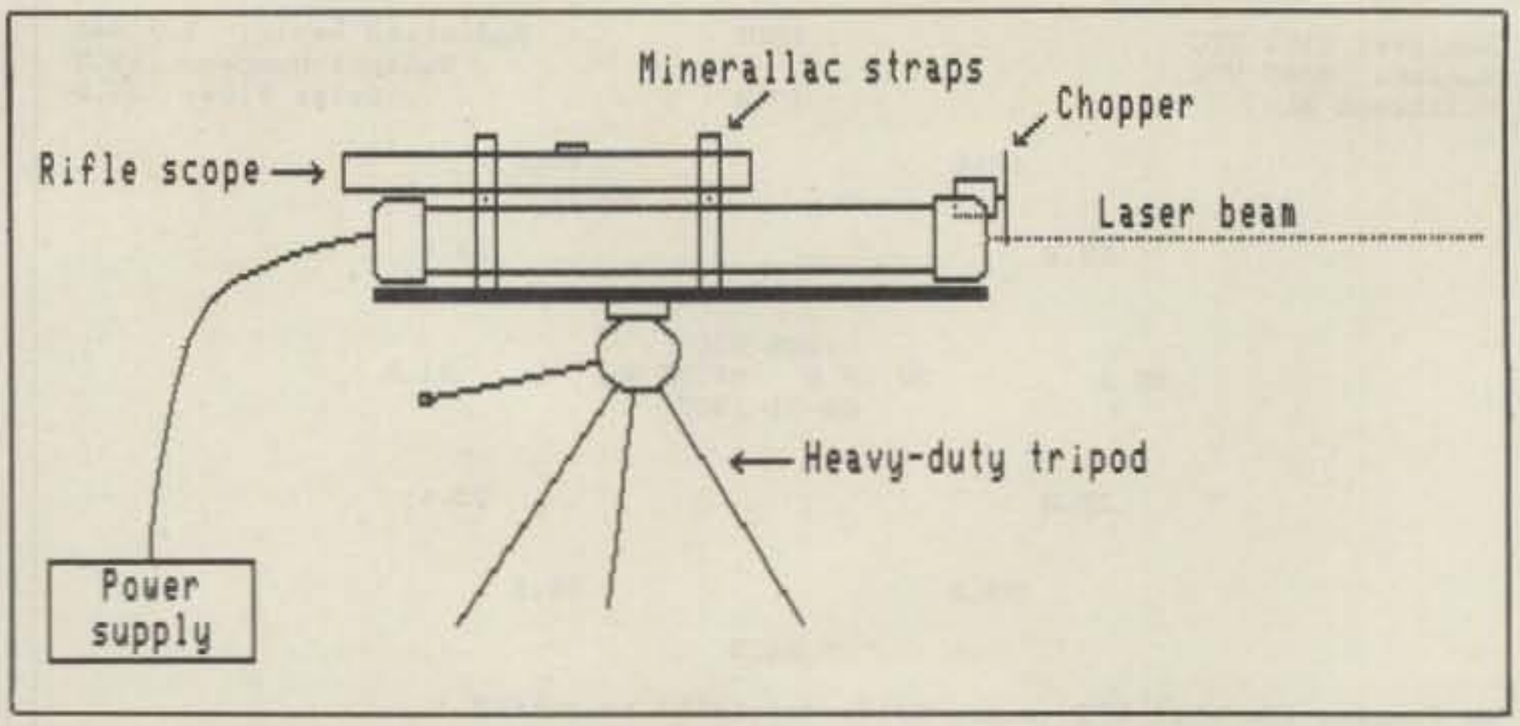


Fig. 6– A complete laser transmitter setup. WA6EJO's manual Amateur Lightwave Communications *provides several ideas for laser transmitters suitable for amateur use, including schematics for power supplies. (Sketch copyright 1985 by Steve J. Noll.)*

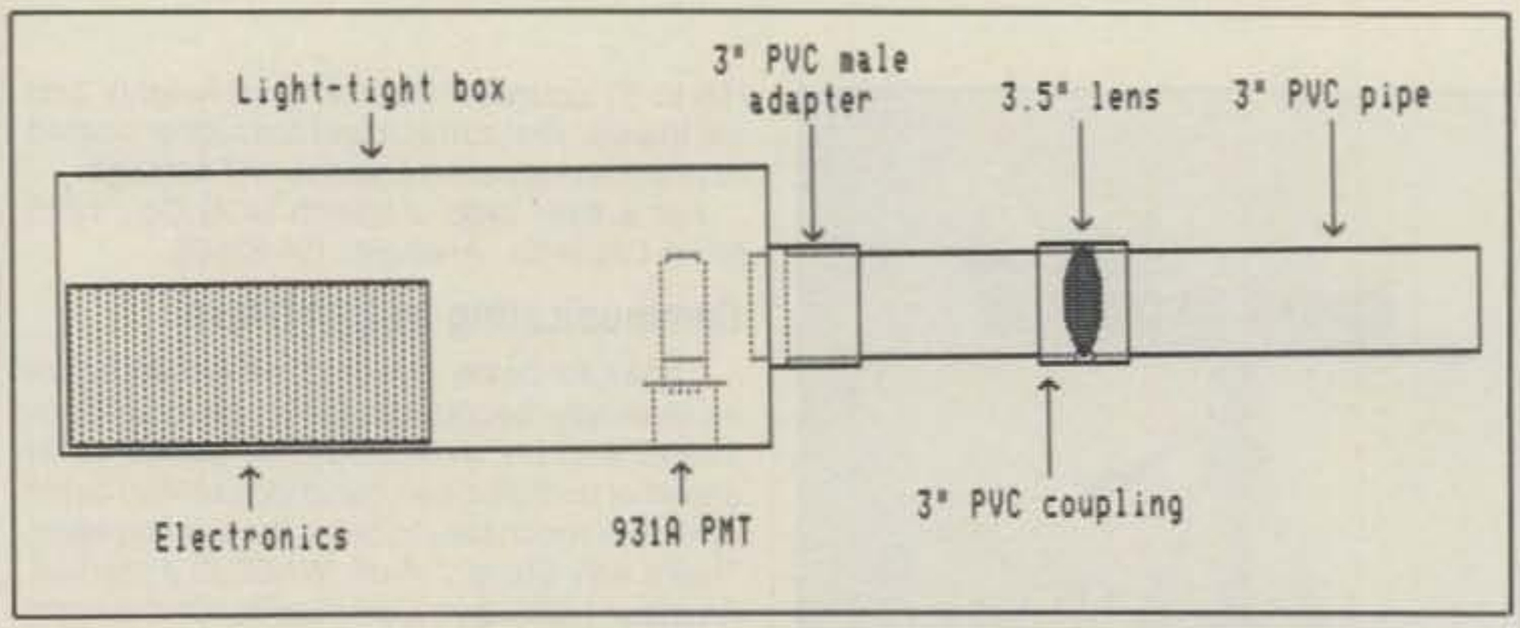


Fig. 7– 3.5 inch lens light receiver. Shown here is one lightwave receiver built by WA6EJO; a 931A photomultiplier tube is used for the detector. (Photo copyright 1985 by Steve J. Noll.)

Short Bursts

Fluorescent Savings. Do you use fluorescent lights in the hamshack, and if so, do you ponder whether it's more efficient to just leave them burning when leaving the shack for a few minutes? Does a fluorescent light have to be turned off for a half-hour or so before the energy saved equals the energy used in initially energizing the light?

Many people think so, and they are wrong, according to an article distributed by the Air Force's PACAF News Service. The article cites a Navy study which showed that fluorescent lights need only be turned off for one second to save the amount of energy required to restart the light. The study suggests it's a misconception that it's cheaper to leave fluorescent lights on for short periods of time, rather than turning them off when not needed.

One rationale for this misconception is that the wasted electricity is cheaper than buying new lamps. This is because when fluorescent lamps first became popular in the 1940s, lamp life was significantly reduced if the lamp was operated for but short periods of time.

While this may have been true in the early years, advances in the construction of fluorescent lamps have increased their life dramatically. In fact, economic studies of tradeoffs between fluorescent lamp replacement and electrical costs have shown that anytime a room is vacated for more than a few minutes, the fluorescent lights should be turned off. Of course, the study doesn't consider all the RFI the buggers can cause, which may mean that you don't want fluorescent lights in your hamshack in the first place!

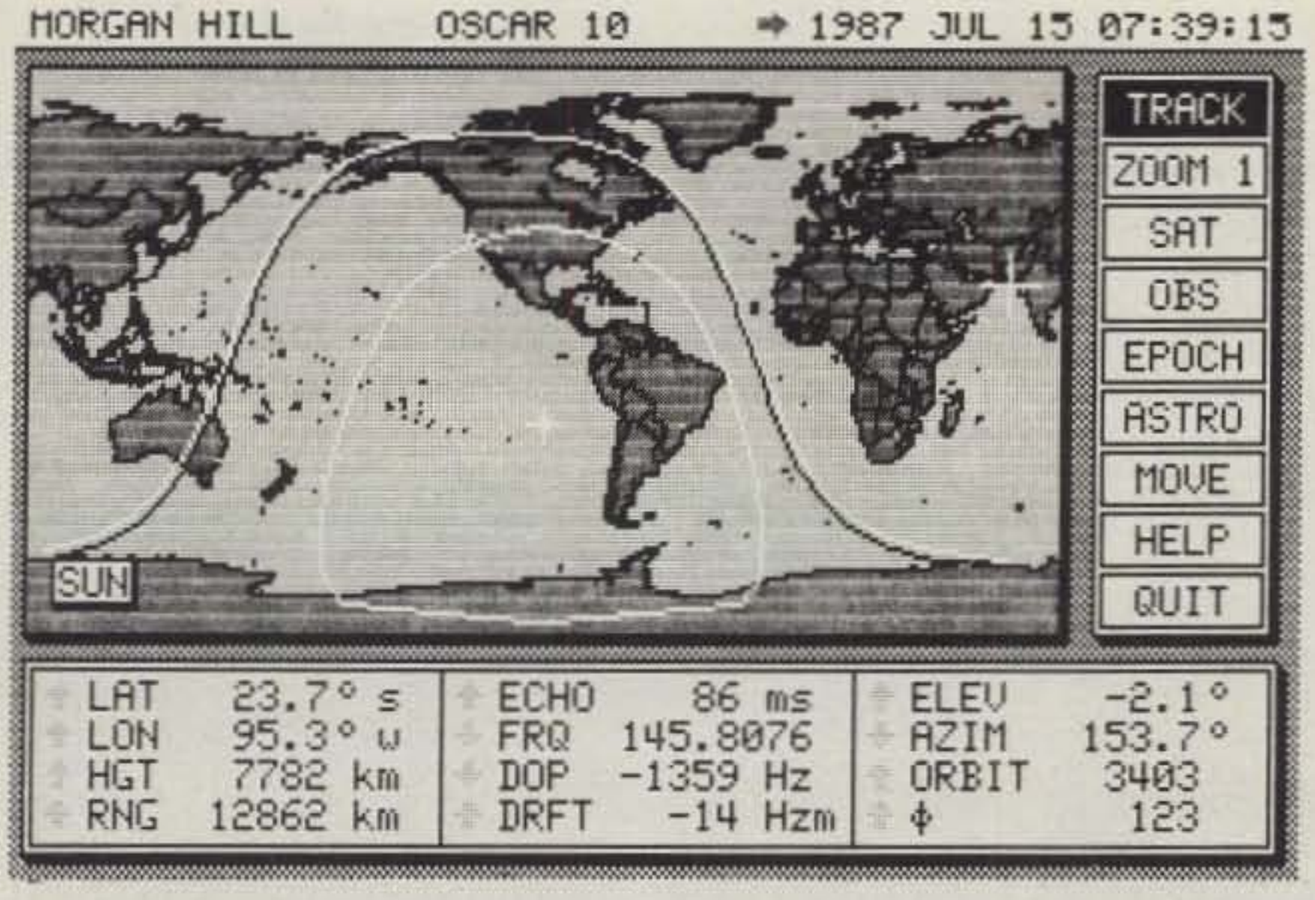
Wrapping It Up

This month we've examined the shareware concept of software distribution, and we focused on one excellent example of amateur radio shareware, Shel Shallon's MINIPROP 2.0. We also briefly described some of the antenna products offered by NCG, and we discussed one of amateur radio's newest frontiers, lightwave communications, honing in on Steve Noll, WA6EJO's book, *Amateur Lightwave Communications*. We also brought out the results of an interesting study of fluorescent lamp usage.

As an aside, the following was overheard: "Don't get too nostalgic about anything, because it just might come back!"

Next time more Antennas and Accessories topics of current interest. See you then.

73, Karl, W8FX



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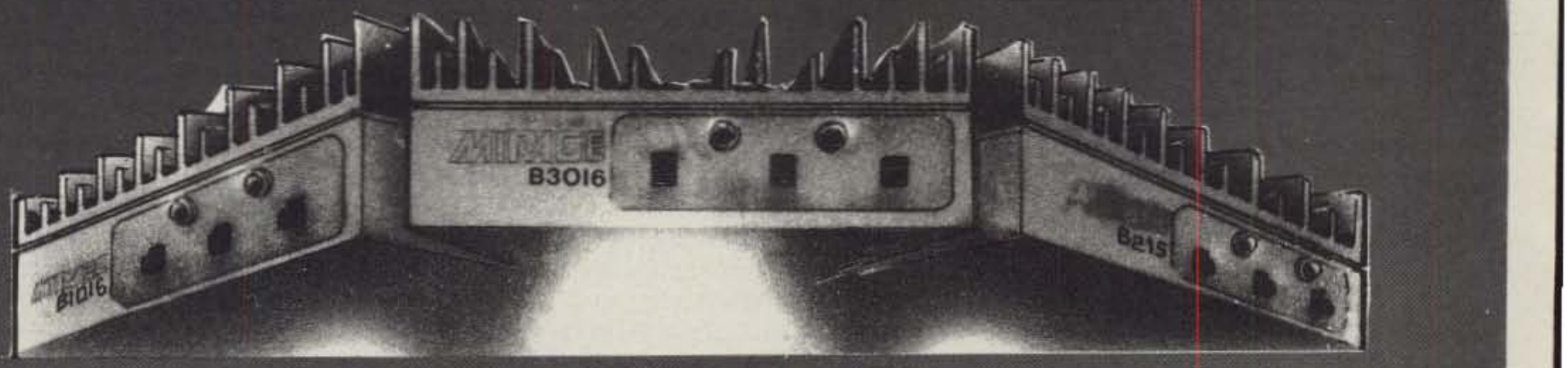

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CIRCLE 31 ON READER SERVICE CARD

World of Ideas

a monthly feature by
DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Super Operating With Today's Hi-Tech Rigs

Turning a high contest score or contacting 100 countries in pacesetting time reflects a perfect blend of operating techniques and top-notch equipment. This month's column investigates the ingredients of that combination in a plain-language manner. My own HF station, recently upgraded with a new Cushcraft A-3 Tribander, deluxe ICOM IC-761 transceiver, and hand-made German keyer paddle serves as an easily recognized reference. Using this barefoot setup, antenna at 35 feet, and strictly average QTH, I worked 102 countries in 1½ days. You might do even better. —K4TWJ

Author K4TWJ with high-tech operating technique well in hand(s). Both paddles are wired to same transceiver for mixed right/left-hand use as discussed in text. (Photo by Joe Veras, N4QB.)

A brief front-panel comparison between HF transceivers of the 1960s and the 1980s yields proof of modern technology's phenomenal advancements. Mechanical bandswitches have given way to direct frequency-entering keypads, analog dials have been replaced with digital readouts, and final-amplifier loading controls have become virtually extinct. Today's transceivers include a variety of special features and controls that were basically nonexistent during the era of vacuum-tube rigs. Heading the list of super attractions are dual digital VFOs, multiple memories, full CW break-in, and single-button split-frequency operation. The overall combination is truly fantastic! That vast array of operating flexibilities, however, raises some interesting questions regarding their use. Are we attracted to new rigs mainly because of their front-panel glitter, or do we really use their special frills advantageously? Are memories used as dynamic operating aids or merely as a glorified bandswitch? Do we utilize full CW break-in and dual VFOs, or are we primarily adapted to single VFO SSB operations? Interesting thoughts, eh?

Two Styles of QSOs

Generally speaking, two categories or styles of operating are popular on today's HF bands—the casual and friendly QSO and the brief DXing or contest-type exchange of basic information. I don't encourage exclusive use of either method. Indeed, alternating the two styles keeps amateur radio life fresh and exciting. Since most of us are familiar with "conversational QSOs," let's thus concentrate on "rapid-fire DXing" or "getting maximum returns for every minute on the air."

Contacting 100 countries during any weekend of reasonably good propagation is both challenging and a great way to prove a new rig's performance. Working "all this" or "all that" within a similar time frame is less attractive because there are always a few "elusive ones" that only sporadically get on the air.

Briefly scanning a world map reveals 40 "often heard and easy to contact" countries in Europe, 20 in Central America and the Caribbean, 12 in Africa, 12 in South America, and 12 in Oceania. That tallies to 96 "common DX countries," and adding at least 4 "semi rare" ones will be unavoidable during such an operating stint (see fig. 1). The keynote to success centers around *"multiplying air time"* when the bands are open and jumping with action. During a 2 hour opening to Europe, we could use the "tune, wait, call, wait" procedure and contact 10 to 12 countries. Only one fourth of our time is actually spent communicating, and we miss other DX calling CQ (without answers) while we're waiting or in a semi-QSO state. if we utilize communicating time for simulataneously tuning and waiting for additional DX stations, however, we can jump directly from (between?) QSO to QSO and increase our contact ratio three or four to one. That's 30 to 40 countries in less than 2 hours!

Super operating begins with recognizing your setup's advantages and limitations. Plot your beam's SWR on CW and SSB portions of all bands and all directions, and then memorize times when your antenna tuner is needed. If you use a manual tuner, mark its controls settings by band (20 CW, 10 SSB, etc.) for later "dial and go" convenience. *Mentally segment your transceiver's memories for maximum flexibility.* Memories 1 through 8 can be allocated for "favorite frequency call-up," memories 9 through 20 used for continuously storing/recalling DX QSOs on one band, and additional memories used for other bands. Continuously work between VFOs and memories until their use is second nature. Finally, learn preferred IF-Shift/Passband-Tuning settings for various modes and filters. When everything blends into one smooth overall motion, you're beginning to realize maximum performance from your rig.

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Fig. 1—One-hundred "often heard and easy to contact" countries categorized according to beam directions and band openings.

Stick with me and you'll be operating your transceiver like a nimble sports car in a slalom race.

Starting Easy

While super operating ideas can be applied to SSB activities, CW is definitely the preferred mode. A greater number and variety of countries operate CW, U.S. QRM is less than on SSB, and *full break-in lets you listen between characters*. I'll thus outline CW methods and let aural diehards relate them to SSB.

As an easy beginning, tune your transceiver's RIT and monitor other band activities while you're calling CQ. Modern RIT circuits cover a 10 kHz spread, and they can be continuously tuned without changing your transmit frequency. Also use *fast AGC*. Next, acquire the knack of talking to one person and listening to another simultaneously. It's not difficult. When you can copy a DX station's call and "basic info" while using full QSK and transmitting to another (different frequency) DX station, you've reached the first plateau. When you can comfortably and naturally conclude that QSO, switch on your rig's XIT, and immediately call the second DX station (or manipulate your T/R times and RIT/XIT so you can call or reply to one station while listening to the other), you've reached a significant second plateau. Subsequent steps involve copying calls backwards (it's easier when you're transmitting to another station) and keying with one hand while operating the rig and logging with the other hand. Now that's really living!

Moving Ahead

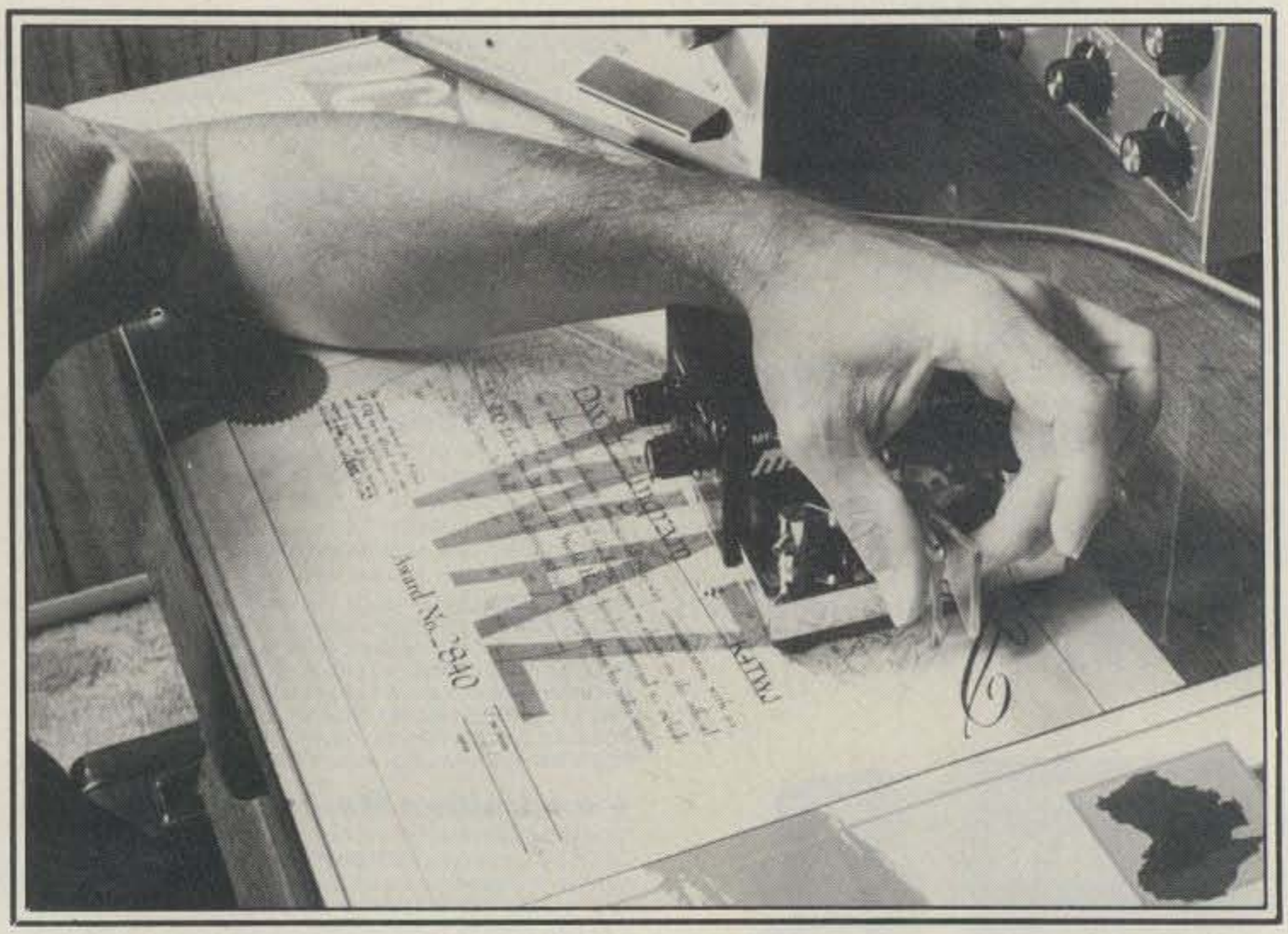
After you've mastered the knack of working two overlapping or simultaneous QSOs on different frequencies, your rig 's dual VFOs can be called into action. As a working example, let's say you're beginning a 20 meter stint and VFO A is set on 14,000 kHz. Press "A=B" and both VFOs are synchronized on 14,000 kHz. Tuning upward reveals an LA5 in QSO on 14,003 kHz. Copy down his call, press "A=B," and continue tuning. A GM4 is next spotted in QSO on 14,008 kHz. Write down his call and then switch to VFO B (you left it on 14,003, the LA5). You can now alternate between the two until one signs clear, or continue DXing with your RIT and XIT. After the LA5 signs, you call him, listen only for your call's return, then switch to VFO A and check the GM4's status during the "de—," etc. There's no rush (yet); you're mainly listening to RST, name, and QTH. You can listen to the GM4 or use your RIT to "line up" a third (or fourth!) DX station 50 percent of that time. It's simply a matter of button pushing with one hand and logging calls and frequencies with the other hand.

Naturally, the GM4 (or another RIT-spotted DX station) will be available for QSO before you sign with the LA5. The solution? Press your transceiver's "SPLIT VFO" button and call the GM4 while listening to the LA5 (remember that full break-in lets you receive any time your key isn't down). The rig's "A/B" VFO button is then used to alternate between QSOs. Just watch your SPLIT transmit frequency and "who's where."

After you return to working a single QSO, the freed VFO can be used for additional DXing. Remember to tune only when the key is up, however, or you'll shift your transmitting frequency. Write down calls and exact frequencies until you have this down pat. You'll soon spot another DX station, and the "simultaneous QSO" cycle repeats.

If your transceiver includes *independently tunable and reprogrammable memories* (like ICOM's), you're set for even more fun. This capability is checked as follows. Store 14,010 kHz in memory 10, and then recall memory 10. Tune it to 14,015 kHz, and then press its "WRITE" button and tune onto 14,025 kHz. Next press recall the memory's stored information. The frequency readout should return to 14,015 kHz. Many Kenwood transceivers don't include this capability. You'll thus be confined to programming them from the VFO, using them for fixed frequency operations, and then reloading them "on the fly."

"All memory" operating or mixing memory and VFO operations can yield *three or even four(!) simultaneous QSOs*. Tune one memory to a DX station, store it, switch to the next memory, store another DX station, and keep rolling—even changing bands (broadbanded tribanders and automatic antenna tuners are great here). You'll now be using VFO A, B, SPLIT VFOs, and switching between memories. Slack QSO times are being used advantageously, transmitting to one station while listening to one or two others. You're moving between QSOs rather than merely waiting in a single line and munching snacks. After 30 minutes of this "super operating," scan the band



The easy way to operate a right-hand-wired paddle with your left hand. Curl wrist around keyer and use its top as a support. (Photo by Joe Veras, N4QB.)

and notice you've worked most of the DX while others are still tied up in waits. That's the time to swap bands and really charge ahead! Return to the previous band a couple of hours later, and shifted propagation will present a new variety of DX. Life just doesn't get any better than this, gang!

Do I sense some readers rapping about crossed arms or jumbled hands? No problem! Modern iambic keyers and smooth-handling paddles are the answer. *Parallel-wire two paddles and place one on each side of your transceiver*. Operate one with your left hand while logging with your right hand, and then swap in a word's middle and operate the rig with your left hand.

Remember how "lefties" wrote in high school with their hand curled over a paper's top? It also works great on right-hand-wired keyers! I prefer the "flat top" style keyer, as it provides a comfortable wrist position. An easy way to master left-hand keying is starting at a very high speed and then slowing down after you get the feel. Let the keyer do the work of completing dots and dashes for you. Trust me. Operating a right-handed keyer with your left hand is easier than using a straight key. Would this young old-timer lead you astray? I'm having a ball working two and three countries simultaneously, and I want you to also enjoy the fun!

It's All Relative

Super operating techniques tend to generate an endless number of "oranges versus apples" questions, so I've developed a similarly confusing group of answers. Basically, I've found that a deluxe barefoot transceiver with full CW break-in and a good tribander are equivalent to the same setup with a 500 watt amplifier but without full break-in. A kilowatt amplifier (no QSK) increases that advantage 5 dB, but an only fair transceiver or mediocre tribander lowers the factor 3 dB. Securing a QSK KW amplifier deflates your pocketbook 6 to 8 dB, but purchasing a choice QTH demolishes that purse.

If your tribander hasn't been refurbished in 8 years, subtract 2 dB. If your coax is over seven years old, subtract another dB. If you're an SSB diehard, subtract 8 dB. It all equates . . . really!

Conclusion

Modern hi-tech transceivers and super operating techniques truly open a completely new dimension to amateur radio enjoyment. They're great! The ideas highlighted in this article are also good "starting points" for unlimited future expansion.

Now follow these thoughts closely, gang. Computer control of a transceiver's VFOs and memories are logical starting points. Another computer, interfaced and programmed to function as an "intelligent" CW terminal, is the second step. A clever computer enthusiast could extend the "second computer's" capabilities to self-monitor received Morse, examine text, and shift operator-designated (DX) calls into a transmit message buffer. Add a few timing loops, information-evaluating subroutines, etc., and we have a *complete robot operator*. The two computer systems could then be interfaced, allowing the full setup to tune the band(s), call CQ, work DX stations, log them in memory, study daily success, and develop its own optimized operating patterns. Assuming we then add system timers, remote control, and full upload/download routines plus solar power and self-extending antenna system, we have a *"robotic DXpeditioner."* We only need a Cap'n Mike Windjammer traveler to set the package ashore on Fernando de Noronha, Tokelau, or Manihiki: *Our own home-controlled DXpedition*. Fantasyland? No way! Seventy years ago we were using spark coil transmitters and galena detector receivers. Today there are no limits!

The techniques described in this article were proven in my own recently upgraded station. It consists of an IC-761 (what a gem!) and Cushcraft A-3 tribander. A Hy-Gain BN-86 balun and 75 feet of unbroken 9913 coax connect the two items. My KW amplifier wasn't used because it doesn't include QSK. The IC-761 is very user friendly. Two hours after turn-on I was working two stations simultaneously. At one point a VK called out of curiosity because he heard me working two QSOs at once. He went bonkers when I explained that while working him, I was also signing with another station 10 kHz lower. Stay alert to those lulls during your QSOs, gang. Your contact may be working another station while you're doodling on a copy pad. What a great life!

Ticket Talk

a monthly feature by
FREDERICK O. MAIA, W5YI

INFO ON AMATEUR RADIO LICENSING

VECs To Revise Written Tests Every Three Years

More than 42,000 applicants were administered nearly 62,000 test elements in the VEC system last year. If present projections hold up, VEs will administer over 75,000 amateur radio operator examinations during 1987 to some 48,000 applicants for upgraded amateur radio licenses at over 4,300 test sessions. In addition, about 28,000 new applicants will enter amateur radio for the first time via the Novice route. All examinations are now developed and implemented by collective VEC agreement. The amateur volunteer testing system has gotten to be a massive undertaking indeed!

There are actually two volunteer testing programs. One for beginners—Novices—and another (called the VEC System) for the Technician through Extra class levels. It takes two volunteer examiners to administer the Novice requirements. Beginners must pass the Element 2 (theory) and Element 1A (the 5 wpm code test).

The higher class examinations are more formal and require three examiners who must be approved by a Volunteer Examiner Coordinator. VECs previously acted solely as the administrative link between the FCC and the VE team. They now have more important duties. It is the VEC that *completely* develops and implements amateur radio testing. Except for oversight authority, the FCC is now out of the amateur radio testing business.

VECs attending the third annual Conference of Volunteer Examiner Coordinators held in Atlanta during July voted to overhaul each of the various written examination question pools on a three year cycle. Only one written element will be worked on at a time. Question changes necessitated by FCC rule changes will be revised at once. Up until this year the FCC handled all maintenance of the question pools. The various written examinations were revised annually by the FCC. The VECs and license preparation material publishers in attendance at the conference, however, felt that this was too often.

Five written amateur radio examinations are designed from question pools ranging from 286 to 507 questions. There are over ten times as many questions in a specific pool as there will be questions in any one test. The revision process will consist of looking at the test outline (syllabus) and making any necessary adjustments to reflect current amateur regulations, operation, and technology. Then individual questions will be deleted, added, or modified as necessary.

A Question Pool Committee which consists of three VEC officials (Jim Clary, WB9IHH, Chairman; Ray Adams, N4BAQ; and R.C. Smith, W65RZA) was appointed to work out a schedule for the various activities. A program will be developed to solicit from the amateur community and to get concurrence from the other VECs prior to adoption and implementation of the new pool. We hope to publish this schedule in our next Ticket Talk column. Table I lists the various test elements and the number of questions currently in each pool.

This means that the license preparation material currently in the marketplace will be accurate—at least for another year. It will take at least that long for the VECs to go through the first revision process. The Extra class examination is anticipated to be the first examination revised by the VECs.

The FCC's Johnny Johnston, W3BE, Chief of the Personal Radio Branch, and Ralph Haller, N4RH, Deputy Chief of the Private Radio Bureau, were both in attendance at the VEC Conference and represented the FCC's Washington office.

The VECs also agreed to file a petition requesting that the Morse code testing rules revert back to the previous wording which stated that telegraphy tests *may* and not necessarily *shall* contain all required alphabet letters, numerals, and certain punctuation and operating procedure signs. The VECs will also ask that the 5 minute code test rules in §Part 97.29(c) be amended to read a 5 minute *minimum*.

Morse Code Testing By Volunteers

We recently got a letter from David Mack, WA1TON, a long-time Tech class amateur from Nashua, New Hampshire. He writes, "I heard you have a sure-fire way to upgrade the CW portion of the FCC exam. I've had a code hang-up for years . . . can't seem to get up to the 13–15 wpm level that I need to get out of the Technician class."

No, Dave, we don't have any *sure-fire* way to upgrade, but our code test preparation tapes are in the same format as our code test examinations, although the copy is different. We also allow our VE examiners more code testing latitude than most other VEC organizations.

Since we get more mail on Morse code testing than on any other single subject, let's cover this in detail this month. Morse code proficiency is an international requirement for Amateur Radio Service operation. As amateurs we get involved in all sorts of local, state, federal, and international law. Everyone seems to be telling us what we can and can't do, where we should do it, what we need to know.

Sending Morse code texts by hand and receiving by ear are an international prerequisite for participation in any nation's amateur service. This is very clear in Article 32, Section I §3.1, of the International Radio Regulations (IRR). This same regulation further states that any nation

National Volunteer Examiner Coordinator, P.O. Box 10101, Dallas, TX 75207

Number of Questions to Select from each Sub-element

Examination Sub-Element	Element: 2 Novice	3A Tech.	3B General	4A Advanced	4B Extra
A Rules & Regulations	9	5	4	6	8
B Operating Procedures	2	3	3	2	2
C Radio Wave Propagation	2	3	3	2	1
D Amateur Radio Practice	4	4	5	4	3
E Electrical Principles	4	2	2	10	7
F Circuit Components	2	2	1	6	5
G Practical Circuits	2	1	1	10	6
H Signals & Emissions	2	2	2	6	3
I Antennas & Feedlines	3	3	4	5	5
Total Test Questions	**30**	**25**	**25**	**50**	**40**
Total Pool Questions (1,840)	**302**	**288**	**286**	**507**	**457**

Table I– Breakdown of amateur radio operator question pools.

"may, however, waive this requirement in the case of stations making exclusive use of frequencies above 30 MHz." Although not an ITU requirement for VHF and higher operation, our FCC requires code knowledge for amateur band operation *on any frequency*. Efforts to change this have been defeated in the past.

Section I §3.2 states that any nation "shall take measures that they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station." Thus, it is the radio regulatory agency of each country that decides what the code guidelines should be.

There are no international rules that require particular code-speed proficiency. Theoretically, recognizing the characters that are sent to you *at any speed* can legally qualify you to be an Extra class amateur radio operator as far as the international regulations are concerned.

There is also another IRR that says that any nation can license any type of radio operation as long as it does not cause interference to authorized services. Japan authorizes HF amateur operation *without Morse proficiency* based on this international legal loophole. Perhaps some countries (such as Costa Rica) that don't require code knowledge for any amateur frequency get around the international law the same way.

Our own FCC also does a little rule bending of its own. Our amateurs are no longer required to send the code by hand, since the Commission has determined that if you can receive, it has been their experience you can also send. Therefore, code sending by hand is not really a requirement, although a particular VE team may require it if they wish to.

The rules covering U.S. amateur code proficiency are very broad and are covered in §Part 97.29(c). A code element is passed if the applicant *proves* that he/she can receive International Morse code information at not less than the prescribed speed with five characters constituting a word. Punctuation and numerals count as two characters. The ARRL's VEC program bends the rules to allow the procedural signals to count as two characters. There is really no reason why they shouldn't either, except the rules don't provide for it.

§Part 97.21(a) states that the specified speeds are 5 words per minute for Novice, 13 for General, and 20 for Extra class. Further specified is that the code exam must contain all letters of the alphabet, numerals 0–9, period, comma, question mark, and operating procedure signs, AR, SK, BT, and DN.

It is the sole responsibility of the volunteer examiner to make the determination on whether the applicant passes the code test (4Part 97.29[a]). Since there are no other rules concerning Morse code tests, the VE is given very wide latitude in Morse code test design, administration, and grading.

Until 1978, when the FCC was giving the tests, they determined that if you could copy for 1 minute solid out of 5 minutes of copy, then you were proficient. They didn't ask questions or even let you correct your paper after the code examination transmission stopped. In 1978 the FCC started giving multiple-choice code exams. It was later left to the discretion of the volunteer examining program as to how code examinations would be conducted and graded. Code had to be transmitted for 5 minutes, but various answer format methods—some very creative—were allowed.

Most teams started off with the same code grading system that the FCC first used—i.e., 1 minute solid copy. The League allowed code candidates to write in the answers to seven out of ten questions if they missed copying the correct number of characters in a row. Other VEC programs authorized multiple-choice, true/false, and fill-in-the-blank answer formats. All were legal.

While the ARRL-VEC only allows seven out of ten questions correctly answered without misspelling or 1 minute solid copy, our VEC program allows the VE team to make the decision as to which answer format they wish to use.

We also allow them to decide on whether they want to use the *Paris* or *Farnsworth* code timing standard. Frankly, we prefer the Farnsworth standard where code characters are sent faster—even at 20 words per minute—but the spaces are lengthened to yield the appropriate net speed.

If you learn the code initially at 20 wpm, you won't have a code plateau as you progress from one speed level to another. This is always the major problem in learning the code. The sound pattern simply doesn't change using Farnsworth timing. The FCC does not care what timing standard is used. If Farnsworth timing helps applicants to learn the code faster and pass tests easier, I say let's use it.

The code tapes that we provide to our VEs are exclusively Farnsworth tapes. In this day of easy microcomputer code test generation, most of our VE teams make their own code test tapes. We don't care what timing system they use as long as the speed yield is correct. Our VE manual simply states that any answer-format Morse code test may be administered.

Perhaps the most controversial code test format seems to be the fill-in-the-blank answer format. This consists of a paragraph of text being provided to the candidate prior to the test with ten words missing. The applicant must fill in seven out of the ten missing words correctly spelled. Applicants have the advantage of being able to follow the code transmission and therefore know when the missing words are coming up. On the other hand, they have to be able to recognize what they are following and then correctly put down the missing word. We checked this with the FCC's Johnny Johnston before allowing it. He said it was a legal code test format.

From The Mailbag

Is it necessary to bring your original amateur operator license to a testing session? A good question, and one that has caused some confusion and upset applicants. There is no §Part 97 rule that requires an applicant to bring his original license with him to an upgrade testing session. Most applicants bring a photocopy with them to turn over to the VE team. Original licenses can't be returned to the applicant. A statement on the Application FCC Form 610 instructions does, however, contain the statement, to:

"Bring with you to the examination session and show to the examiners,

A. The original document of your current FCC amateur radio license (if you hold one):"

We have had cases in which VE teams, sticking to the letter of the law, have refused to examine applicants who have not brought their original licenses with them for their inspection.

While FCC examiners only required photocopies of licenses, it is hard to fault VE teams for following instructions on government forms. Check with the VE team before you go to the test session to determine if they do indeed want to see your original amateur license—or if a photocopy, which you can turn over to them, will do.

What are the requirements for being a Volunteer Examiner? There are actually two different volunteer amateur radio testing systems—one is the older Novice program, another is for Technician and higher level upgrading. Most VE prerequisites apply to both programs. However:

1. You must be 18 years of age; and
2. not be related to the candidate, by blood or marriage.
3. VEs must not be *directly* engaged in the amateur radio equipment or license preparation business.
4. VEs must never have had their amateur operator or station license revoked or suspended.
5. Volunteer examiners may not be compensated for their services. VEs for the Technician level and higher may be reimbursed expenses, however.
6. *Two* volunteer examiners are required to conduct a Novice examination.
7. *Three* accredited (approved by a VE coordinator) volunteer examiners conduct Technician and higher examinations.
8. As a general rule, VE teams for the Novice examination operate pretty much on their own, while VE teams for the higher levels follow VEC developed testing programs.

9. VEs who participate in an examination by fraudulent means are subject to amateur license revocation.

10. Novice applicants may be tested by General class and higher level VEs. Technician class examinations require VEC accredited Advanced or Extra class level examiners. General, Advanced, and Extra class applicants must be tested by Extra class examiners. (The W5YI-VEC program only utilizes Extra Class VEs for Technician and higher testing.)

11. The FCC reserves the right to readminister any examination given by a VE team.

Our club wants to conduct periodic amateur examinations. How do we get set up? We assume that you want to administer all examinations from Novice through Extra class. There are more than 20 testing coordinators, but only 3 are FCC approved to arrange examination sessions in all areas. These are the ARRL-VEC (225 Main St., Newington, CT 06111), DeVry Amateur Radio Society (3300 N. Campbell Ave., Chicago, IL 60618), and our VE program, W5YI-VEC (P.O. Box 10101, Dallas, TX 75207). These three organizations account for nearly 80% of all amateur testing. Write for some VE applications and tell them you want to hold amateur radio testing sessions. You will be sent all of the details. Remember that it takes a team of three volunteer examiners to conduct all examinations.

Why doesn't the FCC have the current FCC Application Form 610? The newer version Form 610 is only available from the VECs. The FCC can't print newer Application for Amateur Radio Station and/or Operator License forms until they exhaust their inventory of the July 1985 version. We understand that they have tens of thousands of these left, so it will be some time before the government prints the newer version. VECs were sent a single draft copy of the newer Form 610 and we had to have them printed for our own use at our expense. The older form does not provide for two Novice volunteer examiners, or for the split of the Tech/General Element 3 into 3A (Technician) and 3B (General). They work fine for license renewals and other routine modifications, however. You can get a few of the newer Form 610s at no cost from the ARRL-VEC or W5YI-VEC for an SASE if you want to conduct a Novice examination.

When do you think I will be able to select an amateur call sign of my choice? PRB-3, the FCC proceeding that is looking into specific amateur call sign assignment by the private sector, is presently under active consideration by the Commission. The comments closed on July 31st—reply comments, August 31st. My guess is that the Private Radio Bureau staff will start working on this right after the FCC reconvenes after their August recess. You can probably expect to see something from the FCC on this around Christmas. The FCC is finding out that there are several groups interested in assigning amateur radio call signs of choice. Several very interesting proposals were submitted to them, and it looks like a lead-pipe cinch that you will be able to select your own call sign next year.

How do I know which questions to ask a Novice applicant? The FCC no longer publishes the PR-1035A bulletin which previously listed the approved Novice Element 2 questions. All Novice questions are now developed by the collective efforts of all VECs. We have just published a new fully illustrated *Novice Voice Class* textbook that tells an applicant everything he ever wanted to know about how to become an amateur radio operator, including all 302 approved Novice questions, multiple choices, answers, and an explanation why the answer is right. It's completely up to date and covers all of the new Novice Enhancement privileges just adopted this year. It's now easier than ever to become a radio amateur. In addition, a chapter advises the volunteer examiner how to conduct the test session. Cost is $4.95 plus $1.25 postage from: W5YI-VEC, P.O. Box 10101, Dallas, TX 75207.

QRP

a feature by
ADRIAN WEISS, K8EEG

THE ART OF VERY LOW POWER OPERATING

QRP Clubs and Activities

In the previous QRP column I gave you some idea about the challenge involved in QRP operation and tried to make the point that now is as good a time as any to give QRP a try, sunspot cycle minimum or not. The QRP philosophy predicates using propagation conditions, whatever they are, to the QRPer's best advantage by adjusting operating strategy and goals appropriately. This month I'd like to describe the range of activities and awards which various organizations are sponsoring for QRP operators. Most of these involve the on-the-air efforts of the individual QRP operator. That's what hamming is all about! But there are exceptions to this general rule. Let's start off with the exceptions because these definitely add the "icing" to the "cake."

The opportunities for getting together and putting a face to the call of another QRPer are rarer than in most other types of hamming. A given city with a decent population level is very likely to have a handful of amateurs for many of the interest areas of hamming, and a local club meeting will usually produce a couple of DXers, several contesters, some county-hunters, and a bunch who are pursuing the latest fad, like packet radio. At best, there might be one QRPer (if the city is lucky), and he's usually somewhat suspect in regard to his grasp on reality! After all, setting a goal such as working all states or 100 countries requires going "all out," and this guy is trying it with a dinky 5 watt rig and nondescript antenna. That smacks of loose wires in the cranial computer! The lucky QRPers live in an area where several can get together for the big event of the year—the ARRL Field Day. This is a big event, because the QRP ARCI and Milliwatt Books sponsor an awards program for QRPers who accept the challenge of operating this major contest with QRP. A handsome plaque is awarded to the highest scoring club group, and that enhances the attraction of forming a group.

The QRP gang seems divided down the middle regarding preferences for Field Day. About half prefer to "go it alone," while the others find that operating with other QRPers is the greatest. For example, Jim Stevens, KK7C, and Bob Joiner, WB7BIV, operated solo FDs until business trips put them at the same location during the 1985 FD bash. Naturally, they joined ranks. They enjoyed it so much that in 1986 WB7BIV drove 800 miles from Oregon to meet up with KK7C at the shores of the Great Salt Lake in Utah. They set up on an island on the Great Salt Lake, "the best ground plane in the continental U.S." as Jim put it, and racked up 236 QSOs in snagging the One-Watt FD Trophy.

In another case Randy, KA9HAO/7, relocated in 1985, moving from the nefarious Harper Air Hawks (the HAH!) to Arizona. His first solo outing was so boring that he closed up shop after a while. A canvas of the area for fellow QRPers had negative results, and being an energetic, optimistic type, Randy started from scratch by finding several individuals who were interested in ham radio, helping them get their licenses, and finally heading out for FD 1986 with a new QRP club consisting of KA7YIX, KA7YHC, KA7YHB, KA7YGY, and KA7YGZ! The payoff: "Our objective was to have fun, and we certainly did." There must be something to this business of doing FD as part of a QRP club, although I've never had the opportunity!

For my money, I'll take another kind of QRP gathering—the annual QRP bash at the Dayton Hamvention or one of Chris Page, G4BUE's summer "picnics" in the U.K. The main activity at these QRP events is talking QRP with QRPers. There's nothing to compare these experiences with! Maybe I feel that way because I've been around the QRP world for a long time.

Back in 1968 or so when I first discovered that I wasn't the only QRPer in the whole wide world, I experienced a real "high" in just finding out about the others, working them on the air, and corresponding with them. Once I had The Milliwatt going, the ranks of known QRPers grew steadily. Then I started writing this column and found even more QRPers. It wasn't until 1974 that I began doing a QRP Forum at the Dayton Hamvention, and that was my first opportunity to actually meet real live QRPers. That somehow made all of this QRP business much more personal. For the remainder of the 1970s, though, we just had the QRP Forum gathering, and then the gang drifted off into the fleamarket and then back to the scattered hotels. That was kind of a waste. But once Thom Davis, K8IF, then-president of the QRP ARCI, succeeded in changing the previously 100 watt club into a bonafide 5 watt QRP organization in 1980, the club took over organizing QRP for Dayton, and it's been getting better ever since.

In 1980 K8IF managed to locate several rooms at the Ramada and scheduled a hospitality suite for one evening as a gathering place for QPRers. Despite poor publicity quite a few of the gang showed up. I can't really comment, since I got there a bit late at around 0230 local time. Two days of rainy weather slowed down my trip from South Dakota on my trusty Honda 550 so that I missed the gathering. Despite the fatigue and late hour, I enjoyed chatting with the core group consisting of K8IF; Red, K5VOL/9 (leader of the infamous HAH!); Brice Anderson, W9PNE, a QRP veteran reaching back to the 1920s and renowned for his milliwatting achievements; and a couple of other QRPers.

The Dayton QRP Hamfest really took a quantum leap beginning in 1985, largely through the efforts of indefatigable Jim Fitton, W1FMR, who undertook the hopeless task of finding a block of rooms in February and organizing room sign-ups. By February the thousands of available rooms in the Dayton area are usually booked up, and the majority of flights into Dayton are full as well. But Jim was driven by the obsession: "Wouldn't it be fantastic to have rooms near each other in the same location?" Somehow W1FMR managed to sweet-talk "an Angel" on the Hamvention Committee into finding a block of 10 rooms, although these were located about 10 miles south of Dayton and about an hour away from Hara Arena on the shuttle buses. Nonetheless, it *was* fantatic!

Naturally, the first order of business was stringing an antenna, one of which turned out to be a rather miserable 33 foot wire on the shrubs hooked up to Mike Michaels, W3TS's WW II German spy transceiver. A sloping dipole around the corner was hooked to Jim Stevens, KK7C's HW-8. I never did find out how many QSOs resulted, but you can't put a QRPer in a motel without some kind of rig! Again, I missed a lot of it. United out of Sioux Falls is never on time, except when I cut it really close in making the Dayton flight, which, of course, I missed by 10 minutes.

Guests of honor at the hospitality suite and QRP Forum were Chris Page, G4BUE, and Colin Turner, G3VTT. Both stole the show during the usual high point of the suite when homebrew gear is discussed. They had brought along several examples of the kind of rig that the G-QRP Club features in its quarterly *SPRAT*—cubic-inch-size one- and two-stage transmitters. Colin proudly showed off his massive QRP transceiver built into three heavy cast aluminum chassis boxes which accounted for the rock-bound stability of the VFO. These guys in the U.K. take pride in producing beautifully crafted gear! Brice Anderson, W9PNE, the "Dean" of QRPers, regaled the group with an account of his first solid-state QRP effort back in 1955 with a 40 meter crystal oscillator putting out 50 mw of RF! Mike Bryce, WB8VGE, added to the program by showing slides of his solar- and wind-powered system which was later written up in the *QRP Quarterly*. The group also included Les Shattuck, WB2IPX, President of the QRP-ARCI; Bill Harding, K4AHK, Treasurer; John, KN1H; Bob, KB2IM; Red, K5VOL/9; Joe, WA1WLU; Pete, WB9FLW; Andy, W8JRO; and others. The QRP booth signed up about 100 new members! The success of the 1985 approach set the stage for bigger and better QRP bashes in 1986 and 1987.

Again, up-front man W1FMR went to work, but this time he scored with a block of 20 rooms and hospitality suite at a motel in downtown Dayton. I had to do a Shakespeare Conference in Iowa the same weekend and only managed to get into Dayton late Saturday afternoon. I can only pass along what I heard about the previous two days. Apparently, the interest in QRP at the hospitality suite and the QRP ARCI booth took everyone by surprise.

833 Duke St. #83, Vermillion, SD 57069

That was obvious from the euphoria that the gang exhibited. The story came out in excited bits and pieces. Everyone was rambling on about the traffic jam at the QRP ARCI booth—like the only hot-dog stand in the football stadium at half-time—two days running! No one had the slightest idea of how many new members had been signed up, but it was a crowd. I'd sent a small box of 20 books to offer at a special sign-up price to make joining the club more attractive, but the crew had forgotten them on Thursday and finally hauled them over on Friday and sold them all. Denny, K3TKS, member of the Board of Directors and QRP Net Manager, rambled on enthusiastically about booth activity and kept repeating that he could have sold 100 if he'd had them. I figure that he probably could have, since I watched him unload 9 copies in about an hour-and-a half on Sunday afternoon when hardly anyone is around and only the lucky vendor rings up a sale.

From what everyone said, the QRP hospitality suite was packed Thursday and Friday evenings. It was pretty crowded on Saturday evening when I was there. A couple of fellas gave their versions of the "QRP Banquet" incident held Friday night. W1FMR had reserved something like 24 seats at a local restaurant, figuring that would allow some leeway for unplanned arrivals. Actually, a troop of about 32 QRPers walked out of the Belton Inn for the banquet! It must have been quite a sight—the biggest collection of live QRPers ever seen (in the entire history of the world) striding along Dayton streets. A veritable mass-movement! The details get kind of fuzzy about why they had to walk into and out of three restaurants before finding one that could accommodate the army. At one of these, however, British humor came to the fore in the guise of Chris, G4BUE, winner of DXCC QRPp, DXCC 200 QRPp, and DXCC Milliwatt trophies. Chris is a tall, lanky chap, and short guys like me have to catch him sitting somewhere to realize he's slightly balding. He's a soft-spoken fella and cracks a big smile when he laughs. He also makes his stabs at humor from behind his very sincere demeanor. So when Chris cracks a joke, it is typically subtle in classic British manner, and Americans usually have to think for a couple of milliseconds to realize they've been had again. At any rate, the QRP army was walking out of one of the intermediate restaurants when a waitress caught up with Chris, who was taking up the rear, and trying to determine the cause of the exodus of so many hungry "tips," she asked if anything was amiss. In his sincerest confidential tone Chris raised his eyebrows and answered, "What, haven't you heard?" and went merrily on his way, leaving the waitress in a fog of bafflement. Apparently, the army restrained its laughter until outside. Wish I'd been there!

Then there was the usual scramble to the fleamarket in search of bargain-priced HW-8's and Argonauts, which usually translates into "*any* HW-8 or Argonaut you find is a bargain, regardless of price." Leo Delany, KC5EV, knows the rules of the game, so he hauled in Tuesday evening after a torturous drive from Austin, Texas. Leo scooped up about the only HW-8 and Argo in the market on Wednesday and passed them along to a couple of late arrivals with very little in the way of mark-up for his efforts. This was the one area in which general disappointment was experienced by the QRP contingent. In fact, one of the standard topics of conversation at QRP gatherings is the "deal I got on an Argo at the——hamfest." Only Leo had a deal to talk about, and the Argo 509 was quite a deal at $115! The exterior was messy, but when he and W1FMR opened it up, the guts were impeccable. So everyone was disappointed. When a QRPer goes to a fleamarket, he automatically runs through looking for an Argo or HW-8—not necessarily because he needs another one, but just so he can brag about finding one!

The hospitality suite on Saturday evening was crowded. Many well-known QRPers were there, as well as newcomers. It would be easier to list those who didn't make it, since over 40 QRPers showed up during the evening. The board of directors was just one short of an official quorum, so a live board meeting was held before banquet time with QRP ARCI President Les Shattuck, WB2IPX, presiding over board members Mike Bryce, WB8VGE, John Collins, KN1H, Jim Fitton, W1FMR, Danny Gingell, K3TKS, Chris Page, G4BUE, Fred Turpin, K6MDJ, Bill Harding, K4AHK, and Red Reynolds, K5VOL/9, and about a dozen other QRPers kibbitzing. Yours truly moved his chair up to the table to make up an unofficial quorum (actually, to be able to butt in with his two-cents worth whenever the spirit moved him!). We'll skip the business and get to the main event of the meeting.

Chris, G4BUE, had brought along a dozen or so kits of a one-transistor, cubic-inch rig featured in *SPRAT*, the quarterly of the G-QRPC, and the fellas snapped them up pronto. This "ONER" kit project is part of the program the G-QRPC sponsors in order to foster homebrewing among U.K. QRPers, and the club is quite successful, since a large majority of U.K. QRPers are homebrewers. During the board meeting someone raised the possibility of the QRP ARCI sponsoring such a rig. Then yours truly butted in with a favorite old idea—a contest with homebrew rigs. The idea took off, and we ended up with something that everyone reading this column should get excited about, since the resulting QRP ARCI rig project is finally a reality. The discussion led to specs for the design of the miniature rig: it was to be a simple two- or three-stage transmitter, VXO controlled, idiot proof, using readily available parts, and easily assembled in an evening. The design work was assigned to John Collins, KN1H, with Mike Michaels, W3TS, assisting, since both had produced reputable rig designs published in the *QRP Quarterly* previously. Pete, WB9FLW, offered 100 free PC boards to back up the project, although a number of the guys argued in favor of sticking to Wes Hayward, W7ZOI's widely-touted "ugly construction" approach.

The plan was to have the rig designed and ready for publication in the July issue of *QRP Quarterly* along with an announcement of the homebrew contest to be scheduled sometime around Christmas 1986. Enthusiasm is not the correct environment for project planning! As it turned out, the rig wasn't ready until the October 1986 issue of the *Quarterly*, and coordinated publication in this column of the rig and the contest announcement was impossible. At any rate, K6MDJ and W6SKQ put together 20 kits of the "Two-fer," the final design, for Dayton 1987 and sold them all before any went on the shelves of the QRP booth! At this time (June 1987) the "Two-fer" project group is searching around for the best deals on parts in the effort to produce kits at around $15 (or less) each. The homebrew contest also is in the final planning stage, and an official announcement should have already appeared. We will try to have an article on the "Two-fer" in the next issue of *CQ* (editor willing) as well as info on the homebrew operating contest. This will leave time for parts acquisitions and construction prior to the December contest date. It should be a lot of fun. For newcomers to QRP, here's an ideal way to get started in homebrewing, and for veterans, it's a chance to start over again and get some relief from the complicated rigs they build! More on this next month!

We had better get on to the main subject of this column—QRP activities and organizations. I got carried away talking about the "icing" on the QRP cake—any wonder, given the excitement of getting together with a multitude of QRPers in person? We'll have to forego notes about the 1987 QRP gala at Dayton, but from what I hear, it beat all the rest. Attendance at the QRP Forum was around 200 standing-room only. The G-QRPC contingent consisting of George Dobbs, G3RJV, Chris, G4BUE, Norm Field, G4LQF, Colin, G3VTT, and Pete, G3PDL, did a forum on QRP homebrewing that also was standing-room only. The Dayton folks recognized that QRP is "the thing" and gave the QRP ARCI a Saturday noon forum slot instead of the usual 0900 Sunday slot! Naturally, I missed the whole thing due to an infernal I/V tube plugged into my arm. I sure would have liked to be there, wouldn't you?

QRP Clubs

The major QRP club in the U.S. is the **QRP Amateur Radio Club International (QRP ARCI)**, which was founded in 1961 by Harry Blomquist, K6JSS, as a 100 watt organization aimed at reducing QRM on the bands. As one writer recently put it, genuine 5 watt QRP-types "were a sub-culture of the QRP ARCI which few members took seriously" during the subsequent 18 years. But in 1979 President Thom Davis, K8IF, an avid QRPer himself, began the effort to transform the QRP ARCI into a bonafide 5 watt organization, and after much work and conflict, he succeeded in 1980. Since then the QRP ARCI activities and awards program has been based upon the 5 watt (10 watt PEP) RF output power standard. Club membership and activity has been growing ever since.

The center-piece of the club program is the *QRP Quarterly*, which has grown from a typed mimeo rag into a typeset professional publication of 20 (usually, but sometimes 40!) 8″ × 11″ pages under the guidance of a sequence of dedicated editors including William Dickerson, WA2JOC, Peter Spotts, N1ABS, Terry M. Gregg, KA5EXI, Fred Bonavita, W5QJM (formerly QRP Editor for *World Radio*, and Jim Stevens, KK7C. Each of these QRPers deserves praise for the continuing effort to make the *QQ* what it is today; it looks like *QST* without the ads and it's *all* about QRP.

Of course, any comment about the development of the *QQ* would be incomplete without commending the many contributions to "The Experimenter's Corner" by Wes Hayward, W7ZOI, who has been writing about solid-state design theory and QRP construction since his first paper in *QST* way back in 1961! Wes has been a major force in QRP ever since. The board recently awarded him a handsome plaque for his "many and sustained contributions to low power communications"—a well-deserved award of appreciation. The usual *QQ* line includes Bob Brown, NM7M, who conducts a monthly propagation column which is an excellent introduction to propagation theory in the practical context of QRPing; Fred Turpin, K5MDJ, who packs a lot of material in-

U.S. QRP Club Activities

M-QRP-C CW QSO Party, 1500Z Jan. 10 to 1500Z Jan. 11
Winter Fireside SSB Sprint, Jan. 16, 0000–0400Z
Spring QSO Party, 1200Z April 18 to 2400Z April 19
Hootowl Sprint, May 30, 0200–0600Z
QRP (ARRL) FD, 1800Z June 27 to 2100Z June 28
Homebrew Sprint, July 11 2000–2400Z
Summer Daze Sprint SSB, Aug. 16. 2000–2400Z
Novice Sprint, August
Fall QSO Party, 1200Z Oct. 17 to 2400Z Oct. 18
Homebrew QSO Party, Dec. (to be arranged)
First Sundays, CW/SSB
Nets: See previous column
CW: 60 kHz up, except 40 up on 40
SSB: 15 kHz down

Other QRP Events*

AGCW-DL Winter CW QRP Test, Jan. 17–18
OK/G-QRPC Weekend, Jan. 31 to Feb. 1, 0800–2400Z daily
ARRL SSB DX Contest, Feb. 20–21
ARRL CW DX Contest, Mar. 7–8
CQ SSB WPX Contest, Mar. 27–28
CQ CW WPX Contest, May 29–30
World QRP Day—IARU, June 17
IARU Radiosport, July 11–12
AGCW-DL Summer CW QRP Test, July 18–19
G-QRPC Summer Ramble Week, August
Radiosport Championship, Oct. 3–4
CQ WW SSB DX Contest, Oct. 24–25
VK/ZL/Oceania QRP Test, Nov. 14–15
CQ WW CW DX Contest, Nov. 28–29
G-QRPC Winter Sports, Dec. 26 to Jan. 1

**check QRP Quarterly or CQ's "Contest Calendar" for details.*

to his 3–4 page column detailing member activities and awards; Danny Gringel, K3TKS, who summarizes net activity; and construction articles, articles about operating techniques, and other QRP subjects round out each issue. The QRP ARCI membership fee of $10 is repaid by a single issue of *QQ* reading as far as I am concerned!

The QRP ARCI sponsors quite a few operating activities. The 1987 dates/times are shown in the calendar listing. The annual scheduling of these events usually occurs on the same weekends. The QRP ARCI weekly QRP nets were described in the last column, which can be checked for meeting times. These provide an excellent opportunity to meet fellow QRPers. Likewise, the first Sunday of the month meetings can usually produce quite a few contacts on the QRP calling frequencies. First Sundays are unstructured events and proceed at a leisurely pace. The objective is to work as many or as few other QRPers as you wish.

The major events are the **Fall** and **Spring QSO Parties** on CW, and the **QRP Field Day** during the annual ARRL Field Day event. The QSO Parties are actually contests for many of the gang, although quite a few jump in for a couple of hours just to work several QRPers. Scoring includes a power multiplier (4–5 watts = ×2, 3–4 = ×4, 2–3 = ×6, 1–2 = ×8, and under 1 watt = ×10; the same station may be worked on all bands to accumulate a sections multiplier; and battery power carries a ×1.5 multiplier and solar power a ×2 multiplier. This scoring system is a bit complex for my taste, but it is intended to reward extra efforts. Full details can be found in the *QRP Quarterly* and *CQ*'s "Contest Calendar" column (usually two months in advance of the event). QRP Field Day is sponsored by Milliwatt Books (formerly *The Milliwatt*) and the QRP ARCI during the annual ARRL Field Day. A full report about this event is usually in *CQ* May and/or June issue.

Stations may enter in three categories: 1 watt, 5 watt, and club. The 1 watt and 5 watt categories are limited to a single transmitter and two operators maximum, while the club category is open-ended—no limit on transmitters and operators. The power multiplier is ×8 in the 1 watt (and club if 1 watt RF output is used) category and ×4 for powers above 1 watt. A bonus of 150 points is credited for full portable operation away from permanent antenna installations and AC mains along with a ×1.5 multiplier for battery power. QRP FD is the "big event" on the QRP calendar and top-scorers are awarded a handsome trophy (1 and 5 watt) or plaque (club). Entrants in these three major events can qualify for an engraved Milliwatt Achievement Certificate by placing in the top five in the QSO Parties, or second in the 1 watt FD category.

The QRP ARCI also sponsors several other "minor" events intended to provide regular opportunities to work QRPers during a limited time frame. These include the "sprints" which usually occur during a 4-hour period. In addition, the club encourages members to participate in the events sponsored by other organizations including World QRP Federation affiliated QRP clubs, *CQ*, and the ARRL. Membership dues for the QRP ARCI is $10 U.S. (check or money order) to Bill Harding, K4AHK, 10923 Carters Oak Way, Burke, VA 22015.

The **Michigan QRP Club** was founded by Ralph Burch, W8LCU, back in 1978 as a bonafide 5 watt QRP organization designed to facilitate personal interaction of QRPers living within a regional area. The concept has had excellent success, although the membership list includes many QRPers from "foreign parts," with 33 new sign-ups listed in the June 1987 *The Five Watter*, the club's quarterly. New membership dues are $7.00 with $5.00 renewal yearly, to: Michigan QRP Club, 5346 W.

Francis Rd., Clio, MI 48420. Membership includes a lifetime M-QRP-C number, an attractive multicolored cloth shoulder patch with the club logos, options to purchase club QSLs and pin-on name badges, and a subscription to *The Five Watter*. The quarterly has shown remarkable development during the editorship of Tom Root, WBBUUJ. It runs about 20 typed pages (offset printing) with regular features by the president and the editor, net activity and first Saturday reports, and special reports on events such as the QRP gala at Dayton and the annual club meeting in Marshall attended by about 30 QRPers. Another popular feature is a biography of one member per issue in "The Ham Behind the Call."

Two new regular features include "M-QRP News at Large" covering happenings in the QRP world, and "M-QRP Club DX Reports," which I am sure will be quite popular with readers. For example, we learned in the June 1987 issue that Stan, AC8W, used a KLM tribander at 60 feet to snag goodies such as TJ1AO (Cameron), 5H3ZR (Tanzania), 9Q5KI (Zaire), SV1AEU (Greece), T77C (San Marina) on 20 CW plus a bunch of garden-variety DX. Larry, NU4B's HW-9 likewise snagged 9Q5KI, as well as D44BC (Cape Verde), 5T5XX (Mauritania), ZS6BCR (SW Africa), and HC8A. Several other items are included. If I'd have known about it, they could have included a few of my "goodies" such as 3D2DD (Fiji) and FO8JP (Samoa). Nonetheless, I'll be looking forward to this feature in future issues! The "meat" of each issue includes several articles such as "Using High Impedance Feed Lines" by Ralph Caryl, W8LHG, and "Simple Approximate DC Design of Common-Emitter Amplifier Stages" by C.F. Rockey, W9SCH, a former contributing editor of *The Milliwatt*. *The Five Watter* kind of reminds me of my old *National Journal of QRPp!* Good job, WB8UUJ!

The club sponsors several types of activities. I noted details about the "First Saturday" meetings at the Regency Restaurant (SW corner of I-69 and Belsay Rd., Flint [Burton], MI, 1000 local time) in the previous column. The M-QRPC Net attracts a large number of check-ins on Tuesday evenings at 2100 EST or EDST (Wednesday, 0200Z or 0100Z) on 3535 kHz. An informal session usually occurs at 1900 EST/ESDT before the formal session begins. The major event sponsored by the M-QRPC is the annual CW **QRP QSO Party** scheduled in January. Three categories include 1 watt or less RF output, 1–5 watts, and over 5 watts. Multipliers include ×1.5 for battery or natural power, and states/provinces/countries totals per band. Certificates are awarded to the highest scoring station in each section (s/p/c) in the QRP categories. Under consideration for 1988 are two new events. The **WMA Contest** will run throughout 1988 with the objective of working as many MI QRPC members as possible. The winner will receive a nice plaque, and certificates will be awarded to the top ten scorers. The club also is considering offering a QRP section and award in the annual Michigan QSO Party sponsored by the Oak Park ARC. Details are yet to be ironed out, but if successful, this event will take place in May 1988.

In addition to the events sponsored by the two U.S. QRP clubs, quite a few other QRP operating events are scheduled annually as seen in the accompanying calendar for 1987. Foreign QRP clubs sponsor several events in which U.S. QRPers participate, although not in great numbers. The Action Group CW in West Germany has long sponsored its winter and summer QRP contests, which attract quite a few U.S. entrants. The G-QRPC, which we'll detail in the next column, sponsors the "Winter Sports Week" and "Summer Ramble Week," annually giving entrants a leisurely week to work QRPers. More recently the G-QRPC joined with the new OK-QRP Club in cosponsoring a weekend contest in January. The YU QRP Club likewise is undertaking to sponsor an event. The fall contest by the VK C.W. QRP Club rounds out the club sponsored events.

CQ led the way in initiating a QRP section in its four major contests, and then the ARRL followed suit in its two DX contests. In each of these major DX contests QRPers compete with each other and not with the QRO boys, and receive recognition in their own "results" sections. Both the ARRL and *CQ* award certificates to high-scoring QRP stations in respective states/countries, and *CQ* awards handsome trophies to top scorers in its QRP sections. The results posted by QRP entrants are frequently quite impressive, even in the context of the big guns' scores, but many of us just get into the contests for the challenge and thrill and don't submit results. Perhaps we should! After all, the sponsoring organization goes through the trouble of putting together a contest, and the reward is in the amount of tangible activity which results. Let's try to submit results even if we've only worked 20 or 30 DX stations during the effort.

Finally, the International Amateur Radio Union (IARU) recently bestowed recognition on the world QRP movement by unilaterally initiating "World QRP Day" for this year, and adding a QRP section to its annual "Radiosport" contest.

73, Ade, W0RSP

Can you boost your CW speed easily? Need an extra 5 wpm to upgrade? W3GXK gives us his "secrets" to faster CW.

Increase CW Speed

BY MAYER D. ZIMMERMAN*, W3GXK

Operating CW at high speeds or even just increasing your speed for purposes of upgrading is easy. It's just a matter of *practice, practice, practice*. What's the best way to practice? That's up to you.

There are several methods of practice, of course: CW tapes, W1AW, computer programs, etc. I have found the best way to increase speed and competence is by **getting on the air!** There is nothing like being in a QSO for incentive. Get on the air for at least two QSOs per day. That gives you much practice in the format of the examination and also gives you an incentive to copy what is being sent.

*8711 Allenswood Road, Randallstown, MD 21133

Spend part of your practice time, whether on the air or with tapes, *copying faster than you can!* I cannot overemphasize the importance of trying to copy faster than you can! Even if you only get 50 or 60 percent copy at first, spend about 10 minutes a day trying to copy faster than you can. Your percentage of copy will increase daily.

Practice skipping letters you miss. Don't try to copy everything. If you linger over a missed letter, you may miss the next five or six letters. But if you leave a space on your paper for each letter you miss and go on to the next letter, missing a letter here and there won't much matter.

Don't copy every single word on paper. If you hear "receiver," write "rcvr." If you hear "rcvr," write "R." You'll know what the word is, and you can use the extra time for a rest, or to determine what the receiver is, rather than to copy down the word "receiver."

Remember, **practice** is the name of the game. Practice daily. If you can't spend 20 minutes a day, spend 10 minutes. If you can't spend 10 minutes, spend 5, but *do it daily*.

You can improve your code speed easily. Let us summarize the steps you need to take. Get on the air; it gives you more incentive to copy. Practice copying faster than you can for part of your practice period. Don't write everything down! Use personal abbreviations. Leave spaces for missed letters. Train yourself to continue with the text when you miss a letter rather than struggling to figure it out. Follow these helpful hints and you'll be surprised how quickly your CW speed increases.

DX

a monthly feature by
HUGH CASSIDY, WA6AUD

NEWS OF COMMUNICATION AROUND THE WORLD

We will not speak of years tonight
For what have years to bring?
But more and more DX to work
And DX songs to sing . . . .

Some will say that there are advantages to a hillside QTH. Among the advantages noted are the chances to meet those on the way up . . . and those on the way down. It is sometimes a place where some come with their questions. But a hillside QTH will always offer a pleasant spot to rest from one's labors in the DX vineyards. The oaks cast a welcomed shade, and life is easy for a weary DXer seeking ease after a summer's toil in the DX fields. October is near, and already one can hear on the early morning's path the DXers singing: "Rest, for the World-Wide is coming . . ." It will be here the last weekend in October.

A couple of weeks back the Old Timer paused on his way down the hill and rested in the shade with us. He is always ready to talk about the Great Days of DX-ing, these being most anything ten or more years back. He was there talking about what might be expected from Cycle 22 when one of the Locals showed, walking the hill in the midday sun. He came with a question. Locals often do, but it is part of their learning process and they are always welcomed. Welcomed, that is, if they show signs of being among the Deserving.

"Tell me something," this Local said. "What the heck do they mean when they talk about the 'Mystery of the Ages'? Or sometimes I hear a DXer mention the 'Eternal Enigmas.' The other day I heard one old timer complaining about 'The Inevitable Fate of DXers.' What do they mean, anyhow?"

We traded glances with the Old Timer. We were tossing mental coins to see who would answer. As usual, the Old Timer won. He got the first chance to speak.

This was agreeable to the Local, so we settled down and the Old Timer spoke. All he said was "Marty's in town. Came in Saturday night on a polar flight." This got our immediate attention, but the Local hardly blinked at all.

We could see the Old Timer make a mental note, and then he continued. "I got a telephone call Saturday night from Pete, K6JG, down the central coast way. Pete was trying to reach Marty, having talked with him a number of times recently on 20 and knowing Marty's plans. Marty had planned to visit one of the venerable DXers down south, but subsequent to the QSOs the old timer had become a Silent Key." The Old Timer paused, leaned closer to the Local, and asked a question. "If K6JG had called you, what would you have done?" The Local shrugged.

"Darned if I know," he said. "Just what could one do?" The Old Timer leaned back on the bench. We noted that though the Local did not yet know the right answers, he wasn't asking any wrong questions . . . yet. The Old Timer continued.

"First I called Sam, W6TSQ, who usually knows everything. Sam first started to suggest that I call Bob, W6RJ, but then remembered that Bob was headed for Europe. So next I called Eric, W6DU, who usually knows most anything about DX going on and especially anything involving the local DX club. Eric knew that Marty was due in but did not know when. He suggested I try Rusty, W6OAT. So I called Rusty and found him sitting by his telephone waiting for a call from Marty on his arrival at the airport. The message from Pete, K6JG, was given to Rusty, W6OAT, along with Pete's telephone number. I reported back to Pete that all the hatches were nailed down and all he had to do was wait."

The Old Timer paused to let all this be absorbed by the Local. It was taking a bit of time. Finally the Local spoke: "I know what you said, but I'm not sure I understand what it means." We had been expecting that, and the Old Timer moved to explain.

"Apparently you did not recognize Marty, OH2BH, out of Helsinki. He came in, some 5000 miles from home, yet most of the DXers hereabouts were attuned to his arrival. No one I queried was surprised about his visit, and it did not take long to run down information about him. But let us go a bit further. Tell me. Even though you did not understand all the happenings, did what I told you about Marty and the others appear logical and consistent?" The Local acknowledged that he could follow what was going on, that he did remember Marty now, and that everything seemed to be straightforward. The Old Timer even smiled a bit to hear this.

"Then let us go a bit further," the Old Timer said. "Have you ever traveled to a far land and a strange area, far from the familiar skies? And there have you felt alone and vulnerable, the stranger in the strange land? Everyone a stranger to you and a stranger to all? And you felt a longing for home and to be among those who know you and whom you in turn know? Have you?" The Local was not hesitant to say he did remember such instances and had known the feelings.

"So you do know," the Old Timer continued. "But have you ever traveled as a DXer? A traveler with friends all around the world. It does not matter whether you have ever met. All that is necessary is the fact that you are a DXer and they are DX-ers and you are not alone. Have you been DXing long enough to have had that experience?" The Local was beaming. This was obviously something he recognized.

"I sure have," he said enthusiastically. "Once I had a 4 hour layover at the Oklahoma City airport. Then I remembered the name of a DXer working in the FAA facility there and gave him a call. In 15 minutes he was at the terminal to pick me up. We spent the waiting time talking about DX and checking over all the electronic gear at the FAA buildings. It sure was interesting."

The Old Timer was actually smiling. "Good," he said, and we knew that things were moving in the right direction. "But tell me how you explain all of that. You had never before met this fellow, but the two of you had a nice visit. Apparently you were quickly at ease as friends and it was a memorable time. What's the explanation?"

We suspected that the Local might be stumped and we were right. He did think for a bit, finally protesting: "But this fel-

Here is a DXer you will recognize. This is ZL1AMO, Ron Wright, who a few months back finished an operation at Vanuatu signing YJ0ARW. Ron has been on many DX efforts in the Pacific. Possibly by the time you see this he will be signing another DX call. Ron is a member of the DX Hall of Fame.

77 Coleman Drive, San Rafael, CA 94901

The WPX Program

Mixed

1289 ..... LA9SN

SSB

1901 ..... IK2FAD
1902 ..... IK2FEO
1903 ..... JR2TRC

CW

2452 ..... EA4BWN
2453 ..... IV3PVD
2454 ..... W8FEM
2455 ..... JH4JNG

WPNX

230 ..... KA4STT

Endorsements

Mixed: 450 LA9SN. 500 W5AWT, LA9SN. 550 KY3V, W5AWT, NK2W, FM5WD, LA9SN. 600 KY3V, W5AWT, NK2W, FM5WD, LA9SN. 650 W9IAL, W5AWT, FM5WD, LA9SN. 700 W5AWT, FM5WD, LA9SN. 750 FM5WD, W5AWT, KS3F. 800 FM5WD, W5AWT. 850 FM5WD, W5AWT. 950 I1EEW, I2YWR, OE1KJW, FM5WD, W5AWT. 1000 I2YWR, NE6I, FM5WD, W5AWT, NE4F. 1100 YU1GR. 1150 AB9O. 1200 AB90. 1250 AB90, AC2J. 1300 AB90, AC2J. 1750 K9BG.

S.S.B.: 400 NE4F. 600 KD9OT. 650 W5ILR. 700 WB4UBD. 850 IS0QDV. 900 IS0QDV, I1EEW. 950 IS0QDV, AB9O. 1000 IS0QDV, AB90. 1050 AB90. 1100 AB90. 1150 NP4CC. 1250 KL7AF. 1500 NJ0C.

CW: 350 EA4BN. 400 EA4BN. 450 EA4BN, W9IAL. 500 EA4BN. 550 IS0QDV. 600 IS0QDV, IK6CGO, I5JRR. 650 IS0QDV, I5JRR. 750 K2SX. 800 K2SX. 850 K2SX, NE4F. 900 I5SMX, K2SX. 950 K2SX. 1000 K2SX

10 Meters: NE6I, FM5WD
15 Meters: IK6GCO, FM5WD, JH4JNG, IV3PVD, KS0Z
20 Meters: FM5WD, YB3CEV, KS0Z
40 Meters: I1EEW, FM5WD
80 Meters: FM5WD, IV3PVD
160 Meters: HI8LC, FM5WD

Asia: FM5WD, K2SX, KS0Z, JR2TRC
Africa: FM5WD, K2SX
No. America: FM5WD, YB3CEV
So. America: AB90, FM5WD, K2SX
Europe: FM5WD, KS0Z
Oceania: FM5WD, K2SX, KS0Z, I2DMK

Award of Excellence Plaque: AB90, FM5WD, I2DMK.
160 Meter Endorsement: K9BG, AB90, FM5WD

Award of Excellence Plaque Holders: I0JX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2**, AB90, FM5WD, I2DMK, W4BQY.

Award of Excellence Plaque Holders with 160 Meter Endorsement: DK5AD, W3ARK, LA7JO, W4VQ, K6JG, W4CRW, N4MM, SM0AJU, KF2O, K5UR, OK1MP, N5TV, W8CNL, W1JR, W6OUL, W4BQY, W5UR, N4NO, W8RSW, N4KE, I2UIY, W8ILC, W1BUS, NN4Q, G4BUE, LU37L/W4, I4EAT, VE7WJ, W9NUF, N4NX, VK9NS, DE0DXM, K9BG, AB90, FM5WD, SM0DJZ.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

low was a DXer, wasn't he?" The Old Timer shrugged.

"If you say so," he said, "but has it ever occurred to you that possibly there is something definitely noticeable that exists between and among DXers, something which you as yet cannot define? You know it but you don't know it. You meet a perfect stranger, strictly speaking, but you are friends. Why?"

Perhaps you are lucky if you enjoy a placid family life where there is but one of the Deserving. How would you like to sit at your dinner table and look at eight other licensed amateurs? In the front row, Julie Gates, KA7TXJ, Terri Monks, KA7VHV, Cheryl Gates, KA7UDV, and Sheryl R. Gates, KA7PYY. In the back from the left are Richard Gates, KA7QEC, Ron Gates, KA7TWK; Brad Monks, KA7VHW, Kenneth C. Gates, KA7UDU, and Jay C. Gates, KA7PVT. All are sons, daughters, wife, and in-laws of KA7PVT, all members of the Borderline Amateur Radio Club in Roosevelt, Utah.

When the Local was slow in answering, the Old Timer passed him on to us. But he first had a few words to say. "Keep in mind," the Old Timer advised, "that it is not wrong just because you do not yet understand. Nor does it mean that you will not eventually attain understanding of the Mysteries of DXing. You are close to the "Mysteries of the Ages" and you will often be asking of yourself, 'Why are DXers different?' When you start answering the question, possibly from others, you will be close to understanding—closer and definitely more Deserving. DXers are always Deserving, some more so."

By this time we were wondering if the Local might be asking himself why he had been so rash as to ever ask such questions. But it was our turn, and the Local was looking at us. We were hoping that he was ready.

"Let us tell you about an incident we saw a couple of weeks back," we started in. "Maybe you will understand what happened." The Local was ready.

"It was out on one of the country boulevards back in the hills," we said, recalling the vivid incident. "We were cruising along on our mountain bike when a car raced by us at high speed. And right after it was a sheriff's patrol, red light flashing, siren screaming, and whistles blowing. The first car screeched to a stop, the sheriff right behind. We were coming up on them on our bike just as the deputy got to the driver's window. Only the driver was in the car. The deputy said a few words, stood up abruptly, and dashed back to the patrol car. The last we saw of them both cars were roaring down the boulevard at high speed. And through all of this, the only word we heard as we passed was something that sounded like 'Peter . . . .'" We paused, then asked, "What do you suppose was happening?"

The Local was long in thinking. We tried to help a bit by mentioning that the passenger car had amateur callplates. Finally the Local shrugged his shoulders and spoke, "I don't get it," he said. "What was happening?"

We were determined that he would bring this one out himself or he would not be Deserving. "Did you think anything significant about the word 'Peter'?" we asked. "And those amateur plates? Could that mean something? It did and suddenly the lights were turned on.

"Could that be Peter I Island?" the Local asked, and we nodded. "Then they both were DXers," the Local stated quickly, "and Peter I Island was on!" We not only nodded at this but had to smile. The steps to understanding of the Mysteries of the Ages come with understanding of how other DXers think and what motivates them. And some maintain that the Eternal Enigmas are not enigmas at all, but special qualities in DXing not understood nor appreciated by others. When they cannot understand, they feel it cannot be understood by anyone. Not by them nor anyone else. But DXers do understand, and some of the Eternal Enigmas have been revealed, but only to the

The WAZ Program

15 Meter Phone

244 ..... I2EOW
245 ..... JI1FJV

20 Meter Phone

609 ..... G4ADD
610 ..... K6SIK
611 ..... IK1HJS

20 Meter CW

263 ..... K6ZUR

40 Meter CW

65 ..... JA7HMZ
66 ..... KD7O

All Band WAZ

SSB

3121 ..... 3D2DM
3122 ..... AA4LU
3123 ..... FE2RK
3124 ..... K6SIK
3125 ..... IK1HJS
3126 ..... DL2IX
3127 ..... I4IQT
3128 ..... KD7PS
3129 ..... I3GJZ
3130 ..... JF7GGE
3131 ..... WA4WIN

Phone/CW

6110 ..... 3D2ER
6111 ..... JE1REU
6112 ..... PY1OL
6113 ..... HB9BOS
6114 ..... VE4MT
6115 ..... IK5CBE
6116 ..... FK8DD
6117 ..... JA0KHD
6118 ..... IK1HJS
6119 ..... W9SU
6120 ..... OZ1CAR
6121 ..... JA5EYW
6122 ..... NS7J
6123 ..... LX1DA
6124 ..... VE1ACK
6125 ..... IK8FUO
6126 ..... JE1GWO

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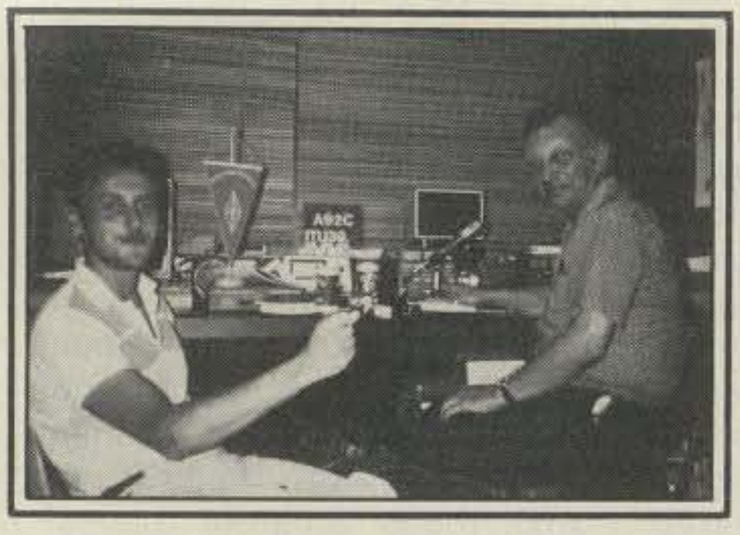


How do you tell a DXer? Easily! Always there is the air of self-assurance, hard-won success, and easy relaxation in front of the rig. Here are a couple of true-blue types. On the left is Rudolf Klos, DK7PE, who continues to turn up in exotic DX spots all around the world. Here DL7KE visits with Mike Bowman on a visit to the Radio Association of Bahrain's club station A92C. Mike has signed A92MB, but was there visiting from England where he has signed G0FBY. (DK7PE photo)

Deserving. If you understand, you are Deserving. And always with a capital "D."

As certified resting DXers, the Old Timer and we were thinking that we had done a full day's work at this point. The Local was closer to understanding, but he needed some cooling down before being ready for the other Great Mysteries of the Ages, the Eternal Enigmas, or the Inevitable Fate of DXers. But the fire of the crusader always has burned within the Old Timer, and he could not pass up the chance to strike a few blows on the forge of DX understanding. He wanted to shape the understanding of the Local and to ensure that it stayed shaped.

"There are some things that you, as a DXer, must always learn because they are part of DXing. And one of the Eternal Truths of DXing is that DXers are the true internationalists of amateur radio. Remember that! The Second Eternal Truth, never to be forgotten, is that no DXer comes as a stranger! Never forget that!" The Local promised that he never would. The Old Timer was not satisfied yet.

"Maybe you'd better repeat those basic truths daily," he advised, "and always in the morning and the evenings before you turn on your rig. Promise?" The Local promised very fervently. This was one day when he might promise most anything. He was soon gone.

We sat there for awhile in the slow warmth of the late summer day, finally stirring ourselves to make a comment. "Haven't I heard you tell those things a number of times, tell those axioms to new DXers, those things about being the true internationalists and never being a stranger? Don't you suppose that most everyone, even those who don't DX, would know them by now?" It must have been an electrifying question from its effect, the Old Timer shooting to an upright position.

"Look," he said, "most DXers come to the trade knowing that DXing is different and DXers are different. But they don't really understand why. They usually learn, but always they should learn first that understanding will not come until they learn, and learn well, the basic tenets of DXing. All this is needed to prepare them for understanding the Mysteries of the Ages. Certainly you know this!"

We did. The Old Timer was right. We understand! We believe! DXers are different. Different and Deserving!

Yemen QSLs

There always seem to be one or two DXers on a never-ending search for one of those rare countries which show sometimes once, sometimes years back, and never seem to show again. Those who need Yemen may recognize the scenario.

The WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ master prefix list. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or to confirm present total. If no up-date, file will be placed into "inactive" until next up-date. Lifetime Honor Roll fee $2.00 (U.S.) for each mode, with no fees required for up-dates.

MIXED

3217	YU2AA	1917	W9NUF	1414	IT9QDS	1193	YU2TY	855	K9BQL
2903	K2VV	1898	PA0SNG	1395	SM6DHU	1159	AI8S	848	W9JBR
2805	W2NC	1863	I2PJA	1391	IS0LYN	1153	N2AIF	840	I2EAY
2619	K6JG	1841	W1NG	1374	W6OUL	1141	N4IB	788	G4SDJ
2502	K6XP	1836	YT7DX	1347	I2UIY	1117	KC8CC	773	YU7DR
2501	VE3XN	1825	EA2IA	1322	NN4Q	1114	N8BJQ	759	OE1KJW
2372	W4BQY	1812	PY1APS	1305	DK5AD	1074	VK8NS	747	KD8IW
2359	W9DWQ	1736	W0SFU	1304	AB90	1067	I1WXY	745	VE6VW
2297	YU2TW	1725	K9BG	1300	AC2J	1060	WD9IIC	726	KI8B
2277	N4MM	1676	KF2O	1293	SM0AJU	1027	N2CIC	715	KL7VZ
2224	N4NO	1671	PY4OD	1291	YU7AJD	1025	WD4RAF	695	W5ASP
2169	N6JV	1665	IN3ANE	1283	K2POF	1018	DF6EX	679	K6UXO
2079	N9AF	1603	CT1LN	1278	3A2LF	1018	NE6I	578	W4WKQ
2072	I2PHN	1600	N5TV	1266	YU2CQ	1007	AI6Z	670	YU1PJ
2069	N6CW	1593	I2MQP	1263	I1POR	1000	KI3L	668	N3KR
2056	YU7BPQ	1537	N6AW	1249	W7CB	978	I0AOF	668	YT7WW
2006	K0BLT	1512	K7NN	1247	W5PWG	972	PY2DBU	652	G4OBK
2002	I8YRK	1484	SM3EVR	1246	YU1SZ	950	I1EEW	650	JO1BMV
1990	N2AC	1470	K8LJG	1234	SV1PL	914	EA1CIM	650	W9IAL
1944	YU1AB	1451	KL7AF	1227	WB8ZRL	901	W0JIE	637	F6HMJ
1924	K5UR	1442	N6JM	1219	K2OLF	877	I1CZQ	633	Y44UI
1922	WA8YTM	1420	EA9IE	1215	G4FAM				

SSB

2711	I0ZV	1661	PA0SNG	1201	I8KCI	984	W0ULU	779	CT1AW
2460	K2VV	1659	VE1YX	1200	KL7AF	981	K8LJG	759	K8ZZU
2330	ZL3NS	1638	K5UR	1143	W4UW	965	IK5ACO	752	K9BQL
2320	K6JG	1614	WF4V	1112	KK0L	962	W3GXK	716	IT9ONV
2210	K6XP	1599	I8YZP	1108	CT4UW	939	WA2FKF	710	N2AIF
2209	K2POA	1573	I2MQP	1106	AB90	936	W3GXK	702	I3ZSX
2291	I0AMU	1509	CT1LN	1095	K5RPC	935	N2CIC	698	I2KKL
2170	CT1UA	1483	NJ0C	1088	KC8CC	930	N4IB	698	G4KHF
2053	I2PHN	1479	W9NUF	1085	PY4OD	929	I8WYD	698	KC2FC
2047	N4MM	1470	WA4QMQ	1079	N2AC	914	I1EEW	694	AI6Z
2005	I3ZKD	1457	CT1FL	1071	NN4Q	900	I2TZK	665	AB1U
2003	W0YDB	1431	I4CSP	1067	SM6DHU	892	I2EOW	661	VO1AW
1904	I4ZSQ	1412	W3ARK	1062	EA8AKN	871	EA4KK	659	I4UFH
1897	WD8MGQ	1406	KF2O	1060	CX9CO	828	W6OUL	657	KE6KT
1859	I2PJA	1399	W1NG	1048	I2UIY	818	IN3AHO	654	NE6I
1844	OZ5EV	1307	EA2IA	1048	PP2ZDD	813	WN5MBS	652	CP8HD
1781	W4BQY	1303	G4CHP	1047	EA3AQC	808	KK5P	652	W5ILR
1768	CT4NH	1300	N5TV	1035	WB8ZRL	798	K3IXD	642	OE5BGL
1765	I6ZJC	1293	AC2J	1030	F6BVB	792	YB3CEV	611	HR1FC
1761	I8YRK	1283	XE1OX	1020	SM0AJU	790	WA8YTM	607	YB3CDL
1699	W9DWQ	1232	W2NC	1016	CT1BY	787	G4SDJ	605	VK9NS
1693	N4NO	1204	KC8YM	993	AG2K				

CW

2562	W2NC	1672	YU7BCD	1246	JA1KRU	915	AB1U	744	CT1LN
2365	K2VV	1593	LZ1XL	1210	IT9VDQ	904	NN4Q	711	I2EAY
2147	N6JV	1570	N4MM	1167	W1NG	904	YU2CQ	707	WB8ZRL
2110	WA2HZR	1525	K5UR	1131	KF2O	899	I2UIY	705	OE1KJW
1991	ON4QX	1502	VO1AW	1098	K2POF	897	W9PWM	700	N4IB
1989	K6JG	1476	W9NUF	1050	KL7AF	889	F6HKD	693	NE6I
1973	N6CW	1448	EA2IA	1026	K8LJG	875	TI4SU	663	LA7JO
1947	W9DWQ	1428	PY4OD	1017	W1WAI	871	AI6Z	659	KA1CLV
1924	N4NO	1414	N4YB	1001	AK2H	854	KN7K	655	K6UXO
1900	VE7CNE	1385	I1YRL	1000	I7PXV	827	VE1ACK	654	W0JIE
1880	K6XP	1300	N5TV	973	DJ1YH	823	G4FAM	644	JA2GCW
1858	W4BQY	1289	JE1JKL	969	LA9XG	813	VE4AEX	644	G3VQO
1845	G2GM	1280	KA7T	940	SM0AJU	800	I8YRK	634	OZ5UR
1836	W3ARK	1266	WA8YTM	940	W6OUL	799	SM5DAC	625	W6YMH
1779	OZ5EV	1261	I2DMK	936	N2AIF	777	EA5QR	602	VK9NS
1751	N2AC								

5 Band WAZ

Standings as of July 1, 1987

New recipients of 5 Band WAZ with all 200 zones worked:

148. JA1GTF
149. DL7AA
150. AA4LU

The top 10 contenders for 5 Band WAZ are:

1. N4WW, 199
2. K6YRA, 199
3. W8UVZ, 199
4. K9CEB, 199
5. DJ9ZB, 199
6. SP6JCY, 199
7. W2YY, 198
8. K7UR, 198
9. K9GX, 198
10. G4BWP, 198

421 Stations have met the 150 Zone level.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (39 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ 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.

How do you tell a top DX club? They always have a top DX club bulletin editor. Here is one of the best, Jack Bock, K7ZR, editor of the Western Washington DX Club's Totem Tabloid. *Not only does the bulletin consistently have fine technical articles, but it also waves the threat of the Zombie's Revenge. Back in 1983 the Zombie's Revenge even caught up with Jack. He tried kicking a recalcitrant power lawn mower. He should have shut it down first.*

A few months back there was one of the Deserving still looking for a QSL all the way back to 1963, that almost a quarter-century. But hope should never die, and while we have not run down 4W1AA, we did pick up some indicators which might help others along the route.

Gunter Beuche, DL6AB, notes that the 4W stations active during that period in the early sixties were generally Swiss nationals operating while in Yemen working for the International Red Cross on humanitarian projects. Gunter notes that he worked 4W1H back then and this one QSLed to HB9ACD, Hans Blaser. He also worked 4W2AA and this one was HB9AET, Frederic de Bros and QSLed via W2GHK.

If you thirst for a long-overdue 4W QSL, this may be of some hope or help. DL6AB speculates that the Swiss Red Cross headquarters in Geneva might be of assistance, or even more if one can corner a DXer with connections.

Live in hope. All things come to him who waits long enough.

United Kingdom Licensing

Jerry Bliss, K6SMH, is living in England and signs G0CLY from his current station. Jerry notes that DXers visiting in the U.K. can get a reciprocal license, but it usually takes several months, requires advance application, and costs about 12 pounds. As a number of amateurs have stopped by to visit Jerry and practically everyone burns to be on the air, Jerry made some inquiries to the licensing authorities as to what might be done.

They advised Jerry that a Temporary Operating Permit can be issued for a stay limited to seven days or less. There is no charge and such permits have been obtained in about a week. What do you need? What will be your stops where you plan to operate, when you plan to operate, and the callsign of the station you will be visiting. Also a copy of your back-home license. Send this to: Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, England, S49 1PF.

What more could you need? You might also think of dropping a line to Naoki Akiyama, JH1VRQ/N1CIX, at downtown Newington should you need any information on operating overseas, off-shore, or across the borders. Naoki heads the International Programs Department and is making a career of supplying needed information to needy DXers not only in the U.K., but most everywhere else.

Barbados

October is the traditional opening of the DX season and it all comes with the CQ WW DX Test the last weekend of the month. From far Barbados the K3KG team will be signing 8P9HR during the DX test.

Not only will you be able to work 8P9HR on phone during the CQ WW, but you can catch them on CW before the contest, all the standard bands plus the new WARC bands. Listen for them on 30, 17, and 12 meters. You might also listen for 8P9HQ and 8P9HS. This will be a multi-single effort. K4BAI is the QSL route for the above and for 8P9HT below.

If you still need 8P-Barbados and manage to miss all this largess, there will still be hope. K4BAI will be in 8P-Barbados the last weekend in November for the *CQ* WW CW Test. He will be signing 8P9HT. And while some may consider the Caribbean local DX, there are some who have tried for years to work some of the common stuff. It is not common if you are a JA or Central Asia/Indian Ocean DXer. DX is relative; it always has been.

WNZ Award

The Worked Novice Zones is the newest award in the WAZ family, this one being available only if the zones are worked by a U.S. Novice or Technician class license. Contacts must be in the Novice 80, 40, 15, or 10 meter bands and use authorized modes and power. WNZ is available as a Mixed, CW, or SSB only award. Essentially, the rules are the same as the well-known WAZ award. All contacts must be made as a Novice or Tech, though application can still be made after one upgrades. You get the award for working 25 of the 40 WAZ zones and you submit the proof to W4KA. After you have upgraded, you can use all these contacts plus the 15 additional ones needed for the regular WAZ award.

Turks and Caicos

Some strange VP5 callsigns have been showing at the T&C Amateur Radio Society, and Sheila Laing, VP5SL, would like it known that it is bothering their QSL Bureau.

In all of the Turks & Caicos there are currently but 35 VP5 licensees. That does not mean there are 35 stations. There are a number of VP5s in some families such as two in the Laing family, two in the Thomas family, three in the Shields family, two in the Dodson family, four in the Mills family, two in the Siegenthaler family, and two in the Ewing faming. Sheila says that only the following suffixes are valid, these and none other: VP5AT, AB, AP, BAM, BIL, BD, DM, DG, EN, EE, FEB, GT, GBS, GLS, HM, HS, JB, LAJ, MES, ME, NM, PC, PAT, PS, RF, RR, RI, RW, SK, SL, TAO, TI, TW, WM. There in capsule form is the whole T&C callbook. These are good. Most anything else might be suspect. If you need more information, go to Box 202, Grand Turk, Turk & Caicos Island.

Tunisia

Craig Maxey, WB7FRA, plans to be in Nabelu this October and to be signing 3V8FRA during the *CQ* WW DX Test. Craig will cover 80 through 10 meters, running the full legal power—100 watts. Recent word has been that there are currently no valid 3V8 licenses though some 3V8 stations are heard from time to time. Look for Craig starting around October 19th. He plans to run through October 27th, or a day or so beyond the *CQ* WW DX weekend. Possibly, the callsign might be TS8FRA.

Nicaragua

YN3ACZ is planning to be active during the *CQ* WW DX Test the last weekend in October. This station is located in Managua. Some of the local DXers there will be joining in a multi-single operation. YN3ACZ is in Nicaragua working for a religious organization doing humanitarian work. This one will QSL to Box 302, Managua, Nicaragua.

Aruba

N1GL will be active from Aruba during the *CQ* WW DX Test in October. Bill will be signing P40A. You might even look for him a bit before. You can also look for this one being a new country one of these days, but is does seem that until full independence is gained, it will just count as it always has. N1GL is William Ovca, usually found at 136 Knobloch Lane, Stamford, Connecticut 06902.

Fast Code

Some may think that it is a thing of the past, that skill with a straight key is a lost art. Years back there was a letter in one of the amateur magazines from a far-Pacific amateur bemoaning the sorrow felt when he could not find any with code skills matching his. There in black and white he advised that ". . . while he could send at 35 wpm, he could only receive at 5 wpm." Possibly the years have filled the need; possibly some of the newer devices help in the sending. However, receiving can still be a problem.

In August we updated the matter of the VR1 QSL bureau having problems with stacks of QSLs for bogus calls. We had quick notes from N2AU who publishes *Inside DX* and K1KI who

has the newsletter *USSR Tidbits*, noting that ability to read what was meant to be sent rather than what was sent would definitely help in identifying these vagrant VR1s as really 4K1s, Russians in the Antarctic. Familiarity with the current suffixes being used by the 4K1s also would help. We even got a note from G4UZN to help get things right.

But if you think that this was an isolated case with everyone pointing out the obvious once they realized the correct answer, how about that 9N7IX that showed back in May? And how do you QSL? Again, when you know the answers, you can understand the question.

You QSL to JA8RUZ. You ask for a QSL for your contact with 9N7ITU. All you had to do is read the suffix as .. - ..- and not .. -..- and you were home free. This knowledge comes from having read the long-gone operator sending at 35 wpm and receiving at 5 wpm. One learns, or one deduces.

San Andres

Jim Talens from Arlington, Virginia, is looking for some action out of HKØ San Andres during the *CQ* WW Test, but which one will mean some listening. It may be the phone test in October, or it could be the CW test the Thanksgiving weekend in November. Some of the frequencies on which you might find him are 14260 kHz and 14025 kHz. He could be found in other places. QSL to home QTH, which is 5916 North 15th Street, Arlington, Virginia 22205. SASE or SAE/IRC requested.

Guatemala

Jules Freundlich, W2JGR, will be in Honduras the latter part of September, about the time you get this copy of *CQ*, and he will be signing TG9/W2JGR. He plans to operate from September 21st to 28th and will be using SSB and RTTY on all HF bands. QSL to his home QTH: 17 Nassau Blvd., Malverne, New York 11565. SASE would help.

The 22 Year Solar Cycle

You may have heard some mention of this and are prepared for the worst. Actually, even if they decide that the cycles are 22 years long, you would hardly notice the difference, and then only if you are a fine-tuned DXer who does nothing without consulting his solar chart. But for those who listen to WWV at 18 after the hour, as long as these reports are available they will continue to bring you the best "now" information, rather than the "well, maybe" long-range forecasts.

As for the 22 year cycle, the theory is that the magnetic areas associated with sunspots start in the very high latitudes and start sliding towards the solar equator. It takes them about a decade or so to slip down to the solar latitudes where sunspots are observed, this being up around the 40th or 50th parallel. For the next decade or so the magnetic areas are marked by sunspots as the magnetic areas near the equator. That is what we see, but at the same time the next cycle has started in the high latitudes, showing as high as 80° from the equator, and they start their long 22 year slide. The new thinking notes that this indicates an overlap, with each cycle running from 18 to 22 years but with sunspots visible only during the tail end of a cycle. Thus, you should continue to see the same picture. All that is changed is the operating instructions.

There continues to be a lot of study of the sun and solar phenomena, and more is being learned each year. Often theories are formulated and then modified, possibly even abandoned when additional knowledge is gained or a new theory offered. You can consider the Howard and LeBonte currents which produce currents, the interplay between the general magnetic field and the differential rotation of the surface with the equator rotating faster than the poles. You can wonder about the eddy rolls which carry hot plasma to the surface. But then again, you can check WWV at 18 minutes after the hour and the Northern California DX Foundation sponsored beacons at 14.1 MHz. Actually this has been such a success (the NCDXF beacons) that the IARU at Buenos Aires last year moved to improve and update the International Beacon Project with 28.190 to 28.200 MHz being assigned to the beacon project.

While we are working that side of the street, it might be timely to note that the bottom of the cycle was last year in the August/September area, maybe one way or the other. If you have the long memory of a competitive DXer, you will recall that last July (1986) the Old Timer was saying that he thought we were then at the bottom. How about that! Those Old Timers know everything and they weren't even yet talking about 22 year cycles.

Mt. Athos

Nikos Giannoukos, SVØDK, has gone to a lot of trouble to supply documentation for the SVØBV operation of Robert Read back in 1985. License, police permit, authorizations from the Holy Epistacy—everything. A translation of permission from the Holy Epistacy reads:

"In reply to your letter dated 26/5/87 we would like to inform you that the Holy Community, having received and taken into account the permit (protocol 80123/5/25/87) of the Ministry of Communications for the temporary installation of your amateur radio station on Mt. Athos, grant to you the required permission.

"So we extend our regards and wishes.

"All members and Superiors of the General Meeting of the twenty holy monasteries of Mt. Athos."

As as long as we are mentioning Mt. Athos, *QRZ DX* reports that the operations by DL7FT/SV/A made from June 28 to July 1, 1985 and the one from March 26 to April 1, 1986 are valid for DXCC credit.

Some Short DX Notes

Jack Sproat, W4LCL, who signed YBØACL up to 1983 is now in Jordan and should show on the air eventually. Jack is a water engineer and working on a project there in Jordan, being on a two year trip. His home CB address is always good for a QSL no matter where he is.

The Kansas City DX Club, noted for its hospitality room at Dayton, will have a similar effort from Belize during the *CQ* WW CW Test in November. All the DX you can handle, just give them a call.

St. Lucia is the site of the Southwest Ohio DX Assn. efforts in the CW go-round of the *CQ* WW CW test. They will be signing J6DX and are even thinking of 160 meters. VU2RBI, Bharathi, was in New Delhi a month or so back looking for the route to the Laccadives. The FCC is handing out KC4 callsigns in W4-land. This can be confusing until you remember that the Antarctic is only represented by a segment of the KC4 calls. From KC4AAA to KC4AAF, that's six calls, and from KC4USA to KC4USZ, that at the most would be a total of 32 altogether. Just

CQ DX Awards Program

SSB

1544	FM5WD	1548	G4WEJ
1545	SP1MHV	1549	KA3HXO
1546	F6BFI	1550	AB1U
1547	YC7DF	1551	KB7VD

CW

700	FM5WD	703	WA7HHX
701	F6CRT	704	AB1U
702	DL6QW	705	VP2MM

SSB Endorsements

310	I8AA/317	300	VE3MRS/308
310	K6WR/317	275	KC2FC/282
310	DJ9ZB/317	275	F6BFI/281
310	VE3MR/317	275	KB7VD/278
310	ZL3NS/316	275	KA3HXO/276
310	YV1KZ/316	250	AB1U/266
310	VE1YX/316	250	I2TZK/265
310	K5OVC/314		

CW Endorsements

300	DL6QW/300	200	AB1U/202
275	F6CRT/285		

Total number of active countries is 317. The basic award fee for subscribers to CQ is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an s.a.s.e. is enclosed for confirmation of total. 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, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for air-mail reply. Please make all checks payable to the awards manager.

learn those 32 KC4 calls in the Antarctic and anything else will probably be in Green Cove Springs in Florida or nearby. Simple, isn't it, when the problem is carefully analyzed.

An international group—Germany, France, and the U.S.—was looking for a Kingman/Palmyra operation this September. Things did not fall into place and the goal is now set for March 1988. The G-land DXers were able to use 50–52 MHz as of June 1st, this including Class B licensees. If you hunger for Kermedec, listen for ZL8HV on the VK9NS net at 14220 kHz from 0400Z. You could get lucky. Some YA stations have shown, but not the true-blue according to report. This year marks the 20th anniversary of the emergence of Surtsey Island out of the sea south of Iceland and the quick operation there by 4X4A, Slim. The H25 prefix, sometimes heard as an /H25 suffix, is on Cyprus. Never be confused by a strange prefix, suffix, or callsign. Work 'em now; worry later!

Lyle Meek, WW6F, Bruce Butler, W6OSP, Dick Maddux, K6BWX, and Len Geraldi, K6ANP, are aiming for the *CQ* WW CW Test where they will be signing VP5W from Provo. Vince, WL7K, wants it noted that it was Stonewall Jackson that Barbara Frietchie was waving the flag at there in Frederick, not Robert E. Lee. Sure enough! It was.

Marion Island might be heard in 1988. *Inside DX* says that ZS6ME aims at March 1988 as the likely period. Besides ZS6ME, the other operators in on the planning are ZS6RM and ZS6BBY. This has become a bit of a difficult country to work. Years back ZS6MI on Marion had a W QSL manager and all one had to do was hang around the frequency of their weekly schedule. Possibly that's what is meant by "... the good old days." ZS8ME is the planned call to be used.

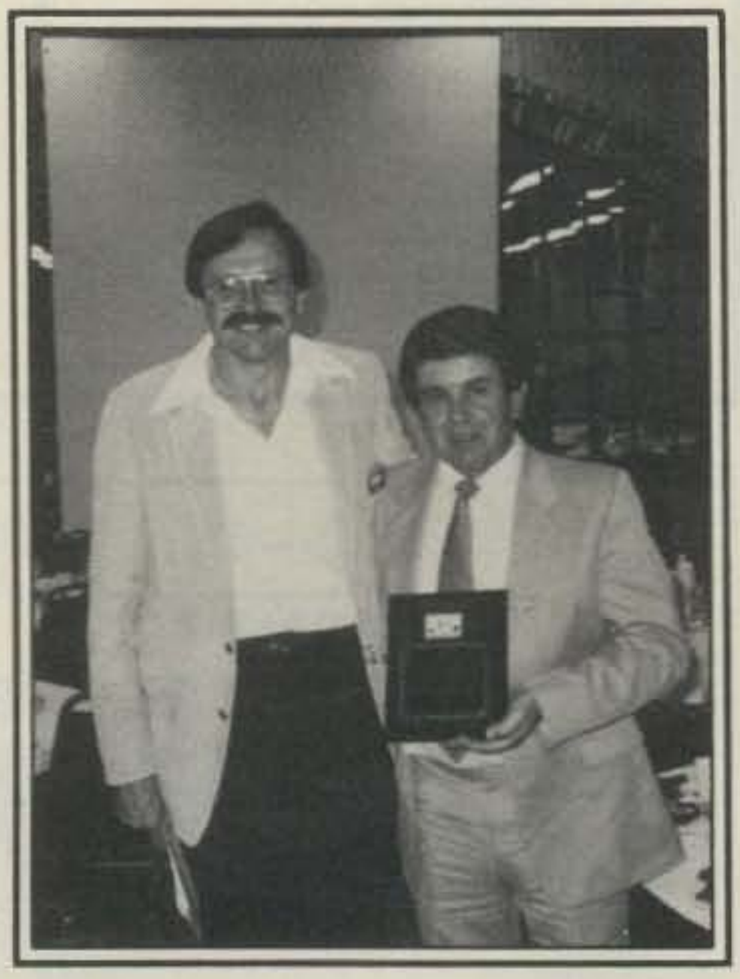
SP5EXA might still be found on Svalbard. He signs his own call with the /JW suffix. Back a few months there were regular appearances around 14024 kHz from 1130Z. Out on Guam N7DF has settled in for a tour and should be heard for another 18 months or so. Larry is planning trips to nearby areas as well as considerable contest action. Mostly CW, he also favors the lower frequencies, 40 meters and down. VKØGC will be on MacQuarie until Christmas. Another low-bander, Graham likes to look for the action around 1832 kHz or 3796 kHz, Mondays being the favored day and after 1130Z.

AK1E was with F6GXB and TR8CR in Equatorial Guinea in July. If you caught 3C1CW it QSLs to F6GXB; 3C2A goes to AK1E, and 3C2CR to TR8CR.

K6ICX was in Baja, California in late July signing XE2ICS. Mike worked the bands, 40 through 10, and his address in the CB has been good since 1976. Also south of the border, Don Daso, WA8MAZ, has a VHS video tape available on the XF4DX Revillagigedo effort of last year. The tape runs about 15 minutes and is available for $20.00, it also being available in PAL, SECAM, or other standards on request. Write to WA8MAZ, Rt. 1, Box 246, Mt. Holly, North Carolina 28120.

George Vlahoupoulous, SV1RP, was in Rhodes in the spring for the *CQ* WPX Test. George signed SV1RP/SV5, and if you worked him QSL to Emm. Xanthou 6, Dasos, Haidari, Athens, Greece 124-62. You can also go via SV1NA.

Early report out of the last ARRL Board meeting (keep in mind we write a couple of months before you read it) was that there will be DXCC awards for higher frequencies, 6 and 2 meters, the format following that of the award for 160. There will be a bicentennial WAS Award patterned on the Golden Jubilee Award, and if you hold on long enough, there will be Diamond Jubilee WAS Award to mark the League's 75th anniversary.



Shown here at the DX Convention in Visalia in April are Ray Harper, N6DKP, right, winner of the W6AM Memorial Award, and Jan Perkins, N6AW, curator of the W6AM archives and memorabilia.

Father Moran was named as the second recipient of the Humanitarian Award, and the proposal to use the defunct Law of the Sea's geographical measuring points for DXCC country criteria was referred to the Advisory Committee, this in connection with DXCC possible restructuring.

The Board also declared that they think that the FCC is the one to handle the issuance of amateur licenses, but should they go ahead and decide to delegate that authority, a number of things should be clarified and provided for. These include the stipulation that only one entity should issue licenses, that any delegated authority for issuing licenses should be self-supporting under a reasonable fee system, and more things such as these. The ARRL constitution was revised, and come January the Canadian Radio Relay League will be autonomous. The board covered a lot of subjects, even the idea of a Political Action Committee (PAC). All the details are in the September *QST* should you have missed them.

Mark your calendar! Polish your rig! The last weekends in October and November are traditional DX celebrations, all activities reserved for and directed to DX. Let there be no doubt! These weekends mark the start of the Great Days of DXing in Cycle 22. Phone will be celebrated the last weekend in October, while CW will be celebrated the last weekend in November. Check the September *CQ* for the contest rules, read carefully the list of trophies available to you, and remember to get the needed contest forms.

Frank Anzalone, W1WY, expects every DXer to do his duty! None of the true-blue Deserving would think of doing anything less!

73, Cass, WA6AUD

QSL Information

Jim Lane, KN4F, is another noble DX type volunteering for duty. Jim is experienced. He was QSL manager for TU4BR. TU4BR is currently in 5U7 with tower, beam, amplifier, ambition, but no license. KN4F, 5104 Pilgrim Road, Memphis, Tennessee 38116.

All of the following has been compiled with a lot of help from those watchers of the lonely night W9NUF and W9LNQ.

A22ME to AK1E
A22TE to AK1E
A22CA to AK1E
A24AS to AK1E
A24DM to AK1E
BVØAE to JA1UT
DU7PO to DU6DO
ED9EXP to EA7AIN
EØ2PPP to UP1BZZ
EW6AA to UV6AM
FKØAW to F6BFH
GBØSWR/mm to G4AAL
HB9LA/TF1 to F6HIZ
HSØC (July '87) to JA2KTP
I2NYN/IE9 to I2MQP
JW6WD to LA5NM
KH7LF/KH3 to KL7VZ
K2IBW/FJ to K2IBW
KX6BU (Bill) to KA8WCF
LZØL to LZ1KCP
OD5FB to WA2QAU
OK5YLS to OK2BBI
P29FG to WAØGUD
R3SP to UZ3AWR
TI9M to TI8CBC
TV7GLC to F6DLM
TG9/W2JGR to W2JGR
TR8JLD to AK1E
TR8WCY to AK1E
TR1G to AK1E
UA1C to RA3AR
UAØS to UA9SIZ
YJØARW to ZL1AMO
ZK1XV to VK2BCH
XE1ICS to K6ICS
ZYØTC to PY1DFF
ZYØTJ to PY2BTR
ZYØTM to PY1DFF
ZYØTO to PY1DFF
3C1CW to F6GXB
3C2CR to TR8CR
3C2A to AK1E
3CØA to TR8JLD
3D6BW to AK1E
3V8FRA to WB7FRA
8P9HR to K4BAI
8P9HQ to K4BAI
8P9HS to K4BAI
8P9HT to K4BAI
AK1E to Dan Morehouse, 618 Leander Street, Shelby, NC 28150-6440
C21XX to Ed DeYoung, Box 17, Republic of Nauru
EP2DL to Davod Alipour, Box 17845/151, Teheran, Iran
ET3PG (Bekele-1980) to K6JYO
GØCLY to Jerry Bliss, Box 19 MHS, APO New York 08210
YN3ACZ to Box 302, Managua, Nicaragua
7P8DX to Ed Douglas, P.O. Box 333, Maseru 100, Lesotho

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FT-2/1/709R/H
FT-1903/1123
FTH-2005/7005

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ICO2AT
IC-03/04AT
IC-A2/U16

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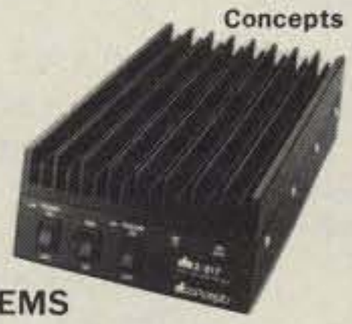
Midland/Standard
Wilson Maxon
Yaesu FTC 1123, FTC 1143
ICOM IC-M5 (Marine) M700
Tempo M-1

RF Concepts



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Propagation

a monthly feature by
GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

DX Contest Special

The 1987 *CQ* World-Wide DX Contest will be held on the following dates:

Phone 0000 GMT Saturday, Oct. 24 to 2400 GMT Sunday, Oct. 25.
CW: 0000 GMT Saturday, Nov. 28 to 2400 GMT Sunday, Nov. 29

Continuing with the practice of the past 37 years, this month's propagation column is devoted to special forecasts for the contest periods, both phone and CW. Previous forecasts for the contest periods have achieved an accuracy in excess of 90%.

Solar Activity

It now appears very likely that the new solar cycle, Cycle 22, began a few weeks before last year's *CQ* World-Wide DX Contest. This resulted in a surge in solar activity during both the phone and CW periods.

The new cycle has been underway for a year. It began during September 1986 with a smoothed sunspot number of 12.

The latest available monthly mean sunspot number, as reported by the Royal Observatory of Belgium, is 17.5 centered on June 1987. This results in a smoothed sunspot number of 16 centered on December 1986.

A smoothed sunspot number of 28 is forecast for October 1987 and a level of 31 for November, as the new cycle continues to rise slowly.

A 10.7 cm solar flux level of 77.6 is reported as the median value for June 1987 by the Algonquin Radio Observatory at Ottawa, Canada. A median solar flux level in the upper 80s is expected during October.

As long as Mother Nature does not produce a radio storm during the 1987 World-Wide contest periods, propagation conditions during this year's contest should be as good as or better than any since 1983.

Compared to contests held during the past three years, expect improved DX conditions on *10, 15,* and *20* meters, with conditions remaining about the same on the other HF bands.

Band-By-Band Conditions

The following is a band-by-band summary of DX propagation conditions normally expected from mid-October through mid-December, and centered on the 1987 contest period.

10 Meters—Solar activity should be high enough for some *10* meter openings, particularly when conditions are High Normal or better. Fairly good openings should be possible to Central America, the Caribbean, and much of South America during the daylight hours. Other openings may also occur to Europe, Africa, the Pacific Islands, Australasia, and New Zealand. Conditions should peak towards the northeast, east, and southeast before noon, and towards the northwest, west, south, and southwest during the afternoon. If a radio storm should develop during the contest, expect few openings on *10* meters.

15 Meters—A considerable improvement is expected in DX conditions on this band during October and November. When conditions are at least Low Normal, good openings should be possible to one area of the world or another from an hour or so after sunrise to almost sunset. The band should peak to Europe before noon; to Africa at about noontime; to South America during the afternoon; and to the Pacific, Australasia, New Zealand, the Far East, and other Asiatic areas during the late afternoon, and possibly into the early evening when conditions are High Normal or better.

20 Meters—Although the band will close earlier than it did during the summer months, good DX openings should be possible to all areas of the world sometime between the sunrise period and the early evening hours. Openings to many southern and tropical areas may be possible to as late as midnight, particularly when conditions are High Normal or better. Signals should peak in *all* directions during a 2 to 3 hour window following sunrise and again during the late afternoon. All in all, *20* meters should be the best DX band during the contest.

40 Meters—DX openings towards Europe and in a generally easterly direction should begin during the late afternoon and improve with darkness. Good openings should also be possible towards the south during the hours of darkness. Openings in a westerly direction should peak during local sunrise in the USA, just before the band closes for DX propagation. Expect some good, strong signal openings on this band during the hours of darkness.

80 Meters—Expect fairly good DX propagation to many areas of the world during the hours of darkness and the sunrise period. Conditions should peak around midnight on paths towards the east, shortly before sunrise on paths to the north and south, and during sunrise on openings in a westerly direction from the USA.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for October 1987

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 5, 11, 23	A	A	B	C
High Normal: 10, 12, 17, 20, 24, 30	A	B	C	C-D
Low Normal: 2-4, 9, 13, 16, 18-19, 21-22, 25-27, 29, 31	A-B	B-C	C-D	D-E
Below Normal: 1, 6, 8, 14-15, 28	B-C	C-D	D-E	E
Disturbed: 7	C-E	D-E	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, 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 fair-to-poor (C-D) on October 1, good-to-fair (B-C) from the 2nd through the 4th, excellent (A) on the 5th, etc. During the CQ World-Wide DX Phone Contest good (B) conditions are expected on October 24th and good-to-fair (B-C) conditions on the 25th.**

Bulletin

A long-range *CQ* propagation forecast based primarily on the 27-day recurrence tendencies of day-to-day conditions indicates that Low to High Normal conditions are most likely to occur during the *CQ* World-Wide DX Phone Contest weekend of October 24–25. See the Last Minute Forecast box in this column for additional information concerning expected day-to-day conditions during October.

160 Meters—With longer hours of darkness, DX conditions on this band should improve. While DX conditions may not be as good as on *40* and *80* meters, look for openings to many areas of the world during the hours of darkness and the sunrise period. Because of power limitations in force on this band in many areas of the world, signals are likely to be weak and noisy, especially on phone. The best time for *160* meter DX is when a path is in *complete darkness. Within this period conditions often peak just as the sun begins to rise at the easterly* point on the path. The best forecaster for *160* meter DX (40 and 80 meters, as well) is a set of sunrise and sunset tables. For example, if the sun is expected to rise at 0700 GMT in western Europe, then this would be the best time to look for *160* meter openings between western Europe and the USA, plus or minus a half hour. Conditions on *80* meters can often also serve as an indicator for *160* meter openings. The band will often open at the same time *80* meters seems to peak on a particular path. With these tips and some patience, it should be possible to work many DX areas of the world on *160* meters during the contest.

Contest Work Plans

The charts on the following pages show the times that each amateur band from *10* through *160* meters is expected to open for DX from the United States to the major areas of the world. Instructions for the use of these charts are given in this column.

The information contained in the charts can easily be reorganized into several different types of operational work plans, or schedules, to serve as propagation guides during the contest period. Experience gained during previous contests has shown that such plans can be extremely useful in piling up a large number of points with a minimum of wasted time.

Table I is an example of one of the many types of plans that can be devised. For each three-hour period throughout the day it shows the areas of the world for which, in this example, *20* meter propagation conditions are expected to be optimum (a rating of 3 or higher in the charts[1]). An eastern USA QTH has been chosen for this example, but similar plans can be devised for central and western locations and for other bands.

Table II is a typical *multi-band* operational work plan devised from the propagation charts for an Eastern USA QTH. The plan shows the times and bands when propagation conditions are expected to be optimum to various areas of the world for each two-hour period throughout the day.

Radio Storms

The forecasts discussed in this column are based on *Normal* propagation conditions expected with a sunspot level of approximately 30. If actual conditions during the contest turn out to be *Above Normal*, DX openings on *10, 15,* and *20* meters are likely to be somewhat better than shown in the charts. On the other hand, if a radio storm should develop, with accompanying Below Normal or Disturbed HF propagation conditions, fewer openings will take place on these bands. During radio storms, propagation conditions on *40, 80,* and *160* meters generally also become erratic, with poorer openings during certain types of storms and improved openings during other types.

If a radio storm should develop during the contest, circuits passing through or near polar regions will probably become weak, fade considerably, or may even black out entirely, depending upon the severity and duration of the storm. During

Time EST	Areas To Which Openings Should Be Optimum
00–03	A few northern and central South American openings, and perhaps to Antarctica, but not much else. Good time for some sleep.
03–06	Still not much except for some weak openings to Europe and Africa. If you didn't get some sleep in before, get it now!
06–09	Excellent period. Good openings in many directions: Europe, north and west Africa, Far East, Asia, New Zealand, South Pacific, Australasia, and South America.
09–12	Fairly good period. Openings to most of Europe, the Middle East, northern South America, and the Pacific area.
12–15	Fairly good period. Openings to most of Europe, the Middle East, some parts of Africa, northern areas of South America. Good time for lunch.
15–18	Fair openings to western and central Europe and the Middle East. Catch them now or you'll miss them. Good openings to most of Africa and South America.
18–21	Good period to pile up points. Openings to most of Africa and south America. Some also to the Far East and other Asiatic areas. Fairly good openings to the Pacific Islands, New Zealand, Australasia, and Antarctica.
21–00	Fairly good period. Openings to the Pacific and Australasia, South America, the Far East, and Antarctica.

Table I– Sample 20 meter operating schedule for Eastern USA QTH.

Time EST	Optimum Band Meters	Areas To Which Band Expected To Be Open
00–02	40	Most of Europe and Middle East; most of South America; a few African countries, possibly Antarctica.
02–04	40	Not much on any band. A good time to eat and catch up on some sleep. Some openings possible to the South Pacific, Australasia, the Far East, and other Asian areas, but generally not too good. Some fairly good openings to South America.
04–06	40	Still time to catch up on some sleep. Some openings to the South Pacific, New Zealand, and Australasia. Some also to northern and central areas of South America. A few Far Eastern and Asian, and perhaps Antarctica.
06–08	20	Good openings to most of Europe, the Pacific area, Australasia, Asia, and the Far East. Also to most of South America and parts of Africa.
08–10	15	Good openings to all of Europe and the Middle East and most of South America. A possible opening to the Pacific, Australasia, and perhaps parts of Asia.
10–12	10	Good openings to most of Europe, most of Africa, and most of South America. Catch them during this period or you will probably miss them!
12–14	15	Good openings to most of Africa and most of South America, and to the western and southern areas of Europe.
14–16	20	Good openings to most of Europe, the Middle East, most of Africa, northern and central South America, and posibly some long-path openings to Australasia.
16–18	20	Good openings to most of Africa and South America, with some also possible to the western and southern areas of Europe.
18–20	15	Fair-to-good openings to the Pacific area, Australasia, Far East, and other Asiatic areas. Good openings to central and southern South America, and a possible opening to Antartica.
20–22	20	Openings to most of Africa, Pacific area, Australasia, Antarctica, and all of South America.
22–00	40	Most of Europe should be possible, as well as the Middle East; most of South America, and some openings to the Pacific and Australasia.

Table II– Sample multi-band work plan for Eastern USA QTH.

[1]*In some cases a rating of (2) or (1) was selected when no higher rating was expected on the particular path.*

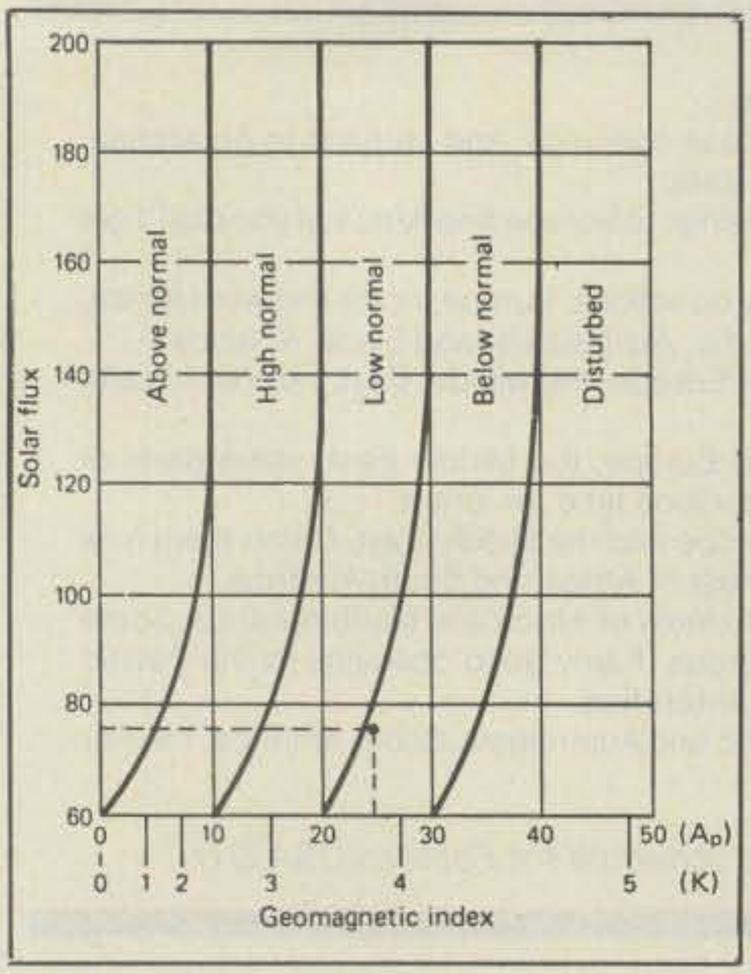


Fig. 1– Intersection of given values of solar flux and geomagnetic activity determine expected h.f. ionospheric propagation conditions. (Example: Solar flux is 75 and Ap is 25; expect Below Normal conditions.)

certain storms, while east-west propagation may become poorer, north-south openings may improve.

If a storm should occur, concentrate on working the higher frequency bands and the paths to the northeast, north, and northwest during the daylight hours, and the lower bands and the paths to the east, south, and west during the evening and early morning hours.

A Last Minute Forecast made at press time for the phone section of the contest appears at the beginning of this column. A similar forecast for the CW section will appear in next month's column. For updated geomagnetic and solar data during the contest period, check the National Bureau of Standards Radio Station WWV broadcasts at 18 minutes past each hour. These broadcasts (transmitted simultaneously on 2.5, 5.0, 10.0, 15.0, and 20.0 MHz) contain the latest available geomagnetic A- and K-figures and the level of 10.7 cm solar flux. They also contain a short-term forecast of geomagnetic and solar conditions given in subjective terms. Fig. 1 can be used to convert the geomagnetic and solar data given on the WWV broadcasts into expected HF ionospheric conditions. The hourly forecasts broadcast on WWV, along with the latest solar flux and geomagnetic indices, also may be obtained by telephoning (303) 497-3235 at any time. This is a service provided by the NOAA Space Environment Services Center, but the call is not toll-free. Direct inquiries to the duty forecaster at the center can also be made 24 hours each day, 7 days a week by calling (303) 497-3171 (collect calls will not be accepted).

If you have a modem-equipped personal computer, you can obtain updated daily summaries of solar and geophysical activity and a daily HF propagation summary and forecast (updated every six hours) directly from the NOAA Space Environmental Services Center (SESC) in Boulder, Colorado. Information about a variety of other useful SESC services and products is also posted on the computer bulletin board.

The bulletin board is in operation 24 hours each day. Modem-equipped PCs can access the system by dialing (303) 497-5000. Either 300 or 1200 baud can be used. Protocal is the standard 8-bit data word with one stop bit and no parity.

There is no charge for the data that can be obtained from the SESC bulletin

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation Index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

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

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

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level: for each 10 db loss, it will lower by one level.

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

October 15 - December 15, 1987
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-11 (1)	08-09 (1) 09-11 (3) 11-12 (2) 12-13 (1)	06-07 (1) 07-08 (2) 08-09 (4) 09-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-02 (2) 02-03 (3) 03-04 (2) 04-05 (1) 19-21 (1)* 21-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*
Northern Europe & European USSR	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (1)	06-07 (1) 07-10 (3) 10-13 (2) 13-15 (1)	17-19 (1) 19-22 (2) 22-01 (1) 01-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	08-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	18-20 (1)* 20-00 (2) 00-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Western Africa	10-12 (1) 12-13 (2) 13-14 (1)	08-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	18-20 (1) 20-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Eastern & Central Africa	10-13 (1)	08-12 (1) 12-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	20-01 (1) 22-00 (1)*
Southern Africa	10-12 (1)	08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-22 (1)*
Central & South Asia	*Nil*	09-11 (1) 17-19 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-21 (1)	05-07 (1) 18-21 (1) 05-07 (1)* 18-20 (1)*
Southeast Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-21 (1)	05-07 (1) 18-20 (1) 05-07 (1)*
Far East	*Nil*	16-17 (1) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 16-19 (1) 19-21 (2) 21-22 (1)	04-08 (1) 17-19 (1) 05-07 (1)* 17-18 (1)*
South Pacific & New Zealand	10-13 (1) 13-15 (2) 15-17 (1)	12-14 (1) 14-15 (2) 15-16 (3) 16-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-22 (2) 22-01 (1)	23-00 (1) 00-02 (2) 02-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	14-16 (1)	10-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-20 (1) 20-23 (2) 23-01 (1)	02-05 (1) 05-07 (2) 07-08 (1) 04-05 (1)* 05-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	00-06 (1) 06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2)	18-19 (1) 19-21 (3) 21-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 19-21 (1)* 21-01 (2)* 01-04 (3)* 04-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-16 (2) 16-17 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	20-22 (1) 22-04 (2) 04-06 (1) 21-23 (1)* 23-03 (2)* 03-04 (1)*
McMurdo Sound, Antarctica	*Nil*	08-10 (1) 13-15 (1) 15-16 (2) 16-17 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-00 (1) 06-08 (1)	03-06 (1)

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1)	08-09 (1) 09-12 (2) 12-13 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	17-18 (1) 18-20 (3) 20-22 (2) 22-00 (1) 00-02 (2) 02-03 (1) 18-20 (1)* 20-00 (2)* 00-02 (1)*

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

Time Zone: PST (24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (2) 09-10 (1) 10-14 (2) 14-16 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-00 (1) 19-23 (1)*
Northern Europe & European USSR	*Nil*	07-10 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	21-00 (1) 21-23 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	07-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (1) 21-23 (1)	18-22 (1) 06-08 (1)
Western Africa	09-11 (1)	08-10 (1) 10-11 (2) 11-12 (3) 12-13 (2) 13-14 (1)	07-10 (1) 10-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 22-00 (1)	18-23 (1) 19-22 (1)*
Eastern & Central Africa	*Nil*	09-12 (1)	06-09 (1) 11-13 (1) 13-16 (2) 16-18 (1) 21-23 (1)	18-21 (1) 06-08 (1)
Southern Africa	08-12 (1)	08-10 (1) 10-13 (2) 13-14 (1)	07-09 (1) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	18-19 (1) 19-20 (2) 20-21 (1) 06-08 (1) 18-20 (1)*
Central & South Asia	*Nil*	17-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 16-17 (1) 17-18 (2) 18-19 (1)	04-06 (1) 06-08 (2) 08-09 (1) 05-07 (1)*
South-east Asia	15-17 (1)	14-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-20 (2) 20-22 (1)	02-03 (1) 03-06 (2) 06-08 (1) 03-07 (1)*
Far East	14-16 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	22-00 (1) 00-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 23-01 (1)* 01-05 (2)* 05-07 (1)*
South Pacific & New Zealand	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	09-12 (1) 12-15 (2) 15-17 (4) 17-18 (2) 18-19 (1)	04-07 (1) 07-09 (3) 09-12 (2) 12-16 (1) 16-17 (2) 17-18 (3) 18-20 (4) 20-22 (2) 22-02 (1) 02-04 (2)	21-22 (1) 22-05 (3) 05-08 (2) 08-09 (1) 22-00 (1)* 00-06 (2)* 06-07 (1)*
Austral-asia	13-15 (1) 15-17 (2) 17-18 (1)	11-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	12-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-03 (1) 03-05 (2) 05-07 (1) 07-10 (3) 10-12 (2)	02-03 (1) 03-04 (2) 04-07 (3) 07-08 (2) 08-09 (1) 03-04 (1)* 04-07 (2)* 07-08 (1)*
Carib-bean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-15 (1)	07-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	00-05 (1) 05-06 (2) 06-08 (3) 08-09 (4) 09-10 (3) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-22 (1) 22-00 (2)	18-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-22 (1)* 22-02 (2)* 02-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argen-tina & Uruguay	09-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-13 (1) 13-14 (2) 14-15 (4) 15-16 (3) 16-17 (1)	01-06 (1) 06-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-01 (2)	19-21 (1) 21-03 (2) 03-05 (1) 20-23 (1)* 23-01 (2)* 01-02 (1)*
McMurdo Sound, Antarctica	13-15 (1)	08-10 (1) 13-15 (1) 15-16 (2) 16-18 (1)	07-09 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-02 (1)	23-02 (1) 02-05 (2) 05-06 (1) 02-05 (1)*

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a propagation index of (2), or higher.

board, but the telephone call is not toll free.

Do-It-Yourself Forecasting

Besides the solar, geophysical, and ionospheric data available from WWV and the SESC computer bulletin board, there are also available several excellent computer programs designed to be used for forecasting propagation conditions and band openings.

One such program is BANDAID™, produced by Base (2) Systems. It is intended for IBM and clone PCs, with color/graphic cards. At the heart of the program is the propagation forecasting module, which predicts ionospheric propagation conditions and band openings between any two points on earth. The results can be presented in either tabular or graphic form. The program calculates the Maximum Usable Frequency (MUF, or frequency with 50% reliability), the Highest Possible Frequency (HPF, or frequency with 10% reliability), and the Frequency of Optimum Transmission (FOT, or frequency with 90% reliability). The program also produces the Lowest Usable Frequency (LUF, or the frequency below which communication is not possible). Distance and bearings between stations are also presented, as are sunrise/sunset times and grayline data.

The program also includes several other very useful features such as a UTC time-zone conversion, a list of 10 and 20 meter beacon stations currently in operation, a QSL databank, and a list of authorized amateur bands by class of license. The program also contains a world map that can be used to display the location of any station.

BANDAID is menu driven, can be customized for your location, and is easy to use. For a more complete critique of BANDAID, refer to Karl Thurber's "Antennas and Accessories" column in the July 1987 issue of *CQ* (page 74).

Base (2) Systems also produces a program called MUFPLOT™. This is intended for use with Commodore and Apple II computers. It contains a propagation module similar to the one used in BANDAID. For additional information and pricing for both BANDAID and MUFPLOT write directly to Base (2) Systems, 2534 Nebraska Street, Saginaw, MI 48601.

Another excellent program available for IBM and clones is MINIPROP.2™. This is an upgraded and revised edition of the popular MINIPROP.1™ program produced by Sheldon Shallon, W6EL. It produces a wealth of propagation data, including predictions for around-the-clock short- and long-path band openings between path terminals located anywhere in the world. The program also produces expected signal levels, sunrise and sunset times, great-circle distances and bearings, and grayline times and bearings. The MINIPROP.2 version also produces a "DX Compass." For any location, at any specific time, the program will show the MUF for every 30 degrees of azimuth.

The program is well prompted, self-explanatory, and easy to use. Required input data are latitude and longitude of path

terminals, date, and smoothed sunspot number or solar flux level. The MINIPROP.2 program is user-supported, and details for its availability can be obtained by writing directly to Sheldon C. Shallon, W6EL, 11058 Queensland Street, Los Angeles, CA 90034.

Incidently, by using the latest available solar flux data from WWV it is possible to obtain "real time" results from both the BANDAID and MINIPROP.2 programs.

Another excellent program available for Commodore 64 and 128 owners is the SUPER DX EDGE™. In addition to calculating the MUF and great circle bearings and distances between any two locations, the program gives detailed information concerning grayline propagation. It lets you see the shape and position of the grayline on keystroke command displayed on a high-resolution world map. At the same time you can see the area of the world that is in daylight and the area in darkness. If you do not have a computer, a slide-rule version called the DX EDGE™ is available. This version calculates the grayline, but does not produce propagation forecasts. For a more detailed discussion of the SUPER DX EDGE see "Antennas and Accessories" in the May 1987 issue of *CQ* (page 74).

For more information and pricing data for both the SUPER DX EDGE and the DX EDGE write directly to XANTEK, P.O. Box 834, Madison Square Station, New York, NY 10159.

Lee Wical, KH6BZF, puts out an excellent weekly newsletter full of interesting propagation information and containing advanced forecasts of HF and VHF ionospheric openings. Write directly to KH6BZF at 45-601 Luluku Road, CRT #4411, Kane'Ohe, Hawaii 96744-1854 for more complete details, availability, and pricing. Enclose an SASE for reply.

If you do not already have a copy of the *Shortwave Propagation Handbook* by myself and Theodore J. Cohen, N4XX, then you might want to get one to read *before* the contest begins. Copies are still available from the *CQ* Book Shop, 76 North Broadway, Hicksville, NY 11801 for $8.95 postpaid (plus $2.00 shipping and handling).

VHF Ionospheric Openings

While the *CQ* DX Contest *does not* include the VHF bands, some ionospheric activity should be possible on these bands during October.

Some fairly good meteor-scatter openings should be possible on the VHF bands around October 21st during the expected two-day *Orionids* meteor shower. This should be a major shower with a maximum hourly rate of at least 25 meteors.

Auroral activity usually increases during October, and some auroral-scatter-type VHF openings are expected during the month, particularly during periods when HF conditions are either Below Normal or Disturbed. Check the Last Minute Forecast at the beginning of this column for the days that are expected to be in these categories during October.

CW Contest Forecast

This month's DX Propagation Charts are valid for both the phone and the CW sections of the contest. Be sure to keep them handy for use during next month's CW section as well. Short-Skip Propagation Charts for using during October appeared in last month's column.

Experience from the past 36 contest years has shown that DX contests are excellent periods in which to test the accuracy of prediction and forecast methods used in this column. Contests generate a large amount of activity in every corner of the world and on all HF bands. Previous results and observations have helped considerably in improving the accuracy of this column. Comments concerning the 1987 contest and the accuracy of these forecasts and predictions would be appreciated, and should be sent directly to W3ASK at P.O. Box 1714, Silver Spring, MD 20902. *Good luck in the contest!*

73, George, W3ASK

Contest Calendar

a monthly feature by
FRANK ANZALONE, W1WY

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Add another contest expedition to our Phone Contest coming up at the end of the month. Ron Oates, AA4VK, will be on from Madeira (Zone 33) on all bands, 160–10 meters, propagation permitting. Ron is taking along a full assortment of gear which will permit him to operate with a full gallon. Call will be AA4VK/CT3.

The J6DX multi-multi group who was on in last year's WW CW Contest is going to give it another go in this year's contest. Most of the old crew plus a couple of new "hot shots," including our own WPX Contest Director, Steve Bolia, N8BJQ, will join the group and make an all-out effort to post a winning multi-multi score. (See photo in August Calendar.)

The Caymans will celebrate Pirates Week again this year, October 24–31. A special attractive QSL card will be issued to all stations sending a confirmation of contacting a ZF station during the above period. Also look for some WW Contest activity during that weekend. Send your QSL and two IRCs no later than December 1st to: C.A.R.S., P.O. Box 1029, Grand Cayman, B.W.I.

I was saddened to read that our good friend Don Riebhoff, K7ZZ, has become a Silent Key. Don could always be expected to show up from a DX spot come WW Contest time. Last year he was back at CT4AT on 160 in the phone section. He had not put up all his antennas before his untimely death. Don was always an exciting person on the air or at conventions. He will be missed. Fred Laun, K3ZO, is sponsoring a memorial plaque for Don in the '87 WW Contest. The category will be announced in next month's Calendar.

Deadline for announcements for the January issue is October 15th, and November 15th for the February issue. Please send all material to my home address.

73 for this time, Frank, W1WY

Calendar of Events

*	Oct.	3-4	California QSO Party
*	Oct.	3-4	Middle of the World Contest
	Oct.	3-4	VK/ZL/Oceania SSB Contest
	Oct.	10-11	VK/ZL/Oceania CW Contest
	Oct.	10&11	IRSA SSB & CW Champion
	Oct.	10-11	Ibero Americano Contest
	Oct.	10-12	Pennsylvania QSO Party
	Oct.	11	RSGB 21/28 MHz SSB
	Oct.	11-12	Illinois QSO Party
	Oct.	14-16	YLRL Anniv. CW QSO Party
	Oct.	17-18	Boy Scout Jamboree
	Oct.	17-18	Rhode Island QSO Party
	Oct.	17-18	ARCI QRP CW QSO Party
	Oct.	18	RSGB 21 MHz CW Contest
	Oct.	**24-25**	**CQ WW DX Phone Contest**
	Oct.	28-30	YLRL Anniv. SSB QSO Party
	Ot.30	- Nv. 1	Maryland/DC QSO Party
	Nov.	7-9	ARRL CW Sweepstakes
	Nov.	14	ALARA YL-OM Contest
	Nov.	14-15	European RTTY Contest
	Nov.	21-22	MARAC Activity Contest
	Nov.	21-23	ARRL SSB Sweepstakes
	Nov.	22	INORC Maritime Contest
	Nov.	**28-29**	**CQ WW DX CW Contest**
	Dec.	4-6	ARRL 160 Meter Contest
	Dec.	5-6	TOPS 3.5 MHz CW Contest
	Dec.	12-13	ARRL 10 Meter Contest

** Covered last month.*

Jeff Steinman, KRØY (top), and Ralph Bowen, N5RZ (bottom), were presented their CQ WPX CW contest plaque awards by Editor Alan Dorhoffer, K2EEK, and CQ Contest Advisor Bernie Welch, W8IMZ, at the North Texas Contest Club's Contest Forum during the '87 Dallas HAMCOM. (Photo by Walt Smith, K1DWQ)

VK/ZL/Oceania DX Contest

SSB: Oct. 3–4 CW: Oct. 10–11
1000Z Saturday to 1000Z Sunday

This is the 52nd year of the VK/ZL contest. The following rules are for overseas stations.

A maximum of 12 hours operating time is permitted in the 24-hour contest period, to be taken in one-hour blocks based on the "even hour to even hour" (1000Z to 1100Z/1300Z to 1400Z, etc.) in minimum periods of one hour. (SSB and CW are separate contests.)

Use all bands, 1.8–28 MHz, except WARC bands.

Oceania stations can work anyone. The rest of the world can work VK, ZL, and Oceania stations only. The same station may be worked on each band for QSO and multiplier credit.

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

Points: Two points per QSO for everyone.

Multiplier: Each VK/ZL/O prefix worked on each band.

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

Awards: Special large, color certificates to top scorers in each country and to each continental winner. A participation certificate to all on request (1 IRC, please).

There is an SWL section. Only VK/ZL/O stations are logged. Call of station being worked and RS(T) being sent must be reported. Scoring same as above but both SSB and CW scores are combined for final score (maximum total of 24 hours).

Use a separate log sheet for each band and underline each new VK/ZL/O prefix as it is worked on each band. Include a summary sheet showing the scoring and other essential information, and the usual signed declaration that all rules and regulations have been observed.

This year logs go to the new WIA Contest Manager, Brian Beamish, VK4AHD, P.O. Box 254, Stones Corner, Qld. 4120, Australia. They must arrive no later than February 15, 1988.

Jock White, ZL2GX, manager of the 1986 contest, reported very poor conditions for last year's contest. Only three North American entries were received for the phone section (VE3CDX, K6SVL, and WØZV) and only three for the CW section (WØZV, K6NA, and AA6EE). After more than 40 years of service with the NZART, Jock has terminated his administration of the VK/ZL/O contest. *(A job well done, Jock. The contest fraternity salutes your dedication—ed.)*

IRSA World Radio Championship

Phone: Oct. 10 CW: Oct. 11
0000Z to 2400Z, Sat. & Sun.

This is the second time around for the International Radiosport Association's championship contest scheduled a week later this year in an effort to find a clear

14 Sherwood Road, Stamford, CT 06905

spot in an already saturated month of October.

It's a worldwide-type contest with a wide assortment of multipliers. Phone and CW are separate contests on different days. Scores, however, can be combined for special awards in certain categories.

Single operator stations are limited to 22 hours out of the 24-hour contest period. The 2-hour off period may be taken in one or two periods. Multi-stations can operate the full 24 hours.

Use all six bands, 1.8–28 MHz (no WARC bands).

Classes: High power, 1000 watts. Low power, 100 watts. And QRP, 5 watts. Single operator, single and all band. Multi-operator, single and multi-transmitter. Club competition.

Exchange: RS(T) and a progressive QSO number starting with 001.

Points: Two for each completed contact in the phone contest. Three if it's in the CW contest.

Multiplier: Each DXCC country and call areas in the following countries worked on each band: USA, Canada, Australia, Brazil, Japan, USSR Europe, and Asia. Also one for each of the land, maritime, aeronautical mobile groups. Stations operating out of their call area must identify area of operation (i.e., VE3BMV/W2).

Final Score: Total QSO points from all bands times the total multiplier from all bands.

Awards: Certificates to winners in each category and power group, in every participating country, call areas, and mobile group. The station having the highest combined score from each country will receive a free one-year subscription to *Radiosporting* magazine. There are also a dozen championship plaques in several categories for both phone and CW winners.

Log Instructions: Phone and CW are separate contests and require separate logs. Indicate the multiplier only the first time it is worked on each band. Do *not* use a separate sheet for each band, except for multi-operator multi-transmitter stations, who should keep separate logs and QSO numbering for each band. Logs must be checked for duplicate contacts and multipliers, and off periods clearly marked.

There are many detailed operating instructions for the different classes. I strongly recommend that you send a large SAE and one "green stamp" or 3 IRCs for a sample contest-form kit (*Radiosporting*, P.O. Box 282, Pine Brook, NJ 07058).

You are encouraged to submit your log regardless of your score; they are useful for checking purposes. A one-year subscription to *Radiosporting* will be awarded to the 10 stations selected by a drawing from the logs received.

Logs must be received by December 31st by the Contest Chairman, Walt McGugan, W3FG, P.O. Box 7, Odenton, MD 21113-0007 USA.

Iberoamericano Contest

2000Z Sat. to 2000Z Sun., Oct. 10–11

Organized by "Seccion Territorial de URE del Valles Oriental" and by "CQ Radio Amateur de Boixareu Editores," this contest will be sponsored every year the weekend before October 12th to commemorate the anniversary of the discovery of America. This is a phone-only contest with the emphasis on Latin-American areas.

Classes: Single operator and multi-operator, single transmitter; both Latin-American and non Latin-American. Single operator EC (EA novice), and QRP, less than 5 watts output.

Exchange: RS plus a progressive QSO number (001, etc.).

Bands: All six bands, 1.8 through 28 MHz.

Points: Latin-American stations score one point per QSO. Non-Latin-Americans, 3 points per QSO with Latin-Americans, 1 point with other non-Latin-Americans.

Multiplier: Latin-Americans use the DXCC list. Non-Latin-Americans use the following L-M country list: CE, CO, CP, CR, CT, CX, C3, C9, DU, EA, HC, HI, HK, HP, HR, HT, KP4, LU, OA, PY, TG, TI, XE, YS, YV, ZP, 3C, and dependencies.

Final Score: Total QSO points from all bands times the sum of multipliers from all bands.

SWL: Same rules apply to SWL entries. The same station cannot be logged more than 15% of the total logged. And the same station can only be logged again after 5 other entries.

Penalties: Taking credit for excessive duplicate contacts, and violation of rules and amateur radio regulations could result in disqualification.

Awards: Certificates will be issued to the highest scores in each DXCC country. Participating certificates will go to non-Latin-American stations making 50 or more QSOs. There are plaques for overall winning scores showing at least 4 hours of operation and 100 or more QSOs.

Mailing deadline for entries is November 30th to: X-Concurso Iberoamericano, Gran Via de les Corts Catalanes, 594, 08007 Barcelona, Spain.

Pennsylvania QSO Party

1600–0500Z Sat.–Sun., Oct. 10–11
1300–2200Z Sun., Oct. 11

This is the 30th annual party sponsored by the Nittany ARC of State College, PA. The same station may be worked on each band and mode for QSO points. PA stations may also work other in-state stations for QSO and multiplier credit, and mobiles in each county change. Novice stations must identify.

Exchange: QSO number and QTH. County for PA, ARRL section for others.

Scoring: One point for SSB contacts, 1.5 points for CW, 2 points if on 80 or 160. Novice QSOs 10 points on CW, 5 points on SSB.

PA stations multiply total by (ARRL sections + PA counties + 1 DX country), total of 143 possible. (Remember West Texas is a new county.) Others use PA counties for their multiplier (total of 67 possible).

Mobiles add 500 points for each county operated from with a minimum of 10 QSOs. Mobiles on a county line give one QSO number, but get credit for two multipliers.

Novice and QRP stations multiply their score by 2.

Frequencies: CW—1810 and 40 kHz up from bottom of each CW band. SSB—1850, 3980, 7280, 14280, 21380, 28580. Novice—10 kHz up from bottom of each Novice band and SSB on 10 meters. Mobile—5 kHz below listed frequencies. Try 160 at 0300Z.

Awards: In five classes—single operator, multi-single, multi-multi, mobile, and QRP (5 watt maximum). Certificates to winners in each PA county, ARRL section, DX country, and club (minimum of 3 members and 20 QSOs). Plaques to top scorers in both eastern and western PA, out-of-state, multi-single, mobile, western, and central USA and QRP (*quite a selection—ed.*).

Include a summary sheet with your entry showing the scoring, a check list of counties and sections worked, and a dupe sheet if you make 100 or more contacts. There is a severe penalty of 100 points deducted for each dupe that has not been removed.

Official log forms are recommended, and samples are available from W3HDH. Send 50¢ for a copy of the results (no SASE).

Mailing deadline for all entries is November 15th to: Douglas R. Maddox, W3HDH, 1187 S. Garner Street, State College, PA 16801.

RSGB 21/28 MHz SSB Contest

0700 to 1900 GMT Sunday, Oct. 11

It's the world working the British Isles on 21 and 28 MHz.

The same station may be worked on each band for QSO and multiplier credit. There are a total of 49 prefixes available on each band. Following are the rules for areas other than the British Isles.

Sections: Single operator and multi-operator, both bands only, and SWL.

Exchange: RS report plus a progressive QSO number starting with 001.

Scoring: Each contact with a B.I. station is worth 3 points. Multiply total QSO

points from each band by the sum of B.I. prefixes worked on each band (maximum of 49 per band). The GB prefix does not count for QSO or multiplier.

Unmarked duplicate contacts will be penalized 10 times the points claimed. Logs containing more than 5 unmarked duplicates will be disqualified.

Awards: Certificates to the three leading overall winners, and at the discretion of the committee, to the leading station in each country. Both for transmitting and SWL.

There is also an SWL section. Only B.I. stations are to be logged. Scoring is the same as indicated above. The same call sign may appear once only in every three contacts, except when the logged station is a new multiplier.

Awards: Overseas stations will be awarded certificates to the leading station in each country and the leading station in the multi-operator section, and to the SWL winner in each country. The first, second, and third overall winners will also receive certificates of merit.

Separate log sheets are required for each band. Include a summary sheet showing the scoring, prefixes worked, and a signed declaration that rules and regulations have been observed.

Logs must be received by December 7th. This year they go to: RSGB Contest Committee, P.O. Box 73, Lichfield, Staffs. WS13 6UJ England.

RSGB 21 MHz CW Contest

0700 to 1900 GMT Sunday, Oct. 18

Like the 21/28 MHz Phone Contest, the activity in this one is between the British Isles and the rest of the world. Competition is limited to single operator stations only. There is a separate QRP section in which power input must not exceed 10 watts, and there is also an SWL section.

The following rules are for areas other than the British Isles.

Exchange: RST report plus a progressive QSO number starting with 001.

Scoring: Each contact with a B.I. station is worth three points. Multiply total QSO points by the number of B.I. prefixes worked (G2, G3, GD3, etc.). A maximum of 49 is possible. (GB does not count for QSO or multiplier.)

Unmarked duplicate contacts for which credit has been taken will be penalized ten times the points claimed. Logs containing more than five unmarked duplicates will be disqualified.

Only British Isles stations are to be logged by overseas SWL's. The same call may be reported only once in every three contacts, unless the logged station is a new multiplier. Scoring is the same as above.

Awards: Certificates to the three leading overall winners, and at the discretion of the committee, to the leading station in each country. Both for transmitting and SWL.

Include a summary sheet with a list of prefixes worked, station description, the usual signed declaration, and your name and address in block letters.

Logs must be received by December 14th. This year they go to: RSGB Contest Committee, P.O. Box 73, Lichfield, Staffs. WS13 6UJ, England.

Illinois QSO Party

1800Z Sun. to 0200Z Mon., Oct. 11–12

This is the 25th anniversary of the Illinois QSO Party sponsored by the Radio Amateur Megacycle Society. It's a shorty, only 8 hours long.

Stations may be worked once per band and mode, and IL stations can contact other in-state stations for QSO and multiplier credit.

Exchange: RS(T) and QTH. County for IL stations; state, VE province, or DX country for others.

Scoring: One point for phone contacts, 2 points if on CW, 25 points if with RAMS club station K9CJU. Illinois stations multiply total QSO points by (states + provinces + IL counties + maximum of 5 countries) worked. Additional DX QSOs count for points but not multiplier.

Others use IL counties for their multiplier (maximum of 102).

Illinois mobiles add 200 points to final score for each county from which 10 or more QSOs were made.

All stations earn an extra multiplier for every eight QSOs made with the same county.

Frequencies: CW—3550, 7050, 14050, and 30 kHz above bottom edge of Novice subbands. SSB—3890, 7290, 14290. Other bands may also be used.

Awards: Certificates to the top 10 scoring IL fixed stations, 5 IL mobiles, winners in each state, province, country, and the highest club/team aggregate score. A plaque goes to the top-scoring Illinois station. And each participant who submits a log will receive a commemorative 25th anniversary certificate.

Logs: Indicate band and mode, circle each new multiplier, and IL mobiles must indicate each county change. Stations with over 100 QSOs must submit a dupe sheet.

A summary sheet showing the scoring and the usual signed declaration is also requested.

Mailing deadline for logs is November 9th to: RAMS, c/o Joe LeKostaj, WB9GOJ, 9134 Ewing Ave., Evanston, IL 60203.

YLRL Anniversary Party

CW: Oct. 14–16 SSB: Oct. 28–30
1400Z–0200Z, Wed.–Fri.

This is the 48th annual party run by the YL Radio League. It is open to all YL's around the world. Activity will be found on all bands, 10 through 80 meters, and will be between YL's only.

CW and SSB are separate contests and require separate logs. A station may be worked *once on each band* for contest credit. Operation is limited to 24 out of the 36-hour contest period. Be sure to indicate off periods in your log.

Exchange: QSO no., RS(T), and QTH; U.S. state, VE province, or DX country.

Scoring: One point per QSO between stations within the U.S. and Canada (including Alaska and Hawaii). Two points for contacts with stations in other areas.

DX YL's score 2 points for QSOs with the U.S. and Canada and with other continents, but 1 point with stations in own continent.

Final Score: Multiply total QSO points from all bands by the sum of states, provinces, and DX countries worked.

There is a low-power bonus multiplier of 1.25 for stations using 150 watts or less on CW and 200 watts PEP on SSB. Multiply final score by 1.25 if applicable.

For each duplicate contact removed from your log there is a penalty of 3 additional and equal contacts removed from your log.

Frequencies: CW—3555, 7055, 14055, 21135, 28195. SSB—3955, 7255, 14265, 21395, 28595 (plus or minus 15 kHz). Look in DX portions of band on 40 and 80 meters.

Awards: Certificates to winning scores in each district, province, and DX country, and first, second, and third place overall winners. There are cups and plaques for YLRL members in North America and DX countries, and two special awards for the highest combined CW and SSB scores.

Include a summary sheet with your entry showing the scoring and other essential information. Logs must be in their original form, no carbon copies.

Your entry must be received by December 12th, and this year logs go to: Mary Lou Brown, NM7N, 504 Channel View Dr., Anacortes, WA 98221.

Scouts Jamboree On The Air

0001 Sat. to 2400 Sun., Local Time, Oct. 17–18

This is the 30th annual Jamboree sponsored by the World Scout Bureau. This is not a contest, but an opportunity for Scouts or anyone interested in Scouting to get together on the air and exchange greetings and information.

Activity is worldwide, and this year the emphasis is on Australia, where the 16th World Scout Jamboree will be held in two months.

Scouts of course will set up their own stations, but amateurs can invite members of Scout units or individuals to visit

their stations or clubs to see how ham radio operates.

Any authorized frequencies may be used. The following frequencies are suggested as calling spots, and once a contact has been established, move to another frequency. CW—3590, 7030, 14070, 21140, 28190 kHz. Phone—3740, 3940, 7090, 7290, 14290, 21360, 28990 kHz.

No specific exchange, no scoring, and no logs are required, but participating stations are requested to send a report of their activity to their National Organizer. In the US they can be sent to: JOTA Coordinator, International Division BSA, 1325 Walnut Hill Lane, Irving, TX 75038-3096.

Rhode Island QSO Party

1700Z Sat. to 0500Z Sun., Oct. 17–18
1300Z Sun. to 0100Z Mon., Oct. 18–19

This one is again being sponsored by the East Bay AWA (WA1YPN). The same station maybe worked on each band and each mode. RI stations may contact others RI stations for QSO points.

Exchange: RS(T) and QTH. City or town for RI; state, province, or DX country for others.

Scoring: Phone QSOs are worth 2 points, CW 3 points.

RI stations multiply total QSO points by RI cities/towns, states, VE provinces, and DX countries worked. Others by the different RI cities and towns worked for their final score (39 cities and towns).

Frequencies: CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110. Phone—1850, 3900, 7260, 14300, 21360, 28400, 50110, 144.2 and 146.52. (Use of FM simplex is encouraged. No repeaters.)

Awards: Certificates to the top-scoring single operator station in each RI county, and each state, province, and country. The top-scoring Novice/Tech. in RI and out of state will also be rewarded, as will the winning RI multi-operator station.

Include a summary sheet with your entry showing the scoring and other essential information, and an SASE for a copy of the results.

Mailing deadline is November 30th to: East Bay AWA Inc., P.O. Box 392, Warren, RI 02885.

ARCI QRP CW Contest

1200Z Sat. to 2400Z Sun., Oct. 17–18

This is the fall edition of the QRP Amateur Radio Club International. This year's activity will be found on CW only. Participants are limited to 24 hours out of the 36-hour contest period.

Exchange: RST and state, province, or country. Members will include their number; non-members their power output.

Scoring: Contacts with members, 5 points. Non-members, 2 points if in same continent, 4 points if in a different continent. The same station may be worked on each band for QSO and multiplier credit.

There is a power output bonus: 4 to 5 watts—× 2; 3 to 4 watts—× 4; 2 to 3 watts—× 6; 1 to 2 watts—× 8; less than 1 watt—× 10; over 5 watts check log only.

The following bonus multipliers are also available: solar or wind power—×2; battery power—×1.5. Must be used for duration of contest. And a new bonus on each band if homebrew equipment is used, 200 if a transmitter, 300 if a receiver, and 500 if a transceiver (maximum of 500 per band).

Multiplier: Each state, VE province, and DX country worked on each band.

Final Score: Total QSO points from all bands × (states + provinces + countries) × power bonus × power type if any + homebrew bonus.

Frequencies: 1810, 3560, 7040, 14060, 21060, 28060, 50060. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to the highest scorers in each state, province, and DX country with two or more entries. All entries will be considered for the Triple Crown QRP Award. In addition, Adrian Weiss, WØRSP, is sponsoring a special *Milliwatt* certificate to be awarded to the top-scoring station in the less than 1 watt category, providing there are two or more entries in that category.

Use a separate log sheet for each band. Include a summary sheet showing the scoring, equipment description, and other essential information. Include a large SASE for a copy of the results. It is suggested you send a large SASE to KA5NLY for official log forms.

Logs must be received by November 19th and go to: QRP ARCI Chairman, Gene Smith, KA5NLY, P.O. Box 55010, Little Rock, AR 72225-0010.

CQ World-Wide DX Contest

Phone: Oct. 24–25 CW: Nov. 28–29
0000Z Saturday to 2400Z Sunday

Complete rules were published in last

month's issue and are the same as those used these many years. There have been a few changes and additions in the sponsors of the more than 65 trophies and plaques that will be awarded in the 1987 contest. The Team Contesting category has been retained.

You are again reminded to study the disqualification clause. Penalties for taking credit for duplicate contacts and other infractions have been clearly defined. You not only risk a deduction in your score, but also possible disqualification, especially if your score was questionable in last year's contest.

There are other areas that might lead to being disqualified—sportsmanship, regulation violations, etc. The Contest Committee is cognizant of the fact and will be watching those areas in this year's contest.

Note: The *CQ* Champion Plaque for stations winning the same category for two consecutive years only applies to world winners, not to other sub-areas.

Repeating the deadline, all entries must be postmarked NO LATER than December 1, 1987 for the phone section, and January 15, 1988 for the CW section. An extension may be granted if requested in writing to the Contest Committee.

Again this year all logs must be sent directly to: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801 U.S.A. Be sure to indicate Phone or CW on the envelope.

Maryland/DC QSO Party

1800Z Sat. to 2100Z Sun.
Oct. 30 to Nov. 1

Sponsored by the Columbia ARA, this party is for single operator competition only. Each station may be worked once on each band and mode, and MD/DC can work other MD/DC stations for multiplier credit but no QSO point credit.

Exchange: Progressive QSO number and QTH. County for MD/DC; ARRL section or DX country for others. (*Note:* Baltimore city and county are two separate multipliers.)

Scoring: One point for phone contacts, 2 points if on CW.

Multiplier: ARRL sections, DX countries, and Maryland counties for MD/DC. Out-of-state stations use Maryland counties (28 MD counties, Baltimore city and Washington DC).

Frequencies: CW—60 kHz up from bottom edge of the 80–10 meter bands (no WARC). Phone—3950, 7250, 14290, 21390, 28490. Novice—10 kHz from bottom of Novice subbands.

Awards: Certificates to top scorers in each call area, including Novice/Tech. and each Maryland county.

Mailing deadline for logs is November 30th to: Jim Reske, NB3P, 8454 Church Lane, Ellicott City, MD 21043.

VHF

a monthly feature by
STEVE KATZ, WB2WIK

PRINCIPLES, PRACTICES, AND PROJECTS FOR THE VHFER

The Third Annual VHF WPX Contest

How did it go for you? From what we could tell, conditions were good and activity was up from last year, but you'd never know it by our score.

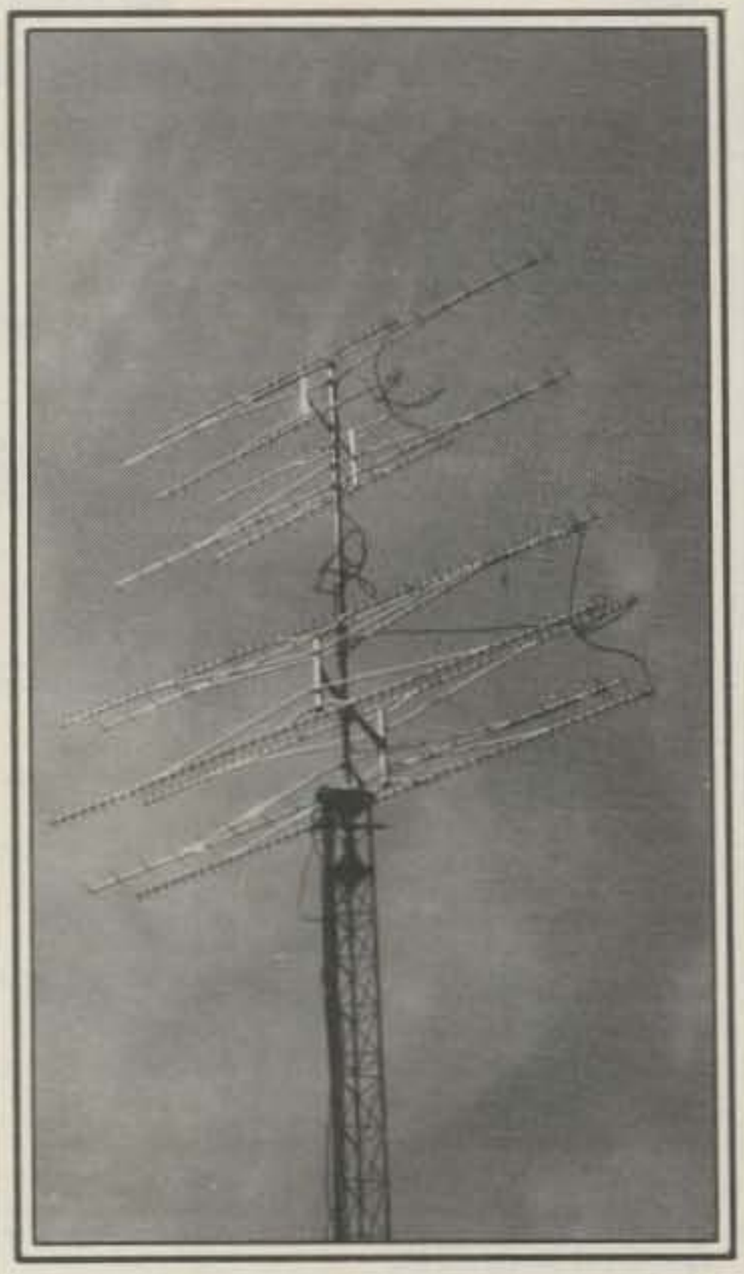
Murphy struck us pretty hard this year. Our small group at KT2B, operating from the KC2PX shack at Belle Mead, NJ, had some incredibly bad luck. First, our entire UHF antenna system—an interlaced array of 396 elements for 70-33-23 cm—which was supposed to be fully installed by the Friday morning of the contest, was not only uninstalled, but mostly still in boxes, remaining to be assembled. Then the 6 meter antenna system, a pair of 7-element Yagis which I had to assemble and install on the tower, was located so far from the operating shack that all attempts to get the rotator working seemed pretty hopeless. Indeed, all Friday night we operated with our beams stuck "west," until I had a brainstorm involving the use of some #14 two-conductor romex paralleling the motor and brake lines to the shack (performed this field surgery at about 1 a.m. Saturday).

Then the 6 meter beams didn't seem to be working very well, probably because the 200 feet of 75 ohm hardline, which was spliced to another 80 feet of Belden 9913 50 ohm coax, had taken in some water and was exhibiting serious losses. We finally ran a new 200 foot length of 9913 on Sunday morning.

Because Ivars, KC2PX, owner of the contest site, hadn't been on the air in a while, nothing was really set up. Pete, KT2B, and I lugged a lot of gear from our homes, and that, combined with a lot of stuff Ivars already had, made operational stations on six bands. But lots of things went wrong all along the way. A coax relay on the 2 meter KW failed and needed replacement. A length of 50 ohm ⅞ inch heliax which was run up the UHF tower wasn't working, so we resorted to 9913 on 70 cm (the other heliax runs for 903 and 1296 were okay). Probably the only thing that went right for us all weekend was that the 70-33-23 cm arrays once finally installed at noontime Saturday worked perfectly. Ivars spent a lot of time meticulously cutting the phasing harnesses for the three 4-bay systems, and his efforts paid off.

We decided to use Pete, KT2B's callsign for the unique prefix. This turned out to be a good idea, because I think we were the only KT2 on the air. However, our call was not nearly as unique as 4U1UN, the multi-op group who operated all bands from the roof of the United Nations building in New York City. After all, they were not just a new prefix, but a new *country* for most people. From what I could tell, they did very well—maybe better than anyone else. At KT2B we did catch some excellent tropo into the midwest Friday night and filled up a couple of log sheets with rare calls on 2 meters. Conditions were good up through 1296 MHz, but our antennas were in a state of mid-assembly Friday night, so we missed our only opportunity to work the midwest on the higher bands. Murphy strikes.

153 Rodman Court, Eatontown, NJ 07724



The 396-element interlaced array at KC2PX was used for 70-33-23 cm operations at VHF WPX Contest station KT2B. While the 4 × 23-element and 4 × 55-element arrays for 33 and 23 cm were conventional "H" frames (2 × 2 Yagis), the 84-element system for 70 cm used 4 stacked 21-element Yagis all on the same vertical mast. This takes up more vertical space, but offers the advantage of broader horizontal beamwidth for easier steering.

Six meters was a disappointment. The band opened sporadically, producing very strong signals from the Gulf and even the west coast, but the openings were brief and not well populated. Some of the problem was on our end. Our GaAsFET front end blew out about one minute into the contest, so we limped along with an unaided transverter until Saturday, when we replaced the preamp. Plus, we did have that lossy feedline until Sunday, when we worked up the ambition to replace it. Still, however, the band was not what it was for the June VHF QSO Party. Murphy strikes another blow.

The contest produced more positive comments, either directed to us or overheard, than the previous two VHF WPXs. Folks seemed deliriously happy with the conditions and activity, and we received several reports of "Congratulations! You really hit it right this year!" Many big-gun VHFers and contesters were heard participating, and there were more stations signing portable than I can recall hearing in any past VHF contest. I hope everyone had fun . . . *and mailed in his logs*. We'll try to run a "top claimed scores" listing in the January issue.

In Other News . . .

Henry, N4HB, of Richmond, VA wrote to tell a bit about his experiences during the June VHF QSO Party and the sporadic-*E* session on June 29–30. Henry says, "It was the best opening I have ever been involved in" and that he worked six new states, including Wyoming on 2 meters, during the two-day session. N4HB is now operational on 220 MHz using a TS180S with an MMT220/28 transverter and a Cushcraft Boomer at 85 feet. Henry's fighting reverse-TVI from Channel 12, but is open for skeds and hopes to have an amplifier running by the time this is printed.

Reverse TVI? Sure. That's interference to amateur reception caused by TV broadcast stations. The 135 cm band suffers more than any other from this, since it is very close to Channel 13, a popular allocation around the country. There are various methods of reducing the interference. One of my favorites is to use high-Q tuned cavity resonators in the receive feedline. Fair Radio Sales (Lima, OH) sold sets of frequency-adjustable filters which tuned in adjacent frequency ranges throughout the VHF spectrum and were ideally suited for this purpose. Henry, you might contact the folks at Fair Radio to see if they still have any of these filters for the 220 MHz range. They offer about 20 dB rejection at 216 MHz when tuned to a center frequency of 220.

N4HB also has an intimate relationship with Murphy. He says that during the June VHF contest when he and Tom, WB4BVY, were operating from his home, he cut his hand wide open on a tin can top, requiring a trip to a hospital emergency room and seven stitches. Sorry to hear about that, Henry, but Murphy eventually gets us all.

Another report of the phenomenal 144 MHz *E*-skip opening of 6/29–6/30 came from Axel, N8AXA (OH), who mailed a copy of his log! N8AXA worked 33 stations in 16 grids during the two-day period, snagging a new state (Wyoming) in the process. Good work, Axel. Did anybody hear anything on 220 during that session?

Harry, KA3B, is gathering material concerning 6 meters for a possible book he's planning to author. He'd like to cover all aspects of 6 meter operation and examine the history of the band as well. Harry's asking for photographs of operators and their antenna systems, mobile installations, beacon stations, and DXpeditions. He writes, "I am also in need of any written material relating to 6 meters, such as old bulletins and newsletters, as I'm planning a chronology of events. Any material such as promotional literature for equipment of past years would be helpful as well. If there is anyone who can provide me with any of the above

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2 Meters

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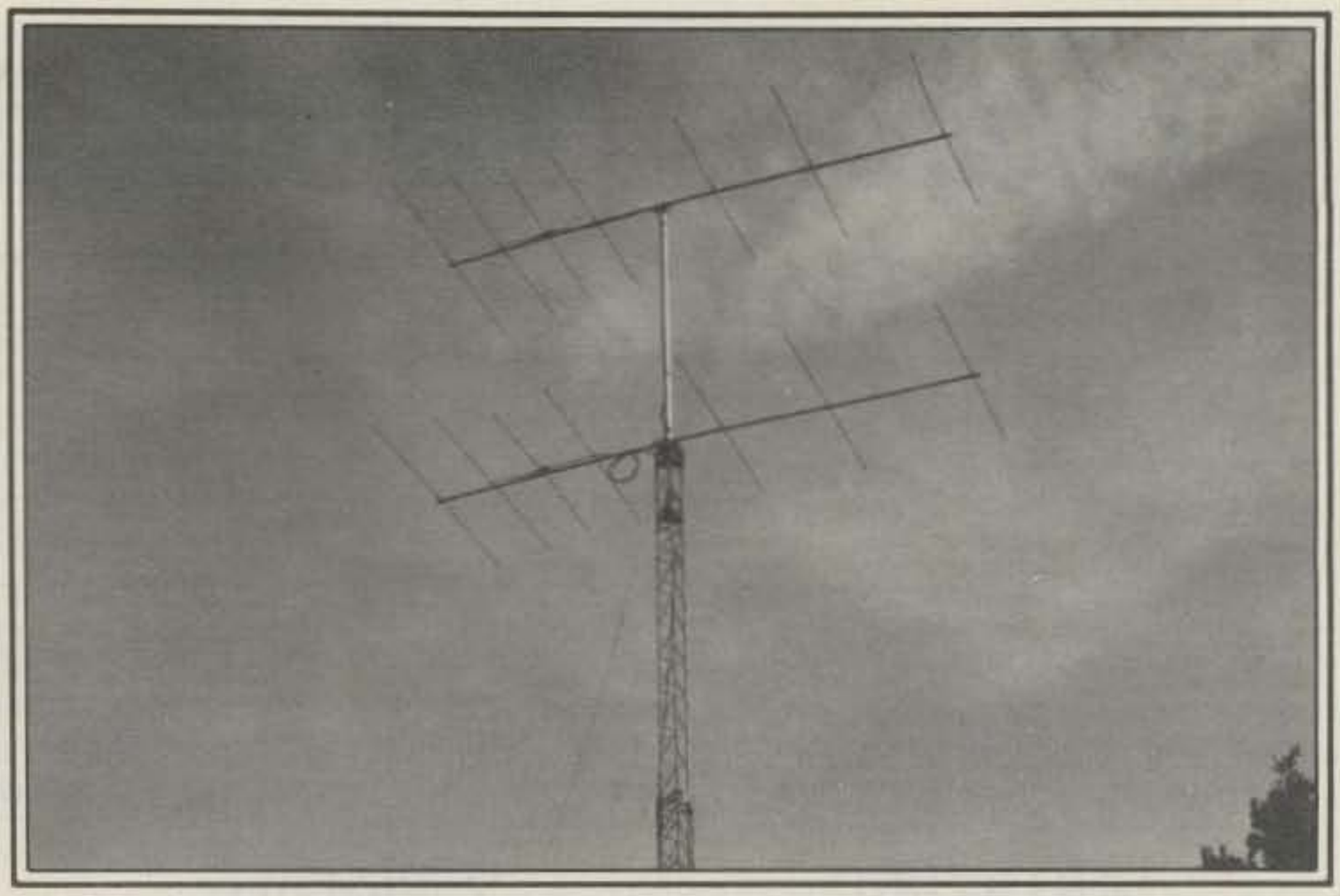
it will be greatly appreciated." Does this mean you want photos of my old Gonset G-50, Clegg Zeus, and Hallicrafters HA-6, Harry? Boy, am I dating myself.

KA3B also relates a bit about his experiences operating from AC3T in Delaware for the June QSO Party and the July WPX Contest. In June he made 400 Qs in 161 grids on 6 meters, including 47 states and five provinces. He says he was state #50 for three people and #49 for quite a few others. While setting up for the July contest, also at AC3T, he heard G3TKF on 50.110 CW at 2050Z on July 17. The UK station built in signal strength from S1 to S9+, which prompted Harry to move to 50.180 and call CQ. In the following hour he worked 18 Gs, 5 GWs, and EI9BG. Good work, Harry!

Anyone who can help out KA3B with the information he requests is urged to write Harry A. Schools, 1606 South Newkirk St., Philadelphia, PA 19145.

Remember FCC General Docket 87-14, which proposed the reduction of the 135 cm amateur allocation from 5 to 3 MHz? As of this writing, this issue still isn't decided. The response, however, was overwhelming, with more than 5000 opposing comments received by the FCC. And that total does not include reply comments, which relate to comments filed by other parties. If the Commission is deluged with comments, it may take several months for any decision to come about. Meanwhile, at least two commercial interests have already advertised the availability of ACSB equipment manufactured for the "220 MHz commercial band." Bah! Humbug! Of course, this all might work out well for us. Assuming we retain the entire 5 MHz as an amateur allocation, and these manufacturers have already built an inventory of commercial equipment for the band, the gear may become available for a song! Thanks to *220 Notes* for information contained above.

Speaking of 220 MHz, a band where Novices now enjoy phone (voice) privileges, *CQ* is sponsoring a brand new award called the *CQ* Novice Century Club. The rules are simple: Novice operators need to work and exchange QSL cards with 100 different stations on any or all the Novice bands using any mode, then prepare a list of claimed QSLs on an award application form, have the listed QSLs verified by two higher class licensees, and mail it in.



The 14-element stacked array for 50 MHz at KC2PX was temporarily installed about 200 feet behind the operating shack for the VHF WPX Contest (KT2B), leading to rotor problems caused by excessive control-cable line loss. These 20 foot long Yagis were stacked just 12 feet apart—not optimum, but they worked well.

There's no application fee. Application forms are available from *CQ*, 76 N. Broadway, Hicksville, NY 11801. Successful applicants will receive handsome numbered certificates. What a wonderful idea! I hope *CQ* awards thousands of these certificates, as each will be a testimonial to an active Novice class operator. We all know that it's only the active Novices who go on to bigger and better things.

WB0DGF's editorial in the *Midwest VHF Report* for June discussed the age-old problem of domestic operators monopolizing the DX calling frequency for 6 meters, 50.110 MHz. W3XO has discussed this problem in his column in *QST*, as have I in these pages. Roger, WB0DGF, recommended we make suggestions on how to deal with the DX window, calling frequency, and other aspects of our 6 meter band plan and give them to N6TX, the ARRL VHF/UHF Advistory Committee chairman.

I've been tentatively invited to speak as a panel member on this topic at the Mt. Airy VHF Club ("Packrats") VHF Conference this month (October). I hope the discussion comes off as planned, and maybe we can resolve something. But still, only actual convention will dictate what happens. If we are upset about domestic stations interfering with weak DX signals at the low end of the phone band, we each can help individually by resolving to not answer them! When operators ask me for 6 meter meteor-scatter skeds on 50.110, or even 50.120 for the matter, I usually ask them to call back after they've sobered up. With a band that is 4 MHz wide, why in the world would I want to set up a schedule in the DX window? I usually shoot for 50.175 or so—higher if the band is crowded.

Still, I'll admit that 50.200 as a calling frequency may not be the best choice. One reason is that those of us using rigs that only tune in 200 kHz increments (Collins S-line and the like) won't be able to QSY up any higher without changing band segments and a lot of retuning. This is a problem on 2 meters as well, though, and we seem to be dealing with it. Whatever the majority decides, I'll be happy to go along with it. There was initial resistance to 144.200 as the calling frequency, remember?

Where to put the mobile rig is neither an earth-shaking nor an age-old problem ('57 Oldsmobiles had lots of room), but we still encounter it daily. I just took delivery of a new Volvo 740 Turbo and had to move my little Alinco ALR-206T from the Cressida to the new Swedish machine. No sweat. I used the same mounting method in the new car, and that is to secure the mounting bracket to the passenger side of the center console, with the rig's panel facing me, the driver. Actually, the Volvo has a lot of interior room, and I'll probably add a 220 MHz rig as well.

Dick Waite, W6MJO, mailed in a letter and a couple of photos of his solution to the rig-mounting problem in a Datsun 200SX. He applied mating strips of "velcro" to the under-

side of the rig and the side of his center console, and just sticks the rig to the console. That's so easy that I can't believe I didn't think of it first (being a very simple person). Dick says the velcro works fine, and uses just a single strip on the rig and the console. Dick's rig is also an Alinco, purchased after reading my review of the radio in this magazine. Good choice, Dick. My ALR-206T is still working flawlessly after about 60,000 miles of bumpy roads.

The bad news is that Q Products, Bozeman, MT is no longer carrying SSB Electronic VHF/UHF products. The good news is that Val Comm, Inc. of Albuquerque, NM is. Val Comm President Mel Pfeffer, W5LTR, says his firm is the authorized U.S. distributor for sales and service of SSB Electronic products and is presently importing all the product line, including preamps, sequencers, converters, and transverters. Of considerable interest to the VHF/UHF weak-signal community is the MV144 and MV432 series of masthead low-noise preamplifiers, and the LT23S (23 cm) and LT33S (33 cm) linear transverters. The LT33S especially is a hot item because it is the only commercially available, wired and tested linear transverter for the 33 cm amateur band, and literally every station I've worked thus far on 903 MHz is using one. So am I, and I intend to review this unit in the next couple of months.

If you're interested in SSB Electronic products, write to Val Comm Inc., 249-B Muriel N.E., Albuquerque, NM 87123, or call them at (505) 292-7509.

Merle Rummel, W9LCE, of Richmond, IN, wrote to ask for information on the design of "cavities" for microwave amplifiers. He wrote, "Twenty some years ago I received info on a P-P 4X250B cavity amp for 432 MHz (since lost) . . . How does one design one's own? How do you locate the power tube/transistor in the cavity?"

Merle, I don't think anybody uses push-pull cavity amplifiers on 432 MHz. Actually, I've never seen a push-pull cavity amplifier. Every design I've seen is single-ended, with a single tube or tubes in parallel. And it is my opinion that the most attracive feature of a resonant-cavity power amplifier (very high Q and efficiency) is outweighed by the problems of tuning instability and thermal drift when used at frequencies as low as 432 MHz. I wouldn't recommend using a resonant cavity design until the operating frequency is high enough to justify backing away from conventional stripline construction—probably about 1 GHz.

Generally, the tube or other active device represents a lumped impedance loading one end of a coaxial resonant cavity, thus modifying its natural resonance. When the cavity is excited with the power generated by the tube, an intense e-field is produced in the resonant structure, allowing one to efficiently deliver power to a load from convenient pickoff point using either inductive or capacitive coupling. If you study the engineering formulas I've provided, you'll find a convenient starting point for resonant cavity design to be 70 ohms impedance. Rather than re-inventing the wheel, if you'll tell me specifically what band and power level you're interested in, I can probably find a construction article to suit your needs.

Well, that's about it for this month. Get your last-minute antenna work done this month, if you can. The weather, at least for those of us up north, is not going to be getting better for a while.

73, Steve, WB2WIK

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TEMPO S-1 $95, Hy-Gain 10–40 meter vertical, $30. You pay shipping, send SASE. N5JVA, Tony E. Byrum, 322 Richmond, Rockwell City, IA 50579.

WANTED: Function switch, wafer, OFF-STBY-PTT-VOX for Eico 753 transceiver or purchase information. W. L. Newcomb, K4AON, RT1 Box 418, Daleville, VA 24083.

SELL: Portable tube tester, Lafayette Model TE-50A, looks/works like new, $20 or B/O. John, WB8IPG, 183 Tacoma, Troy, MI 48084 (313-362-2706).

WANTED: AEA CK-2 Keyer, Kenwood DM-81 Dip Meter, Dentron/Kenwood antenna tuner, Palomar Noise Bridge, back issues of Radiosport. AA6EE, 16832 Whirlwind, Ramona, CA 92065 (619-789-3674).

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WANTED: Small amp such as Heath SB-200, etc. Must be reasonable. WA4LSM, P.O. Box 163, Sumter, SC 29150.

NEED: Timex Sinclair User #5 to review and return. Fred Gunther, K7FG, 1402 W. Craig, Moses Lake, WA 98837.

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SALE: Collins 516F2 $120, 351D-2 $75, 516E1 $75, MP-1 $75, MM-1 $35. W3CJI, 215-433-4485.

WANTED: Novice CW transmitter, need not be working. Voelker, 101-23 Lefferts Blvd., Jamaica, NY 11419.

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OLDTIMERS! N6AW is compiling information for a series of articles and a book about W6AM. If you have a story to tell about Don Wallace, jot it down. If you have pictures of Don or his station from past years, please make a copy. (Costs reimbursed.) Send to: Jan D. Perkins, N6AW, 6200 E. Ocean Bl. #7, Long Beach, CA 90803.

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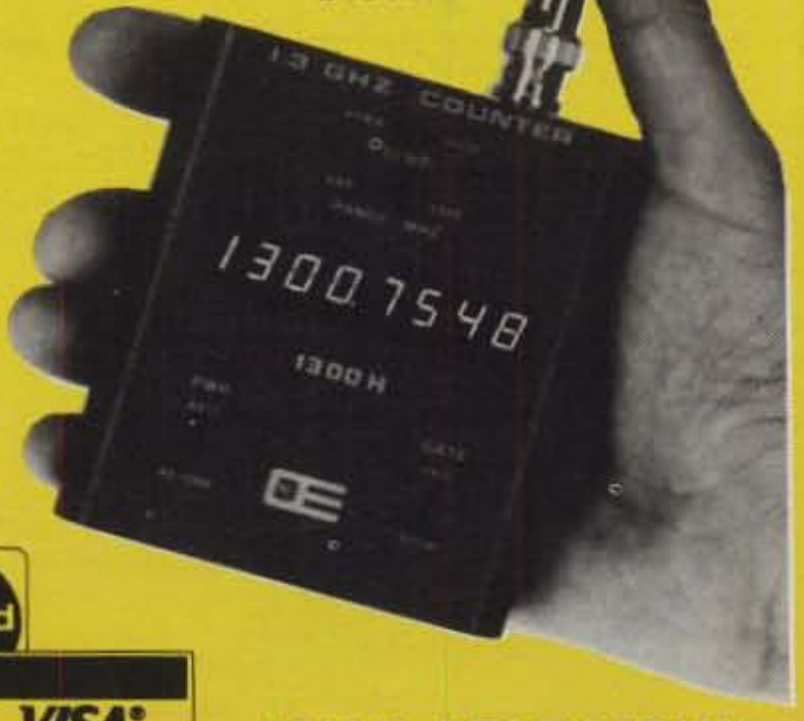

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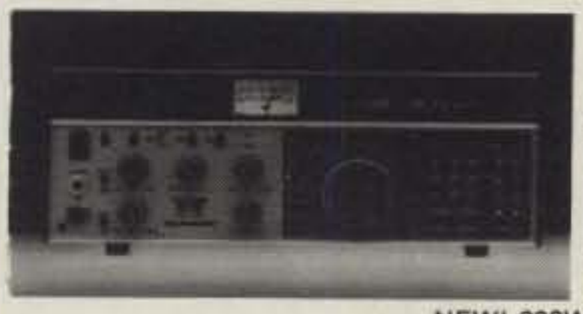

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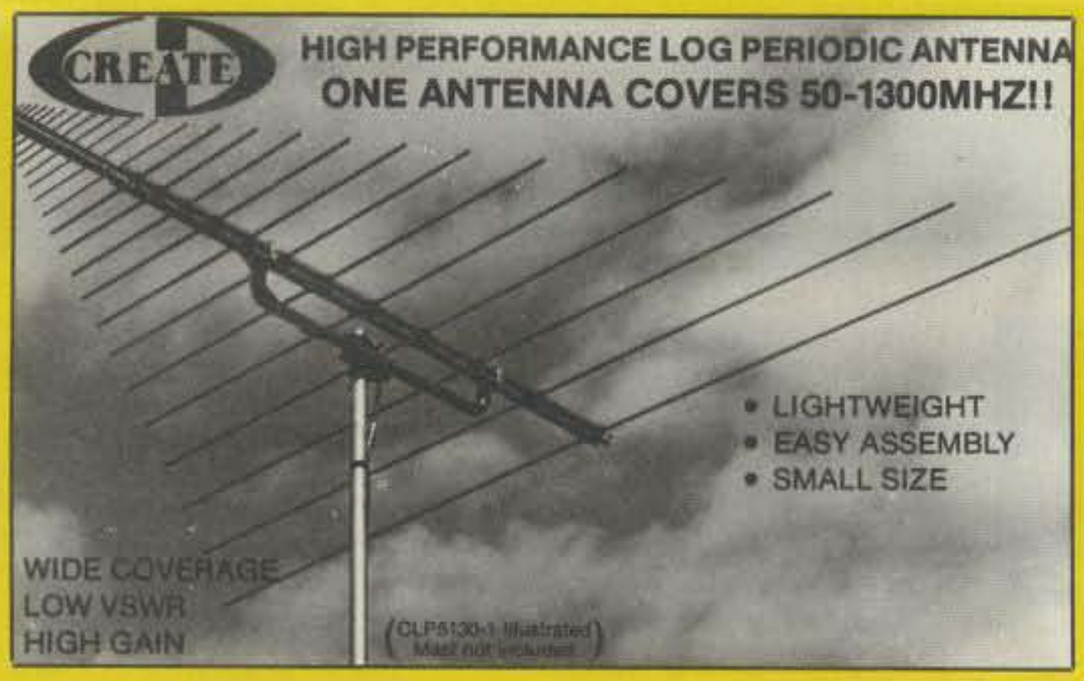
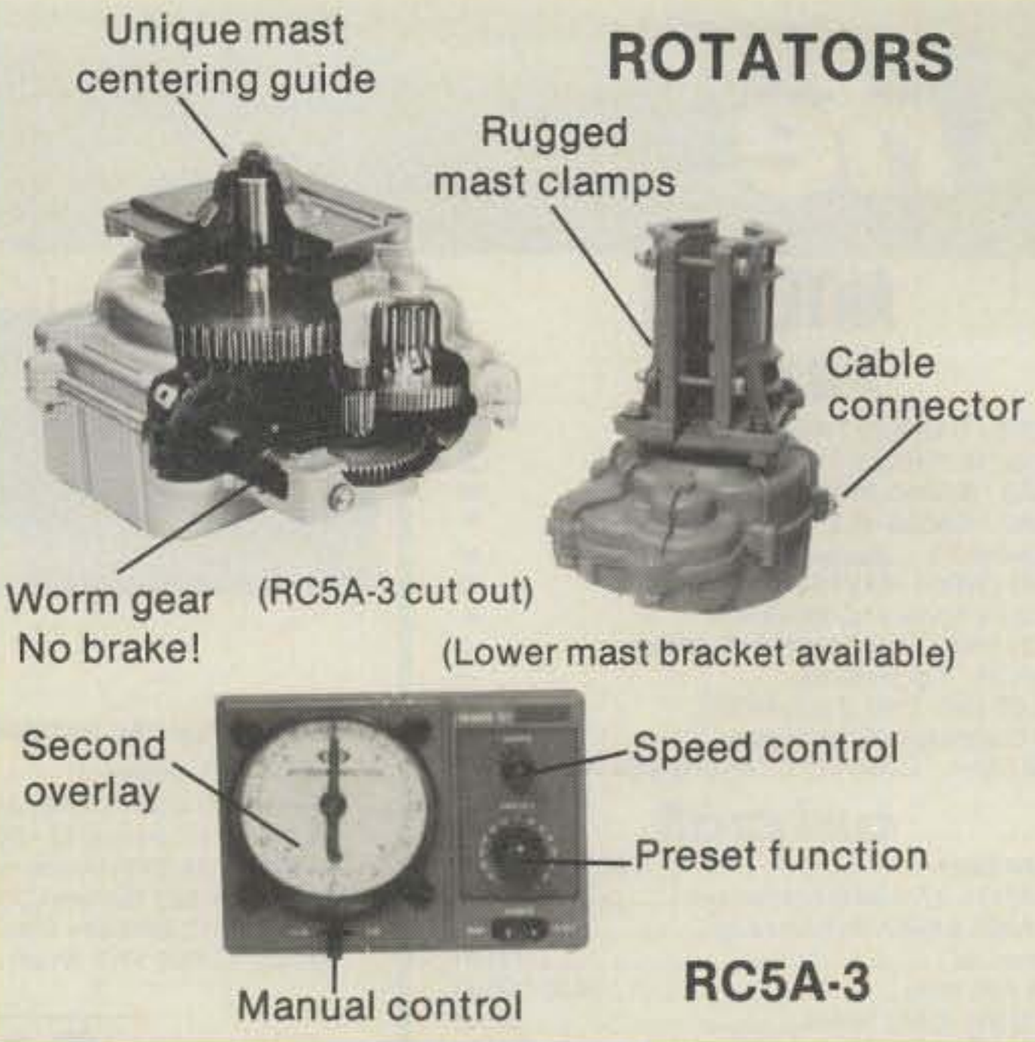
CIRCLE 162 ON READER SERVICE CARD



CLP5130-1 50-1300 MHz 25 el. 500W 6′ Boom $199 UPS
CLP5130-2 105-1300 MHz 20 el. 500W 4′6″ Boom $119 UPS

Operate on 6m, 2m, 1¼m, 70cm, 900 MHz and 1.2 GHz using only one antenna and one feedline. No tuning is required and the VSWR is 2:1 or less across the entire frequency range with excellent forward gain. The boom is made of high quality aluminum and the elements are precut for easy assembly. Each model can be mounted for either vertical or horizontal polarization. Create VHF/UHF log periodics are great for the amateur bands, scanners and numerous other applications.



RC5-1	10 sq. ft.	**$229**
RC5-3	10 sq. ft. preset	**$299**
RC5A-2	25 sq. ft.	**$373**
RC5A-3	25 sq. ft. preset	**$436**
RC5B-3	35 sq. ft. preset	**$736**

(All rotators are UPS shippable)

See Lew McCoy's Review In August 1987 Issue Of CQ.

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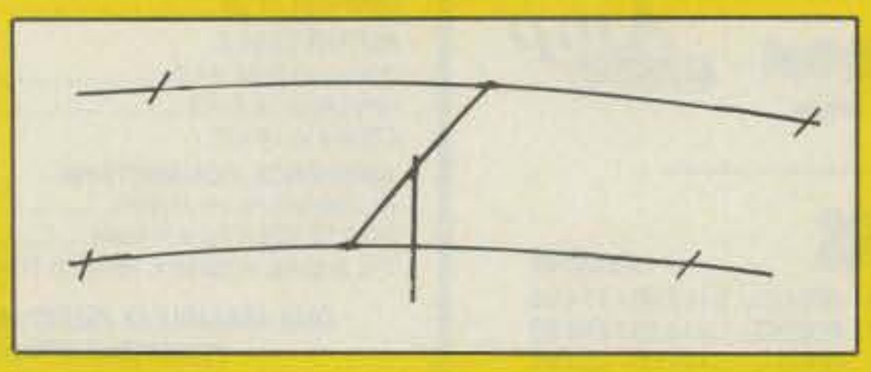
Creative Design Co., LTD.®

CV-48 is a ruggedly built 40 and 75 meter vertical. Overall length of 40′8″ means full size performance on 40m. Antenna comes with radial system. An optional adaptor for 80m is available. Handles 2KW PEP.

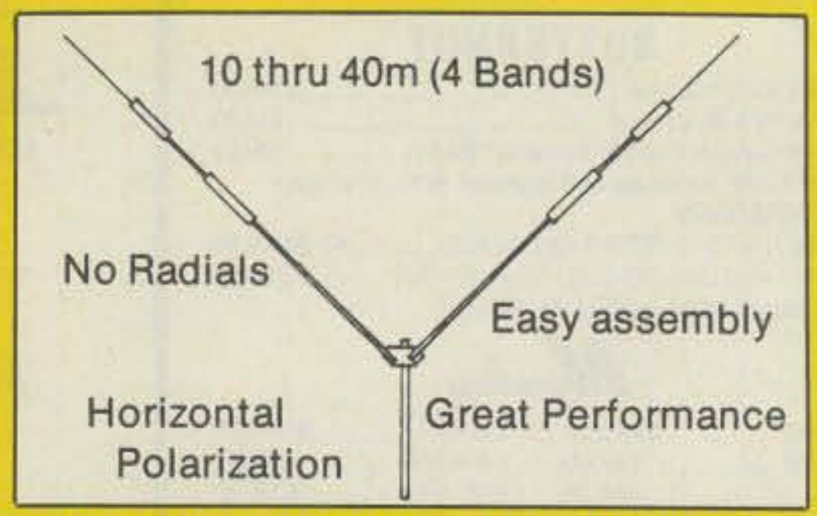
CV-48 $251 UPS AD-385 (adaptor) $63



Unique 2 element phased arrays offer excellent gain and front to back ratio compared to standard parasitic antennas.

AFA75-1	**75 meters 29′6″ boom**	**$1842**
AFA40	**40 meters 16′8″ boom**	**$ 344**

730V-1



The 730V-1 is a V-dipole consisting of two 19 ft. heavy duty, self-supporting elements and bracket with an efficient balun that is ready for mounting on a standard TV mast. The V-dipole is superior to standard vertical antennas in gain, noise and efficiency. **$148 UPS**

Rotatable dipole for 3.5 MHz and 3.8 MHz is 58 feet long. Tuning unit allows operation on 3.5 MHz.

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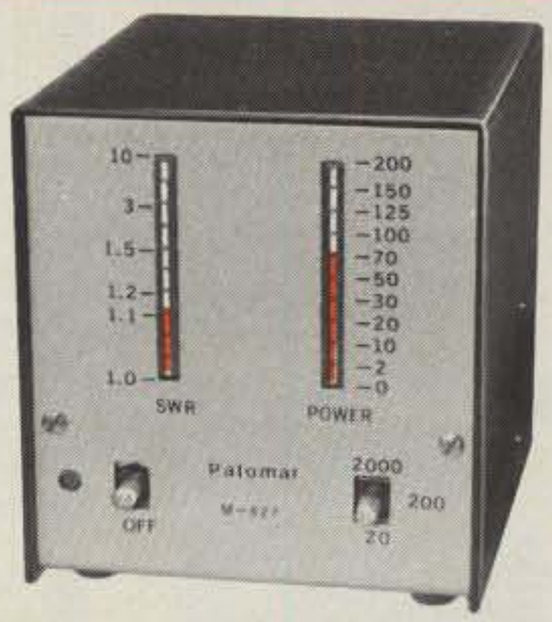

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You see, the FT-736R is the most complete, feature-packed rig ever designed for the serious VHF/UHF operator. But you'd expect this of the successor to our legendary FT-726R.

For starters, the FT-736R comes factory-equipped for SSB, CW and FM operation on 2 meters and 70 cm (430-450 MHz!), with two additional slots for optional 50-MHz, 220-MHz, or 1.2-GHz modules.

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CIRCLE 59 ON READER SERVICE CARD

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12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

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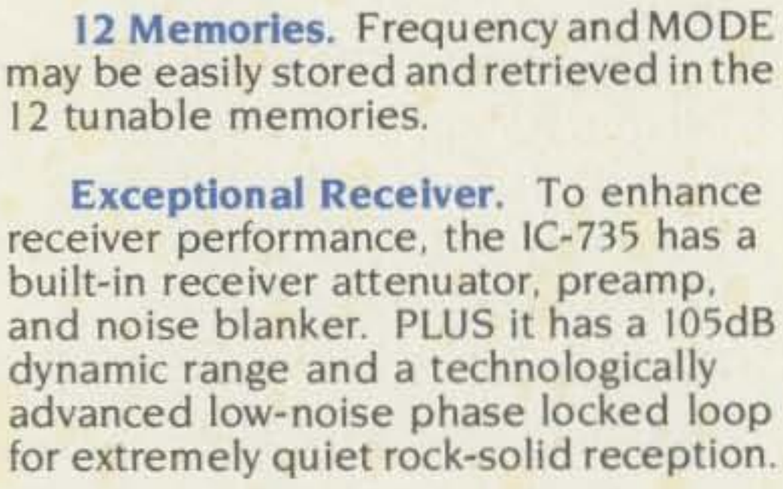

More Features. FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

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CIRCLE 74 ON READER SERVICE CARD

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